TRANSPORT SCOTLAND

ROAD ASSET **MANAGEMENT PLAN**
for SCOTTISH TRUNK ROADS: APRIL 2007 – MARCH 2009

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FOREWORD

CHIEF EXECUTIVE

GOOD TRANSPORT IS VITAL TO THE ECONOMIC AND SOCIAL PROSPERITY AND SUCCESS OF SCOTLAND. TRANSPORT PLAYS A SIGNIFICANT PART IN OUR EVERYDAY LIFE, BE IT TRAVELLING TO WORK, DELIVERING GOODS, GOING TO SCHOOL OR ENABLING US TO MAKE THE MOST OF OUR FREE TIME.

The motorways and trunk road network in Scotland form a fundamental part of our national transport system. Although comprising less than 7% of total road mileage in Scotland, this network carries around 35% of all traffic in Scotland and more than half of all heavy goods vehicle movements. Transport Scotland, an executive agency of the Scottish Government, is responsible for the management and operation of motorways and trunk roads throughout Scotland.

In order to deliver the service required from the trunk road network we recognise the need to adopt industry best practice in asset management. To this end, we carried out a review of our current practices, compared them against industry best practice, and identified where and how we could do things better. This enabled us to develop a three-year *Asset Management Improvement Programme* which sets out the programme and activities that we will undertake between 2006 and 2009 to improve our asset management practices.

This Road Asset Management Plan (RAMP) is one of the key improvements identified. The RAMP sets out how we currently manage, or intend to manage, the trunk road network and the service this will deliver to you. The RAMP is an important document and we will regularly review and update it to reflect changes and improvements in our management practices.

We look forward to receiving your feedback about the RAMP.

Malcolm Reed
Chief Executive
Transport Scotland

November 2007

EXECUTIVE SUMMARY

MAINTAINING A VITAL ASSET

The Scottish trunk road network is estimated to have a construction value of over £15 billion. Its value to Scotland's economy and way of life is many times greater. The operation and maintenance of this vital national asset must support our country by delivering the required service to road users and by using public money wisely.

Scotland's trunk road network includes around 3,500 route kilometres of motorways and main roads and 1,900 bridges. It carries over 30% of all traffic and over 60% of all heavy goods vehicles but is actually less than 10% of the total Scottish road network.

Transport Scotland is the national transport agency for Scotland and is responsible for operating and maintaining the trunk road network. Transport Scotland was launched in January 2006 and is directly accountable to Scottish Ministers. Our Directorates and their responsibilities are set out in our Corporate and Business Plans.

ADOPTING BEST PRACTICE – ASSET MANAGEMENT

Transport Scotland, like all public bodies, is being placed under increasing pressure to justify investment and to demonstrate that best use is being made of resources. We fully appreciate this situation and are taking positive and innovative steps to ensure our management practices are up to the challenge.

Current best practice for the management of large infrastructure networks is set out in recent publications by the Department for Transport and the British Standards Institution. These publications recommend that infrastructure organisations adopt a formal asset management approach. The definition of asset management we have adopted is:

> *A strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the road infrastructure to meet the needs of current and future customers.*

The main benefits of adopting asset management are the ability to make better use of resources, this is demonstrated by:

- providing the same or better service at a reduced cost; or
- providing a better service for the same or marginally increased cost.

In order to embed asset management within Transport Scotland we have developed a three-year *Asset Management Improvement Programme* which commenced in May 2006. The *Asset Management Improvement Programme* is designed to improve practices in a manner that will provide real benefits to road users, including improved safety and journey reliability together with more efficient use of public money. The completion of this programme will place Transport Scotland at the forefront of UK and International practice in road management.

Central to the Asset Management Improvement Programme is the production of the Road Asset Management Plan (RAMP). The RAMP sets out what we aim to achieve with the trunk road network and describes how we will do this, the latter being described by long-term work and financial plans.

LISTENING TO YOU

The majority of us, in one form or another, are road users. As road users we expect safe and reliable journeys. These are not unreasonable expectations.

Central to asset management is actively engaging with road users and other interested parties to understand their views about the service they expect from the trunk road network. This relates to road condition, winter maintenance, journey reliability or lighting provision, to name but a few. In February and March 2007, as part of the Asset Management Improvement Programme, we undertook a survey of a representative sample of road users to identify trunk road issues that are important to them and the service they expect or desire. The initial findings from this survey are reported in the RAMP.

We are using the survey results to identify your priorities for road management and maintenance. We will use these priorities to inform our decision making and the allocation of resources. We expect to undertake further surveys, focusing on issues that are of concern to you.

MAKING BEST USE OF RESOURCES

An important part of asset management is lifecycle planning. A lifecycle plan is a long-term plan for managing an asset with the aim of providing the required service while minimising Whole Life Costs (or maximising Whole Life Value). Developing lifecycle plans will help us to make long-term predictions of network deterioration and maintenance needs. This will allow us to compare the impact of alternative lifecycle plans and to adopt the approach that delivers the required service but also makes best use of resources. The RAMP describes the approach we will use to develop our lifecycle plans.

WORK AND FINANCIAL PLANS

An important function of the RAMP is to present the agreed long-term work and financial plans. The work plan presents the general volumes of work, for example, kilometres of carriageway surfacing, and when they are required, while the financial plan presents the expenditure required to deliver the work plan.

A key objective for the next version of the RAMP will be to present robust and agreed work plan and financial plan figures. Delivering the Asset Management Improvement Programme will enable us to include these figures in the next version of the RAMP.

IMPROVING THE RAMP

This is the first version of our RAMP. We recognise there is still much to do, but we have already made significant progress and learnt much through the development of this first version of the RAMP. We intend to publish the second and fully populated version of the RAMP in spring 2009. Thereafter the RAMP will be updated every two or three years, or more frequently if required, and will highlight the progress made by and benefits realised through the Asset Management Improvement Programme. Most importantly, the RAMP will keep you informed about our ongoing and evolving management practices and plans for the trunk road network.

CONTENTS

GLOSSARY

Asset Management – is a strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the road infrastructure to meet the needs of current and future customers.

Asset Management Improvement Programme – a formal programme of activities that seeks to make positive improvements to management practices while taking full account of existing management practices.

Asset Management Plan – a plan for managing the asset base over a period of time in order to deliver the agreed Levels of Service and Performance Targets in the most cost-effective way.

Asset Valuation – the calculation of the current monetary value of an asset or group of assets. The calculated value is the Net Asset Value but it is normally referred to as the Asset Value.

Backlog – the monetary value of work required to close the gap between the current performance provided by an asset and the required performance. Required performance targets which are defined nationally may be lower than some locally set performance targets.

Information Management – a formal approach to the identification of information needs and the associated collection, storage, usage and maintenance of the information.

Level of Service – a statement of the performance of the asset in terms that the customers can understand. Levels of Service typically cover condition, availability, accessibility, capacity, amenity, safety, environmental impact and social equity. They cover the condition of the asset and non-condition related demand aspirations, i.e. a representation of how the asset is performing in terms of both delivering the service to customers and maintaining its physical integrity at an appropriate level.

Lifecycle Plan – a considered strategy for managing an asset, or group of similar assets, from construction to disposal. A lifecycle plan should give due consideration to minimising costs and providing the required performance.

Maintenance – collective term used to describe all the activities and operations undertaken to manage and maintain road assets, e.g. inspection, assessment, renewal, upgrade, etc.

Need (or maintenance need) – maintenance required on an asset to improve its condition and/or performance.

Operating Company – private sector company who is contracted by Transport Scotland on behalf of the Scottish Government to manage and maintain the trunk road network.

Performance Measure – a generic term used to describe a measure or indicator that reflects the condition and/or performance of an asset, e.g. Best Value Performance Indicators and other Performance Indicators.

Road Asset Management Plan – a document that sets out the agreed ten-year work and financial plans for the trunk road network and describes how we will optimally manage these assets, through the development and application of recognised good asset management practices, to deliver customer expectations and the Aims, Objectives and Targets defined in the Corporate and Business Plans.

SERIS – Transport Scotland's road information system which contains data on the physical characteristics and condition of the trunk road network.

Stakeholder – an individual, group, body or organisation with a vested interest in the management of the transport network, e.g. authority/owner, public, users, community, customers, shareholders and businesses.

The Scottish Government – is the devolved government for Scotland, responsible for most of the issues of day-to-day concern to the people of Scotland, including health, education, justice, rural affairs and transport.

Transport Scotland – an agency of the Scottish Government with responsibility for the operation and management of the trunk road network.

