LG Stars – Road Safety Ratings for Local Government Roads Tool

Reference Document

RoadWise®

WALGA

THE UNIVERSITY OF WESTERN AUSTRALIA

WESTERN AUSTRALIAN CENTRE FOR ROAD SAFETY RESEARCH

Australian Government

MADE SAFER BY iRAP

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General Information

The WA Local Government Association's (WALGA) RoadWise is the Local Government road safety program.

WALGA's RoadWise works to build the capacity of Local Governments and works with other agencies to promote the adoption and application of best practice road safety.

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In addition, WALGA gratefully acknowledges iRAP for their contribution of in-kind support and cooperation in the development of this tool.

Contents

Introduction

This document has been prepared as a supplement to the Road Safety Ratings for Local Government Tool Assessment Guide and contains reference information relevant to using the tool. The document is divided into five sections:

- Literature Review
- Consultation
- Tool Development
- Pilot Project
- Future Directions
- Other Tools

Literature Review

Introduction

Local Governments (LGs) are responsible for over 87.2% of WA's road network and therefore have an important role to play in improving road safety (WALGA, 2021). LGs are responsible for funding, planning, designing, and operating safe road networks in their local areas (National Road Safety Strategy draft; Commonwealth of Australia, 2021).

Deaths and serious injuries in regional and remote areas – many of which occur on LG- managed roads – are often worryingly high. A review of crash data from Australia and New Zealand by Turner, Pyta, Woolley and Zhang (2010) indicated that 52% of casualty crashes and 40% of fatal crashes occurred on LG-managed roads. For unsealed LG roads, the risk was over two times as high as state-managed roads (Turner et al., 2010). Data supplied by the Road Safety Commission (15 December 2021) show that in WA in 2020, 53.9% of KSIs occurred on LG-managed roads in WA.

There are a range of barriers affecting LGs ability to effectively manage local roads in a way that maximises road safety for local communities (Durdin & Tuke, 2020; Turner et al., 2010). Many of the local roads in these regions are of low quality and LGs tend to receive less funding and have fewer resources available for improving road safety compared to State Government (Durdin & Tuke, 2020). Many LGs lack staff that have a sole focus on road safety and even less have expertise or training in this area (Durdin, Harris, Smith, McIntyre, & Beer, 2018).

Vision Zero was adopted by the Swedish parliament in 1997 as an example of an innovative road safety approach (Belin, Tillgren & Vedung, 2012). The goal of Vision Zero is that no one should be killed or seriously injured as a result of a crash on the road network. In the Australian National Road Safety Strategy 2021-2030, Australian governments have committed to a vision of zero deaths and serious injuries by 2050 (Vision Zero). Since the adoption of Vision Zero and the Safe System model, the approach to road safety in Australia has attempted to shift from the conventional approach (e.g., blaming the driver, treating roads and roadsides based on pre-existing crash history, etc.) towards the principles of the Safe System approach. The key principle of the Safe System approach is that the human body can only withstand limited forces in a crash before this results in a fatality or serious injury. For this reason, the transport system must be designed in such a way that these tolerances are not exceeded. This puts a focus on factors such as system failures, the responsibility of system designers and, proactive risk analysis and treatment implementation. However, McTiernan (2019) notes that for many road managers, particularly LG, the approach to road safety remains firmly embedded in the 'conventional' approach as depicted in Table 1.

Table 1: Differences between the conventional and Vision Zero approach to road safety

	Conventional	Safe System
What is the problem?	Accidents	Fatalities and Serious Injuries
What causes the problem?	Mainly poor road user performance Speeding, drink driving, inattention, deliberate risk taking	System failures
Who is ultimately responsible?	Individual road users	System designers and operators
What is the major planning approach?	Incremental approach to reduce the problem with an associated residual crash problem	A systemic approach to build a safe road system and minimise the harm
What is the appropriate goal?	Optimum number of fatalities and serious injuries based on competing objectives	Towards the virtual elimination of death and serious injuries
What is the trade-off?	A balance between mobility and safety	Maximising safe mobility
How is the effort coordinated?	Incremental gain within individual pillars (roads / speeds / vehicles / people)	Optimise solutions across pillars (roads / speeds / vehicles / people) – pillars compensate for each other where performance is poor
What are the cultural manifestations?	Legal liability avoidance and risk aversion	Risk assessment, innovation, trials and demonstrations
Context of tools in use	Bias towards pre-existing crash history, understanding crash causes and likelihood, optimising the network for motor vehicles	Risk analysis based on network design attributes supplemented by crash data, understanding crash consequence, optimising the network for all road users and human frailty

Source: Woolley, Sotkes, Turner, & Jurewicz (2018).

According to McTiernan, this is due to six main factors:

1. The road safety narrative: Until recently, LG remained absent from national and state level road safety strategies and action plans. There is also no legislated requirement to include road safety in their corporate and community planning processes, taking the onus away from owners of the local road network.
2. Road safety funding: The road safety funding model in Australia has traditionally relied on a reactive approach by focusing on crash locations. Ensuring funding is prioritised toward road safety treatments that demonstrate a clear safety improvement aligns with the Safe System approach.
3. A system perspective: The investigation of road crashes focuses on the prosecution of driving offences, rather than examining where the transport system has failed to prevent people being killed and seriously injured.
4. Training and professional development: There is a lack of systems-based training available to road practitioners, leading to a failure to develop a broad awareness of changes in road safety roles and responsibilities.
5. Technical guidelines: Technical guidelines are not always scalable to local roads and the needs of councils. As a result, suggested solutions are seen as inappropriate and unaffordable by local road managers. Austroads guidelines are also often seen as standards rather than guidelines and therefore, are often rigidly adhered to with no thought to taking a step beyond the guidelines.
6. Whole of council commitment: The lack of integration of road safety across council departments makes road safety vulnerable to priorities being diverted elsewhere. There is a lack of understanding and commitment to ensure each part of council delivers its contribution to road safety and monitors its effectiveness.

The new *National Road Safety Strategy 2021-30* (Commonwealth of Australia, 2021) draft outlines a role for LGs in funding, planning, designing, and operating their roads. This infers building and retaining road safety engineering capability in LGs, as well as undertaking road safety assessments and embedding road

safety as a key reporting requirement for the sector. *Driving Change: Road Safety Strategy for Western Australia 2020-30* (Road Safety Commission, 2020) also outlines a commitment to working with LGs to improve road safety outcomes. The Strategy recognizes the importance of all levels of government working together and in collaboration with communities and Local Government areas in regional, remote, and metropolitan WA to increase local understanding of Safe System solutions to road trauma.

Objectives

The overarching aim of this project is to create a new tool or adapt an existing tool to assess the safety of LG roads, help LGs prioritise road network investment, and support the implementation of the Safe System Approach. To facilitate wide-spread utility and uptake, it is important that the tool will not have substantial costs, be overly time-consuming, or require specialised expertise.

This report evaluates existing road safety assessment tools for roads and identifies other international examples to provide the background for the development of a LG road safety assessment tool.

Method

Multiple databases were searched to undertake a literature review of published, peer-reviewed journal articles from 1979 to 2020, including PubMed, Medline (Ovid) and PsychINFO. Grey literature, including web resources, conference proceedings, standards and government documents were also interrogated to ensure capture of all relevant literature.

The search terms included: “road safety AND risk rating OR risk assessment”, “International Road Assessment Programme OR iRAP”, “Australian Road Assessment Program OR AusRAP”, “European Road Assessment Programme OR EuroRAP”, “Australian National Risk Assessment Model OR ANRAM”, “Infrastructure Risk Rating OR IRR”, “Road Stereotypes”.

Literature Review of Existing Tools

International Road Assessment Programme (iRAP)

The iRAP is a registered charity organisation that works in partnership with governments, road authorities, mobility clubs, development banks, NGOs, and research organisations to help tackle the social and economic costs of road crashes (iRAP, 2019). iRAP was established in 2005 by the FIA foundation to assess roadways and road networks and provide ongoing support for organisations to be able to track their road safety performance.

Road Assessment Programmes (RAPs) are now active in more than 100 countries throughout Europe, Asia Pacific, North, Central and South America and Africa. The programme is the umbrella organisation for many RAPs around the world, including EuroRAP, AusRAP, usRAP, KiwiRAP, ChinaRAP, IndiaRAP, BrazilRAP, SARAP, ThaiRAP and MyRAP.

iRAP has developed five globally consistent protocols to assess and improve the safety of roads (iRAP, 2019):

1. Crash Risk Mapping uses detailed crash data to illustrate the distribution of recorded fatalities and serious injuries on a road network.
2. Star Ratings provide a simple and objective measure of the level of safety provided by a road’s design.
3. Fatality and Serious Injury Estimations illustrates the distribution of the expected number of fatalities and serious injuries across a road network.
4. Safer Road Investment Plans draw on approximately 90 proven road improvement options to generate affordable and economically sound infrastructure options for saving lives.
5. Performance Tracking enables the use of Star Ratings and Crash Risk Mapping to track road safety performance and establish policy positions.

Crash Risk Mapping

Crash Risk Maps provide an illustration of where fatal and serious injury crashes have occurred on the road network, and where the crash risk is greatest (iRAP). Figure 1 shows an example of a Crash Risk Map generated for the country of Poland. The road network in this Map is coloured according to the risk rating of the road, which ranges from high risk to low risk.

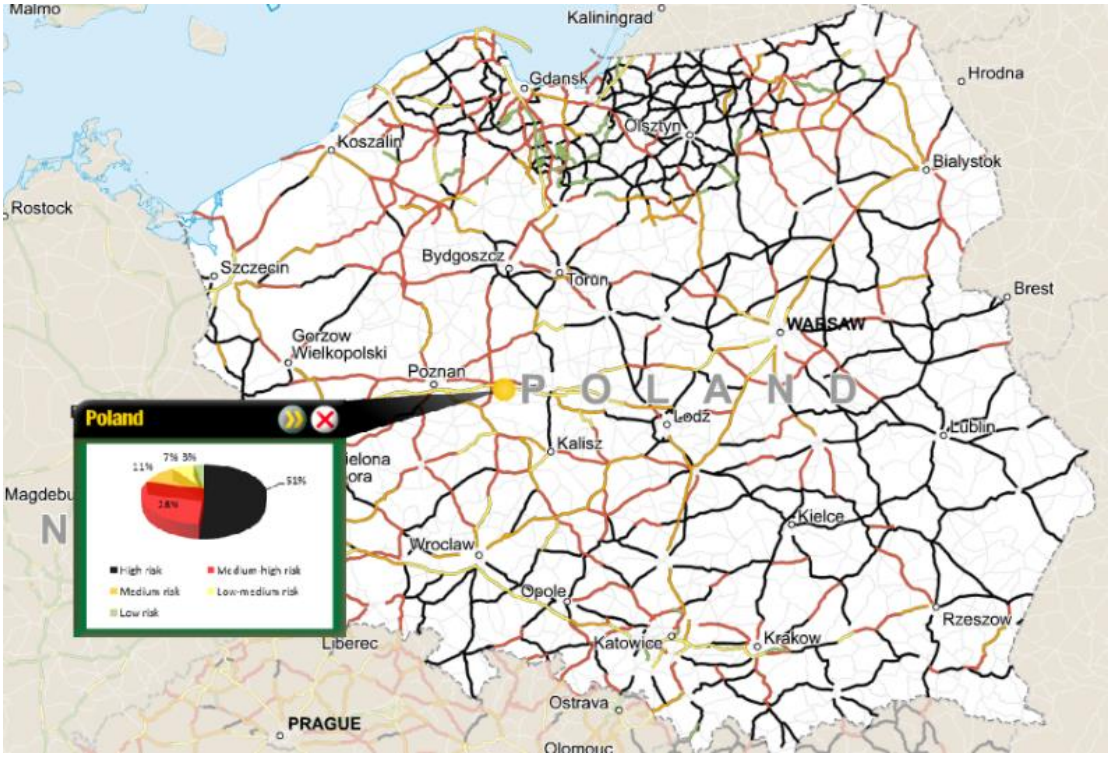
Star Ratings

Star Ratings provide a measure of the level of safety provided by a road's design. Star Ratings are produced through the road attributes in Appendix A that influence risk for vehicle occupants, motorcyclists, bicyclists, and pedestrians. Star ratings are rated on a 5-star system, with 5-star being the safest road to 1-star being the least safe road:

1. 5-star (green)
2. 4-star (yellow)
3. 3-star (orange)
4. 2-star (red)
5. 1-star (black)

A 4- or 5-Star rated road might include separation of opposing traffic by a wide median or barrier, good line-marking and intersection design, wide lanes and sealed shoulders, and footpaths, separated bicycle infrastructure and pedestrian crossings where necessary. A 1- or 2-Star rated road might include a single-carriageway road with frequent curves and intersections, narrow lanes, unsealed shoulders, poor line markings and no accommodation for bicyclists and pedestrians.

Figure 1: Star rated road network using iRAP



The use of Star Rating targets is becoming more prevalent as a road safety management tool for assessing the safety of road networks around the world (Smith, 2015). For example, as of 2015, The Netherlands was within 25km of achieving its 3-star target for national roads. Many other countries also have targets for achieving a 3-star target, including Highways England, which had a target of 90% by 2020, Sweden has a target of 100% by 2025, and Australia included a target of 3-star roads for 80% or its state roads and 90% of its national highways in the *National Road Safety Action Plan 2018-2020*. It is unclear whether these

targets have been met. No such targets were included in the most recent National Strategy draft or the Western Australian Strategy.

Fatality and Serious Injury Estimations

Fatality and Serious Injury Estimations draws on the road attribute data for each road user type, and network-level crash data, to provide an estimation of fatal and serious injuries along each segment of a road. Fatality Estimation Mapping can be an effective tool for understanding the implications of design decisions on vehicle occupants, motorcyclists, bicyclists, and pedestrians.

Safer Road Investment Plans

Safer Road Investment Plans draw on data from both the Star Ratings and Fatality and Serious Injury Estimations to determine the most cost-effective road upgrades and prevent deaths and serious injuries. Safer Road Investment Plans are created using the ViDA software and they also support road safety inspection and road safety impact assessment processes. Planners, designers, and engineers can use the information in the Safer Road Investment Plans together with their expertise and local knowledge to develop implementation plans and designs for road infrastructure improvements.

Performance Tracking

Road safety performance can be tracked over time using data from the Star Ratings and Crash Risk Mapping for a road network. Star Rating performance tracking provides a measure of road infrastructure and speed management over time and Crash Risk Mapping performance tracking provides a measure of the total road system safety outcomes.

Implementation Requirements

iRAP was developed with the aim of achieving Vision Zero by widely sharing global expertise and access to a road safety package for supporting jurisdictions to assess and improve their own road networks (Cavanagh & Sinclair, 2021).

iRAP has its own online software platform called ViDA for uploading road inspection data to produce detailed road condition reports, Star Ratings and Safer Roads Investment Plans (Cavanagh & Sinclair, 2021). Registration for the use of the ViDA software is free and provides instant access to online resources and tools for safety assessment and improvement of road designs. While some aspects of the program can be utilised by novice users, others require expertise in road safety engineering.

iRAP requires two types of detailed visual inspections of the roads depending on the availability of technology and complexity of the road network: drive-through and video-based (McInerney & Smith, 2009). The video-based inspections require a specially equipped survey vehicle (Figure 2) and trained raters and analysts to view and rate the video. To become accredited to conduct iRAP rating and analysis requires completing a training course, which is typically conducted over five days. This course includes information on the programme, instruction on use of software, analysis of the inspection manual and test rating. Drive-through inspections also require specialist training but involve a combination of real-time identification of road attributes and later inspection of video recordings.

Overall, the iRAP protocol is unlikely to be within the capacity or capability of many LGs in WA, who may have limited funding, extensive networks, lack of equipment and limited staff to complete the accreditation process or carry out data collection and analysis.

More information about IRAP can be found here: iRAP - International Road Assessment Programme (https://irap.org/).

Figure 2: Example of an instrumented survey vehicle

Source: ARRB

European Road Assessment Programme (EuroRAP)

The EuroRAP began in 1999 as a partnership between government and non-government partners, seeking to develop and promote consistent methods to measure and map road safety performance in Europe (EuroRAP, 2021). EuroRAP was developed prior to iRAP, which was developed based on several RAPs, including EuroRAP, AusRAP and KiwiRAP. EuroRAP is now used in more than 30 countries across Europe (EuroRAP, 2009).

