

Road Safety Audit Information Session: Wednesday 20 September 2017

To be held at Main Roads WA, Don Aitken Centre, Perth to be Skype broadcast to all Main Roads WA regional offices in: Bunbury; Geraldton; Carnarvon; Kalgoorlie; Albany; South Hedland; Northam; Narrogin, Derby and Kununurra. Skype broadcast to eastern States attendees.

08:40 - 09:00	Registration (refreshments).
09:00 - 09:10	Welcome and outline - Troy Bozich, Manager Engineering Services, City of Canning.
09:10 – 09:35	An overview of Main Roads WA revised Policy and Guidelines for Road Safety Audit – Andy McMahon, Senior Road Safety Investigator, MRWA. (20 mins / 5 mins Q & A)
09:35 – 10:00	Benefits of road safety audit policy development and auditor accreditation for LGA's - Troy Bozich, Manager Engineering Services, City of Canning. (20 mins / 5 mins Q & A)
10:00 – 10:25	Local Government case study in developing a Road Safety Audit policy - Kimberly Brosztl, Manager Engineering, City of Melville. (20 mins / 5 mins Q & A)
10:25 – 10:45	Morning tea
10:45 – 11:10	The Future of Road Safety Audit training and accreditation in WA - Andy McMahon, Senior Road Safety Investigator, MRWA. (20 mins / 5 mins Q & A)
11:10 – 11:45	The New Road Safety Audit Portal and access to the new training hub - Evan Williams, Director, Porter Consulting Engineers and Tim Judd, Director, GTA Consultants. (30 mins / 5 mins Q & A)
11:45 – 12:20	Road Safety Audit templates practical application. Adam Hazebroek, Road Safety Officer, MRWA (30 mins / 5 mins Q & A)
12:20 – 12:25	Final Q and A
12:25 – 13:00	Networking lunch

Welcome to the Road Safety Audit Portal

www.road-safety-audit-wa.org

The Road Safety Audit Portal is a place where Road Safety Auditors can gain accreditation and maintain the currency of their certification.

The Portal provides online training and certification for Road Safety Auditors and enables continuing professional development and maintenance of audit reports and training records.

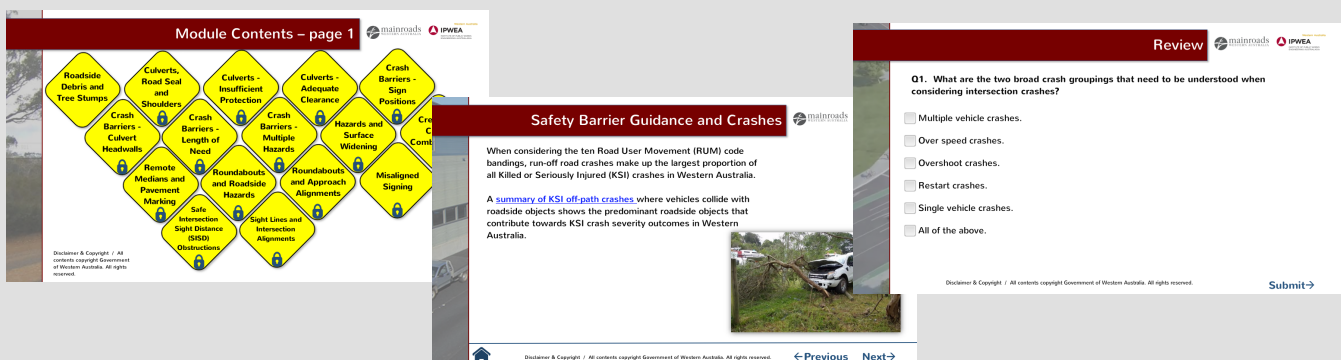
Focus on Safety

**Support the delivery of improved safety outcomes for all users of the transport network*



The Online Road Safety Audit Course consists of 23 interactive, easy to navigate modules that cover all of the knowledge and competencies required to be a successful Road Safety Auditor.

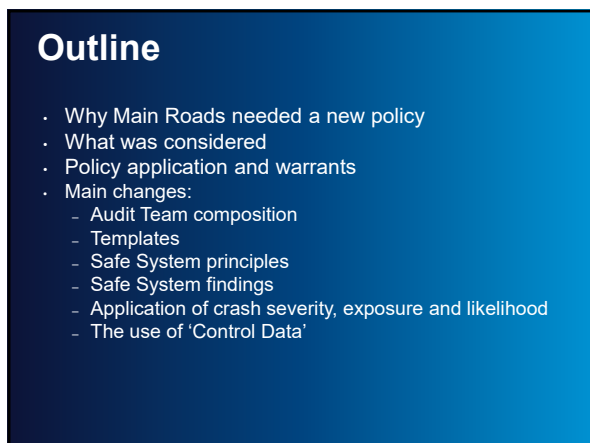
A self-paced approach to online learning enables Auditors to manage their progress, accessing modules at a time and place that suits their schedules.



Visit www.road-safety-audit-wa.org to create your user profile and get access to the online Road Safety Audit professional learning.







- Why Main Roads needed a new policy
- What was considered
- Policy application and warrants
- Main changes:
 - Audit Team composition
 - Templates
 - Safe System principles
 - Safe System findings
 - Application of crash severity, exposure and likelihood
 - The use of 'Control Data'

Why did Main Roads need a new policy?

- Austroads are currently reviewing the Guide to Road Safety Part 6: Road Safety Audit.
- Main Roads previous policy was unclear and provided limited advice.
- Align the policy with Safe System principles.
- Greater focus on Killed or Serious Injury (KSI) crash risk to align with National and State Strategies.
- More evidence based approach to audit delivery.

What was considered?

- Audit policies throughout Australia and New Zealand
- ARRB contract reports
- Austroads draft recommendations
- National and International best practice
- What Main Roads currently audit

Review of key definitions:

Road safety engineering means the design and implementation of physical changes to the road network intended to reduce the number and severity of crashes involving road users, drawing on the results of crash investigation.

Road Safety Inspection means a formal examination of an existing road or road related area to which an independent, qualified team report on the team's potential and likely safety performance of the location, if necessary known as an Existing Road Safety Audit.

RCSRA Road Safety Management means a system adopted by Main Roads for managing Road Trauma on the state road network.

Safe System means a road safety approach adopted by National and State Government to generate improvements in road safety. The Safe System approach is underpinned by three guiding principles: people with errors make mistakes on our roads but should not be killed or seriously injured as a consequence, there are known limits to the forces the human body can tolerate without being seriously injured, and the road transport system should be designed and maintained so that people are not exposed to crash forces beyond the limits of their physical tolerance.

Specialist Adviser means a person approved by the client who provides independent specialist advice to the audit team, such as, road maintenance, advisory, traffic, signal operations, police advisors and individuals with specialist local knowledge.

State road means a highway and main road under the control of Main Roads Western Australia and includes national highways.

2. PRELIMINARY

2.1 Definitions

Audit Brief means the instructions prepared and approved by the client (preparation and design team) prepared using the Main Roads template, it defines the scope of the audit and provides sufficient information to enable the audit team to conduct the audit.

Audit Team means a team that will undertake all work that people independent of the design team, consultants, experts or appropriately qualified and trained in road safety engineering or crash investigation with knowledge of current practice in highway design or traffic engineering principles who undertake the road safety audit.

Audit Team Leader means the person with appropriate training and experience with overall responsibility for carrying out the audit and verifying the report, an Audit Team Leader practicing in Western Australia must be an ARRB/ARRB Roads Accredited Senior Road Safety Auditor.

Audit Team Member means an appropriately experienced and trained person who is appointed to the Audit Team and who reports to the Audit Team Leader. An Audit Team Member practicing in Western Australia must be an ARRB/ARRB Roads Accredited Road Safety Auditor.

Audit Team Trainer means an individual that has successfully completed a recognised Road Safety audit training course who accompanies the Audit Team to gain experience of the road safety audit process.

Corrective Action Report (CAR) means a formal summary report prepared by the Audit Team to be submitted to the client (Client Project Team). Regional Manager or designated representative to respond to identified findings and recommendations required in the audit report.

Crash Investigation means an examination of crashes to identify patterns and common trends that may have contributed to crash causation or crash severity. This can include the detailed investigation of a single crash.

IMPROVEMENT means a state (action, road safety audit finding) which may result in state or national safety outcomes.

Independent Member means an Audit Team Leader with appropriate training and experience who is employed by an organisation independent of the Transport Audit Team Leader.

Main Roads means Main Roads Western Australia.

Trainer Audit Team Leader means an Audit Team Member with appropriate training and experience who is independently verified by an Audit Team Leader to meet the requirements to qualify for accreditation as an Audit Team Leader.

Permanent (change) means any permanent change to the road network, including but not limited to permanent improvement works and temporary works.

Policy Application and Warrants

- All State roads in Western Australia and all Federal and State funded Blackspot projects on public roads.

[illegible]

Main Changes

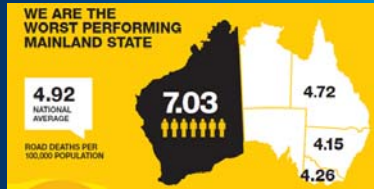
Audit Team Composition

- *Austroroads* “an independent, **qualified team** reports on the project’s crash potential and safety performance.”
- Minimum Team composition WA:
 - Accredited Senior Road Safety Auditor; and
 - At least one accredited Road Safety Auditor.*(Also adopted by the Road Safety Audit Panel)*

Audit templates:

[illegible][illegible]

Safe System Principles (KSI)



Safe System Findings

- **Crash Severity**
 - head-on crashes (>70 km/h)
 - right angle crashes (>50 km/h)
 - run off road impact object crashes (>40 km/h)
 - crashes involving vulnerable road users (>30 km/h)

"IMPORTANT"

Safe System Findings

- **Crash Exposure**
 - this refers to which road users, in what numbers and for how long are using the road and are thus exposed to a potential crash.

'LOW' 'MODERATE'

'HIGH' or 'VERY HIGH'



Table 4.4 - Austroads Safe System Assessment Framework

Safe System Findings

Crash Likelihood

- groups of factors affecting the probability of a crash occurring, including: issues such as level of intersection control (e.g. priority/signals/movement ban), speed, sight distance, geometric alignment, driver guidance and warning.

'LOW' 'MODERATE' 'HIGH' or 'VERY HIGH'

[IMPORTANT | MODERATE]

Safe System Finding Example

Crash Severity

- Restricted SISD
- Right angle crash risk (110 km/h)
- "IMPORTANT"
- 3500 AADT



Safe System Finding Example

Crash Exposure:

- 3500 AADT
- "MODERATE"

Crash Likelihood:

Consider other factors,
Can be Lower or Higher
than Exposure

[IMPORTANT | HIGH]

Crash Exposure	Crash Likelihood	Crash Severity
<p>Crash exposure is the number of vehicles that are exposed to a particular hazard. It is calculated by multiplying the number of vehicles that are exposed to the hazard by the number of times the hazard occurs.</p> <p>Crash exposure is a measure of the risk of a crash occurring. It is calculated by multiplying the number of vehicles that are exposed to the hazard by the number of times the hazard occurs.</p> <p>Crash exposure is a measure of the risk of a crash occurring. It is calculated by multiplying the number of vehicles that are exposed to the hazard by the number of times the hazard occurs.</p>	<p>Crash likelihood is the probability of a crash occurring. It is calculated by dividing the number of crashes that have occurred by the number of vehicles that are exposed to the hazard.</p> <p>Crash likelihood is a measure of the risk of a crash occurring. It is calculated by dividing the number of crashes that have occurred by the number of vehicles that are exposed to the hazard.</p> <p>Crash likelihood is a measure of the risk of a crash occurring. It is calculated by dividing the number of crashes that have occurred by the number of vehicles that are exposed to the hazard.</p>	<p>Crash severity is the number of vehicles that are involved in a crash. It is calculated by multiplying the number of vehicles that are involved in a crash by the number of times the crash occurs.</p> <p>Crash severity is a measure of the risk of a crash occurring. It is calculated by multiplying the number of vehicles that are involved in a crash by the number of times the crash occurs.</p> <p>Crash severity is a measure of the risk of a crash occurring. It is calculated by multiplying the number of vehicles that are involved in a crash by the number of times the crash occurs.</p>

'Control Data'

ICE – Practical Road Safety Auditing

'Control Data' is documented sources used to support identified road safety audit findings.

Examples of sources of 'Control Data' could include:

- Austroads guidelines;
- Australian Standards;
- ARRB Reports;
- Publications;
- Policies; and
- Crash Studies



Using 'Control Data' is not a standards check.

'Control Data'

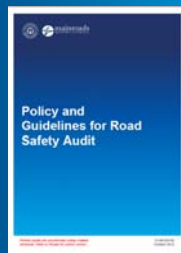
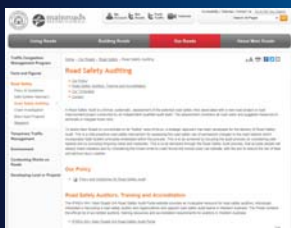
Benefits:

- To avoid the application of road safety myths;
- To avoid the application of road safety gut feelings;
- To be in a position to substantiate a case to client;
- To be in a position to substantiate a case at a public enquiry;
- To be in a position to substantiate a case at a court of law; and
- To avoid wasting time on non-safety issues.

Where do I find the Policy?

www.mainroads.wa.gov.au

/ Our Roads / Road Safety / Road Safety Auditing



Questions?

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Planning and Technical Services
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08 9323 4288

A risk assessment approach has been adopted that includes exposure, likelihood and severity. The Safe System approach has helped practitioners understand that exposure and severity are both important considerations in fatal and serious crash outcomes. However, likelihood (which was perhaps the main issue considered prior to Safe System thinking) has often been overlooked. All elements are important. As indicated below, elimination of exposure or likelihood or severity will mean that fatal and serious outcomes will be eliminated.

