



حكومة أبوظبي
GOVERNMENT OF ABU DHABI

EMIRATE OF ABU DHABI ROAD SAFETY AUDIT MANUAL

TR-540



**Standards Guideline
For
ROAD SAFETY AUDIT MANUAL
ABU DHABI**

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Second Edition

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Department of Municipalities and Transport

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1. Amendment Page

To ensure that each copy of this technical document (Abu Dhabi Guideline) contains a complete record of amendments, the Amendment Page is updated and issued with each set of revised/new pages of the document. This ADG/ISGL is a live document which can be amended when necessary. QCC operates Road Safety Audit Manual Working Group which prepared this document and can review stakeholder comments in order to review and amend this document and issue an updated version when necessary.

Edition Number	Year of Approval	Number of pages	Sections Changes	Notes
First Edition	2018	-	-	New edition
Second Edition	2023	43	Several sections have been updated due to technical road safety requirements	

2. About the Abu Dhabi Quality and Conformity Council

Abu Dhabi Quality and Conformity Council (QCC) is an Abu Dhabi government entity established in accordance with Local Law No. (3) of 2009 to raise the quality of Abu Dhabi's exports and products traded locally. QCC consists of a council of regulators and industry with a mandate to ensure provision of quality infrastructure in line with global standards.

- o QCC's functions are divided into six key areas:
 - Developing standards and specifications
 - Capacity building of metrology systems
 - Strengthening testing infrastructure
 - Launching conformity schemes
 - Protecting consumer interests
 - Ensuring fair trade

- o QCC's key stakeholders include regulatory authorities, consumers, retailers and wholesalers, industry, conformity assessment bodies (CABs) and importers.

QCC supports regulators and government organizations through offering quality and conformity facilities, expertise and resources that allow them to implement products safety and compliance requirements and regulations. Additionally, QCC works towards promoting a culture of quality and protecting the interests of consumers. In doing this, QCC seeks to promote the Emirate's competitiveness to become one of the world's most attractive regions for investments and human capital, and to support the competitiveness of national industries in world markets.

3. Working Group

The Professional Working Group was organized by Abu Dhabi Quality and Conformity Council and established in January 2023. which was requested by Department of Municipalities and Transport, to prepare Road Safety Audit Manual in cooperation with the related stakeholders including representatives from government and private sectors, in order to establish operating procedures and technical guidelines for the relevant Authorities, Project Developers, Planners, Engineers etc., a step-by-step guidance on how to prepare the waste management aspect of a planning application for new development in the Emirate of Abu Dhabi at the Inception, Planning & Design stages of the Project.

4. Purpose

The purpose of updating this manual is to serve as official reference all Road Safety Audit activities undertaken in Abu Dhabi Emirate. The manual contains Road Safety Audit policies and procedures and includes pre-design and design activities, monitoring and post-construction site inspection.

5. Scope

TR-540 is compiled set of Road Safety Audit rules and policies that standardize infrastructure stages in the Emirate of Abu Dhabi. The current amendment provides more information regarding Road Safety Auditors Training and Experience, Audit Stages, Road Safety Procedure.

The requirements set out in this manual are applicable to all planning, design, or construction of changes to the Emirate of Abu Dhabi Road Network (EADRN) and those who are commissioned to undertake audits to ensure that the road safety implications of all projects are fully considered for all road users and others affected by the project.

6. Introduction

General

Road Safety is of paramount importance to the Department of Municipalities and Transport, Abu Dhabi Police and other stakeholders, especially road users.

The objective of this document is to ensure that the safety implications of all road schemes and developments are fully considered for all users of the road and those working on the road.

The primary purpose of carrying out safety audits is to ensure that any additions to or changes carried out on the road network are safe and do not include features, or combination of features, that may contribute to any type of future potential conflicts and to offer advice to minimise the likelihood of them occurring.

It is recommended that design teams include engineers with road safety engineering experience to ensure that safety issues are considered during design. However, any engineer included in the design

of a scheme cannot be a member of the RSA team for that scheme. Neither should the involvement of a road safety engineer within a design team be considered as a substitute for a road safety audit. Ideally, all design engineers should have road safety engineering training to at least be aware of the likely hazards a design may generate and be able to assess the risk and “design out” the hazard. There are also many other functions taking place on the highway, including regular “like for like” maintenance works which present an opportunity to ensure that safety considerations are included as part of the works.

Scope of this Manual

This manual must be followed by all persons who are involved in the planning, design or construction of changes to the Emirate of Abu Dhabi Road Network (EADRN) and those who are commissioned to undertake audits to ensure that the road safety implications of all projects are fully considered for all road users and others affected by the project.

This manual shall apply to all measures proposed on the EADRN that involve a change to the road/highway. This includes work resulting from developments alongside or affecting the EADRN.

Large or Complex construction projects requiring temporary traffic management will generally require a work zone safety audit.

All Work-Zone traffic management is to be site specific and to comply with the current Emirate of Abu Dhabi Work Zone Traffic Management Manual (2014). Road Safety Audit (RSA) is to be conducted in line with the procedures set out within this manual. Period Road Safety Audits of the existing road network will be described as **Road Safety Inspections**. This is to distinguish them from road safety audits of new or proposed roads and developments. The requirements set out in this manual are applicable to all design and construction work through the design and construction process for all stages of Road Safety Audit and Road Safety Inspection. This manual does not include general health and safety arrangements during construction.

Development of the Manual.

This Manual is a combination of existing practice within Department of Municipalities and Transport which have previously compiled best international practice for Road Safety Audits in Europe, Australia, New Zealand and the Middle East (Dubai).

7. Definitions

#	Term	Definition
1	Audit Brief:	The instructions to the Audit Team defining the scope and details of the road or development project to be audited, including sufficient information for the audit to be undertaken.
2	Audit Report:	The report produced by the Audit Team describing the road safety related problems identified by the team and the recommended solutions to those problems.
3	Audit Team Continued Professional Development (CPD):	A record of courses, conferences, workshops and any other training undertaken with the purpose of keeping Road Safety Auditors up to date with the latest developments in Road Safety Audit, crash investigation, crash data analysis and Road Safety Engineering.
4	Audit Team Leader:	A person with the appropriate training, skills and experience who is approved for an audit by the relevant road authority on behalf of the client organisation as the audit team leader. The Audit Team Leader

		has overall responsibility for carrying out the audit, managing the Audit Team and certifying the report.
5	Audit Team Observer:	A person with the appropriate training, skills and experience accompanying the Audit Team to observe and gain experience of the audit procedure. The Audit Team Observer is encouraged to contribute actively to the audit process.
6	Audit Team:	A team that works together on all aspects of the audit, independent of the Design Team and approved for an audit by the relevant road's authority. The team shall comprise a minimum of two persons with appropriate levels of training, skills and experience in Road Safety Engineering work and/or Crash Investigation.
7	Client:	The party responsible for promoting the project/Development.
8	Crash:	A rare random multifactor event in which one or more road users fails to cope with their environment and results in loss, injury or death.
9	Crash Data Analysis:	The collection and examination of historical crash data over a period to identify patterns, common trends and factors which may have contributed to the occurrence of crashes and / or to the severity of the outcomes.
10	Crash Investigation:	The on-site investigation and collection of evidence to determine the events and circumstances which contributed to the occurrence of a crash and / or to the severity of the outcome.
11	Design Organisation:	The organisation(s) commissioned to undertake the various phases of scheme preparation.
12	Design Team Leader:	A person within the Design Team responsible for managing the scheme design and coordinating the input of the various design disciplines.
13	Design Team:	The group within the Design Organisation undertaking the various phases of scheme preparation.
14	Feedback Form / Exception Report:	A report which describes the hazards identified in the audit, the likely outcome and severity of those hazards and proposed solutions based on the auditor's knowledge and experience of crash reduction and preventative measures and road safety engineering experience. Also, included is the designer's response to the auditor's observation(s) and proposed solution(s) and the auditor's response to the designer. This report is copied to the relevant highway authority at all stages. The relevant road authority will be the final arbitrator for unresolved differences between the audit and design teams. The relevant road authority may choose to override any RSA recommendation and provide an alternative measure or none.
15	Highways:	The main inter-urban road network ("E" Roads).
16	Highway Improvement Schemes:	All works that involve construction of new highway or permanent change to the existing highway layout or features. This includes changes to road layout, kerbs, signs and markings, lighting, signalling, drainage, landscaping and installation of roadside equipment, including ITS and other infrastructure additions within the road space.
17	Interim Road Safety Audit	: The application of Road Safety Audit to the whole or part of a Highway Improvement Scheme at any time during the preliminary and construction stages. Interim Road Safety Audit is not mandatory or a substitute for the formal Stage 1, 2 and 3 Safety Audits.

