VOLUME 5 **ASSESSMENT AND PREPARATION OF ROAD SCHEMES**

SECTION 2 **PREPARATION AND IMPLEMENTATION**

PART 2

HD 19/03

ROAD SAFETY AUDIT

SUMMARY

This document updates the requirements for Road Safety Audits which are mandatory for all trunk road Highway Improvement Schemes including motorways. It describes the stages at which audits shall be carried out, the procedures to be followed and the requirement for monitoring of Highway Improvement Schemes after opening. HD 19/03 supersedes HD 19/94 and HA 42/94.

INSTRUCTIONS FOR USE

1. Remove existing Contents pages for Volume 5.
2. Insert new Contents pages for Volume 5 dated November 2003.
3. Remove HD 19/94 from Volume 5, Section 2, Part 2 and archve as necessary.
4. Remove HA 42/94 from Volume 5, Section 2, Part 3 and archive as necessary.
5. Insert HD 19/03 into Volume 5, Section 2, Part 2.
6. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.

HD 19/03
Supersedes
HD 19/94
& HA 42/94

THE HIGHWAYS AGENCY

SCOTTISH EXECUTIVE

WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND

Road Safety Audit

Summary: This document updates the requirements for Road Safety Audits which are mandatory for all trunk road Highway Improvement Schemes including motorways. It describes the stages at which audits shall be carried out, the procedures to be followed and the requirement for monitoring of Highway Improvement Schemes after opening. HD 19/03 supersedes HD 19/94 and HA 42/94.

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Contents

1. INTRODUCTION

General

1.1 The objective of this Standard is to ensure that the road safety implications of all Highway Improvement Schemes are fully considered for all users of the highway including those working on the highway.

1.2 The Overseeing Organisations attach great importance to the improvement of road safety. The use of Standards that are based on road safety considerations helps to ensure that this objective is met.

1.3 Many elements of a Highway Improvement Scheme design are based on the use of Design Standards and Advice Notes. Whilst these Standards and Advice Notes provide a basis for safe design, care has to be taken when combining them to avoid the creation of hazards. However, it is important to note that Road Safety Audit is not exclusively concerned with those aspects that are associated with the interaction of Design Standards. The objective of Road Safety Audit is to identify any aspects of a Highway Improvement Scheme that give rise to road safety concerns and, where possible, to suggest modifications that would improve the road safety of the resultant scheme.

1.4 Although road safety has always been considered during scheme preparation, there have been instances where details of the design have contributed to accidents on newly opened schemes. Design Teams do not necessarily contain staff with Accident Investigation or Road Safety Engineering experience and consequently they may not adequately understand the nature of accident causation.

1.5 Road Safety Audits are intended to ensure that operational road safety experience is applied during the design and construction process in order that the number and severity of accidents is kept to a minimum. Auditors identify and address problem areas using the experience gained from accident reduction schemes, accident investigation and research work. The Overseeing Organisations' aim is that the monitoring of audited schemes will result in better informed designs, leading to schemes that rarely require road safety related changes after opening.

1.6 It is recommended that Design Teams include staff with Road Safety Engineering experience to ensure that safety issues are considered during design. However, road safety engineers included within the Design Team will not be permitted to be part of the Road Safety Audit Teams due to their lack of independence from the scheme design as their views may be influenced by familiarity and a natural "pride of authorship". The involvement of a Road Safety Engineer within the Design Team should not be considered to be a satisfactory or acceptable substitute for undertaking a Road Safety Audit.

Scope of this Standard

1.7 This Standard sets out the procedures required to implement Road Safety Audits on Highway Improvement Schemes on trunk roads including motorways. It defines the relevant schemes and stages in the design and construction process at which audits shall be undertaken and sets out the requirements for post-implementation accident monitoring.

1.8 This Standard is commended to other highway authorities.

1.9 This document includes several significant changes from the previous Standard HD 19/94 **(DMRB 5.2.2)** and Advice Note HA 42/94 **(DMRB 5.2.3)** namely:

- the introduction of Interim Road Safety Audit;
- additional guidance on the suitable training, skills and experience recommended for Audit Teams;
- guidance on the relationship between Road Safety Audit and Health and Safety Legislation;
- the requirement for the accident monitoring of completed Highway Improvement Schemes in the form of a Stage 4 Audit.

Mandatory Sections

1.10 Mandatory sections of this document are contained in boxes. The Design Organisation must comply with these sections or obtain agreement to a Departure from Standard from the Overseeing Organisation. The remainder of the document contains advice and explanation, which is commended to users for consideration.

Application in Northern Ireland

1.11 This Standard will apply to those roads designated by the Overseeing Organisation.

Superseded Documents

1.12 This Standard supersedes HD 19/94 **(DMRB 5.2.2)** and HA 42/94 **(DMRB 5.2.3)**, which are hereby withdrawn.

Implementation

1.13 This Standard shall be used forthwith for all Road Safety Audits on all Highway Improvement Schemes with the exception of audits for which a brief in accordance with HD 19/94 and HA 42/94 has been issued before the publication date of HD 19/03. Those audits may be completed in accordance with HD 19/94 and HA 42/94.

1.14 Exemptions granted (under paragraph 2.4 of HD 19/94) for Highway Improvement Schemes that are incomplete at the publication date of HD 19/03 are not valid from that date and all such schemes shall be audited at the end of the current design or construction stage, and at Stage 4.

Definitions

1.15 **Road Safety Audit:** The evaluation of Highway Improvement Schemes during 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 and to suggest measures to eliminate or mitigate those problems. The audit process includes the accident monitoring of Highway Improvement Schemes to identify any road safety problems that may occur after opening. This Stage 4 Audit will include the analysis and reporting of 12 and 36 months of completed personal injury accident data from when the scheme became operational.

1.16 **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 detailed design stages. Interim Road Safety Audit is not mandatory or a substitute for the formal Stage 1, 2 and 3 Safety Audits.

1.17 **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.

1.18 **Design Organisation:** The organisation(s) commissioned to undertake the various phases of scheme preparation.

1.19 **Design Team:** The group within the Design Organisation undertaking the various phases of scheme preparation.

1.20 **Design Team Leader:** A person within the Design Team responsible for managing the scheme design and coordinating the input of the various design disciplines.

1.21 **Audit Team:** A team that works together on all aspects of the audit, independent of the Design Team and approved for a particular audit by the Project Sponsor on behalf of the Overseeing Organisation. The team shall comprise a minimum of two persons with appropriate levels of training, skills and experience in Road Safety Engineering work and/or Accident Investigation. The members of the Audit Team may be drawn from within the Design Organisation or from another body.

1.22 **Audit Team Leader:** A person with the appropriate training, skills and experience who is approved for a particular audit by the Project Sponsor on behalf of the Overseeing Organisation. The Audit Team Leader has overall responsibility for carrying out the audit, managing the Audit Team and certifying the report.

1.23 **Audit Team Member:** A member of the Audit Team with the appropriate training, skills and experience necessary for the audit of a specific scheme reporting to the Audit Team Leader.

1.24 **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.

1.25 **Director:** The Director in the Overseeing Organisation with overall responsibility for the Highway Improvement Scheme. In Scotland, the term Director shall mean the Chief Road Engineer. In Wales, the term Director shall mean the Chief Highway Engineer. In Northern Ireland, the term Director shall mean the appropriate Divisional Roads Manager or the Assistant Director of Engineering.

1.26 **Project Sponsor:** A person within the Overseeing Organisation responsible for ensuring the progression of a scheme in accordance with policy and procedures of the Overseeing Organisation, and ensuring compliance with the requirements of this Standard.

1.27 **Exception Report:** A report from the Project Sponsor to the Director on each recommendation in the Audit Report that the Project Sponsor proposes should not be implemented. (See Paragraph 2.75).

1.28 **Audit Brief:** The instructions to the Audit Team defining the scope and details of the Highway Improvement Scheme to be audited, including sufficient information for the audit to be undertaken.

1.29 **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.

1.30 **Interim Road Safety Audit File:** A file containing copies of all communications between the Design Team and Audit Team and the Project Sponsor and the Audit Team. The file is only required for Highway Improvement Schemes where the Audit Team undertakes 'Interim Road Safety Audit' (see paragraph 2.42).

1.31 **Road Safety Engineering:** The design and implementation of physical changes to the road network intended to reduce the number and severity of accidents involving road users, drawing on the results of Accident Investigations.

1.32 **Accident Investigation:** The collection and examination of historical accident data over a period of time in order to identify patterns, common trends and factors which may have contributed to the accidents.

1.33 **Specialist Advisor:** A person approved by the Project Sponsor, to provide specialist independent advice to the Audit Team should the scheme include complex features outside the experience of the Audit Team Members, e.g. a complex traffic signal controlled junction. (See paragraph 2.60).

1.34 **Overseeing Organisation:** The highway authority responsible for the Highway Improvement Scheme to be audited.

2. ROAD SAFETY AUDIT

Schemes to be Audited

2.1 This Standard shall apply to all Highway Improvement Schemes on trunk roads including motorways regardless of procurement method. This includes work carried out under agreement with the Overseeing Organisation resulting from developments alongside or affecting the trunk road.

2.2 Maintenance works that solely involve a like-for-like replacement or refurbishment of existing highway features are excluded from Road Safety Audit. However, this Standard does apply to Highway Improvement Schemes that are constructed as part of the same procurement package as maintenance works.

Delegation

2.3 The Overseeing Organisation will decide on the extent of delegation of the Director's and Project Sponsor's responsibilities, duties and tasks, with respect to this Standard.

2.4 The Project Sponsor shall inform the Audit Team Leader and Design Team Leader in writing of any such delegations.

Application to Temporary Traffic Management Schemes

2.5 This Standard is not generally required for application to temporary traffic management schemes. The publication "Guidance for Safer Temporary Traffic Management" contains the necessary guidance to facilitate the safe planning and implementation of temporary traffic management activities. However, Road Safety Audit should be applied to exceptional temporary traffic management schemes that involve temporary changes to the layout and operation of junctions or realignment of roads that will affect the network for a considerable period. Examples of such schemes include installation of a temporary roundabout junction or a diversion using a length of temporary carriageway to allow major excavation on a main carriageway.

Exemption

2.6 Where the Project Sponsor considers it unnecessary for Road Safety Audit to be applied to a particular Highway Improvement Scheme, approval for a Departure from Standard must be obtained from the Overseeing Organisation. The Departure application must clearly state why an audit is not considered necessary.

2.7 A Departure from Standard allowing Exemption from Road Safety Audit will only be approved when, in the opinion of the Overseeing Organisation, the effect of the Highway Improvement Scheme on the highway would be minimal.

The Relationship Between Road Safety Audit and Health and Safety Legislation

2.8 Road Safety Audit does not cover health and safety legislation issues concerning the construction, maintenance and use of the road.

2.9 Although the Audit Team's contribution to design is limited, in making recommendations they may be considered to have undertaken design work under health and safety legislation. It is therefore recommended that Audit Teams make themselves aware of current health and safety legislation and consider the implications of their recommendations for the health and safety of others.

2.10 When incorporating Road Safety Audit recommendations into scheme designs (see paragraph 2.77), the Design Team shall be responsible for reviewing and amending any design risk assessments required by health and safety legislation.

Scope of the Audit

2.11 Road Safety Audit shall only consider road safety matters.

2.12 Road Safety Audit is not a technical check that the design conforms to Standards.

2.13 Road Safety Audit does not consider structural safety.

2.14 The Road Safety Audit Team, in formulating recommendations for dealing with the identified problems, should make allowance for the fact that strategic decisions on matters such as route choice, junction type, standard of provision and Departures from Standards already reflect the best balance of a number of factors including road safety. Recommendations requiring major changes in these areas are unlikely to be acceptable when balanced with other aspects of the scheme and the Audit Team should not make such proposals.

2.15 However, where the Project Sponsor considers that these matters have not been addressed previously, for example when a project has not been subject to a feasibility study carried out on behalf of the Overseeing Organisation, the Project Sponsor may instruct the Audit Team via the Audit Brief that the scope of recommendations is extended. This will only apply to Stage 1 Audits or when audit Stages 1 and 2 are combined at Stage 2 (see paragraph 2.20).

2.16 Advice on the general aspects that should be addressed at the first three Audit Stages is given in the lists in Annexes A to C. An example Stage 2 Audit Report is shown in Annex E and example Stage 4 Road Safety Audit Reports are contained in Annexes F and G.

2.17 The lists in Annexes A, B and C are not intended to be exhaustive. They provide a prompt for optional supplementary checks that audit teams could make following their less prescriptive and more wide-ranging audit.

2.18 Auditors should examine the overall geometry of the scheme. All users of the highway should be considered including pedestrians, cyclists, equestrians, those working on the highway and motor vehicle users. Particular attention should be given to vulnerable road users such as the very young, the elderly and the mobility and visually impaired.