EuroRAP uses the same globally consistent protocols developed for iRAP to assess and improve the safety of roads (EuroRAP, 2009):

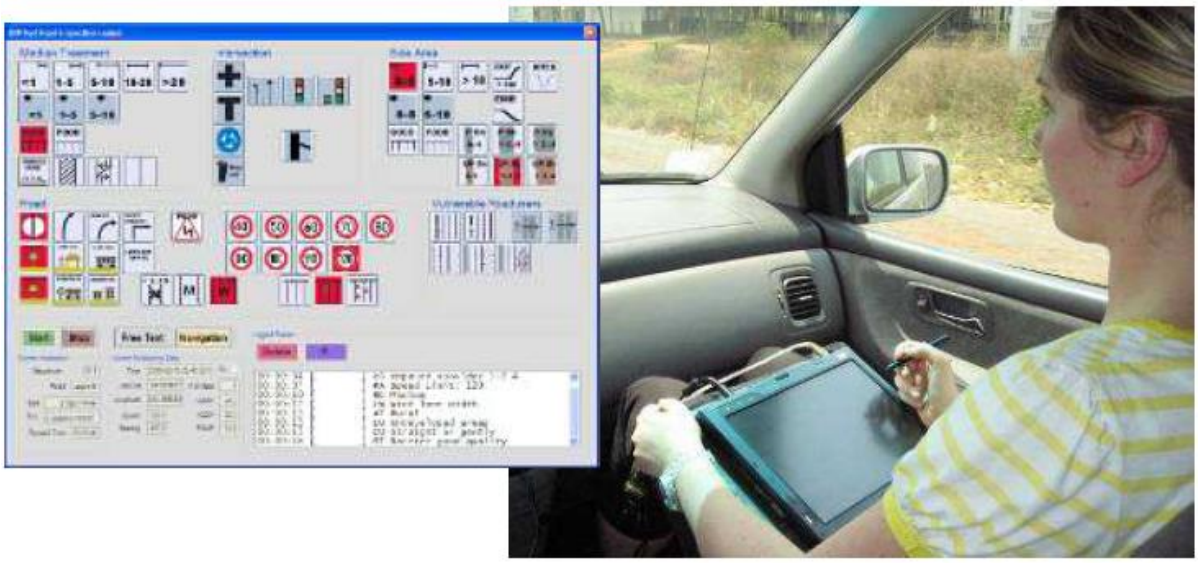
1. Crash Risk Mapping
2. Star Ratings
3. Fatality and Serious Injury Estimations
4. Safer Road Investment Plans
5. Performance Tracking

The protocols for conducting these steps are as described in Section 3.1.

According to the EuroRAP methodology (EuroRAP, 2009), EuroRAP Star Ratings are based on a visual inspection of a road's infrastructure elements. This involves two types of road inspections:

1. Drive-through inspections: partial collection of data during drive-through, partial rating retrospectively from video. A minimum of two people is required for these inspections, which involve a continuous record of road infrastructure elements. Figure 3 shows the EuroRAP accredited RAP Inspection Device interface which is used for drive-through inspections.
2. Video-based inspections: retrospective rating of all data, which are recorded at 5-10m intervals. However, the actual results are produced for 100m sections of road.

Figure 3: The RAP Inspection Device (RAPID)



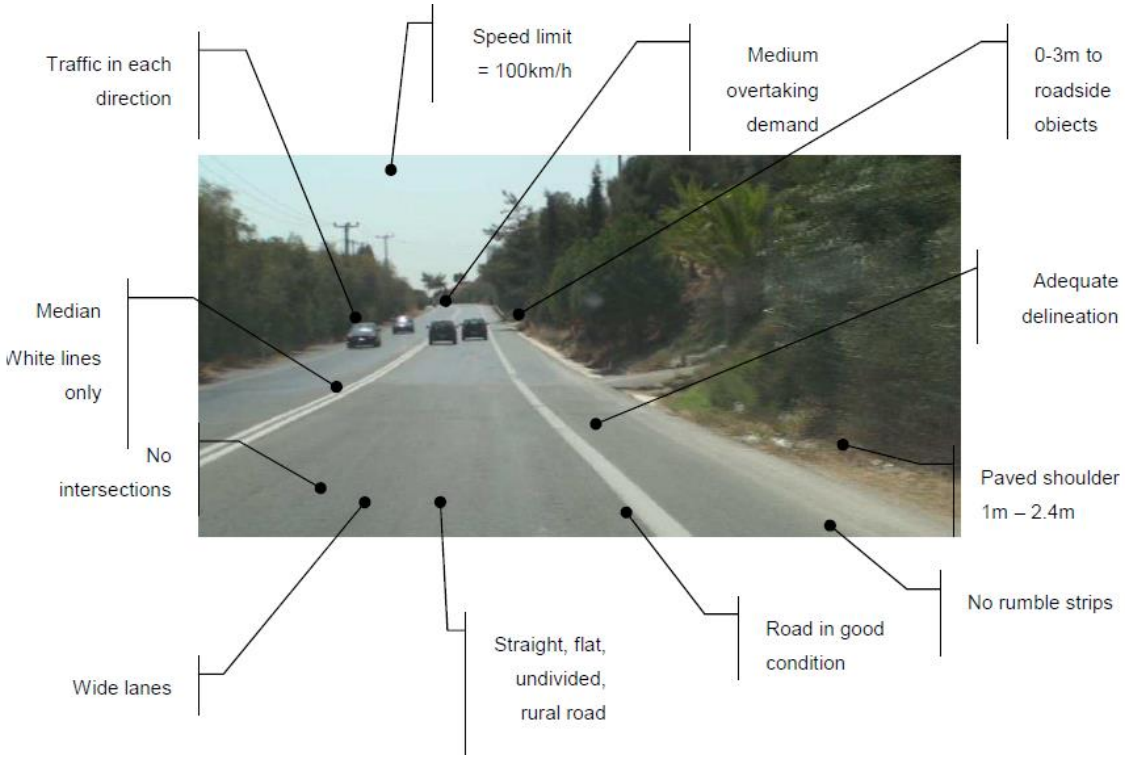
The type of inspection conducted depends on availability of technology, complexity of the road network, and capability and capacity of the surveyor.

In terms of capacity and capability, EuroRAP requires its surveys to be accredited by EuroRAP, which involves both accreditation for the individual surveyor/s and the technology used for surveying (i.e., vehicle, camera, hardware, and software).

A detailed condition report that summarizes roadway characteristics for the EuroRAP network can then be produced at the completion of each type of inspection, which will form the basis of Star Ratings.

As in the iRAP protocol, the Star Rating system is based on an inspection of infrastructure elements that influence the likelihood of crashes occurring and the severity of those crashes that do occur on the road network (EuroRAP, 2009). Road infrastructure elements, such as those shown in Figure 4, are assigned to categories by the surveyors/ raters, depending on its condition. For example, a section of road could be rated as adequate (e.g., sealed shoulders, edge lines, barriers, roadside hazards cleared) or as poor (e.g., absent seals and edge lines, no barriers, the presence of roadside hazards).

Figure 4: Road design element categories for infrastructure elements on a section of road



European Road Protection Score

Using EuroRAP software, a Road Protection Score (RPS) is calculated for each 100m section of road following the inspections of road infrastructure elements (EuroRAP, 2009). The RPS is a measure of the likelihood and severity of a crash occurring along the 100m section of road and forms the basis for the Star Ratings, and a subsequent Safer Roads Investment Plan.

To generate Star Ratings, each RPS is allocated to one of five Star Rating bands, with the least safe, 1-star, being black and the safest, 5-star, being green. This process is like the process used in iRAP. An important feature of the RAP protocols is that Star Ratings can be completed without reference to detailed crash data, which is often unavailable or unreliable in some countries. If crash data is available, however, it may be used to validate the RPS.

Implementation Requirements

The implementation requirements for EuroRAP closely mimic those for iRAP.

Australian Road Assessment Programme (AusRAP)

The AusRAP builds on its European equivalent by applying the philosophy of independent assessment in the Australian context, which has its own distinct road environments, traffic patterns and road safety governance (Metcalfe & Smith, 2005). AusRAP was introduced to Australia by state mobility clubs, with the Australian Automobile Association (AAA) providing leadership, and partnering with Austroads, ARRB and iRAP (iRAP, 2021). The program is now led by Austroads. AusRAP has worked together in conjunction with state, territory and LGs on infrastructure safety assessment and measurement since 2001 (iRAP, 2021). To date, over 300,000 km of AusRAP star rating and investment planning assessments have been completed, over 40,000 km of risk mapping and over 400 km of road designs have been star rated in Australia (iRAP, 2021).

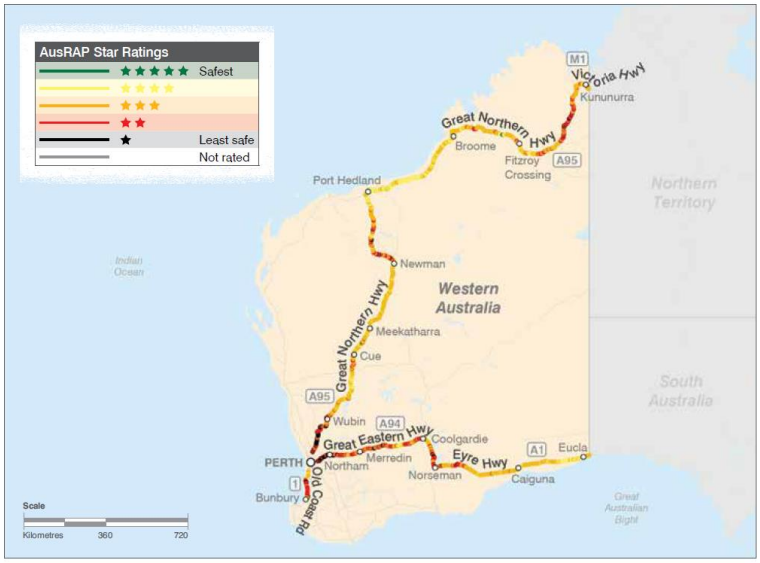
The AusRAP protocol is essentially the same as the iRAP protocol - AusRAP considers the physical attributes of a road every 100m and quantifies the safety risk associated with each of these to produce a Star Rating Score, from which Star Ratings can be determined. The model produces different Star Ratings for vehicle occupants, motorcycles, cyclists, and pedestrians.

In 2013, the Australian Automobile Association (AAA) produced a report documenting AusRAP's assessment of the national road network (AAA, 2013). AusRAP assessed 21,921 kilometres of national highway with a speed limit of 90 km/h or above and rated roads according to the AusRAP 5-star rating system. A higher star rating (4- or 5-star) is assigned to safer roads with design elements such as dual lane divided carriageways, good line markings and wide lanes, whereas a lower star rating (1- or 2-star) is assigned to unsafe roads with design elements such as single-lanes, undivided with poor line marking and hazards such as trees and steep embankments. The AusRAP analysis revealed that almost 40% of Australia's network was rated as either 1 or 2-star, more than 60% of the network was rated 3- to 4-stars, while 5-star stretches of road were negligible.

An analysis of 4,671 kilometres of Western Australia's highway network found that 5% of the network was rated as 1-star, 22% was rated as 2-star, 57% were rated as 3-star, and 16% were rated as 4-star. There were no 5-star rated roads on the network. Figure 5 shows the Western Australian star rating distribution by highway.

Figure 5: Western Australia star rating distribution by highway

Highways	Length (km)	Proportion in each Star Rating				
		1-Star	2-Star	3-Star	4-Star	5-Star
A94 Coolgardie-Esperance Highway	163.0	7%	47%	46%	0%	0%
A1 Eyre Highway	718.5	1%	9%	71%	20%	0%
A94 Great Eastern Highway	507.1	15%	52%	28%	4%	0%
A95 Great Northern Highway	3,041.4	4%	17%	60%	19%	0%
M1 Perth-Bunbury Highway*	161.6	6%	70%	22%	3%	0%
M1 Victoria Highway	79.8	0%	15%	84%	0%	0%
Total	**4,671.4**	**5%**	**22%**	**57%**	**16%**	**0%**



Implementation Requirements

The implementation requirements for AusRAP closely mimic those for iRAP. More information about the AusRAP program can be found here: AusRAP - Star Rating Australia's National Network of Highways - NRSPP Australia (https://www.nrspp.org.au/resources/ausrap-star-rating-australias-national-network-of-highways/).

Australian National Risk Assessment Model (ANRAM)

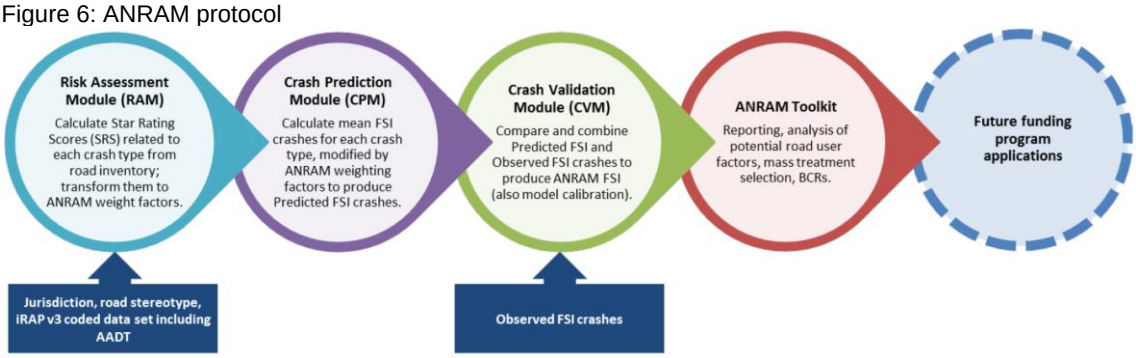
ANRAM was developed to be a nationally consistent approach to determining levels of severe crash risk on sections of the national, state controlled and major LG road networks (Jurewicz, Steinmetz, & Turner, 2014). It can identify parts or segments of the road network that require treatment and considers factors such as traffic volume, road engineering features, speed zones and severe crash performance.

ANRAM builds on existing crash risk assessment programs such as iRAP, AusRAP and NetRisk, to create a system directly relevant and applicable for Australian state and local road agencies (Jurewicz, Steinmetz, & Turner, 2014). It was developed in partnership with Austroads, Australian road agencies, the AAA, iRAP and ARRB.
Figure 6 presents the structure of the ANRAM protocol. Each module in the ANRAM structure is applied for each road section.

ANRAM is made up of four modules:

1. Risk Assessment Module (RAM)
2. Crash Prediction Module (CPM)
3. Crash Validation Module (CVM)
4. ANRAM Toolkit

Figure 6: ANRAM protocol



Risk Assessment Module (RAM)

The RAM allows the relative risk of different types of severe crashes (i.e., run-off-road, head-on, intersection, pedestrian and other) to be estimated, while also accounting for the effect of road features, speed, and levels of potentially conflicting traffic.

As with iRAP, a Star Rating Score is computed for each 100m carriageway segment, which are then averaged to produce ANRAM Star Rating Scores at a road section level (3 km on rural roads and 1 km on urban roads). The Star Rating Scores for each of the five severe crash types are also calculated for each 100 m segment and then averaged over the whole road section. Each of the five Star Rating Scores at section level is then transformed into an ANRAM Weighting Factor.

ANRAM also utilises road attributes (e.g., operating speed, skid resistance, grade, curvature, and delineation; See Appendix B) for the risk calculations, which is less than the amount utilised in iRAP. Each individual road attribute used in risk calculations has several categories referring to different levels of crash risk. Each category has a corresponding risk factor value. Values less than 1.0 indicate a lower risk than the category representing the baseline.

Crash Predication Module (CPM)

The CPM estimates the fatal and serious injury crashes (i.e., run-off-road, head-on, intersection, pedestrian and other) for each road section given its length, traffic flow, road infrastructure and speed, over a typical five-year period.

The five ANRAM Weighting Factors from RAM are then used to adjust the relevant mean fatal and serious injury crash value predicted from the model based on the road stereotype, section length and AADT for each road section. Aggregated, they form the Total Predicted FSI crashes for a given road section.