Treatment Option – one type of maintenance that may be used for an asset.

Trunk Roads – the main strategic routes, including motorways.

Trunk Road Network – the system of motorways and trunk roads in Scotland.

Value Engineering – the development of optimal solutions for prioritised maintenance needs using option appraisal, whole life costing, scheme development, and synergies with other road schemes.

Value Management – the assessment and prioritisation of identified maintenance needs.

Whole Life Cost – the total cost of the asset over the term of its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal.

ABBREVIATIONS

AMP	Asset Management Plan
AMIP	Asset Management Improvement Programme
CSS	County Surveyors Society
DBFO	Design, Build, Finance and Operate
DMRB	Design Manual for Roads and Bridges
DfT	Department for Transport
DRC	Depreciated Replacement Cost
DST	Decision Support Tool
GRC	Gross Replacement Cost
HGV	Heavy Goods Vehicle
KPI	Key Performance Indicator
NPV	Net Present Value
OC	Operating Company
PAG	Performance Audit Group
RAMP	Road Asset Management Plan
RAVS	Roads Asset Valuation System
SCANNER	Surface Condition Assessment of the National Network of Roads
SCRIM	Sideways Force Coefficient Routine Investigation Machine
SERIS	Scottish Executive Road Information System
SMA	Scottish Ministers' Agent
SRTDb	Scottish Roads Traffic Database
TAG	The Local Authority Technical Advisors Group
TRBDB	Trunk Road Bridges Database
TRN	Trunk Road Network
TRNMD	Trunk Road Network Management Directorate
VM	Value Management
VMS	Variable Message Sign
WLC	Whole Life Cost
WLV	Whole Life Value

1 INTRODUCTION

This section provides an overview of the role and importance of the Scottish trunk road network (TRN) and highlights the key challenges faced in managing it. An introduction to asset management is provided and the purpose and scope of the Road Asset Management Plan (RAMP) explained.

1.1 THE SCOTTISH TRANSPORT NETWORK

SCOTLAND'S TRANSPORT – A VISION

1.1.1 The Scottish Government's vision for transport is set out in *Scotland's National Transport Strategy*[1], which is available from the Transport Scotland website (www.transportscotland.gov.uk). The vision is for an accessible Scotland with safe, integrated and reliable transport that supports economic growth, provides opportunities for all and is easy to use. The vision also encompasses the need for the transport network to meet everyone's needs, respect the environment, and contribute to health, social inclusion and sustainable development. This vision seeks to make a real difference for people and businesses using the transport network.

1.1.2 Scotland's transport network includes trunk roads, local roads, railways, airports and ports. The trunk road network is one of the largest and most visible community assets for which the Scottish Government is responsible. It is used daily for thousands of journeys and is fundamental to the economic, social and environmental well being of Scotland. It connects our economic centres and our remote communities while making a contribution to the wealth of our nation.

1.1.3 In order for the trunk road network to fulfil its potential, it is crucial that it is appropriately maintained. This includes not just carriageways and footways, but also bridges, lighting, traffic signs, drainage systems and much else besides. It is widely acknowledged that inadequate maintenance of the road network will only store up problems for the future. The Scottish Government is committed to ensuring the trunk road network is maintained in a manner that supports its vision.

SCOTLAND'S ROADS – THE CUSTOMER

1.1.4 The majority of us, in one form or another, are road users. As road users we are likely to agree with the Scottish Government's vision for transport, but of course we will be more concerned with the specific journeys we make, which we expect to be safe and reliable. These are not unreasonable expectations.

1.1.5 We expect reliable journey times, preferably on roads that are congestion free. Increased journey times, exacerbated by unexpected congestion, are frustrating, even more so when it is the result of roadworks. In such situations it's easy to find ourselves asking questions like: Why can't they use materials that last longer? Why don't they do more roadworks at night? Don't they care about the customers?

1.1.6 At the same time, no one wants their roads to be in poor condition. Roads in poor condition can make driving unsafe, for example drivers may swerve to avoid potholes, or may be unable to stop in time due to poor surface condition. It is also known that roads in poor condition increase the daily wear and tear on vehicles.

1.1.7 So it's a fact, roadworks are necessary. In recent years the coordination and management of traffic at roadworks has improved[1], but some key questions still need to be addressed, including:

- Should the roadworks be there in the first place?
- How do we maintain the roads in a safe and serviceable condition while reducing the frequency and quantity of roadworks?

1.1.8 Transport Scotland is responsible for answering these questions for the trunk road network. This Road Asset Management Plan (RAMP) explains how we, Transport Scotland, are taking proactive and innovative steps to address these problems for the trunk road network.

TRUNK ROADS AND LOCAL ROADS

1.1.9 The Scottish Government sets the overall policy framework for roads and road transport, including trunk and local roads policy, toll bridge policy and legislation, road safety policy, bus and taxi policy and road pricing and user charging policy. The Scottish Government is not responsible for the day-to-day operation and management of the road network; these duties are discharged to other public bodies. The public bodies responsible for day-to-day operation and management can be categorised by the road types they look after, namely, local or trunk.

- *Trunk Roads* – the trunk road network is comprised of roads that are considered to be of strategic importance to Scotland's economy, primarily motorways and other A class major route corridors, ranging from the ten-lane M8 in the centre of Glasgow, to single carriageways in the West Highlands. Trunk road maintenance and investment and details of major road infrastructure projects are the responsibility of Transport Scotland, an agency of the Scottish Government.

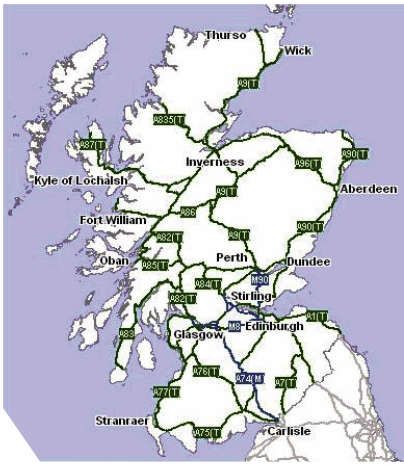
1 following the publication of the 'Code of Practice: The Reduction of Delays at Roadworks'

- *Local Roads* – all other roads, except private roads, on the Scottish road network, including some A class and all B and C class roads and unclassified roads, which range from multi-lane dual carriageways to single line rural roads, are the responsibility of individual local authorities.

1.1.10 This RAMP sets out the management practices and plans in relation to the trunk road network that is under the responsibility of Transport Scotland. Where appropriate, due consideration is given to the relationship between the trunk road network and local roads, for example, the impact that diversions/events on the trunk road network can have on local roads.

1.2 THE TRUNK ROAD NETWORK

1.2.1 The trunk road network (TRN) is comprised of route corridors that are considered to be of strategic importance to the economic stability and growth and social wellbeing of Scotland. The TRN is vital because it connects our cities, rural communities and the ports that serve the islands. Key TRN statistics are:



- 3,432 route kilometres of motorways and main roads.
- 1,821 bridges and 3,846 other structures.
- Carries over 30% of all traffic and over 60% of all HGV traffic (but is actually less than 10% of the total Scottish road network).
- Has a gross Asset Value of £15.4 billion.

1.2.2 A more detailed breakdown of the key assets on the TRN is provided in Section 3, along with information about their key characteristics such as size, material and age.

1.3 TRANSPORT SCOTLAND

ORGANISATIONAL STRUCTURE

1.3.1 Transport Scotland is the national transport agency for Scotland. Our website is www.transportscotland.gov.uk. Transport Scotland was launched in January 2006 and is directly accountable to Scottish Ministers.

1.3.2 Our purpose is to help deliver the Scottish Government's vision and commitments for transport. The organisational structure and directorates of Transport Scotland are shown in Figure 1 and described below.

