Public Works, Ports & Inland Water Transport Department

Road Safety Audit
Field Guide

Edition One – 2013

Foreword

This Road Safety Audit Field Guide is a brief but fully comprehensive document that has been developed to assist PWP&IWTD engineers and others as they undertake road safety audits of new road projects in Karnataka.

This field guide draws together the best and most current international practices in this subject. It is to be used for all road safety audits undertaken in Karnataka. It:

- Offers advice on the selection of an audit team(ensuring you have a qualified and independent audit team)
- Offers useful tips about how to inspect a site
- Provides expert advice about how to write an audit report
- Gives you an idea about what to expect from a response report
- Contains a series of checklists, to assist you according to the audit stage you are working on

This Field Guide also offers background information about some of the most important technical topics that commonly arise in audits in Karnataka. An example of a local audit is provided to show you an effective way to set out your audit reports, and to offer some examples of typical safety concerns that you may find during your audits.

The three other Field Guides are entitled Road Safety Review, Blackspot Investigation, and Traffic Control at Road Works.

I commend this field guide to all of you with a responsibility for road planning, design, construction or management in Karnataka. Road safety audits are a positive and low cost way to improve safety on our new road projects. It is an essential tool for safer roads in our State.

I thank Mr. Phillip Jordan, Road Safety Expert, and Dr. Robert Smith, Team Leader for the assignment representing VicRoads, Melbourne, Australia for their efforts in the preparation of this guide.

Mr H.S. Prakash Kumar
Project Director,
PIU, KSHIP

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PART A - ROAD SAFETY AUDIT PRINCIPLES

1. What is road safety audit?

This field guide has been prepared to assist you while you undertake a road safety audit of a new road proposal. If you need to undertake a road safety review of an existing road, you should obtain and use a copy of the Road Safety Review Field Guide.

"A road safety audit is a formal and detailed examination of a road project by an independent, qualified team of auditors that reports on the potential road safety concerns of the project".

2. The objectives of road safety audit

When you undertake a road safety audit your objective is to identify safety concerns in a road design. Auditors are problem finders. By identifying safety concerns while they are still "pencil lines on a piece of paper" (or mouse clicks on a computer screen) you can make recommendations for changes that will improve safety on the new road. By making changes at the design stage, safety can be built into the new road and the risk to the future road users of that road minimised.

Road safety auditors are problem finders!

A road safety audit assesses a road proposal from the point of view of the safety needs of all the future road users, including–

- Car drivers and passengers
- Pedestrians, bicyclists and motorcyclists
- Truck and bus drivers and passengers
- Auto-rickshaws, and animal drawn vehicles

The outcome of a road safety audit is an audit report that identifies road safety concerns and makes recommendations to remove these or

to reduce their impact. It is the responsibility of the Project Manager to then decide upon and implement these recommendations.

There are five internationally recognised stages of audit:

1. Planning stage - at the completion of the planning phase for a new road project
2. Preliminary design – at the completion of the preliminary design
3. Detailed design - when the detailed design is completed but before the project is put out to Tender
4. During Road Works - to ensure safety at the work site
5. Pre-opening - to ensure the project is as safe as practical prior to “opening”.

A minimum of two auditors must be used on audits in Karnataka, each of whom is registered on the approved PWP&IWTD database of road safety auditors.

The audit policy for the PWP&IWTD requires audits of road projects at one or more stage as detailed on page 5 of this Field Guide.

In Karnataka, all audit teams must have at least two qualified auditors

A good road safety audit will be accomplished when you:

- focus on road safety issues only
- keep relevant standards and guidelines in mind while remembering that compliance with standards does not guarantee that the road will be safe
- consider the needs of all road users (including pedestrians - especially children, cyclists, and motor-cyclists) in all weathers and lighting conditions
- are thorough and comprehensive in your thinking
- are realistic and practical in your findings. But do not rule out options because of cost - it is the client who should decide whether the investment can be justified
- produce your audit report promptly - within two weeks of the audit inspection

3. Audit is more than a compliance check with standards

Remember that an audit is more than a compliance check with standards. Designers are expected to comply with standards but your job is not to check that they have done this. Your job as an auditor is to put yourself into the shoes of the future road users of the road – how will they use the new road and what safety problems may some of them encounter?

You should be aware that total reliance on standards is no guarantee of a safe road. There are many road and traffic situations for which no standards apply, and there are some situations which need more than a standard treatment.

Think broadly and think of potential road safety concerns only.

Consider the safety needs of all road users

PART B - KEY STEPS IN A ROAD SAFETY AUDIT

Road safety audit step	Responsibility
1. Determine that an audit is to be undertaken	Project Manager
2. Select a road safety audit team	Project Manager and Road Safety Audit Team Leader
3. Provide information (especially the drawings) about the project to the audit team	Designer (via Project Manager)
4. Hold a commencement meeting – outline the project and discuss the work ahead	Project Manager (plus designer and the Road Safety Audit Team Leader)
5. Assess the project drawings for safety concerns (the "desktop" audit)	The audit team
6. Inspect the site – daytime and night time	The audit team
7. Write the audit report. Send to the Project Manager	The audit team
8. Hold a completion meeting – to discuss the key safety concerns and clarify outstanding matters	Project Manager (plus designer and Road Safety Audit Team Leader)
9. Write a response report, referring to each audit recommendation	Project Manager
10. Follow-up, implement agreed changes	Project Manager

1. Deciding that an audit is necessary

The Project Manager will decide if an audit is needed based on the Karnataka road safety audit policy. Generally, the earlier in the planning and design process, the better! Will this road project benefit from an audit? The answer is almost always yes!

In Karnataka, the PWP&IWTD Road Safety Audit Policy (below) details the type of road projects and the stages of audit that are to be undertaken. The Project Manager is responsible for ensuring that the Policy is followed and that all the new road projects in Karnataka are audited at the required stages.

Statement of Road Safety Audit Policy

Road Safety Audits shall be undertaken throughout the planning, design and construction stages of new road projects in accordance with the process detailed in the PWP&IWTD Road Safety Audit manual (2012).

(a) Purpose of Audits

Road safety audits are undertaken to identify safety concerns in a new road design so that those who are responsible for delivering the road project can take these safety concerns into account and make the necessary amendments at an early time.

(b) Project Selection

All road projects in Karnataka shall be road safety audited as shown in the following Table.