2.19 The potential for road safety problems is often greatest at junctions, tie-ins and immediately beyond tie-ins. Where a Highway Improvement Scheme joins an existing road or junction, inconsistency in the standard of provision can lead to accidents, so special attention should be paid to these areas to ensure a safe transition is achieved. This applies particularly to on-line improvements where variations in the standard of provision between new and existing sections may not be obvious to the road user.

Stages of Audit

2.20 Highway Improvement Schemes shall be audited at Stages 1, 2, 3 and 4. If, for any reason, a Stage 1 Road Safety Audit has not been carried out (for example, where a scheme is of such a scale that no preliminary design has been necessary and the scheme has progressed directly to detailed design with the agreement of the Project Sponsor) Audit Stages 1 and 2 shall be combined at Stage 2 and should be referred to as a Stage 1/2 Audit.

Stage 1: Completion of preliminary design

2.21 Stage 1 Road Safety Audits will be undertaken at the completion of preliminary design (Order Publication Report Stage) before publication of draft Orders and for development-led Highway Improvement Schemes before planning consent where possible.

2.22 This is the last occasion at which land requirements may be increased and it is therefore essential to consider fully any road safety issues which may have a bearing upon land take, licence or easement before the draft Orders are published or planning consent is granted.

2.23 At Road Safety Audit Stage 1 all team members shall visit together:

- the sites of Highway Improvement Schemes that involve permanent change to the existing highway layout or features;
- the sites where new offline Highway Improvement Schemes tie-in to the existing highway.

Stage 2: Completion of detailed design

2.24 At this stage, the Audit is concerned with the more detailed aspects of the Highway Improvement Scheme. The Audit Team will be able to consider the layout of junctions, position of signs, carriageway markings, lighting provision and other issues (see Annex B).

2.25 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.

2.26 At Road Safety Audit Stage 2 all team members shall visit together:

- the sites of Highway Improvement Schemes that involve permanent change to the existing highway layout or features;
- the sites where new offline Highway Improvement Schemes tie-in to the existing highway.

Stage 3: Completion of construction

2.27 The audit should be undertaken when the Highway Improvement Scheme is substantially complete and preferably before the works are opened to road users. This is to minimise potential risk to road users and the difficulty that would be experienced by Audit Teams in traversing the site when open to traffic. Where this is not feasible, alternative arrangements should be agreed with the Project Sponsor. This may result in the audit being carried out a short time after opening or in phases where a scheme is subject to phased completion and opening. However, all Highway Improvement Schemes should be subjected to a Stage 3 Road Safety Audit within 1 month of opening.

2.28 Auditors are required to examine the Highway Improvement Scheme from all users' viewpoints and may decide to drive, walk and/or cycle through the scheme to assist their evaluation and ensure they have a comprehensive understanding. Issues raised in the Stage 2 Audit Report should also be reviewed at the Stage 3 Road Safety Audit.

2.29 All Audit Team Members shall examine the scheme site together during daylight. They shall also examine the site together during the hours of darkness at Stage 3 so that hazards particular to night operation can be identified.

2.30 Auditors should also consider the effects of various weather conditions that may not be present at the time of inspection.

2.31 The Audit Team Leader should discuss any alterations proposed at this stage with the Project Sponsor as soon as possible to give the opportunity for modifications to be undertaken before opening. This will give a safer working environment for the work force and delays to traffic will be minimised.

Stage 4: Monitoring

2.32 The Overseeing Organisation will arrange for accident monitoring of audited Highway Improvement Schemes. This should be integrated into the routine accident monitoring required by the Overseeing Organisation's road safety management system, to ensure that it takes place as a matter of course.

2.33 During the first year a Highway Improvement Scheme is open to traffic, a check should be kept on the number of personal injury accidents that occur, so that any serious problems can be identified and remedial work arranged quickly.

2.34 Stage 4 accident monitoring reports shall be prepared using 12 months and 36 months of accident data from the time the Highway Improvement Scheme became operational and shall be submitted to the Overseeing Organisation. The accident records shall be analysed in detail to identify:

- locations at which personal injury accidents have occurred;
- personal injury accidents that appear to arise from similar causes or show common factors.

2.35 The analysis should include identification of changes in the accident population in terms of number, types, and other accident variables, and comparisons should be made with control data. Where the Highway Improvement Scheme is an on-line improvement then the accident record before the scheme was built should be compared with the situation after opening. The accident data should be analysed to identify the influence of problems and recommendations identified at previous audit stages, and any Exception Reports.

2.36 If accident records are not sufficiently comprehensive for detailed analysis, the police should be contacted to ascertain the availability of statements and report forms, which could aid the 36-month data analysis.

2.37 The accident 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.

2.38 Illustrative Stage 4 reports examining 12 months and 36 months of accident data are contained in Annexes F and G respectively.

2.39 The Department for Transport publication "A Road Safety Good Practice Guide" contains useful information on the monitoring of Highway Improvement Schemes and accident data analysis.

Design Changes and Audit Shelf Life

2.40 Stage 1, 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 5 years old. 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.

2.41 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.

Interim Road Safety Audit

2.42 It is a fundamental principle of the auditing process that the Audit Team is independent from the Design Team. Independence is required so that the Audit Team's views are not influenced by familiarity or from natural "pride of authorship".

2.43 However, the requirement for independence need not prevent contact between the Design Team and the Audit Team throughout the design process, provided certain conditions are met (see paragraph 2.46). In trials this has produced the benefits of early identification of road safety problems leading to savings in programme and design costs. This could be particularly beneficial to larger projects with accelerated programmes, such as Highway Improvement Schemes involving early contractor involvement.

2.44 The Project Sponsor will decide whether to employ Interim Road Safety Audit. Design Teams shall not contact Audit Teams without the Project Sponsor's prior written authorisation. Audit Teams undertaking Interim Road Safety Audit shall only be appointed with the approval of the Project Sponsor in accordance with paragraphs 2.48 to 2.53 of this Standard.

2.45 Subject to the Project Sponsor'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. 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 Project Sponsor.

2.46 Interim Road Safety Audit is subject to the following conditions:

- Audit Teams shall report in the format illustrated in the report in Annex E, namely the "problem/recommendation" format;
- Audit Teams shall limit their reports to matters within the scope of this Standard;
- Minutes of meetings shall be recorded;
- All communications between the teams including design submissions, interim audit reports and minutes of meetings must be submitted to the Project Sponsor and copies recorded on an Interim Road Safety Audit File. The Audit Team is responsible for maintaining the file and delivering it to the Project Sponsor at the completion of the preliminary or detailed design;
- Road Safety Audits at Stages 1, 2, 3 and 4 shall still be carried out and reported.

2.47 The Audit Team will require an Audit Brief for an Interim Road Safety Audit containing as many of the items given in paragraph 2.62 as are available, though obviously it will not be possible to provide everything on the list in early design stages. A full Audit Brief in accordance with paragraphs 2.61 and 2.62 must still be supplied to the Audit Team at the end of the design stage for Stage 1 or Stage 2 Audits.

Audit Team Approval and Appointment

2.48 Responsibility for the appointment of the Audit Team will vary according to the procurement method for the scheme. Reference should be made to the scheme contract documents or the Overseeing Organisation for each scheme. If it is considered appropriate, the Project Sponsor may ask the Design Organisation to propose an Audit Team for approval.

2.49 The Audit Team shall be independent from the Design Team. The Project Sponsor 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.

2.50 A Road Safety Audit Team shall comprise the Audit Team Leader and at least one Audit Team Member. This enables discussion between the auditors of the problems and recommendations and maximises the potential to identify problems. Audit Team Observers may also join the team to gain experience in carrying out Road Safety Audit, however the number of Observers shall be limited to a maximum of two.

2.51 The Project Sponsor must be satisfied as to the independence and competence of the team to undertake the audit. Members of the Road Safety Audit Team shall demonstrate their competence by means of a curriculum vitae. Approvals are scheme specific and the use of personnel or organisations on previous Road Safety Audit work does not guarantee their suitability to audit other schemes. Experience must be relevant to the type of scheme being audited.

2.52 The Project Sponsor is responsible for issuing the Audit Brief and instructing the Audit Team and Specialist Advisors on their role.

2.53 It is not necessary for the same Audit Team to undertake all audit stages of a scheme, however, any changes to an Audit Team and its individual members will require further approval from the Project Sponsor.

Audit Team Training, Skills and Experience

2.54 Paragraphs 2.55 to 2.59 give guidance on the general levels of training, skills and experience that are expected of road safety auditors. They are not absolute requirements but are intended to assist Project Sponsors when considering proposals for Audit Teams and also to assist potential auditors to prepare themselves as candidates for Road Safety Audit Teams. The guidance is intended to be flexible, recognising that the experienced road safety professionals that are needed to carry out Road Safety Audits may have developed their careers from a range of backgrounds.

2.55 The most appropriate candidates for Audit Team Leader and Audit Team Member are individuals whose current employment involves Accident Investigation or Road Safety Engineering on a regular basis. This should ensure that auditors are well versed in the most recent practices and developments in the field. Those candidates who have the recommended experience in Accident Investigation or Road Safety Engineering experience but who have not undertaken such work on a regular basis in the previous 2 years are unlikely to be acceptable.

2.56 Candidates who carry out Road Safety Audits full time to the exclusion of general Accident Investigation or Road Safety Engineering work are unlikely to be acceptable as they may lack the appropriate and recent Accident Investigation or Road Safety Engineering experience.

2.57 The Project Sponsor must be satisfied that the proposed Audit Team Leader, Audit Team Members and Observer have adequate and relevant training, skills and experience. The Audit Team Leader, Audit Team Member and Observer's curriculum vitae submitted to the Project Sponsor should consist of no more than 3 pages of information for each. The curriculum vitae should demonstrate that previous experience of Road Safety Audit, Accident Investigation or Road Safety Engineering is relevant to the scheme to be audited, in terms of scheme type and complexity. The Continuing Professional Development (CPD) record included on the curriculum vitae should also focus on Road Safety Audit, Accident Investigation and Road Safety Engineering. It should mention any other relevant CPD, covering areas such as highway design, traffic management and highway maintenance.

2.58 Teams comprising highway design engineers with no experience of road safety work are not suitable.

2.59 The following list gives guidelines on acceptable training, skills and experience for Audit Team Members:

- **Audit Team Leader:** A minimum of 4 years Accident Investigation or Road Safety Engineering experience. Completion of at least 5 Road Safety Audits in the past 12 months as an Audit Team Leader or Member. In order to become an Audit Team Leader the auditor will already have achieved the necessary training to become an Audit Team Member. However, they should also demonstrate a minimum 2 days CPD in the field of Road Safety Audit, Accident Investigation or Road Safety Engineering in the past 12 months.

- **Audit Team Member:** A minimum of 2 years Accident Investigation or Road Safety Engineering experience. Completion of at least 5 Road Safety Audits as Audit Team Leader, Member or Observer in the past 24 months. The Audit Team Member should have attended at least 10 days of formal Accident Investigation or

Road Safety Engineering training to form a solid theoretical foundation on which to base practical experience. They should also demonstrate a minimum of 2 days CPD in the field of Road Safety Audit, Accident Investigation or Road Safety Engineering in the past 12 months.

- **Observer:** A minimum of 1-year Accident Investigation or Road Safety Engineering experience. The Observer should have attended at least 10 days of formal Accident Investigation or Road Safety Engineering training.

Specialist Advisors

2.60 The Design Organisation and the Audit Team should consider if there are any particular features of the project, such as complex signal controlled junctions, highway design, traffic management or maintenance issues that warrant the appointment of Specialist Advisors to advise the Audit Team. Appointment of Specialist Advisors is subject to the approval of the Project Sponsor 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.

Audit Brief

2.61 The Design Team is responsible for preparing the Audit Brief. A copy of the brief shall be forwarded to the Project Sponsor for approval in advance of the audit. The Project Sponsor may instruct the Design Team to delete unnecessary items or to include additional material, as he/she considers appropriate. The Project Sponsor must document the reasons for deleting or adding any information to the Audit Brief. The Project Sponsor shall issue the Audit Brief and instruct the Audit Team.