Crash Validation Module (CVM)

The CVM ensures that severe crash levels are quantified, regardless of the crash history, by calculating ANRAM fatal and serious injury crash estimates based on Predicted fatal and serious injury crashes and Observed fatal and serious injury crashes for each road section. It includes the local, road use and road user factors not included in iRAP's risk algorithms.

If the Predicted fatal and serious injury crashes score differs from the Observed fatal and serious injury crashes score for each road section, this may be due to a range of factors, including statistical variation in observed crash history, road use, crash reporting rates, roadworks, speed limit changes, and changes in speed enforcement.

ANRAM Toolkit

The ANRAM program provides a basic Toolkit that enables users to examine severe crash risk on the road network and explore potential treatment programs, as well as costings.

Implementation Requirements

ANRAM was developed as a nationally consistent approach to determining levels of severe crash risk on sections of the road network (Jurewicz, Steinmetz, & Turner, 2014). It is described as ideal for LG use as it addresses crashes which are dispersed across a road route, which is more common in regional and remote areas where traffic volume may be lower. This provides LGs with the ability to assign a crash risk rating to a road route which may have no crash history, which may open opportunities for road safety funding.

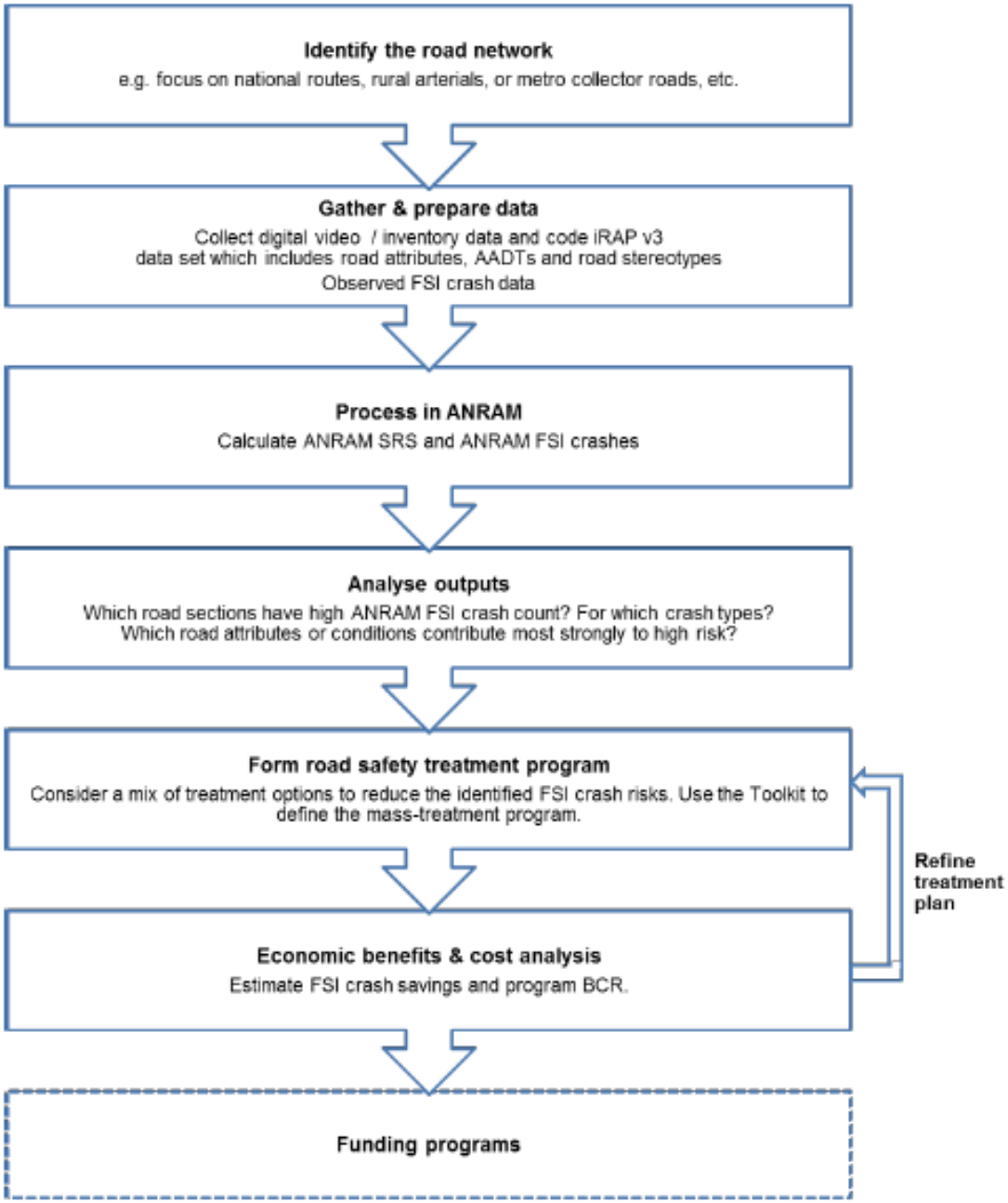
ANRAM provides a Toolkit to make it easier for road agency users to apply the protocol and analyse crash risk across the road network (Jurewicz, 2013). The ANRAM protocol requires resources such as survey staff (internal or external), data collection equipment, software, coding staff and analysts (See figure 7). Data collection involving digital video can be quite costly, particularly in regional areas.

The ANRAM software itself has basic system requirements such as Windows 7 or higher and Microsoft Excel 2010 or later. The ANRAM software uses the same data input format as iRAP and requires a specialised coding process by experienced staff from digital video.

ANRAM road data coding is associated with a significant effort and cost, depending on which of the following approaches is taken:

- In-house resourcing, which would require data coding staff to be trained
- Hiring an external experienced service provider
- Collaborating with established AusRAP partners and sharing the costs

Figure 7: ANRAM implementation process



Overall, the ANRAM protocol is comprehensive and in line with the Safe System approach to road safety. However, it is likely to be well beyond the capacity and capability of many LGs in WA, particularly regional offices which have limited access to funding, expertise, and equipment. More information on the ANRAM tool can be found here: ANRAM | Australian Road Research Board (arrb.com.au) (https://www.arrb.com.au/anram) and AP-R451-14 | Austroads (https://austroads.com.au/publications/road-safety/ap-r451-14).

Infrastructure Risk Rating (IRR)

The IRR method was designed to provide a better understanding of the function and safety risk of a road (Zia, Harris, & Smith, 2019). It is primarily used for speed limit setting. The IRR is calculated by coding the following road and roadside features (Zia, Harris, & Smith, 2019):

- Land use
- Road stereotype
- Lane and shoulder width
- Horizontal alignment

- Roadside hazards
- Intersection density
- Access density
- Traffic volume – rural roads only
- Speed limit – rural roads only

Austroads' Infrastructure Risk Rating Manual for Australian Roads (AP-R587A-19) sets out the steps for undertaking an IRR assessment (Zia, Harris, & Smith, 2019). Table 2 describes the four steps involved in the IRR assessment process:

Table 2: Infrastructure Risk Rating method steps

Step 1: Identify Supporting Data Sources Identify and code road and roadside features that impact on road safety risk using a range of data sources: • Aerial imagery (horizontal alignment, access density, intersection density) • Road asset management datasets (road stereotype, traffic volume, lane width, shoulder width) • Street view imagery (roadside hazards, land use, road stereotype) • Other datasets (e.g., map layers of land use activity or land use zoning, traffic count datasets, road centreline datasets and speed limit datasets)
Step 2: Identify Homogenous Sections Identify homogenous road sections where there is little variation across the IRR road and roadside attributes: • Split roads by land use (e.g., 'urban' or 'rural') • Split roads by road stereotype (e.g., 'divided road' or 'undivided road') • Break sections where there is significant change in horizontal alignment, on rural roads only (use aerial imagery) • Split the road when traffic volume shifts from one band to another for a significant length • Cluster urban roads with similar IRR attributes (e.g., 'local / access' or 'collector' streets) • Consider other factors (e.g., roadside hazards, significant change in road width, etc.)
Step 3: Code IRR Attributes Code each homogenous section against the IRR road and roadside attributes: • Land use – Commercial strip shopping (5.0) – Commercial big box/ industrial (4.0) – Urban residential (3.0) – Rural town/ urban fringe (2.5) – Controlled access (2.0) – Rural residential (1.5) – Remote rural (1.0) – No access (motorway/ freeway; 1.0) • Road stereotype – Unsealed (10.0) – Two-lane undivided (3.7) – Multi-lane undivided (3.4) – Divided (traversable; 3.0) – Divided (non-traversable) or one-way (1.0) • Lane and shoulder width

Shoulder Width	Lane width		
	Narrow (<3.0m)	Medium (3.0-3.5m)	Wide (>3.5m)
Very narrow (0 to <0.5m)	2.01	1.79	1.58
Narrow (0.5m to <1.0m)	1.79	1.45	1.18
Wide (1.0m to <2.0m)	1.22	1.00	0.85
Very wide (≥2.0m)	1.00	0.78	0.66

- Horizontal alignment
  - Tortuous (≥300 degrees of turn/ km; 6.0)
  - Winding (≥150 and <300 degrees of turn/ km; 3.5)
  - Curved (≥50 and <150 degrees of turn/ km; 1.8)
  - Straight (<50 degrees of turn/ km; 1.0)
- Roadside hazards (severe: 2.80, high: 2.28, moderate: 1.43, minor: 0.67 or low: 0.40, risk)
  - Cliffs
  - Deep water
  - Aggressive vertical faces
  - Deep drainage ditches
  - Buildings, rigid structures, or bridges
  - 20+ non-frangible point hazards per km
  - Upslopes and downslopes that would cause rollover
  - Car parking, semi-rigid structures, or buildings
  - Metal or concrete safety barriers
  - Low severity hazards such as kerbs, level and safe slopes, frangible trees, posts, poles, and wire-rope barriers
- Intersection density
  - 10+ intersections/km (5.00)
  - 5 to <10 intersections/ km (2.60)
  - 3 to <5 intersections/ km (1.50)
  - 2 to <3 intersections/ km (1.25)
  - 1 to <2 intersections/ km (1.15)
  - <1 intersection/ km (1.00)
- Access density
  - 20+ accesses/km (1.30)
  - 10 to <20 accesses/km (1.10)
  - 5 to <10 accesses/km (1.06)
  - 2 to <5 accesses/km (1.03)
  - 1 to <2 accesses/km (1.01)
  - <1 access/km (1.00)
- Traffic volume (rural roads only)
  - <1,000 vehicles per day (1.0)
  - 1,000 - 6,000 vehicles per day (1.4)
  - 6,000 - 12,000 vehicles per day (2.2)
  - 12,000 - 18,000 vehicles per day (3.0)
  - 18,000 vehicles per day (3.4)
- Operating Speed Factor (rural roads only)

Speed Limit	Horizontal Alignment			
	Straight	Curved	Winding	Tortuous
<=30 km/ h	0.15	0.15	0.13	0.13
40 km/ h	0.31	0.31	0.27	0.27
50 km/ h	0.55	0.55	0.49	0.33
60 km/ h	0.81	0.81	0.81	0.42

70 km/ h	1.25	1.25	1.11	0.47
80 km/ h	1.82	1.82	1.30	0.52
90 km/ h	2.54	2.54	1.41	0.58
100 km/ h	3.24	3.24	1.52	0.64
110 km/ h	4.28	3.24	-	-

Step 4: Calculate IRR Score and Risk Band

The IRR score is calculated using a multiplicative log equation using the category score for each category:
*IRR Score = Log*10*(Land Use x Road Stereotype x Lane and Shoulder Width x Horizontal Alignment x Roadside Hazard x Intersection Density x Access Density x Traffic Volume x Operating Speed Factor*
The IRR score translates to an IRR risk band, which determines the risk of the overall road network by length (below).

IRR score (threshold)	Rural	Urban
0 to <1.4	Low	Low
1.4 to <1.6	Low Medium	Low Medium
1.6 to <1.8	Medium	Low Medium
1.8 to <2.0	Medium	Medium
2.0 to <2.2	Medium High	Medium
2.2 to <2.6	High	Medium-High
2.6+	High	High

Risk Band	Percent of overall road network by length
High	5%
Medium-High	10%
Medium	50%
Low-Medium	35%
Low	

Implementation Requirements

The IRR is a simplified risk-based road assessment methodology and is based on fewer features than road risk tools such as iRAP or ANRAM, requiring the input of just 10 road variables (Chhanabhai, Beer, & Johnson, 2017). Calibration studies on Victorian and Queensland roads, compared against roads in New Zealand, have shown IRR to be a valid tool for use by state road authorities (Chhanabhai, Beer, & Johnson, 2017; Zia & Atabak, 2018).

The Austroads Infrastructure Risk Rating Manual for Australian Roads (Zia, Harris & Smith) contains little information regarding the implementation of the IRR protocol beyond the data collection methods required. According to the manual, a map-based tool for calculating IRR is available online. However, this tool was unable to be accessed at the time of writing. The assessment requires the identification and coding of road and roadside features that impact on road safety risk, including aerial imagery, road asset management datasets, Street view imagery using a platform such as Google Street View, and other relevant data sets. Site visits or drive-overs can also be undertaken to gather the necessary information for coding, particularly in areas where Google surveys have not been conducted in the area for some time.

While the coder/analyst does not need to be IRR accredited, some of the analysis requires expert knowledge and should be conducted by a competent road engineer or road safety practitioner.

Overall, the data collection and analysis of IRR would cost less and require less time and expertise than iRAP or ANRAM but is still likely to be beyond the capacity of some LGs in WA. More information on the IRR tool can be found here: AP-R587A-19 | Austroads (https://austroads.com.au/publications/road-safety/ap-r587a-19).

Road Stereotypes

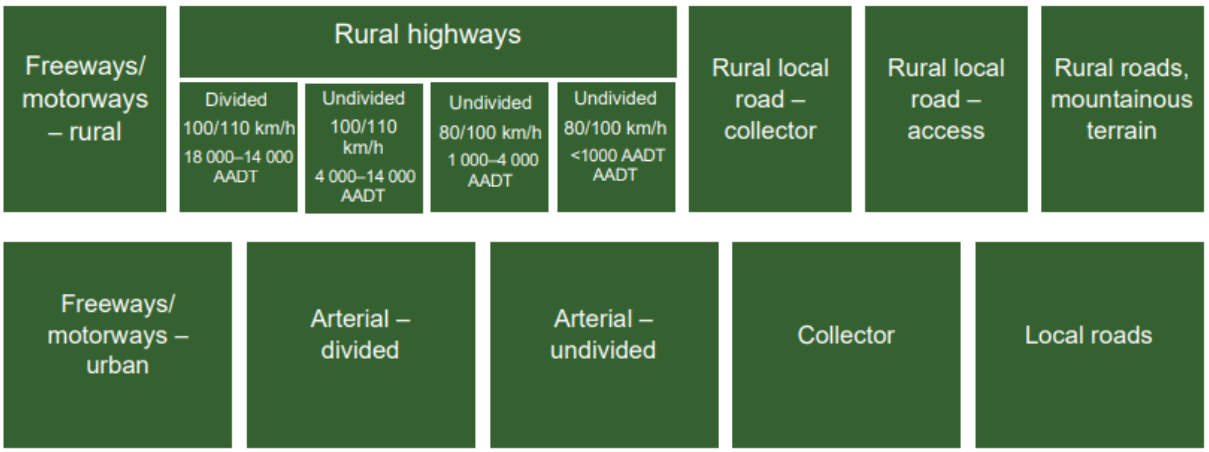
In 2020, Austroads developed the Network Design for Road Safety (Stereotypes for Cross-sections and Intersections) User Guide. This follows on from previous work, outlined in Road Cross-section Design for Road Stereotypes (including Network Safety Plans) and a Safe System (Aumann et al., 2020a). The aim of this body of work is to provide simple and easy-to-use guidance to achieve the safest network given jurisdictional resources, including available funding (Aumann et al., 2020b). The strategy is to adopt a 'stereotype' approach to road cross-section design and intersection treatments so that the best safety outcome for the network overall is achieved rather than focusing on improvements for localised road sections.