AUDIT STAGE	EXPRESSWAYS	NATIONAL HIGHWAYS	STATE HIGHWAYS	COLLECTORS AND LOCAL STREETS
PLANNING	√	√	N/A	N/A
PRELIMINARY	√	√	Optional	N/A
DETAILED	√	√	√	√
ROAD WORKS	√	√	Optional	Optional
PRE-OPENING	√	√	√	Optional
NO. OF AUDITS	5 stages	5 stages	Minimum 2	Minimum 1

(c) Road Safety Audit Team

A minimum of two auditors are to be used, each of whom is to be registered in the PWP&IWTD database of approved road safety auditors. It is essential that the audit team is highly knowledgeable and skilled in all facets of the work being audited and is independent of the project.

(d) Road Safety Audit Report

The output from a road safety audit is a formal road safety audit report. The report shall list the safety concerns identified, together with a brief explanation of each. Reference to current standards and road safety principles and practices shall also be given where applicable. The Senior Road Safety Auditor (the team leader of the audit team) is required to submit the road safety audit report to the Project Manager.

(e) Response to the Road Safety Audit Report

The Project Manager will arrange for a response report setting out the proposed course of action to address each safety concern. Changes will then be made as agreed.

2. Select a road safety audit team

A road safety audit team leader is appointed by the Project Manager. The team leader should be a registered Senior Road Safety Auditor in the register of auditors maintained by the Road Safety Cell within the PWP&IWT Department of Karnataka.

For Karnataka, a Senior Road Safety Auditor shall:

- Have completed an approved road safety audit training workshop, and
- Have a minimum of 2 years practical experience in a road safety related field, and
- Have previously completed at least 5 road safety audits under the guidance of an experienced Senior Road Safety Auditor

A Road Safety Auditor shall:

- Have completed an approved road safety audit training workshop, and
- Have a minimum of 2 years practical experience in a road safety related field.

The Team Leader is to select one or more auditor(s) to assist him/her with the audit. If you are the Team Leader, there are two key issues you will need to decide:

- How many people do you need for your team?
- What backgrounds should they have?

A team of at least 2 qualified auditors is required for all audits in Karnataka because:

- Two (or more) people can bring different views about safety concerns due to their diversity of backgrounds and experiences.
- Cross fertilization of ideas can result from discussions.
- There are advantages of having more knowledge available.
- Additional people in a team can increase the chance of detecting less obvious safety concerns.

The audit team is to be led by a Senior Road Safety Auditor. All audit team members are to be qualified Road Safety Auditors. Unless it is an exceptionally large project, one other registered auditor will be sufficient to join you in most audits. To decide who that auditor should be, ask four simple questions:

- Is the auditor independent of the project?
- Is the auditor on the Karnataka PWP&IWTD register of auditors?
- Has the auditor the necessary skills for this size and stage of project?
- Is the auditor able to see potential safety concerns from different road users' points of view?

There is no substitute for an experienced road safety audit team that understands the audit process and is able to foresee potential safety concerns at the design stages.

You should be sensitive to the concerns of designers who may feel that they are having their design work 'judged'. Auditors need to be objective in their assessments, yet sensitive to the fact that no one likes criticism. Designers need to welcome audit recommendations as positive inputs to assist their work. They need to look objectively at the audit findings, learn from them and not take the report as any form of personal criticism.

3. Obtain all the background Information

A copy of all the drawings and any pertinent reports are to be given to the road safety audit Team Leader to permit a thorough road safety audit to take place. The information required usually includes:

- All drawings of the project at a suitable scale. Hard and soft copies are usually provided.
- A copy of the design report that details the purpose of the project and the key design criteria (such as design speed, and any constraints) adopted.
- A clear statement of the stage of the audit.

4. Participate in a commencement meeting

A commencement meeting provides an opportunity for the audit process to be explained, and for the project manager to explain the proposal in some detail.
This meeting also provides an opportunity for the audit team to request any other information that it feels is necessary. The audit team will not be able to inspect the site under all traffic or weather conditions, so if particular conditions are important (e.g. traffic conditions during market days), the audit team should be advised.
As audits become more common in Karnataka, commencement meetings will become less significant. In time, the Team Leader will be sent the drawings attached to an email and will be requested to offer a timeframe and a cost for undertaking the audit. This is the common way that audits are commenced in those countries that have had many years audit experience.

5. Assess the drawings and documents (the desktop audit)

This step reviews the drawings and any other information that has been provided to the audit team.
This "desktop" audit involves you and the audit team reviewing the drawings and documents in the office before, and again after, carrying out the inspections.

Before inspecting the site, take time to closely examine the drawings. Scribble on the drawings as necessary, and mark all possible safety concerns to be checked on site, making use of the checklists as required. When you are back in the office, use the drawings again to double check for safety concerns now that you know more about the site and its traffic conditions.

6. Inspect the site

The site of the road proposal is to be inspected – by the entire audit team - during day time and again at night time.

The inspection involves taking the drawings of the proposal out to the site and inspecting the site – trying to imagine what the finished road project will look like and how it will operate. During the site inspection, you and your audit team should put yourselves into the shoes of the future road users of that new road project.

While doing this, auditors need to anticipate whether different light (day and night) conditions or weather (such as fog or rain) conditions may create safety concerns on the completed road. Your team is expected to look beyond the limits of the project and to include adjacent sections of road in the audit. Transition zones, where the new road matches into the existing road system can often become locations of increased risk.

Remember that your inspection should be undertaken from the point of view of all the likely road user groups - not just motorists. Karnataka has a wide variety of road users and they have quite different safety needs. Do your best to consider them all in your audits.

7. Write the road safety audit report

Writing the report is the responsibility of the Audit Team Leader. The team members may check the report, and provide comments on it, but in most cases the Team Leader is the one who completes the report.

The ability to write an accurate and technically proficient audit report is a necessary skill for the completion of a quality road safety audit.

Audit reports are concise reports with brief, but technically clear descriptions of each of the safety concerns that have been identified. It is best if the report follows an agreed format; this makes it easier for the team to write and importantly it assists project managers and designers to respond.

Your audit report is to contain:

- A title page – with the name of the road project, its location, the stage of the audit.
- A brief description of the project –what type of road project, why it has been proposed.
- The names of the road safety audit team members.
- Dates of the audit inspection(s), and the weather conditions on-site.
- A table of all the safety concerns found from the desktop audit and from the site inspection, each with a risk rating (see below), together with a recommendation for corrective action for each.
- Digital photographs of important safety issues.
- A statement signed and dated by the Team Leader indicating the team has audited the drawings, inspected the site and identified the road safety concerns noted in the report.
- A list of all drawings, reports and documents reviewed as part of the audit, including drawing numbers and dates.