2.62 To maximise the benefit from the Road Safety Audit, the brief needs careful preparation and must include sufficient information to enable an efficient Audit to be undertaken. An Audit Brief should contain the following:

a) Scheme drawings showing the full geographical extent of the scheme and including the areas beyond the tie-in points.

b) Details of approved Departures and Relaxations from Standards.

c) General scheme details, to help give an understanding of the purpose of the scheme and how the layout will operate, including design speeds, speed limits, traffic flows, forecast flows, queue lengths, non-motorised user flows and desire lines. Also details of any environmental constraints on the design.

d) Any relevant factors which may affect road safety such as adjacent developments (existing or proposed), proximity of schools or retirement/ care homes and access for emergency vehicles.

e) For on-line schemes and at tie-ins, the previous 36 months accident data in the form of 'stick plots' and interpreted listings. The accident data should cover both the extent of the scheme and the adjoining sections of highway.

f) At Audit Stages 2 and 3, details of any changes introduced since the previous stage.

g) A3 or A4 size plans using an appropriate scale for the Audit Team to mark up for inclusion in the Audit Report.

h) Previous Road Safety Audit Reports, Exception Reports, and a copy of the Interim Road Safety Audit File (where an Interim Road Safety Audit has taken place).

i) Contact details of the Maintaining Agent to whom any identified maintenance defects should be notified (by telephone and immediately confirmed in writing for serious defects) separately from the audit report (see paragraph 2.74).

j) Details of the appropriate police contact.

2.63 If the Audit Team considers the brief to be insufficient for their purpose then requests for further information should be made to the Design Team Leader and copied to the Project Sponsor. Any information requested but not supplied to the Audit Team should be identified in the introduction to the Audit Report.

Audit Management

2.64 The Project Sponsor 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.

2.65 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.

2.66 The Audit Team Leader shall invite representatives of the police and the Maintaining Agent to accompany the Audit Team to offer their views for the Stage 3 Audit. The Audit Team Leader shall notify the Project Sponsor of the date proposed for the site visit.

2.67 The Audit Team Leader may also, with the approval of the Project Sponsor, invite representatives of the police and the Maintaining Agent to advise on audits at Stages 1 and 2 where the Audit Team Leader considers that their participation will benefit the audit.

Audit Report

2.68 At all Stages the Audit Team shall prepare a written report. For Stage 4 reports see paragraph 2.32-2.39. Stage 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) Recommendations for action to mitigate or remove the problems;

f) A3 or A4 location map, marked up and referenced to problems and, if available, photographs of the problems identified;

g) A statement, signed by the Audit Team Leader in the format given at Annex D; and

h) A list of documents and drawings considered for the audit.

2.69 The report shall contain a separate statement for each identified problem describing the location and nature of the problem and the type of accidents considered likely to occur as a result of the problem.

2.70 Each problem shall be followed by an associated recommendation. The Audit Team should aim to provide proportionate and viable recommendations to eliminate or mitigate the identified problems. Recommendations to "consider" should be avoided. Recommendations to "monitor" should only be made where a need to supplement the scheduled Stage 4 monitoring is specifically identified in terms of frequency and incidence of particular vehicle manoeuvres or accident causation factors, and the monitoring task can be specifically allocated.

2.71 Items such as correspondence with the Overseeing Organisation or copies of marked up checklists shall not be included.

2.72 An illustrative Stage 2 Audit Report is shown in Annex E. The report format shown should be used for Stage 1, 2 & 3 Audits. Alternatively the Project Sponsor may instruct the Audit Team via the Audit Brief to present the problems and recommendations in the order that they are encountered progressing along the length of the scheme.

2.73 The Audit Team shall send a draft report directly to the Project Sponsor and not via the Design Team. The Audit Team Leader shall discuss the draft report with the Project Sponsor prior to formal submission so that anything agreed to be outside the terms of reference can be identified and removed. In addition, where the Project Sponsor agrees a variation on a recommendation with the Audit Team Leader, this revised recommendation should be incorporated into the final Audit Report. The Audit Team Leader should consider the need to discuss variations with the Audit Team and Specialist Advisors before variations are made. The Audit Team Leader shall not include in the Audit Report technical matters that have no implications on road safety or any other matter not covered by the Audit Brief, such as maintenance defects observed during site visits and health and safety issues.

2.74 The Audit Team Leader shall send any comments on matters that are not covered by the Audit Brief to the Project Sponsor in a separate

letter. Maintenance defects noted during site visits shall be immediately reported direct to the Maintaining Agent and the Project Sponsor shall also be informed.

Exception Report

2.75 It is the Project Sponsor's responsibility to ensure that all problems raised by the Audit Team are given due consideration. The Project Sponsor may wish to consult the Design Team at this stage. If the Project Sponsor considers any problem raised to be insignificant or is outside the terms of reference, or that the solutions recommended are not suitable given the relevant economic and environmental constraints, the Project Sponsor shall prepare an Exception Report giving reasons and proposing alternatives for submission to the Director, with whom the final decision rests. If there is more than one exception in respect of an audit then each exception shall be considered and approved separately.

2.76 The Project Sponsor shall provide copies of each approved Exception Report to the Design Team and Audit Team Leader for action and information respectively.

Subsequent Actions

2.77 The Project Sponsor will instruct the Design Team in respect of any changes required during the preparation, design and construction of the scheme resulting from audit.

2.78 Through the construction period following the Stage 2 Audit, the Design Organisation shall keep the Project Sponsor informed of all design changes that occur so that any requirement for a further Stage 2 Audit can be identified. The Project Sponsor shall then initiate any additional audits required.

2.79 The Project Sponsor is responsible for initiating prompt action on all recommendations in the Audit Report, and on all Exception Reports approved by the Director. The Project Sponsor shall notify the Director of the reasons if works to implement Stage 3 recommendations or alternative measures proposed in Exception Reports, are not completed within 6 months of acceptance of the Stage 3 Audit recommendations and/or approval of Exception Reports.

2.80 The Stage 4 reports (see paragraphs 2.32 - 2.39) shall be submitted to the Overseeing Organisation who will consider the reports and decide on appropriate action.

3. REFERENCES

1) Guidance on Safer Temporary Traffic Management – Published by TRL Limited, 2002 on behalf of CSS and Health and Safety Executive for Highways Agency.

2) A Road Safety Good Practice Guide, First Edition: Department for Transport, June 2001.

4. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

Chief Highway Engineer
The Highways Agency
Room B153A
Romney House
43 Marsham Street
London SW1P 3HW

G CLARKE
Chief Highway Engineer

Chief Road Engineer
Scottish Executive
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J HOWISON
Chief Road Engineer

Chief Highway Engineer
Transport Directorate
Welsh Assembly Government
Llywodraeth Cynulliad Cymru
Crown Buildings
Cardiff
CF10 3NQ

J R REES
Chief Highway Engineer
Transport Directorate

Director of Engineering
Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

G W ALLISTER
Director of Engineering

ANNEX A: STAGE 1 CHECKLISTS – COMPLETION OF PRELIMINARY DESIGN

List A1 – General

Item	Possible Issues
• Departures from Standards	What are the road safety implications of any approved Departures from Standards or Relaxations?
• Cross-sections	How safely do the cross-sections accommodate drainage, ducting, signing, fencing, lighting and pedestrian and cycle routes?
• Cross-sectional Variation	What are the road safety implications if the standard of the proposed scheme differs from adjacent lengths?
• Drainage	Will the new road drain adequately?
• Landscaping	Could areas of landscaping conflict with sight lines (including during windy conditions)?
• Public Utilities/Services Apparatus	Have the road safety implications been considered?
• Lay-bys	Has adequate provision been made for vehicles to stop off the carriageway including picnic areas? How will parked vehicles affect sight lines?
• Access	Can all accesses be used safely? Can multiple accesses be linked into one service road? Are there any conflicts between turning and parked vehicles?
• Emergency Vehicles	Has provision been made for safe access by emergency vehicles?
• Future Widening	Where a single carriageway scheme is to form part of future dual carriageway, is it clear to road users that the road is for two-way traffic?
• Adjacent Development	Does adjacent development cause interference/confusion e.g. lighting or traffic signals on adjacent road may affect a road user's perception of the road ahead?
• Basic Design Principles	Are the overall design principles appropriate for the predicted level of use for all road users?

List A2 – Local Alignment

Item	Possible Issues
• Visibility	Are horizontal and vertical alignments consistent with required visibility?
	Will sight lines be obstructed by permanent and temporary features e.g. bridge abutments and parked vehicles?
• New/Existing Road Interface	Will the proposed scheme be consistent with standards on adjacent lengths of road and if not, is this made obvious to the road user?
	Does interface occur near any hazard, i.e. crest, bend after steep gradient?
• Vertical Alignment	Are climbing lanes to be provided?

List A3 – Junctions

Item	Possible Issues
• Layout	Is provision for right turning vehicles required?
	Are acceleration/deceleration lanes required?
	Are splitter islands required on minor arms to assist pedestrians or formalise road users movements to/from the junction?
	Are there any unusual features that affect road safety?
	Are widths and swept paths adequate for all road users? Will large vehicles overrun pedestrian or cycle facilities?
	Are there any conflicts between turning and parked vehicles?
	Are any junctions sited on a crest?
• Visibility	Are sight lines adequate on and through junction approaches and from the minor arm?
	Are visibility splays adequate and clear of obstructions such as street furniture and landscaping?

List A4 – Non Motorised User Provision

Item	Possible Issues
• Adjacent Land	Will the scheme have an adverse effect on safe use of adjacent land?
• Pedestrian/Cyclists	Have pedestrian and cycle routes been provided where required?
	Do shared facilities take account of the needs of all user groups?
	Can verge strip dividing footways and carriageways be provided?
	Where footpaths have been diverted, will the new alignment permit the same users free access?
	Are footbridges/subways sited to attract maximum use?
	Is specific provision required for special and vulnerable groups i.e. the young, elderly, mobility and visually impaired?
	Are tactile paving, flush kerbs and guard railing proposed? Is it specified correctly and in the best location?
	Have needs been considered, especially at junctions?
	Are these routes clear of obstructions such as signposts, lamp columns etc?
• Equestrians	Have needs been considered?
	Does the scheme involve the diversion of bridleways?

List A5 – Road Signs, Carriageway Markings And Lighting

Item	Possible Issues
• Signs	Are sign gantries needed?
• Lighting	Is scheme to be lit?
	Has lighting been considered at new junctions and where adjoining existing roads?
	Are lighting columns located in the best positions e.g. behind safety fences?
• Poles/Columns	Will poles/columns be appropriately located and protected?
• Road Markings	Are any road markings proposed at this stage appropriate?

ANNEX B: STAGE 2 CHECKLISTS – COMPLETION OF DETAILED DESIGN

The Audit Team should satisfy itself that all issues raised at Stage 1 have been resolved. Items may require further consideration where significant design changes have occurred.

If a Highway Improvement Scheme has not been subject to a Stage 1 Audit, the items listed in Lists A1 to A5 should be considered together with the items listed below.

List B1: General

Item	Possible Issues
• Departures from Standards	Consider road safety aspects of any Departures granted since Stage 1.
• Drainage	Do drainage facilities (e.g. gully spacing, flat spots, crossfall, ditches) appear to be adequate? Do features such as gullies obstruct cycle routes, footpaths or equestrian routes? Do the locations of features such as manhole covers give concern for motorcycle/cyclist stability?
• Climatic Conditions	Is there a need for specific provision to mitigate effects of fog, wind, sun glare, snow, and icing?
• Landscaping	Could planting (new or when mature) encroach onto carriageway or obscure signs or sight lines (including during windy conditions)? Could mounding obscure signs or visibility? Could trees (new or when mature) be a hazard to a vehicle leaving the carriageway? Could planting affect lighting or shed leaves on to the carriageway? Can maintenance vehicles stop clear of traffic lanes?
• Public Utilities/Services Apparatus	Can maintenance vehicles stop clear of traffic lanes? If so, could they obscure signs or sight lines? Are boxes, pillars, posts and cabinets located in safe positions? Do they interfere with visibility? Has sufficient clearance of overhead cables been provided? Have any special accesses/parking areas been provided and are they safe?
• Lay-bys	Have lay-bys been positioned safely? Could parked vehicles obscure sight lines? Are lay-bys adequately signed? Are picnic areas properly segregated from vehicular traffic?

List B1: General (continued)

Item	Possible Issues
• Access	Is the visibility to/from access adequate? Are the accesses of adequate length to ensure all vehicles clear the main carriageway? Do all accesses appear safe for their intended use?
• Skid Resistance	Are there locations where a high skid resistance surfacing (such as on approaches to junctions and crossings) would be beneficial? Do surface changes occur at locations where they could adversely affect motorcycle stability?
• Agriculture	Have the needs of agricultural vehicles and plant been taken into consideration (e.g. room to stop between carriageway and gate, facilities for turning on dual carriageways)? Are such facilities safe to use and are they adequately signed?
• Fences and Road Restraint Systems	Is there a need for road restraint systems to protect road users from signs, gantries, abutments, steep embankments or water hazards? Do the restraint systems provided give adequate protection? Are the restraint systems long enough?
• Adjacent Developments and Roads	Has screening been provided to avoid headlamp glare between opposing carriageways, or any distraction to road users? Are there any safety issues relating to the provision of environmental barriers or screens?

