



ROAD SAFETY AUDIT IMPLEMENTATION PLAN

Alberta Transportation

March 2004

Prepared by:

Geoffrey Ho, M.Eng., P.Eng.
Julian Rozental, P.Eng. (BC)

G. Ho Engineering Consultants

TABLE OF CONTENT

SYNOPSIS OF THE ROAD SAFETY AUDIT IMPLEMENTATION PLAN

1.	INTRODUCTION	1
2.	APPROACH	2
2.1	TASK 1: COLLECT AND REVIEW INFORMATION	
2.2	TASK 2: STAKEHOLDER CONSULTATION	
2.3	TASK 3: PREPARE AND RECOMMEND AN IMPLEMENTATION PLAN (CURRENT DOCUMENT)	
2.4	TASK 4: ALBERTA TRANSPORTATION ROAD SAFETY AUDIT PROCEDURE GUIDE (PENDING)	
3.	ROAD SAFETY TOOLS	4
3.1.	BACKGROUND TO ROAD SAFETY AUDITS	
3.2.	ROAD SAFETY AUDITS	
	3.2.1 Typical Road Safety Audit Stages	
	3.2.2 In-service Road Safety Audits	
3.3	Alberta Transportation Engineering Assessments	
3.4	Summary	
4.	DEVELOPMENT OF THE IMPLEMENTATION PLAN	10
4.1	WHEN TO CONDUCT ROAD SAFETY AUDITS?	
4.2	ALBERTA TRANSPORTATION ENGINEERING PROCESSES	
4.3	RECOMMENDED STAGES FOR ROAD SAFETY AUDITS	
4.4	SUMMARY OF THE RECOMMENDATIONS	
4.5	WHAT PROJECTS SHOULD BE AUDITED?	
4.6	CONCLUSIONS	
4.7	WHERE ARE ROAD SAFETY AUDITS MOST VALUABLE?	
4.8	COST-SHARED PROJECTS	
	4.8.1 COST-SHARED PROJECTS WITH THE FEDERAL GOVERNMENT	
	4.8.2 COST-SHARED PROJECTS WITH LOCAL GOVERNMENTS	
5.	WHO SHOULD CONDUCT THE ROAD SAFETY AUDITS?	25
5.1	INTERNAL VERSUS EXTERNAL ROAD SAFETY AUDIT TEAM	
5.2	EXTERNAL RESOURCES	
5.3	ROAD SAFETY AUDIT TEAM CREDENTIALS	
5.4	RETAINING THE SERVICES OF A ROAD SAFETY AUDIT TEAM	

6.	HOW TO UNDERTAKE ROAD SAFETY AUDITS	27
7.	PILOT PROGRAM	28
7.1	PROPOSED PILOT RSA PROGRAM PROCESS	
7.2	RSA COMMITTEE AND COORDINATOR	
7.3	RSA TRAINING	
7.4	NUMBER AND TYPE OF PROJECTS	
7.5	SCHEDULE	

APPENDIX A - List Of Attendees, Stakeholder Meeting April 25, 2003

APPENDIX B – Complementary Safety Tools

APPENDIX C – RSA and Design-Build Delivery Method

LIST OF TABLES

Table 1	Road Safety Audit Stage Equivalency Table	5
Table 2	Highlight of Potential Safety Issues at Various Road Safety Audit Stages	7
Table 3	Summary of Recommended Road Safety Audit Stages for Project Types and Locations	23

LIST OF FIGURES

Figure 1	Highway Engineering Process and Project Life Cycle	11
Figure 2	Functional Planning Process and Recommended Road Safety Input/Audits	13
Figure 3	Recommended Road Safety Audit Requirements for Functional Plans Completed in or Prior to 2003	14
Figure 4	Recommended Road Safety Audit Stages	17

SYNOPSIS OF THE ROAD SAFETY AUDIT IMPLEMENTATION PLAN

Background

Alberta Transportation has set its goal to undertake Road Safety Audits (RSA) on road transportation projects at the planning and design stages. This initiative was formalized in Alberta Transportation's business plan and goals tabled through the Legislative Council under "Core Business Objective One: *Manage Transportation Safety Programs*; Goal 2: *Enhance safety through highway system improvements*". In its statement to the Council, Alberta Transportation proposes to "*undertake safety audits at the planning and design stage to ensure overall integration of geometrics, traffic signals, pavement markings and other specialties*"

The Canadian Road Safety Audit Guide published by the Transportation Association of Canada defines a road safety audit as follows:

A road safety audit is a formal and independent safety performance review of a road transportation project by an experienced team of safety specialists, addressing the safety of all road users.

An Implementation Plan to deliver road safety audits in accordance with Alberta Transportation's goals and objectives was developed. This Implementation Plan provides guidelines as to the **type of projects** most likely to benefit from safety audits, the most appropriate **geographical location** of these projects, at **what stages** to conduct the audits, **who should be conducting** the audits and **how to manage** the road safety audit process.

The following tasks were undertaken in developing the Road Safety Audit Implementation Plan:

- Task 1: Collect and Review Information
- Task 2: Stakeholder Consultation
- Task 3: Prepare and Recommend an Implementation Plan (current document)
- Task 4: Alberta Transportation Road Safety Audit Procedure Guide

Road Safety Audit Stage

The road safety audit stages described in the TAC Canadian Road Safety Audit Guide include planning, preliminary design, detailed design, construction and pre-opening. It is proposed that Alberta Transportation uses unique RSA terminology for various audit stages to avoid confusion with its engineering process. The road safety audit stages as defined by the TAC Guide and the Alberta Transportation equivalent are summarized in

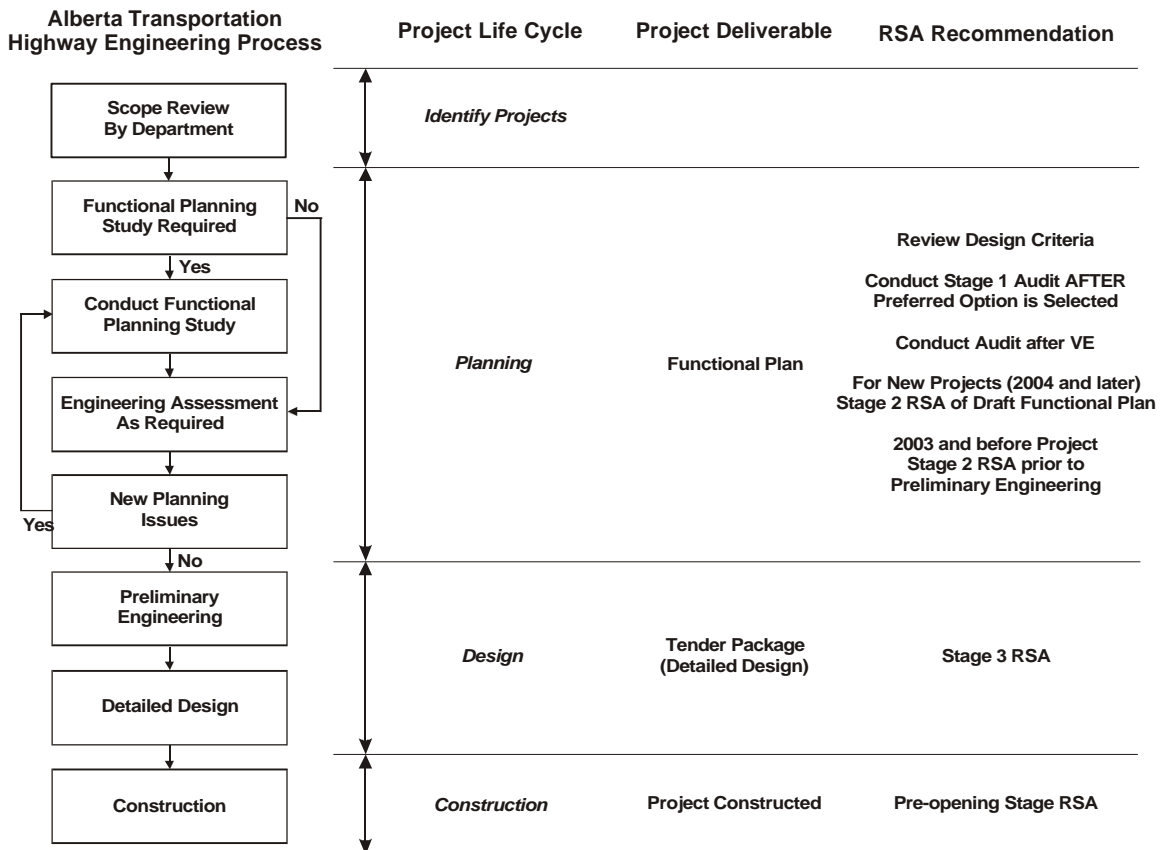
Table S-1. Through consultation with the stakeholders, it was determined that the in-service road safety audit stage would not be undertaken by Alberta Transportation.