When writing the audit report, you should:

- Clearly describe each safety concern and its location.
- Avoid being too specific with your recommendations.
- Avoid redesigning – that is for the design team to do.
- Think about high/low cost and short/long term options.
- Be realistic - take into account the level of risk associated with the safety concern and the cost likely to rectify it.
- Be constructive and practical about how the safety concern might be eliminated.

List the safety concerns (and your recommendations for each) either:

- in order from highest risk to lowest risk, or
- in groups of similar concerns (eg cross section matters), or
- by chainage along the project length.

Remind yourself that the audit team guides the Project Team but it is the responsibility of the Project Manager and the designers (not the audit team) to decide what recommendations to adopt.

Risk assessment

The following tables outline a risk assessment process to assist you to provide an indication of the level of risk for each safety concern.

- Estimate which category in Step 1 and Step 2 the safety concern best fits.
- From those, select the risk category in Step 3.
- The Project Manager may then determine a course of action based on Step 4.

STEP 1 ESTIMATE THE POSSIBLE CRASH FREQUENCY

Frequency	Definition
Frequent	One or more per month
Probable	One or more per year (but less than one per month)
Occasional	Once every five or ten years
Improbable	Less often than once every ten years

STEP 2 ESTIMATE THE LIKLEY CRASH SEVERITY

Severity	Description	Examples
Catastrophic	Multiple deaths are likely	High speed, multi-vehicle crashes on expressways or highways. A bus collision at high speed with a bridge abutment
Serious	A death and/or serious injuries are likely	High/medium speed vehicle/vehicle collisions or collisions with fixed roadside objects. Pedestrian crashes on highways
Minor	Minor injuries only are likely	Low speed collisions, such as a bicyclist sliding on a sandy road surface, a rear end crash in a slip lane, or a pedestrian hit in a car park
Limited	Trivial injuries or property damage only	Very low speed vehicle collisions. Pedestrian trips on uneven footpath, a car collides with a median island in a car park.

STEP 3 DETERMINE THE LEVEL OF RISK

RISK		From Table 1 - Frequency			
		Frequent	Probable	Occasional	Improbable
From Table 2 – Severity	Catastrophic	Intolerable	Intolerable	Intolerable	High
	Serious	Intolerable	Intolerable	High	Medium
	Minor	Intolerable	High	Medium	Low
	Limited	High	Medium	Low	Low

STEP 4 DETERMINE A COURSE OF ACTION (PROJECT MANAGER)

RISK	Suggested Treatment Approach
Intolerable	Safety concern “must” be corrected at any cost.
High	Safety concern “should” be corrected (or the risk significantly reduced), even if the cost is high.
Medium	Safety concern “should” be corrected (or the risk significantly reduced), if the treatment cost is moderate, but not high.
Low	Safety concern “should” be corrected (or risk reduced), if a treatment cost is low.

8. Participate in a completion meeting

The Project Manager is to arrange a Completion meeting involving:

- The audit Team Leader,
- The Project Manager, and
- The designer.

At this meeting, outline your audit findings and your recommendations. The meeting provides an opportunity for you, the Project Manager and the design team to discuss possible ways to overcome the identified problems. Do not entertain any suggestion to “soften” your audit report.

In time, you will find that completion meetings will become less common in Karnataka. Similar to Commencement meetings, the Completion meeting will eventually give way to a transfer of the audit report via email to the Project Manager.

9. Respond to the audit report

The Project Manager is required to respond in writing to each audit recommendation in your report. He/she can either:

- Accept it completely (and develop solutions to overcome or reduce the safety concern); or
- Accept the safety concern but not agree to the recommendation. In these cases he/she will seek alternative ways to resolve the safety concern; or
- Not accept the recommendation.

To provide useful feedback, the Project Manager should send a copy of the response report to the audit Team Leader for information. The audit team should note the response, aware that they should not create an on-going dispute over which recommendations have or have not been accepted.

Following up and implementing changes

In many audits, particularly while the project is in the early design stage, changes can be made at low cost. But sometimes an audit may reveal a safety concern that causes a difficult decision to be made by the Project Manager. The decision is difficult usually because the cost of remedial action is high.

In these cases a Project Manager may seek low cost (and possibly less effective) countermeasures, or he/she may stage the safety improvements over a long period. Sometimes, a Project Manager may decide not to do anything – and risk the consequences.

Other options available to the Project Manager include seeking an increase in the project budget to allow the desired countermeasures, or shortening the project (say by 10%) and placing the savings into safety improvements. These are all valid decisions. As long as they are committed to writing in the Response Report, that is all that the audit process can ask.

PART C – SOME COMMON SAFETY CONCERNS ON KARNATAKA'S HIGHWAYS

1. Remembering the safety of road users

Experienced road safety auditors put themselves "into the shoes of the future road users" in an effort to anticipate the road safety concerns of the future road. They understand that humans make mistakes and they take such failings into account during each audit.

For example, inexperienced drivers/riders often find it difficult to judge speed, distance or reaction time. This can lead them to under-estimating their crash risk. Very young pedestrians are more likely to be impulsive, with underdeveloped cognitive skills in judging speeds. Motorcyclists are at high risk of injury or death, but are often the most forgotten road users.

Complying with standards is an excellent starting point for designing safety into a road project. However, ensuring that minimum standards are satisfied is not a guarantee of safety.

A road safety audit goes beyond a compliance check with standards.

An audit is an assessment of how people will use the road once it is opened, and is a report of all the safety concerns in the new road project that could lead to crashes once the road is operational.

A road safety audit helps to achieve a safer new road by checking that it:

- **WARNS** the road users of risks,
- **INFORMS** the road users of conditions ahead,
- **GUIDES** the road users through changing road sections,
- **CONTROLS** priorities, speeds and travel paths, and
- **FORGIVES** the road user's errant or unsafe behaviour.

WARN, INFORM, GUIDE, CONTROL AND FORGIVE

WARN. Warnings can be given by signs, line markings or rumble strips. The message should be clear and simple.

INFORM. Information is best provided in small amounts, and repeated as necessary. Direction signs and lane direction arrows are good examples of informing drivers/riders of where to go to safely reach their destination, or which lane to use on the approach to a signalised intersection.

GUIDE. If the geometry of the design cannot be improved, one option is to install chevron alignment markers to guide drivers through tight curves. Strong edge lines also assist.