Exposure, likelihood and severity (the rows of the matrix) are defined as follows:

- **Road user exposure:** this refers to which road users, in what numbers and for how long are using the road and are thus exposed to a potential crash. The measures of exposure include: AADT, side-road traffic volumes, number of motorcycles, cyclists and pedestrians crossing or walking along the road, length of the road, area and length of time.
- **Crash likelihood:** groups of factors affecting the probability of a crash occurring. They can be elements which moderate opportunity for conflict (e.g. number of conflict points, offset to roadside hazards, separation between opposing traffic). They can also include elements of road user behaviour and/or road environment. Typically, these are the elements which moderate road user error rates. This includes issues such as level of intersection control (e.g. priority/signals/movement ban), speed, sight distance, geometric alignment, driver guidance and warning. and maintenance (change in practice; implications of timing).
- **Crash severity:** groups of factors affecting the probability of severe injury outcomes should a crash occur. Typically, these factors are associated with the amount of kinetic energy and its transfer in the crash, e.g. impact speeds and angles, severity of roadside hazards.

The matrix columns show the following major crash types:

- run-off-road (also referred to as 'loss of control', or 'off path on curve/straight')
- head-on (or 'vehicles from opposing directions')
- intersection ('vehicles from adjacent directions')
- other (this incorporates all same direction, manoeuvring, overtaking, on path and miscellaneous crashes)
- pedestrian
- cyclist
- motorcyclist.

These crash types represent the main crash and road user types that contribute to death and serious injury. They are included as an element of the matrix to help concentrate thinking on crash causes and solutions. They are also provided in this way to ensure that vulnerable road users are directly considered.

Pedestrian, cyclist and motorcyclist crashes are separated to highlight the special focus on vulnerable road users. Note that in some circumstances (depending on the purpose of the assessment) other columns may also be added for specific crash types if these are of high importance (e.g. heavy vehicles).

As already discussed in Section 4.3, the additional Safe System components have been included to help meet the objective that each Safe System pillar be included. Note that post-crash care has been added as a pillar. This forms a pillar of the global road safety action plan through the United Nations (WHO 2011). In the infrastructure context there are sometimes measures that can be taken to facilitate quicker emergency response times, including access to the crash scene, thereby improving safety outcomes.

Examples of how this matrix might be applied are provided in Section 4.5. Depending on the purpose of the assessment, the process may simply require application of this matrix as a way to guide thinking, and document likely Safe System outcomes for a project. However, it is likely that in many cases solutions will be required to improve safety. A draft treatment hierarchy and selection process is outlined in Section 4.6.

Table 4.4: Safe System matrix scoring system

Road user exposure	Crash likelihood	Crash severity
<p>0 = there is no exposure to a certain crash type. This might mean there is no side flow or intersecting roads, no cyclists, no pedestrians, or motorcyclists).</p>	<p>0 = there is only minimal chance that a given crash type can occur for an individual road user given the infrastructure in place. Only extreme behaviour or substantial vehicle failure could lead to a crash. This may mean, for example, that two traffic streams do not cross at grade, or that pedestrians do not cross the road.</p>	<p>0 = should a crash occur, there is only minimal chance that it will result in a fatality or serious injury to the relevant road user involved. This might mean that kinetic energies transferred during the crash are low enough not to cause a fatal or serious injury (FSI), or that excessive kinetic energies are effectively redirected/dissipated before being transferred to the road user.</p> <p>Users may refer to Safe System-critical impact speeds for different crash types, while considering impact angles, and types of roadside hazards/barriers present.</p>
<p>1 = volumes of vehicles that may be involved in a particular crash type are particularly low, and therefore exposure is low.</p> <p>For run-of-road, head-on, intersection and 'other' crash types, AADT is < 1 000 per day.</p> <p>For cyclist, pedestrian and motorcycle crash types, volumes are < 10 units per day.</p>	<p>1 = it is highly unlikely that a given crash type will occur.</p>	<p>1 = should a crash occur, it is highly unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies must be fairly low during a crash, or the majority is effectively dissipated before reaching the road user.</p>
<p>2 = volumes of vehicles that may be involved in a particular crash type are moderate, and therefore exposure is moderate.</p> <p>For run-of-road, head-on, intersection and 'other' crash types, AADT is between 1 000 and 5 000 per day.</p> <p>For cyclist, pedestrian and motorcycle crash types, volumes are 10–50 units per day.</p>	<p>2 = it is unlikely that a given crash type will occur.</p>	<p>2 = should a crash occur, it is unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, and the majority of the time they are effectively dissipated before reaching the road user.</p>
<p>3 = volumes of vehicles that may be involved in a particular crash type are high, and therefore exposure is high.</p> <p>For run-of-road, head-on, intersection and 'other' crash types, AADT is between 5 000 and 10 000 per day.</p> <p>For cyclist, pedestrian and motorcycle crash types, volumes are 50–100 units per day.</p>	<p>3 = it is likely that a given crash type will occur.</p>	<p>3 = should a crash occur, it is likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, but are not effectively dissipated and therefore may or may not result in an FSI.</p>
<p>4 = volumes of vehicles that may be involved in a particular crash type are very high, or the road is very long, and therefore exposure is very high.</p> <p>For run-of-road, head-on, intersection and 'other' crash types, AADT is > 10 000 per day.</p> <p>For cyclist, pedestrian and motorcycle crash types, volumes are > 100 units per day.</p>	<p>4 = the likelihood of individual road user errors leading to a crash is high given the infrastructure in place (e.g. high approach speed to a sharp curve, priority movement control, filtering right turn across several opposing lanes, high speed).</p>	<p>4 = should a crash occur, it is highly likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are high enough to cause an FSI crash, and it is unlikely that the forces will be dissipated before reaching the road user.</p>

Safe System Findings Explanation and Example

Auditors need to focus on 3 key elements when applying Safe System principles to the road safety audit process:

- Crash Severity;
- Crash exposure; and
- Crash Likelihood

Crash Severity

Auditors when applying the road safety audit process should provide emphasis to any road safety audit findings that have the potential to result in fatal or serious injury.

Austroads guidelines and the National and State Road Safety Strategies provide direction about the crash types, where the chances of surviving a crash decrease rapidly above certain impact speeds, depending on the nature of the crash.

- Head-on crashes > 70 km/h;
- Right-angle crashes > 50 km/h;
- Run off road impact object crashes > 40 km/h; and
- Crashes involving vulnerable road users > 30 km/h

This is applied by providing the additional annotation “**IMPORTANT**” to any finding that has the potential to result fatal or serious injury, using the crash types and associated speeds provided. This provides a more scientific approach to determining findings with the potential to result in a KSI crash outcome.

Crash Exposure

The next element auditors need to consider when you identify a finding with a potential KSI crash outcome that is deemed “**IMPORTANT**” is crash exposure.

For the application of crash exposure the revised audit process has adopted the crash exposure volume ranges provided in the *Austroads Safe System Assessment Framework*, which defines Crash exposure as: road users in what numbers and for how long are using the road and are thus exposed to a potential crash.

For the application of crash exposure auditors should refer the road user number ranges provided in Table 4.4 in the *Austroads Safe System Assessment Framework*.

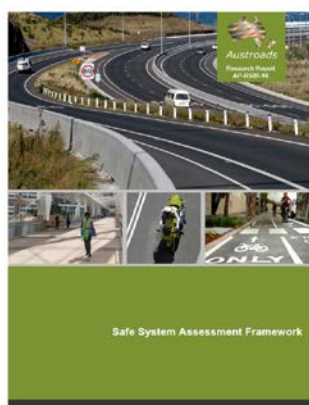


Table 4.4 Safe System audit finding examples		
Crash exposure	Crash severity	Crash likelihood
1. A finding that a road has a high volume of traffic, which increases the potential for a crash.	2. A finding that a road has a high speed limit, which increases the potential for a crash.	3. A finding that a road has a high number of road users, which increases the potential for a crash.
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100. A finding that a road has a high volume of traffic, which increases the potential for a crash.	101. A finding that a road has a high speed limit, which increases the potential for a crash.	102. A finding that a road has a high number of road users, which increases the potential for a crash.

The level of Crash exposure identified is categorised as either ‘**LOW**’ ‘**MODERATE**’ ‘**HIGH**’ or ‘**VERY HIGH**’.

Crash Likelihood

The final element auditors need to consider for all findings with a potential KSI crash outcome deemed **“IMPORTANT”** is the overall level of Crash Likelihood.

This is defined in the Austroads Safe System Assessment Framework as: a group of factors affecting the probability of crash occurring, including issues such as the level of intersection control, speed, sight distance, geometric alignment, driver guidance and warning.

This should be considered by auditors by applying their road safety engineering experience, using the category of crash exposure identified in the previous step as a starting point and then consider various other aspects of each findings location to determine the overall level of Crash Likelihood.

This can either be the same, higher or lower than the level of crash exposure identified in the previous step. With the overall crash likelihood defined as either **‘LOW’ ‘MODERATE’ ‘HIGH’ or ‘VERY HIGH’**

This annotation is then displayed next to the additional annotation **“IMPORTANT”** on applicable road safety audit findings.

E.g. [**IMPORTANT | MODERATE**]

Safe System Finding Example

The photograph below shows an example of a site at an intersection with restricted Safe Intersection Sight Distance (SISD) on a road with a 110 km/h speed limit.



Crash Severity

This location has a right angle crash risk with a potential impact speed far in excess of > 50 km/h, hence it is a Safe System finding and it should have the additional annotation **“IMPORTANT”** associated with the finding.

Crash Exposure

The traffic volume at the site is 3500 vehicles per day and when referring to Table 4.4 of the *Austroads Safe System Assessment Framework* we can see that the level of exposure is found to be **“MODERATE”**

Table 4.4: Safe System matrix scoring system

Road user exposure	Crash likelihood	Crash severity
0 = there is no exposure to a certain crash type. This might mean there is no side flow or intersecting roads, no cyclists, no pedestrians, or motorcycles.	0 = there is only minimal chance that a given crash type can occur for an individual road user given the infrastructure in place. Only extreme behaviour or substantial vehicle failure could lead to a crash. This may mean, for example, that two traffic streams do not cross at grade, or that pedestrians do not cross the road.	0 = should a crash occur, there is only minimal chance that it will result in a fatality or serious injury to the relevant road user involved. This might mean that kinetic energies transferred during the crash are low enough not to cause a fatal or serious injury (FSI), or that excessive kinetic energies are effectively redirected/dissipated before being transferred to the road user. Users may refer to Safe System critical impact speeds for different crash types, while considering impact angles, and types of roadside hazards/barriers present.
1 = volumes of vehicles that may be involved in a particular crash type are particularly low, and therefore exposure is low. For run-of-road, head-on, intersection and other crash types, AADT is < 1,000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are < 10 units per day.	1 = it is highly unlikely that a given crash type will occur.	1 = should a crash occur, it is highly unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies must be fairly low during a crash, or the majority is effectively dissipated before reaching the road user.
2 = volumes of vehicles that may be involved in a particular crash type are moderate, and therefore exposure is moderate. For run-of-road, head-on, intersection and other crash types, AADT is between 1,000 and 5,000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 10-50 units per day.	2 = it is unlikely that a given crash type will occur.	2 = should a crash occur, it is unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, and the majority of the time they are effectively dissipated before reaching the road user.
3 = volumes of vehicles that may be involved in a particular crash type are high, and therefore exposure is high. For run-of-road, head-on, intersection and other crash types, AADT is between 5,000 and 10,000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 50-100 units per day.	3 = it is likely that a given crash type will occur.	3 = should a crash occur, it is likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, but are not effectively dissipated and therefore may or may not result in an FSI.
4 = volumes of vehicles that may be involved in a particular crash type are very high, or the road is very long, and therefore exposure is very high. For run-of-road, head-on, intersection and other crash types, AADT is > 10,000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are > 100 units per day.	4 = the likelihood of individual road user errors leading to a crash is high given the infrastructure in place (e.g. high approach speed to a sharp curve, priority movement control, filtering right turn across several opposing lanes, high speed).	4 = should a crash occur, it is highly likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are high enough to cause an FSI crash, and it is unlikely that the forces will be dissipated before reaching the road user.

Crash Likelihood

Auditors then need to apply their road safety engineering experience to determine the overall crash likelihood using the level of exposure identified in the previous step as a starting point.

Remember, the overall crash likelihood can be either the same, lower or higher than the level of crash exposure identified in the previous step.

Examples of reasons an auditor may elect to increase the “**MODERATE**” exposure level to “**HIGH**” or even “**VERY HIGH**” overall Crash Likelihood in this example could include:

- a high traffic volume entering from the side road;
- a right angle crash history; or
- the intersection may be located on a crest or curve with severely restricting sight lines.

If none of these conditions exist, the auditor may decide to leave the overall crash likelihood as ‘**MODERATE**’.

Alternatively, an example where an auditor may elect to reduce the level from “**MODERATE**” exposure level to “**LOW**” overall Crash Likelihood in this example could include:

- a very low traffic volume entering from the side road with no crash history.

Control Data

What is 'Control Data'?

Control data is documented sources used to 'support' identified road safety audit findings. The new road safety audit templates provide a road safety audit finding structure that promotes the use of 'Control Data'.

Why do we need 'control data'?

Control data is used to 'support' road safety findings and provides a more evidence based scientific approach to road safety audit delivery, by minimising the application of subjective opinion.

Examples of control data could include:

- Austroads guidelines;
- Australian Standards;
- ARRB Reports;
- Other Publications;
- Policies; and
- Crash Studies

Using 'Control Data' is not a standards check, 'Control Data' should be used to 'support' your findings and minimise the application of subjective opinion in the delivery of road safety audit to achieve better outcomes.

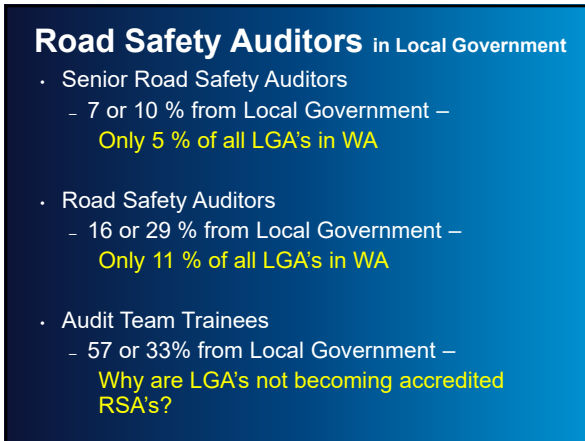
The benefits of using 'Control Data' to support your road safety audit findings include:

- To avoid the application of road safety myths; (E.g. the risk to motorcyclists from wire rope barriers.) There is little evidence to support this myth, there are others.
- To avoid the application of road safety gut feelings and subjective opinion;
- To be in a position to substantiate a case to a client or designer;
- To be in a position to substantiate a case at a public enquiry;
- To be in a position to substantiate a case at a court of law; and
- To avoid wasting time on non-safety issues.