18	Department of Transport (DMT) roads:	All publicly owned and operated roads and highways.
19	Maintaining Agent:	The authority responsible for maintaining the completed Road Project. This is typically a term contractor employed on behalf of the Road Authority to undertake this function.
20	Planning Authority	The authority responsible for development control. (<i>i.e.</i> , DMT , <i>Department of Municipalities and Transport</i> , or <i>Abu Dhabi / Al Ain/ Al Dhafra Region Municipality</i>).
21	Road Authority:	The authority ultimately responsible for the operations and maintenance of the road being <i>audited</i> (<i>i.e.</i> , DMT , or <i>Abu Dhabi / Al Ain/ Al Dhafra Region Municipality</i>).
22	Road Safety Audit:	The evaluation of highway and road schemes during planning, design and at the end of construction (preferably before the scheme is open to traffic) to identify potential road safety problems that may affect any users of the highway or road and to suggest measures to eliminate or mitigate those problems. The audit process includes the crash monitoring of highway and road development or improvement schemes to identify any road safety problems that may occur after opening. Road Safety Audit also includes inspections of the existing road network or a part thereof.
23	Road Safety Engineering:	The design and implementation of physical changes to the road network intended to reduce the number and severity of crashes based on the results of crash investigations and/or collision data analysis.
24	Road Safety Review:	A review of the road safety implications or requirements based on an informal review of the drawings, maps, photographs or collision data of a proposed development or a perceived or suspected high risk collision location on the existing road network
25	Road Safety Inspections:	Includes all road safety reviews of the existing road network or a part thereof and periodic Road Safety Inspections as may be prescribed through the EAD Road Safety Strategy or commissioned by the relevant road's authority.
26	Road Users:	All persons located within the road reserve, irrespective of the purpose of their trip or mode of transport. They include the visually and mobility impaired.
27	Specialist Advisor:	A person approved by the Project Sponsor, to provide specialist independent advice to the Audit Team should the scheme includes complex features outside the experience of the Audit Team Members, e.g., a complex traffic signal-controlled junction.
28	Stage 0 – Feasibility, Road Safety Audit:	A feasibility stage RSA is an early design stage RSA used to assist in defining the high-level road safety choices of road alignment, transport or development plans or developments. It is used to identify possible safety problems likely to impact on a project and pre-empt counter measures at an early stage. Where more than one design option exists, the Road Safety Audit may help to identify the preferred option. All small private developments should be assessed by the highway authority's road safety audit team at the conception of the development to assess the project and when it is considered that a safety audit will assist in defining the design choices of the project to enhance safety a Stage 0, Feasibility Audit will be required.

29	Stage 1 - Preliminary Design Road	Safety Audit shall be undertaken near to but prior to completion of preliminary design. It should be finalised prior to commitment to construct, finalisation of the purchase of land or property purchases. Road safety issues which may affect the land take required should be identified as early as possible and taken into consideration at this stage of the design.
30	Stage 2 - Detailed Design	shall be undertaken at the completion of detailed design BUT before tender or construction commences. Where tenders are being sought, sufficient time should be allowed for any road safety audit issues requiring design changes to be incorporated into the design prior to publication of the tender. The contract or tender documents should include provision for the contractor to employ a RSA team approved by the road authority. For Design Build or Design, Build and Operate contracts within which the detailed design may be altered during the construction phase provision should be included to engage a RSA team, approved by the road authority to carry out interim RSAs on the final designs as required.
31	Stage 3 – Construction or Opening	shall be undertaken at the substantial completion of the project preferably before the road project is opened to traffic (Pre-Opening Stage - 3a). Where it is not feasible to undertake the audit prior to opening, it can be completed either as a phased or complete opening as a Stage 3b, within two weeks of opening but before handover.
32	Stage 4 – Post opening audits.	These data driven investigations are to evaluate collisions that have occurred post opening of a scheme. The scope of the audit will include the scheme itself and the adjacent road network within the influence of the scheme to identify the causes and contributory causes of those collisions and the resulting severity. The audit or investigation should identify appropriate counter measures to reduce the incidence of the collisions and / or their severity. The decision to undertake a stage 4 RSA will be determined by the post opening crash history. Where no post opening crashes have occurred, an audit will not be required but a note to that effect should be generated by the relevant road authority.
33	Stage 4A - 12 months monitoring	can be undertaken on the 12-month anniversary of a schemes opening.
34	Stage 4b - 36 months monitoring	can be undertaken on the 36th month anniversary of a schemes opening.
35	Work Zone Management:	The arrangement of temporary sign, markings, and other devices to guide all road users safely through road works, whilst also ensuring the protection of works personnel.
36	Vulnerable Road User (VRU):	All persons located within the road reserve with little or no external protection such as pedestrians, cyclists, powered two-wheelers, and wheelchair users.

8. Road Safety Auditors Training and Experience

Scope

The following chapter sets out the requirements for the Safety Audit Team Who Audit in the Emirate of Abu Dhabi. These are the required standards for all Road Safety Audit Teams.

The Audit Team.

The Road Safety Audit Team shall comprise of no less than a two-person team - Audit Team Leader and Audit Team Member.

The Audit Team should be independent from the project design team and work as 3rd party team.

The Road Safety Audit Team shall comprise of no less than a two-person team - Audit Team Leader and Audit Team Member.

There is no upper limit on the size of the Audit Team, if required specialist advisors may be consulted and/or attend during the site inspections as instructed by the relevant highway authority.

Where a RSA team comprises many attendees, the RSA Team Leader may choose to split the team into smaller specialist groups to complete the audit. The RSA team leader is responsible to ensure all aspects of the project are thoroughly examined and will be responsible for the content of the final report.

The appointment of the RSA team shall be at the discretion of the relevant roads authority, as to the appropriateness of an individual(s) nominated to conduct the RSA for a scheme. A road safety audit submitted by a consultant or developer where the team was not approved by the relevant road's authority will be rejected.

Road Safety Auditors who audit full time to the exclusion of other crash investigations / road safety engineering work are unacceptable.

3.2.7 Requirement for years of experience in Safety Engineering, Crash Analysis or Collision Investigations does not include road safety audit stages 0 to 3. The primary experience requirement for auditors is an understanding of how crashes occur and what remedial measures work. Stage 4 RSA experience can be included here providing the site has crashes post construction.

Audit Team Leader.

The Audit Team Leader must be able to demonstrate the following levels of experience:

- a) Demonstration of 5 years (2 for ATM) of Safety Engineering, Crash Analysis or Collision Investigations; and
- b) Attendance of a 10-day recognised Collision Investigation or Road Safety Engineering course; and
- c) Completion of at least 5 Road Safety Audits in the past 12 months as an Audit Team Leader or member; and one of them should be within the UAE.
- d) A minimum of 2 days Continuing Professional Development (CPD) in the fields of Road Safety Audit, Collision Investigation or Road Safety Engineering in the past 12 months.
- e) And can demonstrate that they have a well-rounded knowledge of Highway Design.

Audit Team Member.

The Audit Team Member must be able to demonstrate the following levels of experience:

- a) A minimum of 2 years Collision Investigation or Road Safety Engineering Experience; and

- b) Attendance of a 10-day recognised Collision Investigation or Road Safety Engineering course; and
- c) Completion of at least 5 Road Safety Audits as Audit Team Member or Observer in the past 24 months.
- d) A minimum of 2 days CPD in the fields of Road Safety Audit, Collision Investigation or Road Safety Engineering in the past 12 months.
- e) And can demonstrate that they have a well-rounded knowledge of Highway Design.

Audit Team Observer.

The Audit Team Observer must have:

- a) A minimum of 1 years Collision Investigation or Road Safety Engineering Experience; and
- b) A minimum of 2 days CPD in the fields of Road Safety Audit, Collision Investigation or Road Safety Engineering in the past 12 months.
- c) An interest or willingness to learn about road safety audit

Specialist Advisors

Whilst there are no specific requirements for the specialist advisor, it will be at the discretion of the Design Organisation and Audit Team if it is considered that the scheme has complex features requiring a specialist to be included as part of the Audit Team.

9. Audit Stages

Introduction

Figure 4.1 outlines the relationship between design and road safety audit function from the start of design through to the completion of construction.

An interim audit can be undertaken at any stage in between each formal road safety audit.

For smaller schemes stage 1 and stage 2 of the road safety audit process can be combined into a single road safety audit report. (RSA Stage 1 / 2.) after getting the approval from the authority.

Feasibility Design Stage Audits (Stage 0)

Feasibility/Conceptual Stage Road Safety Audits should be undertaken during feasibility or conceptual design on each of the probable routes or options being considered for large scale developments, route realignments, new major inter-urban links and major transport developments. This is the first occasion when major considerations such as tie-ins to the existing road network, junction format, alignment and lanes configurations are being examined. Land requirements and other major constraints need to be evaluated fully as these may impact on road safety issues later in the design process

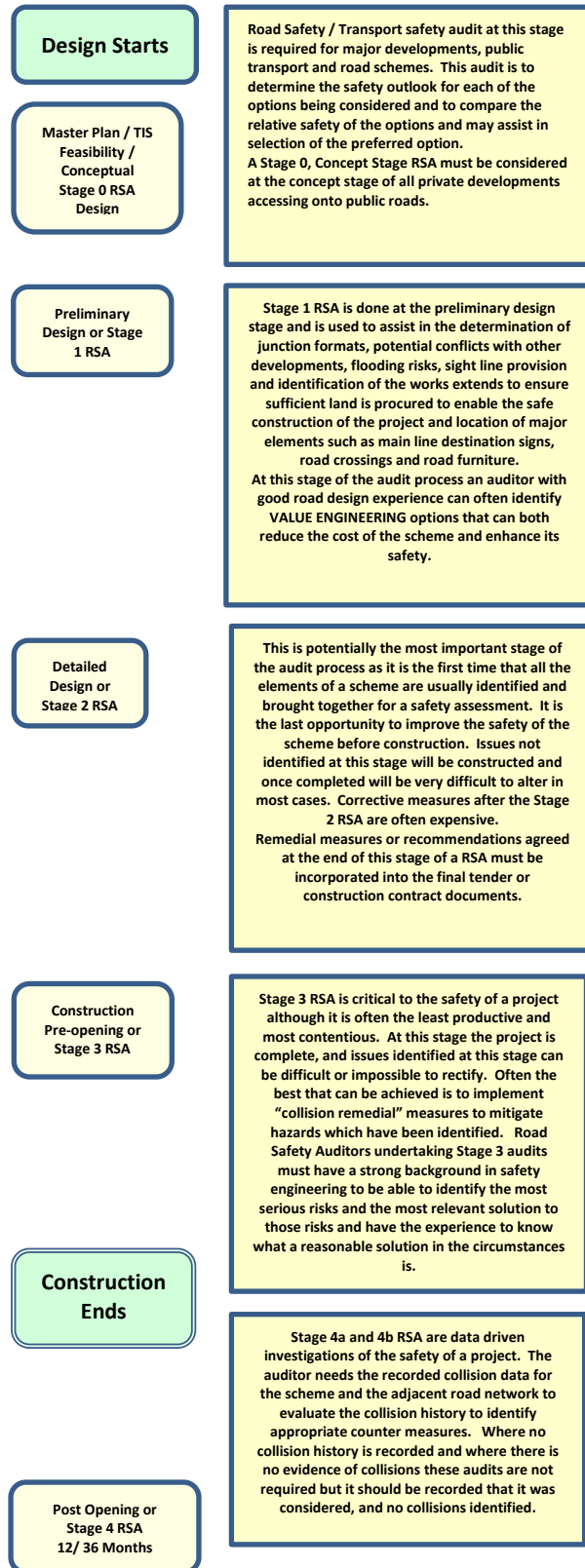
A Stage 0 Road Safety Audit must accompany any Master Plan and TIS for schemes identified by the relevant road authority's road safety team as requiring a Stage 0 RSA. The Audit is to be submitted for approval by the relevant road authority's road safety team.