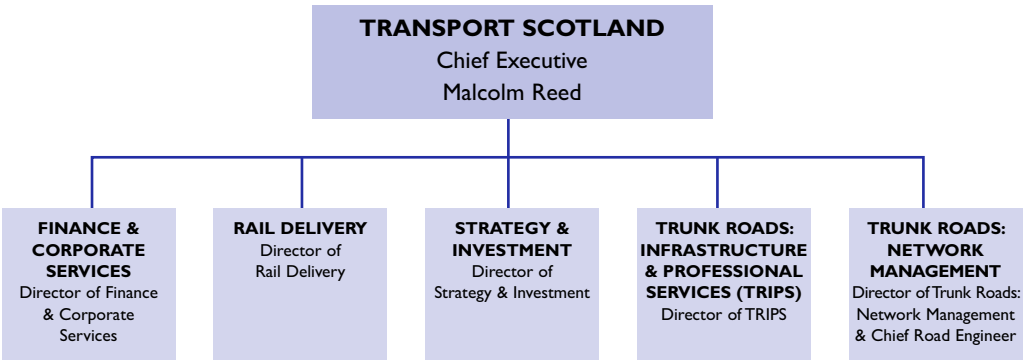


FIGURE 1 TRANSPORT SCOTLAND ORGANISATION STRUCTURE

1.3.3 We are organised into five Directorates:

- *Finance & Corporate Services* – monitoring how efficiently we deliver against our core principles.
- *Rail Delivery* – delivering commitments on rail services, infrastructure and improvements.
- *Strategy & Investment* – leading policy development across Transport Scotland.
- *Trunk Roads: Infrastructure & Professional Services* – delivering major improvements to the trunk road network, e.g. new roads and road widening.
- *Trunk Roads: Network Management* – undertaking management and operational duties and delivering maintenance on the trunk road network.

1.3.4 The Trunk Roads: Network Management Directorate (TRNMD) is responsible for the operation and maintenance of the trunk road network and the delivery of asset management. This RAMP has been produced by the TRNMD.

CHALLENGES FOR TRANSPORT SCOTLAND

1.3.5 Transport Scotland faces many challenges across all areas of their work. Specific challenges relating to the management of the trunk road network include:

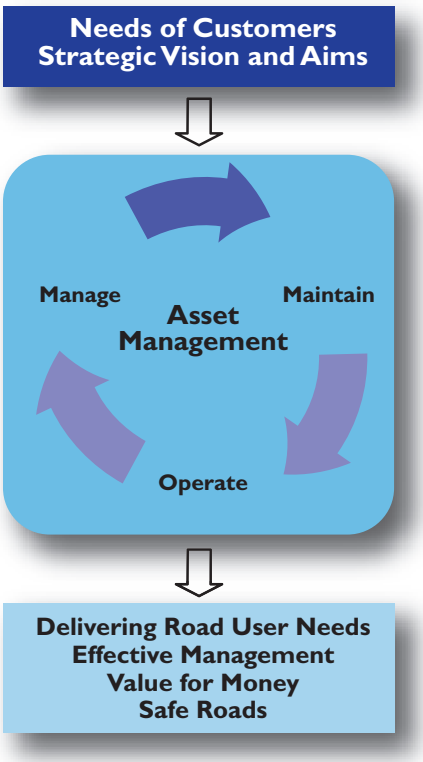
1. Acting, first and foremost, as a network operator that focuses on the provision of safe and reliable journeys.
2. Understanding how our asset manager responsibilities align with and fully support our network operator responsibilities.
3. Meeting increasing demands and expectations from customers for safe and reliable journeys.
4. Minimising the disruption caused by roadworks, but at the same time maintaining the network in a safe and serviceable condition.
5. Understanding the link between maintenance activities and their impact on the economy and the quality of people lives, and taking account of this when planning and doing work.
6. Dealing with the logistical complexities of planning and undertaking maintenance activities in a safe manner on a highly trafficked network while minimising disruption.
7. Placing more emphasis on the preservation of existing assets for the long-term because it is not practical, or often feasible, to construct new roads or reconstruct large parts of the existing network.
8. Getting more out of existing assets, for example, catering for increasing traffic volumes and extending asset lives through improved and innovative maintenance techniques.
9. Demonstrating that planned work will deliver long-term aims and objectives using management processes and systems that are robust, transparent and auditable.
10. Providing improved financial accountability and transparency, including justification and audit trails for decisions made, and demonstrating that decisions made, and the resulting work, provide tax payers with good *Value for Money*.
11. Maximising the contribution of road maintenance to sustainability and the environment through appropriate material and construction choices and the recycling of materials where appropriate.
12. Training and retaining engineering staff in a competitive market and recruiting from a limited pool of skilled, experienced and qualified engineers and other specialist personnel.

1.3.6 These challenges demonstrate the need for a formalised and rational approach to the management of the trunk road network. Asset management is widely recognised as the formalised and rational approach that should be adopted.

1.4 ASSET MANAGEMENT

WHAT IS ASSET MANAGEMENT?

1.4.1 Asset management is a relatively modern but well developed discipline that is recognised as current best practice for managing transport infrastructure assets. It is practiced in many countries and across a wide range of industries, including roads, railway, oil and gas, water and wastewater, aerospace and nuclear.

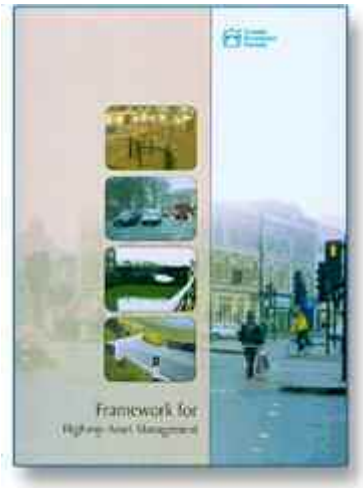


1.4.2 Asset management is applied to the whole life of assets and determines the optimum way of managing assets to achieve the desired outcomes. In simple terms, asset management can be defined as "knowledge based planning focused on outcomes", that is:

- **Knowledge** – accurate and up-to-date knowledge of assets and their attributes are held, for example, materials, dimensions, condition and costs. The quality of knowledge is sustained through formal information management activities, including data collection programmes and audits, which are supported by appropriate computerised systems that are user-friendly and present information in the required format.
- **Planning** – the whole life of assets are considered when planning works thereby enabling the most cost effective solution, which meets service requirements, to be identified. This produces long-term work and financial forecasts that, once agreed, are documented in an Asset Management Plan. In developing this long-term plan, techniques are used to objectively and optimally allocate budgets; this allows the impact of different levels of funding on the service to be assessed.
- **Outcomes** – work planning focuses on delivering outcomes to the customer, for example, improved journey reliability (i.e. average time to travel from A to B), not traditional measures (i.e. 50km of motorway resurfaced). The latter is simply a means of achieving the former, where the former are normally customer focused strategic targets that are established through direct consultation with the customers. As such, the Asset Management Plan documents the work and finances needed to deliver the agreed outcomes to the customers.

1.4.3 The basis and principles of asset management are well documented. Documents which give particular regard to transport infrastructure asset management and which have formed the basis of our asset management approach include:

- Framework for Highway Asset Management [2]
- PAS 55-1: Asset Management: Specification for the optimized management of physical infrastructure assets [3]
- PAS 55-2: Asset Management: Guidelines for the application of PAS 55-1 [4]
- International Infrastructure Management Manual, UK Edition [5]



1.4.4 All of the above documents provide slightly different definitions of asset management, but in essence these all have the same meaning and embody the same core principles and philosophy. We have adopted the definition provided in the *Framework for Highway Asset Management* [2], amending it slightly to suit the characteristics of our network:

Asset management is a strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the road infrastructure to meet the needs of current and future customers.

1.4.5 Our definition embodies the key principles of asset management:

- **Strategic Approach** – a systematic process that takes a long-term view.
- **Whole of Life** – the whole-life/life-cycle of an asset is considered.
- **Optimisation** – maximising benefits by balancing competing demands.
- **Resource Allocation** – allocation of resources based on assessed needs.
- **Customer-focused** – explicit consideration of customer expectations.

1.4.6 Although asset management introduces new practices it does not replace existing good practice. Instead it provides the overall framework and logic within which existing good practice may be more effectively applied and complemented by new practices.

DRIVERS FOR ASSET MANAGEMENT

1.4.7 The challenges described in paragraph 1.3.5 are all strong drivers for the adoption of an asset management approach. Furthermore, in recent years there have been a number of key government initiatives aimed at driving, encouraging and supporting the development, implementation and improvement of asset management for transport infrastructure, including:

- **Building a Better Scotland (November 2004)** – places a number of challenges on road management, including year on year efficiency savings, and explicitly states that "we will achieve up to £5m more output from trunk roads maintenance through the implementation of robust Asset Management Plans".
- **Scotland's Transport Future: The Transport White Paper (June 2004)** – clearly sets out that a well managed transport system is fundamental to achieving the vision of a prosperous and socially-just Scotland. The overall aim of the White Paper (to promote economic growth, social inclusion, health and protection of the environment through a safe, integrated, effective and efficient transport system) is supported by well defined and challenging objectives that will directly inform and drive forward road asset management. The White Paper also explicitly states than an Asset Management Plan will be developed that provides a strategic long-term approach to the management, operation and enhancement of the network.
- **Scotland's National Transport Strategy (April 2006)** – the strategy sets out the Scottish Government's vision for transport and the actions they intend to take to deliver the vision. This sets the overall direction for transport strategy and planning in Scotland.
- **Maintaining Scotland's Roads, Audit Commission (November 2004)** – provides a number of recommendations for councils in Scotland, but also two key recommendations for the Scottish Government that need to be acted upon, namely publicly reporting condition and backlog annually and calculating backlog using an accepted methodology.
- **Efficient Government Plan (November 2004)** – the Scottish Executive published the Efficient Government Plan aimed at attacking waste, bureaucracy and duplication. Asset management is fundamental to achieving and demonstrating efficiency improvements.