List B2: Local Alignment

Item	Possible Issues
• Visibility	Obstruction of sight lines by: i. safety fences ii. boundary fences iii. street furniture iv. parking facilities v. signs vi. landscaping vii. structures viii. environmental barriers ix. crests x. features such as buildings, plant or materials outside the highway boundary Is the forward visibility of at-grade crossings sufficient to ensure they are conspicuous?

List B2: Local Alignment (continued)

Item	Possible Issues
• New/Existing Road Interface	Where a new road scheme joins an existing road, or where an on-line improvement is to be constructed, will the transition give rise to potential hazards? Where road environment changes (e.g. urban to rural, restricted to unrestricted) is the transition made obvious by signing and carriageway markings?

List B3: Junctions

Item	Possible Issues
• Layout	Are the junctions and accesses adequate for all vehicular movements? Are there any unusual features, which may have an adverse effect on road safety? Have guard rails/safety fences been provided where appropriate? Do any roadside features (e.g. guard rails, safety fences, signs and traffic signals) intrude into drivers' line of sight? Are splitter islands and bollards required on minor arms to assist pedestrians or formalise road users' movements to/from the junction? Are parking or stopping zones for buses, taxis and public utilities vehicles situated within the junction area? Are they located outside visibility splays?
• Visibility	Are the sight lines adequate at and through the junctions and from minor roads? Are visibility splays clear of obstruction?
• Signing	Is the junction signing adequate and easily understood? Have the appropriate warning signs been provided? Are signs appropriately located and of the appropriate size for approach speeds? Are sign posts protected by safety barriers where appropriate?
• Road Markings	Do the carriageway markings clearly define routes and priorities? Are the dimensions of the markings appropriate for the speed limit of the road? Have old road markings and road studs been adequately removed?

List B3: Junctions (continued)

Item	Possible Issues
• T, X, Y-Junctions	Have ghost islands and refuges been provided where required?
	Do junctions have adequate stacking space for turning movements?
	Can staggered crossroads accommodate all vehicle types and movements?
• All Roundabouts	Are the deflection angles of approach roads adequate for the likely approach speed?
	Are splitter islands necessary?
	Is visibility on approach adequate to ensure drivers can perceive the correct path through the junction?
	Is there a need for chevron signs?
	Are dedicated approach lanes required? If provided, will the road markings and signs be clear to all users?
• Mini Roundabouts	Are the approach speeds for each arm likely to be appropriate for a mini roundabout?
	Is the centre island visible from all approaches?
• Traffic Signals	Will speed discrimination equipment be required?
	Is the advance signing adequate?
	Are signals clearly visible in relation to the likely approach speeds?
	Is "see through" likely to be a problem?
	Would lantern filters assist?
	Is the visibility of signals likely to be affected by sunrise/sunset?
	Would high intensity signals and/or backing boards improve visibility?
	Would high-level signal units be of value?
	Are the markings for right turning vehicles adequate?
	Is there a need for box junction markings?
	Is the phasing appropriate?
	Will pedestrian/cyclist phases be needed?
	Does the number of exit lanes equal the number of approach lanes, if not is the taper length adequate?
	Is the required junction intervisibility provided?

List B4: Non Motorised User Provision

Item	Possible Issues
• Adjacent Land	Are accesses to and from adjacent land/properties safe to use? Has adjacent land been suitably fenced?
• Pedestrians	Are facilities required for NMUs at: a) junctions; b) pelican/zebra crossings; c) refuges; d) other locations? Are crossing facilities placed and designed to attract maximum use? Are guardrails/fencing present/required to deter pedestrians from crossing the road at unsafe locations? For each type of crossing (bridges, subways, at grade) have the following been fully considered? a) visibility both by and of pedestrians; b) use by mobility and visually impaired; c) use by elderly; d) use by children/schools; e) need for guardrails in verges/central reserve; f) signs; g) width and gradient; h) surfacing; i) provision of dropped kerbs; j) avoidance of channels and gullies; k) need for deterrent kerbing; i) need for lighting.
• Cyclists	Have the needs of cyclists been considered especially at junctions and roundabouts? Are cycle lanes or segregated cycle tracks required? Does the signing make clear the intended use of such facilities? Are cycle crossings adequately signed? Do guardrails need to be provided to make cyclists slow down or dismount at junctions/crossings? Has lighting been provided on cycle routes?

List B4: Non Motorised User Provision (continued)

Item	Possible Issues
• Equestrians	Should bridleways or shared facilities be provided?
	Does the signing make clear the intended use of such paths and is sufficient local signing provided to attract users?
	Have suitable parapets/rails been provided where necessary?

List B5: Road Signs, Carriageway Markings And Lighting

Item	Possible Issues
• ADS and Local Traffic Signs	Do destinations shown accord with signing policy?
	Are signs easy to understand?
	Are the signs located behind safety fencing and out of the way of pedestrians and cyclists?
	Is there a need for overhead signs?
	Where overhead signs are necessary is there sufficient headroom to enable designated NMU usage?
	Do signs need reflectorisations where road is unlit and is facing material appropriate for location?
• Variable Message Signs	Are the legends relevant and easily understood?
	Are signs located behind safety fencing?
• Lighting	Has lighting been considered at new junctions and where adjoining existing roads?
	Is there a need for lighting, including lighting of signs and bollards?
	Are lighting columns located in the best positions e.g. behind safety fences and not obstructing NMU routes?
• Road Markings	Are road markings appropriate to location? a) Centre lines; b) Edge lines; c) Hatching; d) Studs; e) Text/Destinations; f) Approved and/or conform to the regulations.
• Poles and Columns	Are poles and columns protected by safety fencing where appropriate?

ANNEX C: STAGE 3 CHECKLISTS – COMPLETION OF CONSTRUCTION

The Audit Team should consider whether the design has been properly translated into the scheme as constructed and that no inherent road safety defect has been incorporated into the works.

Particular attention should be paid to design changes, which have occurred during construction.

List C1: General

Item	Possible Issues
• Departures from Standards	Are there any adverse road safety implications of any departures granted since Stage 2?
• Drainage	Does drainage of roads, cycle routes and footpaths appear adequate?
	Do drainage features such as gullies obstruct footpaths, cycle routes or equestrian routes?
• Climatic Conditions	Are any extraordinary measures required?
• Landscaping	Could planting obscure signs or sight lines (including during periods of windy weather)?
	Does mounding obscure signs or visibility?
• Public Utilities	Have boxes, pillars, posts and cabinets been located so that they don't obscure visibility?
• Access	Is the visibility to/from access adequate?
	Are the accesses of adequate length to ensure all vehicles clear the main carriageway?
• Skid Resistance	Do any joints in the surfacing appear to have excessive bleeding or low skid resistance?
	Do surface changes occur at locations where they could adversely affect motorcycle stability?
• Fences and Road Restraint Systems	Is the restraint system adequate?
	In the case of wooden post and rail boundary fences, are the rails placed on the non-traffic side of the posts?
• Adjacent Development	Have environmental barriers been provided and do they create a hazard?
• Bridge Parapets	Is the projection of any attachment excessive?
• Network management	Have appropriate signs and/or markings been installed in respect of Traffic Regulation Orders?

List C2: Local Alignment

Item	Possible Issues
• Visibility	Are the sight lines clear of obstruction?
• New/Existing Road Interface	Is there a need for additional signs and/or road markings?

List C3: Junctions

Item	Possible Issues
• Visibility	Are all visibility splays clear of obstructions?
• Road Markings	Do the carriageway markings clearly define routes and priorities? Have all superseded road markings and studs been removed adequately?
• Roundabouts	Can the junction be seen from appropriate distances and is the signing adequate?
• Traffic Signals	Can the signals be seen from appropriate distances? Can drivers see signals for opposing traffic? For the operation of signals: Do phases correspond to the design? Do pedestrian phases give adequate crossing time?
• T, X and Y junctions	Are priorities clearly defined? Is signing adequate?

List C4: Non Motorised User Provision

Item	Possible Issues
• Adjacent Land	Has suitable fencing been provided?
• Pedestrians	Are the following adequate for each type of crossing (bridges, subways, at grade)? a) visibility; b) signs; c) surfacing; d) other guardrails; e) drop kerbing or flush surfaces; f) tactile paving.

List C4: Non Motorised User Provision (continued)

Item	Possible Issues
• Cyclists	Do the following provide sufficient levels of road safety for cyclists on, or crossing the road? a) visibility; b) signs; c) guardrails; d) drop kerbing or flush surfaces; e) surfacing; f) tactile paving.
• Equestrians	Do the following provide sufficient levels of road safety for equestrians? a) visibility; b) signs; c) guardrails.

List C5: Road Signs, Carriageway Markings And Lighting

Item	Possible Issues
• Signs	Are the visibility, locations and legibility of all signs (during daylight and darkness) adequate? Are signposts protected from vehicle impact? Will signposts impede the safe and convenient passage of pedestrians and cyclists? Have additional warning signs been provided where necessary?
• Variable Message Signs	Can VMS be read and easily understood at distances appropriate for vehicle speeds? Are they adequately protected from vehicle impact?
• Lighting	Does the street lighting provide adequate illumination of roadside features, road markings and non-vehicular users to drivers? Is the level of illumination adequate for the road safety of non-motor vehicle users?
• Carriageway Markings	Are all road markings/studs clear and appropriate for their location? Have all superseded road markings and studs been removed adequately?

ANNEX D: AUDIT TEAM STATEMENT

I certify that this audit has been carried out in accordance with HD 19/03.

AUDIT TEAM LEADER:

Name: Signed:

Position: Date:

Organisation:

Address:

AUDIT TEAM MEMBERS

Name: Name:

Position: Position:

Organisation: Organisation:

Address: Address

OTHERS INVOLVED

(E.g. observer, police, network management representative, specialist advisor.)

ANNEX E:

ILLUSTRATIVE REPORT

A795 AMBRIDGE BYPASS

ROAD SAFETY AUDIT STAGE 2

EWING AND BARNES PARTNERSHIP

November 2004

Volume 5 home page

1 INTRODUCTION

1.1 This report results from a Stage 2 Road Safety Audit carried out on the A795 Ambridge Bypass at the request of the Design Organisation: Ambridge Bypass Design Team, DLS Partnership (Highways Division), 12-14 Cathedral Close, Borchester. The Audit was carried out during November 2004.

1.2 The Audit Team membership was as follows:

I K Brunel (Ms)	BSc, MSc, CEng, MICE, MIHT Ewing and Barnes Partnership (Traffic and Accident Investigation Division)
T MacAdam	IEng, FIHIE Ewing and Barnes Partnership (Traffic and Accident Investigation Division)
Eur Ing. C Chan	MEng, CEng, MICE Road Safety Engineering Consultant

1.3 The audit took place at the Erinsborough Office of The Ewing and Barnes Partnership on 17 and 18 November 2004. The audit was undertaken in accordance with the audit brief contained in Highways Agency letter reference HA/11.10.04/001. The audit comprised an examination of the documents provided by the Highways Agency's Project Sponsor, South Midlands Regional Office, and listed in the Annex. These documents consisted of a complete set of the draft tender drawings, a summary of the general details of the scheme including traffic flows, predicted queue lengths, non-motorised user counts and desire lines, an A3 plan for the Audit Team's use, a copy of the Stage 1 Road Safety Audit Report dated June 2003, details of the response to the issues raised in the Stage 1 Audit, details of other changes to the design since June 2003 and a schedule of Departures from Standards and the relevant approvals contained in the design. A visit to the site of the proposed bypass was made on the morning of Wednesday 17 November 2004. During the site visit the weather was fine and sunny and the existing road surface was dry.

1.4 The terms of reference of the audit are as described in HD 19/03. The team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

1.5 All comments and recommendations are referenced to the detailed design drawings and the locations have been indicated on the A3 plan supplied with the audit brief.

1.6 The proposed A795 Ambridge Bypass incorporates the provision of 2.3km of 7.3m wide single carriageway between Station Road to the south of the A827 and Ambridge Road to the north east of Ambridge village. The scheme includes the provision of 5 priority junctions and a roundabout at the A827 dual carriageway junction. The improvement also encompasses the provision of two lay-bys, the diversion of a footpath and the stopping up of Old Church Lane.

2 ITEMS RAISED AT THE STAGE 1 AUDIT

2.1 The safety aspects of the Ambridge Road Junction were the subject of comment in the June 2003 Stage 1 Road Safety Audit Report. (Items A3.1 and A3.2) These items remain a problem and are referred to again in this report (paragraph 3.13 below).

2.2 All other issues raised in the Stage 1 Audit have been resolved.

3 ITEMS RAISED AT THIS STAGE 2 AUDIT

3.1 GENERAL

3.2 PROBLEM

Locations: A and N (drawing RSA/S2/001) – Adjacent to the Ambridge railway station.