Table S-1 Road Safety Audit Stage Equivalency Table

TAC Canadian RSA Guide Terminology	Alberta Transportation Equivalent
Planning Stage RSA	Stage 1 RSA
Preliminary Design Stage RSA	Stage 2 RSA
Detailed Design Stage RSA	Stage 3 RSA
Pre-opening Stage RSA	Pre-opening Stage RSA

The Implementation Plan incorporates road safety audits at the appropriate stages for various engineering processes, focusing on the traditional delivery method involving design, tender and construction. The recommended Road Safety Audit Stages are summarized in **Figure S-1**.

FIGURE S-1 Recommended Road Safety Audit Stages



Project Type and Location

The various types of projects and the level of safety input desirable and associated with each type were reviewed and evaluated based on whether road safety audits would be cost-effective and suitable for the type of projects. During the stakeholders consultation and in subsequent meeting with Alberta Transportation staff, it became evident that a **Pilot Program** would be desirable to address issues that may be raised in the initial implementation. Further, it is noted that some project types discussed in the Plan are not clear candidates for road safety audits and their inclusion in a Pilot Program will provide a more definitive answer. The recommendations of the Implementation Plan include:

Project Type

- 3R/4R projects, Bridge Replacement, Bridge (stand-alone projects), Culvert Replacement (stand-alone projects), Grading (stage 2), and Site Development projects are recommended as candidates for the Pilot Programs.
- Road safety audits are recommended for all interchange, intersection improvements, widening, reconstruction and realignment projects.

Project Location

- Road safety audits are recommended for all urban projects that involve widening, interchange/intersection, bridge, development, the North-South Trade Corridor and the Edmonton/Calgary Ring Roads projects.
- Road safety audits are recommended for all rural projects that include interchange, bridge and major reconstruction & realignment projects.
- It is recommended that Alberta Transportation consider designating all major routes (e.g. routes with AADT greater than 10,000 vpd) to have mandatory road safety audits conducted regardless of the project type of location.

Cost-Shared Projects

- Road safety audits are recommended for projects funded by the Federal Government regardless of project type when required by Transport Canada. Road safety audits are suggested for cost-shared projects with local governments. It is suggested that a capital threshold be used to determine whether RSA's are required (e.g. Alberta Transportation share greater than \$1,000,000). Alberta Transportation may wish to conduct consultation with the AUMA and AAMD&C for their input.

Road Safety Audit Team Requirements

Alberta Transportation should make it mandatory to have a RSA Team composed of a minimum of two persons. It is recommended that Alberta Transportation follows the road safety audit team composition and skills as described in the TAC Canadian Road Safety Audit Guide. As well, the following RSA Team credentials are desirable:

Appropriate experience for road safety auditors includes:

- *Successfully completed a recognized safety audit training course, of at least 2 days duration;*
- *At least 5 years experience in a relevant road safety, road design, or traffic engineering field (this is a minimum and team leaders for audits of more complicated projects should have significantly more road safety experience); and*
- *Kept their road safety audit experience current by undertaking at least one audit per year.*

To be designated as the Team Leader, an individual has to also satisfy the following:

- *Undertaken at least five formal road safety audits in the past three years, including at least three audits conducted at design stages.*

It is recommended that the road safety audit team be retained by the design consultant responsible for the project as an independent team. No members of the team should be involved in the planning and design of the project.

Undertaking the Road Safety Audit

The road safety audits should be conducted following the procedures outlined in the Canadian Road Safety Audit Guide published by the Transportation Association of Canada. The Canadian Road Safety Audit Guide provides details of how to conduct a road safety audit at various stages.

Alberta Transportation Road Safety Audit Pilot Program

The Pilot Program was developed to address the various issues outlined in the Implementation Plan to collect meaningful experience and data about road safety audits for certain types of projects. As well, the program was developed to fine-tune the general RSA process into a process that would fit into Alberta Transportation's other process without significantly changing them.

PROPOSED PILOT RSA PROGRAM PROCESS

1. Achieve endorsement of Implementation Plan by management
2. Prepare Draft Alberta Transportation RSA Procedure Guide
3. Select RSA Committee and RSA Coordinator
4. Provide RSA training to regional construction teams
5. Select pilot projects to be audited
6. Conduct pilot audits
7. Monitor progress and collect results (Road Safety Audit reports and the corresponding response reports)
8. Evaluate results of pilot projects and finalize Alberta Transportation RSA Procedure Guide

A RSA Committee should be established to oversee the Pilot Program and a RSA Coordinator should be appointed. The chair of the committee should be the RSA coordinator who will work with the RSA Committee to coordinate the various activities of the pilot program. The Regions will manage the delivery of the road safety audit process, including the preparation of Requests for Proposals (RFP), sign off on the road safety audit report and the response report, and the implementation of the accepted changes.

Before embarking on the auditing of various projects, a core group of Alberta Transportation staff should be trained to familiarize with the general RSA process and techniques. The training would provide Alberta Transportation with knowledgeable staff in managing road safety audits. Regional staff involved in project management and construction should be trained.

Pilot Projects

It is suggested that approximately 15 projects be selected for the Pilot Program to obtain meaningful experience and data for evaluation. Previous road safety audits conducted on an ad-hoc basis could be included as part of the Pilot Program if appropriate.

The time period for the Pilot Program is expected to be ten months. Assuming a start in January 2004, the pilot program is expected to be substantially completed by December 2004.

It was estimated that Alberta Transportation should budget between \$360,000 (lower range using \$10,000 per project) and \$800,000 (upper range using \$50,000 per project) for the one-year Pilot Program. It is recommended that funding be allocated for the Pilot Program only. Once the Pilot Program is completed, the cost for audits should be included in project funding.

1. INTRODUCTION

Alberta Transportation has set its goal to undertake Road Safety Audits (RSA) on road transportation projects at the planning and design stages. This initiative was formalized in Alberta Transportation's business plan and goals tabled through the Legislative Council under "Core Business Objective One: *Manage Transportation Safety Programs*; Goal 2: *Enhance safety through highway system improvements*". In its statement to the Council, Alberta Transportation proposes to "*undertake safety audits at the planning and design stage to ensure overall integration of geometrics, traffic signals, pavement markings and other specialties*"

This new initiative supplements Alberta Transportation's engineering practices already in place to address operational and safety concerns on the existing road network. These engineering practices are part of a systematic process integral to the Province's efforts to improve and preserve the integrity of the highway network.

With the newly established initiative to undertake road safety audits on transportation projects at the planning and design stages, Alberta Transportation has moved forward onto a more holistic approach towards road safety. Conducting road safety audits at the planning and design stages ensures that road safety is proactively addressed and considered before projects are constructed, i.e. early in the project life cycle.

To this end, Alberta Transportation has requested G. Ho Engineering Consultants to develop and recommend an Implementation Plan to effectively and efficiently deliver road safety audits in accordance with Alberta Transportation's goals and objectives. This Implementation Plan provides guidelines as to the ***type of projects*** most likely to benefit from safety audits, the most appropriate ***geographical location*** of these projects, at ***what stages*** to conduct the audits, ***who should be conducting*** the audits and ***how to manage*** the road safety audit process.

This report summarizes the activities undertaken and recommends an Implementation Plan.

2. APPROACH

The following tasks were undertaken in developing the Road Safety Audit Implementation Plan:

2.1 TASK 1: COLLECT AND REVIEW INFORMATION

Relevant information, including various Alberta Transportation guidelines, sample planning and design reports as well as documents obtained from the Alberta Transportation website were reviewed. The review focused on:

- a. the Alberta Transportation organizational structure and administration, the inter-relationship between Headquarters and regions, project delivery methods, etc.; and,
- b. the Alberta Transportation engineering practices, including review of various safety practice and programs for further integration.
- c. current Alberta Transportation highway planning and design processes, to determine the most appropriate stages in these processes when road safety audits could be included.