The Audit Team should therefore focus on 'high-level' safety aspects such as route alignment, tie-in with existing road network, and number, type, layout and location of intersections or interchanges.

All Audit Team Members should examine the site together during this Stage. It is essential to consider fully any road safety issues which may have a bearing upon land take, including development-led road projects, before planning consent is granted

A Stage 0 Road Safety Audit must also be considered at the concept stage for all private developments. Exemptions may be applied for from the Relevant Road Authority's road safety team

Figure 4.1 is a schematic diagram showing the relationship between the timings, Stage Number, Stage Names and Stage Functions of the Road Safety Audit Process.



Preliminary Design Stage Audits (Stage 1)

The Preliminary design stage Road Safety Audit must be undertaken on or prior to completion of the preliminary design. This stage often occurs before the land acquisition process commences and is therefore sometimes the last opportunity at which land requirements may be increased.

Drawings may only show general details such as route alignment, profile of the road and typical cross sections to the appropriate scale. Intersections and interchanges are generally shown at a larger scale. Although the Audit Team will be unable to see the full details of the design as it will appear in the detail design stage, a site visit must still be undertaken to assess how the road project will tie into the existing road network and how consistent the design will be from the perspective of different road users. All members of the Audit Team must visit the site together to consider the prevailing climatic conditions, surrounding vegetation and topography and the local drivers' behaviour.

With the route choice, overall design and layout having been decided previously, the Audit Team can still suggest some localised changes, such as horizontal and vertical alignment, consolidation of access points and location of accesses. Other issues may include provision of a median, lane and shoulder width, provision of cycle lanes and sidewalks, and channelization. Accesses, public and private, including junctions and interchanges should be reviewed for upstream/downstream effects, potentially conflicting movements, and sight distances. If staged implementation of the road project is to be carried out, each stage should be considered as well as the transition between each stage.

If alternative design options are being considered, they should be reviewed separately by the Audit Team and the RSA report should also include a comparison to evaluate and recommend the preferred option based on road user safety. The Stage 1 Audit should include a review of the issues raised in the Feasibility Stage Audit. Any issues that have not been satisfactorily resolved from the Feasibility Stage 0 Audit should be reiterated in the Stage 1 Audit report.

Detailed Design Stage Audit (Stage 2)

The Detailed Design Stage Audit should be conducted before completion of the final design drawings for the construction of a road project. This stage of audit provides the last opportunity to change the design before actual construction of the road commences. Land acquisition may have been finalized by this stage and this will prevent the Audit Team from making any recommendations involving significant changes to road alignment or road footprint. The Stage 2 Audit is concerned with the more detailed aspects of the road project.

All Audit Team Members must examine the site together during the Detailed Design Stage.

Drawings at the Detailed Design Stage will show significant detail, as follows:

- Horizontal and vertical alignment: drawings showing the alignment and vertical profile
- Cross section: number and width of lanes, shoulders, drainage, curbs and gutters, boulevards, medians, sidewalks, clear zone, roadside barriers, significant roadside structures, and potential roadside hazards
- Intersection layout: including all traffic control devices, signs, pavement markings, number of lanes on each approach, medians, and channelization
- Interchange layout: including advance and exit direction signs, length and width of acceleration/deceleration lanes, delineation, gore area treatments, and roadside barriers
- Other details: driveway accesses, landscaping and traffic calming devices, illumination, signs, marking, and delineation

The Audit Team will need to consider how these aspects of the design will affect the operation of the road project for all the different road user groups likely to use it. The base map will show significant detail of vertical contours, existing roads, structures, vegetation and property boundaries at an even larger scale than for the preliminary design drawings. Intersections and interchanges will also be shown at larger appropriate scales.

The Stage 2 Audit should include a review of the issues raised in the Stage 1 Audit report. Any issues that have not been satisfactorily resolved from the Stage 1 Audit should be reiterated in the Stage 2 Audit report.

Opening Stage Audit (Stage 3)

The Opening Stage Audit should be undertaken when the road project is substantially complete and preferably before the road project is opened to traffic (i.e., Pre-Opening Stage or Stage 3). This is to identify and rectify potential risks to road users that may have arisen during construction or that had not been identified earlier in the audit process. In some cases, it may also reduce the difficulty that would be experienced by Audit Teams in traversing the site when open to traffic.

However, when a pre-opening site visit is carried out a post-opening visit will also be required so that the road safety audit team can observe actual human behaviour on the new scheme.

A pre-opening RSA is crucial on larger and complex schemes and should be undertaken if possible. Remedial works are easier to implement and more cost effective during the construction phase. On large or complex projects with the phases opening at different times, the pre-opening audit may be done in phases as required to ensure the works are inspected prior to opening.

Pre-Opening Stage Audits represent the last opportunity that the Audit Team should identify potential safety concerns before the road project is opened to all road users. They will have an opportunity to conduct a detailed inspection of the new road and tie-ins with the existing road network. The Audit Team will need to conduct the site visit by driving through it and walking along key stretches by foot to see the entire site first hand. The stage 3 RSA is essentially a site visit and must be attended by all members of the RSA team in daylight and darkness.

All Audit Team Members must examine the site together during daylight and during the hours of darkness so that hazards particular to night operation can be identified.

The Audit Team should also consider the effects of various weather conditions that may not be present at the time of inspection (such as fog or sandstorms).

In addition to road safety audit team, the police should be invited to attend the Stage 3 RSA. Representatives from the road authority, the contractor, designer and traffic signal or other specialists, where required, may attend the audit. The actual invitees should be decided by the ATL depending on the schemes size and complexity. It is essential at the Stage 3 RSA that the road safety auditor is aware of issues that may impact on all road users including the continuity of pedestrian, cycle, mobility impaired, micro mobility users and other vulnerable road user accesses and facilities. Reference should be made to the Interim Advice Note on Vulnerable Road Users.

The Audit Team may be under a time constraint and may need to provide a quick response to the Client and Design Team. To expedite the process, the Audit Team may undertake their site visit and then meet with the client and design team immediately afterwards while still on-site to show them first hand any identified safety issues and suggested improvements. This will allow the client and design team to address the identified safety issues immediately, minimizing any delay to the opening of the road facility.

The audit team may then follow up with their audit report, and the client and design team may complete the corresponding feedback and exemption report after the opening of the road project.

Since the road will have been built in its entirety, it is unlikely to be feasible for the client or design team to implement some of the recommendations identified by the audit team which concern physical changes to the cross section, layout, or alignment of the roadway. All recommendations in the RSA should be proportional and viable.

All identified problems should be reported in the road safety audit report and referred to the client and / or the road authority to be prioritised for remediation according to the likely impact on traffic safety. It is however likely that the Audit Team will tend to identify problems and make proportional and viable recommendations which will focus on factors such as changes to illumination, signage,

delineation, pavement markings, roadside barriers, removal of fixed object hazards, or on minor structural changes.

Issues raised in the Stage 2 Audit report should also be reviewed at the Stage 3 Road Safety Audit. Any issues that have not been satisfactorily resolved from the Stage 2 Audit should be reiterated in the Stage 3 Audit report.

Attention should be made to the hazards identified in the Stage 2 RSA which had not been implemented but could have been and are no longer feasible.

Post Construction Monitoring (Stage 4a/b)

Abu Dhabi Police and SAAED are the sole agencies with responsibility for the recording of collision data in Abu Dhabi.

Stage 4 RSA is a data analysis of recorded collisions that have occurred on the scheme and on the adjacent road network within the influence of the scheme.

During the first year (12 months) a Highway Scheme is open to traffic; a check can be kept by Abu Dhabi Police on the number of personal injury crashes that occur, and the data should be supplied to the relevant road authority so that any problems can be identified, and remedial work arranged quickly.

Stage 4 crash monitoring reports should be prepared using 12 months (Stage 4a) and 36 months (Stage 4b) of crash data from the time the Highway Scheme became operational, supplied by Abu Dhabi Police.

The crash records shall be analysed in detail to identify:

- Locations at which personal injury crashes have occurred.
- Personal injury crashes that appear to arise from similar causes or show common factors.

The analysis of data should include identification of changes in the number of incidents. The crash data should be analysed to identify the influence of problems and recommendations identified at previous audit stages, and any approved Exception Reports.

The stage 4 12/36-month monitoring reports should identify any road safety problems indicated by the data analysis and observations during any site visits undertaken.

The reports should make recommendations for remedial action and should be submitted to the relevant highway authority and Abu Dhabi Police.

If there have been no reported crashes on the site following completion, then an exception form can be signed off that a RSA4 report is not required.

Interim Audits (Any Stage)

The Client will decide whether to employ Interim Road Safety Audit. Design Teams shall not contact Audit Teams without the Client's prior written authorisation. Audit Teams undertaking Interim Road Safety Audit shall only be appointed with the approval of the relevant road's authority in accordance with section 5.5.

The Audit Team will require an Audit Brief for an Interim Road Safety Audit containing as many of the items given in paragraph 5.10 as are available, though obviously, it will not be possible to provide everything on the list in early design stages. A full Audit Brief must still be supplied to the Audit Team at the end of the design stage for Stage 1 or Stage 2 Audits.

Interim RSA3 on large-scale projects are strongly advised. There is a significant difference between looking at things like kerb-lines on a plan and seeing them on site. Significant cost and time savings can be made if problems are identified during construction as opposed to after completion.