CONTROL. Safe traffic control at intersections is an integral part of any road network. Speed must be managed carefully, and drivers need to be made well aware of the speed limit – no secrets and no surprises!

FORGIVE. Experienced audit teams will check to ensure good roadside safety. Roads with unsafe roadsides may need crash barrier to shield the hazard and to reduce the risk to the occupants of any vehicle that leaves the road. Audit teams need to understand the technical details of barriers, and will also check that the road is to be well delineated too. This road lacks line marking.

A key element of road safety audit is judgement. Decisions about road safety are rarely “black or white”. There are many shades of grey in between. An experienced audit team will go through the checklists for the stage of audit, and the team members will also ask general questions such as:

- Will the design be well understood by the road users?
- Is there a risk that the design could lead to confusion?
- Does it provide adequate visibility from all directions?
- What will happen if a vehicle runs off the road?
- Where will pedestrians cross the road, or walk along the road?
- Will sealed shoulders be provided to assist motorcyclists, pedestrians and animal drawn vehicles?
- Will the signage provide enough information to assist users?

An example of a road safety audit report of a road project in Karnataka is provided below, showing a recommended format for an audit report.

After the audit report, some common safety issues that often arise during road safety audits in Karnataka are outlined. These safety issues are included in this field guide to provide some technical guidance on common safety issues that may assist you in your audit work. The safety tips illustrate many things, one of which is that making a decision in a road safety audit is often a complex interaction of elements. Sound judgement and logical thinking are essential for a road safety auditor.

2. An audit case study from Karnataka

This report provides the results of a preliminary design stage road safety audit of a proposal to duplicate 9km of State highway in SW Karnataka.

Description of the proposal

This report provides the major findings of a preliminary design stage road safety audit of a section of state highway proposed for duplication next year. Included in the task will be the construction of two new bridges (one over a river, one over a railway line), three two-way side roads totalling 1.8km in length, 10 new culverts and one major new intersection. The highway passes through two villages and special attention is being paid in the design to minimise the impact of the new road on these villages.

This road safety audit

This preliminary design stage road safety audit was carried out in accordance with the Road Safety Audit Field Guide for Karnataka. It was undertaken by XXXXX and YYYYY. Both are registered Senior Road Safety Auditors in the Karnataka PWP&IWTD register of road safety auditors. Neither has previously been involved in any aspects of the planning or design of this proposal; each is independent of the project. It is understood that there have been no previous audits of this proposal. The highway was inspected on 12thMarch (afternoon and night time). The weather was fine and warm during the inspections.

Key safety findings from this preliminary design stage audit

A number of general road safety concerns were detected during this preliminary design stage audit.

Cross section

The standard cross-section for the highway will be:

- *(i) Two 7m wide carriageways (each with 2 x 3.50m wide lanes);*
- *(ii) A 2m wide central median;*
- *(iii) 1.5m unsealed shoulders on the outside of each carriageway;*
- *(iv) 0.5m sealed shoulders against the median on each side.*

The first concern is the unsealed shoulder. It will eventually present a maintenance issue for the road authority, it will break up where trucks cross it regularly (such as driveways) and it will get wet and muddy. Pedestrians will walk on the road in preference to muddy shoulders. Drop-offs will develop and these will present a risk for motorcyclists.

The second concern is the narrow median. 2m is insufficient to permit sheltered right turn or U turn lanes to be provided. This means that vehicles slowing to make turns at the openings proposed near Km 19.5, 22.6 and 25.7 will be at risk of being struck from the rear.

The third concern is the cross section on the two new bridges. The drawings indicate there will not be a shoulder across the bridges. It is important for safety to continue the full cross section across the new bridges.

Road side hazard management

With no on-coming traffic there will be less demand on drivers/riders. Higher speeds are expected on the new highway, and more "single vehicle" crashes can be expected unless sound road safety engineering measures are implemented. The existing road side has a number of hazards, including trees, culverts, light poles, bridge end posts, bus shelters and steep side slopes. Internationally recognised clear zone guidelines indicate a clear zone of 9m is appropriate for roads with operating speeds of 100km/h, and traffic volumes of about 20000vpd. The drawings are silent about roadside hazard management.

Crash barriers

Crash barriers are costly to install and maintain. They also represent a hazard to errant road users, especially motorcyclists. During design therefore every effort should be made to eliminate the need for roadside barriers. The drawings show only two lengths of barrier proposed along the highway. However, crash barriers are also considered necessary at five other locations:

- *On an embankment at bridge 1 where the slope is greater than 1:6 and the vertical height difference exceeds two metres.*
- *To shield a sign support plus several large trees which are road side hazards (any fixed object greater than 100mm in diameter) within the agreed 9m clear zone.*

The provision of a crashworthy end treatment is required where a crash barrier terminates within the clear zone or where it is likely to be hit by an errant vehicle. The Standard drawings indicate unsafe "fish tail" terminals as standard for the steel barrier. These are dangerous and should not be used.

AUDIT CONCLUSIONS

This road safety audit has identified features of the proposed highway duplication that should be altered, redesigned or removed to improve road safety in this road.

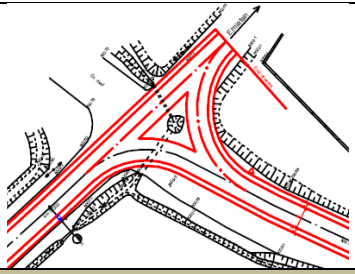
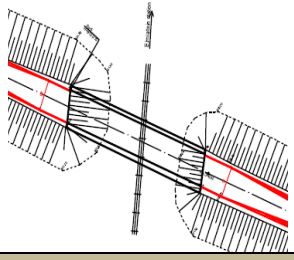
XXXXX
(Senior Road Safety Auditor)

REFERENCES USED DURING THE AUDIT

1. *Road Safety Audit Field Guide, 2013.*
2. *PWP&IWTD Karnataka drawings numbered 01 – 10 for Highway Duplication (Km 18.0 to Km 27.0) (dated March).*

NO.	AUDIT FINDINGS	RISK	RECOMMENDATIONS	CLIENT RESPONSE
1 SAFETY CONCERNS WITH THE PROPOSED STATE HIGHWAY DUPLICATION BETWEEN Km 18.70 - 27.70				
1.1	This highway passes through a number of villages. The existing highway is in poor condition with numerous abutting houses and properties. It will be vital to keep speeds to reasonable and safe levels on the new highway through the two villages in this proposal. The duplication and the generous cross sections will increase speeds.	**HIGH**	• Implement traffic calming (Gateway treatments) at the entrance to each village. • Install duplicate 40km/h speed restriction signs at these gateway treatments and at 500m spacings through each village. • Paint large yellow 40km/h signs on the road at these points.	
1.2	The three median openings (at Km 19.5, 22.6 and 25.7) have no sheltered right turn lane. This means that a vehicle waiting to turn right or to do a U turn is at risk of being struck from the rear. The opening at Km 22.6 in just 50m beyond a small crest meaning that approaching drivers/riders may not see a stationary vehicle in time to stop.	**HIGH**	• Review the proposed cross section. Try to achieve a median that is 6m wide so that sheltered turn lanes (3m wide) can be constructed. • If this is not possible, install warning signs (Median Opening) and suitable lane markings approximately 100m in advance of each opening to alert approaching drivers/riders. • Consider relocating the opening from Km 22.6 to Km 22.7 to increase sight distance to the opening.	