Benefits of Road Safety Audit Accreditation and Policy Development for Local Government

Troy Bozich – Manager Engineering Services
City of Canning



Road Safety Auditors in Local Government

- Senior Road Safety Auditors
 - 7 or 10 % from Local Government –
Only 5 % of all LGA's in WA
- Road Safety Auditors
 - 16 or 29 % from Local Government –
Only 11 % of all LGA's in WA
- Audit Team Trainees
 - 57 or 33% from Local Government –
Why are LGA's not becoming accredited RSA's?



Road Safety Auditors in Local Government

- LGA's are very well positioned to get staff qualified as an auditor.
- Maintaining Accreditation.
- Work with adjacent LGA's
 - Eg. Group of 3 or 4 LGA's work together to undertake RSA's for one another.
- Engage a consultant
 - eg. Group of 3 or 4 LGA's engage a Consultant to undertake a RSA's on projects as a group – training.
- Acknowledge this is more difficult for Regions.

Benefits of Road Safety Audit Accreditation for Local Government

- Road Safety Audits may be required as part of assessing applications
 - Subdivision Applications
 - Development Applications
 - Building Permits
 - JDAP (Joint Development Assessment Panels)
- Engage with developers
- Build relationships with planners
- Save time and save money

Benefits of Road Safety Audit Accreditation for Local Government

- Keep Builders and Consultants informed of changes to your policy and standards.
- Planning or Engineering.
- The engineering conditions are now a Planning function in many LGA's.
- If LGA's don't get it right they will be responsible to fix the problem.

Benefits of Road Safety Audit Accreditation for Local Government

- Council works
 - Develop a Road Safety Audit Policy (Next Presentation)
 - Need to audit our works
 - Initially audit high cost project – move to auditing all projects
 - Main Roads WA grant requirements

Benefits of Road Safety Audit Accreditation for Local Government

Main Roads WA Funding

Black Spot - compulsory design audits on projects worth >\$150,000 (only recommend audits on projects of lesser value if project treatments are complex such as modifying road user behaviour)

Road Safety Design Audits (conducted in accordance with the Austroads Road Safety Audit Guidelines) must be conducted where the estimated project cost exceeds \$150,000). The exception is for project treatments such as tactile edgelines, widen and seal shoulders, where a road safety design audit would not be beneficial for the purpose. However, if the project cost is less than \$150,000 but project treatments are complex, such as modification of road user behaviour at an intersection, project owners should consider undertaking road safety design audits.

Benefits of Road Safety Audit Accreditation for Local Government

Main Roads WA Funding

Road Improvement – Mandatory preliminary and/or detailed design audits to be undertaken during design process. Costs to be incorporated with project costs.

It is mandatory for projects that are awarded funding to be subject to a formal, independent road safety audit in accordance with the Austroads Guide to Road Safety. Such road safety audits should be undertaken during the design process, for instance at the preliminary and/or detailed design stages. Costs associated with such road safety audits should be incorporated into the project costs.

Policy Development for Local Government

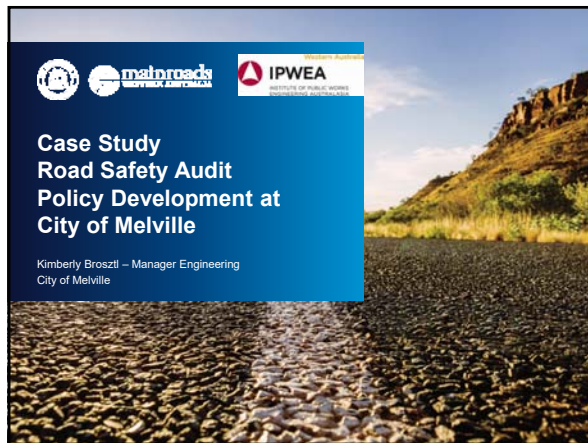
- What is a road safety audit policy?
 - Only about 8 Metro LGA's have a road safety audit policy.
 - Objective : To promote the development and implementation of a safe road environment through the adoption of road safety auditing principles and practices on roadworks within the City.
 - This applies to LG works and works undertaken by developers on LG roads.

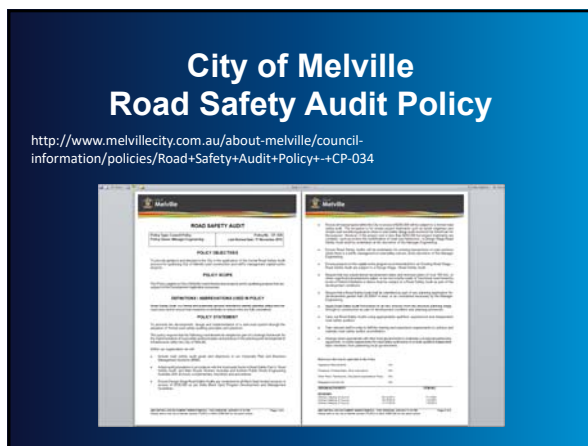
Policy Development for Local Government

- Why do LGA's need a road safety Audit Policy?
 - To ensure that all works consider the safety of all road users.
 - Conditions relating to road safety audits that are placed on Subdivision Applications, Development Applications, Building Permits and JDAPs are sometimes challenged and a policy supports the placement of these conditions.
 - Ensure the policy requires an Accredited Main Roads WA / IPWEA WA Senior Road Safety Auditor undertakes the audit.

Questions?

Troy Bozich
Manager Engineering Services
City of Canning
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Benefits of the Policy



- Emphasises the City's commitment to improving road safety
- Provides direction to City Officers on Road Safety Auditing
- Ensures Road Safety Audits are part of the design process
- Provides direction to external agencies such as developers
- Provides a consistent approach across the organisation

Shortfalls of Current Policy



- Not enough detail in some areas
 - What type of audit and when
 - Make up of the audit team
- No reference to Safe Systems
- Has been misunderstood by developers and in JDAP
- Needs to be updated to reflect MRWA policy and Road Safety Audit Panel recommendations

What to Include When Developing a Policy



- Definitions
- Benefits
- Principles
- Make up of team
- Types of projects to be audited and what audits should be carried out.
- Clear parameters for auditing developments

What to Include When Developing a Policy

- Requirements for CAR and close out
- Refer to Safe Systems
- Refer to templates
- Create a procedure on how the policy will be implemented.



Watch This Space...



The Updated City of Melville Policy should be adopted in November 2017

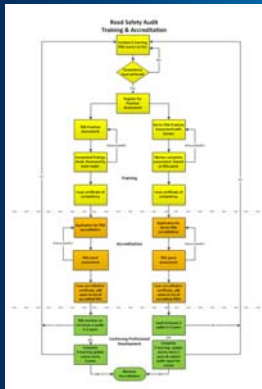
Questions?







New requirements:



Becoming a Road Safety Auditor

- Successful completion of the competency assessed training: comprising 23 online modules and the practical module.
- On completion of the competency assessed training students will be granted the designation of 'Audit Team Trainee (T)'.
- Audit Team Trainees are required to take part in a further road safety audit before applying for auditor accreditation.
- Auditor Accreditation to become an accredited 'Road Safety Auditor (A)'

New Requirements – Auditors and Senior Auditors

- New online competency assessed CPD Update training.
- Requirements when first completing the online competency assessed CPD Update training.
- Audit report registration – 2 in a continuing 2 year period.
- Report review (Senior Auditors only).
- Accreditation requirements are now managed by a Learning Management System (LMS).
- LMS automatically manages accreditation from **01 January 2018**

What is the Auditor Transitional Arrangement?

- Temporary arrangement to assist non-accredited auditors practising in WA become accredited.
- Temporary arrangement available until:
31 December 2018
- Application forms provided on the Portal website.

The image shows a form titled 'Application for Road Safety Auditor Transitional Arrangement'. It includes logos for 'mainroads' and 'IPWEA'. The form has several sections with headings like 'Road Safety Auditor Transitional Arrangement', 'Road Safety Auditor Training', and 'Road Safety Auditor Report'. It contains various fields for personal details, training information, and a declaration section.

What is the Regional Temporary Exemption?

- Temporary exemption for regional road authorities from the minimum accredited team composition requirement.
- To assist road authorities to build and maintain audit resources.
- Application forms provided on the Portal website.

The image shows a form titled 'Regional Road Authority Exemption'. It includes logos for 'mainroads' and 'IPWEA'. The form has sections for 'Regional Road Authority Exemption', 'Regional Road Authority Exemption Details', and 'Regional Road Authority Exemption Declaration'. It contains various fields for authority details, exemption information, and a declaration section.

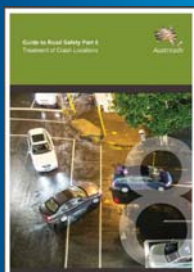
Example of the application of transitional arrangement, regional exemption and discounts in regional Western Australia

- Regional Shires, Regional Main Roads offices apply for regional exemption and auditor transitional arrangement (if applicable).
- RoadWise Road Safety Advisors can also take advantage of the auditor transitional arrangement (if applicable).
- Regional Shires and Main Roads use in-house or appointed Senior Road Safety Auditor to lead audit teams, then use Audit Team Trainees to make up team. (This can include RoadWise Audit Team Trainees or Auditors):
 - Shires take advantage of training discounts of up to **60 %** to increase the numbers of Audit Team Trainees who can then become Auditors. (**available to 96 Regional Shires**)
- Apply for auditor accreditation using audits attended as Audit Team Trainee and use Black Spot experience to evidence Road Safety Engineering experience.
- Regional exemption encourages building relationships with adjoining Shires, Main Roads and WALGA RoadWise to share and build auditor resources in regional Western Australia.
- This group of measures enables Regional Shires, Regional Main Roads and RoadWise to build and maintain auditor resources in regional Western Australia.
- Shires can reapply for an exemption if staff leave and they need to re-establish resources.

Planned Future Training

Austrroads states that "Experience in road safety engineering is the one essential ingredient in any road safety audit team."

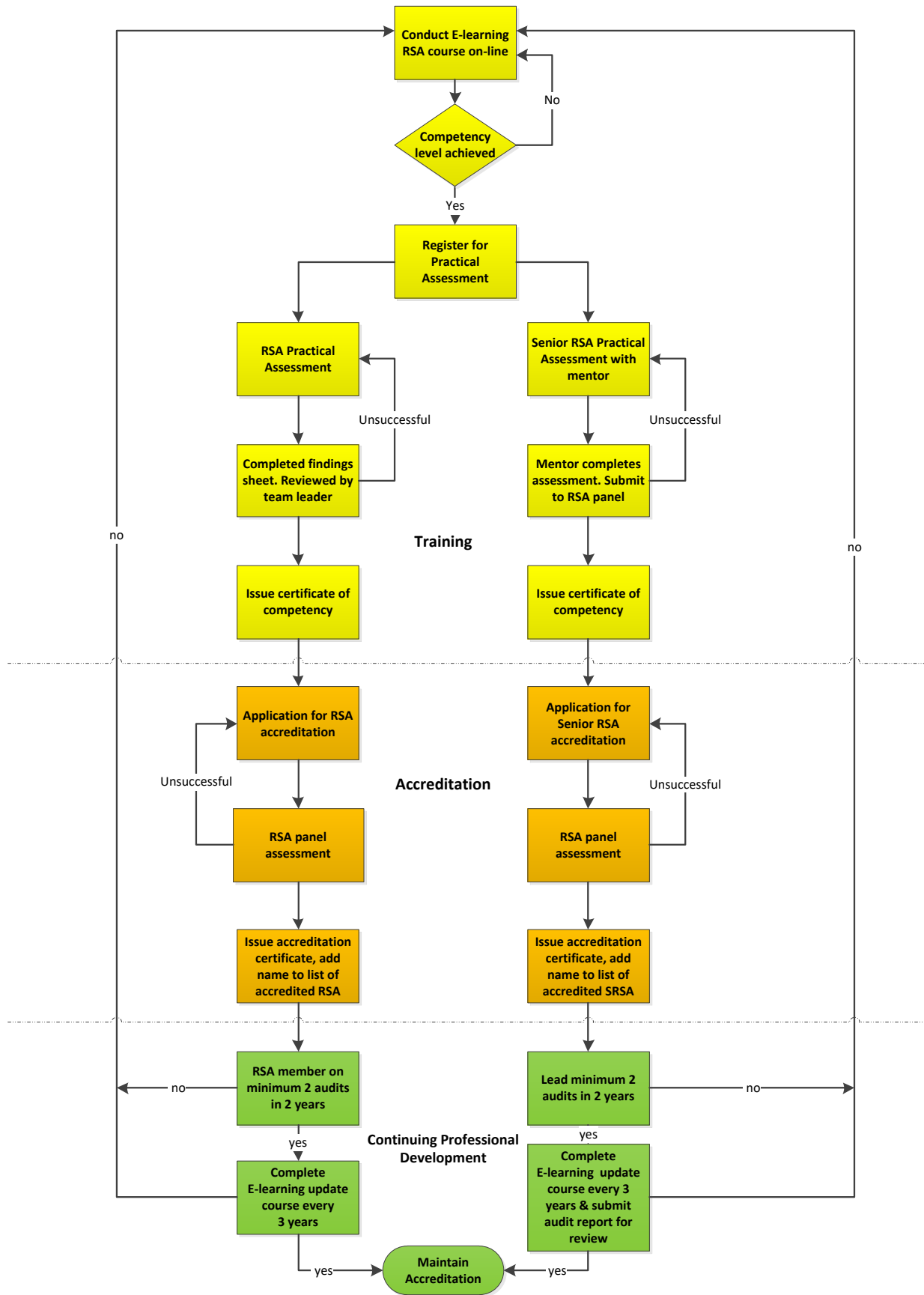
- Competency assessed road safety engineering training based on Austrroads Guide to Road Safety Part 8: Treatment of Crash Locations
- New accreditation requirement by end 2018



Questions?

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Planning and Technical Services
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Road Safety Audit Training & Accreditation



Auditor Accreditation Experience and Knowledge Requirements Guidance:

How do I demonstrate crash investigation or road safety engineering experience?