Work Zone Temporary Traffic Management Audit

Relationship between the Work Zone Traffic Management Plan and Safety Audit

- The objective of traffic management for construction work zones is to guide all road users past the work zone in a safe and efficient manner whilst protecting the operatives in the zone itself.
- The design and approvals process of WZTTM should be a part of the overall design submission including the WZTTM Road Safety Audit were requested by highway authority's road safety audit team. Sufficient time should be given in the preparation of traffic management and the WZTTM safety audit.

Scope

- Road Safety Audit of traffic management projects (road works) should be undertaken on large or exceptionally complex traffic management projects that involve temporary changes to the layout and operation of junctions, or realignment of roads or that will affect the network for considerable periods of time, i.e., 6 months or more. Examples of such projects include but are not limited to the installation of a temporary roundabout junction or a diversion using a length of temporary carriageway to allow major excavation on a main carriageway.
- The Road Safety Audit of traffic management projects should involve an assessment of the proposed drawings for each different configuration or staging of traffic, before they are implemented. If necessary, the site should be inspected, taking note of any existing features that will need to be covered or removed (e.g., traffic signs and lane markings, and reflective road studs) or shielded (e.g., roadside hazards that will be close to traffic).
- The Road Safety Audit of temporary traffic management does not absolve the contractor or consultant of any responsibility for safe working arrangements.

Issues to focus on during traffic management (work zones) audits include:

- Adequacy of advance warning.
- Proposed speed limits.
- Appropriateness of the selected standard layout.
- Conflicts between permanent and temporary features.
- Any aspects of layout or devices that could be misread by drivers (for example traffic signs, lane markings and delineation).
- Likelihood of mud or dust obscuring devices.
- Appropriateness of crash barriers and the correct installation.
- Adequate provision for pedestrians, particularly the mobility impaired.
- Adequate protection of works personnel; and
- Conflict points between works traffic and the public.

Planning

- The road safety audit of temporary traffic management is not intended to be a technical check of the proposed work zone traffic management or to replace any approvals process in place at the relevant highway authority. It is an examination of the WZTTM to ensure it is safe for the public and those expected to work on the project.
- The audit will consider the following elements but is not limited to:
 - a) Layout in relation to the highway
 - b) Driver and advanced warning
 - c) Delineation devices (including barrier, road markings etc.)
 - d) Signing
 - e) Miscellaneous devices
 - f) Conflicts and conflicting signage.

Safety Audit Review Report

The report will follow the same format of a stage 3 road safety audit and contain the information as set out within Para 5.14 (Compile / issue audit report).

Dangerous Defects Notification / Order to Cease Works

During the construction, periodic inspections of the traffic management will be undertaken by the relevant authorities and if at any time elements, even if temporary are identified to be unacceptable

or dangerous, an immediate notification of dangerous defect will be raised and in more serious cases an order by the relevant authority to cease works will be raised.

10. Road Safety Audit Procedure

Overview

These procedures are based largely on the UK’s Highways Agency’s and Transport Infrastructure Ireland’s Standards’ (HD19/15) procedures for carrying out Road Safety Audits which are a part of the Design Manual for Roads and Bridges for both states.

There are additional requirements in these procedures which are specific to Abu Dhabi.

The main parties involved in the Road Safety Audit process are: The Client (Relevant Highway Authority or Developer), Abu Dhabi Police, the Design Organisation, the Contractor and the Audit Team. Abu Dhabi Police is one of the stakeholders responsible for Road Safety Audit as a shared responsibility with the relevant road authorities.

- The Client is the organisation or party responsible for commissioning the design and the Road Safety Audit.
- The Design Organisation is the organisation or party responsible for designing the road project.
- The contractor is the organisation responsible for the implementation of the project and findings of the RSA.
- The Road Safety Audit Team is the independent group of experts assembled to review the safety of the road design.

The Client depends on the type of road project:

- Highway projects: road authority (i.e., Department of Transport)
- Municipal Roads: road authority (i.e., the Municipalities)
- Private Developments: Developers

The Client’s interests will generally be represented by a Project Manager

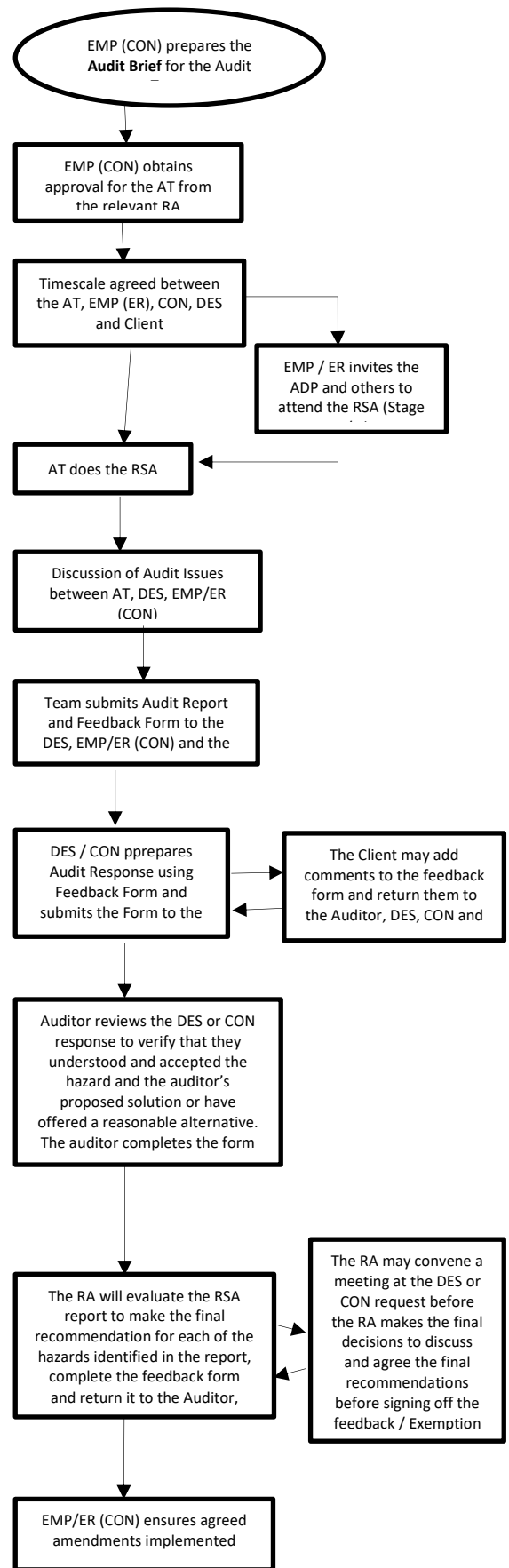
Figure 5.1 - Road Safety Audit Process

Scope of the Audit

Road Safety Audit should only consider road safety matters. Road Safety Audit is not a technical check to ensure that the design conforms to standards. Road Safety Audit should not consider structural safety.

Health and Safety issues are also not addressed in the Road Safety Audit. Auditors should examine all road safety elements of the project. All users of the highway should be

ABBREVIATIONS
 AT: Audit Team, EMP: Employer, ER: Employer’s Representative, DES: Designer
 CON: Contractor
 RA: Road Authority (ADM, AACM, ADR or DMT)
For road schemes where the contractor is responsible for design, the contractor shall take the place of EMP/ER in most instances, as indicated with (CON).



considered including pedestrians, cyclists, motorcyclists, those working on the highway and motor vehicle users. Attention should be given to vulnerable road users such as the very young, the elderly and the mobility and visually impaired.

Scheme extents for the purposes of the road safety audit should extend into the adjoining road network likely to be impacted by the project. The client and designer should make provision for this early in the design process especially at adjoining junctions and at scheme tie-ins.

The potential for road safety problems is often greatest at intersections, tie-ins and immediately beyond tie-ins. Where a road improvement project joins an existing road or intersection, inconsistency in the standard of provision can lead to crashes, so special attention should be paid to these areas to ensure a safe transition is achieved. This applies particularly to online improvements where variations in the standard of provision between new and existing sections may not be obvious to the road user.

When & What to Audit

It is mandatory to undertake the full range of audits for all new major transport or road projects, namely:

- Feasibility Stage Audit: (Stage 0).
- Preliminary Design Stage Audit: (Stage 1).
- Detailed Design Stage Audit (Stage 2).
- Opening Stage Audit (Stage 3); and
- Monitoring (Stage 4 a/b) on the 12 and 36 months of the schemes opening.

All road and transport projects must be audited at the design and construction stages. The Feasibility (Stage 0) and / or the Preliminary (Stage 1) design stage audits may be exempted where the project is of a scale deemed not to warrant either one or both of those stages.

Approval of exemptions must be obtained early in the design process from the relevant roads authority and recorded in the design file. For guidance, see Appendix A: Scheme Type and Audit Stage.

Where a project is of a scale that no feasibility or preliminary design stage audit has been necessary and the project has progressed directly to detailed design, Audit Stages 1 and 2 can be combined at Stage 2 and referred to as a Stage 1 / 2. The relevant road authority should be consulted on the audit stages that shall be undertaken.

With Design and Build and Design, Build and Operate projects, design work is an ongoing process throughout the period of the project and completion of the works is often staged. Thus, it is often not possible to undertake audits at discrete points during the design and construction of the project.

The Feasibility and Preliminary Stage Audits are generally undertaken for the whole project in single audit for each stage prior to tender. The Stage 2 and Stage 3 Road Safety Audits are undertaken on final design and prior to opening by an approved road safety audit team, engaged for the duration of the project, as the design stages are completed.

Design Changes / Audit Shelf Life

No audit will be deemed as complete until designer's responses have been reviewed and commented on by the road safety auditor and it has been received by the relevant road's authority. Audits which have not been completed within 6 months of having been undertaken will be deemed as being void and must be redone.

Completed Stage 1, combined Stage 1/2 and Stage 2 Audits shall be repeated if the scheme design materially changes or if the previous audit for the relevant stage is more than 2 years old. For Stage 0 audits the period may be extended to 5 years.