1.4.8 In addition to the above, the Department for Transport (DfT) publication *Maintaining a Vital Asset* [6], which is supported by the Codes of Practice [7, 8 and 9], clearly identifies asset management as good practice and emphasises the need for all road management organisations to adopt an asset management approach.

BENEFITS OF ASSET MANAGEMENT

1.4.9 In general, organisations say that adopting asset management has enabled them to manage their assets more effectively and efficiently. The main benefits are considered to be the ability to make better use of resources, normally demonstrated by:

- providing the same or better service at a reduced cost; or
- providing a better service for the same or marginally increased cost.

1.4.10 Unfortunately most organisations are unable to quantify this because they did not systematically record and monitor their practices pre asset management, meaning they are unable to compare their asset management practices against their previous practices.

1.4.11 We are putting in place practices that will enable us to demonstrate improvements made by implementing asset management. In particular we are currently developing a Performance Management Framework, including appropriate Performance Measures, which will allow us to demonstrate how we are performing against our asset management goals, objectives and targets. The Performance Management Framework is described in Section 6 of the RAMP. However, we recognise that it will be a number of years before we are able to meaningfully demonstrate the above. More immediate benefits that we expect to achieve from adopting asset management include:

- Improved understanding of how asset management will help deliver our network operator commitments.
- Improved data and information quality and completeness through the development of formalised information management protocols.
- Establishing the importance of each data and information item, and using this to inform the data management protocols, thereby focusing resources on information that is most valuable to us.
- Improved understanding of the current state (condition) of the trunk road assets.
- Engaging with customers, through targeted surveys, to understand their requirements from the trunk road network, and to use this to set management and engineering performance targets for the assets.

- Developing computerised tools that will support asset management, in particular the ability to demonstrate the levels of funding needed to deliver the required service on the trunk road network, and the impact that alternative funding levels have.
- Improved robustness and transparency in decision making.
- Improved understanding of the whole life costs involved in the operation and management of the trunk road assets.

- Explicit identification of the key risks that face the trunk road assets, for example, land slides and bridge impacts, and the development of Risk Management Plans to actively manage these risks.
- Developing a Road Asset Management Plan (this document) that will help inform you of the practices we use to manage the trunk road network.

1.4.12 The full benefits of asset management will only be realised when it is embedded as our recognised and accepted way for working. To achieve this we are implementing a long-term plan of asset management learning, development, implementation and continuous improvement; the *Asset Management Improvement Programme*.

ASSET MANAGEMENT IMPROVEMENT PROGRAMME

1.4.13 In 2004 we commissioned a review of the management practices we use for the trunk road network. This review compared our 2004 practices against recognised good asset management practice and identified a number of crucial gaps. The review made a number of findings and recommendations on how the gaps should be closed. We have developed a three year *Asset Management Improvement Programme* to deliver these recommendations; the programme will run from April 2006 to March 2009. The improvement programme includes 12 separate, but interrelated packages of work. A description of these work packages is presented in Section 14.

1.5 ROAD ASSET MANAGEMENT PLAN

WHAT IS THE ROAD ASSET MANAGEMENT PLAN?

1.5.1 While there is general agreement on the core components of an Asset Management Plan (AMP), (for example, a description of the assets covered, Levels of Service, lifecycle plans, and work and financial plans), each industry and organisation have tailored AMPs to reflect their specific circumstances and needs. Our vision for the Road Asset Management Plan (RAMP) is:

A document that sets out the agreed ten-year work and financial plans for the trunk road network and describes how we will optimally manage these assets, through the development and application of recognised good asset management practices, to deliver customer expectations and the Aims, Objectives and Targets defined in the Corporate and Business Plans.

1.5.2 This is our first RAMP and as a result does not fully meet this vision because we are still developing and implementing our *Asset Management Improvement Programme*. The RAMP sets out key areas where developments and improvements will be made over the coming years to ensure our aims and objectives can be delivered.

1.5.3 This RAMP is relevant for the period April 2007 to March 2009. The second version of the RAMP will be published in March 2009.

WHO WILL USE THE RAMP?

1.5.4 We envisage the RAMP will be used by a wide range of parties, including:

- *Customers* – to understand the service we propose to deliver and how we intend to do so.
- *Elected Members and Senior Management* – to understand long-term funding requirements for the trunk road network and the quality of service this will deliver.
- *Asset Managers* – both asset managers within Transport Scotland and our Service Providers (Operating Companies) will use the RAMP to understand and apply our overall asset management practices, and to ensure short-term (one to three year) detailed maintenance plans align with the long-term (ten-year) generic work plans described in the RAMP.

1.5.5 As such, we have written the RAMP in a style that reflects the needs of all of these parties. We welcome feedback and comments from all the above, and others, on the style, content and usefulness of the RAMP.

RELATIONSHIP OF RAMP TO KEY DOCUMENTATION

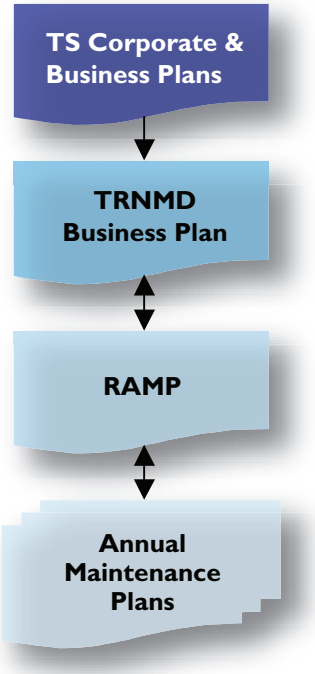
1.5.6 The relationship of the RAMP to other key Transport Scotland documentation is shown below. It is important to note that the RAMP provides the key link between the strategic Corporate and Business Plans and the Operational Delivery Plans (Annual Maintenance Plans), thereby ensuring operational plans align with strategic plans, and that strategic plans take note of operational issues. A brief overview of these key documents is provided in the following.

CORPORATE PLAN AND BUSINESS PLAN

1.5.7 The Transport Scotland Corporate Plan and Business Plan are available on our website www.transportscotland.gov.uk.

1.5.8 The Corporate Plan covers a period of two years, the current plan is for 2006 to 2008, and:

- Explains the role of Transport Scotland in the context of transport as a whole.
- Sets out the roles and responsibilities of each of the Directorates, which cover strategy and investment, rail, trunk roads and corporate services.
- Details the high-level expenditure allocated to Transport Scotland for the period of the plan.



- Sets Aims, Objectives and Targets for the plan period, and starts to scan the horizon beyond that.
- Sets out broader corporate policies and commitments on open government, efficiency, equalities and the environment.
- Explains how Transport Scotland will deliver this Plan and report on its success.

1.5.9 The Transport Scotland Business Plan sets out what Transport Scotland will do in the following year to achieve the Aims, Objectives and Targets set in the Corporate Plan, in turn delivering services and improvements to Scotland's transport users.

TRUNK ROADS: NETWORK MANAGEMENT DIRECTORATE BUSINESS PLAN

1.5.10 The Aims and Targets for the TRNM Directorate and the other four directorates in Transport Scotland are set down in the Corporate documents. The TRNM Directorate Business Plan provides an additional and more detailed breakdown of the branch-focused performance targets which complement the Corporate Aims.

ANNUAL MAINTENANCE PLANS

1.5.11 The Operating Companies produce annual maintenance plans that describe in detail the programme of works, and their associated costs, for the following financial year.

1.6 SUMMARY OF FINANCIAL PLAN

1.6.1 In future versions of the RAMP this section will provide a high level summary of the long-term financial plan, for example, the total annual amount of planned expenditure on trunk road maintenance for the next ten year period. These numbers are not presented in this version of the RAMP because the computerised tools that will assist us with the long-term financial predictions are currently under development.