Firstly, you need to understand the definitions for 'Crash investigation' and 'Road safety engineering'.

Crash investigation means an examination of crashes to identify patterns and common trends that may have contributed to crash causation or crash severity. This can include the detailed investigation of a single crash.

Road safety engineering means the design and implementation of physical changes to the road network intended to reduce the number and severity of crashes involving road users, drawing on the results of crash investigations.

Austroads Guide to Road Safety Part 8: Treatment of Crash Locations provides a further explanation of road safety engineering skills:

- sound knowledge in traffic engineering and road design practice;
- an appreciation of road user behaviour and the contribution it makes to road crashes;
- competency in crash investigation (i.e. crash data analysis, and identification of crash causation and severity factors), and countermeasure development (i.e. identification of targeted cost-effective remedial treatments); and
- competency in monitoring and evaluation methods.

Examples of crash investigation or road safety engineering experience for road safety audit accreditation can include:

- Involvement in the preparation of Blackspot submissions where you examine crashes to identify patterns and common trends that may have contributed to crash causation or crash severity, and involvement in the identification of targeted cost-effective remedial treatments.
- The development of changes to the road network where you examine crashes to identify patterns and common trends that may have contributed to crash causation or crash severity, and then identify targeted cost-effective remedial treatments.
- Detailed investigations of crashes or a single crash (i.e. fatal crash investigation) where crash causation and crash severity is considered and remedial treatments are recommended.
- The investigation of crashes at locations on the road network where crash causation and crash severity is considered to identify potential remedial treatments in response to customer or client enquiries.

Why is it important that a road safety auditor can demonstrate crash investigation or road safety engineering experience?

Road safety auditors need to have an understanding of where crashes occur and the road elements that can contribute to an increased risk of crash causation and severity to be effective at identifying potential crash risk, crash likelihood and exposure related to existing roads and proposed changes to the road network, and have an understanding of effective targeted remedial treatments.

How is your crash investigation or road safety engineering experience demonstrated in your application for road safety auditor accreditation?

Your crash investigation or road safety engineering experience should be demonstrated in your CV or resume, and listed and verified in the completion of the auditor application form.

How do I demonstrate knowledge of current practice in road design or traffic engineering principles?

Firstly, it is important to understand that you are required to demonstrate 'knowledge of' and **not** 'experience in' road design or traffic management principles.

You are **not** required to be a practising road designer or engineer to demonstrate knowledge of road design or traffic management principles for road safety auditor accreditation, although experience in road design and traffic management when combined with road safety engineering experience can be beneficial when conducting a road safety audit.

Applicants need to demonstrate that they have knowledge of Austroads guidelines, Australian Standards and Main Roads guidelines (if applicable) which provide guidance and standards on various road design and traffic management principles that apply to the road network in Western Australia.

Why is it important that a road safety auditor can demonstrate knowledge of current practice in road design or traffic engineering principles?

In conducting a road safety audit, it is important that an auditor possess knowledge of standards and guidelines. This is because this knowledge can assist in identifying findings (e.g. are sight lines sufficient for a particular speed environment?) and to ensure that suggested recommendations are feasible and do not contravene standards and best practice guidance.

A road safety audit is not a design or standards check; however auditors need to have knowledge of which standards or best practice guidelines to reference when considering a particular finding or when making an audit recommendation.

How is your knowledge of current practice in road design or traffic engineering principles demonstrated in your application for road safety auditor accreditation?

Your knowledge of current practice in road design or traffic engineering principles should be demonstrated in your CV or resume.

Non-Accredited Practising Road Safety Auditors Transitional Arrangement - WA

Temporary transitional arrangements have been put in place to assist existing non-accredited Road Safety Auditors currently practising in Western Australia to become accredited road safety auditors following the review of accreditation requirements in Western Australia conducted in 2015/16.

IMPORTANT

Please note that the transitional arrangements will **only** be in place until **31 December 2018**.

From **01 January 2019** all applicants applying for accreditation in Western Australia will have to meet **all** the accreditation requirements listed on the Road Safety Audit Portal website. www.road-safety-audit-wa.org

Why is it important for road safety auditors in Western Australia to become accredited?

It is important for road safety auditors practising in Western Australia to become accredited, because accreditation provides assurance that auditors meet recognised national and international best practise guidance. This is achieved by ensuring that auditors have successfully completed adequate training, possess appropriate experience and regularly update their skills by completing the Continued Professional Development (CPD) requirements of auditor accreditation in Western Australia.

Main Roads Western Australia and a number of Local Governments require auditors to be accredited to enable practitioners to conduct road safety audits on their road network. The Road Safety Audit Panel is also actively working with WALGA and Local Government to promote the benefits of adopting the requirements of accreditation with Local Governments for the delivery of road safety auditing throughout Western Australia.

Eligibility criteria:

Existing non-accredited road safety auditors currently practising in Western Australia must meet the following requirements to be eligible to apply the transitional arrangement:

- Applicants must be able to provide evidence that demonstrates that they have attended a road safety audit training seminar; and
- Applicants must provide evidence of continued practise by demonstrating that they have been a team member on at least 2 road safety audits in the previous 2 years prior to the date of their application.

How do I apply?

Please complete and return the application form below to rsaudits@ipwea.asn.au Applications will be considered by the Road Safety Audit Panel and you will be informed regarding the result of your application.

What happens if my application is unsuccessful?

If your application is unsuccessful and it remains your intention to become an accredited road safety auditor in Western Australia, you will be required to meet **all** the road safety auditor accreditation requirements that are listed on the road safety audit portal website. www.road-safety-audit-wa.org

What happens if my application is successful?

If your application is successful you will be granted the designation of **Audit Team Trainee** and your name will be added to the list of Audit Team Trainees displayed on the Road Safety Audit Portal website www.road-safety-audit-wa.org

Gaining **Audit Team Trainee** status will enable you to apply for accreditation as a Road Safety Auditor in accordance with the requirements of accreditation listed on the Road Safety Audit Portal website. Successful completion of the transitional arrangement means that you will be given an exemption to the requirement to have completed a road safety audit training seminar within 5 years.

Application for Road Safety Auditor Transitional Arrangement - WA

Personal Details:	
Name:	
Name of employer:	
Job title:	
Address:	
Tel. no.	
Email address:	

Road Safety Audit Practise (2 years):		
Enter audit title	Select Stage	Select Date
Enter audit title	Select Stage	Select Date
Enter audit title	Select Stage	Select Date
Enter audit title	Select Stage	Select date

Road Safety Audit Training:	
Enter course/seminar title of formal road safety audit training completed and name of the training provider?	Select Date

Your application must include:

- Evidence of audits attended (including a copy of the audit report front cover page, the page listing your name, audit date and the role you performed in the audit); and
- Evidence of attendance at the WA Road Safety Audit Seminar or recognised equivalent (Course Certificate).

To be Completed by Road Safety Audit Panel:	
Date application received:	Select Date
Transitional arrangement approved:	Choose an item.

Application for Audit Accreditation Temporary Exemption – Regional WA

The temporary audit report registration and accreditation exemption process has been introduced to assist road authorities in regional Western Australia to retain and develop road safety audit skills, experience and resources following the review of the road safety audit accreditation requirements conducted in 2015/16.

Regional road authorities can apply for an exemption of up to 18 months to enable organisations to ensure existing audit resources are retained and further resources can be put in place for the ongoing effective delivery of road safety auditing.

The Western Australia road safety audit definitions provided on the Road Safety Audit Portal website www.road-safety-audit.wa.org states that an **Audit Team** shall comprise at least two people, independent of the design team, comprising members appropriately experienced and trained in road safety engineering or crash investigation with knowledge of current practice in road design or traffic engineering principles who undertake the road safety audit.

In Western Australia the **Road Safety Audit Panel** manages this requirement by requiring an audit team is to be made up of an accredited **Senior Road Safety Auditor** to lead the audit team and at least one accredited **Road Safety Auditor** team member.

What does the exemption permit?

- The exemption permits regional road authorities in Western Australia up to 18 months to conduct resource planning to retain and develop road safety audit skills, experience and resources within their organisation.
- The exemption permits regional road authorities a temporary exception to the accredited Audit Team composition for auditor accreditation and audit report registration requirements. This allows audit teams to be temporarily made up of the following minimum team composition:
 - A team led by an accredited **Senior Road Safety Auditor**; and
 - At least one **Audit Team Trainee** team member.

An **Audit Team Trainee**: means an individual that has successfully completed a recognised Road Safety Audit training course within 5 years who accompanies the Audit Team to gain experience of the road safety audit process.

The aim of the exemption is to enable road authorities to develop existing audit resources within regional Western Australia. This is to be achieved by assisting road authorities to meet the accreditation requirements for existing and new road safety auditors in locations where geographic constraints make it difficult to establish and maintain auditor resources.

This process also aims to encourage bordering regional road authorities to make arrangements and form partnerships to share resources for the successful delivery of road safety auditing.

Please complete and return the application form below to rsaudits@ipwea.asn.au Applications will be registered by the Road Safety Audit Panel to be applied to the audit report registration and accreditation process over the time period of the exemption.

Application for Audit Accreditation Temporary Exemption – Regional WA

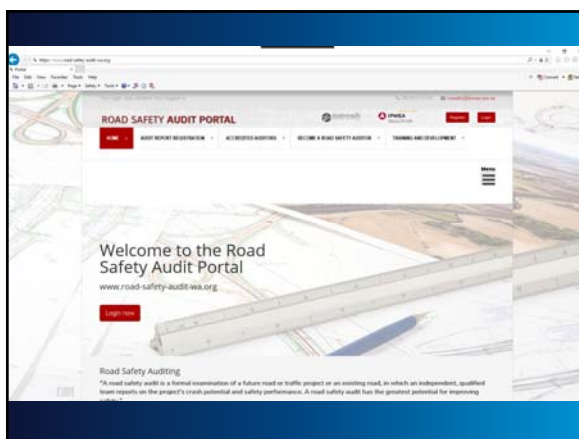
Regional Road Authority Details:	
Road authority applying for an exemption:	
Contact name: (must be roads, traffic or transportation manager)	
Contact job title:	
Tel. no.	
Email address:	

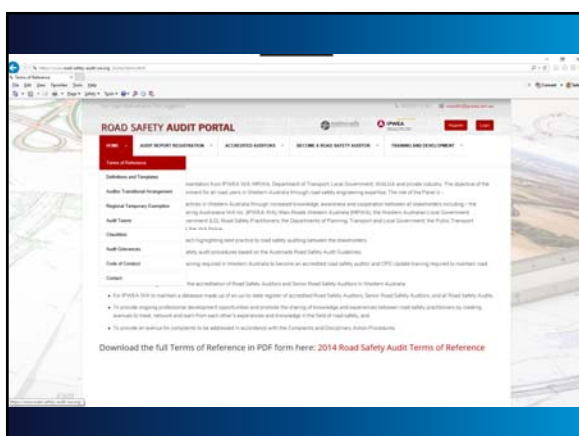
Exemption Application Period Requested:	
6 months	Choose an item.
12 months	Choose an item.
18 months	Choose an item.

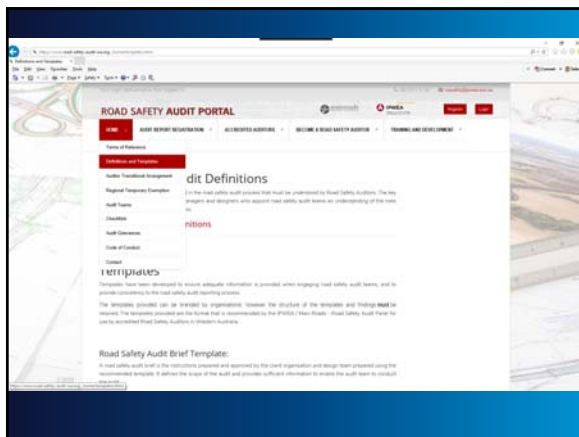
Regional Road Authority Resource Plan Commitment:	
Increase no. Senior Road Safety Auditors:	Choose an item.
Increase no. Road Safety Auditors:	Choose an item.
Liaise with bordering roads authorities to make arrangements to share audit resources:	Choose an item.
All of the above:	Choose an item.

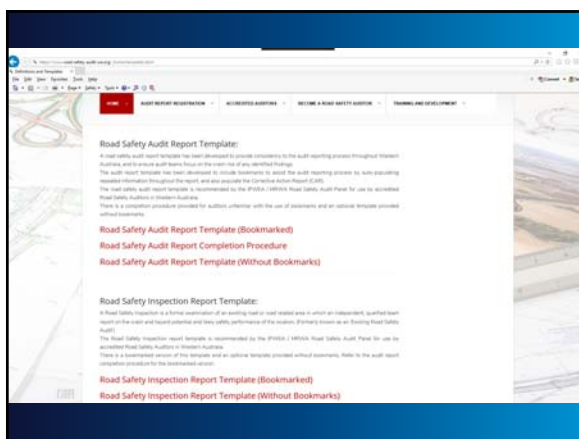
To be Completed by Road Safety Audit Panel:	
Date exemption received:	Click here to enter a date.
Period of exemption:	