2.2 TASK 2: STAKEHOLDER CONSULTATION

A one-day road safety audit presentation to Alberta Transportation staff was conducted on April 25, 2003 for consultation purpose. The presentation was open to a wide spectrum of audience, including programming, planning, design, traffic, project management, and operations staff. The presentation provided opportunities for staff to gain an understanding of RSA as well as raising potential issues that should be addressed by the Implementation Plan. The key issues identified in the consultation process were summarized and incorporated in the Implementation Plan. A list of the attendees at the stakeholder consultation is included in **Appendix A**.

A progress meeting was held with key Alberta Transportation staff on May 13, 2003 to solicit additional input in the development of the Implementation Plan.

2.3 TASK 3: PREPARE AND RECOMMEND AN IMPLEMENTATION PLAN (CURRENT DOCUMENT)

Based on findings of Tasks 1 and 2, the Implementation Plan was developed to provide guidelines on deciding what projects, where, when, who and how to undertake road safety audits.

2.4 TASK 4: ALBERTA TRANSPORTATION ROAD SAFETY AUDIT PROCEDURE GUIDE

Following the approval of the Implementation Plan, a Road Safety Audit Procedure Guide will be prepared for staff reference. This document will constitute the guidelines for Alberta Transportation in conducting road safety audits. The Guide will be prepared based on the accepted recommendations of the Implementation Plan.

3. ROAD SAFETY TOOLS

3.1. BACKGROUND TO ROAD SAFETY AUDITS

The Road Safety Audit (RSA) is one of the modern tools available to safety practitioners that can assist in evaluating road safety at various stages of a project. A road safety audit is a process for systematically checking the safety of road transportation projects, based on sound road safety engineering principles and undertaken from the road users' perspectives. A road safety audit provides an independent assessment of the "anticipated" safety performance of a road transportation project at predetermined intervals by road safety specialists.

Other road safety tools including design criteria reviews, design consistency reviews and in-service road safety reviews, and a more detailed description for each is provided in **Appendix B**. In context, it should be noted that RSA's are not a solution looking for a problem. The remaining sections are dedicated to the Road Safety Audits, as well as to the safety activities currently undertaken by Alberta Transportation.

3.2. ROAD SAFETY AUDITS

The Canadian Road Safety Audit Guide published by the Transportation Association of Canada defines a road safety audit as follows:

A road safety audit is a formal and independent safety performance review of a road transportation project by an experienced team of safety specialists, addressing the safety of all road users.

The objectives of a road safety audit are to:

- minimize the frequency and severity of preventable collisions;
- consider the safety of all road users, including vulnerable road users;
- ensure that collision mitigation measures that may eliminate or reduce the identified safety problems are considered fully; and to,
- minimize potentially negative safety impacts outside the project limits, i.e. to avoid introducing collisions elsewhere along the route or on the network.

The road safety audit is not a complete solution to the road safety problem. It does not replace other road safety strategies that road agencies may be undertaking. It is an additional tool that road authorities can use to further reduce the frequency and severity of collisions. A road safety audit is not an opportunity to redesign a project or evaluate different options, nor a check for adherence to design guidelines. It should be noted that the project design team remains ultimately responsible for the design.

Road safety audits are best suited to explicitly address road safety issues during the project planning and design stages. During the planning and design stages, road safety issues can be addressed before the infrastructure is built, and has proven to be more cost-effective than addressing collisions after they occur.

3.2.1 Typical Road Safety Audit Stages

The road safety audit stages described in the TAC Canadian Road Safety Audit Guide include planning, preliminary design, detailed design, construction and pre-opening. It is proposed that Alberta Transportation uses unique RSA terminology for various audit stages to avoid confusion with its engineering process. The road safety audit stages as defined by the TAC Guide and the Alberta Transportation equivalent are summarized in **Table 1**. In-service road safety audits are discussed in a separate section.

Table 1 Road Safety Audit Stage Equivalency Table

TAC Canadian RSA Guide Terminology	Alberta Transportation Equivalent
Planning Stage RSA	Stage 1 RSA
Preliminary Design Stage RSA	Stage 2 RSA
Detailed Design Stage RSA	Stage 3 RSA
Pre-opening Stage RSA	Pre-opening Stage RSA

An outline for each of the road safety audit stages is provided as follows:

STAGE 1 (PLANNING STAGE) AUDIT

At this stage the audit team would review the fundamental design elements related to alignment, laning, facility classification, access management concept, project limits, design speed and design criteria.

STAGE 2 (PRELIMINARY DESIGN STAGE) AUDIT

At this stage the audit team would review the design elements that can still be changed, such as cross-section dimensions, interchange/intersection layout, traffic operations, access, drainage, clear zones and the interaction of road users.

STAGE 3 (DETAILED DESIGN STAGE) AUDIT

This audit would be undertaken just prior to the submission of the final design plans. This will provide an opportunity to address any remaining issues from the previous audits and to correct, if necessary, prior to construction.

PRE-OPENING STAGE AUDIT

The objective of this stage is to ensure that the results of the design and the design audits were correctly implemented. The focus is on the implementation details such as signing, paintmarkings and delineation, visual impacts and connectivity with existing infrastructure.

Table 2 provides an illustrative summary of the type of issues that could be raised during the various road safety audit stages.

Table 2 Highlight of Potential Safety Issues at Various Road Safety Audit Stages

	Stage 1 (Planning)	Stage 2 (Prelim. Design)	Stage 3 (Detailed Design)	Pre-Opening Stage
Potential Safety Issues	Design Criteria	Design volume and traffic characteristics	Action taken as a result of previous audit	Action taken as a result of 90%-100% Design Audit
	Design Consistency	Design Speeds and Speed Limits	Road, Intersection, and Interchange Design Details	Intersection/Interchange Details
	Project Scope, function and traffic mix	Typical Cross Sections and Variations	Alignment Details	Alignment Details
	Route choice	Horizontal and vertical alignment	Signing and Pavement Markings	Signs and Pavement Markings Placement and Visibility
	Access management & Adjacent Developments	Visibility and Sight Distance	Shoulder Treatments, Clear zones, Roadside Features	Shoulder Treatments, Clear zones, Roadside Features
	Continuity with existing network	Vulnerable Road Users	Channelization	Access Management and Control
	Design speed, volume & traffic characteristics	Lighting	Lighting and Drainage	Lighting (night visit), Drainage
	Interchange/ Intersection Layouts & Traffic Controls	Drainage	Bridges and Culverts Treatment	Bridges and Culverts Treatment
	Interchange/ intersection Spacing	Shoulders & Clear Zone	Bridges and Culverts Treatment	Traffic Signals and Control
	Tie-ins with existing network	Driver Expectancy	Traffic Signals and Control	Vulnerable Road Users
	Deviation from Design Domains	Interaction with Road Users	Vulnerable Road Users	Roadside Hazards
	Future Works and Wider Network Effects	Signs	Barriers, Guard Rails, Utility Poles, and Obstructions	Street Furniture and Landscaping
	Environmental Constraints	Environmental Constraints	Street Furniture and Landscaping	

3.2.2 In-service Road Safety Audits

In-service road safety audits are a sub-set, and can be considered a distinct stage of the road safety audit; they are conducted on roads in-service, and are proactive in nature compared to in-service road safety reviews. They share similar methodologies and approach with the planning and design RSAs. Thus, an in-service road safety audit aims to identify potential safety hazards that may or may not have caused collisions. Potential countermeasures are also suggested to mitigate the potential safety hazards at the conceptual level. Further, in-service audits do not typically involve any economic evaluation of the proposed countermeasures.

Experience in the United Kingdom and Australia has indicated that in-service road safety audits are best conducted to complement a high collision location program, rather than being conducted as a separate program for better economic return. In-service road safety audits are most beneficial for jurisdictions where collision records are either not kept or difficult to obtain.

Therefore, in-service road safety audits may be considered as a complement to an existing program treating locations with high collision experience.

Through consultation with the stakeholders, it was determined that the **in-service road safety audit stage would not be undertaken by Alberta Transportation** as a matter of course. However, certain elements such as a more in-depth review of human factors and positive guidance as opposed to geometrics and standards only, may be used as part of the current Engineering Assessment process described below.

3.3 Alberta Transportation Engineering Assessments

Alberta Transportation conducts engineering assessments on facilities three to five years in advance of rehabilitation or construction. A number of engineering assessments that may address existing safety issues include:

- Safety Assessment
- Geometric Assessment
- Railway Crossing Assessment
- Bridge Assessment

The above-mentioned assessments are detailed engineering assessments undertaken by Alberta Transportation on a systematic and annual basis.