1.3	The junction in the side road near Km 23.05 has a triangular island in the middle of the intersection. This will permit 2-way traffic on each of the three sides of the triangular island, creating 3 Y junctions and numerous conflict points at this location. Crash risk will thus be increased.	**MED**	• Redesign this intersection to eliminate the triangular island. • Design this as a T junction, with left turning islands as necessary to shelter vehicles and to minimise "corner cutting".	
1.4	Both bridges require W beam guardrail to be installed to shield the bridge parapets. At the railway flyover, the guardrail should be extended so that it shields the entire slope that is more than 2m high. The drawings are silent about the use of crash barrier at the bridges.	**HIGH**	• Ensure W beam guardrail is shown on the drawings to shield all bridge abutments. • Ensure that standard drawings are developed that show the safe and correct way to affix guardrail	
1.5	The right hand curve near Km 26.9 has a much shorter radius than any other curve in this section of the Highway. It will be one of the "sharpest" curves on the entire highway. Some drivers/riders may be caught by surprise at the curve, and run-off-road crashes could result. The drawings are silent about what is intended to address this risk.	**MED**	• Review the design to try to increase the radius of this curve. • If this is not possible, ensure that the outer shoulder is sealed and has a slope to match the superelevation of the carriageway • Ensure that chevron alignment markers are installed around the outside of the curve in addition to the guide posts.	

		
The drawing shows this triangular island near Km 23.05. This will create numerous conflict points. It should be redesigned into a T junction.	*The existing road is in very poor condition. Speeds are less than 20km/h for much of the length. When the highway is duplicated, speeds will increase. This will increase risk for pedestrians especially.*	*Pedestrians are amongst the largest users of this highway. They warrant special safety attention. Sealed shoulders are recommended.*
		
It is recommended that gateway treatments be developed for each village – comprising flat topped road humps, speed restriction signs, and road markings.	*The embankment at the railway flyover is almost 10m high, and an errant vehicle is at high risk if barrier is not correctly installed. With no barriers, the existing bridge is unsafe.*	*This photo shows W beam barrier firmly attached to a bridge; the posts become more closely spaced to add strength to the barrier close to the rigid abutment.*

2 SAFETY CONCERNS WITH VULNERABLE ROAD USERS BETWEEN Km 18.700 – 27.700				
2.1	The existing bus stop in the centre of the first village is a central point for pedestrians. They cross the highway at this point and the bus stop is well used. The proposal is silent about any work at the bus stop and is silent also about how pedestrians are to cross the highway when it is duplicated. The bus stop should be provided with a sealed area, with a good shelter and with a street light for night time security. The volume of pedestrians indicates a set of push button signals should be considered to assist pedestrians to cross the highway safely.	**MED**	• Ensure that the bus stop is fully sealed. • Install a street light at the shelter for night time security. • Consider how best to assist pedestrians to safely cross the highway to access the bus stop. • Push button pedestrian signals are likely to offer the best option but they will require Police enforcement from time to time.	
2.2	The drawings show landscaping along the median. It is expected that many pedestrians will use the median to stage their crossing of the highway. The landscaping may obscure sight lines to/from the pedestrians-putting them at risk. Some of the vegetation is shown close to the median openings, where it may block sight lines for turning drivers/riders.	**MED**	• Ensure that the type of vegetation used is a low growing variety that will not hide pedestrians (especially children) and is able to be maintained easily. • Do not plant any vegetation within 50m of a median opening.	
2.3	The unsealed shoulders will become wet	**MED**	• Seal the shoulders at least 1.5m wide along	

	and muddy during the monsoon. Pedestrians do not like walking along muddy shoulders and many will walk on the road. This will expose them to risk of collision		the length of this highway duplication. • Ensure that an edge line is installed to guide drivers/riders	

The Audit Team has carried out this preliminary design road safety audit according to the Road Safety Audit Field Guide.

SIGNED: .....on behalf of the RSA Team by the Team Leader (24th March)

Lessons learnt:

- Ensure an experienced team (2-3 people) undertakes each audit. Good audits depend on the experience and judgement of the audit team in identifying road safety concerns from the drawings.
- Undertake audits at the earliest possible stage within the project schedule. Do not wait until Final Design – by then there are many constraints in place that may prevent some concerns from being fully addressed.
- Site inspections are vital – day time and night time – even for a new road at the preliminary design stage.
- The audit team should set a good example for personal safety – wear safety vests and take all necessary safety precautions while on site.
- Take many photographs of the site, and insert these into the audit report.

3. What to look for when you are on-site

When you are on-site for your audit inspection, try the following tips:

- Park your vehicle well off the road.
- Wear your reflective safety vest – for your own protection and to show that you are serious about safety.
- Look for safety concerns in the geometric design first.
- Move on to intersection layouts and traffic control.
- Think then of signs and line markings. Remember that it is better overall to eliminate a safety concern by better geometric design (if possible) rather than simply using a sign to warn of the problem. Early stage audits are good for this. The later an audit the less chance there is to make geometric changes.
- Remember the needs of pedestrians – not only crossing the road but walking along it. Are paths continuous, obvious, and well separated from high speed traffic? Make sure you walk the proposed road project too!

Cross-section

Look for consistency in cross-section throughout the new road project and also from the old to the new road. Avoid squeeze points and provide consistent lane widths and lane arrangements.

On high speed roads, such as highways, a paved shoulder should be wide enough for a stationary vehicle to be clear of the traffic lanes. A sealed shoulder 2.5 metres wide is desirable, but if this cannot be achieved try to get at least 1.5m sealed shoulders.