The relevant roads authority may extend the shelf-life of an audit at its' own discretion up to a maximum of four years if no material is likely from an additional audit.

In the case of minor changes to a Highway Improvement Scheme then the re-audit should only be concerned with the elements of the scheme that have been changed.

If the design of the Highway Improvement Scheme is changed during the construction period, then the elements of the scheme that have been redesigned shall be resubmitted for a Stage 2 Road Safety Audit prior to construction.

Appointment of the Road Safety Audit Team

Road Safety Audit Team Leader's and Team Member's registration with one of the roads authorities must be current.

A Road Safety Audit Team must comprise at least two members: The Audit Team Leader and Audit Team Member. This enables discussion between the auditors of the problems and recommendations and maximises the potential to identify problems (i.e., reduces the risk that road safety issues are missed). The most competent auditor is generally designated as Audit Team Leader.

Audit Team Observers may also join the team to gain experience in carrying out Road Safety Audit, however the number of Audit Team Observers should normally be limited to a maximum of two. Audit Team Observers does not include the stakeholders' representatives.

The Client and the Audit Team should consider if there are any features of the project, such as complex signal-controlled intersections, highway design, traffic management or maintenance issues that warrant the appointment of Specialist Advisors (See section 3.6.1) to advise the Audit Team. Appointment of Specialist Advisors is subject to the approval of the Client who would separately instruct them on their role. A Specialist Advisor is not a member of the Audit Team but advises the team on matters relating to their specialism.

The relevant roads authority should be satisfied as to the independence and competence of the team to undertake the audit.

Members of the Road Safety Audit Team should demonstrate their competence by means of registration with one of the DMT/ DUPM roads authorities. Registration is obtained by submitting a completed application form to the road's authority. See Appendix B - CV Format.

Experience should be relevant to the type and complexity of Project being audited and be in line with the requirements as set out within Chapter 3 of this manual.

In proposing any specialist advisors and observers to a safety audit team, the roads authority is to be provided with a completed CV in the format shown in Appendix B - CV Format.

Approvals for RSA team members, specialists and observers are project and stage specific. The use of personnel or organisations on previous Road Safety Audit work does not guarantee their suitability to audit other Projects.

The relevant roads authority will not accept a team if it lacks the necessary training, skills and experience or where its independence from the design team is in doubt. In such cases, an alternative team shall be proposed by the designer or contractor.

It is not necessary for the same Audit Team to undertake all audit stages of a project.

Independence of the Road Safety Audit Team

It is central to the auditing procedures that no member of the Audit Team has had any connection with the design of the measures being audited and should maintain this independence throughout the audit process.

The requirement for Audit Team independence does not preclude direct contact between the Audit Team and Design Team. There may be times where there is clear benefit in allowing this to happen, for example in clarifying the Audit Brief.

It is of paramount importance, however, that the Audit Team maintains its independence. The Design Team should not in any way influence the outcome of the audit by discussing any design considerations or issues with the Audit Team.

Generally, the Audit Team must have sufficient road safety engineering experience to enable them to advise on relevant, reasonable and viable recommendations to mitigate identified hazards.

Recommendations made by auditors are advisory and the designer may choose to accept or reject them. However, the designer must provide a reasonable explanation as to why the recommendation cannot be implemented and must provide an alternative solution.

Any issues within the Audit Report that the client or designer disagrees with or are considered by the design team to be outside the terms of reference or irrelevant to the Road Safety Audit should be addressed through the feedback form.

The Audit Report and feedback form will be reviewed by safety team of the relevant road's authority. The form, once completed by the roads authority's RSA Team Leader will constitute the Exemption Report and will be issued as a recommendation for the approval by the relevant road authority and to the relevant client officer as final.

Neither the Client Organisation nor the Design Organisation should petition the Audit Team to change the content of the Audit Report.

All contact between the Design Organisation and Audit Team must be recorded. The Audit Team will report such contacts in the introduction chapter of the RSA report.

Subject to the Client's prior agreement, at any time during the preliminary and detailed design stages, designers may submit or be instructed to submit interim designs of the whole or parts of schemes to the Audit Team for completion of an Interim Road Safety Audit.

This is subject to certain conditions being met:

1. Audit. The teams are permitted to meet if considered necessary to enable the Design Team to explain their designs and the Audit Team to explain any identified problems and recommendations. This meeting should be chaired by the Client.
2. Audit Teams shall report in the standard RSA format, including the feedback/exemption spreadsheet, illustrated in the manual in Appendix D.
3. Audit Teams shall limit their reports to matters within the scope of the interim audit report but shall include matters affected by hazards identified within that scope.
4. Minutes of meetings shall be recorded and all communications between the teams including design submissions, interim audit reports and the minutes of these meetings must be submitted to the Client and copies recorded on an Interim Road Safety Audit File.
5. The Audit Team is responsible for maintaining the file and delivering it to the Client at the completion of the preliminary or detailed design.
6. Road Safety Audits at Stages 0, 1, 2, 3 and 4 shall still be carried out and reported.

Initiating the Audit

The Client initiates the Road Safety Audit process at the appropriate stages of a project's development ensuring that sufficient time is available to complete the full procedure. (See Figure 5.1). This shall include time allowance for the incorporation of changes into the design that may arise from the Road Safety Audit.

The Client ensures that the road safety audit organisation team is given due notice of when the proposals will be ready for the RSA and agrees with the Road Safety Audit team leader the date by which the Safety Audit Report will be issued.

For guidance, Client should anticipate allowing between two and three working weeks between issue of a complete audit brief, undertaking the audit and for the delivery of audit report, depending on the complexity of the project. Complex projects may take considerably longer than this.

The Client is to liaise with the Design Team to prepare the Audit Brief utilising the audit brief checklist as a guide.

The Audit Brief is forwarded to the nominated Audit Team Leader for consideration. The Audit Team Leader may direct any requests for clarification of the Brief to the Client, who will liaise as appropriate with the Design Team.

Where the Client considers it unnecessary for a Road Safety Audit to be carried out, he must seek approval from the relevant road authority. His request must clearly state why an audit is not considered necessary.

Approval of the Audit Team

The Client, Design Organisation or the Contractor proposes an Audit Team and submits the team for the relevant roads authority's approval as previously described in Section 5.5

Audit Management

The Client and Design Team should liaise and ensure that the audit process is initiated at the appropriate stages, allowing sufficient programme time to complete the full audit procedure. This should include an allowance for the incorporation of design changes, should any arise from the audit report.

The Design Team should ensure that the Audit Team is given sufficient notice of when the scheme will be ready for audit and the date by which the report will be required.

Adequate time must be given for the preparation and submission of the audit report, response from the design team, review of the responses by the auditor and submission to and evaluation by the relevant road's authority.

The Audit Team Leader may also, **with the approval of the Client**, invite representatives of the police and the relevant highway authority to advise on audits at Stages 1 and 2 where the Audit Team Leader considers that their participation will benefit the audit.

The relevant roads authority may nominate a member of their safety team to attend any audit at their discretion as observers.

The Audit briefs

The Audit Brief is essential to the safety audit procedure. It defines the scope of the audit and contains all the information necessary to give the Audit Team a full understanding of the project.

The Audit Brief is prepared utilising the audit brief checklist, which is likely to include, if appropriate and available:

- a) an instruction to carry out the Audit as per this manual.
- b) Project title.
- c) a description of the section of carriageway or junction to be audited.
- d) a description of the purpose and key elements of the project.
- e) A full set of drawings appropriate to the stage of audit being undertaken.
- f) Details of approved Departures from Standard or Relaxations from Standard.
- g) traffic signal and phasing diagrams.
- h) any known departures from standard.
- i) confirmation of construction dates (Stage 4).
- j) all previous Road Safety Audit Reports relating to the project, approval from Abu Dhabi Police and the relevant roads authority relating to the project (Stages 1,2,3 and 4).

- k) all previous response reports, exception reports, approval from Abu Dhabi Police and the relevant roads authority relating to the project (Stages 1,2,3 and 4).
- l) appropriately sized plans of the project for the Audit Team to mark up and include in the Audit Report (either A4 or A3 sized sheets).
- m) traffic / pedestrian flow data (where available).
- n) where the proposal contains new or modified traffic signals and detailed designs have already been prepared and had a design/safety check undertaken by the Traffic Signals design and checklist must also be forwarded to the Audit Team.
- o) details of other notable events that have occurred since construction (stage 4 audits only); and
- p) Any other information relating to existing features that in the opinion of the Client Officer will be required by an Audit Team that has no prior knowledge of the proposals or existing conditions.

The Audit Team can request further information from the design organization where the road safety audit brief which is considered inadequate

Assess Audit Brief (and associated information)

The Audit Team will initially assess all the information provided within the Audit Brief before undertaking the site visit to flag up potential safety problems that may be identified on site. It may also give the Audit Team an indication of when it is best to undertake the site visit (time of day or day of week). For example, crash data may indicate high occurrence of crashes during the afternoon peak. On return from the site visit, the Audit Team will review all the information again, with the new insight gained from the visit.

Undertaking the Site Visit

1.1.1 The Audit Team must undertake at least a daytime site visit for all stages of audit. A night-time site visit must be undertaken at all Stage 3 and Stage 4 audits (when there has been reported crashes after opening) and all Road Safety Inspections.

Road Safety Audits or Safety Checks for very minor works may be exempted of the requirement for either the night-time or the day-time site visit at the discretion of the relevant road authority's road safety section.

1.1.2 All members of the Audit Team must visit the site together and at the same time.

It is the Audit Team Leader's responsibility to invite representatives of the police and the relevant highway authority to accompany the Audit Team to offer their views for the Stage 3 Audit. As much notice as possible should be given before the site visit date.

The Audit Team Leader should notify the Client of the date proposed for the site visit where possible.

Compile / issue audit report

On return from the site visit(s) and following a review of the Audit Brief and associated information, the Audit Team needs to compile the Road Safety Audit report.