The **Safety Assessment** methodology is similar to that of an in-service road safety review, and is conducted to address operational safety problems at particular locations identified by the province, the public, municipal staff, etc.

Geometric Assessments are conducted to address network issues which involve pavement rehabilitation and/or geometric improvements on existing paved and gravel roadways.

Railway Crossing Assessments are typically conducted where an existing public at-grade railway crossing is under consideration for safety improvements.

Bridge Assessments are typically undertaken when replacement or major rehabilitation of an existing crossing structure is anticipated.

Through engineering assessments, it appears Alberta Transportation has excellent processes in-place to address various safety issues on the existing road network.

3.4 Summary

It is evident that road safety audits can have a positive impact on Alberta Transportation's objectives to address potential road safety issues at the project planning and design stages and to complement other road safety tools currently used by Alberta Transportation to address existing operational and safety problems.

In the following sections the project team has endeavored to develop the Implementation Plan based on the afore review of the Safety Audit context and details and the internal engineering processes, such that road safety audits logically match the life-cycle of projects undertaken by Alberta Transportation.

4. DEVELOPMENT OF THE IMPLEMENTATION PLAN

4.1 WHEN TO CONDUCT ROAD SAFETY AUDITS?

In determining when to conduct road safety audits, the project team consulted and worked closely with key Alberta Transportation staff to gain an understanding of various Alberta Transportation engineering processes in project delivery. It is understood that the large majority of Alberta Transportation projects use the traditional project delivery method. Therefore, the Implementation Plan incorporates road safety audits at the appropriate stages for various engineering processes, focusing on the traditional delivery method involving design, tender and construction.

Alberta Transportation staff has indicated that the department is exploring alternative delivery methods. One of the most popular alternative delivery methods is the Public-Private-Partnership (P3) concept (sometimes referred to as design-build concept). The potential requirements for road safety audits for the P3 or design-build delivery method is provided in **Appendix C** for reference. Should Alberta Transportation pursue this delivery method, more detailed recommendations for inclusion in the Implementation Plan can be made.

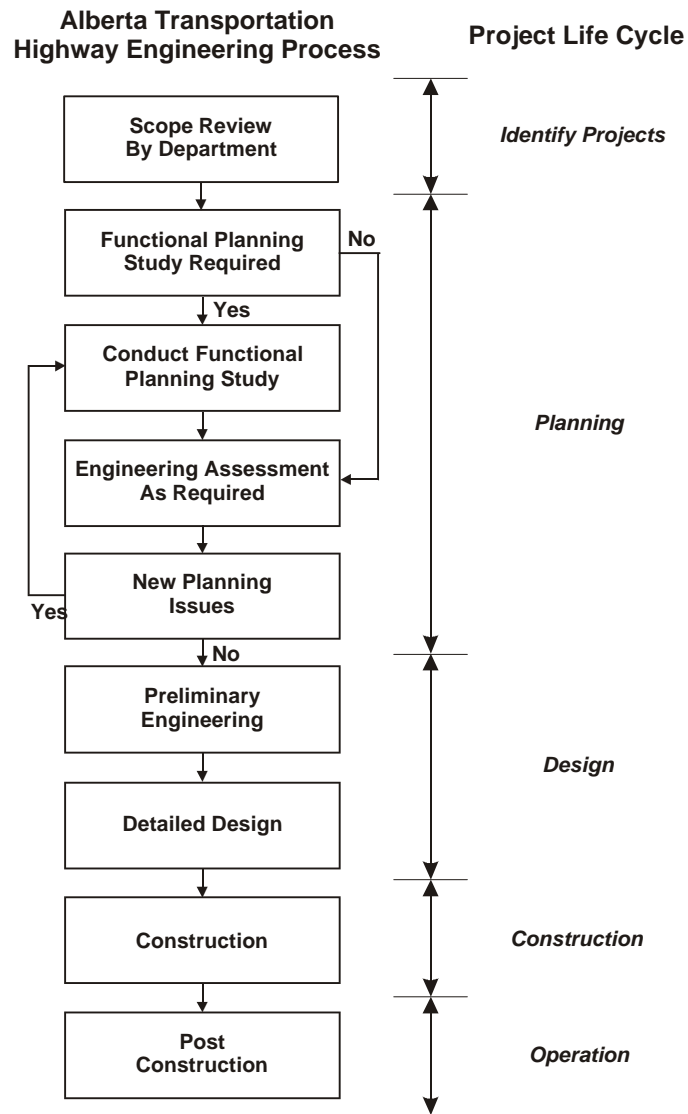
4.2 ALBERTA TRANSPORTATION ENGINEERING PROCESSES

One of the critical tasks of the implementation is to identify milestones in the various Alberta Transportation highway engineering processes appropriate for the various road safety audit stages. The Alberta Transportation engineering processes were determined from:

- Review of the Engineering Consultant Guidelines for Highway and Bridge Projects, Volume 1, Design and Tender, published by Alberta Transportation in 2002.
- Reviewing various flow-charts provided by Alberta Transportation
- Discussions with key Alberta Transportation staff involved in functional planning, engineering assessments, and bridge planning

According to the Highway Engineering Process Flow Diagram, Alberta Transportation projects can be categorized into the project life cycle of planning, design and construction as shown in **Figure 1**.

FIGURE 1 Highway Engineering Process and Project Life Cycle



4.3 RECOMMENDED STAGES FOR ROAD SAFETY AUDITS

For each identified milestone in the life-cycle of a project we made recommendations to include road safety audit stages, as follows:

A. PLANNING STAGE

Alberta Transportation Functional Planning

Functional planning is initiated by Alberta Transportation when considering new highway corridors, and an alignment study within a new or existing corridor. Functional planning could be initiated to address a variety of projects, including (but not limited to):

- Geometric Improvements
- Bridge Location Study
- Access Management
- New Interchanges or Modification to Existing Interchanges
- New Intersections or Modification to Existing Intersections
- Public Roadside Developments
- Private Development

The functional planning process includes the following steps:

- Selection of design criteria by the design team with input from various stakeholders
- Development of alternatives
- Value Engineering¹ (not a requirement, but conducted in some cases)
- Final Functional Plan

Once the functional planning is finished, the project would proceed to the design stages. The functional plan provides information and direction on right-of-way, alignments, cross-section, geometry, etc... Value engineering is sometimes conducted for projects towards the end of the functional planning when the design has gathered all information and generated alternatives.

It is recommended that for functional planning projects initiated in 2004:

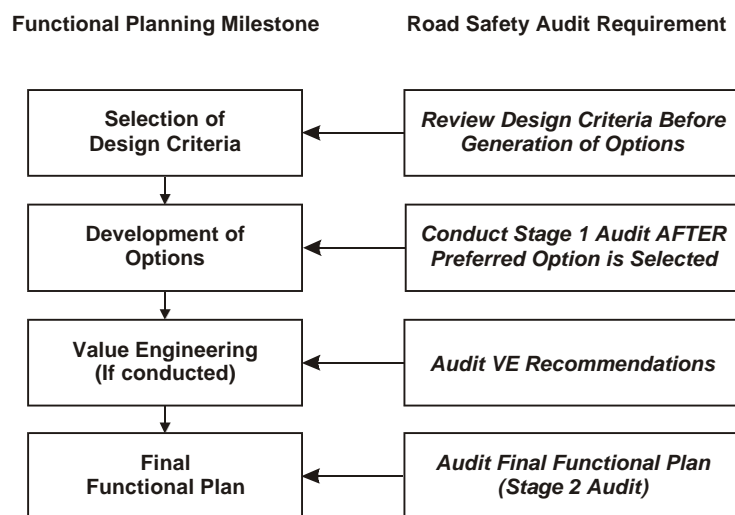
- ***Safety input be provided at the design criteria selection stage. This can be done by the same independent safety audit team that will provide safety audit services to the project;***
- ***A Stage 1 road safety audit to be conducted once the desirable option is selected;***

¹ The U.S. Federal Highways Administration (FHWA) defines **Value Engineering** as the systematic application of recognized techniques by a multi-disciplined team to identify the function of a product or service, establish a worth for that function, generate alternatives through the use of creative thinking, provide the needed functions to accomplish the original purpose of the project, reliably, and at the lowest life-cycle cost without sacrificing safety, necessary quality, and environmental attributes of the project.