1.7 CONTENTS OF THE RAMP

SECTION	SUMMARY OF SECTION CONTENTS
2. Aims, Objectives, Targets & Expectations	Sets out the overall aims, objectives and targets of Transport Scotland in relation to the trunk road network and initial findings on customer expectations. This provides the overall context for asset management activities in Transport Scotland.
3. Road Assets	Describes Transport Scotland's trunk road assets. The asset quantities and key characteristics are summarised.
4. Asset Management Practices	Provides an overview of the asset management practices, including roles and responsibilities, the Asset Management Framework, Asset Management Systems and the Asset Management Planning process.
5. Current & Future Demand	Presents current and expected future network demand, including the assumptions used to determine expected future demand. The impact of any change in network demand on management is identified.
6. Performance Management Framework	Summarises how the strategic aims, objectives and targets are translated into Levels of Service, and in turn Performance Measures/Targets, that inform and direct asset management planning.
7. Risk Management	Describes the approach Transport Scotland currently uses to identify and manage risks associated with service delivery, and summarises how Transport Scotland aims to improve this in the future.
8. Lifecycle Plans	Describes the procedure Transport Scotland has adopted to develop lifecycle plans for the transport assets, and explains how Transport Scotland takes account of asset deterioration and maintenance needs when developing these.
9. Decision Support	Describes some of the key decision support techniques and tools that are used to support trunk road management, for example, Value Management and Whole Life Costing.
10. Work Plan	Describes the work volumes required to maintain the network at the agreed Levels of Service, e.g. the quantity of carriageway resurfacing required each year by road type.
11. Financial Plan	Describes the associated finance required to maintain the network at the agreed Levels of Service.
12. Risks to the RAMP & their Management	Describes the key risks to the achievement of the RAMP and how they will be mitigated or managed.
13. Monitoring, Reviewing & Continual Improvement	Describes how the performance (or realisation) of the RAMP will be monitored and the results fed back into the asset management planning process.
14. Asset Management Improvements	Describes the improvements that need to be made to asset management over the RAMP period, e.g. staff training, processes, data and systems.

2 AIMS, OBJECTIVES, TARGETS & EXPECTATIONS

This section summarises Transport Scotland's strategic Aims, Objectives and Targets that provide the overall context and direction for asset management planning. Details of public consultation exercises used to identify customer expectations are also provided.

2.1 TERMINOLOGY

2.1.1 In support of the Scottish Government's vision for transport, Transport Scotland's aim for the trunk road network is to *deliver a safe, efficient, reliable and environmentally acceptable service that meets current and future needs*. Our corporate aims are set down in the Corporate Plan 2006-2008, and each Aim is supported by Objectives and Targets.

- *Aims:* Our five high-level, but specific, outcomes – in other words, what will be different at the end of the Plan period.
- *Objectives:* Measurable outputs – what our Directorates will do, jointly or singly, to deliver the Aims.
- *Targets:* More detailed inputs – the tasks required to deliver the Objectives and meet the Aims.

2.1.2 We have also started work on identifying customer expectations through a series of surveys. An overview and some initial findings are presented after the Aims, Objectives and Targets.

2.2 CORPORATE AIMS

2.2.1 Aims 1, 3, 4 and 5 are of particular relevance to the trunk road network, but all five aims are shown below for completeness.

- *Aim One:* Ensuring that Scotland's trunk road and railway systems are managed efficiently, effectively and economically.
- *Aim Two:* Establishing and running the national concessionary travel schemes.
- *Aim Three:* Delivering the Scottish Government's committed programme of enhancements to Scotland's rail and trunk road infrastructure.
- *Aim Four:* Helping to build Scotland's National Transport Strategy by setting investment priorities for tomorrow's rail and trunk road networks.
- *Aim Five:* Strive towards excellence by building our working principles into everything we deliver, and into how we work as an organisation.

2.2.2 Delivery of these aims will support the Transport Ministers' overall vision to promote economic growth, social inclusion and health and protection of our environment through a safe, integrated, effective and efficient transport system. In delivering these aims, we will adhere to a core set of working principles:

- Strive to become a centre of excellence in transport delivery, both nationally and internationally.
- Promote transport integration.
- Maintain a clear outward focus on the needs of transport users.
- Work in partnership with other transport providers and wider government in our planning and delivery.
- Make the most efficient use of public resources, and equip our staff to do the best possible job.

2.3 CORPORATE OBJECTIVES AND TARGETS

2.3.1 Each Aim is supported by Objectives and Targets, those relevant to the trunk road network are presented below.

Aim 1 – Ensure that Scotland's rail and trunk road systems are managed efficiently, effectively and economically.

Objectives:

- Maintain and renew the trunk road network infrastructure.
- Ensure trunk road service levels are maintained to required standards.

Targets:

- Improve the trunk road network condition, through managing and monitoring the delivery of our annual maintenance programmes and operating contracts over the next decade.
- Contribute to the Scottish Government's overall target to reduce serious/fatal road accidents by 2010 through delivery of our annual road safety improvement programmes.
- Improve trunk road network efficiency over the next decade through the use of Intelligent Transport Systems.
- Improve joint working on trunk road issues between planning authorities, developers and the Scottish Government.

Aim 2 – Establish and run the national concessionary travel schemes.

- *Objectives and Targets:* does not include objectives and targets relevant to asset management on the trunk road network.

Aim 3 – Deliver the Scottish Government's committed programme of enhancements to Scotland's trunk road infrastructure.

Objective:

- Deliver Ministers' agreed programme of investment in the trunk road network.

Target:

- Make the most effective use of budget availability for minor and additional trunk road improvements.

Aim 4 – Help to build Scotland's National Transport Strategy by recommending and advising on investment priorities for tomorrow's rail and trunk road networks.

- *Objectives and Targets:* the current supporting objectives and targets are not relevant to asset management on the trunk road network.

Aim 5 – Strive towards excellence by building our working principles into everything we deliver; and into how we work as an organisation.

Objectives:

- Develop and lead excellence in transport delivery.
- Manage our resources transparently and efficiently.
- Manage and monitor our performance, including risks to business delivery.
- Continuously improve our performance and how we deliver what our customers require.

Targets:

- Manage and develop our staff, through effective visible leadership, and the right Human Resources policies, so we are delivering our Aims to the highest standard.
- Develop and implement a Best Value regime for the period 2006-2008, to ensure our business processes achieve continuous improvement.
- Develop and implement an appropriate Quality Management regime for the period 2006-2008, and measure what we achieve through our Annual Business Reviews.
- Document and report on the management of our finances and other resources.
- Develop, implement and evaluate a Communications Plan for Transport Scotland during 2006-2007.

2.4 CUSTOMER EXPECTATIONS

2.4.1 We fully recognise the importance of, and the need to understand, customer perceptions of and expectations for the trunk road network, and use these to inform the way in which we manage the network and the services we provide. We also need to understand the language used by customers to describe the network and the service. We typically use technical and engineering terms, but these may not be meaningful to many customers. We need to establish a 'common language' that describes network performance and is meaningful to customers and to us.

2.4.2 To address these issues we have, as part of the AMIP, undertaken a first wave of customer surveys in February and March 2007. A second wave of surveys was undertaken in June and July 2007. Important objectives of the surveys include:

- actively engaging you in the management of the trunk road network;
- establishing a common language for the service provided on the trunk road network;
- identifying your perceptions and expectations of the trunk road network and, in light of these, reviewing our aims, objectives, targets and Levels of Service;
- producing a consistent/readily understood scale on which customer perceptions, requirements and priorities can be quantified;
- identifying your key issues, requirements and priorities; and
- identifying customer views on the service we provide and whether or not this delivers value for money.

2.4.3 1,030 people were surveyed for the first wave. They were selected to provide a representative sample of the Scottish population. Initial findings from the first wave are starting to come through and a brief summary is provided in the following.

CONDITION OF THE TRUNK ROAD SURFACES

2.4.4 Those surveyed were asked to rate their degree of satisfaction with the surfaces on the trunk road network. Figure 2 shows that just over half (53%) are satisfied with the general condition of trunk road surfaces, while around a third (30%) are dissatisfied.