At all Stages the Audit Team shall prepare a written report which will be in the format show in Appendix E. The Stage 0, 1, 2 and 3 Audit Reports shall include:

- a) A brief description of the proposed scheme.

- b) Identification of the audit stage and team membership as well as the names of others contributing.
- c) Details of who was present at the site visit, when it was undertaken and what the site conditions were on the day of the visit (weather, traffic congestion, etc.).
- d) The specific road safety problems identified, supported with the background reasoning.
- e) A3 or A4 location map, marked up and referenced to problems and, if available, photographs of the problems identified.
- f) A statement, signed by the Audit Team Leader in the format given at Appendix E; and
- g) A list of documents and drawings considered for the audit.
- h) The report shall contain a separate statement for each identified problem describing the location and nature of the problem and the type of crashes considered likely to occur because of the problem.
- i) Each problem shall be followed by an associated recommendation. The Road Safety Auditor cannot give instructions, but the Audit Team should aim to provide proportionate and viable recommendations to eliminate or mitigate the identified problems based on their knowledge and experience as road safety engineers.
- j) Recommendations to “monitor” should only be made in terms of identified vehicle manoeuvres or crash causation factors and the monitoring task can be specifically allocated, usually to the road’s maintenance section or the police.
- k) Items such as correspondence with the Overseeing Organisation or copies of marked up checklists shall not be included.

The relevant highway authority is to be sent a draft copy of the Road Safety Audit report for each stage for comment and will be asked to provide their comments within 7 working days to the Audit Team leader. The comments received from the above-mentioned authorities must be taken into consideration.

The Audit Team Leader shall send the finished audit report, including copies of marked up drawings simultaneously to the client, designer / contractor and the roads authority.

For Stage 3 and 4 audits the marked-up drawings and the road safety audit report should be copied into all relevant parties, including the Police.

Compile and Issue the Exception Report

Once the audit report has been issued to the designer / client, they must set about reviewing each problem and recommendation from the report and decide whether to accept or reject them.

It is the designer’s responsibility to ensure that all problems raised by the Audit Team are given due consideration. The designer and client should respond to each problem and recommendation formally using the feedback form / exception report. Should any of the road safety audit recommendations be rejected, the response should include reasons why any recommendation cannot be implemented; alternatives considered; and the difficulties involved in implementing them.

The designer / client shall simultaneously provide copies of the feedback / exception report to the Audit Team Leader and the relevant roads authority.

The road safety auditor shall review each of the responses to confirm designer / client has understood the hazard as described and responded to the risk as described by accepting the auditor’s recommendation or providing a reasonable alternative.

The auditor shall copy the feedback from containing the original hazard description, recommendation, designer's / client's responses and the auditor's review to the designer, client and the relevant roads authority.

For Stage 3 and 4 audits items as listed in 5.13.4 should be copied into all relevant parties, including the Police.

Approval of the Road Safety Audit and Exception Report

On receipt of the completed feedback form the roads authority's safety section will review all the hazards, recommendation, responses and the auditor's review to finalise the feedback / exemption report.

As part of the preparation of the exemption report the roads authority may convene a meeting with the auditor, client, designer and or contractor before making final decisions on any outstanding, unresolved hazards and recommendations.

The final feedback / exemption report as issued by the road's authority finalises the RSA process.

Abu Dhabi Police and the relevant roads authority reserves the right to reject any road safety audit report or exception report where road safety is likely to be compromised.

Implement design changes

The client / designer is ultimately responsible for initiating prompt action on all recommendations in the audit and the exception report.

Once the exception report has been authorized (signed) by the relevant road's authority, the Design Organisation can implement the design changes accordingly.

Until such time that an exception report has been completed and the audit recommendations incorporated into the design, that stage of the design process will be considered as being incomplete.

Issues outside the scope of the Audit Brief

The Audit Team Leader shall include all hazards identified during the RSA or on site in the feedback form including items that may be outside the scope of the audit as comments.

During the review of the RSA each item will be remarked on by the designer / contractor and the roads authority. Those items that are deemed to be maintenance issues will be passed directly to the relevant roads authority or client to be prioritised for remediation according to the likely impact on traffic safety.

Issues deemed to be outside the scope of the project and not to be maintenance issues may be passed to the relevant section for consideration or, in the case of a road's authority, the scope of the project may be widened to include those hazards.

Feedback knowledge gained

There is a risk that unless the knowledge gained from audits are fed back into the design process, the same mistakes will be repeated in future. Road Safety Auditing should therefore be an opportunity to provide constructive feedback to the Design Organisation, client or roads authorities.

This can be done simply by circulating the audit reports and exception reports through the Design Organisation, or by undertaking a review periodically of the most common problems identified by auditors for projects designed by different design teams.

There may also be an opportunity or mechanism whereby this knowledge can be fed into and ultimately incorporated into, design standards to improve them, as there may be a design element that is inherently unsafe or an aspect of a current standard that is ambiguous or vague and which can be misinterpreted by the designers.

The feedback form currently in use in Abu Dhabi is a spreadsheet. Most of the Road Safety Audits feedback forms since late 2014 have been in this format. One of the reasons for using the format was

to easily collate the data from multiple Road Safety Audits to form the basis of such a knowledge sharing exercise.

There are now, after almost two years of RSAs, sufficient data to begin a meaningful evaluation of these audits. This can be an on-going live document and learning exercise.

There may also be opportunities for knowledge to be transferred from the Design Organisation to the Audit Team through the issuing of exception reports to the Audit Team for information. The knowledge exchange is therefore essentially a two-way process.

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Appendix A: Scheme Type and Road Safety Audit Stage.

Project Type	Design / Construction Stage							Report Format 5.13.2 and Feedback Form.	Examples
	Feasibility / Conceptual Design (Stage 0)	Preliminary Design (Stage 1)	Detailed Design (Stage 2)	Detailed Design Combined (Stage 1 / 2)	Pre-opening (Stage 3)	Post -Opening (Stage 4)	Traffic Management		
Major New Road or Transport Project Requiring Route Selection	✓	✓	✓		✓	✓		✓	Major New Road or Transport Project Requiring Route Selection
Major Transport Projects and Links to other Main Inter-Modal Hubs.	✓	✓	✓		✓	✓		✓	Rail, Air, Sea, Light-rail, Metro Lines and Station Location to ensure access to other transport mode are efficient and safe for all road users.
Major Development Affecting Main Inter-Urban Routes	✓	✓	✓		✓	✓		✓	Shopping Malls, Hospitals, Schools or other major development within 1.5Km of a major inter-urban route.
Major Rehabilitation / retrofit Not requiring route selection but requiring a Full design		✓	✓		✓	✓		✓	On-line road re-alignments and junction improvement or signalization or sector rehabilitation.
Major Additions of Street Furniture to the Existing Road Network		✓	✓		✓	✓		✓	ITS or advertising signs and gantries, and other large roadside furniture installed within the clear zone
Medium works requiring full design but exempted from Stage 1 RSA				✓	✓			✓	Medium road improvement or rehabilitation schemes
Minor Private Developments onto Public Roads	✓			✓	✓			✓ or RSA Feedback Form Only	Minor Private Developments
Minor Rehabilitation Works Requiring Limited Design				✓	✓			RSA Feedback Form Only	Minor Rehabilitation Works Requiring Limited Design
Complex Traffic Management Arrangements Likely to Affect High Speed Roads, Major Inter-Urban Routes and Congested Inter-changes and Signalized Junctions		✓	✓	✓	✓			✓ Feedback Form Only	WZTTM likely to Affect High Speed Roads, Major Inter-Urban Routes and Congested Inter-changes and Signalizes Junctions
Like for Like Maintenance and Refurbishment Works	EXEMPT. (However, maintenance and refurbishment contracts should include corrective remedial measures into their works where they are observed, and the opportunity presents itself).							Maintenance engineers can consult with the road safety team at any stage for advice and guidance if required.	

Appendix B: Example CV Submission for assessment

Road Safety Auditor CV for

Name			
Audit Team Position:	Team Leader <input type="checkbox"/>	Team Member <input type="checkbox"/>	Other <input type="checkbox"/>
Organisation / Employer:			
Date			
Phone Number and E-mail	Ph.	E-mail	

Continued Professional Development Record (10 days training + 2 days CPD)		
See Manual for further guidance on suitability of courses attended.		
Course	Date	Duration

Qualifications		
Qualification Name / Awarding Body	Post Nominal	Date

Record of Recent Safety Audits (Previous 2 to 3 years only)		
Scheme / Details	Date	Role
Audit Name / Stage:		
Description:		
Audit Name / Stage:		
Description:		

Record of Recent Safety Engineering, Crash Analysis or Collision Investigations (Previous 2 to 3 years only)		
Project / Details	Date	Role
Type. Name and Location of Project:		
Description:		
Type. Name and Location of Project:		
Description:		

Career Summary (500 words) including audit experience and key dates
The candidate is to demonstrate their experience in safety engineering, crash investigation and roads safety audit.

Statement of Fact - I confirm that the information given above is a true and accurate reflection of my experience and training and that I meet the requirements of the Emirate of Abu Dhabi's Road Safety Audit Manual.	
Name	Signature

Notes:

1. All road safety auditors are approved on a by scheme, per stage basis.
2. Misleading or directly representing training and/or experience will result in the named individual being prohibited from any future road safety work in the Emirate of Abu Dhabi.

Appendix C: Sample RSA Exemption Note / Certificate

Required where an asterisk (*) is indicated on the Scheme Type and RSA Stages Table in Appendix A.