- ***If value engineering is undertaken on the preferred option, then a Stage 1 or 2 road safety audit (depending on when the value engineering is conducted) should be conducted on the preferred option and the associated VE proposals*** immediately after the value engineering is completed by an independent RSA Team; and,
- ***A Stage 2 road safety audit is recommended for the design prior to the final submission*** of the functional planning report, to allow for changes.

The recommended road safety activities for functional planning are illustrated in a flow chart in **Figure 2**.

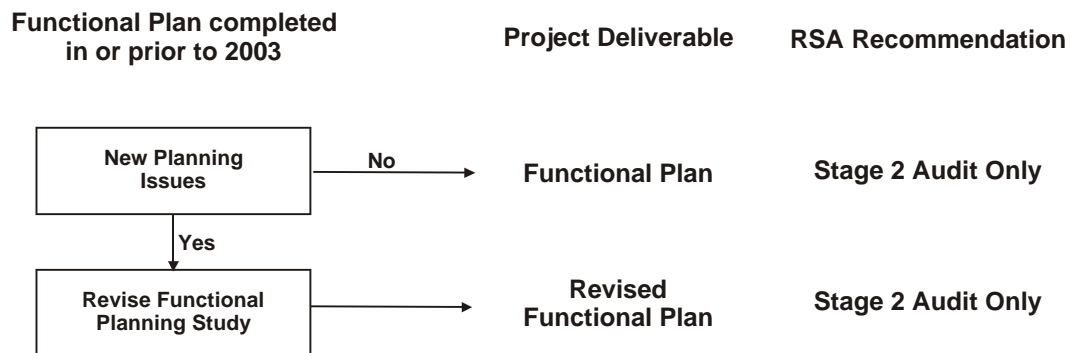
FIGURE 2 Functional Planning Process and Recommended Road Safety Input/Audits



For functional planning projects initiated in 2003 or before, and functional planning projects that are already completed, the steps and road safety audit stages that are recommended **prior to the commencement of preliminary engineering** are illustrated in the flow chart in **Figure 3**. It is recommended that a Stage 2 road safety audit be conducted if the project meets one or more of the following criteria, however the need for an audit remains at the discretion of the project manager.

1. **Complex Design** (interchanges, unconventional/complex intersections, curvilinear road segments, bridges etc...)
2. **Introduce new road features** (new lanes, new traffic control devices, changes in alignment, etc...)
3. **Significant presence of vulnerable road users** (elderly, children, cyclists, motorcyclists, etc...)
4. **Significant presence of other interacting modes** (commercial vehicles, farm vehicles, railway, horses, etc...)

FIGURE 3 Recommended Road Safety Audit Requirements for Functional Plans Completed in or Prior to 2003



Alberta Transportation Engineering Assessment

Engineering Assessments are conducted on projects three to five years in advance of construction. Engineering assessments are typically conducted to identify, prioritize and determine the scope of the project prior to detailed engineering work is undertaken. Engineering assessments are divided into three general categories and sub-categories:

- Roadway Engineering Assessment
 - Geometric Assessment
 - Safety Assessment
 - At-grade Railway Crossing Applications
 - Roadway Appurtenances
 - Traffic Data

- Surfacing Engineering Assessment
 - Surfacing Strategy and Basic Pavement Structural Design
 - Seal Coat Prioritization

- Bridge Assessment

Based on a review of a number of engineering assessment sample reports, **road safety audits may not be appropriate for engineering assessment** assignments except for Bridge Assessments that are discussed in the subsequent section. However, **elements of in-service audits such as a more in-depth review of human factors and positive guidance may be considered** to supplement the current activities.

Bridge Planning

Bridge planning is recognized as a distinct engineering process in the Alberta Transportation project delivery process. The process involves identification and optimization of appropriate alignment, location, hydrotechnical, geotechnical and environmental constraint solutions ultimately leading to development of structure type concepts and right-of-way requirements definition. Conceptual alternatives are prepared for advancement to Design Data Drawing stage. Based on the review of a sample DD Drawing, it is concluded that the DD Drawings are the equivalent of a “preliminary” detailed design stage. ***It is recommended that a Stage 2 road safety audit be conducted at the completion of the Design Data Drawing (DD Drawing) stage.***

B. DESIGN STAGE

The Alberta Transportation Highway Engineering projects proceed to the design stage with *preliminary engineering* and *detailed design*. A consultant is typically hired to conduct the design. The deliverable of the consultant will be a tender package submitted to the project sponsor.

A review of the “Consultant Highway Grading/Surfacing Design Coordination Flow Chart” indicates that an appropriate juncture to conduct road safety audits would be:

- **A Stage 3** road safety audit will be appropriate to be conducted prior to the Milestone “Modify Design Based on Recommendations from Others” (before 75% completion) by the consultant. The Stage 3 road safety audit provides a final input to the design before it is finalized for tender.

At the Stage 3 audit, it may also be appropriate to ***audit the traffic accommodation*** plans, when complex projects are involved with significant detours and construction staging. It should be noted that the daily management of construction detour should remain the responsibilities of the contractor.

C. TENDER AND CONSTRUCTION

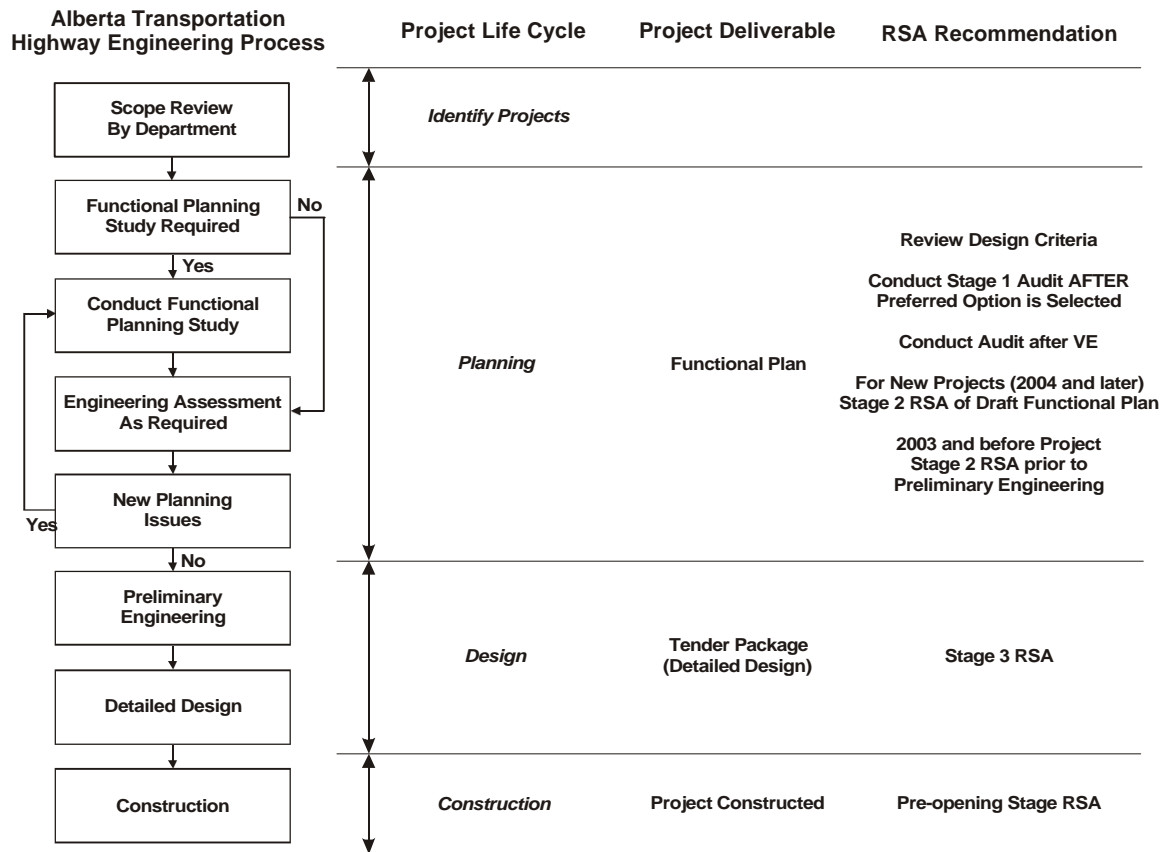
Once the detailed engineering and design is completed, the project is tendered and proceeds to construction. The following recommendations are made:

- Road safety audits should be considered at the pre-opening/post-construction stage.
- Pre-opening stage audits should be mandatory if the project is a new road construction (i.e. green-field project).
- For retrofit projects, consider conducting pre-opening stage audits when the project is substantially completed (i.e. pavement markings and signing are installed, but project still has budget to address issues raised by the road safety audits).
- If value engineering is conducted on the design at the post-tendered/pre-construction stage, the value engineering proposals should also be audited. The RSA team could be retained by Alberta Transportation or the Contractor.