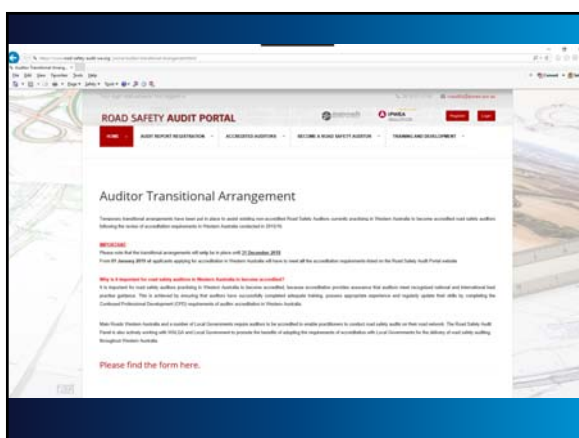


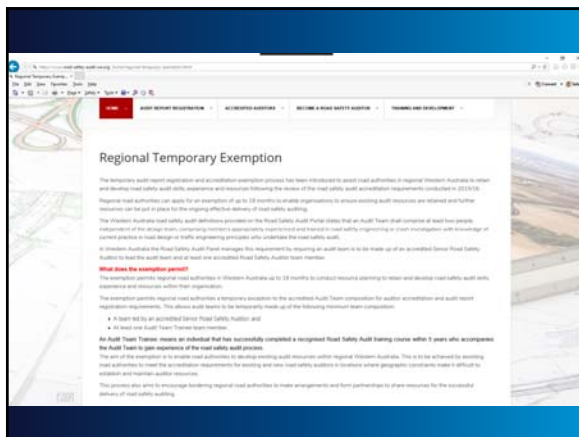


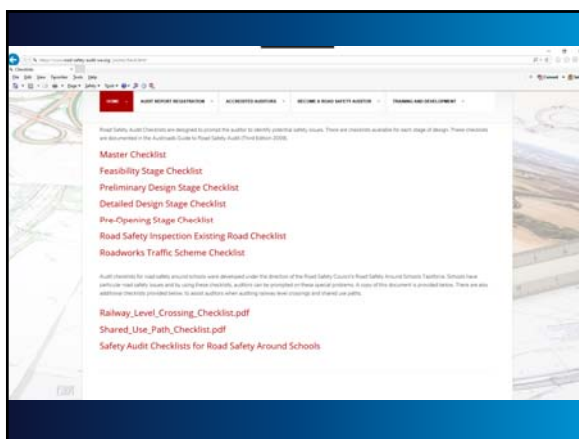


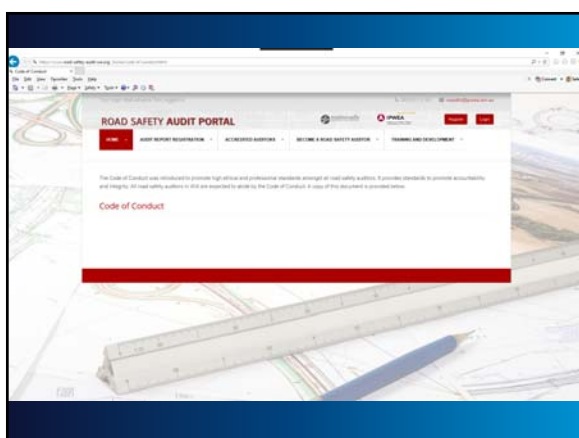


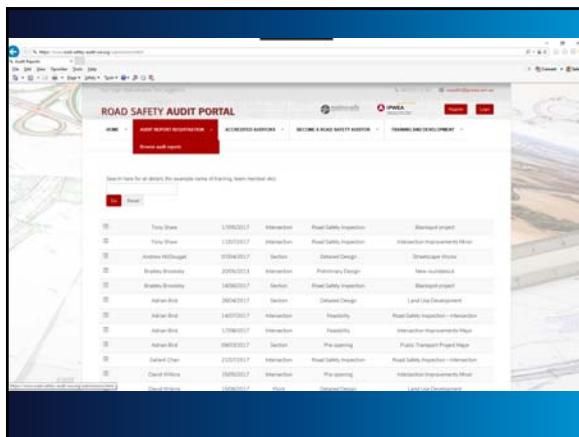


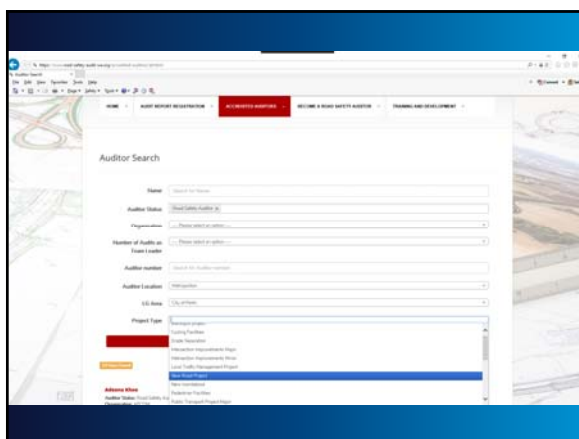


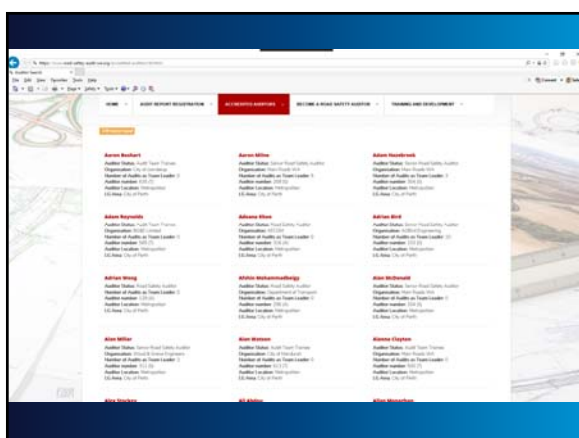


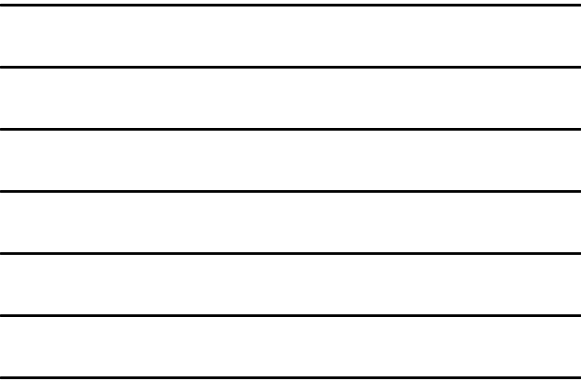


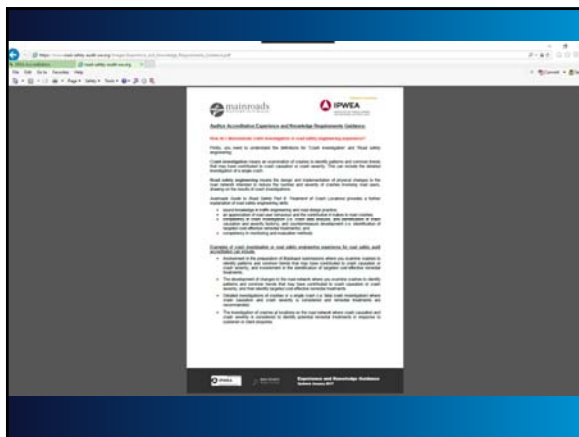


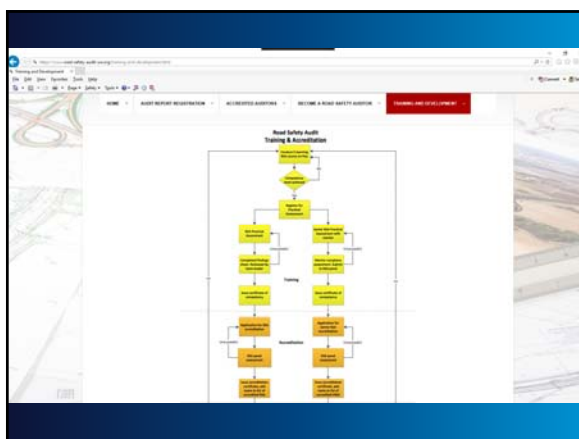


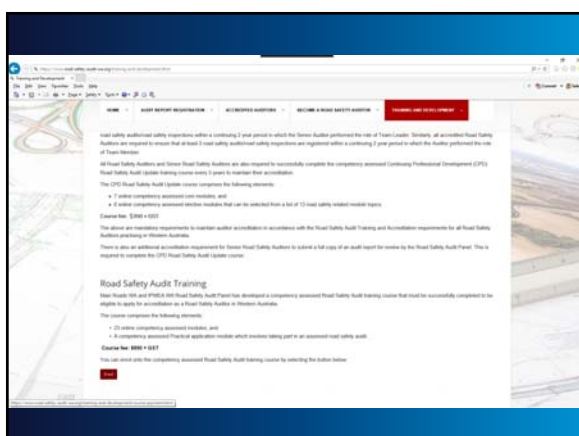


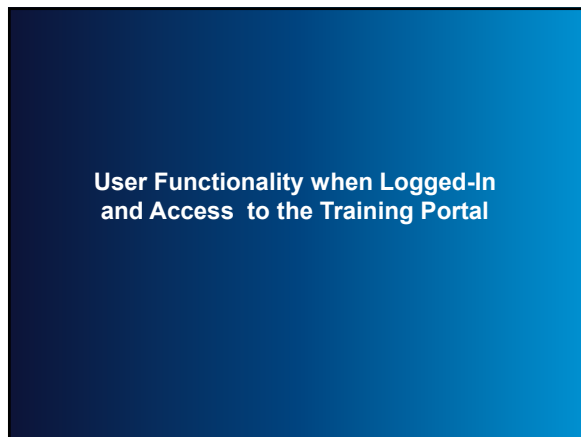


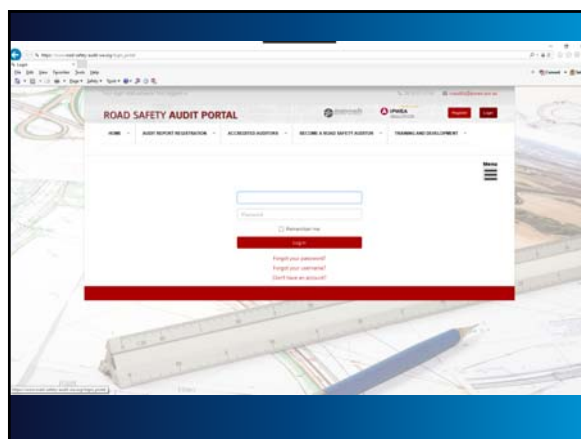


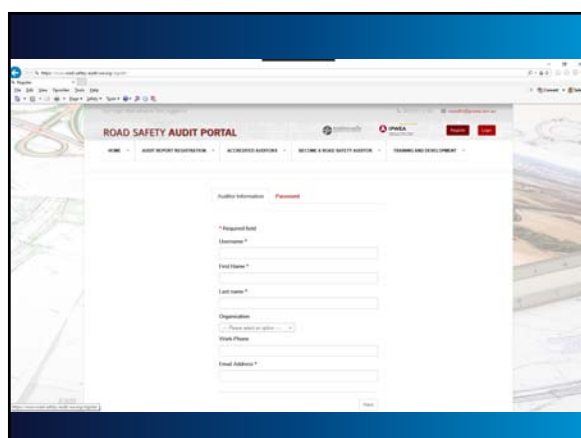












[illegible]

The screenshot shows a web application interface for incident management. The top navigation bar includes a logo, a user profile, and a search bar. The main content area is titled 'Add New Incident' and is part of the 'Incident Management' module. The form is divided into several sections: 'Incident Details', 'Incident Location', 'Incident Status', and 'Incident History'. The 'Incident Details' section includes fields for 'Incident Type', 'Incident Description', 'Incident Category', 'Incident Sub-category', 'Incident Severity', 'Incident Priority', 'Incident Status', 'Incident Date', 'Incident Time', 'Incident Location', 'Incident Address', 'Incident Contact', 'Incident Notes', and 'Incident Attachments'. The 'Incident Location' section includes fields for 'Incident Location', 'Incident Address', 'Incident Contact', 'Incident Notes', and 'Incident Attachments'. The 'Incident Status' section includes fields for 'Incident Status', 'Incident Address', 'Incident Contact', 'Incident Notes', and 'Incident Attachments'. The 'Incident History' section includes fields for 'Incident History', 'Incident Address', 'Incident Contact', 'Incident Notes', and 'Incident Attachments'. A red box highlights the 'Add New Incident' button.

ROAD SAFETY AUDIT PORTAL

HOME SIGNAGE ROAD PROFILE AUDIT REPORT MANAGEMENT ACCIDENTAL HISTORY TRAINING AND DEVELOPMENT LOGOUT

Upload evidence of road safety related training to my profile

Name of training

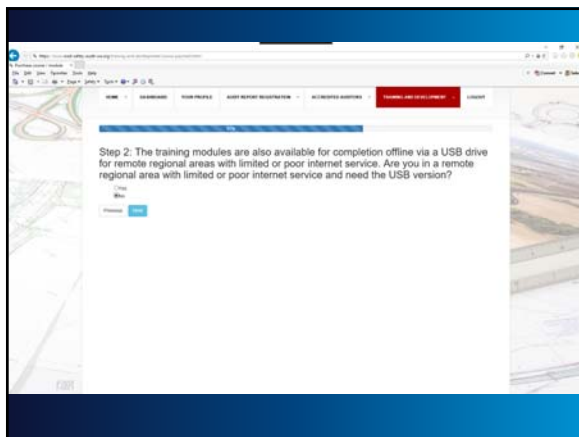
Evidence of training Browse...