The approach helps practitioners determine:

- the road stereotype that matches the functional classification based on the road function, geometric characteristics, and traffic volume
- a suitable road cross-section treatment and standard that can be applied on a corridor/link
- the forecast (indicative) fatal and serious injury (FSI) crashes for the treatment (compared to that of the existing asset or alternative treatments)
- the corresponding iRAP star rating
- the expected benefits within available funding and resources, considering the aggregate cost of the corridor treatments and the forecast/aspired funding for the complete network.

Austroads determined thirteen road stereotypes as representing roads typically found in a road network, ranging from freeway/motorways to local access streets (Figure 8). The road stereotypes are based on the current classification systems and geometric characteristics, including number of carriageways, number of lanes, traffic volume and speed zones. iRAP and ANRAM road attributes were also factored into the development of the road stereotypes.

Figure 8: Stereotypes overview



Several design considerations were factored into the development of the road stereotypes, including road function and movement and place, the Safe System model, speed limits, and traffic type and volumes. To determine the road cross-section which provides the safest and most cost-effective outcome for each road stereotype, a network design assessment is conducted. The five-step network design procedure is outlined in Figure 9:

Figure 9: Network design procedure for road safety overview

The iRAP star rating and ANRAM predicted crash risk were assessed for each road stereotype, meaning the user is not required to conduct Star Rating calculations for this method.

Implementation Requirements

The Austroads *Road Cross-section Design for Road Stereotypes* project aimed to provide guidance to road safety practitioners, in the form of road stereotype tables and cross-sections, with a simplified method to improve safety performance on the road network in Australia (Aumann et al., 2020). This risk assessment protocol is more recent than iRAP, ANRAM or IRR and incorporates elements of iRAP and ANRAM.

While information about *Road Cross-section Design for Road Stereotypes* training is not available online, the Austroads manual alludes to training conducted in the testing phase of the development of the tool. ARRB also advertises training on their website for preparing Network Safety Plans using road stereotype tables and other methods within the *Road Cross-section Design for Road Stereotypes* protocol. This training appears to be intended for road safety practitioners and road engineers, as well as LG personnel in road-related roles.

The Austroads report does not specify the need for video-based surveys or drive-throughs to conduct a road stereotypes assessment. However, it is assumed that some form of imagery of the site is required, such as aerial imagery or street view imagery from Google Maps. This method would reduce the cost of data collection substantially, however a drive-through may be required if such imagery is not up to date.

From the information contained in the Austroads report, it appears likely that some level of road safety expertise is required to conduct a *Road Cross-section Design for Road Stereotypes* assessment, especially given training is required. However, it is likely that this method is much cheaper and less complex than the iRAP and ANRAM protocols.

More information on the Road Stereotypes method can be found here: AP-R619-20 | Austroads (https://austroads.com.au/publications/road-design/ap-r619-20) and AP-R618-20 | Austroads (https://austroads.com.au/publications/road-design/ap-r618-20).

Conclusions

LGs are responsible for over 87% of WA's road network but often do not have staff with a dedicated road safety role. Furthermore, the staff that are responsible for road safety may not have a good understanding of the safe system approach (see McTiernan, 2019). These handicaps would be less significant if risk rating tools existed that could be cheaply and effectively applied by LG staff.

This report reviewed the risk rating tools that could theoretically be utilised by LG staff to progress road safety in their jurisdiction, with a view to understanding the operational requirements of each approach. The table below displays a comparison of the evaluated risk assessment tools (i.e., iRAP / AusRAP, ANRAM, IRR, Road Stereotypes) and the associated requirements for implementation. Red and yellow boxes indicate what are likely to be significant and moderate barriers to implementation respectively, for many WA LGs.

Operational requirement	***iRAP / AusRAP***	***ANRAM***	***IRR***	***Road Stereotype***
Road safety expertise	HIGH	HIGH	MODERATE	MODERATE
Training	YES	YES	NO	YES
Accreditation	YES	NO	NO	NO
Time commitment	HIGH	HIGH	MODERATE	LOW
Cost	HIGH	HIGH	MODERATE	LOW
Instrumented survey vehicle	YES	NO	NO	NO
Route must be driven	YES	NO	NO	NO
Existing data sources can be used successfully	NO	NO	YES	YES
Software available	YES	YES	UNCLEAR	NO
Support available	YES	SOME (ARRB)	UNCLEAR	SOME (ARRB)

Based on this preliminary assessment, all the risk rating tools reviewed have at least some operational requirements that are likely to constitute a significant barrier to utilisation by some WA LGs. The assumption at this stage is that a tool that would be suitable for all WA LGs would require all the operational requirements in table 3 to be 'green'. That is, most critically, a low level of road safety expertise, little training, no accreditation requirement, little time commitment, relatively low cost, ability to use existing data sources, and availability of user support. However, this assessment is preliminary, and based on assumptions that will be empirically tested over the course of this project. The next stage of the project will test this assessment by consulting with WA LG staff. In addition, the consultation will investigate key contextual issues, including, level of understanding of and commitment to road safety generally, knowledge of these existing tools, resource availability, and existing practice.

Consultation

The Road Safety Ratings for Local Government Roads project commenced in July 2021 with the preparation of a comprehensive Literature Review of existing road safety rating tools. Phase 2, the consultation phase of the project, began in January 2022.

In order to ensure that the adaptation of an existing tool or creation of a new tool is tailored to suit Local Government needs, the Project Team undertook a consultation process, which included the dissemination of a survey, five in-person workshops, and two virtual workshops.

The consultation workshops involved a brief presentation to introduce the project, including a discussion of the goals of the project, the organisations conducting the project, and philosophical underpinnings of the project, followed by a detailed summary of the existing road safety rating tools. The presentation can be found in Appendix 1. Subsequent to this presentation, workshop attendees participated in a monitored discussion and four workshop activities.

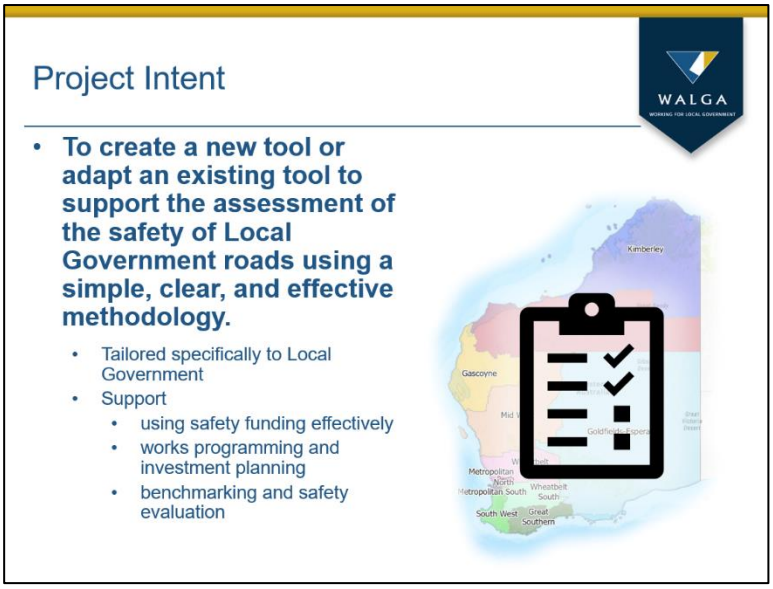


Figure 10: Sample Slide from Opening Presentation

Bright Ideas

In the first activity, attendees were asked to form small groups to brainstorm ideas for developing a Local Government road safety rating system, keeping the constraints of their specific Local Government in mind. This activity facilitated discussions around local capacity, available resourcing, and utility of a safety ratings method. Each group presented their findings at the end of this activity.

Operational Requirements

The second activity was a discussion of the operational requirements, i.e., what would be required from Local Governments to conduct a road safety assessment of their entire network. Many of these ideas came up in the previous discussions, so this activity led to a general discussion of these ideas. The Project Team noted the ideas on a flipchart.

Barriers and Enablers

Following on from the operational requirements discussion, the attendees were split into two groups. Each group listed either the key barriers or key enablers to generating a road safety rating system on a Local Government's road network on a flipchart. After approximately 10 minutes, each group switched and added any further ideas to those already noted. Participants were then asked to vote on the most important two barriers and enablers using coloured stickers. This exercise provided some information regarding what barriers and enablers to developing a safety rating system are most significant to Local Governments.

Outputs

The final activity was a facilitated discussion on the outputs of potential tools, including the key audiences and the specific format of the outputs. The results of this activity provided some valuable information regarding how the outputs of a tool might be used, including what other systems/programs might interface with the safety rating system and which audience would require which output type.

The results of the individual consultation sessions are presented in the following sections.

In-Person Consultation Sessions

Consultation – South West Region – 3 June 2022

WALGA staff travelled to Bunbury in the South West region of Western Australia on 3 June for the first consultation workshop. Despite numerous cancelations, the meeting went ahead with three attendees participating.

Figure 11: South West Consultation Workshop

How to develop a tool

During the discussion, the group advocated for collecting data on roads during the collection of other data, i.e. asset data, and recommended driving the network to ensure that local knowledge is supplemented by actual observations.

Steps to achieving a top safety rated road should also be defined, i.e., the tool should show what a high-quality road would look like as well as indicate current conditions. However, the group indicated that it will also be important to realise that the highest rating may not be achievable. Taking the environment, including context and type of road into account, will also be crucial in determining which safety features apply and make sense. Some recommendations may also be quite costly, and therefore out of reach for some Local Governments, so any recommended treatments should be organised by cost.

Operational Requirements

The group identified various operational steps and processes to develop a safety ratings tool for Local Government Roads.

- Recording (Video)
- Defined criteria to ensure consistency – this will help ensure compliance across different users
- Segmentation – Intersection vs. road vs. Context
- Current Condition – What is currently there
- Land Use/Future Development Considerations/Growth Projections
- Frequency of Hazards/Issues
- Build into current requirements, e.g., asset valuations
- Road User Group, e.g., active transport, freight
- Environmental Issues
- Context
- Flexibility

In a wide-ranging conversation, the key points included a consideration of context in the tool, ensuring that the information inputted into the tool is accurate, linking the tool with current processes, and embedding different road users into the tool.

Enablers/Barriers

Various enablers and barriers to using a road safety rating tool at the Local Government level were identified by the group.

Barriers	Vote Count
- Staff Availability	2
- Complexity of Tool	2
- Data Collection Equipment	1
- Competing Processes	1
- Road Ownership	0
- Standardization	0
- Training Requirements	0
- Lack of Interest	0

Enablers	Vote Count
- Bettering Understanding of Network – Prioritisation / Justification	2
- Linkage to Funding (Carrot/Stick Approach)	1
- "In it Together" Idea – All Local Governments Participate	1
- Do a good job for the community	1
- Help explain why money is spent	1

The key theme from this section is that resourcing, including staff, cost, and expertise, will play a fundamental role in the uptake of the tool by Local Governments.

Outputs – Who is the target audience?

The group responded with some general ideas, including that any results should be credible, legible, and concise; that the tool should highlight improvements; and should create simple and clear maps/graphics. The target audience for any tool outputs would be the CEO, directors, and counsellors.

Outputs – Formatting

Regarding the best way to communicate the outputs, including the data in state-wide publications, such as the WALGA Assets and Expenditure Report, would be helpful. Maps/graphics were also mentioned as key outputs. Otherwise, the results should be framed as successes, rather than failures, and process outputs (kms improved) rather than percentages (0.01% of the network improved) should be highlighted.

Consultation – Metropolitan Region – 8 June 2022

The consultation session for the metropolitan region was held on 8 June 2022 at the Boulevard Centre in Floreat and was well attended, with 12 Local Government officers and one Elected Member in attendance. In total, nine metropolitan Local Governments were represented.

How to develop a tool

The attendees formed three individual groups to respond to the question, "Considering your Local Government's capacity, how would you develop a tool to rate the safety of Local Government roads?"

Group 1

This group discussed ensuring that the proposed tool would be able to be embedded within current procedures, such as routine inspections (e.g., maintenance, asset video assessment) and audits. The interface with other tools, such as Crash Map, was also mentioned. Additionally, the existing warrants should be considered as part of this tool.

A lack of resources was also identified in this group as an issue, while a lack of knowledge (i.e. asset management people are not necessarily aware of road safety) at the officer level also came up. Political interference may also become an issue, so having a comprehensive scoring system for the entire network will help. Additionally, having a tool that is used across all Local Governments was viewed as helpful. Funding, especially linked to this network assessment, is key for the implementation of this tool. To support Local Governments with limited resources, this group proposed that resources for the assessment be shared among neighbouring Local Governments.

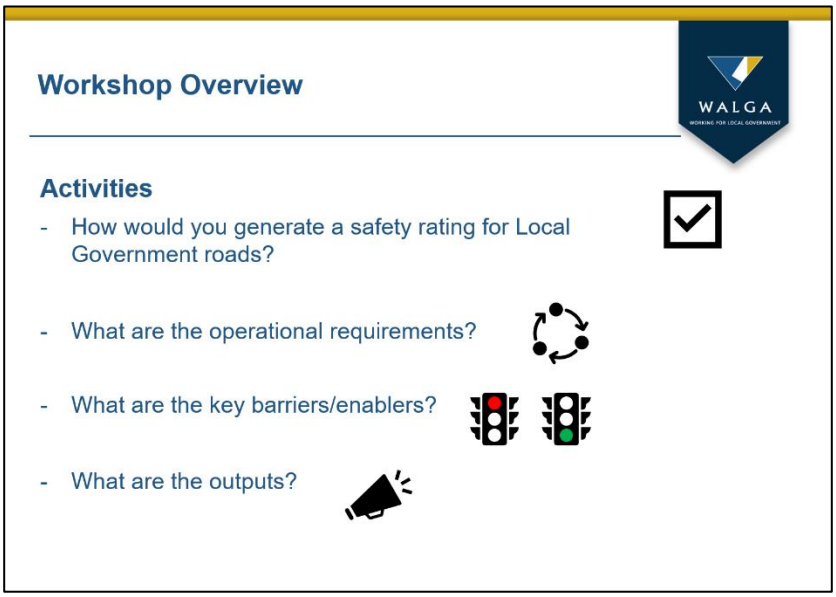


Figure 12: Overview of the Workshop Activities Slide

Finally, this group mentioned that different tools may be necessary for different contexts, i.e. urban, rural, remote, etc. Would this tool also consider different road users? This is an important consideration in the metropolitan region. Also, existing data, such as asset data, speed data, crash data, and volume data, should be utilised for the purposes of conducting this assessment.

Group 2

The second group discussed the relationship of risk assessments to safety ratings and how speed, local context, crash data analysis, and Road Safety Inspection data will relate to the development of a tool. Data collection was also a topic here. Will local knowledge of the asset be enough, or will additional data be required to perform an analysis?

Group 3

In order develop a safety ratings tool, this group discussed what key elements should be assessed and concluded that speeds, road width, and vehicles travelling are most important. The data should also be as accurate as possible. Sometimes existing data is outdated and the process to develop a road safety rating tool can help update data, including road hierarchy.

Using a holistic approach was also discussed in this group. Many of the tools come from external organisations, such as Main Roads WA, and are typically reactive (i.e., use crash data). Better outcomes are possible if the existing money is used wisely. The group also mentioned that road safety often sits at the bottom of the system, not at the top, so prioritising road safety is important. One other issue is that staff movement often leads to reduction in the capacity of Local Governments, so ensuring that the tool has a methodology that can be easily understood and replicated without the need for substantial training will be important.

Operational Requirements

Various operational requirements were identified by metropolitan Local Governments officers regarding what will be required to develop a tool to provide safety ratings for Local Government roads. The key items include the following:

- Staff Time
- Local Champions/Management Support
- A vision for what the best-case scenario road looks like
- Minimal expertise requirements? Training?

- Steps/Process on how to do it for consistency (remove bias)
- Overall collective data to use for advocacy (WALGA perspective)
- Context Sensitive (e.g., town centre vs. rural road)
- Future Development – What will the road look like based on community plans, development proposals, etc.
- Same tool for different roads? Will the tool be able to consistently evaluate?
- Active Transport must be considered

The group also discussed the data requirements of the tool. One discussion point was to establish what baseline data was necessary to use in the tool and what data is available to all Local Government across WA. The following data sources were mentioned as possible inputs into the tool development.