4.4 SUMMARY OF THE RECOMMENDATIONS

Figure 4 summarized the recommended road safety audits stages at various stages of a project.

FIGURE 4 Recommended Road Safety Audit Stages



4.5 WHAT PROJECTS SHOULD BE AUDITED?

In order to ensure that road safety audit is not a solution looking for a problem, it is essential to review the various types of projects and the level of safety input desirable and associated with each type.

The 2003-2005 List of Tentative Major Capital Construction Projects from Alberta Transportation was reviewed. The projects were categorized into the following project types:

- 3R/4R
- Bridge
- Interchange
- Widening
- Grading
- Culvert Replacement
- Intersection Improvement
- Edmonton/Calgary Ring Roads
- Reconstruction/Realignment
- Site Development
- Miscellaneous

A discussion and recommendation is provided for each project type with regards to its suitability for road safety audits. The various project categories were evaluated based on whether road safety audits would be cost-effective and suitable for the type of projects.

During the stakeholders consultation and in subsequent meeting with key Alberta Transportation staff, it became evident that a ***Pilot Program*** would be desirable to address issues that may be raised in the initial implementation. Further, it is noted that some project types discussed below are not clear candidates for road safety audits and their inclusion in a Pilot Program will provide a more definitive answer. The Pilot Program is discussed in ***Chapter 7***.

A. 3R/4R PROJECTS

The 3R/4R projects typically include selective overlay, preservation & overlay, paving, cold mill & inlay, overlay & selective reconstruction type projects. Over the three-year period, there would be approximately 164 projects which consist of 53% of all major capital projects. It is anticipated that road safety audits would not be required for the majority of these projects since they do not involve significant geometric design changes. It may be worthwhile to conduct road safety audits on a percentage of projects at the detailed design and pre-opening stages. For example, safety issues may arise related to the roadside, lane width, traffic operations, etc...

It is recommended that 3R/4R type projects be considered as potential candidates for Pilot Projects.

B. BRIDGE PROJECTS

Bridge projects include bridge rehabilitation, bridge structure, culvert, and bridge replacement projects. Bridge projects consist of approximately 59 projects (19% of all projects) over the three-year period. The majority of bridge projects would occur as part of a major roadway construction project with system expansion or as part of an interchange. However, a number of bridge projects would be undertaken as a stand-alone project. The bridge projects that occur as part of a major roadway construction project would be addressed by other project types in the Implementation Plan, whereas bridge projects that occur as stand-alone projects would merit conducting road safety audits. For example, safety issues may arise when the bridge approaches are changed, barrier placement, other road users, etc...

It is recommended that stand-alone bridge projects be considered as potential candidates for Pilot Projects.

C. INTERCHANGE PROJECTS

Interchange projects include all interchange and interchange structure projects. Interchange projects account for approximately 21 projects (7% of all projects). Interchange projects typically involve lane change ramps, weaving, merging and diverging movements, complex geometrics and traffic operations. In urban areas, interchanges would also need to accommodate various road users such as pedestrians and cyclists. Interchanges are ideal candidates for road safety audits.

It is recommended that road safety audits be considered for all interchange projects.

D. WIDENING PROJECTS

Widening projects include road widening & overlay/reconstruction type projects. They account for approximately 20 projects (6% of all projects). Widening projects may impact cross section, roadside, access control, and intersection configurations. Widening projects are suitable candidates for road safety audits.

It is recommended that road safety audits be considered for all widening projects.

E. GRADING PROJECTS

Grading projects include all grading projects which typically are staged. They account for approximately 19 projects (6% of all projects). Stage 1 of grading projects would not require road safety audits as detailed design elements such as signing and pavement markings would not be available. Stage 2 grading projects would be appropriate for road safety audits, but should only involve projects with significant changes in geometrics.

It is recommended that road safety audits be considered for stage 2 grading projects that involve significant changes in geometrics.

F. CULVERT REPLACEMENT PROJECTS

Culvert replacement projects include all culvert replacement projects. Any culverts larger than 1.5m in diameter are considered by Alberta Transportation as bridge projects. Culvert replacement projects account for approximately 9 projects (3% of all projects). Similar to bridge projects, these types of projects could be a part of a major roadway construction project, or could be stand-alone project. For culvert replacement projects that are part of a major construction project, they could be part of a road safety audit and would be covered by other project types in the Implementation Plan. Depending on the size of and the complexity of the project, stand-alone culvert replacement projects would merit conducting road safety audits. For example, safety issues may arise when the road alignment is changed, barrier placement, roadside issues, etc...

It is recommended that stand-alone culvert replacement projects be considered as potential candidates for Pilot Projects.

G. INTERSECTION IMPROVEMENT PROJECTS

Intersection improvement projects include all intersection improvement projects. They account for approximately six projects (2 % of all projects) in the major capital plan. Intersection improvement projects are typically generated through engineering assessments, and have undergone extensive analysis. However, if the intersection projects were generated to address network expansion, mobility or operational issues, it would be worthwhile to conduct a road safety audit. In addition, Alberta Transportation staff indicated that every year a number of new traffic signals (typically two to three per year) would be installed, and road safety audits would be beneficial and appropriate for new signal installations.

It is recommended that road safety audits be considered for intersection improvement projects if the intersection improvements were driven by mobility or operational issues. In addition, it is recommended that road safety audits be considered for all new traffic signal installations.

H. MISCELLANEOUS PROJECTS

Miscellaneous projects include Grading Stubb Fills, Side Slope Improvement, Utility Adjustment, Erosion Control and Truck Turn-Out projects. In the three-year capital plan, there is one of each project (2% of all projects). Road safety audits are not required for these type of projects.

Road safety audits are not recommended for miscellaneous projects such as Grading Stubb Fills, Side Slope Improvement, Utility Adjustment, Erosion Control and Truck Turn-Out projects.

I. EDMONTON/CALGARY RING ROAD PROJECTS

Edmonton and Calgary Ring Road projects include all Edmonton and Calgary Ring Road Projects. These projects account for approximately three projects (1% of all projects), but involve major capital investments in urban area with significant traffic volumes.

It is recommended that road safety audits be considered for all Edmonton and Calgary Ring Road projects.

J. RECONSTRUCTION/REALIGNMENT PROJECT

Reconstruction and realignment projects include all reconstruction and realignment projects, and accounts for two projects (0.6% of all projects). Reconstruction and realignment projects typically involve significant geometric and operational changes, and are ideal candidate projects for road safety audits.

It is recommended that road safety audits be considered for all reconstruction and realignment projects.

K. SITE DEVELOPMENT PROJECTS

Site development projects include all site development projects, and accounts for one project (0.4% of all projects). Alberta Transportation staff also indicated a desire to audit private developments, with the developer to undertake road safety audits. Development led projects are worthwhile candidates for road safety audits, and could form part of the development approval process. Road authorities in the United Kingdom and Australia have started to include road safety audits for development led projects.

It is recommended that road safety audits be considered for development led projects. The criteria to include road safety audit for development approval would be addressed in the procedure and policy document.

4.6 CONCLUSIONS

- 3R/4R projects, bridge replacement, bridge (stand-alone projects), culvert replacement (stand-alone projects), grading (stage 2), and site development projects are recommended as candidates for the Pilot Programs.
- Road safety audits are recommended for all Edmonton and Calgary Ring Road projects.
- Road safety audits are recommended for all interchange, intersection improvements, widening, reconstruction & realignment projects.

4.7 WHERE ARE ROAD SAFETY AUDITS MOST VALUABLE?

The Implementation Plan addressed the merits of conducting road safety audits for projects in various settings. For example, urban versus rural, functional classification of roadways, intersection type, etc... Based on experience from other jurisdictions, road safety audits are more valuable and useful in complex urban projects, where the traffic movements are higher and road users are competing for road space. Road safety audits are also useful for rural projects, but may need less audit stages.