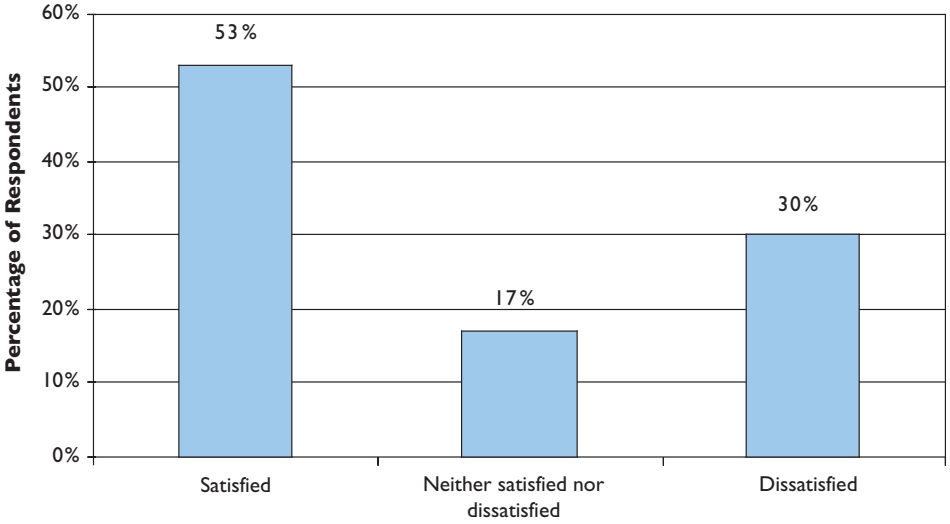


FIGURE 2 GENERAL SATISFACTION OF ROAD CONDITION

PRIORITIES FOR IMPROVING THE TRUNK ROAD NETWORK

2.4.5 Those surveyed were presented with a list of possible areas for improvement. From this list they were asked to identify their top priorities. Around half (54%) selected *improving the condition of road surfaces* as a top priority, and a similar number (52%) selected *improving safety* as a top priority. *Improving aesthetics* of the trunk road network was selected by the least number of people (3%) as being a top priority.

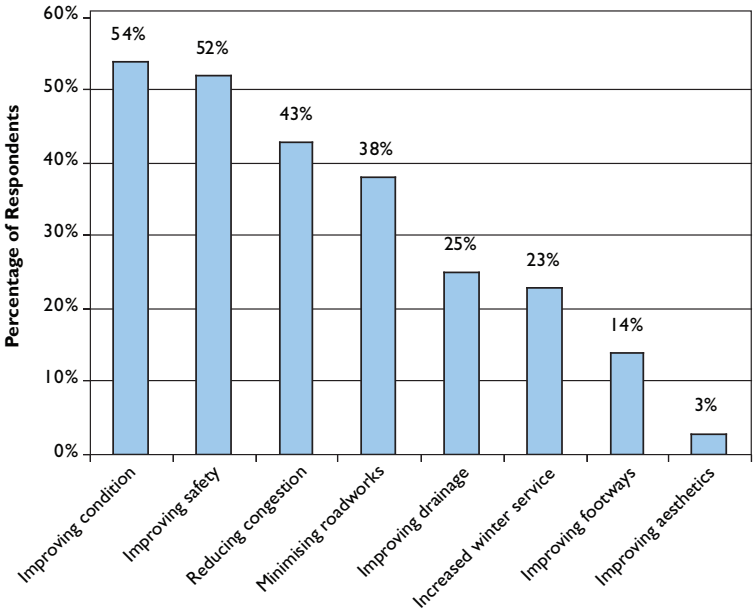


FIGURE 3 PRIORITIES FOR INCREASED SPENDING

DOING ROADWORKS AT NIGHT

2.4.6 Those surveyed were asked whether most roadsworks should be done at night. Almost half (45%) were in favour of this, but a similar number (42%) felt that roadworks should only be done at night in special circumstances. A small number of people (8%) were against any roadworks being done at night.

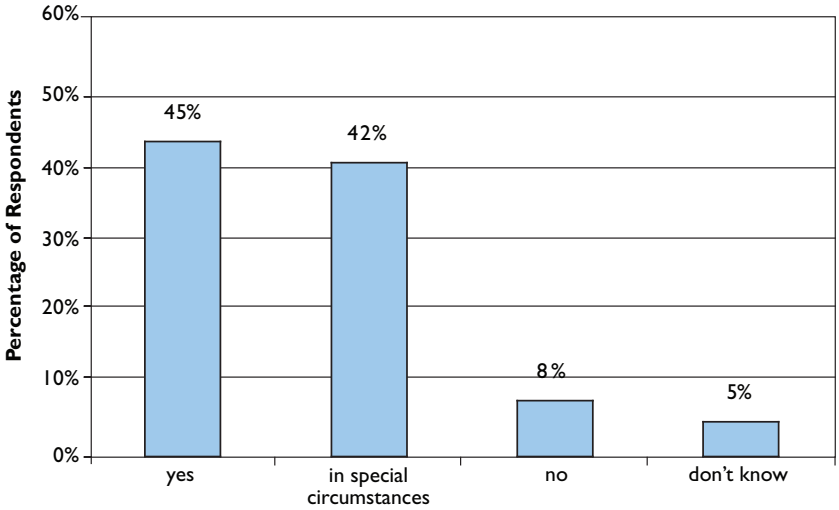


FIGURE 4 MOST ROADWORKS SHOULD BE DONE AT NIGHT

USING THE SURVEY INFORMATION

2.4.7 In the next version of the RAMP we will provide full details of the findings from the first and second wave of surveys and we will explain how this information has been used to inform our management and engineering practices.

3 ROAD ASSETS

This section describes the trunk road assets that Transport Scotland is responsible for maintaining. The assets included, and excluded, from the RAMP are identified, and a summary provided of those included. The summary includes details of the asset quantities and key characteristics such as materials, condition and age.

3.1 THE TRUNK ROAD NETWORK

OVERVIEW OF THE NETWORK

3.1.1 Transport Scotland is responsible for 3,432 route kilometres of motorways and main roads and associated infrastructure and furniture, including 1,821 bridges and major culverts and 3,846 other structures, signage, roadside drainage and verges. A map of the trunk road network is shown in Figure 5.

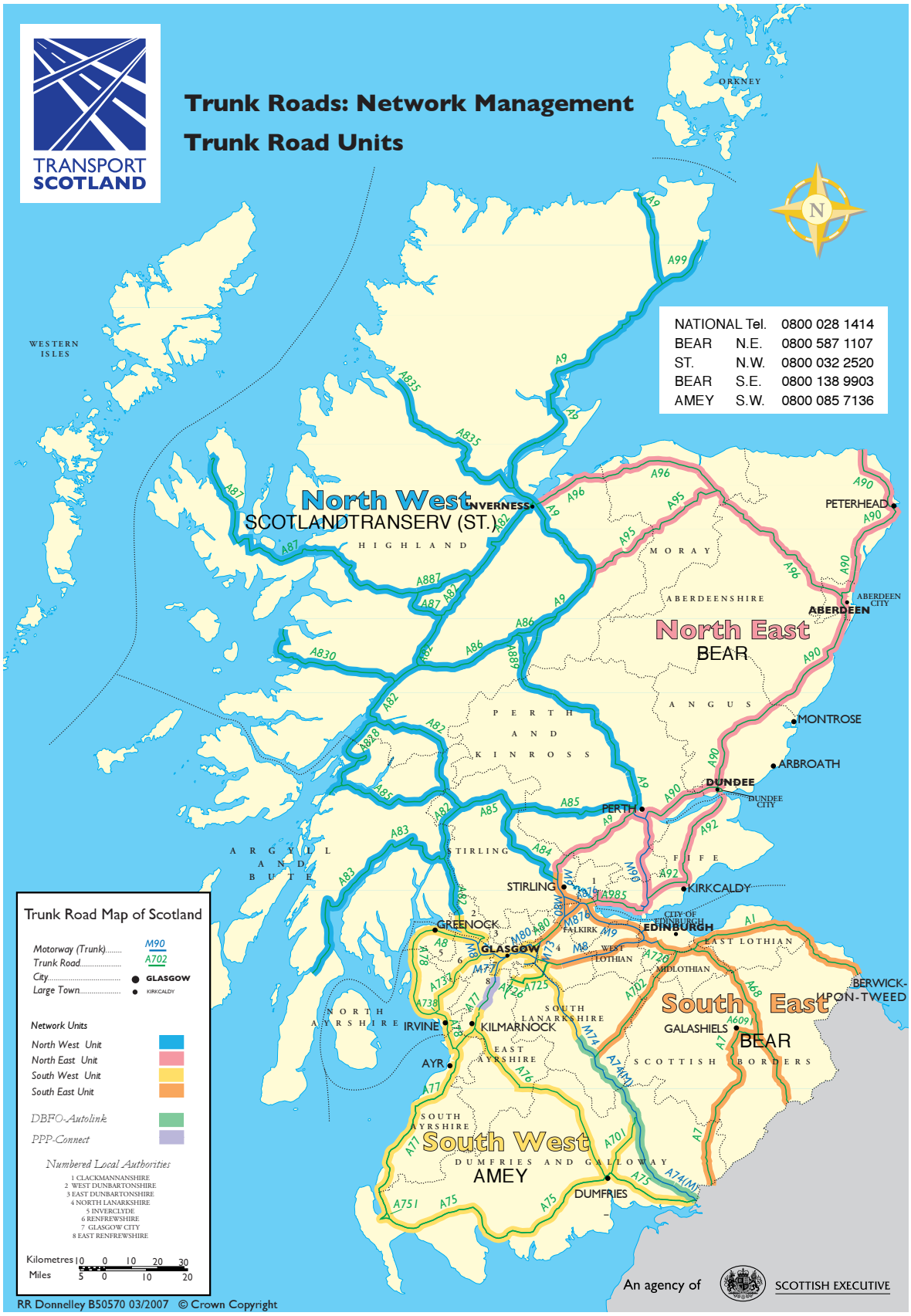


FIGURE 5 SCOTTISH TRUNK ROAD NETWORK (2005-06)