It is safest to maintain full pavement width and full shoulders at all culverts, bridges, overtaking lanes and intersections. To reduce the shoulders at these locations creates squeeze points which often catch some road users (especially motorcyclists) by surprise.

Sight distance

Sight distance can be affected by many things including trees, fences, and bus shelters. Sight distance out of side roads can be a major safety concern. Inspect each side road and review restrictions – such as parking or vegetation – that may restrict sight lines to approaching highway traffic.

Intersections

Intersection layouts should be simple and obvious to approaching motorists, motorcyclists and pedestrians. Audit teams should look carefully at intersections with acute angles as these restrict visibility. At left turn slip lanes, aligning the slip lane at 70˚ to the intersecting road will assist drivers to get a better view of approaching traffic.

Safe road designs provide adequate visibility for emerging traffic. Safe road designs avoid obstructions from street furniture or landscaping, and they provide adequate visibility to traffic control features. Central medians should be wide enough (generally 6m for cars and small vehicles) to provide shelter for crossing vehicles plus right turn lanes for turning vehicles. Medians also serve as refuges for pedestrians and bicyclists to cross one direction at a time (which is safer and easier than judging gaps in both directions at once). Keep landscaping away from intersections.

The traffic control used at an intersection should be clearly understood. Traffic signals need to be conspicuous and easy to understand. Pedestrian signals and audio-tactile facilities are highly desirable to assist pedestrians and the disabled to cross.

Roundabouts are a safe form of intersection control – they must have adequate deflection on entry and they must have the correct signing. For safety, roundabouts should be signed correctly with both regulatory and direction signs. In addition, road users should be made aware to give way on entry to the roundabout.

SAFETY TIPS FOR AUDIT TEAMS – ROADSIDE HAZARDS

Roadside hazards are a major road safety risk on the roads and highways of Karnataka. There is a five step strategy for managing roadside hazards and reducing their risk:
Step 1 - Keep the vehicles on the road
Step 2 - Remove any fixed objects from the roadside (within the “clear zone”)
Step 3 - Relocate hazards from the roadside (outside the “clear zone”)
Step 4 - Alter the hazard to reduce the severity of a collision
Step 5 - Shield the occupants of errant vehicles from the hazard by installing suitable crash barrier

Step 1 - Keep the vehicles on the road.

A combination of good geometrical design, good information for drivers and good maintenance of the road is needed. An early stage of audit (such as the preliminary design stage) can focus on geometric design to minimise the risk of a vehicle running off the road. In later audits, as the design becomes more settled, other safety options to reduce run-off-road crashes such as sealed shoulders, tactile edge lines, warning signs, guideposts and chevron alignment markers may be recommended.

Step 2 - Remove any fixed objects from the ‘clear zone’

Poles and large signs exist along most roads – if a vehicle strikes these at speed the occupants of the vehicle will suffer extremely serious if not fatal injuries. Any fixed object (defined as those with a diameter of 100mm or greater) should be removed from the “clear zone”. The clear zone is an area beside the road – its width is dependent on vehicle speed and volume. Along high speed roads, a clear zone of 9m is desirable. In the clear zone, all side slopes should be flat enough to be “drivable” – that is flatter than 4:1 slopes.

Concrete guide posts are commonly used in Karnataka but they are serious roadside hazards. They should be made highly conspicuous, with reflectors attached to them. When damaged, they should be replaced with white plastic guide posts with large reflective strips on each.

Step 3 - Relocate hazards to a position outside the "clear zone"

The further the fixed object is from the edge of the road, the lower the risk of it being struck. If it is not possible to totally remove a fixed object from a roadside, the next option is to consider relocating it further off the road. Experience and judgement will be necessary in such cases.

Step 4 - Alter the hazard to reduce the severity of a collision

Sign posts, and culverts, can cause serious injuries to the occupants of any vehicle that strikes them. To reduce these injuries, it is possible to place signs on "weakened' posts. It is also possible to install "driveable end walls" at culverts so that the vehicle can ride up and over the culvert, avoiding the savage sudden stop.

Step 5 – Install crash barriers to shield the hazard.

When the first four steps in the strategy have been exhausted, the installation of crash barriers may be a final option. The purpose of crash barriers is to protect the human beings who are inside an errant vehicle from striking a more serious roadside hazard. Remember that a crash barrier is a fixed object, and can cause injury when struck. Try to design the new road to minimise their use. If used - ensure they are correctly designed and installed.

SAFETY TIPS FOR AUDIT TEAMS – SIGNS & MARKINGS

Signs are too often used as a 'quick fix' to many safety concerns. They may be an acceptable solution to an existing problem at a small cost however audit teams should debate whether or not erecting a sign is the best solution to a problem. Normally, removing the hazard is the best solution, and should be given priority in design stage audits. If the design does not permit removal of the hazard, or if the cost to remove it is too great, then a sign may be the next best solution. Signs provide a large part of the information needed by drivers. Audit teams should remember the basic principles (the 6C's) of good signing.

CONSPICUOUS – the sign must be able to be seen. This is a new and reflective sign but has been poorly located and it cannot be seen by drivers/riders. If a sign cannot be seen it cannot be of any use to the road users.

CLEAR – the shape and colour of the sign, as well as the legend/symbol, have to be able to be read from a sufficient distance. This warning sign is not clear and should be replaced.

COMPREHENSIBLE – the sign has to be able to be understood. This confirmation sign is quite clear and easy for drivers to understand.

	**CREDIBLE** – the message conveyed by the sign has to be believable to the drivers. This sign informs drivers of a diversion 200m ahead. Drivers need good credible information on which to make their driving decisions. In this case they have to prepare to use a diversion on the left.
	**CONSISTENT** – every sign used for one task should look the same as the other sign(s) for that task. Direction signs are important to assist drivers to find their way to their destination. Consistent shape and colour is important in this regard.
	**CORRECT** – any sign that is used for be the correct sign for the purpose. It is usually better not to use a sign than to use the wrong sign! This “Keep Left” sign is conspicuous, but it is not the correct sign.
	**LINE MARKING -** is an important part of a safe road project. Audit teams should closely examine the line marking drawings, trying to anticipate what the road users will make of the new lines. Will they be conspicuous, consistent and correct?

Speed management and traffic calming

High speed is a major contributor to serious road crashes. You should check the drawings to ensure that the operating speeds of the new road can be managed within levels that are appropriate for the design speed of the road.