It is recommended that Alberta Transportation focus road safety audits on projects where a variety of constraints are present as follows:

- Urban projects would involve widening, interchange/intersection, bridge, development, the North-South Trade Corridor and the Edmonton/Calgary Ring Roads projects.
- Rural projects that would involve road safety audits include interchange, bridge and major reconstruction & realignment projects.

It is recommended that Alberta Transportation consider designating all major routes (e.g. routes with AADT greater than 10,000 vpd) to have mandatory road safety audits conducted regardless of the project type or location.

Table 3 provides a summary of the recommended road safety audit stages and project types for both rural and urban projects.

Table 3 Summary of Recommended Road Safety Audit Stages for Project Types and Locations

Project Type	Location	Road Safety Audit Stage				Recommendation
		Stage 1	Stage 2	Stage 3	Pre-opening	
Interchange	Urban	✓	✓	✓	✓	Recommended
	Rural	✓	✓	✓	✓	
Widening	Urban	✓	✓	✓	✓	
	Rural		✓	✓	✓	
Intersection Improvements	Urban		✓	✓	✓	
	Rural		✓	✓	✓	
Edmonton/Calgary Ring Roads/NSTC	Urban	✓	✓	✓	✓	
Reconstruction/ Realignment	Urban	✓	✓	✓	✓	
	Rural		✓	✓	✓	
3R/4R	Urban			✓	✓	
	Rural			✓	✓	
Bridge Replacement	Urban		✓	✓	✓	
	Rural		✓	✓	✓	
Site Development	Urban	✓	✓	✓	✓	
	Rural			✓	✓	
Bridge	Urban		✓	✓	✓	Pilot Project Candidate for Stand-alone Projects
	Rural		✓	✓	✓	
Culvert Replacement	Urban			✓	✓	
	Rural			✓	✓	
Grading	Urban			✓	✓	Pilot Project Candidate for Stage 2 Grading Projects
	Rural				✓	

✓ denotes recommended road safety audit stage

4.8 COST-SHARED PROJECTS

4.8.1 COST-SHARED PROJECTS WITH THE FEDERAL GOVERNMENT

It appears that road safety audits are becoming a requirement by Transport Canada as one of the cost-sharing requirements.

Road safety audits are recommended for projects funded by the Federal Government regardless of project type when required by Transport Canada.

4.8.2 COST-SHARED PROJECTS WITH LOCAL GOVERNMENTS

It is recognized that Alberta Transportation grants to local governments may benefit from requiring road safety audits for Quality Assurance purpose. The City Transportation Fund (Calgary & Edmonton), Basic Capital Grant (Cities & Urban Area), City Special Transportation Grant (Cities & Urban Area), Streets Improvement Program (Towns, Villages, etc...), and Rural Transportation Grants could include road safety audits as part of the cost-sharing agreements. It is suggested that a capital threshold be used to determine whether RSA's are required (e.g. Alberta Transportation share greater than \$1,000,000). Alberta Transportation may wish to conduct consultation with the AUMA and AAMD&C for their input.

5. WHO SHOULD CONDUCT THE ROAD SAFETY AUDITS?

5.1 INTERNAL VERSUS EXTERNAL ROAD SAFETY AUDIT TEAM

Various models of road safety audit teams were explored, including:

- Use of internal staff only (e.g. Central Region staff auditing Peace Region project);
- Outsourcing to consultants; and
- Combination of internal staff and consultants.

In the stakeholder consultation and in subsequent meeting with key Alberta Transportation staff, it was concluded that since the majority of Alberta Transportation project is outsourced, it would be most appropriate to outsource road safety audits to qualified specialized consultants.

It should be noted that Alberta Transportation should make it mandatory to have a RSA Team composed of a minimum of two persons. The RSA Team could be hired directly by Alberta Transportation or as part of the design package RFP.

5.2 EXTERNAL RESOURCES

There was some concern with the availability of consultants “qualified” to conduct road safety audits. Based on the review of the Capital Program, approximately 20 to 25 projects would be audited each year (excluding the pilot projects). Given the number of projects to be audited, it appears that the resources available in the private sector are adequate to meet the potential demand for road safety audit work.

5.3 ROAD SAFETY AUDIT TEAM CREDENTIALS

It is recommended that Alberta Transportation follows the road safety audit team composition and skills as described in the TAC Canadian Road Safety Audit Guide. As well, the following RSA Team credentials are desirable:

Appropriate experience for road safety auditors includes:

- *Successfully completed a safety audit training course of at least 2 days duration recognized by Alberta Transportation;*
- *At least 5 years experience in a relevant road safety, road design, or traffic engineering field; and*
- *Kept their road safety audit experience current by undertaking at least one audit per year in the past two years.*

To be designated as the Team Leader, an individual has to also satisfy the following:

- *Undertaken at least five formal road safety audits in the past three years, including at least three audits conducted at design stages.*
- *For more complex projects, the Team Leader should have undertaken at least 10 road safety audits in the past three years, including at least five audits as Team Leader.*

5.4 Retaining the Services of a Road Safety Audit Team

It is recommended that the road safety audit team be retained by the design consultant responsible for the project as an independent team. No members of the team should be involved in the planning and design of the project. In order to ensure the quality of the safety audit to be conducted, the design consultant should demonstrate to Alberta Transportation that the independent road safety audit team credentials meet the requirements described in section 5.3.

6. HOW TO UNDERTAKE ROAD SAFETY AUDITS

The road safety audits should be conducted following the procedures outlined in the Canadian Road Safety Audit Guide published by the Transportation Association of Canada. The Canadian Road Safety Audit Guide provides details of how to conduct a road safety audit at various stages.

7. PILOT PROGRAM

As discussed in Chapter 2, it became apparent during the stakeholder consultation and subsequent meeting with Alberta Transportation staff that a Pilot Program would be desirable. The Pilot Program could be useful for:

- Determining the effectiveness of road safety audits for different type of projects discussed in Chapter 4
- Determining any additional resources required to retain the RSA Team and to address RSA Issues (for services and infrastructure)
- Answering any questions or issues that may arise during the initial implementation period, and to address potential challenges before full implementation

The Pilot Program was developed to address the various issues outlined in the Implementation Plan to collect meaningful experience and data about road safety audits for certain types of projects identified in Chapter 4. As well, the program was developed to fine-tune the general RSA process into a process that would fit into Alberta Transportation's other process without significantly changing them.

7.1 PROPOSED PILOT RSA PROGRAM PROCESS

1. Achieve endorsement of Implementation Plan by management
2. Prepare Draft Alberta Transportation RSA Procedure Guide
3. Select RSA Committee and RSA Coordinator
4. Provide RSA training to regional construction teams
5. Select pilot projects to be audited
6. Conduct pilot audits
7. Monitor progress and collect results (Road Safety Audit reports and the corresponding response reports)
8. Evaluate results of pilot projects and finalize Alberta Transportation RSA Procedure Guide

For each individual project, the RSA Coordinator would select the audit team and arrange the necessary start-up meeting. The audit team should be selected from a pool of qualified consultants.

The level of effort required to conduct RSA for various types and sizes of projects will be monitored. In addition, the costs of the audit suggestions, and other potential issues that may impact project delivery will be monitored.

7.2 RSA COMMITTEE AND COORDINATOR

A RSA Committee should be established to oversee the Pilot Program. The committee members should include both headquarters and regional staff from a variety of areas (e.g. geometric design, traffic operations, roadside planning, bridge planning, construction and safety). The chair of the committee should be the RSA coordinator. The Coordinator will work with the RSA Committee to coordinate the various activities of the pilot program including but not limited to:

- Select road safety audit team
- Select pilot projects
- Oversee the RSA process and data collection
- Keep the process moving and allow it to be effective for various projects
- Maintain communications
- Resolve conflicts
- Process reports and arrange meetings
- Monitor safety issues that were repetitive
- Program future improvements associated with the accepted audit suggestions
- Serves as the resource person on road safety audits for the regional offices
- Provide quality assurance of the road safety audits

The role of the RSA Coordinator will require a person with knowledge of the general RSA process, experience in highway design/traffic engineering and enthusiastic about the Pilot Program. Ideally the person should be an Alberta Transportation employee who is familiar with Alberta Transportation processes and procedures.

The Regions will manage the delivery of the road safety audit process, including the preparation of Requests for Proposals (RFP), sign off on the road safety audit report and the response report, and the implementation of the accepted changes.