Road Safety Audit Exemption Note / Certificate			
Project Name			
Audit Stage			
Project Description			
<p><i>During the process of preparing the RSA Brief for the above stage in the project design, it was considered unnecessary to carry out a Road Safety Audit for the reason stated below.</i></p>			
<input type="checkbox"/>	Deferred only	a) RSA deferred to the next stage of the design (May be applied for Stage 0 and / or Stage 1 only)	
<input type="checkbox"/>	Deferred only	b) Minor works with minimal design approved for a Stage 1 / 2 RSA at detailed design stage	
<input type="checkbox"/>	Exempt	c) Minor works that have a negligible effect on the existing Abu Dhabi Road Network	
<input type="checkbox"/>	Exempt	d) Maintenance work that involved solely like for like replacement	
<input type="checkbox"/>	Exempt	e) Refurbishment of existing street furniture	
<input type="checkbox"/>	Exempt	f) Other... Describe the reason for the exemption	
Designer		Date	Roads Authority Approval (Road Safety Team)

Tick the reason for the exemption.

A copy of this exemption certificate is to be included in the design file for the project.

Appendix D: Sample Feedback Form / Exception Report Template

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Road Safety Audit Recommendations: Decision Tracking Form												
2	Project:	Sample 12345											
3	Contract Number:	12345-DT-02-A Stage 1											
4	Client Project Manager:	WXYZ											
5	Road Safety Auditors:	AT/Leader, AT/Member, ACP/Observer											
6		Design Consul											
7		Auditor											
8	Identified Risk (of a casualty)	Risk Rating	Recommendation (to mitigate risk of a casualty)	Report Reference	Response (to risk)	Response (to Recommendation)	Designer Comment	Response to Designer	Audit Team Comment	Agree / Disagree	Client Comment	Response (to designer)	ADM/PSA Team Leader Comment
9	Risk of collisions between vehicles and MMU.	High	Appropriate signage should be provided at all pedestrian crossings.	3.1	Agree	Agree	Signage will be added	Agree			Note Client may comment on the audit for consideration before final decision by ADM	OK	CLOSED
10	Risk of side-swipe type collisions.	Medium	Lane guidance markings should be provided in these circumstances.	3.2	Agree	Agree	Guidelines will be added	Agree				OK	CLOSED
11	Risk of vehicle collision with signpost column.	High	Signpost columns adjacent to the carriageway should be passively safe.	3.6	Agree	Agree	Signpost columns to ADM standard details will be provided	Agree				Agree with the auditor's observation.	If the sign columns are within the clear zone, they must be either passively safe or shielded by a barrier, which is also properly designed and located not to also become a hazard. Ensure sufficient room is available to locate the barrier and to provide sufficient clear width in front of the barrier and voiding width behind it.
12	Risk of overshoot collisions.	High	The sign should be located so that it does not obscure the primary signal.	3.7	Agree	Agree	It shall be attached to the traffic signal post supporting the signals for traffic coming from the opposite direction	Agree				OK	CLOSED
13	Risk of side-swipe collisions.	Medium	The directional road markings should be amended to reflect the allowable movements at the junction and to direct drivers accordingly.	3.3	Agree	Agree	Marking will be amended	Agree				OK	CLOSED
14	Risk of loss of control collisions.	Medium	Signage should be provided to inform drivers of the road layout ahead.	4.2	Agree	Agree	Signage will be added	Agree				OK	CLOSED
15	Comments												
16	The geometry of the plot access is such that drivers exiting the plot and wishing to complete may have difficulty performing the		The geometry of the plot access should be amended to connect perpendicular to the local road.	5.1	Agree	Agree	Access will be amended	Agree				OK	Discussed and agreed at the design review.
17	Date Completed		Auditor Name	Date of Response	Response	Designer	Designer Name	Date Reviewed	Auditor Name	Date of Comment	Client Representative	Date of Decision	Comment
18	Date Completed		Name	Date of Response			Name	Date Reviewed	Name	Date of Comment	Name	Date of Decision	Name
19	The purposes of the Audit Team's responses are as follows - to indicate to the ADM/PSA Team Leader whether or not the problems raised in the RSA report have been correctly understood by the Designer - if an alternative solution has been proposed by the Designer to mitigate risk, to review whether this is acceptable from a safety perspective. The Audit Team do not approve or reject the Designer's Responses. Unless otherwise indicated, the Audit Team have not reviewed revised drawings to ensure that the Designer has implemented his responses. The responsibility for approving / rejecting the Designer's Responses and ensuring that the proposed changes have been implemented in the design drawings lies with the relevant Roads Authority.												

Appendix E: Example Road Safety Audit Report

We are grateful to Duffy Consulting Engineers for allowing providing the RSA and Feedback / Exemption Form to use as a specimen audit.

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NOTE: This is an extract from a bigger RSA report and is intended as a guide to the format of RSA reports as per section 5.13 of this manual. (Original report 48 pages, see the associated feedback form / Exemption Report in Appendix D)

ROAD SAFETY AUDIT CONCEPT DESIGN

1. INTRODUCTION

1.1 This report examines the road safety aspects of Abu Dhabi, on behalf of DESIGNER. The study was carried out between 2nd December 2015 and 10th of December 2015 in the offices of Audit Team Organisation.

1.2 The Audit Team members were as follows: -

Team Leader:

Leader Name

Engineer Professional Qualification, Company Engineers

Team Members:

Member 1,

Engineer Professional Qualification, Company Engineers.

1.3 The audit comprised an examination of the drawings and other information relating to the scheme supplied by the design office. The Audit was undertaken in accordance with the brief supplied by DESIGN ENGINEER. A visit to the site of the proposed scheme was made on 28/10/2015. The people attending the site visit should be listed here in the same manner as the audit team list. It should be mentioned "During the site visit the weather was XXXXXXXX and traffic conditions were XXXXXXXX."

1.4 This Preliminary Design Road Safety Audit has been carried out in accordance with the "Emirate of Abu Dhabi Road Safety Audit Manual 2016". The team has examined only those issues within the design relating to the road safety implications of the scheme and has therefore not examined or verified the compliance of the design to any other criteria.

1.5 **Appendix A** describes the drawings and other information examined by the Audit Team.

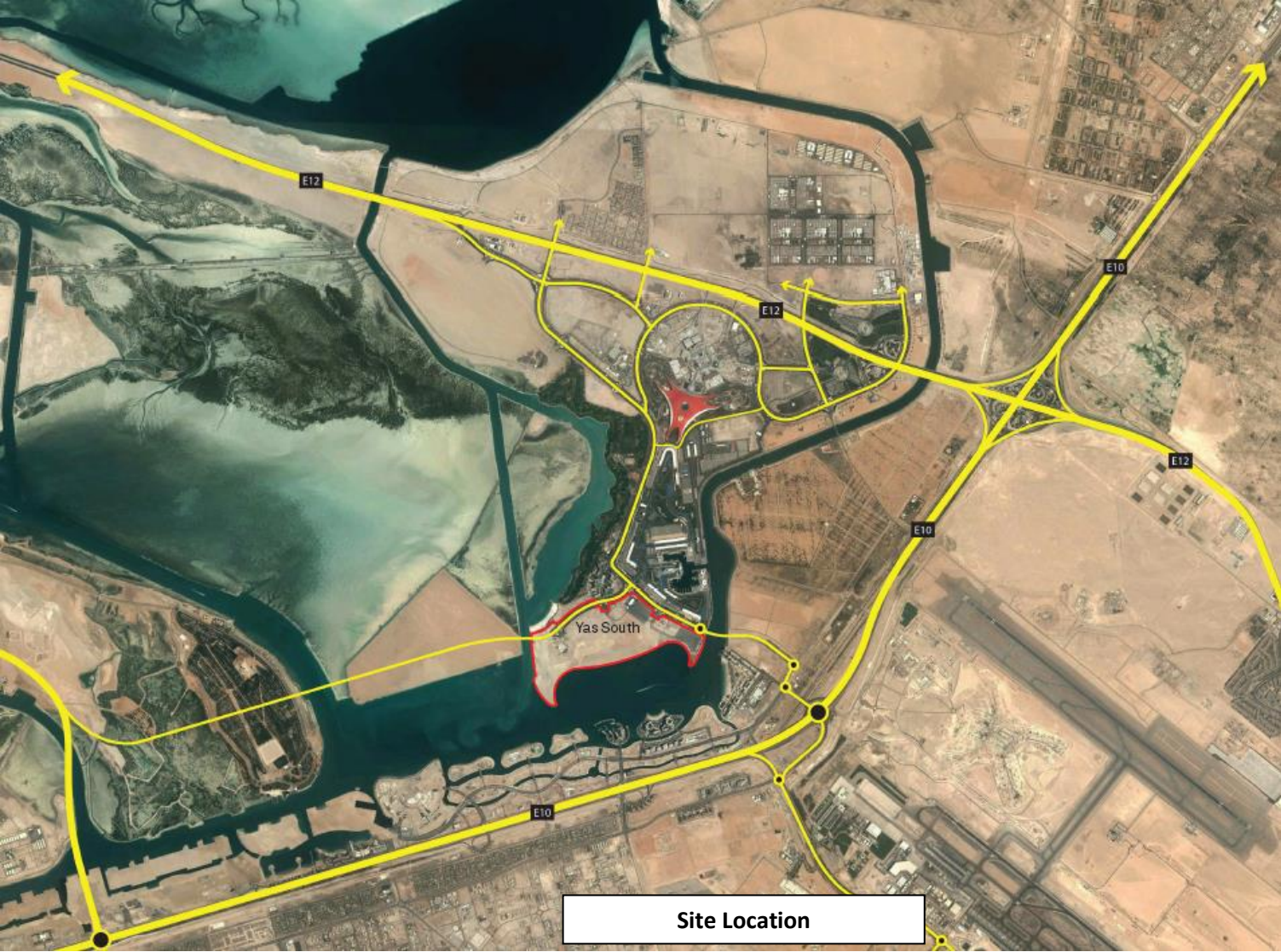
1.6 All of the problems described in this report are considered by the Audit Team to require action in order to improve the safety of the scheme and minimise accident occurrence and severity.

1.7 The drawings contained in **Appendix B** show indicative locations of the problems. The location numbers refer to the problem numbers in this report.