- Asset Management Data
- Crash Data
- Speed Data
- Volume Data
- Condition Data
- Pedestrian Counts
- Active Transport Counts

Enablers/Barriers

In the discussion regarding the key enablers and barriers to performing an assessment of the road network for safety, several new ideas were identified.

Enablers	Vote Count
- Management on Board/ Whole Organisation behind this	8
- Resources – Time, People, Money, Expertise	4
- Government Grants/Incentives/Funding (External)	4
- Case Studies, Best Practice, What has worked/what has not	1
- Ease of Use/User Friendly	1
- Fits into existing processes	1
- Management Plans	0
- LG Partnerships	0
- Strategic Direction	0
- Feedback/Community Support (Road Users)	0
- Availability of Data – Understanding what is out there	0
- Local Government Champion	0
- Internal Funding Allocation	0
- WALGA Support	0
Barriers	**Vote Count**
- Resources – Time, People, Knowledge, Equipment	7
- Human Resources – No Road Safety Officers	5
- Road User Priority Focus	4
- Funding	2
- Political Priority	1
- Requirement – currently do not need to do it	0
- Technical Understanding/Difficulty of tool to use	0
- Road User Priority Focus	0
- Elements outside of Local Government control have impact on crashes, e.g., Vehicle Features, Training for New Road Users	0
- Public still okay to speed a little	0
- Political/Community Understanding	0
- Staff Changeover	0

- Training	0
- Consistent Data across Local Governments	0
- Resources	0

Consistent with the consultation workshop in the South West, the key theme of resources (time, people, knowledge, equipment) was voted as most notable in enabling (if resources are present) or serving as a barrier (if no resources are available) to undertaking a safety ratings process. The group also identified the role of the Local Council in supporting the assessment; funding, both in terms of conducting the assessment, but also that the outputs of the assessment lead to funding outcomes; and a focus in different road users as important.

Outputs – Who is the target audience?

In response to this query, the group provided the following key points:

- Tool outputs should inform
    - Operational Plans
    - Budgets
    - Works Plans
    - Road Safety Action Plans
- Provide summary information to Elected Members
- Help develop road safety projects
- Provide clarity for different types of roads (we did this for these reasons)
- Internal Focus Priority
- Framing road safety to suit
    - Community
    - Managers
    - Elected Members
    - Internal Stakeholders

Additionally, the group mentioned that providing information to the public could have significant implications in terms of liability, but could be used later to showcase projects that improved safety on Local Government roads.

Outputs – Formatting

The data that is generated from the tool must be provided to Local Governments in a useful way. Participants identified the following formats as key in delivering useful outputs from the tool.

- Raw Data (CSV, Excel format)
- Online System
- Spreadsheet + Macro – Report Generation direct from Spreadsheet
- GIS Compatible format
- Visual/Infographic

Providing the data in an easily understandable way will be paramount in ensuring that audiences other than internal staff see the benefit of assessing the road network for safety.

Consultation – Great Southern Region – 13 June 2022

The consultation meeting in the Great Southern region was held in the Cranbrook Regional Community Hub in Cranbrook and was attended by six Local Government staff members and one Elected Member.

How to develop a tool

While the question (Considering your Local Government's capacity, how would you develop a tool to rate the safety of Local Government roads?) is open-ended, it does stimulate discussion about both capacity and possible methods for undertaking a network rating project. In the Great Southern region consultation workshop, the participants were split into two groups. Summaries of the discussion is provided for each group below.

Figure 13: Great Southern Region Consultation Workshop

Group 1

Group 1 discussed several topics, but broadly focused on two key topics, resources, constraints, and compatibility.

Under resources, the group discussed how money is not the only issue. The availability of quality people, including contractors, is a big issue, so this tool should be developed to keep this lack of expertise in mind. Additionally, having the tool be an "add-on" that must be completed on top of existing processes will make using the tool difficult.

Regarding constraints, this group identified the necessity of obtaining environmental approvals as an important consideration which may limit the ability of Local Governments to achieve the safest facility, i.e. a high safety rating. Otherwise, the road reserves are exceedingly small in some cases, further limiting Local Governments' ability to make improvements.

Any tool must also be able to integrate with existing processes and systems. Maintenance priority is always a question, so ensuring that the tool contributes to that is important.

Otherwise, cost questions are always an issue. Most Local Governments indicated that they did not have enough money to get ahead of their maintenance requirements.

Group 2

Like Group 1, Group 2 discussed the resourcing, constraints, and compatibility, echoing sentiments about the lack of guidance from other agencies, the trade-off between saving money and high-quality safety, and integrating the tools with asset management tools like RAMM.

Other topics, such as the need to standardise this tool to ensure that Local Governments use it consistently and creating a tool that will help educate/upskill the next generation, were also discussed. The fusion of local operational knowledge and engineering knowledge was also mentioned. The tool must be careful that recommended treatments do not make the road less safe, e.g. paving an unsealed road is not always the best outcome for safety.

Operational Requirements

The key operational requirements mentioned by the workshop participants include the following:

- Understanding of Local Context
    - Road Design
    - Road Purpose
- Availability of Contractors/Funding
- Resources – Need staff, time, and knowledge
- Compatible with Existing Data
- Many different Local Governments (metropolitan, rural, large rural, regional, remote, urban centres) – this tool should try to suit all
- Determination of what is being assessed
- Standardisation of ratings across Local Government boundaries
- Same operation between Local Governments
- Understanding of how often the tool will be repeated
- Adequate pilot test

Enablers/Barriers

In this activity, Local Government Officers and Elected Members split into two groups and provided their input on the key enablers and barriers for Local Governments in rating their road network for safety. The session ended with each participant voting on their top priorities.

Enablers	Vote Count
- Funding	6
- Training/Capacity	6
- Compatibility with RAMM/Automatic generation of safety ratings from RAMM software	3
- Simplicity – carries on from current practice/complementary	2
- 3rd Party Managed – remove the bias	1
- Incorporated into cost of project	0
- WALGA to provide leadership/coordination	0
- Capacity/Capability	0
- Buy-In – get users involved in journey	
- Carrots work better than sticks	0
- Policy or guidelines or mandatory – linked to funding?	0
- Flexible management – able to complete over several stages	0

Barriers	Vote Count
- Money	6
- Resources	6
- Time	4
- Knowledge/Capacity	1
- Transferring of Existing Data	1
- Conflicting Priorities – lack of Elected Member Support	0
- Maintenance vs Safety	0
- Time constraints on spending allocated funding already	0
- Difference in urban, peri-urban, rural, regional areas in road types, funding	0
- Seen as duplication – similar to Black Spot	0

As in other regions, the key enabler and barrier were the presence or lack of funding, respectively. Other resources, such as time and knowledge, were also deemed important for rating the safety of the road network. This group also identified the interface with existing software as helpful and highlighted the need to ensure that this safety ratings tool was complementary to existing systems and processes.

Outputs – Who is target audience?

In the discussion of the target audience, the participants focused on this tool as helpful for internal use, rather than for use by Elected Members. Otherwise, the group identified the following as key stakeholders to receive the outputs of the tool:

- Funding Bodies
- Internal use by your Local Government
- Summary to neighbouring Local Governments
- The public – in terms of providing success stories (e.g., x kilometres were upgraded from one check to two checks)

Outputs – Formatting

The discussion under this heading focused on how Local Government staff could use the data. The group identified the interface with other tools as important to make this tool "not just another tool," but rather a useful input to other processes. Other tools for which this tool could provide useful inputs are as follows:

- RAMM or other asset management software
- GIS format

Otherwise, having some data as an infographic or compelling visual graphic would be helpful for communicating and understanding results quickly. Reports and the automatic generation of reports was also discussed, though questions persist around what would be provided in a report.

Consultation – Mid West Region – 21 June 2022

This workshop in the Mid West region was held in the Batavia Conference Centre in the City of Greater Geraldton and involved three Local Government officers and one Elected Member.

How to develop a tool

Working as one group, the participants addressed the question, "Considering your Local Government's capacity, how would you develop a tool to rate the safety of Local Government roads?"

One key element was the discussion around sealed and unsealed roads. Unsealed roads were deemed to have a higher risk, based on the geometry and cross-section. One strategy would be to start with higher risk roads and work backwards, e.g., address the bends and crests on each road to determine the safety of the road. The road users of specific road, i.e. the context of the road, is important as well. Particularly in regional areas where gravel roads serve different users, have different features (e.g., creek crossings, etc.), are maintained on varying schedules, and are made of varied materials, the safety of gravel roads can be determined by the context. While an understanding of what is there or, more pertinently what is not there, is important, knowledge of the road use is key. Participants also identified MRWA and the setting of speed limits as an issue for safety on gravel roads.

The group also indicated that achieving a broad understanding across all levels of an organisation from operational officers to Elected Members is crucial for any tool to be successful. Data collection practices may also vary between Local Governments, while specific data sources may not be available for all roads or to all jurisdictions.

The issue of roads crossing between shires was also an issue; coordination between Local Governments will be important for this. The coordination with Main Roads WA and their acceptance of the tool was also flagged as important in this discussion.

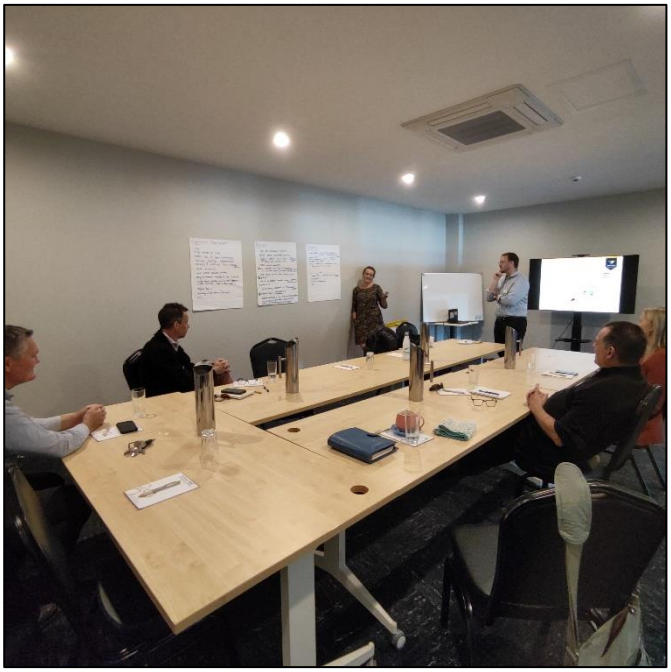


Figure 14: Mid West Consultation Workshop

Operational Requirements

Following on from the discussion of how to develop a tool was a discussion of the key operational requirements for rating the safety of Local Government roads. Participants considered the use of cross-sections as helpful, advocated for using existing data, and suggested using technology to collect data on the road network for input into the tool. Any tool must be easy to maintain, continue to use, and update, while the interface with existing tools/software/current operations is also important.

The group also discussed the issue of bias in the tool and suggested some level of training be provided to ensure that results where standardised. Also discussed was the availability of staff and other resources, which are likely to be fundamental to the any rating of the road network to be performed. Political pressure in the prioritisation process was also a key factor. This tool should help Local Government officers responded to outside pressures to change the prioritisation of projects in the works program.

Regional buy-in would also be a key factor in the uptake of this tool. If neighbouring Local Governments are using the tool and data is available regionally, that will provide a helpful dataset to support regional planning and development.

Enablers/Barriers

As in the other consultation sessions, participants in the workshop split into two groups and provided their feedback on the key enablers and barriers to generating a road safety ratings system for their Local Government road network.

Enablers	Vote Count
- Adequate Funding	4
- Consistency over shires & levels of Local Government (Standards, expertise over different tiers of Local Government)	3
- Core function of Local Government	2
- Fit for purpose – useful for Local Government	1
- Available Staff	1
- Building on previous knowledge/expertise	0
- Funding associated with tool outputs	0
- Black Spot – not reactive/to be proactive	0
- Compatible to Existing Tools	0
- Community Buy-In	0
- Commitment to Realistic Goals	0
- User friendly (uncomplicated)	0

Barriers	Vote Count
- Funding	4
- One Consistent Tool	3
- Complete Buy-In – both internal in LG, all stakeholder	3
- Political Will	1
- HVS RAV Assessment Process	0
- MRWA Speed Assessment Process	0
- Videos – General Access Issues (Road Condition Assessment)	0
- MRWA Approval Exemptions	0
- Staff Movement – loss of trained staff	0
- How do you quantify “perceived” crashes	0
- Different levels/types of government	0
- Time (if it takes too long, it will not be used)	0

The presence of adequate funding is rated as the most important enabler toward generating a road safety rating for Local Government roads. A lack of funding is rated as the largest barrier. The question of consistency, both between shires and levels of government, but also within the tool itself, was also identified as an essential element. It was also indicated that any tool must necessarily be fit for purpose and have the support of management to succeed.

Outputs – Who is target audience?

The group identified several key audiences for the outputs of the tool. Elected Members are an important audience, while the public would likely receive the data as part of an annual report. Some specific outputs may not be suitable to share with the public. Otherwise, some interface with neighbouring Local Governments would also be helpful.

Another audience for the outputs of the tool could be the Regional Road Groups. Participants thought that the data could be used as part of the criteria in scoring projects and prioritising funding allocations.

Outputs – Formatting

Regarding the format, participants put forward a GIS compatible format as helpful for Local Government business. Any outputs should be formatted in such a way that they support recommendations for decisions, should be non-biased, and relate to the hierarchies of roads.

Consultation – Wheatbelt Region – 27 June 2022

The consultation workshop in the Wheatbelt region was held at the Duke's Inn in Northam on 27 June 2022. Overall, four Local Government officers attended the meeting from the Shires of Northam, Gingin, York, and Tammin.

How to develop a tool

In response to the question, "Considering your Local Government's capacity, how would you develop a tool to rate the safety of Local Government roads?", the group using video captured by driving the roads, similar to a data captured for the purposes of disaster recovery (DRFAWA, WANDRA). However, questions remained about how the data would be recorded, used, interpreted, presented, and integrated into the tool.

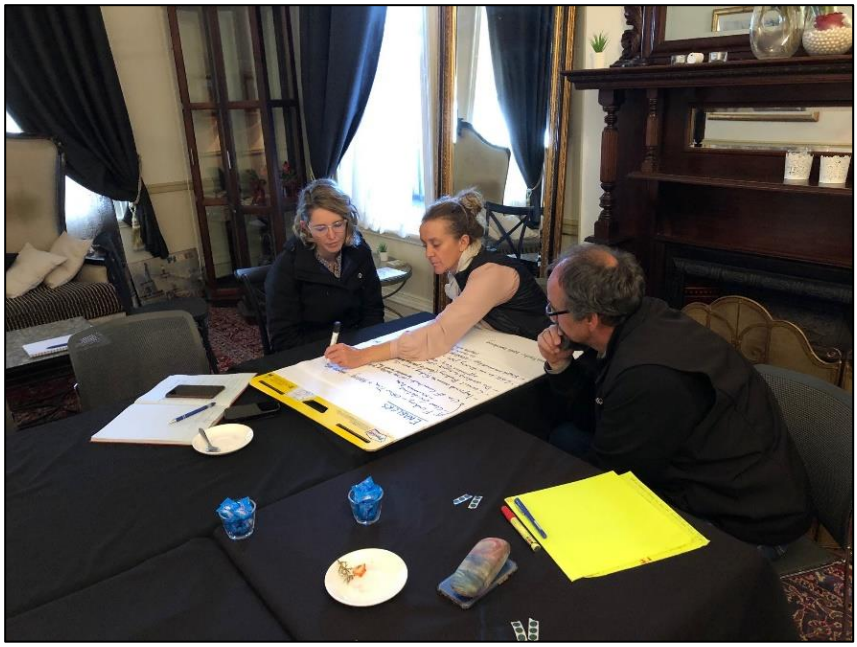


Figure 15: Wheatbelt Consultation Workshop

There was general consensus around the fact that crash data is not representative in terms of predicting where crashes will occur on rural roads, as run-off road crashes can occur anywhere. The topic of vehicle exposure was also discussed, with road carrying more traffic prioritised in the funding stage.