Firstly, ensure that the design speed and the likely operating speeds match each other. Otherwise some drivers may be caught by surprise at curves.

Secondly, be satisfied that there will be a suitable speed limit imposed. This will need adequate speed restriction signs along the route to remind drivers/riders of the speed limit.

Thirdly, consider the need to reduce operating speeds through “self-enforcing” measures such as traffic calming in towns and villages (such as gateway treatments, raised crossings, road narrowing’s) or by speed enforcement (such as speed cameras).

Night visibility

Roads are used both day and night, and so they should be inspected during day time as well as night time. Some locations look very different at night; they may or may not have street lighting. Some street lighting can create visual deceit (see below). Older people generally have poorer eyesight and this makes reading road signs more difficult than it is for younger people. This is made worse after dark, so particular attention should be paid to night time conspicuity and visibility for the elderly. Perception of widths and distances by older drivers also becomes more difficult at night time.

Visual deceit

Sometimes there are visual cues along a road that give the wrong message to a driver. A long row of trees, or power lines, can give an impression that the road continues straight. But if the road takes a bend, some drivers will be misled by the trees or the power poles – regardless of the number of warning and guide signs used to tell them otherwise. This impression may be so strong that the bend and any warning sign will go unnoticed by some motorists, and run-off-road crashes will result.

SAFETY TIPS FOR AUDIT TEAMS - PEDESTRIANS

Pedestrians are the largest and most vulnerable group of road users in Karnataka. Firstly, control vehicle speeds through villages to reduce crash frequency and severity. Provide sealed shoulders to assist pedestrians who need to walk along the road. Use signalised crossings to give pedestrians time separation from vehicles to cross busy roads. Use medians or refuges to give spatial separation from vehicles. Overpasses or subways are not popular with pedestrians and should only be used as a "last resort" to segregate pedestrians and vehicles on roads with high speed and high traffic volumes.

HIGH RISK PEDESTRIANS - an audit team needs to consider the safety needs of all pedestrians, and in particular the safety needs of high risk groups such as school aged pedestrians, elderly pedestrians, and intoxicated pedestrians.

IN THE SHOES OF THE PEDESTRIAN- the audit team should walk the site day and night to check for pedestrian issues. Pedestrians need to be able to clearly see where they should go. While this may be clear to engineers on a plan, it is not always obvious on the ground.

FOOTPATHS AND SEALED SHOULDERS- in urban areas footpaths are desirable to provide pedestrians with their own space on which to walk. In rural areas sealed shoulders give pedestrians their own space on which to walk. They help motorcyclists also.

PART D - ROAD SAFETY AUDIT CHECKLISTS

Road safety audit checklists are provided on the following pages. They have been designed to assist you in your audits, but they are not a substitute for knowledge and experience. There is a set of checklists for each of the following stages of audit:

1. Planning (Feasibility) Stage
2. Preliminary Design Stage
3. Final (Detailed) Design Stage
4. Roadwork (Construction) Stage
5. Pre-opening Stage

Using the Checklists

- Determine which set of checklists is needed based on the stage of audit you are doing.
- The checklists have been designed to be photocopied. Each copy may be used as a set of field sheets.
- Remember that a successful audit is not achieved by simply ticking off the checklist. The topics listed cover only the more common elements of design and practice; they are not exhaustive and auditors should use their own skills and judgement about the safety of any feature.
- If a listed topic is not apparently relevant to the project being audited, take a broad view of the topic to see if it prompts a relevant question.

Do not append the checklists to your audit report. Your audit report should contain sufficient explanation of its recommendations, without any need to refer to hand written notes on checklists.

Planning stage

Issue	Yes	No	N A	Comments
1 Route choice				
Is the project consistent with the adjacent network?				
Will all necessary turns (including U turns) be able to be made safely?				
2 Road design standards				
Are the design standards/or guidelines used “safe” (considering the project and its function)?				
Will sight distances be satisfactory – especially at intersections and property accesses?				
Will the design speed be “safe” with regard to horizontal and vertical alignment, sight distances, merging, or weaving?				
Will the likely operating speed on the proposed road be compatible with the design speed?				
3 Cross section				
Will the proposed cross section be “safe” for the expected volume and mix of traffic?				
Are all roadside hazards being managed “safely”?				

4 Interchanges				
Will the type of interchange be understood by drivers?				
5 Intersections				
Are the proposed layouts and traffic control as “safe” as practical for the type and volume of traffic?				
6 Pedestrians, bicyclists and motorcyclists				
Pedestrians and bicyclists – young, old, disabled? Have they been considered crossing the road, walking along the road? Do bicyclists have connectivity and clearance?				
Motorcyclists – will shoulders be sealed to provide them with lateral separation from faster vehicles?				
7 General road safety issues				
Will the road gradients be gentle enough to not require auxiliary lanes – such as truck lanes, overtaking lanes?				
Are there adequate locations along the road for trucks/ buses to safely stop – in case of breakdowns, or for driver rests?				
Will the new road be as safe as practical given the local weather (sunrise, sunset, dust storms, and wind)?				
Is the project free of all “visual deceit”? (Refer to Part C of this field guide).				

Preliminary design stage				
Issue	**Yes**	**No**	**N A**	**Comments**
1 Vertical and horizontal alignment				
Will horizontal and vertical alignments be safe and consistent, especially at interchanges and intersections?				
Will all merge, diverge and weaving areas be “safe”?				
2 Visibility and sight distance				
Are sight and stopping distances adequate?				
Is the design free of sight restrictions (maybe due to crash barriers, parking, signs, structures or landscaping)?				
3 Staged or future works				
If the scheme is to be constructed in stages, are the stages arranged to ensure maximum safety?				
If the scheme is a stage towards a wider road or a dual carriageway highway, will this be clear to drivers? (Always look for misleading things that could confuse drivers)				
Is the transition between single and dual carriageway (either way) handled safely?				

4 Interchanges				
Are all features of the interchange design "safe"?				
5 Intersections				
Is the type of intersection (cross roads, T, roundabout, signals) appropriate and safe?				
Is the proposed intersection control "safe"?				
6 Cross section				
Will the proposed cross section be "safe" for the expected volume and mix of traffic?				
7 Roadside hazards				
Has the 5 step roadside hazard strategy been followed (refer to page – of this field guide)?				
Will crash barriers be provided only where necessary?				
Will approved "safe" terminals be used for the crash barrier?				
8 Pedestrians, bicyclists and motorcyclists				
Are pedestrian needs safely considered? (To cross the road, and to walk along the road?) (Refer to Part C of this field guide).				
Does the design safely provide for motorcycles and bicycles?				