1.8 All designer responses are provided by the DESIGN ENGINEER. **Appendix C** contains the Designer's Response Form.

1.9 The Audit Team did not deem it necessary to liaise with police or maintenance personnel for this Road Safety Audit.

1.10 JOB NAME is a large, mixed-use development located GIVE A GENERAL DESCRIPTION OF THE JOB.... And intended use.



2. ITEMS RESULTING FROM THE ROAD SAFETY AUDIT CONCEPT DESIGN STAGE

2.1 The Audit Team have received and reviewed the Designer's Responses to the Concept Design Road Safety Audit report. The Audit Team provided feedback on each of the Designer's Responses at the end of the Stage 0 RSA process prior to submission to ADM.

2.2 The Audit Team have reviewed the Designer Responses again in conjunction with the preliminary design drawings. ADM responses have not been provided. Comments in relation to the BRT have been removed from this RSA on the basis of the Designer's responses to the Stage 0 RSA but may still be of relevance.

2.3 Table 1 below outlines the status of problems raised in the Concept Design Road Safety Audit. A number of problems have not been fully addressed in the opinion of the Audit Team. These problems still exist and are repeated again in this report. Where appropriate, these points have been expanded upon in more detail.

Table 1 - Summary of Stage 1 RSA

Concept Design RSA Reference	Summary of Issue	Recommendation	Issue Addressed (Yes/No) / Auditor Comment
2.1	The geometry of the U-turns is such that there may be conflict between U-turners and vehicles diverging from the mainline to the internal road. This could result inside swipe collisions.	The island between the U-turner and merge lane should be extended so as to separate merging vehicles.	Yes
2.2	Breaks in the central median have been provided to allow drivers to access plots and perform U-turn manoeuvres. To access the plots, drivers will be required to cross two lanes of traffic. This could result in side impact collisions. Additionally, the breaks in the median may encourage illegal manoeuvres which may result in collisions between vehicles or NMU collisions.	The breaks in the median should be closed and a continuous median provided. Drivers should be directed to the nearest roundabout or signalised junction to U-turn in order to access plots.	Yes

2.3	<p>Drop off/ pick up areas have been provided in the central median of the dual carriageway. It is not clear how pedestrians will move safely to/from this area. Pedestrians may be forced to cross the dual carriageway at an inappropriate location where they are at risk of being struck by a passing vehicle.</p> <p>Drivers of vehicles merging from this area to the mainline will also be on the 'wrong side' of the vehicle, thus restricting their view of oncoming vehicles. This may result in pull out or rear shunt collisions.</p>	<p>The drop off/ pick up areas should be relocated so that it is accessed by vehicles from the nearside lane of the carriageway. This will result in pedestrians being dropped off / picked up outside the buildings.</p>	<p>No (Refer to Problem 3.12 3.13 3.14)</p>
3.8	<p>Parking bays are located in close proximity to the entrance to the car park. Drivers diverging from the mainline may not perceive the vehicle ahead entering/ exiting the bay leading to rear shunt collisions.</p> <p>Alternatively, parking vehicles may cause traffic to back onto the mainline and cause rear shunt collisions.</p>	<p>The parking bays should be sufficiently set back from the diverge junction to the car park.</p>	<p>Yes</p>
3.9	<p>Drivers may attempt to turn right to travel eastwards from the junction. This could lead to awkward manoeuvres due to the geometry of the kerb on the right side of the junction leading to side impact collisions.</p>	<p>The gap in the median should be closed.</p> <p>The geometry of the plot access should be amended to a RIRO junction.</p>	<p>In Part Refer to problem 4.6</p>

3. ITEMS RESULTING FROM THIS AUDIT (GENERAL PROBLEMS)

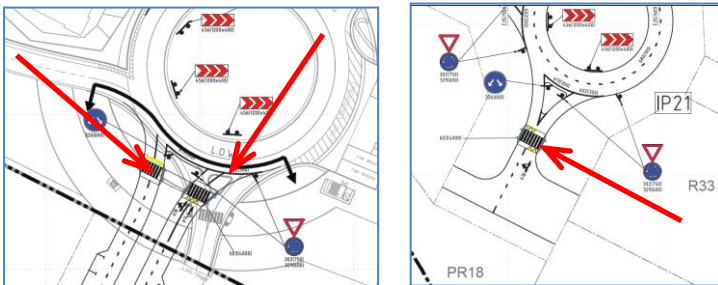
The images included within the general section of the report are simply representative of a problem that occurs at numerous locations throughout the scheme. Therefore, if the problem is general, it occurs a number of times within the scheme.

Signage and Road Marking

3.1 Problem

Location: Pedestrian crossings
 Summary: Risk of collisions between vehicles and NMU.

"Give way to Pedestrians" signage has not been provided at some pedestrian crossings. This may lead to drivers being unaware of the pedestrian crossing or not yielding to pedestrians on the crossing resulting in NMU collisions.



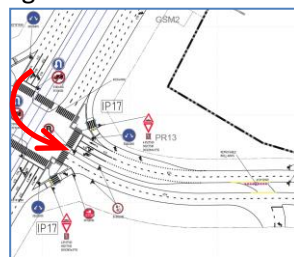
Recommendation

Appropriate signage should be provided at all pedestrian crossings.

3.2 Problem

Location: General - Junctions
 Summary: Risk of side swipe type collisions.

In certain locations within the development, there are two left turning lanes at signalised junctions. Where there are no lane guidance markings, vehicles may stray from the correct path which may result inside swipe type collisions with other left turning vehicles.



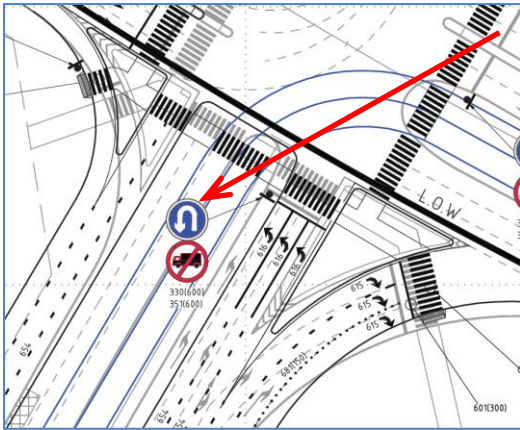
Recommendation

Lane guidance markings should be provided in these circumstances.

3.3 Problem

Location: Signage.
 Summary: Risk of overshoot collisions.

U-turn signage has been provided in advance of signalised junctions. The signage may obscure the primary signal. This could result in overshoot collisions as the signal is not visible to drivers.



Recommendation

The sign should be located so that it does not obscure the primary signal.

3.4 Problem

Location: Schools

Summary: Risk of collisions between NMU's and vehicles.

Schools exist within the development. Schools will be a significant attractor for vulnerable road users. Excessive speed in these areas will increase injury severity in the event of a collision.

Recommendation

Appropriate signage and road markings should be provided on all approach roads to the schools to alert drivers to the fact that they are entering a "School Zone".

Reference should be made to the Abu Dhabi Department of Transport School Zone Guidelines.

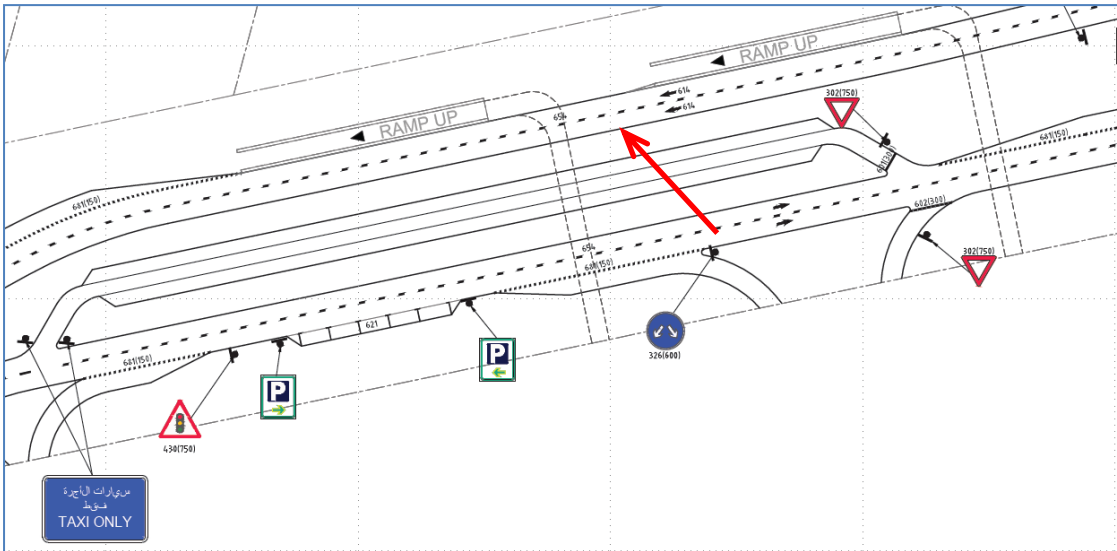
Geometry

3.5 Problem

Location: Basement up-ramps

Summary: Risk of side swipe or rear shunt collisions.

Basement up-ramps are proposed to connect to the mainline. Drivers travelling on the up ramp attempting to join the mainline will have difficulty viewing oncoming vehicles. This could result in side swipe or rear shunt collisions as drivers join the mainline in the path of oncoming vehicles.



Recommendation

The Audit Team note the Designer’s response that the connections will be done as part of plot access arrangements. However, a ramp is an unusual plot access, it is recommended that an indicative connection be provided now for review in Stage 2 RSA, or that a separate audit be done on the connection at a later date.

AUDIT TEAM STATEMENT

We certify that we have examined the drawings and other information listed in Appendix A. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the safety of the scheme. The problems that we have identified have been noted in the report, together with suggestions for improvement which we recommend should be studied for implementation.

signed....

Road Safety Team Leader, Consulting Engineers

date....10/12/2016.....

APPENDIX A - Drawings and other Information Examined

Audit brief
Road layout
Signs and markings
Masterplan

APPENDIX B – Marked up Drawings with Indicative Locations of Problems

APPENDIX C – RSA Decision Tracking Form