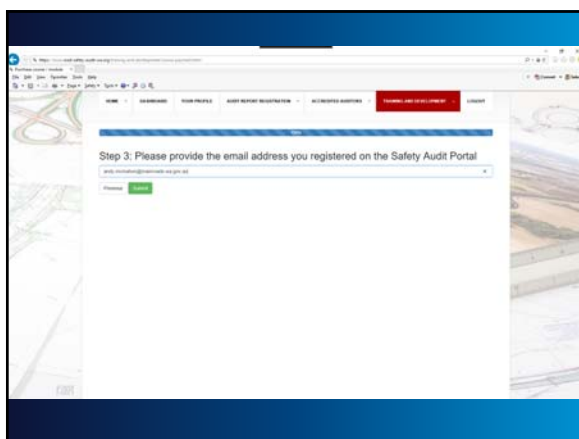
Training Provider

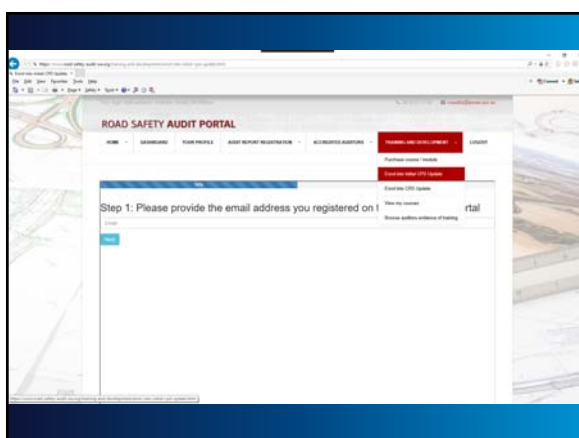
Duration High Risk

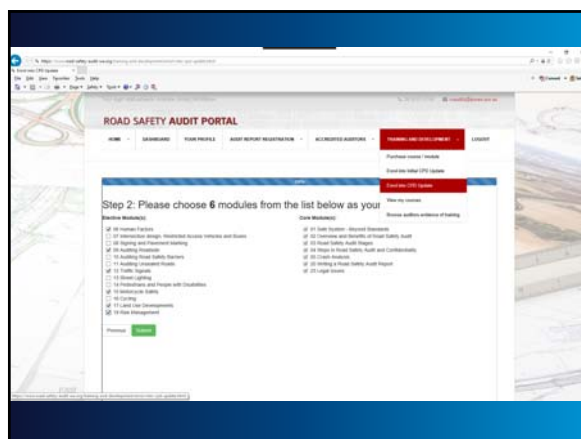
Save Changes

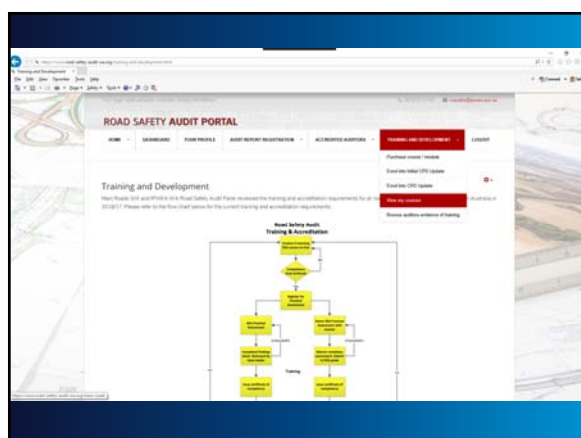


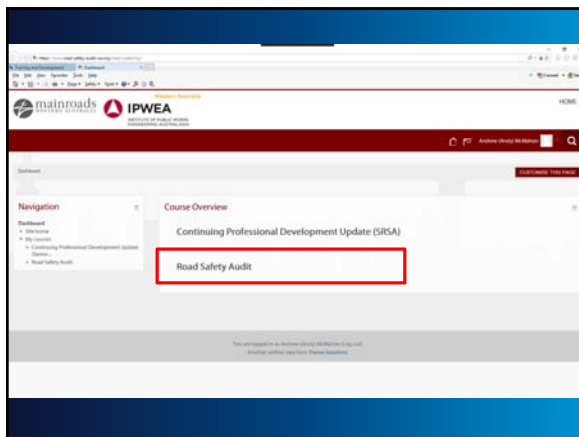


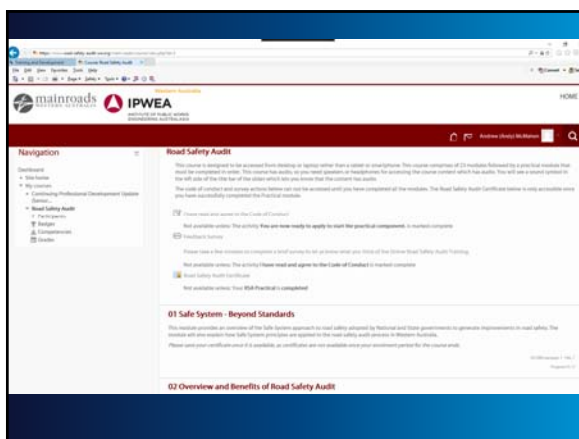


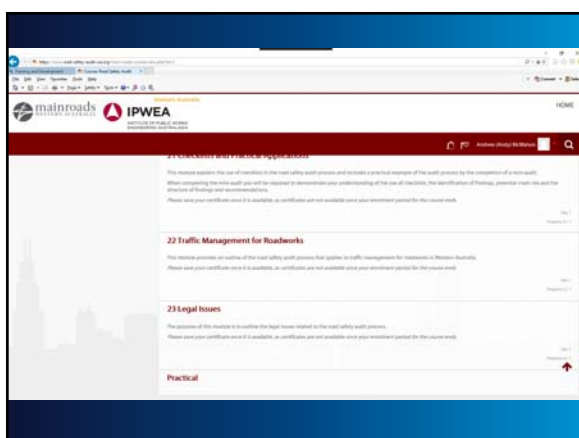


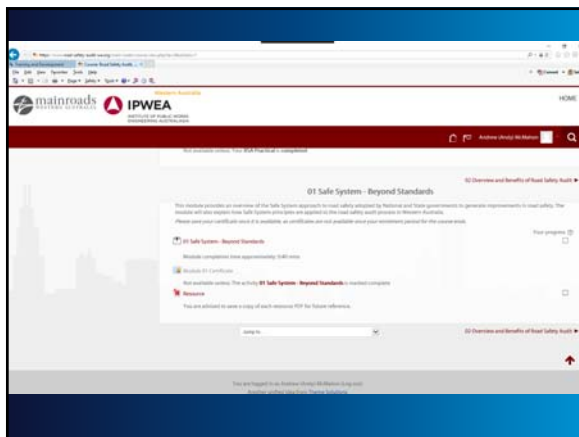


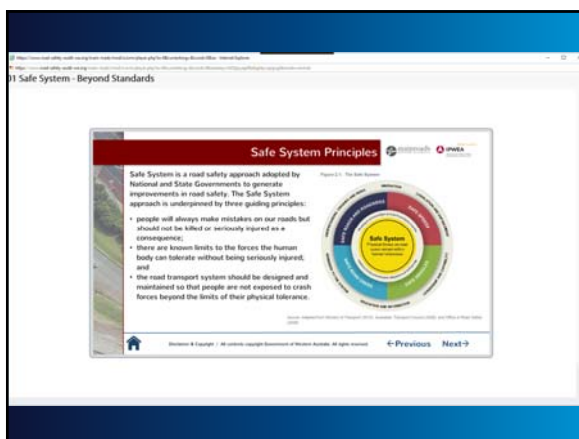


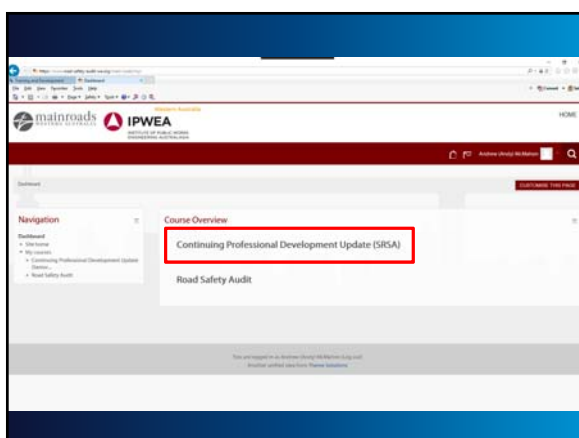


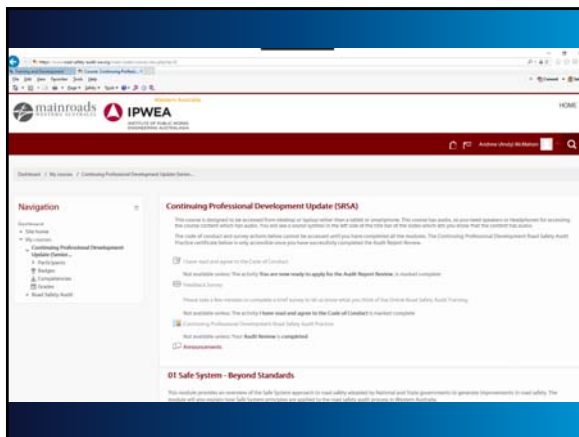


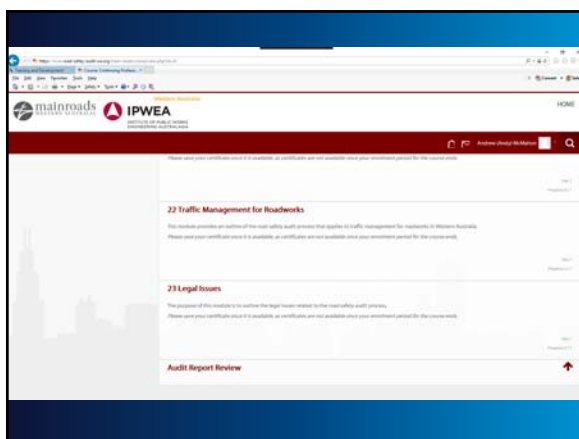












Questions?

Evan Williams
 Director Traffic and Transport
 Porter Consulting Engineers
 evan@portereng.com.au
 08 9315 9955

Tim Judd
 Director
 GTA Consultants
 tim.judd@gta.com.au
 08 6169 1000



Where to find templates?

- Main Roads website
(www.mainroads.wa.gov.au)
 - Our Roads > Road Safety > Road Safety Auditing > Our Templates
- Road Safety Audit Portal (www.road-safety-audit-wa.org)
 - Home > Definitions and Templates

Completion Procedure

- A procedure has been developed for completing reports using the bookmarked template
- The procedure can be found in the same location as the templates
- Highly recommended to refer to the procedure when using the bookmarked template for the first time, or until you're comfortable using bookmarks

Things to remember

- The structure of the report is the important thing – not whether to use bookmarks or not
- The structure of the report in the template is recommended by the IPWEA / Main Roads - Road Safety Audit Panel for use by accredited Road Safety Auditors in Western Australia
- Reports created using the template can be rebranded with your company name and logo

ROAD SAFETY AUDIT BRIEF	
The completed brief was sent to: Audit Team Contact Name: Adam Hazebrook Audit Team Organisation: Main Roads WA Audit Team Organisation Contact Details: 9323 4033 adam.hazebrook@mainroads.wa.gov.au	
A. To be completed by the Client / Design Team	
Road Safety Audit Stage	Stage 3 - Detailed Design
Project Location:	Describe project location including its extent (e.g. Marmon Avenue, Westford Avenue to Ocean Reef Road (11.42 – 12.8 km))
Project Description:	Describe the project (e.g. Proposed Roundabout Safety, Roundabout, Proposed Traffic Signal Controlled Intersection including improved pedestrian crossing facilities etc)
Project Number / Task Number: (Internal MOWA Projects)	E.g. 21102487 / 400 01
B. Client / Design Team Contact Details	
Organisation / Department:	E.g. Main Roads / Metropolitan Project Delivery
Contact Name:	John Smith
Contact Tel. No.:	9323 4111
Email Address:	john.smith@mainroads.wa.gov.au
Date the Final Audit is Required:	30/09/2017 (max. completion time 10 working days)
C. Previous Road Safety Audits Undertaken	
Previous Road Safety Audit:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Road Safety Audit Stage:	Stage 2 - Preliminary Design
Previous Audit Date:	1/1/2015
Previous Audit Organisation:	E.g. Main Roads / Road Safety Branch
Previous Audit Team Leader:	Adam Hazebrook
Copy of Audit and CAR Provided:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

ROAD SAFETY AUDIT BRIEF			
D. Project Information			
Project Objective:	E.g. This project was developed to alleviate a congestion problem involving right turn crashes. The proposed roundabout has been designed to minimise the risk of this crash type in the future. OR The project was developed to alleviate a congestion problem on the westbound approach to the intersection. The additional lane and traffic signals have been provided to alleviate the problem.		
Speed Limit / Design Speed:	80 km/h / 100 km/h		
Standards, Departures from Standards and Mitigation:	E.g. The project was designed to Australian Guide to Road Design and Australian Standards. The required Safe Intersection Sight Distance could not be achieved for vehicles exiting Ocean Reef Road due to site constraints. Mitigation measures were provided in the form of traffic calming measures on the adjoining road. This was provided to ensure vehicle speeds are adequately reduced in the vicinity of the intersection.		
Existing Traffic Flows:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 50,000 AADT Ocean Reef Rd (Aug 2014)		
Forecast Traffic Flows:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 60,000 AADT Ocean Reef Rd (2020)		
Crash Data (5 Years):	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Speed Survey Data:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
E. List of Documents Supplied			
Document Ref.	Document Title	Scale	Date
TR05/01/100 H	Junction Alignment - Signs and Road Markings	1:500	01/01/2015
TR05/01/101 G	Junction Alignment - Geometric Design	1:500	01/01/2015
TR05/01/102 F	Junction Alignment - Drainage Details	1:500	01/01/2015
TR05/01/071	Existing Traffic Volume Detailed Report with Vehicle Classification	N/A	Aug 2014
TR05/01/072	Forecast Traffic Volume Detailed Report	N/A	01/01/2015

Add Client Organisation Details		Main Roads Western Australia	
Audit Requested By:	??	Date:	1/01/2015
To be Completed by Road Safety Audit Team			
Date Request Received:	1/01/2015	Date Request Received:	20/09/2017
Audit Reference Number:	PTS / RSB / RSA / 2015 / 001	Audit Reference Number:	PTS / RSB / RSA / 2017 / 001
Audit Team Leader:	?	Audit Team Leader:	Adam Macdonald

Benefits of the Road Safety Audit Brief Template

- Provides guidance to the client on the information required by the auditor
- Ensures all the information is provided to the auditor at the start of the process
- Prevents the need for the auditor to make repeated contact with the client to obtain more information

Add Audit Team Organisation Details and Change Logo		Main Roads Western Australia	
<p>Enter The Project Location in This Space Provided – This is a Bookmark So Enter The Text Within This Text</p> <p>Enter The Project Proposal in This Space Provided – This is a Bookmark So Enter The Text Within This Text</p> <p>Road Safety Audit Stage 2 - Preliminary Design Audit Ref: E.g. PTS/RSB/RSA/2015/001</p> <p>Prepared for: Enter The Client Contact Person and Organisation Here – This is a Bookmark So Enter The Text Within This Text</p> <p>By: Road Safety Branch Main Roads Western Australia</p> <p>Report Issue Date: 1/01/2015</p>		<p>Marmion Avenue / Ocean Reef Road Intersection, Ocean Reef</p> <p>Traffic Signal Controlled Intersection modifications including improved pedestrian crossing facilities</p> <p>Road Safety Audit Stage 3 - Detailed Design Audit Ref: PTS/2017 / AH 001</p> <p>Prepared for: John Smith</p> <p>By: Road Safety Branch Main Roads Western Australia</p> <p>Report Issue Date: 20/09/2017</p>	