Summary: Risk of an accident between a pedestrian and a vehicle due to potential shortcut to bus stop.

A cross-section departure (in that there is no room for provision of a footway) on the existing railway bridge at location A has been reported. The departure has been introduced since the Stage 1 Audit. Although pedestrians have been rerouted to cross the railway using the renovated station footbridge they may still be tempted to use the road bridge as this will provide a much shorter route to the adjacent bus stop (location N). Pedestrians using the road bridge would have to walk on the carriageway and therefore there would be an increased risk of an accident between a vehicle and a pedestrian.

RECOMMENDATION

Relocate the bus stop currently on the bypass to Station Road. In addition provide pedestrian deterrent paving on the verges on the immediate approaches to the bridge (both sides).

3.3 PROBLEM

Locations: B and C (drawing RSA/S2/001) – Northern verge of Home Farm Road.

Summary: Open ditch is a potential hazard to an errant road user.

An open ditch is proposed to run along the side of Home Farm Road on the outside of the bend. This ditch is the main outfall for the storm water drainage from much of the bypass and in places is more than 1.5m deep. It is likely to carry substantial quantities of water following heavy rainfall and represents a danger to errant motorists and cyclists. This problem could increase the severity of an accident involving a vehicle or cyclist leaving the carriageway in this location.

RECOMMENDATION

Provide a safety fence at the back of the grass verge between location B and location C.

3.4 PROBLEM

Locations: D and E (drawing RSA/S2/001) – Lay-bys north of Old Church Lane.

Summary: Lay-by positions provide an increased risk of shunt and right turn accidents.

Drivers travelling north will reach the lay-by at location D on their right before the lay-by at location E on their left. Similarly vehicles travelling south will reach the lay-by at E on their right first. Since the lay-bys are not inter-visible and there are no advance signs, drivers could be tempted to cross the carriageway to use the first lay-by that they reach. This problem would increase the number of right turning manoeuvres and therefore increase the potential for accidents between right turning vehicles and vehicles travelling ahead in the opposite direction. It could also increase the likelihood of shunt accidents involving vehicles running into the back of other vehicles waiting to turn right into the lay-by.

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RECOMMENDATION

Reposition the lay-bys so that drivers encounter a lay-by on their nearside first. When relocating the lay-bys ensure that adequate visibility is provided for a driver both entering and leaving the facility. In addition, provide advance signing of both facilities.

3.5 PROBLEM

Location: F (drawing RSA/S2/001) – Junction between Old Church Lane and the bypass.

Summary: Downhill gradient and limited visibility on sideroad approach increases the risk of overshoot type accidents.

The realigned section of Old Church Lane where it meets the bypass has a downhill longitudinal gradient of 7% and limited forward visibility. There is danger of traffic failing to stop at the give way line and skidding into the bypass in bad weather conditions. This feature could result in vehicles on Old Church Lane overrunning the give way line and colliding with through traffic on the bypass.

RECOMMENDATION

Provide the realigned section of Old Church Lane with a high grip surfacing and additional signs to warn traffic of the give way junction ahead.

3.6 PROBLEM

Location: G (drawing RSA/S2/001) – On the bypass midway between Old Church Lane and Home Farm Road adjacent to the northbound lane.

Summary: Unprotected embankment could increase the severity of an accident in this location.

The safety fence on the west side of the bypass between chainage 1+550 and 1+650 leaves some embankment unprotected. This could increase the severity of an accident involving a vehicle or cyclist leaving the carriageway.

RECOMMENDATION

Extend the safety fence back to chainage 1+500.

3.7 PROBLEM

Locations: H to I (drawing RSA/S2/001) – On the bypass adjacent to the Westlee dairy.

Summary: Headlights of vehicles on the parallel dairy access road could distract and disorientate drivers on the bypass.

The access road to the Westlee Diary Depot runs parallel to the bypass for about 250m. We understand that there is considerable vehicular activity on this road at night. The headlights of traffic using this road could be very confusing when viewed from the bypass. This could distract and disorientate drivers on the bypass to the extent they lose control of their vehicles.

RECOMMENDATION

Provide earth bund, solid fence or similar screen adjacent to Westlee Diary boundary.

3.8 PROBLEM

Location: Q (drawing RSA/S2/001) – Entrance to the electricity sub-station north of Home Farm Road.

Summary: No provision for service vehicles to stop off the bypass when accessing the sub-station.

The entrance gates to the electricity sub-station at chainage 1+900 (location Q) are located such that drivers wishing to enter the compound would have to park on the bypass whilst they unlock the gate. This could result in a vehicle travelling on the bypass colliding with the parked vehicle. It could also encourage vehicles to overtake parked vehicles increasing the risk of head-on collisions.

RECOMMENDATION

Relocate the gates further back from the edge of the carriageway. If, however, the location of equipment in the compound precludes the relocation of the gates, provide a lay-by or hardstanding area to allow vehicles to wait off the road while the gates are being opened or secured.

3.9 THE ALIGNMENT

3.10 PROBLEM

Location: J to L (drawing RSA/S2/001) – Crest to the north of Old Church Lane.

Summary: Proposed hazard road marking is not sufficient to discourage drivers from overtaking in this area.

The entire length of the bypass between the Ambridge Road Junction (location J) and the Bull Roundabout (location L) is marked with hazard lines (to Traffic Signs Regulations and General Directions diagram 1004.1) indicating the lack of full overtaking sight distance. The meaning of this lining is not understood by the general public and there is no indication that the visibility reduces appreciably over the crest at chainage 1+250. This problem could increase the potential for accidents involving inappropriate overtaking.

RECOMMENDATION

Provide 1m carriageway hatch markings (to Traffic Signs Regulations and General Directions diagram 1013.1B) over the crest. The use of this marking must be coordinated with recommendation 3.13 below.

3.11 THE JUNCTIONS

3.12 PROBLEM

Location: L (drawings RSA/S2/001 and RSA/S2/002) – North from the Bull Roundabout.

Summary: Confusion over the layout of road north of the roundabout may result in inappropriate overtaking.

Traffic originating from the existing dual carriageway A827 Borchester Road (which has a mature quickthorn hedge in the central reserve) and turning onto the new bypass (northbound) may be confused into thinking that the new bypass is a dual carriageway, particularly as the old field hedge to the west could be assumed to be in a central reserve and concealing a northbound carriageway. Traffic on the access road to the Westlee Diary could further confuse traffic in this location unless the recommendation at paragraph 3.7 above is implemented. This problem could increase the potential for accidents involving vehicles overtaking in an inappropriate location.

RECOMMENDATION

Redesign the splitter island and associated hatch markings shown on drawing RSA/S2/002 to accentuate that the bypass is a single carriageway. In addition provide two-way traffic signs (to diagram number 521 of The Traffic Signs Regulations and General Directions) on the northbound bypass immediately after the roundabout.

3.13 PROBLEM

Location: J (drawings RSA/S2/001 and RSA/S2/003) – Northbound approach to Ambridge Road Junction.

Summary: The road layout on the approach to the junction does not discourage overtaking on this straight downhill section of the bypass.

The approach to this junction along the proposed bypass from the south is via a straight downhill section of about 1km length and traffic speeds are likely to be high. The necessity of making sure that overtaking manoeuvres are complete in good time before the central reserve at the junction commences was flagged at the Stage 1 Audit. The current design does not adequately address this issue. As a result there is a potential for overtaking accidents and side impact accidents as overtaking vehicles abruptly move back into the northbound lane before the junction.

RECOMMENDATION

(a) Provide a continuous prohibitory double white line to diagram 1013.1 from the southern end of the central reserve (location M drawing RSA/S2/003) for a distance of about 340m uphill (FOSD/4 before the nosing), to replace the proposed hazard marking. This will force drivers into a single line well before the junction. Coordination with the recommendation in paragraph 3.10 above is necessary.

(b) Reposition the advanced direction sign ADS6 approximately 150m from the junction to warn traffic travelling at higher speeds.

(c) Provide "SLOW" carriageway markings on the approaches to the junction from both the north and south direction to moderate speeds through the junction.

(d) Provide hatching within the hard strip to further discourage drivers from attempting to overtake in the short single lane dual carriageway section through the junction.

3.14 NON-MOTORISED USERS

3.15 PROBLEM

Locations: O and P (See drawing RSA/S2/001) – Former line of the footpath at the crest to the north of Old Church Lane.

Summary: The former footpath alignment may still attract pedestrians to cross at a location with limited visibility.

The scheme allows for the diversion of Footpath No 12 so that it crosses the bypass away from the crest curve at location K. The old route may, however, be more attractive to pedestrians. This could result in an accident between a vehicle and pedestrian due to the reduced visibility at the crest curve.

RECOMMENDATION

Modify landscaping with heavy planting to block old route at the edge of the bypass (location O) and remove the old stile at the field boundary (location P) and replace with solid wall to match existing.

3.16 PROBLEM

Location: Throughout the length of the bypass.

Summary: The proposed raised ribbed edge line may be hazardous to cyclists at junctions.

It is not uncommon for cyclists to use the marginal strip provided along busy bypasses to avoid being intimidated by other vehicles. The drawings indicate that road markings to Diagram 1012.3, raised ribbed markings, will be used as edge line markings. These markings may cause difficulties for cyclists entering or leaving the marginal strip near junctions and result in cyclists losing control of their bicycle.

RECOMMENDATION

Replace markings to Diagram 1012.3 by those to Diagram 1012.1 for a length of 20m on the approach and exit sides of any junction.

3.17 SIGNING AND LIGHTING

3.18 PROBLEM

Location: L (drawings RSA/S2/001 and RSA/S2/002) – westbound approach to the Bull Roundabout.

Summary: The risk of errant vehicle colliding with a lighting column located in front of the safety fence.

On the A827 Borchester Road dual carriageway approach to the Bull Roundabout a length of safety fence is proposed to protect a large advance direction sign in the nearside verge. The drawings provided show a lighting column approximately 60 metres from the roundabout located in front of the proposed safety fence. A vehicle leaving the carriageway in this location could run along the length of safety fence into the lighting column, this could significantly increase the severity of an accident occurring in this location.

RECOMMENDATION

Relocate the proposed lighting column behind the length of safety fence.

4 AUDIT TEAM STATEMENT

I certify that this audit has been carried out in accordance with HD 19/03.

AUDIT TEAM LEADER

Ms I K Brunel BSc, MSc, CEng, MICE, MIHT
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Signed I K Brunel
Date 22/11/04

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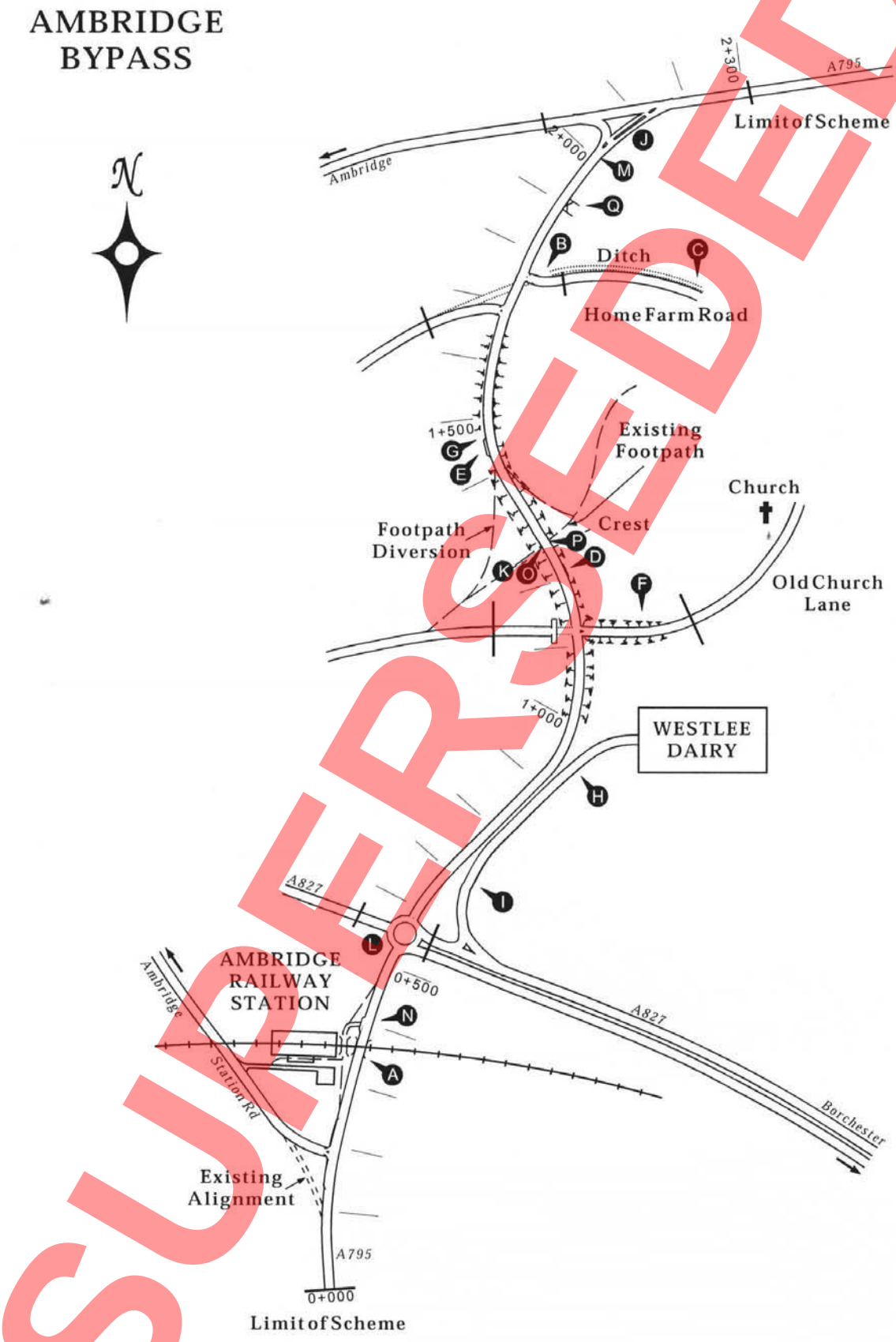