7.3 RSA TRAINING

Before embarking on the auditing of various projects, a core group of Alberta Transportation staff should be trained to familiarize with the general RSA process and techniques. The training would provide Alberta Transportation with knowledgeable staff in managing road safety audits. Regional staff involved in project management and construction should be trained.

7.4 NUMBER AND TYPE OF PROJECTS

It is suggested that approximately 15 projects be selected for the Pilot Program to obtain meaningful experience and data for evaluation. Previous road safety audits conducted on an ad-hoc basis could be included as part of the Pilot Program if appropriate. It is recommended that one of each of the project types (11 types) discussed in Chapter 4 be included in the Pilot Program, and the remaining 4 projects may be made up using audits conducted previously.

7.5 SCHEDULE

The time period for the Pilot Program is expected to be ten months. Assuming a start in January 2004, the pilot program is expected to be substantially completed by December 2004. A preliminary schedule is shown below.

Task	2003		2004											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Implementation Plan	→													
Draft RSA Guide		→												
RSA Committee & Coordinator		→												
RSA Training			→											
Audit Pilot Projects			→											
Evaluate Results													→	→
Final RSA Procedure Guide														→

APPENDIX A - List Of Attendees, Stakeholder Meeting April 25, 2003

A.1 Alberta Transportation

Terry Willis, Director, Materials & Technical Services
Robert Duckworth, Traffic Operations Engineer, Traffic Engineering Unit
Jim Der, Director, Roadside Planning
Bill Kenny, Geometric Standards Specialist, Highway Engineering
Steve Otto, Acting Infrastructure Manager, Barrhead
Jerry Lau, Planning Engineer, Southern Region
Danny Jung, Infrastructure Engineer, Peace River
Bob Rebus, Urban Infrastructure Engineer, Barrhead
Dennis Adamkewicz, Safety Officer, Southern Region
Liz Owens, Unit Head, Transportation Safety Services
Alex Broda, Urban Construction Manager, Calgary (CPMG)
Geoff Dunn, Operations Manager, Grand Prairie (MPMG)
Lonnie Stewardson, Legal Services Division, Alberta Justice
Ernie Waschuk, Bridge Preliminary Engineering Specialist

A.2 EXTERNAL STAKEHOLDERS

Don Szarko, Alberta Motor Association
Brian Petzold, Consulting Engineers of Alberta

APPENDIX B – Complementary Safety Tools

B.1 Design Criteria Review

A safety review can be conducted to assess the safety impact of various design elements as set forth in the proposed design criteria. The design criteria review aims to provide quantifiable safety implications of various design criteria based on latest available research and information, and provide the design team and stakeholders with the best available safety knowledge for informed decision making. The review also aims to identify any potential design domains or standards set forth in the design criteria that may be inappropriate for the proposed facility and inadvertently introduce potentially significant negative safety implications.

The design criteria review is best conducted before a project progresses to the design stage when the design parameters can still be changed. This review is typically conducted prior to any road safety audits.

B.2 Design Consistency Review

A method to reduce or eliminate uncertainty or the unexpected for drivers is the design consistency review. In the 1999 Geometric Design Guide for Canadian Roads published by the Transportation Association of Canada, a methodology to conduct design consistency is provided for designers to evaluate consistency of a road design. Design consistency provides a good basis for designers to incorporate appropriate design elements to avoid violating driving consistency. It should be noted that the methodology is still in development, and the United States Federal Highway Administration (FHWA) is developing a design consistency module in the *Interactive Highway Safety Design Model* (IHSDM).

The design consistency review provides safety surrogates for designers to address driver workloads, and may be considered an implicit tool to address road safety. Its focus is on the driver and is primarily done on rural two-lane highways. For more complex urban conditions with many different road users, it may not be adequate in addressing the overall safety.

B.3 In-service Road Safety Reviews

In-service road safety reviews are typically driven by the need to address road safety at high crash locations, sometimes referred to as collision black spots. This type of review is reactive in nature, and is initiated when the safety performance of the road facility exceeds a certain pre-established threshold by the road authority. The in-service road safety review is based mostly on the collision history of the site, and generates effective safety countermeasures to reduce the collision frequency and/or severity at the location.

The Transportation Association of Canada is currently working on developing a methodology to systematically conduct in-service road safety reviews. This effort is expected to be completed by the Fall of 2003 with the publication of the Canadian Guide to In-service Road Safety Reviews. The In-service Road Safety Review is defined as:

“An In-Service Road Safety Review is an in-depth engineering study of an existing road using road safety principles with the purpose of identifying cost-effective countermeasures that would improve road safety and operations for all road users.”

In-service road safety reviews are intended for roads in-service which have adequate collision histories (typically three to five years).

APPENDIX C – RSA and P3 Delivery Method

Public-private partnership (P3) projects (sometimes referred to as design-build projects) is a project delivery model in which the private sector designer-builder forges a single contract with the project owner to provide engineering design and construction services. Greater efficiency can be achieved in P3 projects. Variations of P3 projects include Design-Build-Operate (DBO), Design-Build-Operate-Transfer (DBOT), Design-Build-Develop (DBD) among others. P3 projects typically offer the following characteristics:

- Some degree of risks and responsibilities are transferred from the public to the private sector.
- The contract amount is typically based on performance-based outcomes rather than work activities.
- There is a potential to use non-traditional means of financing the project, such as land swap or tolling.
- Rather than the traditional arm's length relationship, a partnership style approach is used.
- The projects are usually constructed on a fast-track schedule, and can result in significant time and cost savings compared to the traditional design-tender-build model.

Under the P3 project delivery model, the highway design team is often under pressure to complete the design under a fast-track environment to meet minimum design criteria set out in the contract. Even in the conventional design-tender-construct project delivery model where the project is often under the close scrutiny of the project owner, safety problems can be inadvertently introduced to the design, leading to safety and operational problems once the roadway is in service. Thus, by incorporating road safety audits into the design-build process, it would offer the project owner an added level of confidence in the safety performance of the project once the project becomes operational.

As such, the Implementation Plan provides suggestions for Alberta Transportation to consider incorporating road safety audits into their future design-build requirements (if implemented). A number of issues were considered and are discussed below.

1. It is recommended that road safety audits be required as part of the P3 or Design-Build RFP, and it is the proponent's responsibility to hire and administer the road safety audit team as part of the fees.
2. A proponent's proposed road safety audit team should be identified in the Expression of Interest (EOI) together with details of each member's qualifications. Once a proponent has been short-listed, no changes to the proposed road safety audit team

should be permitted, except by approval of the owner. In this way, the qualifications issue does not have to be addressed during the RFP stage.

3. The RFP should require that proponents use the Alberta Transportation Guidelines and the TAC Canadian Road Safety Audit Guide in preparing the safety audit component of their proposals. Additional or alternative requirements that are specific to the needs of a particular project can be added by the Owner if necessary.
4. The RFP should include provisions that allow the Owner to negotiate the terms of the successful proponent's proposed road safety audit methodology and prices. This provision could be covered by a blanket provision in the RFP that covers negotiation ability on all aspects of a proponent's proposal.
5. If a road safety audit is required, the Owner must recognize that any audit findings, if accepted, could constitute changes in the scope of work as specified in the RFP, and may result in the design/build contractor claiming for additional compensation. At the same time, the Owner may want to minimize the potential for rejecting potentially advantageous safety proposals from consideration of cost alone.

To minimize the likelihood of additional claims, the conceptual design that forms the basis of the RFP should either be well thought out or the scope of the potential changes well defined in advance. To this end, a stage 1 and 2 road safety audit could be done independently by the Owner on the conceptual design prior to the release of the RFP. The road safety audit report and the response by the Owner should then be issued as part of the RFP. This will provide a basis to the proponent's team as to what features of the design can be realistically subjected to changes or to define the limits of such changes. In that case, the Owner may take certain responsibilities for the changes indicated in the pre-RFP road safety audit.

This is illustrated in the following table:

Issue raised in RFP	RFP audit suggestion	Consequence
Owner accepts it is an issue.	Owner accepts	Defined modification becomes part of the project
Owner accepts it is an issue	Owner accepts in principle	Specific modification to resolve the issue is the responsibility of the proponent as part of the project. Subsequent RSA may confirm the adequacy of the solution.
Rejects the issue	N/A	Owner takes responsibility and subsequent RSA may not need to address this issue.