The topic of the safety of unsealed roads was also mentioned. On some rural roads, the seal can be as little as four meters, while unsealed roads are often tricky to maintain due to the current environmental regulations. The batter of the road cannot be cleared without a clearing permit in some cases, which is very problematic, when trees begin growing there. Participants indicated that expanding the footprint of rural roads is often quite difficult due to the limited ability to clear roadside vegetation.

According to participants, the tool should also consider the different types of vehicles/machines driving on the roads. Vehicles are becoming larger and larger over time, while longer road trains can cause considerable damage to roads, so some understanding of the type of vehicles in use on the roads will be important to consider in the tool.

Lastly, participants referenced a chronic lack of funding for Local Government road maintenance, which often results in a lack of capacity to make safety improvements, while maintaining the roads. Some funding, particularly in terms of the secondary freight network, is there to support building better roads. However, the Local Government must then maintain those roads, which results in a significant cost burden.

Operational Requirements

Taking the discussion on how to develop a tool into account, the group provided suggestions on what operational requirements would be required to create a tool to assess the safety of Local Government roads.

Due to the changeable nature of Local Government roads, particularly if they are unsealed, the group agreed that utilising some method of data capture (video, etc.) would be helpful to assess the condition of the road. Also, the level of traffic and types of vehicles on the road are often a determiner of the safety of that specific facility, so those considerations should also be included in the tool. Essentially, road context should play a role in the tool.

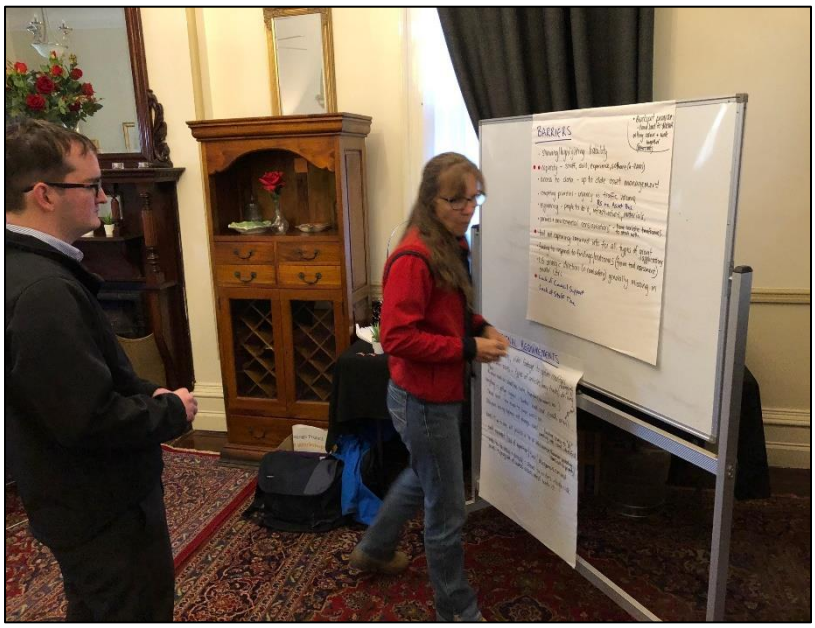


Figure 16: Wheatbelt Consultation Voting Exercise

Another key operational requirement would be to provide associated funding once the assessment is completed. This will support Local Governments in actually using the tool.

Other points identified under this section include using the functional classification as a basis for undertaking works and using the data from the assessment to update the Local Government's asset management system. Participants flagged the issue that in Local Government, particularly small shires, that the asset management system is not always up to date.

The tool, according to participants, must be simple, clear, show the high-priority areas for improvement, and should be easy to add into the works program for the Local Government. Also, the tool should not require a substantial amount of time, expertise, or training, as Local Government staff do tend to move around quite a bit and replacement staff may not have the same skills and expertise. Any user bias or discrepancies in the way the information is entered should be minimised in the tool.

Enablers/Barriers

As in the other regions, the group discussed either the barriers or the enablers to assessing the safety of Local Government roads in groups of two for approximately 10 minutes, then switched. Following the identification of enabler/barriers, each participant was provided with six total dots to 'vote' for the barrier (3 votes) or enabler (3 votes) that they felt was most significant. The results are below.

Enablers	Vote Count
- Funding – Officer Time and Training – integrate into asset management	4
- Simple Methodology	3
- Clear Guidelines, including data requirements	3
- Council Backing (plus suitable format for presenting to Councils)	1
- Link to new funding sources	1
- Use of consultant	0
- Improved access to funding	0
- Analysis should support other funding (e.g., RSAs) – make sure tool covers all requirements for RSAs	0

For enablers, funding was the key element, while having a simple methodology and clear guidelines were also voted as highly significant in terms of enabling the use of a rating tool. Having council backing and a link to funding sources were also voted as important.

Barriers	Vote Count
- Capacity – Staff, Skill, Experience, Software	4
- Showing/Highlighting Liability	2
- Access to Data – e.g., up-to-date asset management data	2
- Tool not capturing relevant info for all types of grant applications	2
- Engineering – People to do it, tools/machinery, materials	1
- Lack of Council Support	1
- Competing Priorities – Urgency vs Traffic Volume, Road Safety vs Asset Preservation	0
- Permits and Environmental Considerations (have realistic timeframes to start with	0
- Funding to respond to Finding/outcomes	0
- LG Strategi Direction (in road safety) generally missing in smaller LGs	0
- Lack of Staff Time	0

The key barrier to using a tool was a lack of capacity, in terms of staff time, skills, experience, and software. The liability issue, access to data, and the tool not capturing the right data to link to funding were also considered as significant barriers. A lack of people using the tool, lack of tools (e.g. tools, cameras, etc.), and lack of materials as well as a lack of council support are also important.

Outputs – Who is target audience?

The group envisioned the outputs of the tool being primarily directed at internal staff, though a public version should also be prepared and retained, as Shire records are public documents and can be requested. Councillors would also be a key audience for this type of document as well.

Main Roads WA is preparing several different tools, including RoadView, which could benefit from the outputs of this tool, so ensuring that outputs (e.g., GIS format) are compatible with those tools will have substantial benefits. Another key audience is neighbouring shires. Particularly in regional areas, roads will often cross shire boundaries, so cooperation between shires is very important. Ensuring that a cooperative relationship exists between shires is particularly important as well; data sharing in relation to the safety of roads to support funding applications and maintenance activities should be considered in the tool, according to participants.

Outputs – Formatting

Regarding the format of the tool outputs, both a spreadsheet format and GIS format are desirable from the perspective of the group. While not everyone uses GIS, this format is helpful for Local Governments, while maps, pictures, and/or infographics would also be helpful to communicate the outputs to Councillors. The group suggested a hierarchy of outputs, including a high-level overview with visually appealing graphics; a staff level view, including detailed reports and information; an easy format, which can be interpreted by depot staff/outside staff, who may not have substantial computer expertise/knowledge; and a

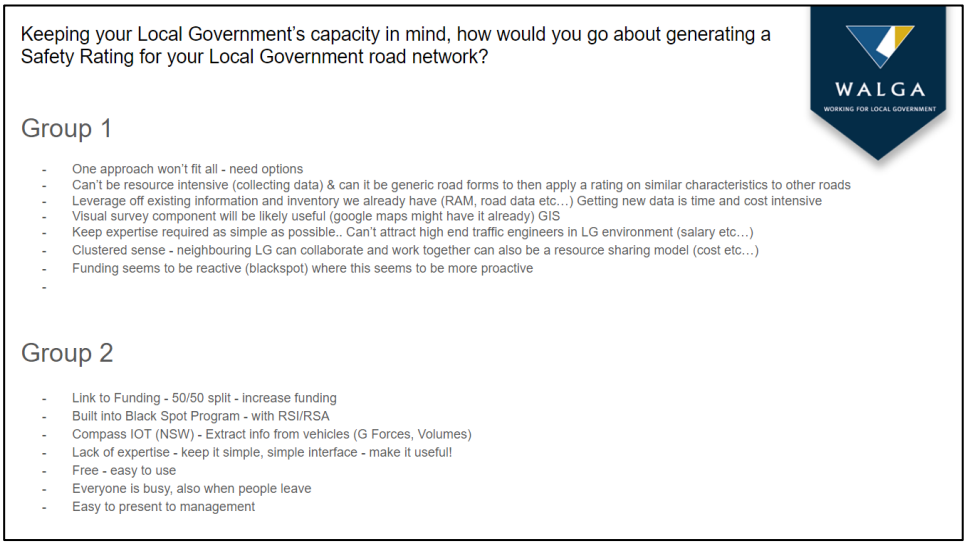


Figure 17: Virtual Consultation Workshop Slide

one-page summary for possible public consumption.

One participant also suggested a traffic light, as a way to represent the safety ratings, with green indicating a high level of safety, yellow indicating needing improvement, and red indicating a low level.

Online Consultation Sessions

In order to provide a forum for interested Local Governments in those regions where no in-person consultation workshop was held and also for those Local Government who were unable to participate in the in-person workshops, two virtual consultation sessions were scheduled via Teams. The process remained the same with a brief presentation followed by an interactive workshop.

Breakout rooms were used within the Microsoft Teams environment to facilitate smaller discussions on the operational requirements for creating a tool and enablers/barriers to using a tool to rate the safety of Local Government roads. This information was recorded in a Google Slide presentation. Each participant was sent a link in the meeting chat to use green or red dots to indicate the most important enablers and barriers to using a tool that were identified in the discussion.

Virtual Session 1 – 30 June 2022

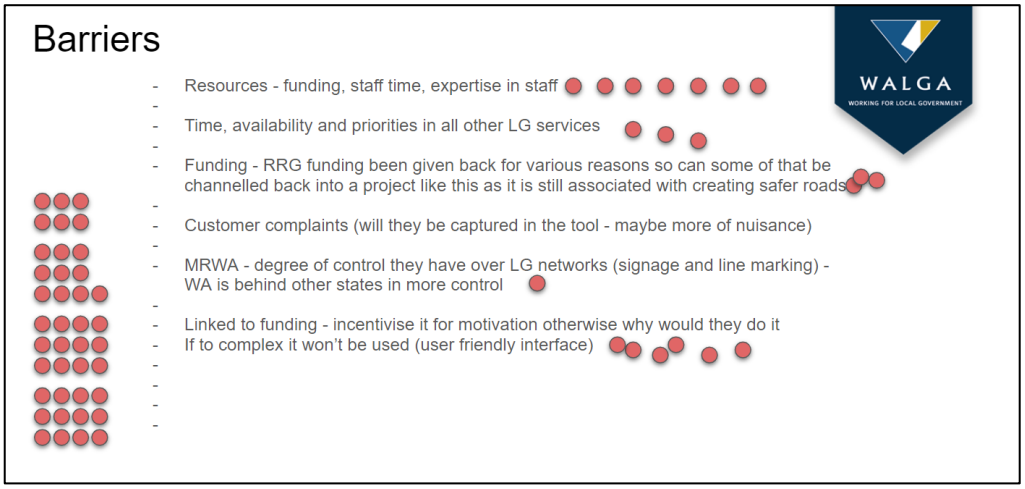
In total, this session was attended by seven Local Government officers, representing six Local Governments.

How to develop a tool

Results of the question, “Keeping your Local Government’s capacity in mind, how would you go about generating a Safety Rating for your Local Government road network?” were captured using a Google Slide and generated the following points.

- One approach will not fit all - need options
- Cannot be resource intensive (collecting data) & can it be generic road forms to then apply a rating on similar characteristics to other roads
- Leverage off existing information and inventory we already have (RAM, road data etc…) Getting new data is time and cost intensive
- Visual survey component will be likely useful (google maps might have it already) GIS
- Keep expertise required as simple as possible Cannot attract high end traffic engineers in LG environment (salary etc…)
- Clustered sense - neighbouring LG can collaborate and work together can also be a resource sharing model (cost etc…)
- Funding seems to be reactive (blackspot) where this seems to be more proactive
- Link to Funding - 50/50 split - increase funding
- Built into Black Spot Program - with RSI/RSA
- Compass IOT (NSW) - Extract info from vehicles (G Forces, Volumes)
- Lack of expertise - keep it simple, simple interface - make it useful!
- Free - easy to use
- Everyone is busy, also when people leave
- Easy to present to management

The key points here are that the tool must be **easy to use and understand**, should **not be resource intensive**, and should **leverage existing data and information**. Also, participants indicated that the tool should either provide inputs into funding submissions or should have associated funding.



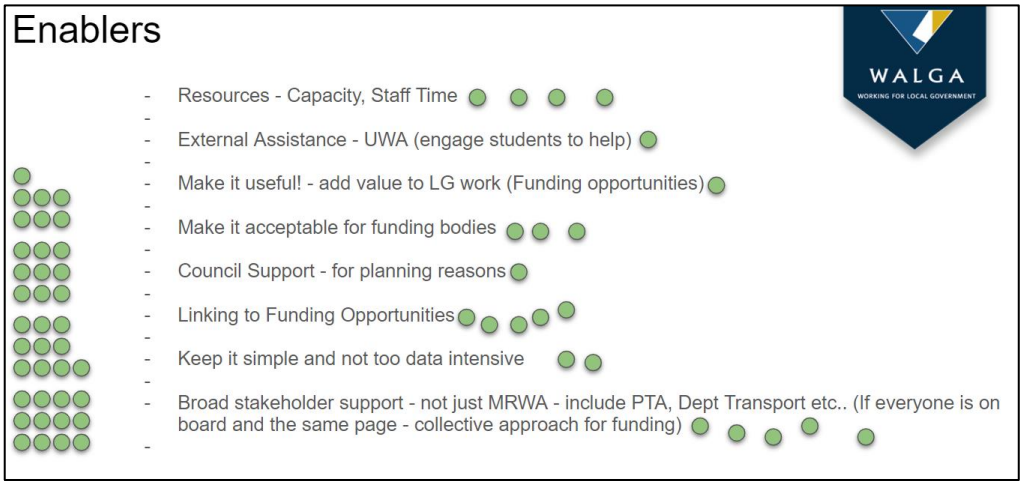


Figure 18: Interactive Voting Slides for Enablers/Barriers

Operational Requirements

Many of the same topics were referenced in the operational requirements section of the consultation workshop.

- Funding - linked to funding
- Easy to use, ideally free to use
- Stakeholder complexities - MRWA frustrations, LG can identify the issue but moving forwards the timely and costly part - planning and developing - so work on MRWA relationships to simplify
- This tool can provide justification back/upwards and to community/elected members
- Local road safety urban improvement - will these two talk to each other, consider each other
- Flexible and agile (metro/rural/regional/remote) to suit all LG's and be scalable
- Broadening stakeholder base - not only MRWA but also Dept Transport, PTA, DPLH etc… bring them all in to talk road safety in all areas to make it not car-centric only involve different modes of transport
- E-vehicles - keep up with technology, the model cannot go stale
- Will it cope with unsealed roads, low volume roads and extremely high-volume roads?
- Unsealed roads - roadside hazards main issue, width of road
- Regulatory signage

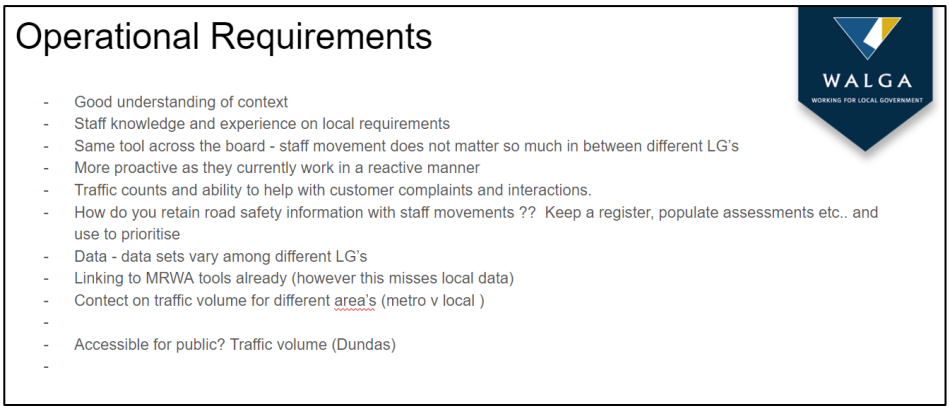


Figure 19: Virtual Consultation Session Feedback Slide

Again, participants referenced that the funding needs to be linked to the outputs of the tool and the tool should be easy to use. Otherwise, the tool should be accessible and applicable to all types of Local Governments and could relate to the processes of relevant stakeholders, including Main Roads WA. Unsealed roads are another key element that must be considered.