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ANNEX F:

ILLUSTRATIVE REPORT

A795 AMBRIDGE BYPASS

ROAD SAFETY AUDIT STAGE 4
12 MONTH MONITORING REPORT

DLS PARTNERSHIP

May 2007

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1 INTRODUCTION

1.1 This report results from the Road Safety Audit Stage 4 - 12 month monitoring carried out on the A795 Ambridge Bypass Scheme as part of DLS Partnership (Maintenance Division) maintenance agreement with the Highway Agency. The report has been produced as part of a routine accident monitoring/Road Safety Audit procedure and the terms of reference for this monitoring report are described in HD 19/03.

1.2 A site visit was conducted on Monday 7th May 2007, during which the road surface was wet as it was raining heavily.

2 SCHEME DETAILS

2.1 The A795 Ambridge Bypass was completed in March 2006 and involved the provision of 2.3km of 7.3m wide single carriageway between Station Road to the south of the A827 and Ambridge Road to the north east of Ambridge village.

2.2 The scheme included the provision of 5 priority junctions and a roundabout at the A827 dual carriageway. The improvement also encompassed the provision of two lay-bys, the diversion of a footpath and the stopping up of Old Church Lane.

2.3 The scheme was subjected to a Stage 1 Road Safety Audit in June 2003, a Stage 2 Audit in November 2004 and a Stage 3 audit prior to opening in March 2006.

3 ANALYSIS OF ACCIDENTS

3.1 During the period 1st April 2006 to 31st March 2007 a total of 3 personal injury accidents were recorded throughout the 2.3km length of the scheme. The severity of all three accidents was slight.

3.2 The accident frequency on Ambridge bypass has been briefly compared with values predicted in the Design Manual for Roads and Bridges COBA manual. The COBA manual predicts an accident frequency of 3.48 accidents a year based on the Annual Average Daily Traffic (AADT) flow of 18500 vehicles in 2006.

3.3 All three accidents have occurred at different locations throughout the scheme. The location and a brief description of each accident has been included below:

- Accident Ref. 1 – A827 / A795 roundabout. Vehicle 1 from A827 fails to give way at roundabout and runs into vehicle 2.
- Accident Ref. 2 – N/bound approach to Old Church Lane. M/cycle loses control on a patch of oil.
- Accident Ref. 3 – S/bound lay-by north of Old Church Lane. Vehicle 2 travelling north waiting to turn right into lay-by struck in rear by vehicle 1.

3.4 Two of the accidents (references 2 and 3) occurred during the daytime in fine weather on a dry road surface. The remaining accident (reference 1) occurred during the daytime in a period of rain on a wet road surface.

4 TRAFFIC CONDITIONS

4.1 Traffic count data has been obtained from an Automatic Traffic Counter (ATC) located on the A795 north of Home Farm Lane. The ATC indicates that the traffic flows along the A795 are 18500 vehicles AADT in 2006.

4.2 No significant congestion has been recorded throughout the scheme in its first year of opening. However, some queuing has been observed on the A827 westbound approach to the A827/A795 roundabout during the am peak period.

5 CONCLUSIONS

5.1 A brief assessment of the 12-month accident history of the Ambridge Bypass has indicated that the accident frequency is lower than the predicted national average and no common factors or trends have been identified in the data. However, it has been noted that one of the three accidents that have occurred has resulted from a vehicle travelling northbound waiting to turn right into the southbound lay-by being struck from behind. This problem was raised in the Stage 2 Audit report, however there were difficulties in acquiring the land necessary to relocate the lay-by so an Exception Report was approved.

5.2 As this report considers only 12 months of accident data and no common factors or trends have been identified at this early stage no firm conclusions can be drawn from the accident information.

ANNEX G:

ILLUSTRATIVE REPORT

A795 AMBRIDGE BYPASS

ROAD SAFETY AUDIT STAGE 4
36 MONTH MONITORING REPORT

DLS PARTNERSHIP

May 2009

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CONTENTS

1 INTRODUCTION

1.1 Background to the study

1.1.1 This report results from the Road Safety Audit Stage 4 - 36 month monitoring carried out on the A795 Ambridge Bypass Scheme as part of DLS Partnership (Maintenance Division) maintenance agreement with the Highways Agency. The report has been produced as part of a routine accident monitoring / Road Safety Audit procedure and the terms of reference for this monitoring report are described in HD 19/03.

1.1.2 A site visit was conducted on Friday 8th May 2009, during which the weather was overcast and the road surface was dry.

1.2 Study purpose

1.2.1 The purpose of this study is as follows:

- to undertake an in-depth study of the accidents that have occurred on the scheme during the three years since opening;
- to identify any road accident problems;
- to suggest possible measures that would contribute to accident reduction on the scheme;
- to review the recommendations from the Road Safety Audit Reports at Stages 1 to 3 and the Exception Reports to identify if they had any effect on the scheme.

2 SCHEME DETAILS

2.1 Description of the scheme

2.1.1 The A795 Ambridge Bypass was completed in March 2006 and involved the provision of 2.3km of 7.3m wide single carriageway between Station Road to the south of the A827 and Ambridge Road to the north east of Ambridge village.

2.1.2 The scheme included the provision of 5 priority junctions and a roundabout at the A827 dual carriageway. The improvement also encompassed the provision of two lay-bys, the diversion of a footpath and the stopping up of Old Church Lane.

2.1.3 The road is subject to the national speed limit and with the exception of the A827 / A795 Bull Roundabout the scheme is unlit.

2.1.4 The scheme was subjected to a Stage 1 Road Safety Audit in June 2003, a Stage 2 Audit in November 2004, a Stage 3 Audit prior to opening in March 2006 and a Stage 4 12 month monitoring report in May 2007.

3 ANALYSIS OF ACCIDENTS

3.1.1 During the 36 month period between 1st April 2006 to 31st March 2009 a total of 11 personal injury accidents were recorded throughout the 2.3km length of the scheme. There have been 2 (18%) serious accidents and 9 (82%) accidents that were slight in severity. No accidents involving fatalities have been recorded during the 36 month period. These figures are generally consistent with national average values taken from the DfT publication "Road Accidents in Great Britain" (RAGB) which indicates that on major roads with a 60mph speed limit 4% of accidents were fatal, 21% were serious and 75% were slight in severity.

3.1.2 Stick diagrams for these accidents together with a breakdown of accident types are included in Appendix I.

3.1.3 Appendix II shows a plot of the location of each of the accidents. Generally this diagram shows that the accidents are evenly distributed throughout the scheme, however there is a cluster of 4 accidents at the A827/A795 roundabout and two accidents at the lay-by north of Old Church Lane.

3.1.4 The information contained in the accident data has been compared to national averages from the DfT publication "Road Accidents in Great Britain" (RAGB) and the "Design Manual for Roads and Bridges COBA manual" below and in Appendices III to V:

3.1.5 **Accident Frequency (see Appendix III)**

	Year (01/04/06 to 31/04/09)			Total
	2006/2007	2007/2008	2008/2009	
Number of Accidents	**3**	**3**	**5**	**11**

3.1.6 The above table indicates that there have been on average 3.67 personal injury accidents a year along the Ambridge bypass. The COBA manual predicts an accident frequency of 3.76 a year based on the year 2008 AADT traffic flow of 19000 vehicles.

3.1.7 **Accidents by Weather, Road Surface and Light Conditions (see Appendices IV & V)**

Weather Conditions	Ambridge Bypass		National Average (RAGB)	
	No. of Accidents	%	No. of Accidents	%
Fine	8	73%	40173	75%
Rain	3	27%	10568	20%
Snow	0	0%	338	1%
Fog	0	0%	580	1%
Unknown	0	0%	1726	3%
Total	**11**	**100%**	**53385**	**100%**

Road Surface Conditions	Ambridge Bypass		National Average (RAGB)	
	No. of Accidents	%	No. of Accidents	%
Dry	7	64%	27660	52%
Wet	4	36%	23301	44%
Snow/Ice	0	0%	1751	3%
Unknown	0	0%	673	1%
Total	**11**	**100%**	**53385**	**100%**

Light Conditions	Ambridge Bypass		National Average (RAGB)	
	No. of Accidents	%	No. of Accidents	%
Daylight	8	73%	38788	73%
Darkness	3	27%	14597	27%
Total	**11**	**100%**	**53385**	**100%**

3.1.8 The above tables indicate that the weather conditions, road surface conditions and lighting conditions recorded in the accident data for the Ambridge bypass are generally consistent with national averages for 2008. Statistical tests carried out for the weather, road surface and lighting condition information indicate that there are no significant differences between the site data recorded in the personal injury accident reports and national data.

3.1.9 **Accidents by Manoeuvre**

Manoeuvre	No. of Accidents	%
Loss of control	2	18%
Side impact – failed to give way	2	18%
Nose to tail shunt impact	4	36%
Side Impact - Changing lanes	2	18%
Car hit Pedestrian	1	9%
Total	**11**	**100%**

3.1.10 Further analysis of the accident types indicate that 1 of the nose to tail shunt accidents and 1 of the failure to give way accidents occurred on the A827 dual carriageway approach to the A827/A795 roundabout. In addition, 2 of the nose to tail impacts occurred at the lay-by north of Old Church Lane while a vehicle was waiting to turn right into the facility. Finally, 2 of the 4 accidents that have occurred at the A827 / A795 roundabout have involved cars leaving the roundabout crossing the path of pedal cyclists negotiating the circulatory carriageway.

4 TRAFFIC CONDITIONS

4.1 Traffic Flows

4.1.1 Traffic count data has been obtained from an Automatic Traffic Counter (ATC) located on the A795 north of Home Farm Lane. The ATC indicates that the traffic flows along the A795 in 2008 were 19,000 vehicles AADT. This compares to the AADT flow recorded in 2006 of 18,500 vehicles.

4.1.2 The daily flow profile suggests that the Ambridge bypass has pronounced peaks in both the AM and PM periods and the traffic volumes are tidal, the high volumes occur in the southbound direction in the AM period and in the northbound direction in the PM period.

4.2 Traffic Speeds

4.2.1 Traffic speeds were measured during January 2009 and the results are shown below:

Location of survey	Southbound		Northbound	
	85% ile speed (mph)	Speed range (mph)	85% ile speed (mph)	Speed range (mph)
100m South of Old Church Ln	52	41 - 65	51	41 – 62
100m North of Old Church Ln	54	44 - 66	55	40 - 66

4.2.2 The results show that speeds along the Ambridge Bypass are typical of those with a 60mph speed limit. A small proportion of drivers exceed the speed limit by more than 5mph.

4.2.3 No significant congestion has been recorded throughout the scheme. However, some queuing has been observed on the A827 westbound approach to the A827 / A795 roundabout during the am peak period. This congestion generally occurs between 08:30 and 09:00 in the morning on weekdays and extends for a length of approximately 15 vehicles in each lane.

5 STATEMENT OF SAFETY PROBLEMS ON THE AMBRIDGE BYPASS

5.1 Problems Identified

5.1.1 Although the accident rate along the Ambridge bypass is consistent with the national average for the type of road, this study has shown that there are a number of specific safety problems along the route:

- Two accidents on the A827 dual carriageway approach have involved drivers failing to appreciate the A827/A795 roundabout.
- Two accidents at the A827/A795 roundabout have involved car drivers exiting the junction across the path of cyclists.
- A cluster of two accidents have occurred at the lay-by north of Old Church Lane.