CLASSIFYING THE TRUNK ROAD ASSETS

3.1.2 Formal classification of assets, i.e. placing assets into logical groupings, is an important part of asset management. It supports and streamlines the analysis of assets during the asset management planning process and provides a consistent basis for the grouping and presentation of information, for example, presenting annual expenditure needs by asset type. In particular, the classification system should group together assets that require similar management strategies and maintenance activities.

3.1.3 As part of the *Asset Management Improvement Programme* we are reviewing our data and information requirements and management practices, and this will include the development and documentation of a formal asset classification system and the associated asset types and groups. For the purpose of this RAMP we have adopted the classification system shown in Figure 6.

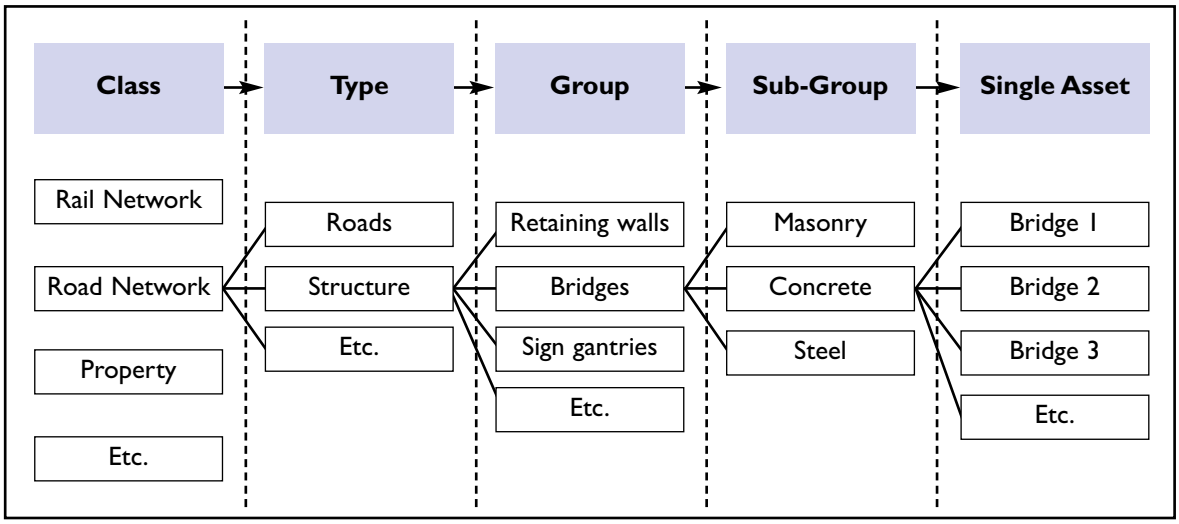


FIGURE 6 ASSET CLASSIFICATION SYSTEM

3.1.4 Using this approach, the road network has been classified into the following asset types:

- *Roads*, including carriageways, hard shoulders, laybys, crossovers, central islands, footways, cycle facilities, kerbs, central reservations, safety fences, guardrails, fences and barriers, road studs and road markings.
- *Bridges and Other Road Structures*, including culverts, retaining walls, footbridges, high mast lighting, signal gantries and reinforced/engineered earth.
- *Geotechnical*, including embankments and cuttings.
- *Road Traffic Signs*, including signage at the road side and on gantries.
- *Road Lighting*.
- *Road Traffic Signals*, including variable message signs (VMS).

- *Communication Equipment*, including communication cabinets, emergency telephone boxes, CCTV and speed cameras.
- *Road Drainage*, including channels, gullies, interceptors, catchpits, manholes, piped grips, piped drainage, ditches, filter drains, counterfort drains and balancing ponds.
- *Landscaping*, including verges, grassed areas, hedges, shrubs, woodland, trees, scrub, bulb and wetland.

TRUNK ROAD ASSETS COVERED BY THE RAMP

3.1.5 The philosophy and principles described in this RAMP apply to all the assets that form part of the trunk road network. However, this is our first RAMP, and it was decided that it would be more prudent to only cover some of the asset types in this first version. It was agreed that the two major asset types of (i) Roads (focusing on carriageways); and (ii) Bridges and Other Road Structures, would be used for this RAMP. We believe that important lessons have been learnt from the application of asset management principles to these assets, and these will help us to apply asset management more effectively to the other asset types.

3.2 ROADS

3.2.1 The major asset groups within the road asset type are focused on in this version of the RAMP, namely carriageways, hard shoulders, laybys, crossovers and central islands, that is, those parts of the network that are travelled on by vehicles. This includes the visible surface layers of these assets and the sub-surface layers; these are shown schematically in Figure 7.

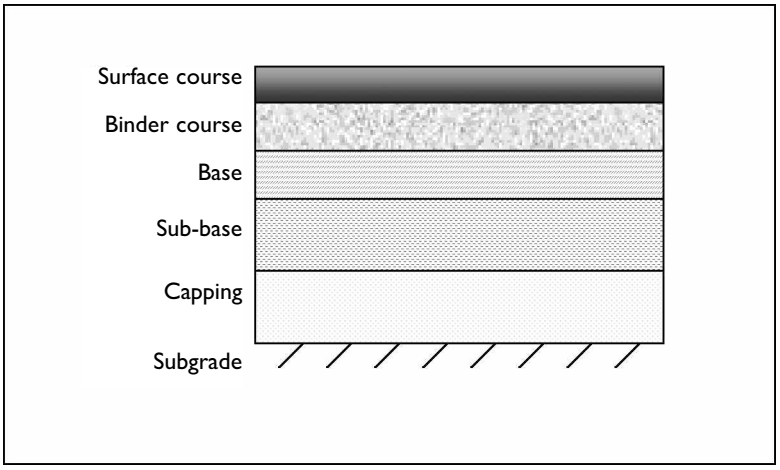


FIGURE 7 CROSS-SECTION OF A TYPICAL CARRIAGEWAY CONSTRUCTION

3.2.2 Currently, the two main criteria used to classify a section of trunk road into groups and sub-groups are road type, surface material and base material, all of which have an impact on management and maintenance. The classifications and the impact of the criteria on maintenance and management are discussed in the following.

ROAD TYPE

3.2.3 The road type reflects the perceived strategic importance of the route and the volume of traffic using the route. The route type can give an indication of the expected deterioration rates (related to traffic volume) and suitable maintenance practices for the route. These range from multi-lane motorways to single-track roads with passing places, the three main types are:

- Motorway
- Dual carriageway
- Single carriageway

SURFACE MATERIAL

3.2.4 The common surfacing types fall into six classifications:

- Bitumen macadam
- Hot rolled asphalt
- Surface treatment (includes surface dressing, thin layer surfacing and microsurfacing)
- Stone mastic asphalt
- High skid resistant surfacing (anti skid)
- Concrete

BASE MATERIAL

3.2.5 The base type falls into five classifications:

- Bituminous
- Cement bound
- Concrete
- Granular non-cementing action
- Granular with cementing action

CARRIAGEWAY GROUPS

3.2.6 Based on the above criteria, the carriageway is currently classified into the groups shown in Table 1.

Table 1: Carriageway Classifications

		SURFACE MATERIAL	BASE MATERIAL
Road Type	Motorway	■ hot rolled asphalt ■ stone mastic asphalt ■ surface treatment ■ concrete ■ high skid resistant ■ bitumen macadam	■ bituminous ■ cement bound ■ granular non-cementing
	Dual carriageway	■ hot rolled asphalt ■ stone mastic asphalt ■ surface treatment ■ concrete ■ high skid resistant ■ bitumen macadam	■ bituminous ■ cement bound ■ granular non-cementing ■ concrete
	Single carriageway	■ hot rolled asphalt ■ stone mastic asphalt ■ surface treatment ■ high skid resistant ■ bitumen macadam ■ concrete	■ bituminous ■ cement bound ■ granular non-cementing

QUANTITIES

3.2.7 The quantities are presented by road type, surface material and base material. In all of the following, the quantities may be subject to minor revision as the *Asset Management Improvement Programme* progresses.