Enablers/Barriers

Each participant was allocated three votes to indicate the importance of the identified barriers/enablers for a total of 6 votes. The following tables indicate the most important barriers/enablers for the tool, as evaluated by the participants in the virtual consultation workshop 1.

Barriers	Vote Count
- Resources - funding, staff time, expertise in staff	7
- Linked to funding - incentivise it for motivation otherwise why would they do it If to complex it will not be used (user friendly interface)	7
- Time, availability, and priorities in all other LG services	3
- Funding - RRG funding been given back for various reasons so can some of that be channelled back into a project like this as it is still associated with creating safer roads	3
- MRWA - degree of control they have over LG networks (signage and line marking) - WA is behind other states in more control	1
- Customer complaints (will they be captured in the tool - maybe more of nuisance)	0

Enablers	Vote Count
- Linking to Funding Opportunities	5
- Broad stakeholder support - not just MRWA - include PTA, Dept Transport etc. (If everyone is on board and the same page - collective approach for funding)	5
- Resources - Capacity, Staff Time	4
- Make it acceptable for funding bodies	3
- Keep it simple and not too data intensive	2
- External Assistance - UWA (engage students to help)	1
- Make it useful! - add value to LG work (Funding opportunities)	1
- Council Support - for planning reasons	1

Funding and resources (time, funding to perform the analysis, staff expertise) were again identified as the key enablers and barriers (the lack of funding/resources). The lack of a linkage to funding sources was also a key barrier, while having broad stakeholder support was also considered as important.

Outputs – Who is target audience?

Regarding the target audience, this group identified Elected Members and internal staff as the key stakeholders, while considering the provision of the safety rating information to neighbouring councils was also mentioned as a possibility. As in other consultation sessions, having different levels of information for use by different stakeholders would make sense, e.g., it may not make sense to give the public the raw data, but having an easily understandable summary would make sense.

The RAC was also mentioned as a possible audience for this data.

Outputs – Formatting

Again, providing different formats for different audiences was seen as helpful, with the raw data more useful for internal staff and summary data in a visually appealing format more useful for Elected Members and the public. A specific format for benchmarking would be helpful as well.

Considering integration with current systems (RAMM, GIS, etc.) was also important to this group.

Virtual Session 2 – 4 July 2022

In total, this session was attended by seven Local Government officers, representing five Local Governments. Importantly, this session was attended by a representative from the Shire of Halls Creek, who provided the perspective of remote Local Governments.

How to develop a tool

In response to the question, "Keeping your Local Government's capacity in mind, how would you go about generating a Safety Rating for your Local Government road network?" the group produced a number of ideas.

The representative from the Shire of Halls Creek provided a summary of their current process to evaluate the roads for maintenance after the rainy season, which could generate useful data for input into a safety ratings tool. The process is as follows:

1. Inspect (video - google maps and in person) - look for
    a. trafficability,
    b. defects - prob the most technical part (insurance claims)
    c. immediate works required to be safely opened. Mostly by eye, but with the video. Staff need to be trained to pick up defects (own staff and a consultant engineer).
2. Repair
3. Reopen

Having technical staff on board that understand the local context was also identified as a key component to developing any safety ratings tool. According to the group, it would also be important to determine what deficiencies are the priority to treat using infrastructure.

Operational Requirements

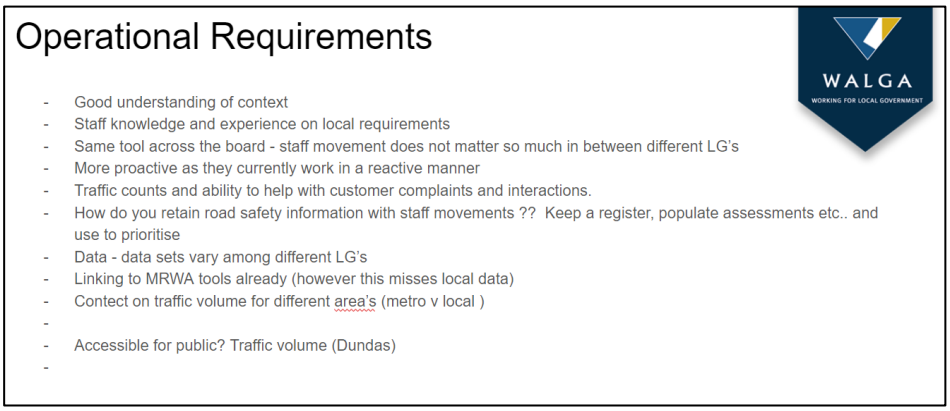


Figure 20: Virtual Consultation Session Feedback Slide

The participants presented the same themes in the discussion of the key operational requirements for using a tool to rate the safety of Local Government roads: a good understanding of the local context and having knowledgeable staff. Ensuring that the tool is the same used across all Local Government in WA will also be helpful, according to feedback, as staff turnover will not have as much of an effect. Also, this will provide an insight into road safety at a specific point in time. As staff move on, this can serve as "institutional memory" and a record of work performed on the local road network.

The proactive nature of the proposed tool was also looked upon favourably by the consultation participants as most of the current safety ratings tools are reactive. The tool was also seen as an effective way to address questioning and complaints from the public regarding the program of works.

Another important element to evaluating the safety of Local Government roads would be to accept a variety of data sources, as data may vary across Local Governments. The linkage to other tools in existence, such as those maintained by Main Roads WA, is also important.

Enablers/Barriers

To better understand the critical barriers and enablers to rating the safety of Local Government roads, participants first identified barriers/enablers and then voted using dots on a Google Slide to prioritise the most important ones.

Barriers	Vote Count
- Staff Time - well trained and experienced in local conditions - skills and experience	5
- Funding - rates downturn etc..	5
- Safety assessments - expectation/safety outcomes not meeting funding/materials access reality	3
- Capacity	1
- Lack of Buy in and understanding	1
- Small shires - hard to pre-plan, roads on asset register they will never use again however they stay there due to funding (convert to 4x4 tracks - Qld model). Funding allocation model	1
- Staff retention	1
- Council support - only at higher level, additional resources etc. rest is done at business unit level; right people right positions	0
- MRWA data may not go to local level, access to tools	0

Enablers	Vote Count
- Staff time, capacity, and expertise	3
- Funding to do the work/assessments/findings	2
- Funding outcomes linked to having completed/used the tool (e.g., - bike plan DoT)	2
- Any mapping tools - display relevant data	1
- If the tool was separate to current funding requirements (e.g., - traffic volume etc. as regional is always different to metro which they are currently based on)	1
- Senior managers and elected members support	0

Unsurprisingly, staff time, capacity and expertise are paramount to successfully undertaking a safety rating assessment of Local Government roads. Funding both to undertake an assessment and associated with a completed assessment is also considered particularly important.

The group did identify that the expectation of safety outcomes may not meet the funding/materials that are available in that Local Government, i.e. that the assessment may recommend improvements not grounded in reality.

Outputs – Who is target audience?

One of the key outputs for regional Local Governments is neighbouring shires. Particularly in remote locations, neighbouring shires may in fact be closer to certain roads than the shire itself. For this reason, shires often see the benefit of information-sharing to support maintenance at remote locations.

Otherwise, there was wide acknowledgment that internal stakeholders should receive the information first, before deciding on disseminating the outputs of the tool to the public or to Elected Members. Councillors and external stakeholders, however, are often the custodians of the funding, so care should be taken to provide information from the road safety ratings tool to these stakeholders effectively.

Outputs – Formatting

Regarding the formatting, both raw GIS data and mapped GIS data would be helpful to Local Governments in addition to the raw data in Excel format. For external stakeholders, it would also be helpful if the tool provided data in an infographic format and could help show the priorities of the entire network.

Tool Development

This tool was developed with funding under the Commonwealth Office of Road Safety Road Safety Innovation Grants scheme and involved five phases undertaken over a two-year period.

Phase 1: Literature Review

The Road Safety Ratings for Local Government Roads project commenced in July 2021 with the preparation of a comprehensive Literature Review of existing road safety rating tools. Each tool was assessed for its suitability in the Local Government context. The Literature Review can be found in the Road Safety Ratings for Local Government Roads Project Reference Document.

Phase 2: Consultation

Phase 2, the consultation phase of the project, began in January 2022. In order to ensure that the adaptation of an existing tool or creation of a new tool is tailored to suit Local Government needs, the Project Team undertook a consultation process, which included the dissemination of a survey, five in-person workshops, and two virtual workshops. The consultation report can be found in the Road Safety Ratings for Local Government Roads Project Reference Document.

Phase 3: Tool Development

During this phase, the Project Team refined the concept, based on input from the consultation and literature review and developed the cross-sections. The Project Team ultimately decided to adapt the simplified International Road Assessment Program (IRAP) tool to the Local Government context using a cross-sections approach.

Phase 4: Pilot Project/Testing

In the third quarter of FY 2022-23, Local Governments pilot tested the draft tool to determine its usability and provide feedback for improvement.

Phase 5: Final Edits

The final step in the tool development process was to incorporate feedback from the pilot test phase, begin to market the Safety Ratings tool to Local Governments in Western Australia, and evaluate the project.

Pilot Project

During the pilot project phase of this project, WALGA liaised with seven Local Governments across WA to complete user testing of the paper-based version of the tool. The Local Governments that indicated a willingness to participate in the pilot project are the following:

- Shire of Serpentine-Jarrahdale
- Shire of York
- City of Kalamunda
- City of Albany
- Shire of Murray
- City of Bunbury
- Shire of Northam

Figure 21: Pilot Project Kick-off Meeting in Albany

To support the pilot testing by each Local Government, WALGA prepared a Microsoft Excel macro tool, which allowed users to input their data for each attribute into Excel and transfer it to a summary table as a row at the click of a button. This macro replaced the paper-based checklist and summary tables.

Figure 22: Pilot Project Kick-off Meeting in Serpentine-Jarrahdale

The Project Team and the Regional Road Safety Advisor for the region attended a kick-off meeting with Local Government staff and, on some occasions, Elected Members to commence the project. At this meeting, WALGA provided an overview of the project, discussed the process for developing the tool, outlined the cross-section approach, and presented the requested actions to be undertaken by each Local Government. Local Government practitioners were encouraged to ask questions, provide feedback, and work with the Regional Road Safety Advisor for their region to complete the pilot testing of the tool. The dates for each kick-off meeting are listed in the table below.

Table 3: Pilot Project Kick-Off Meeting Dates

Local Government	Kick-Off Meeting Date
Shire of Serpentine-Jarrahdale	21 February 2023
Shire of York	22 February 2023
City of Kalamunda	23 February 2023
City of Albany	23 February 2023
Shire of Murray	14 March 2023
City of Bunbury	27 March 2023
Shire of Northam	28 March 2023

Each Local Government was tasked with using the tool to analyse four or five different road segments on their network. The focus in selecting segments was to identify typical roads as well as extremes, i.e. segments with high traffic volumes and segments with low traffic volumes in both a rural and urban context. This allowed the tool to be tested on different road types and under different road conditions. Each Local Government was also asked to test the tool on both a sealed and unsealed road segment.

In addition, the Project Team asked each Local Government to run the tool by Elected Members. However, feedback from the pilot project participants identified some hesitancy to involve Elected Members in the analysis process to avoid misinterpretation of the data.

The final step in the pilot project was to provide feedback in a structured focus group session, which was held on 4 May 2023. The feedback from this meeting is summarised in the following section.

Focus Group Feedback

Seven Local Governments agreed to trial the tool and provide feedback on their experience with using it. Individuals selected to participate in this way attended kick-off meetings with WALGA, held between February and March 2023 that provided an overview of the tool and an opportunity to ask questions about the application of the tool. In addition, they were provided with relevant documentation for using the tool, the draft Assessment Guide and draft Reference Document. On 04 May 2023, representatives from four of the seven Local Governments attended a (virtual) meeting with WALGA to provide feedback on their experience with using the tool. The meeting was 1 hour in duration. The meeting was recorded and the observations below were extracted from viewing this recording.

Meeting Observations

All meeting participants said that the tool was easy to use. However, several users felt that it was sometimes difficult to know how to assign star ratings to attributes and that some attribute definitions needed clarifying. In particular, the difficulty of deciding whether a road was “narrow” was identified. Related to this, there was some suggestion that it would be helpful to provide more explanation about how the tool worked, as this would support better decision making when assigning safety ratings. The intent of the tool was also not totally clear to all users. There was also little understanding of how the tool could be used in conjunction with the iRAP Demonstrator. Again, this suggests that there is scope to expand coverage and explanation in the manual.

It was generally agreed that the tool was quick to use, although it was noted that this was predicated on the availability of existing data that could serve as input and the assumption that the input data was accurate and did not require a quality check. All users made use of existing data, either video or asset management records. Using this approach, one user was able to assess 3 segments in half an hour. However, one user noted that if the whole network was to be rated that this would be an onerous and impractical task.

There was enthusiastic discussion around the possibility of using existing asset management data systems, such as RAMM, to provide input to the tool, potentially in an automated way, and, conversely, the possibility of recording safety output from the tool within these asset management systems. Perhaps because the users all had access to existing data in some useable form, there seemed to be a lack of appreciation that the tool was designed to be functional with very basic data sources, including field observation, and local knowledge. All users identified ways of using the tool in their practice consistent with what was envisaged by the tool designers. This included identifying a pool of roads that require attention, investigating the actual safety profile of roads that were the subject of a public complaint, and to supply evidence for funding requests. One interesting suggestion was that asset management systems could flag a rerating by the tool when significant

works were undertaken. This would result in an automatic update of the safety profile of roads in the Local Government.

Users agreed that the cost to use the tool in their Local Government would be minimal, with the main cost being staff time. It was agreed that if the tool could be incorporated into asset management systems this would increase efficiency by reducing the demand on staff time.

There was some discussion about who should be the audience for the outputs of the tool. It was suggested that outputs would be most appropriate for technical staff and that there would be some danger making these available to elected members and the public because of the liability considerations. This concern is judged to be misplaced, but its expression in the meeting suggests that this issue should be covered in some detail in the manual.

Key Takeaways

In summary, from a user perspective, it appears that the tool has met the objectives that were identified for the project. It is perceived as easy to use, makes use of existing data sources, is quick and cheap to implement, and requires little existing road safety knowledge. However, the user results suggest that the tool can be usefully finessed in a few ways. These include providing clearer explanation in the manual about the purpose of tool, how to classify attributes, how it can be used in conjunction with other road safety risk rating tools, and a discussion about liability.

Other Feedback

Otherwise, feedback was consolidated from Local Governments via email or via direct contact to the Project Team or relevant Regional Road Safety Advisor from Local Government officers. A summary of the feedback is presented in the table below. This table also includes feedback received from others during the pilot project period, e.g. Panel of Expert Stakeholders members, WALGA Internal Staff.