Preliminary design stage (cont.)				
Issue	**Yes**	**No**	**N A**	**Comments**
Are bus stops located where they will be safe and well used?				
9 Road maintenance vehicles				
Will road maintenance vehicles be able to work safely on this new road?				
10 Drainage				
Will the road be well drained?				
11 General road safety considerations				
Will the new road be as safe as practical given the local weather (sunrise, sunset, dust storms, wind)?				
Is the project free of all “visual deceit”? (Refer to Part C of this field guide)				

Final design stage

Issue	Yes	No	N A	Comments
1 Horizontal and vertical alignment				
Will horizontal and vertical alignments be consistent with "safe" visibility requirements?				
Is there adequate provision for "safe" overtaking?				
2 Typical cross sections				
Will lane widths, shoulders, medians and cross sections be adequate for the function of the road?				
Will median widths be adequate and safe for pedestrians, for turning vehicles (sheltered turns) and for road furniture (signs and signals)?				
Is provision made for broken down vehicles, and emergency vehicles?				
3 New / existing road interface				
Will the transition from old road to the new scheme be "safe"?				
4 Staged or future works				
If the scheme is to be constructed in stages, are the stages arranged to ensure maximum safety?				
If the scheme is a stage towards a wider or dual carriageway is the design adequate to clearly impart this message to drivers? (Always look for misleading things that could confuse drivers)				
Is the transition between single and dual carriageway (either way) handled safely?				

5 Interchanges				
Are sight lines open and free of obstruction at all merges and diverges?				
Will the distances between decision making points be sufficient for safety?				
Is the signing scheme for each interchange clear and easily understood?				
6 Intersections				
Is the type of intersection (cross roads, T, roundabout, signals) appropriate and safe?				
Will the design be free of sight obstructions (due to crash barriers, fences, landscaping, parking or other obstructions)?				
Will the traffic signal control at the intersection(s) be clearly seen and understood? Will the signal phasing be “safe”?				
Is adequate time proposed for all traffic and pedestrian movements at the signals?				
With roundabouts, is adequate deflection provided?				

Final design stage (cont.)

Issue	Yes	No	NA	Comments
7 Adjacent Land				
Will all accesses to and from adjacent properties be "safe"?				
8 Roadside hazards				
Has the 5 step roadside hazard strategy been followed? (Refer to Part C of this field guide).				
Will crash barriers be provided only where necessary?				
Will approved "safe" end terminals be used for the crash barrier?				
9 Pedestrians, bicyclists and motorcyclists				
Are pedestrian needs safely considered? (To cross the road, and to walk along the road?). (Refer to page – of this field guide).				
Does the design safely provide for motorcycles and bicycles?				
Are bus stops well positioned for safety?				
10 Signs, line marking and delineation				
Are all signs (regulatory, warning and direction) in accord with the 6 C's? (Refer to Part C of this field guide).				
Are sign supports out of the clear zone, or frangible?				

Is good delineation (curve warning signs, advisory speed signs, guide posts and chevron alignment markers) provided where required?				
11 Parking				
Is the parking that is to be provided adequate and safe?				
12 Emergency service vehicle access				
Has provision been made for safe access and movements by emergency vehicles?				
Are median breaks on divided carriageways safely located? (I.e. frequency, visibility)				
13 Lighting				
Is lighting required and if so, has it been adequately provided?				
Are frangible or slip-base poles to be used? (Refer to Part C of this				
14 Drainage				
Has the design provided adequate drainage?				

15 General road safety considerations				
Is the new road as safe as practical given the local weather (sunrise, sunset, snow, fog, storms, wind)?				
Is the project free of all “visual deceit”? (Refer to Part C of this field guide).				
Is the road surface free of gravel and sand, and with good skid resistance?				

Road work (Construction) stage

Issue	Yes	No	N A	Comments
1 Compliance with the Road Safety at Road Works Field Guide				
Does the Traffic Management Plan (TMP) for the road works comply with the requirements of the Road Safety at Road Works Field Guide?				
Does the TMP show the 4 zone concept being correctly applied?				
2 New / Existing Road Interface				
Is the connection of the new road and the old road as safe as practical?				
3 Interchanges				
Are sight lines open and free of obstruction at all merges and diverges?				
Are the distances between decision-making points sufficient for safety?				
Is the direction signing scheme for each interchange clear and easily understood at the expected operating speeds?				
4 Intersections				
Are sight lines to/from the intersection clear?				
Are traffic signals conspicuous, functioning properly?				

5 Roadside hazards				
Has the 5 step roadside hazard strategy been followed? (Refer to Part C of this field guide)				
Are all crash barriers correctly and safely installed?				
6 Signs, line markings and delineation				
Do all signs and pavement markings satisfy the 6C's of good signage and line marking practice? (Refer to Part C of this guide)				
Is there a need for any more signs to warn, inform, guide, control or delineate?				
Have all old signs and markings been removed?				
Is the speed zone safe, and clearly signed?				
7 Pedestrians, bicyclists and motorcyclists				
Is there safe provision for all pedestrians motorcyclists and bicyclists through this project?				
8 General road safety considerations				
Is the road surface free of gravel and sand, and with good skid resistance?				

Pre-opening stage

Issue	Yes	No	N A	Comments
1 Visibility				
Are sight lines free of obstructions?				
2 New / Existing Road Interface				
Is the connection of the new road and the old road as safe as practical?				
3 Interchanges				
Are sight lines open and free of obstruction at all merges and diverges?				
Are the distances between decision-making points sufficient for safety?				
Is the direction signing scheme for each interchange clear and easily understood at the expected operating speeds?				
4 Intersections				
Are sight lines to/from the intersection clear?				
Are traffic signals conspicuous, functioning properly?				

Are pedestrian signals easy to see and with adequate crossing time?				
Are roundabouts visible and recognisable from all approaches?				
5 Roadside hazards				
Has the 5 step roadside hazard strategy been followed? (Refer to Part C of this field guide)				
Are all crash barriers correctly and safely installed?				
6 Signs, line markings and delineation				
Do all signs and pavement markings satisfy the 6C's of good signage and line marking practice? (Refer to Part C of this guide)				
Is there a need for any more signs to warn, inform, guide, control or delineate?				
Have all old signs and markings been removed?				
Is the speed zone safe, and clearly signed?				
Is all delineation and road marking visible and readily visible?				