Main Roads Western Australia	
Safety Audit Document Control Sheet	
Project Location:	Enter The Project Location in This Space Provided - This is a Bookmark So Enter The Text Within This Text
Project Proposal:	Enter The Project Proposal in This Space Provided - This is a Bookmark So Enter The Text Within This Text
Audit Stage:	Stage 2 - Preliminary Design
Prepared By:	Enter The Client Contact Person and Organisation Here - This is a Bookmark So Enter The Text Within This Text
Prepared By 1:	Road Safety Branch
Prepared By 2:	Main Roads Western Australia
Audit Team Leader:	Enter Your Name - This is a Bookmark So Enter The Text Within This Text
Audit Team Leader Organisation:	Main Roads Western Australia
Audit Reference:	E.g. PPSR00000000000000000000
Report Issue Date:	1/1/2015
The Safety Audit Document Control Sheet Above Should be Completed Prior to Entering Any Other Part of the Report Template	
E.g. PPSR00000000000000000000 2/17 x 2	

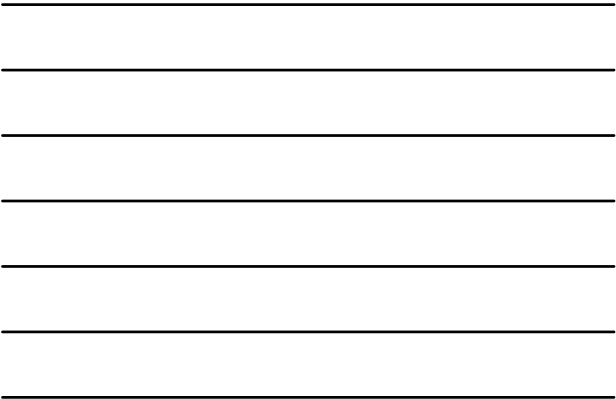
Main Roads Western Australia	
Safety Audit Document Control Sheet	
Project Location:	Marmion Avenue / Ocean Reef Road intersection, Ocean Reef
Project Proposal:	Traffic Signal Control Intersection modifications including improved pedestrian crossing facilities
Audit Stage:	Stage 3 - Detailed Design
Prepared By:	John Smith
Prepared By 1:	Road Safety Branch
Prepared By 2:	Main Roads Western Australia
Audit Team Leader:	Adam Mackintosh
Audit Team Leader Organisation:	Main Roads Western Australia
Audit Reference:	PTD 2017 / AM 001
Report Issue Date:	20/09/2017
The Safety Audit Document Control Sheet Above Should be Completed Prior to Entering Any Other Part of the Report Template	
PTD 2017 / AM 001 2/17 x 2	

Main Roads Western Australia			
1. INTRODUCTION			
1.1 Scope of Audit			
This Road Safety Audit has been undertaken in accordance with the requirements contained in the Main Roads Western Australia Policy and Guidelines for Road Safety Audit.			
This report results from a Stage 2 - Preliminary Design Road Safety Audit carried out on the proposed Enter The Project Proposal in This Space Provided - This is a Bookmark So Enter The Text Within This Text at Enter The Project Location in This Space Provided - This is a Bookmark So Enter The Text Within This Text.			
The background and objective of the proposed project is INCLUDE INFORMATION SUPPLIED BY THE CLIENT IN THE AUDIT BRIEF			
The Audit was undertaken by Enter Your Name - This is a Bookmark So Enter The Text Within This Text of Main Roads Western Australia with reference to the details provided in the Audit Brief.			
The audit comprised an examination of the drawings and other information supplied by Enter The Client Contact Person and Organisation Here - This is a Bookmark So Enter The Text Within This Text as listed in Appendix C.			
All the findings described in Section 2 of this report are considered by the audit team to require action in order to improve the safety of the proposed project and to minimise the risk of crash occurrence and reduce potential crash severity.			
The audit team has examined and reported only on the road safety implications of the project as presented and has not examined or verified the compliance of the design to any other criteria.			
1.2 The Audit Team			
Auditor No.	Name	Role	Organisation
0000	Enter Your Name - This is a Bookmark So Enter The Text Within This Text	Audit Team Leader	Main Roads Western Australia
0000	ENTER NAME	Audit Team Member	ENTER ORGANISATION
0000	ENTER NAME	Audit Team Trainee	ENTER ORGANISATION
E.g. PPSR00000000000000000000 2/17 x 2			

Main Roads Western Australia			
1. INTRODUCTION			
1.1 Scope of Audit			
This Road Safety Audit has been undertaken in accordance with the requirements contained in the Main Roads Western Australia Policy and Guidelines for Road Safety Audit.			
This report results from a Stage 2 - Detailed Design Road Safety Audit carried out on the proposed Traffic Signal Control Intersection modifications including improved pedestrian crossing facilities at Marmion Avenue / Ocean Reef Road intersection, Ocean Reef.			
The background and objective of the proposed project is to improve pedestrian crossing facilities to improve the safety performance at this location.			
The audit was undertaken by Adam Mackintosh of Main Roads Western Australia with reference to the details provided in the Audit Brief.			
The audit comprised an examination of the drawings and other information supplied by John Smith as listed in Appendix C.			
All the findings described in Section 2 of this report are considered by the audit team to require action in order to improve the safety of the proposed project and to minimise the risk of crash occurrence and reduce potential crash severity.			
The audit team has examined and reported only on the road safety implications of the project as presented and has not examined or verified the compliance of the design to any other criteria.			
1.2 The Audit Team			
Auditor No.	Name	Role	Organisation
304 (S)	Adam Mackintosh	Audit Team Leader	Main Roads Western Australia
279 (S)	Andy McElroy	Audit Team Member	Main Roads Western Australia
686 (T)	Zelma Todorovski	Audit Team Trainee	Main Roads Western Australia
PTD 2017 / AM 001 2/17 x 2			

Main Roads Western Australia		
1.3 Specialised Advisors		
Others present during the daytime / night time visits were:		
Name	Role	Organisation
ENTER NAME	E.g. Police Advisor	ENTER ORGANISATION
ENTER NAME	E.g. Traffic Signal Advisor	ENTER ORGANISATION
ENTER NAME	E.g. Transport Advisor	ENTER ORGANISATION
1.4 Safe System Findings		
The aim of Safe System Findings is to focus the Road Safety Audit process on considering safe speeds and by providing forgiving roads and road users. This is to be determined through the Road Safety Audit process by considering that people will always make mistakes and by considering the known limits to crash forces the human body can tolerate. This is to be achieved by focusing the Road Safety Audit on particular crash types that are known to result in higher severity outcomes at relatively lower speed environments to reduce the risk of fatal and serious injury crashes.		
The additional annotation 'IMPORTANT' shall be used to provide emphasis to any road safety audit finding that has the potential to result in fatal or serious injury or findings that are likely to result in the following crash types above the related speed environment: head-on (>70 km/h), right angle (>50 km/h), run off-road impact object (>40 km/h), and crashes involving vulnerable road users (>30 km/h), as these crash types are known to result in higher severity outcomes at relatively lower speed environments.		
The exposure and likelihood of crash occurrence shall then be considered for all findings deemed 'IMPORTANT' and evaluated based on an auditors professional judgement. Auditors should consider factors such as, traffic volume and movements, speed environment, crash history and the road environment, and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either 'VERY HIGH', 'HIGH', 'MODERATE' or 'LOW' and this additional annotation shall be displayed following the 'IMPORTANT' annotation on applicable findings.		
E.g. PPSR00000000000000000000 2/17 x 2		

Main Roads Western Australia		
The audit team visited the site on Monday 18 th September at 14:00 - 18:00 hrs. At the time of the site visit the weather was [ENTER] and the existing road surface was [ENTER METRE]		
A night time site visit was undertaken on Monday 18 th September at 18:30 hrs.		
1.3 Specialised Advisors		
Others present during the daytime / night time visits were:		
Name	Role	Organisation
Raymond Revell	Traffic Signals Advisor	Main Roads Western Australia
1.4 Safe System Findings		
The aim of Safe System Findings is to focus the Road Safety Audit process on considering safe speeds and by providing forgiving roads and road users. This is to be determined through the Road Safety Audit process by considering that people will always make mistakes and by considering the known limits to crash forces the human body can tolerate. This is to be achieved by focusing the Road Safety Audit on particular crash types that are known to result in higher severity outcomes at relatively lower speed environments to reduce the risk of fatal and serious injury crashes.		
The additional annotation 'IMPORTANT' shall be used to provide emphasis to any road safety audit finding that has the potential to result in fatal or serious injury or findings that are likely to result in the following crash types above the related speed environment: head-on (>70 km/h), right angle (>50 km/h), run off-road impact object (>40 km/h), and crashes involving vulnerable road users (>30 km/h), as these crash types are known to result in higher severity outcomes at relatively lower speed environments.		
The exposure and likelihood of crash occurrence shall then be considered for all findings deemed 'IMPORTANT' and evaluated based on an auditors professional judgement. Auditors should consider factors such as, traffic volume and movements, speed environment, crash history and the road environment, and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either 'VERY HIGH', 'HIGH', 'MODERATE' or 'LOW' and this additional annotation shall be displayed following the 'IMPORTANT' annotation on applicable findings.		
PTD 2017 / AM 001 2/17 x 2		



Add Audit Team, Organisation Details and Change Logs

mainroads
WESTERN AUSTRALIA

Corrective Action Report - Enter The Project Location in This Space Provided - This is a Bookmark So Enter The Text Within This Text - Enter The Project Proposal in This Space Provided - This is a Bookmark So Enter The Text Within This Text

Stage 2 - Preliminary Design

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
2.1 - Finding - Provide a title for the identified finding including its location E.g. Safe Intersection Sight Distance at the intersection of Ocean Reef Road and Marmion Avenue [THIS IS A BOOKMARK] Provide a summary of the finding including further clarification of the location if necessary. E.g. There is a tree that partially obscures visibility to the north for vehicles exiting Ocean Reef Road. This summary is a BOOKMARK that populates the corrective action report, as such, input your finding summary within the existing text and delete the remainder of the text once complete.	Choose an item.		
Recommendation Provide your recommendation ensuring that you do not use the terms 'consider' or 'monitor' E.g. Adequate Safe Intersection Sight Distance	Choose an item.		

E.g. PTS/RSB/RSR/2015/001 31 | Page

Main Roads Western Australia

mainroads
WESTERN AUSTRALIA

Corrective Action Report - Marmion Avenue / Ocean Reef Road intersection, Ocean Reef- Traffic Signal Controlled Intersection modifications including improved pedestrian crossing facilities

Stage 3 - Detailed Design

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
2.1 - Finding - Safe Intersection Sight Distance at the intersection of Ocean Reef Road and Marmion Avenue There is a tree that partially obscures visibility to the north for vehicles exiting Ocean Reef Road.	Choose an item.		
Recommendation Adequate Safe Intersection Sight Distance should be provided in accordance with Austroads guidelines. [IMPORTANT HIGH]	Choose an item.		
2.2 - Finding - Trees located within the clear zone There are trees that are located within 3.5 m from the edge of the travelled way in the median on the southern leg of the intersection which are within the effective clear zone.	Choose an item.		

PTS/ 2017 / AH 001 18 | Page

Main Roads Western Australia

mainroads
WESTERN AUSTRALIA

Recommendation Remove non-frangible items from the clear zone or provide suitable protection in accordance with Austroads guidelines. [IMPORTANT MODERATE]	Choose an item.		
2.3 - Finding - Approach sight distance The approach sight distance to the intersection is measured at 40 m due to the presence of a crest on the approach to the intersection.	Choose an item.		
Recommendation Provide sight distance on the approach to the intersection in accordance with Austroads guidelines.	Choose an item.		

PTS/ 2017 / AH 001 19 | Page

Benefits of the Road Safety Audit Report Template

- Provides clear direction for new auditors or anyone who has not previously written reports
- Ensures a consistent format making it easier to locate information when referring to reports
- Promotes best practice for writing reports
 - highlights crash risk in finding justifications
 - promotes use of control data in findings
 - ensures the use of Safe System findings

Questions?

Adam Hazebroek
Road Safety Officer
Planning and Technical Services
adam.hazebroek@mainroads.wa.gov.au
08 9323 4633

ROAD SAFETY AUDIT BRIEF

The completed brief was sent to: Adam Hazebroek
Main Roads WA
9323 4633
adam.hazebroek@mainroads.wa.gov.au

A. To be completed by the Client / Design Team				
Road Safety Audit Stage	Stage 3 - Detailed Design			
Project Location:	Marmion Avenue / Ocean Reef Road intersection, Ocean Reef			
Project Description:	Traffic Signal Controlled Intersection modifications including improved pedestrian crossing facilities.			
Project Number / Task Number: (Internal MRWA Projects)	21102487 / 400.01			
B. Client / Design Team Contact Details				
Organisation / Department:	Main Roads / Metropolitan Project Delivery			
Contact Name:	John Smith			
Contact Tel. No.	9323 4111			
Email Address:	john.smith@mainroads.wa.gov.au			
Date the Final Audit is Required:	30/09/2017 (min. completion time 10 working days)			
C. Previous Road Safety Audits Undertaken				
Previous Road Safety Audit:	Yes:	<input checked="" type="checkbox"/>	No:	<input type="checkbox"/>
Road Safety Audit Stage:	Stage 2 - Preliminary Design			
Previous Audit Date:	1/09/2016			
Previous Audit Organisation:	Main Roads / Road Safety Branch			
Previous Audit Team Leader:	Joe Bloggs			
Copy of Audit and CAR Provided:	Yes:	<input checked="" type="checkbox"/>	No:	<input type="checkbox"/>

D. Project Information				
Project Objective:	The project was developed to alleviate a congestion problem on the westbound approach to the intersection. The additional lane and traffic signals have been provided to alleviate the problem.			
Speed Limit / Design Speed:	80 km/h			
Standards, Departures from Standards and Mitigation:	<p>The project was designed to Austroads Guide to Road Design and Australian Standards.</p> <p>The required Safe Intersection Sight Distance could not be achieved for vehicles exiting Ocean Reef Road due to site constraints.</p> <p>Mitigation measures were provided in the form of traffic calming measures on the adjoining road. This was provided to ensure vehicle speeds are adequately reduced in the vicinity of the intersection.</p>			
Existing Traffic Flows:	Yes	24,216 AADT Ocean Reef Rd (Aug 2014)		
Forecast Traffic Flows:	Yes	35,000 AADT Ocean Reef Rd (2020)		
Crash Data (5 Years):	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
Speed Survey Data:	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
E. List of Documents Supplied				
Document Ref.	Document Title	Scale	Date	
TRS/01/10/100 H	Junction Alignment – Signs and Road Markings	1:500	01/01/2015	
TRS/01/10/101 G	Junction Alignment – Geometric Design Layout	1:500	01/01/2015	
TRS/01/10/102 F	Junction Alignment – Drainage Details	1:500	01/01/2015	
TRS/01/10/TF1	Existing Traffic Volume Detailed Report with Vehicle Classification	N/A	Aug 2014	
TRS/01/10/TF2	Forecast Traffic Volume Detailed Report	N/A	01/01/2015	