Table 4: Collated Feedback from Pilot Project

List of Changes	From
Add pedestrian facilities to unsealed access road	Phil Taylor
Validate remaining sections	Max Bushell
Revise Macro	Brianna in Albany
- redo table, add other fields, redo macro, include Unique ID	Brianna in Albany
Associate Roadside Hazard with Roadside Object to be clear about change in distance	Brianna in Albany
Having a safety barrier for large sections of road is very unlikely, and we want to minimise the granularity of road segmentation in applying the star rating as it will be too onerous otherwise. However, we also need to be able to tie the rating back to our road data so we are using our carriageway section data which can be entire road length of an access road but can be 20 sections on say a rural distributor road. So we are pulling out the carriageway sections from our inventory then amalgamating them based on sameness of cross section and then applying the rating tool.	Brianna in Albany
We have tested a couple of sections so far using the macro and have found a few ambiguous items that I will elaborate on. We have some more rural cross sections with pedestrian and/or cycling infrastructure and your examples are not included. And you have to flick through all the examples to work out what option gets a tick in what star rating.	Brianna in Albany

In your Attribute Definitions at the back of the assessment guide it would be good if the definition service level is linked to a star rating eg. Do we assume the non-physical separation also means a formal footpath? And does a physical barrier include a barrier kerb?	Brianna in Albany
The intersection types are difficult given a road segment in data bases is generally from intersection to intersection but to aggregate same cross section types I am not sure how useful it becomes. But I also understand that crash risk is much higher at intersections. Did you consider assessing intersections separately? Also we have no traffic lights in Albany so no signalised intersections which is appropriate. I would prefer an option for controlled intersections and uncontrolled intersections regardless of 4 leg or 3 leg and roundabout single lane and roundabout multilane. Median crossing points - I assume this means for pedestrians. Again very difficult to work out what to score for the different types of intersections, do all roundabouts get a 5. I would think most of ours would fall into uncontrolled 0 - controlled no turning lane 1. Controlled turning lane 3, roundabout 5.	Brianna in Albany
add ranges to road type definitions, instead of 110/100 say, typically between 90-110km	Shobair Hosseini
possibly change attribute name from Stars to Safety Ranking - Low Safety, Medium Low Safety, Medium High Safety, High Safety	Shobair Hosseini
Change "Roadside Hazards" to mention alignment with number 11	Shobair Hosseini
Consider adding more information about picking the cross-section	Shobair Hosseini
It was difficult to know when submit was pressed on the macro, so we ended up with duplicate entries	Shobair Hosseini
Shobair asked what would be the output of all the data entry and an offered suggestions: A number and % of kms of x-star rated roads to assist with target setting and progress monitoring	Shobair Hosseini
Agreed that a GIS output would be useful to visualise	Shobair Hosseini
Wanted to consider the pros and cons of a more sophisticated tools for richer data	Shobair Hosseini
Would be good to be able to review the ratings for each segment to see which elements received the various ratings. If we were presenting/workshopping the information in the Summary Sheet tab, we would naturally get questions like “what were the items that rated <1 star for Forrest Ave?” The current process relies on memory or manually saving each checklist as you go, in order to have that history available. Whilst manually saving is achievable, it would be great if this was done automatically.	Daniel Hall
Another positive feature would be Optimisation of potential Improvements. i.e. “if we improve road condition and add a centreline to Dixon Street, what does that do to the star rating?” Again, this could be achieved manually through the tool, but some sort of optimisation functionality would be beneficial for scenario testing and workshopping of possible road segment improvements.	Daniel Hall
Make more complex in Beta Version - add weights,	Iain Cameron
Get people to think about things - start with	Iain Cameron
Management of making decisions - add management advice (how to upgrade gradually - what to do first) - add linking paragraphs (write in prioritisation process)	Iain Cameron
Add information for each treatment in terms of which crash type addressed - we are working backward from human tolerance factors - short introduction with this (working backward from…)	Iain Cameron
Key messages - think about this in marketing…	Iain Cameron
Add vehicle technology/human behaviour?	Iain Cameron

Will vehicles solve it? Add why it makes sense - set context - Validate why tool and infrastructure is so important	Iain Cameron
1. The draft tool does not clearly articulate the immediate safety benefit that can be delivered by speed reductions. For example, Rural Highway (A) shows that a 3-star road has a lower speed limit AND a shoulder AND a wider median AND wider lanes AND better road surface, skid resistance and clearance from hazards than a 1-star road. This doesn't convey that a significant safety benefit can be achieved without the large expense of upgrading all of these elements. I am concerned that the tool will not lead road managers to the most impactful and immediate measures they can apply.	Michael Nieuwesteeg
1. The lack of median barrier in all settings is a concern. This is a result of anchoring designs in RAP stereotypes. It is important to recognise that a 5-star RAP road is not necessarily a safe system compliant road and may still generate death and serious injury.	Michael Nieuwesteeg
road designers/managers need an understanding of the broader system in order to make the most effective use of their efforts.	Michael Nieuwesteeg
Add Speed management as key element to tool - this has most effect	Michael Nieuwesteeg
Rural collector (sealed) both 1 and 3 star are 100km/hr – should there be a lower speed for 3 star?	Terri-Anne
Rural highway (sealed) – should there be an indication of speed? Most other cross sections have a speed indicated.	Terri-Anne
Urban access (sealed) 0 and 1 star – it is very unlikely that such a road would be signed 70km/hr rather 60 or unsigned 50. Can we please make these 60 instead?	Terri-Anne
Urban access (sealed) – does the white space on the 1 star cross section mean anything safety-related? The same area is grey in the 3 star version.	Terri-Anne
Urban access (sealed) 5 star (and other cross sections) – is that fencing or some type of barrier designed to protect road users? It the latter, what barrier system and is there an attribute in Sketchup that looks more like a barrier system than a fence?	Terri-Anne
Urban collector (sealed) – I don't believe you would see signed 80km/hr. Can we use 60? An unintended consequence of using 80 might give license to some LG people to request and increase to 80.	Terri-Anne
Urban access (unsealed) – do we have any examples of posted 70 speed limit on these type of roads? If not, can we make it 60. Same reason as above.	Terri-Anne
Many of the driveways are quite narrow and therefore may look more like paths. Can the driveways be a little wider?	Terri-Anne
What do you think about having a couple of cross sections without guide posts on the 0 or <1 star versions? There are areas, in rural and remote regions, where guide posts are sparse.	Terri-Anne
Pavement colour – I note that in some cross sections the higher rated versions have a darker (black) pavement compared to the lower version which is grey. Is there any relevance? If not, then it might incorrectly overinflate the effect of pavement on safety.	Terri-Anne

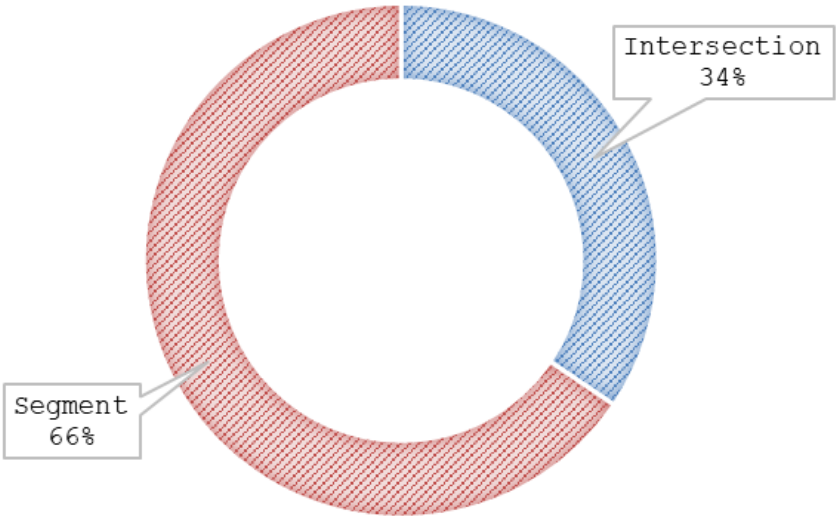
Each of these recommendations was considered in revising the draft Road Safety Ratings Tool. While some were not included, all of these recommendations provided guidance on creating a tool that reflects the needs of Local Governments.

Future Directions

This tool provides a starting point for evaluating the safety of the Local Government road network in WA using a tool specifically for Local Governments. For some Local Governments, this tool may suffice to provide a baseline understanding of the safety of the road network and represent a reasonable input into the works programming process, while others may wish to assess the safety of their networks more comprehensively.

Some areas for future development in Local Government road safety include the development of a tool to assess the safety of intersections and a tool to better understand the impact of specific safety improvements on the level of risk of a road segment. There may also be potential to investigate the suitability of this tool for Local Governments in other jurisdictions.

Intersection Safety Assessment Tool



On the Local Government Road Network, slightly more than 34% of Killed and Serious Injury crashes occurring between 2017 and 2021 correspond to the Right Angle and Right Turn Thru crash types.[1] These crash types are typically associated with intersection crashes.

The methods for evaluating road segments and intersections differ substantially. In its current form, this tool only addresses infrastructure elements on road segments and does not address intersection infrastructure elements or provide guidance on recommended treatments at intersections. Though not always the case, intersection treatments are often not implemented or assessed on a network level. As such, there is scope to develop a bespoke tool or adapt an existing tool for use by Local Governments.

Some tools to assess intersection safety include the MRWA Crash Map tool and AustRoads Publication: AP-R556-17: Understanding and Improving Safe System Intersection Performance (https://austroads.com.au/publications/road-design/ap-r556-17). As with this tool, any future intersection assessment tool should endeavour to keep costs, time commitment, expertise, and capacity requirements to a minimum, while also delivering a useful tool with engineering rigor.

Safety Treatment Effectiveness Tool

During the pilot project, certain Local Governments expressed an interest in using the tool to evaluate the effectiveness of one treatment over another. However, the LG Stars tool methodology was intentionally developed to be simple and easy-to-use and does not support the evaluation of individual treatments in a granular way. The IRAP Star Rating Demonstrator does perform this function and is freely available for use, but some exploration of the different methodologies for assessing risk, including the Infrastructure Risk Rating tool, Star Ratings, and Crash Modification Factors is warranted to best determine which assessment methodology is best suited to the Local Government context in WA.

Use by Other Jurisdictions

Should other jurisdictions across Australia be interested in using the tool then further evaluation of the tool would be required to determine if it provides valuable additional information to Local Governments and is effective in improving safety outcomes.

[1] Road Safety Commission. (2022). 2017-2021 RSIC Road Safety Performance Report Raw Data.

Other Tools

This section contains a summary of a selection of other tools that Local Government practitioners may find useful in assessing and addressing issues on the road network, to achieve safety improvements.

Road View

Road View is an application that uses a GPS enabled dashcam to create video files which are then georeferenced with crash data and asset information. The videos are available to Local Governments and consultants working for Local Government and can be downloaded and used to assist with road safety route assessments. To apply to access and use Road View, visit the Main Roads WA website.

Crash Map

Crash Map is an interactive mapping application that provides real time crash data available to Local Governments and their consultants. Users can perform macro and micro analysis of reported road crashes to provide an indication of the road safety performance of the examined location. Further information, access to, and training in Crash map can be found on the Main Roads WA website.

Road Safety Audits and Inspections

A Road Safety Audit is a formal, systematic assessment of a new road project or improvement to identify any potential road safety risks. A Road Safety Inspection follows the same process to identify any potential road safety risks on an existing road.

Road Safety Audits and Inspections must be carried out by an independent qualified audit team led by an accredited Senior Road Safety Auditor.

Further information regarding Road Safety Audit training and accreditation and a full list of accredited Auditors in Western Australia can be found on the Road Safety Audit Portal.

Crash Investigations

Main Roads Western Australia conduct crash location investigations after the occurrence of a fatal crash. If a preliminary investigation determines that the road environmental factors may have contributed to the cause or severity of the crash, a full investigation is then completed.

Crash Location Reports are completed for all fatal crashes and a copy of the report is supplied to the Local Government responsible for the road on which the crash occurred. Preliminary Investigation Reports will also be supplied to the relevant Local Government when the road environment is determined to have not been at fault, or if road safety issues not directly related to the crash have been identified during the investigation and require attention.

Preliminary Investigation and Crash Location Reports can be used in conjunction with Road Safety Audits to identify weak links in the road network. Further information and access to an Interactive Intersection Crash Ranking Report can be found on the Main Roads WA website.

Black Spot Program

The Black Spot program identifies and treats locations which experience high numbers of crashes over a defined period or are identified as high risk in a Road Safety Inspection Report. Black Spot Funding is focused on the most cost-effective treatment for the situation and evidence suggests the Black Spot Program is effective in reducing crashes and therefore improving the safety of high-risk roads.

Further information on the National and Western Australian Black Spot Programs can be found on the Main Roads WA website.

References

Australian Automobile Association. (2013). *Star Rating Australia's National Network of Highways*. Canberra, ACT: Author.

Aumann, P., Bekavac, M., Steinmetz, L., Tziotis, M., Ahmed, F., Fanning, R., & Bobbermen, D. (2020a). Road Cross-section Design for Road Stereotypes (including Network Safety Plans) and a Safe System (AP-R618-20). Sydney, NSW: Austroads.

Aumann, P., Bekavac, M., Steinmetz, L., Tziotis, M., Ahmed, F., Fanning, R., & Bobbermen, D. (2020b). Network Design for Road Safety (Stereotypes for Cross-sections and Intersections) User Guide (AP-R619-20). Sydney, NSW: Austroads.

Belin, M.-Å., Tillgren, P., & Vedung, E. (2012). Vision Zero – a road safety policy innovation. *International Journal of Injury Control and Safety Promotion, 19*(2), 171-179. doi:10.1080/17457300.2011.635213.

Commonwealth of Australia. (2021). *National Road Safety Strategy 2021-30: Consultation Draft*. Canberra, ACT: Author.

Cavanagh, C. & Sinclair, M. (2021). *The utility of the iRAP star rating system in assessing (and potentially changing) the safety level of rural road intersections*. Virtual Southern African Transport Conference 2021, 5 – 7 July, South Africa.

Chhanabhai, V., Beer, K., & Johnson, M. (2017). *Calibrating Infrastructure Risk Rating (IRR) for Victorian roads*. Proceedings of the 2017 Australasian Road Safety Conference, 10th – 12th October, Perth, Australia.

Durdin, P., Harris, D., Smith, D., McIntyre, A., & Beer, K. (2018). *Best practice in road safety infrastructure programs* (No. AP-R562-18). Sydney, NSW: Austroads.

Durdin, P. & Tuke, R. (2020). *Local government road safety management guidance* (AP-R612-20). Sydney, NSW: Austroads.

European Road Assessment Programme (EuroRAP). (2009). *Star Rating Roads for Safety: the EuroRAP Methodology*. Hampshire, UK: Author.

International Road Assessment Programme (iRAP). (2021). AusRAP News: New direction under Austroads. https://irap.org/2021/11/ausrap-news-new-direction-under-austroads/

International Road Assessment Programme (iRAP). (2019). *iRAP Project Planning Manual*. London, UK: Author.

Jurewicz, C. (2013). *Australian National Risk Assessment Model: From vision to action*. Proceedings of the 2013 Australasian Road Safety Research, Policing & Education Conference, 28th – 30th August, Brisbane, Queensland. Melbourne, VIC: ARRB Group Ltd.

Jurewicz, C., Steinmetz, L., & Turner, B. (2014). *Australian National Risk Assessment Model* (AP-R451-14). Sydney, NSW: Austroads.

McInerney, R., & Smith, G. (2009). *Saving lives through investment in safer roads: the iRAP partnership*. Proceedings of the 13th Road Engineering Association of Asia and Australasia (REAAA) Conference, Incheon, Korea.

McTiernan, D. (2019). Road Safety – Is It a Local Government Priority? (What Does the Experience Suggest?). *Journal of the Australasian College of Road Safety, 20*(1), 46-53. doi: 10.33492/JACRS-D-18-00285.

Metcalfe, J., & Smith, G. (2005). *The Australian Road Assessment Program (AusRAP)*. 2005 Australasian Road Safety Research Policing Education Conference, Wellington, New Zealand, Ministry of Transport.

Road Safety Commission. (2020). *Driving Change: Road Safety Strategy for Western Australia 2020-2030*. East Perth, WA: Author.

Turner, B., Pyta, V., Woolley, J., & Zhang, S. (2010). *Road Safety on Local Government Roads: Final Report* (No. AP–T144/10). Sydney NSW: Austroads.

WALGA (2021) https://walga.asn.au/getattachment/Policy-Advocacy/Our-Policy-Areas/Infrastructure/Roads/Report-on-Local-Government-Road-Assets-and-Expendi/Road-Assets-and-Expenditure-Report-2019-20-website.pdf?lang=en-AU

Woolley, J., Sotkes, C., Turner, B., & Jurewicz, C., (2018). *Towards Safe System Infrastructure – A Compendium of Current Knowledge* (AP-R560-18). Sydney, NSW: Austroads.

Zia, H., & Atabak, S. (2018). *Calibrating Infrastructure Risk Rating (IRR) to inform speed management in Queensland*. Proceedings of the 2018 Australasian Road Safety Conference, 3 – 5 October 2018, Sydney, Australia.

Zia, H., Harris, D., & Smith, D. (2019). *Infrastructure Risk Rating Manual for Australian Roads* (AP-R587A-19). Sydney, NSW: Austroads.

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