5.2 Review of Previous Road Safety Audit Reports and Exception Reports

5.2.1 None of the previous Road Safety Audits raised a specific problem in respect of either the potential for accidents involving drivers approaching from the A827 not appreciating the A827/A795 roundabout or for accidents involving car drivers exiting the junction across the path of cyclists. However, the potential for accidents involving vehicles turning right into the lay-by to the north of Old Church Lane was identified in the Stage 2 Road Safety Audit undertaken in November 2004.

5.2.2 The following problem and recommendation was raised in the Stage 2 Road Safety Audit report:

PROBLEM

Locations: D and E (drawing RSA/S2/001) – Lay-bys north of Old Church Lane.

Summary: Lay-by positions provide an increase risk of shunt and right turn accidents.

Drivers travelling north will reach the lay-by at location D on their right before the lay-by at location E on their left. Similarly vehicles travelling south will reach the lay-by at E on their right first. Since the lay-bys are not inter-visible and there are no advance signs drivers could be tempted to cross the carriageway to use the first lay-by that they reach. This problem would increase the number of right turning manoeuvres and therefore increase the potential for accidents between right turning vehicles and vehicles travelling ahead in the opposite direction. It could also increase the likelihood of shunt accidents involving vehicles running into the back of other vehicles waiting to turn right into the lay-by.

RECOMMENDATION

Reposition the lay-bys so that drivers encounter a lay-by on their nearside first. When relocating the lay-bys ensure that adequate visibility is provided for a driver both entering and leaving the facility. In addition, provide advance signing of both facilities.

5.2.3 The recommendation of repositioning the lay-bys was not implemented by the Project Sponsor as it would involve the costly acquisition of third party land and therefore an Exception Report was prepared by the Project Sponsor and approved by the Director. However, in mitigation, the design was amended to include the provision of signing of the lay-bys ½ mile in advance of each of the facilities.

6 OPTIONS FOR TREATMENT

6.1 Accidents Occurring on the A827 dual carriageway approach to the A827/A795 roundabout

6.1.1 Two of the accidents that have occurred on the A827 westbound approach to the roundabout appear to have involved a driver travelling too fast or not comprehending the junction layout ahead. A remedial measure option to reduce this problem would be to provide Transverse Yellow Bar markings on this approach. This road marking has been shown to have a significant effect in reducing accidents associated with inappropriate approach speeds.

6.1.2 Economic Assessment

The cost of providing Transverse Yellow Bar markings is estimated to be £4000. A study undertaken by the TRRL[(1)] has shown that this improvement could result in an overall reduction in speed related accidents in the order of 57% on fast dual carriageway approaches to junctions. However, the TRRL study does identify that the accident saving in relation to accidents occurring during the hours of darkness would be less. Therefore as one of the two accidents on the A827 westbound approach to the junction has been during the hours of darkness an accident saving of 25% has been assumed. Therefore this measure could provide a saving of 0.17 accidents per year, which is equivalent to £18,697 based on the national average cost of £109,983 for an injury accident (including an allowance for damage only accidents) taken from Highways Economic Note No. 1 (HEN1).

6.1.5 The First Year Rate of Return (FYRR) for this improvement is estimated at 467%.

6.2 Accidents Involving Cyclists at the A827/A795 roundabout

6.2.1 Two of the four accidents that have occurred at this junction have involved car drivers leaving the roundabout across the path of cyclists negotiating the circulatory carriageway. Site observations have indicated that numerous cyclists use the roundabout to access the Westlee Dairy from the residential areas to the west and south. It is therefore recommended that a segregated off-road route is provided around the junction to assist these vulnerable road users.

6.2.2 Economic Assessment

The estimated cost of providing a segregated cycle track/footpath around the junction would be £60,000. Both the Department for Transport publication "A Road Safety Good Practice Guide"[(2)] and the MOLASSES[(3)] database indicate that cycle schemes have produced a 58% reduction of injury accidents overall. As some cyclists will continue to use the circulatory carriageway it is estimated that this improvement could save 50% of the accidents involving cyclists coming into conflict with motorised vehicles on the carriageway. Therefore this measure could provide a saving of 0.33 accidents per year, which is equivalent to £36,294 based on the national average cost of £109,983 for an injury accident (including an allowance for damage only accidents) taken from HEN1.

(1) Transport Research and Road Laboratory Report LR 1010 "Yellow bar experimental carriageway markings – accident study"
(2) A Road Safety Good Practice Guide, First Edition: Department for Transport, June 2001
(3) Monitoring Of Local Authority Safety Schemes, County Surveyors' Society & Highways Agency

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6.2.3 The First Year Rate of Return (FYRR) for this improvement is estimated at 60%.

6.3 Accidents Occurring at the Lay-by

6.3.1 The accident data indicates that there have been 2 accidents involving northbound vehicles waiting to turn into the lay-by north of Old Church Lane. The potential for this type of accident was identified in the Stage 2 Road Safety Audit Report. As highlighted in Section 5.2 above the Project Sponsor was unable to implement the full recommendations as included in the Audit Report due to problems with land ownership. However the design did include the provision of signing of the lay-bys ½ mile in advance of each of the facilities.

6.3.2 It is considered that on both approaches to the lay-bys some drivers may mistake the lay-by on the other side of the road as the facility signed at ½ mile. Therefore it is recommended that a second advance sign is placed on the opposite side of the road to each lay-by informing drivers of the distance to the lay-by on their side of the road.

6.3.3 Economic Assessment:

The cost of providing the two extra signs is estimated to be £500. It is estimated that this improvement could save 10% of the accidents involving vehicles turning right into the lay-bys. This saving equates to a reduction in 0.07 accidents per year, which in turn is equal to a saving of £7,699 based on the national average cost of £109,983 for an injury accident (including an allowance for damage only accidents) taken from HEN1.

6.2.4 The First Year Rate of Return (FYRR) for this improvement is estimated at 1539%.

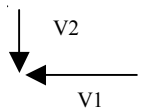
7 CONCLUSIONS

7.1.1 An analysis carried out on the 3-year period 1 April 2006 to 31 March 2009 has revealed a total of 11 reported personal injury accidents.

7.1.2 The study has shown that there are a number of specific safety problems on the route and that there are several options for treatment. As all the measures considered give a high First Year Rate of Return it is recommended that all are considered for implementation.

APPENDICES

Appendix I – Accident Record 1st April 2006 to 31st March 2009

Reference:	1	2	3	4	5	6	7	8	9	10	11
Accident No.	T39195	T12495	T56395	T32196	T22396	T34596	T43196	T55296	T11297	T37897	T56797
Year	2006	2006	2007	2007	2007	2008	2008	2008	2008	2009	2009
Month	June	October	January	May	July	March	June	November	December	January	March
Date	8	25	19	14	1	19	10	12	12	11	25
Day	Thursday	Wednesday	Friday	Monday	Sunday	Wednesday	Tuesday	Wednesday	Friday	Sunday	Wednesday
Time	10:40:00	09:10:00	13:15:00	19:25:00	16:10:00	12:15:00	15:15:00	21:20:00	16:45:00	11:15:00	17:00:00
Severity	Slight	Slight	Slight	Slight	Serious	Slight	Slight	Slight	Serious	Slight	Slight
Dark/Light	Light	Light	Light	Dark	Light	Light	Light	Dark	Dark	Light	Light
Weather	Rain	Fine	Fine	Rain	Fine	Fine	Rain	Fine	Fine	Fine	Fine
Road Surface	Wet	Dry	Dry	Wet	Dry	Wet	Wet	Dry	Dry	Dry	Dry
No. Vehicles	2	1	2	2	2	1	2	1	2	2	2
Vehicle 1	Car	M/C	Car	M/C	P/C	Car	Car	Car	Car	Car	P/C
Vehicle 2	Van		Car	Car	Car		Van		Van	Car	Car
Vehicle 3											
No. Casualties	1	1	2	1	1	1	1	1	2	1	1
Casualty 1	Driver V1 Male 25	Rider V1 Male 34	Passenger V2 Female 54	Rider V1 Male 27	Rider V1 Male 54	Passenger V2 Female 65	Driver V2 Male 32	Pedestrian V1 Male 22	Driver V1 Male 23	Driver V1 Male 72	Rider V1 Female 48
Casualty 2			Driver V1 Male 43						Driver V2 Male 44		
Causation	Veh 1 failed to give way and pulled out across path of veh. 2	Rider lost control of machine on oil patch	Veh. 2 waiting to turn right into Lay-by, veh 1 skids into rear	Veh 2 turns right out from junction in path of motorcycle	V2 exits rbt to A795 across path of P/C V1 negotiating cir/cway	Veh. 1 lost control – distracted by passenger	Veh. 1 skids into rear of Veh. 2 turning right into lay-by	Ped. drunk in road hit by car	Veh 1 runs into the back of Veh 2 on approach to junction	Veh 1 runs into the back of Veh 2 on approach to junction	V2 exits rbt to A827 across path of P/C V1 negotiating cir/cway
Manoeuvre											
Location	A827/A795 Rbt	N/B approach to Old Church Lane	S/B lay-by north of Old Church Lane	A795/Home Farm Road Junction	A827/A795 Rbt	South of Home Farm Road	S/B lay-by north of Old Church Lane	South of Station Road	A827/A795 Rbt	A795 Ambridge Rd junction	A827/A795 Rbt