Audit Requested By:	John Smith	Date:	13/09/2017
----------------------------	------------	--------------	------------

To be Completed by Road Safety Audit Team	
Date Request Received:	13/09/2017
Audit Reference Number:	PTS / RSB / RSA / 2017 / 001
Audit Team Leader:	Adam Hazebroek

Marmion Avenue / Ocean Reef Road
intersection, Ocean Reef

Traffic Signal Controlled Intersection
modifications including improved
pedestrian crossing facilities

Road Safety Audit Stage 3 - Detailed Design

Audit Ref: PTS/ 2017 / AH 001

Prepared for:

John Smith

By:

Road Safety Branch

Main Roads Western Australia

Report Issue Date: **20/09/2017**

Safety Audit Document Control Sheet

Project Location:	Marmion Avenue / Ocean Reef Road intersection, Ocean Reef
Project Proposal:	Traffic Signal Controlled Intersection modifications including improved pedestrian crossing facilities
Audit Stage:	Stage 3 - Detailed Design
Prepared for:	John Smith
Prepared by 1:	Road Safety Branch
Prepared by 2:	Main Roads Western Australia
Audit Team Leader:	Adam Hazebroek
Audit Team Leader Organisation:	Main Roads Western Australia
Audit Reference:	PTS/ 2017 / AH 001
Report Issue Date:	20/09/2017

The Safety Audit Document Control Sheet Above Should be Completed Prior to Editing Any Other Part of the Report Template

1. INTRODUCTION

1.1 Scope of Audit

This Road Safety Audit has been undertaken in accordance with the requirements contained in the Main Roads Western Australia Policy and Guidelines for Road Safety Audit.

This report results from a Stage 3 - Detailed Design Road Safety Audit carried out on the proposed Traffic Signal Controlled Intersection modifications including improved pedestrian crossing facilities at Marmion Avenue / Ocean Reef Road intersection, Ocean Reef.

The background and objective of the proposed project is to improve pedestrian crossing facilities to improve the safety performance at this location.

The Audit was undertaken by Adam Hazebroek of Main Roads Western Australia with reference to the details provided in the Audit Brief.

The audit comprised an examination of the drawings and other information supplied by John Smith as listed in Appendix C.

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

The audit team has examined and reported only on the road safety implications of the project as presented and has not examined or verified the compliance of the design to any other criteria.

1.2 The Audit Team

Auditor No.	Name	Role	Organisation
304 (S)	Adam Hazebroek	Audit Team Leader	Main Roads Western Australia
279 (S)	Andy McMahon	Audit Team Member	Main Roads Western Australia
656 (T)	Zlatko Todorovski	Audit Team Trainee	Main Roads Western Australia

The audit team visited the site on Monday 18th September at 14:00 – 19:00 hrs. At the time of the site visit the weather was clear and the existing road surface was dry.

A night-time site visit was undertaken on Monday 18th September at 18:30 hrs.

1.3 Specialist Advisors

Others present during the daytime / night-time visits were:

Name	Role	Organisation
Raymond Reveley	Traffic Signals Advisor	Main Roads Western Australia

1.4 Safe System Findings

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

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

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

1.5 Previous Safety Audits

A Preliminary Design Stage Audit was undertaken by Main Roads Western Australia in September 2016. Reference number PTS/2016 AH 001.

The items raised in the Preliminary Design safety audit have been addressed with the exception of the items listed below. These items are discussed again in this road safety audit.

Earlier Audit Finding Ref.	Description	Audit Item Ref.
2.1	Safe Intersection Sight Distance	2.1

1.6 Background Data

1.6.1 Crash History

A study of the recent crash history has been conducted in the vicinity of the proposed project for the five-year period to the end of December 2016. This showed that there were 65 reported crashes within the extracted data which is summarised below:

- 49 rear end crashes, 1 involving northbound vehicles turning right onto Marmion Avenue resulting in hospital treatment, 4 involving southbound vehicles, 2 involving northbound vehicles 1 involving eastbound vehicles and 1 involving westbound vehicles resulting in medical treatment;
- 6 through right crashes, 1 involving a southbound vehicle turning right colliding with a northbound through vehicle resulting in hospital treatment.

1.6.2 Traffic and Speed Data

A summary of recent traffic data is provided below:

Location	Vehicles per day (% heavy vehicles)	Date	Source
Marmion Avenue, north of Ocean Reef Road (7795)	24,216 (5.0 %)	2014/15	Traffic Map

A summary of recent speed data is provided below:

Location	Average Speed (km/h)	85th Percentile Speed (km/h)	Date	Source
Marmion Avenue, north of Ocean Reef Road (7795) northbound	68.4 km/h	76.2 km/h	2014/15	Traffic Map

1.6.3 Appendices

Appendix A – Audit Findings Location Plan

Appendix B – Audit Photographs

Appendix C – List of Documents Provided for the Audit

Appendix D – Corrective Action Report (CAR)

2. ITEMS RAISED IN THIS STAGE 3 - DETAILED DESIGN AUDIT

2.1 Finding – Safe Intersection Sight Distance at the intersection of Ocean Reef Road and Marmion Avenue

There is a tree that partially obscures visibility to the north for vehicles exiting Ocean Reef Road.

Justification of the finding:

There is a risk of vehicles failing to give way whilst exiting the intersection which could result in right angle crashes.

The tree located to the north of the intersection reduces Safe Intersection Sight Distance to 120 m. *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersection* indicates that Safe Intersection Sight Distance is the minimum distance which should be provided on the major road at any intersection. Using an operating speed of 110 km/h and reaction time of 2.0 seconds the required Safe Intersection Sight Distance is 285 m measured 5 m back from the holding line on the side road.

Recommendation

Adequate Safe Intersection Sight Distance should be provided in accordance with Austroads guidelines.

[IMPORTANT | HIGH]

2.2 Finding – Trees located within the clear zone

There are trees that are located within 3.5 m from the edge of the travelled way in the median on the southern leg of the intersection which are within the effective clear zone.

Justification of the finding:

The trees located in the median pose a risk to vehicle occupants of errant vehicles.

Hazards within the clear zone should be removed or suitably protected or be frangible to the impact of a vehicle. Main Roads determines effective clear zones using the Austroads method described in *Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers*. Using an 85th percentile speed of 80 km/h, straight alignment, flat batter slopes and > 6000 vehicles per day, the required clear zone is 6.5 m.

Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers indicates removal of roadside hazards is rated very high as an effective treatment to prevent an off path incident.

Recommendation

Remove non-frangible items from the clear zone or provide suitable protection in accordance with Austroads guidelines.

[IMPORTANT | MODERATE]

2.3 Finding – Approach sight distance

The approach sight distance to the intersection is measured at 40 m due to the presence of a crest on the approach to the intersection.

Justification of the finding:

There is a risk that drivers may not see the intersection and stop abruptly resulting in rear end crashes.

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections indicates that Approach Sight Distance (ASD) is the minimum level of sight distance which must be available on the minor road approaches to an intersection to ensure that drivers are aware of the presence of an intersection. Using an estimated 85th percentile speed of 60 km/h, reaction time of 2.0 seconds and a 2.2 % upgrade, the required sight distance is 71 m.

Recommendation

Provide sight distance on the approach to the intersection in accordance with Austroads guidelines.

3. **AUDIT TEAM STATEMENT**

I hereby certify that the audit team have examined the documents listed in Appendix C in undertaking this Road Safety Audit and confirm that this audit has been carried out independently of the design team and in accordance with Main Roads Policy and Guidelines for Road Safety Audit.

Audit Team Leader

Adam Hazebroek
Road Safety Officer
Main Roads Western Australia

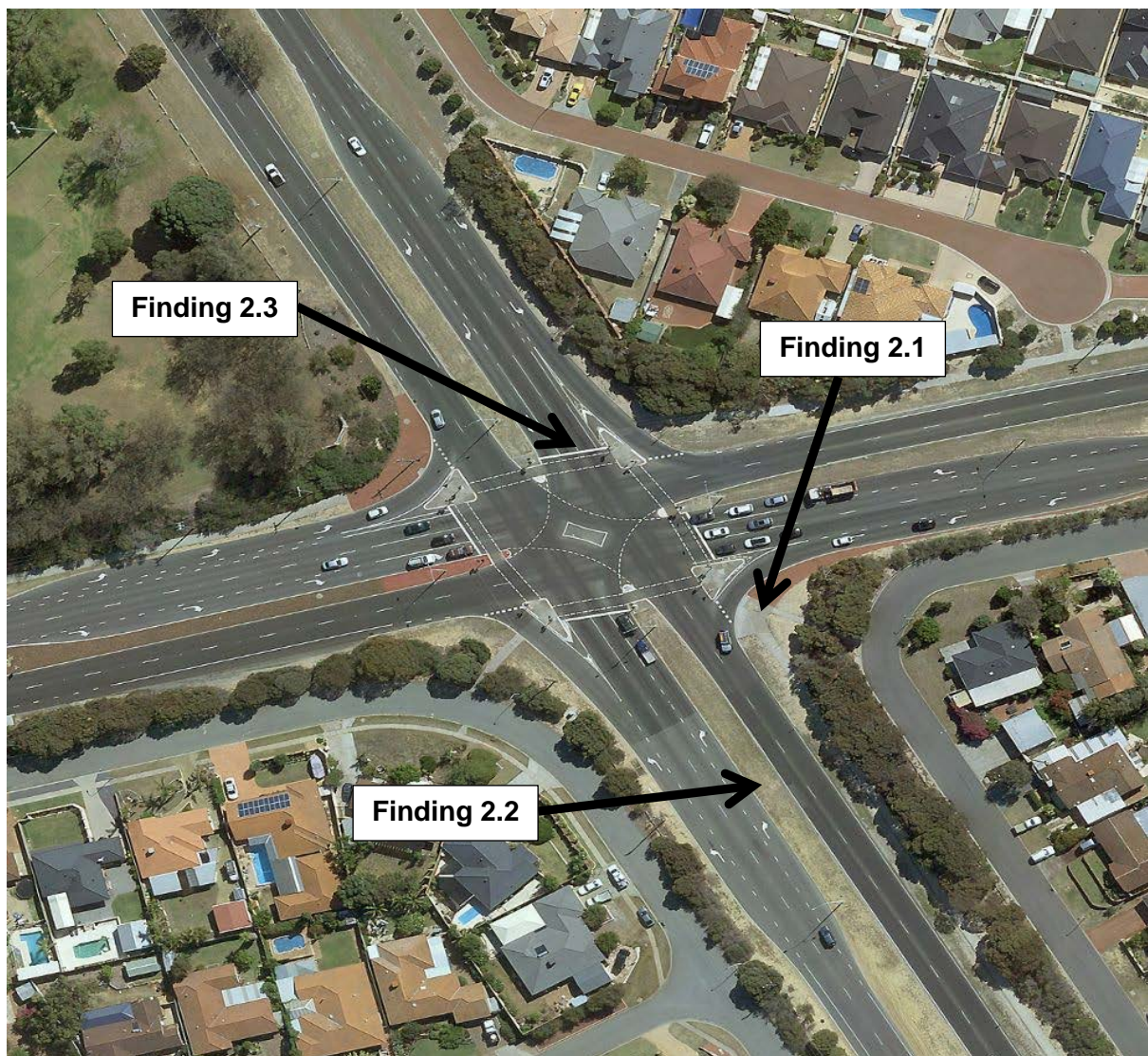
9323 4633
adam.hazebroek@mainroads.wa.gov.au

Adam Hazebroek Signature

20/09/2017 Date

APPENDIX A

AUDIT FINDINGS LOCATION PLAN



Audit Findings Location Plan

APPENDIX B

AUDIT PHOTOGRAPHS



Finding 2.1 – Tree obscuring visibility to the south at the intersection



Finding 2.2 – Trees located within the clear zone



Finding 2.3 – Insufficient Approach Sight Distance on approach to intersection

APPENDIX C

LIST OF DOCUMENTS PROVIDED FOR THE AUDIT

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APPENDIX D

CORRECTIVE ACTION REPORT

**Corrective Action Report - Marmion Avenue / Ocean Reef Road intersection, Ocean Reef- Traffic Signal Controlled
Intersection modifications including improved pedestrian crossing facilities**

Stage 3 - Detailed Design

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
2.1 – Finding - Safe Intersection Sight Distance at the intersection of Ocean Reef Road and Marmion Avenue There is a tree that partially obscures visibility to the north for vehicles exiting Ocean Reef Road.	Choose an item.		
Recommendation Adequate Safe Intersection Sight Distance should be provided in accordance with Austroads guidelines. [IMPORTANT HIGH]	Choose an item.		
2.2 – Finding - Trees located within the clear zone There are trees that are located within 3.5 m from the edge of the travelled way in the median on the southern leg of the intersection which are within the effective clear zone.	Choose an item.		

Recommendation Remove non-frangible items from the clear zone or provide suitable protection in accordance with Austroads guidelines. [IMPORTANT MODERATE]	Choose an item.		
2.3 – Finding - Approach sight distance The approach sight distance to the intersection is measured at 40 m due to the presence of a crest on the approach to the intersection.	Choose an item.		
Recommendation Provide sight distance on the approach to the intersection in accordance with Austroads guidelines.	Choose an item.		

**Corrective Action Report - Marmion Avenue / Ocean Reef Road intersection, Ocean Reef- Traffic Signal Controlled
Intersection modifications including improved pedestrian crossing facilities**

Stage 3 - Detailed Design

NOTE:

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

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

Responsible Project Representative	Company / Agency / Division	Position	Date

Asset Owner Representative	Company / Agency / Division	Position	Date