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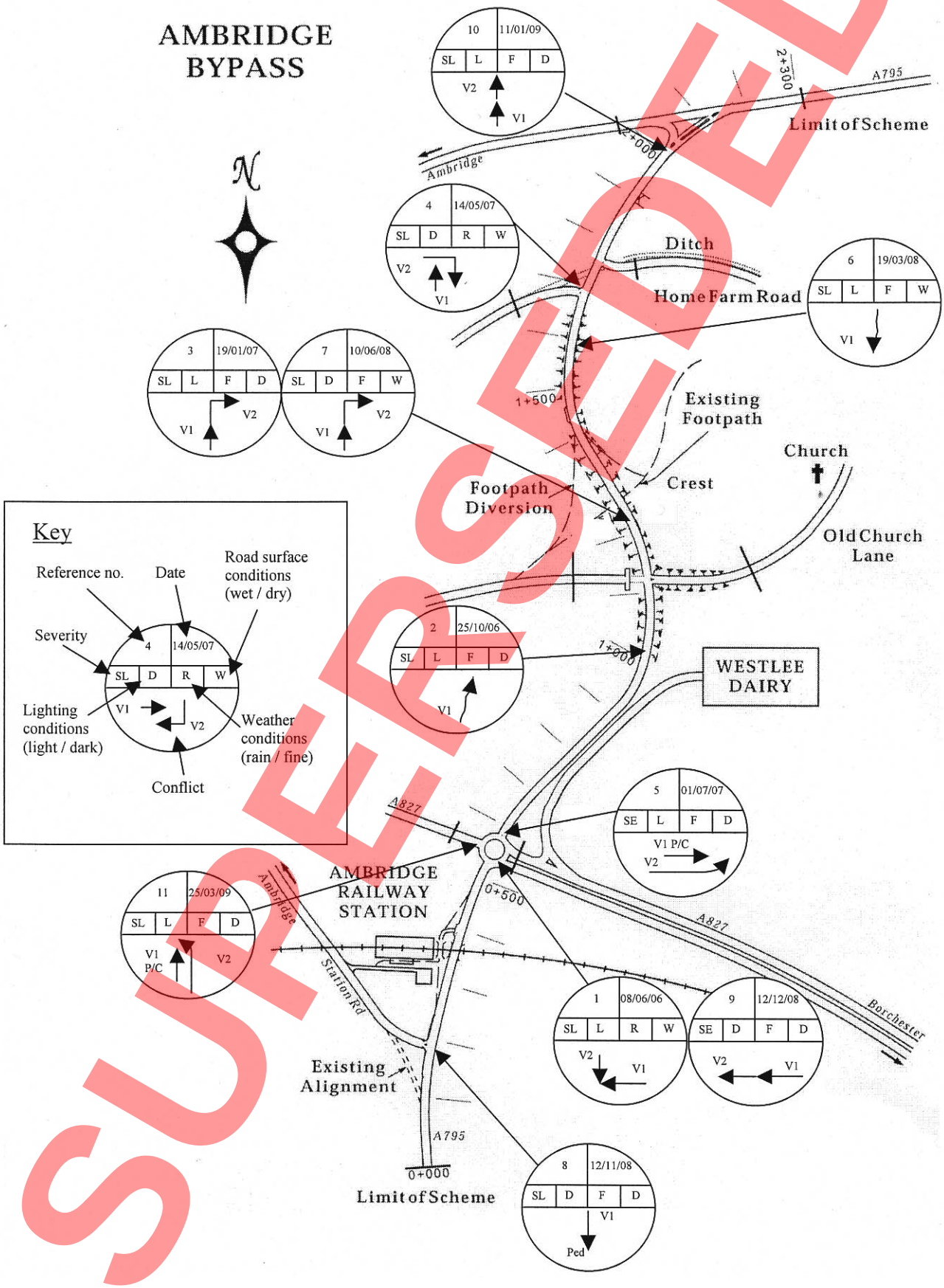
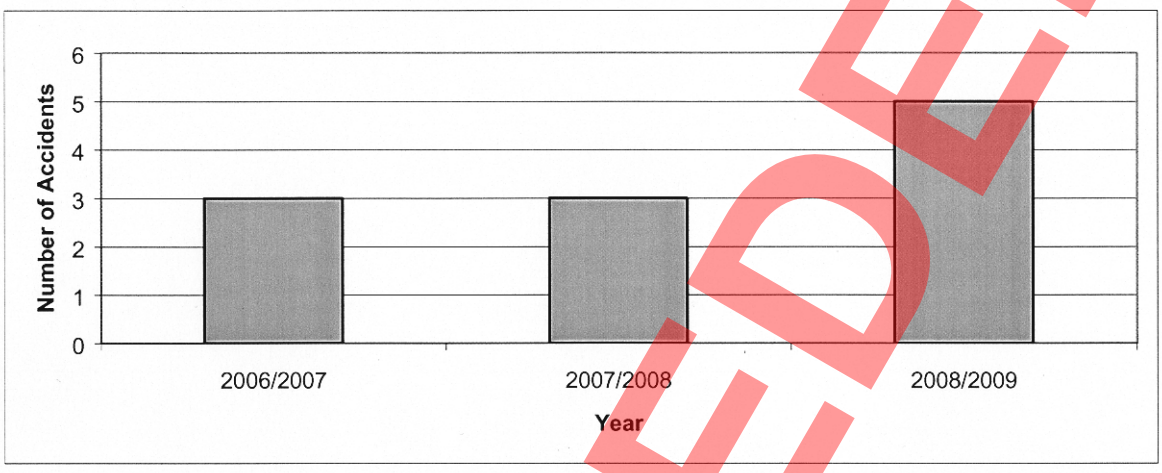
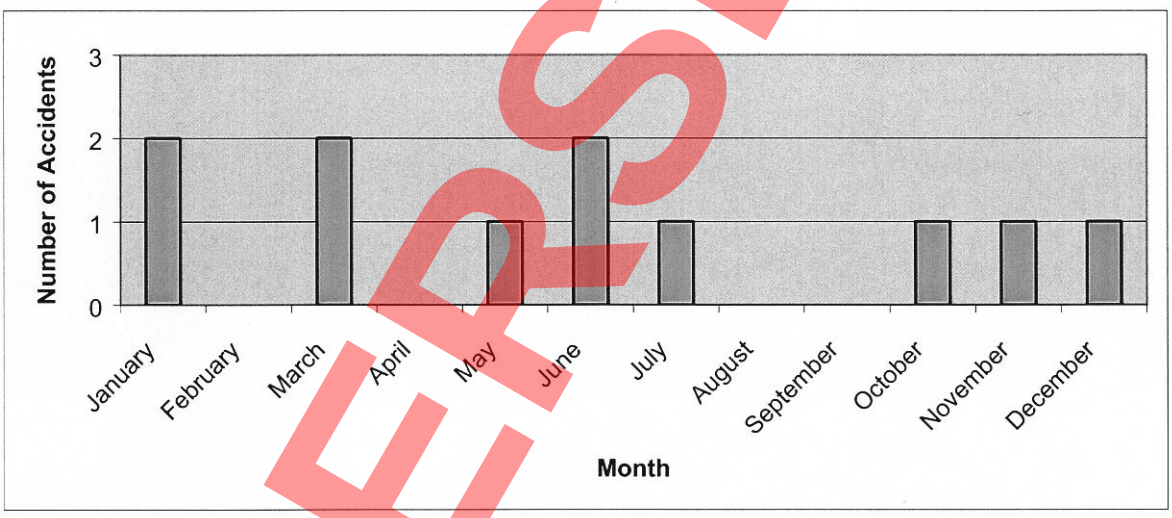
Appendix II – Accident Plot 1st April 2006 to 31st March 2009

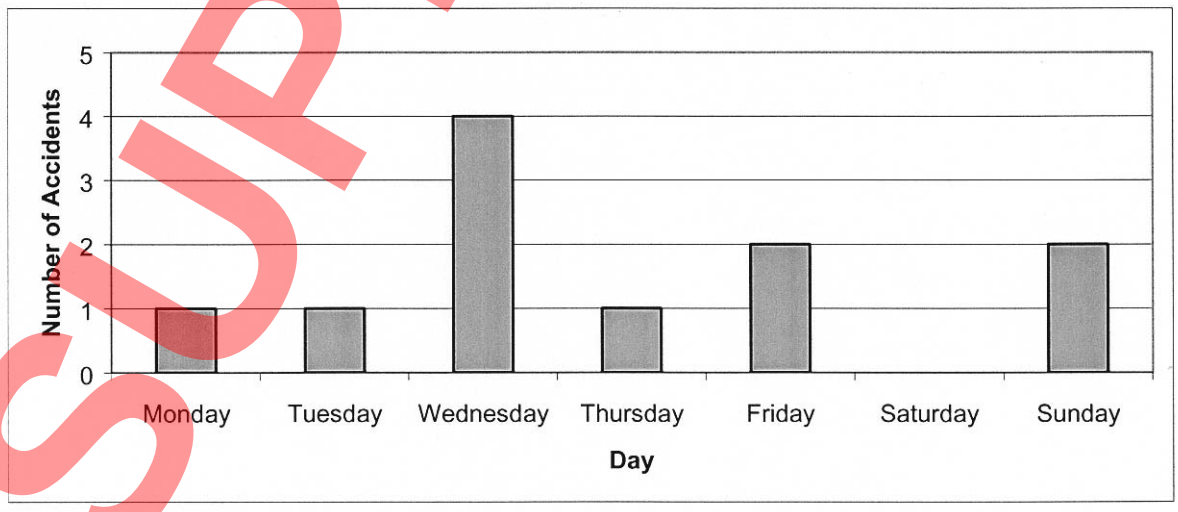


Appendix III - Accident Frequency by Year, Month & Day of Week

Ambridge Bypass from 01/04/2006 to 31/03/2009

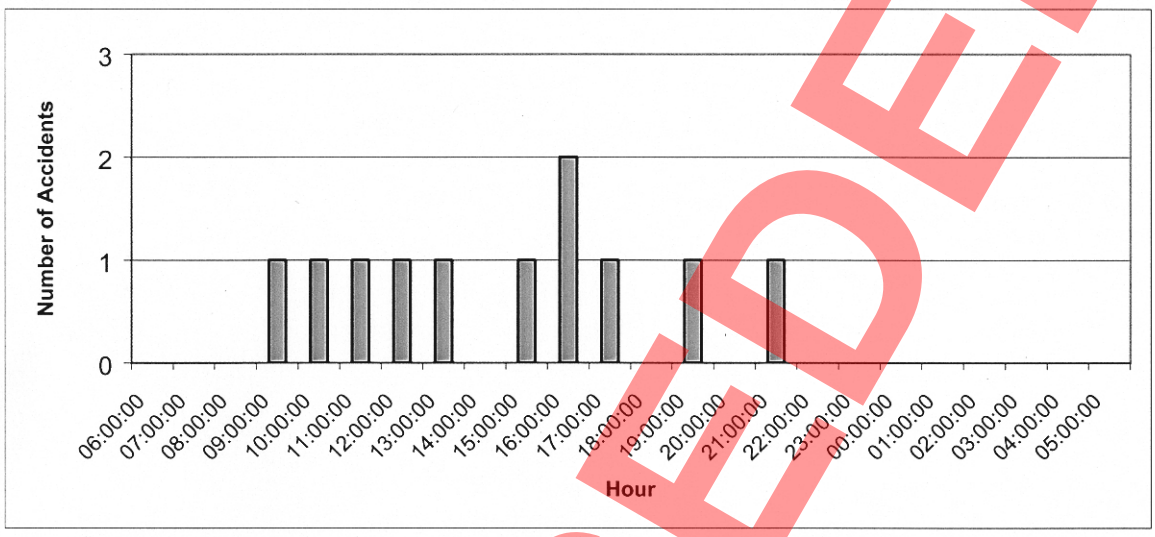


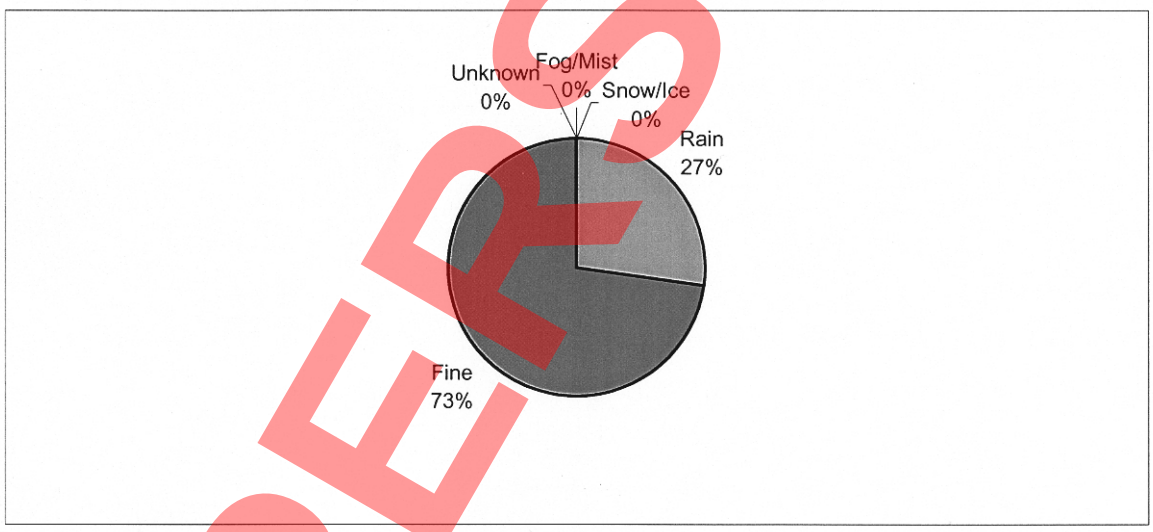


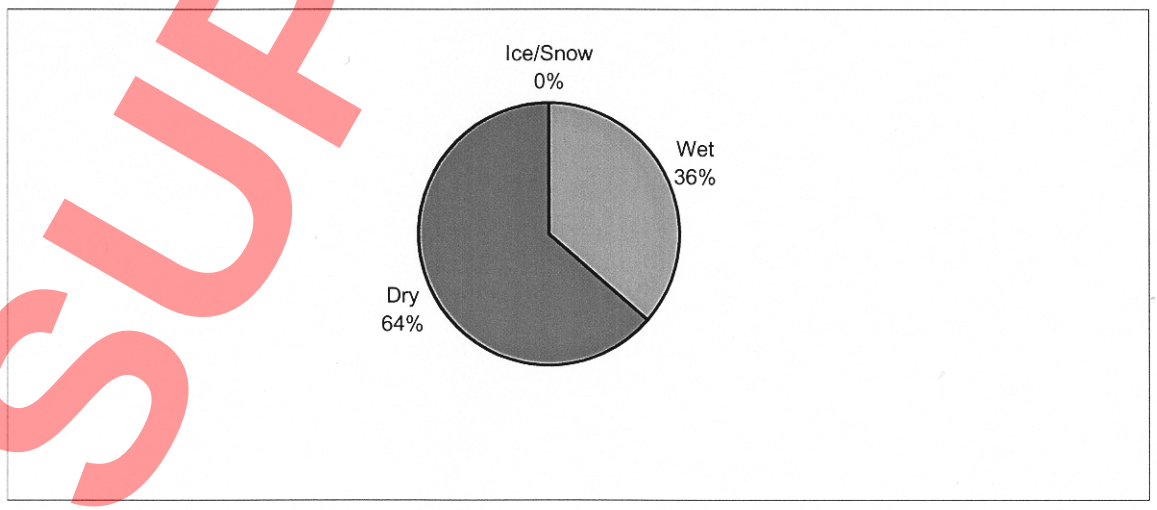


Appendix IV - Accident Frequency by Hour of the Day, Weather Conditions & Road Surface Conditions

Ambridge Bypass from 01/04/2006 to 31/03/2009







Appendix V - Accident by Light Conditions

Ambridge Bypass from 01/04/2006 to 31/03/2009