3.2.8 An overview of the road types that make up the trunk road network is shown in Figure 8. The trunk road network is 3,432 route kilometres in length, comprising 539 kilometres of motorway, 512 kilometres of dual carriageway and 2,381 kilometres of single carriageway. The trunk road network accounts for approximately 6% of the total Scottish road network.

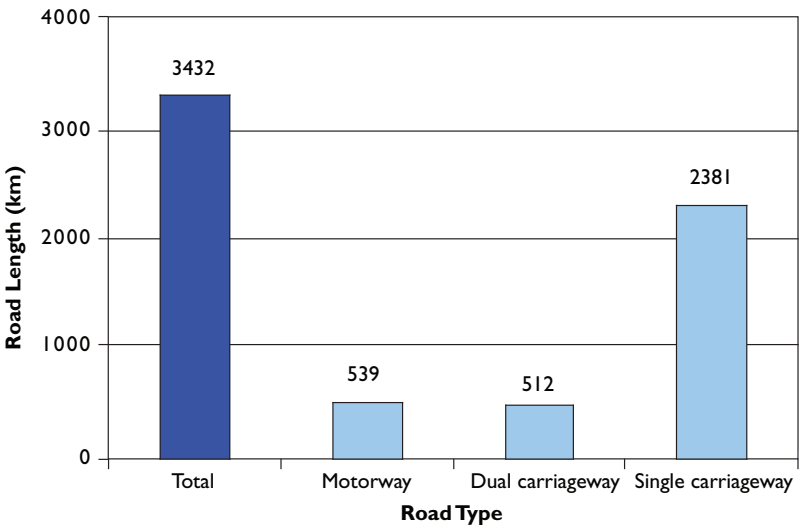


FIGURE 8 TRUNK ROAD SUBDIVIDED BY ROAD TYPE

3.2.9 Figure 9 provides a breakdown of the trunk road network by surface material type. It shows the trunk roads are predominantly surfaced with bituminous materials, with a small number being concrete with no bituminous surface. High-friction surfacing is used on approaches to high-risk sites such as pedestrian crossings, traffic lights and roundabouts.

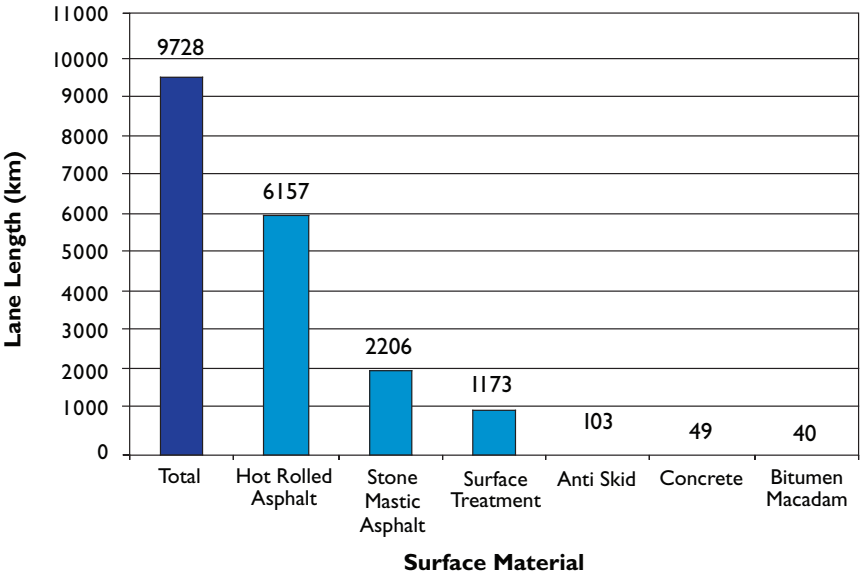


FIGURE 9 TRUNK ROAD SUBDIVIDED BY SURFACE MATERIAL

3.2.10 Figure 10 shows the trunk road network subdivided by road type and surface material. In general this shows that the proportion of surface materials used on the different road types is consistent.

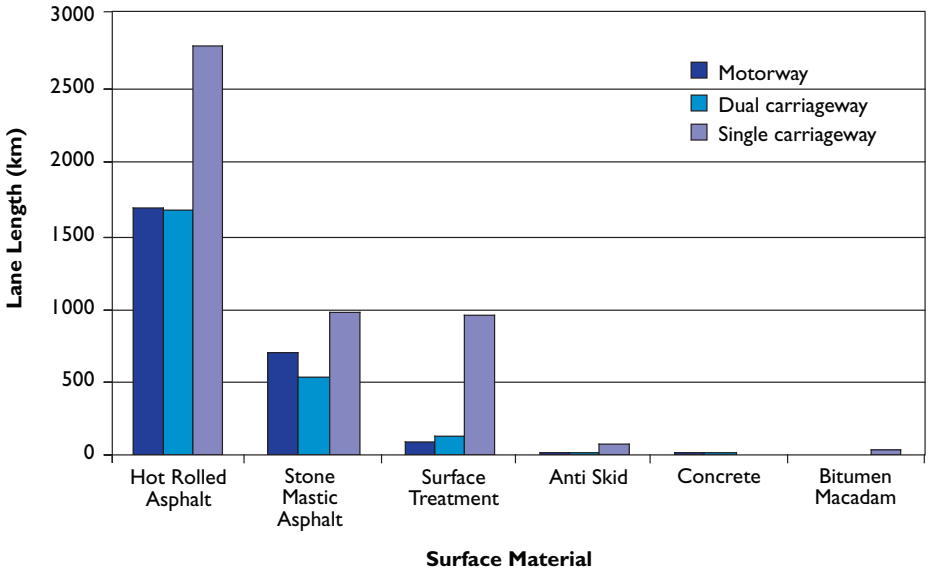


FIGURE 10 TRUNK ROAD SUBDIVIDED BY ROAD TYPE AND SURFACE MATERIAL

3.2.11 Figure 11 provides a breakdown of the trunk road network by base material. This shows that trunk roads predominantly have a bituminous base layer.

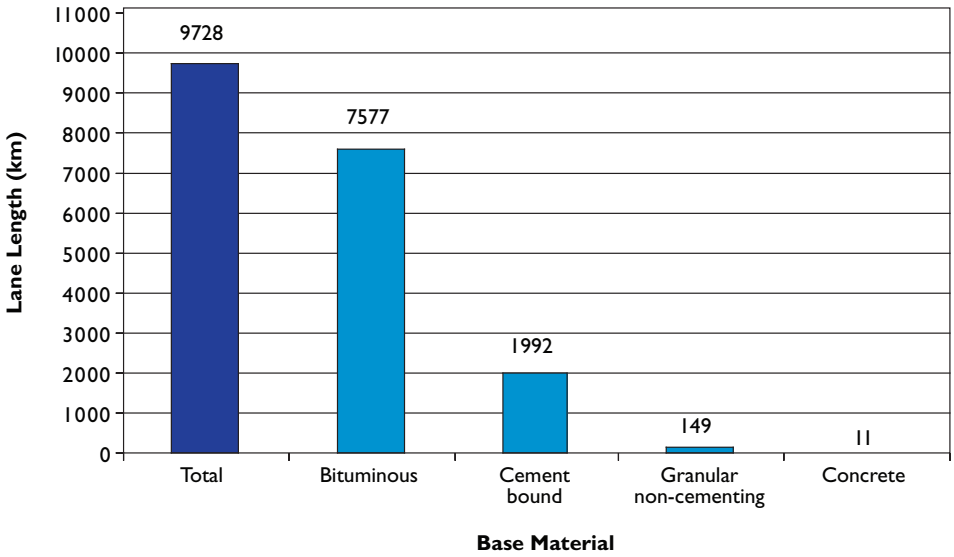


FIGURE 11 TRUNK ROAD SUBDIVIDED BY BASE MATERIAL

3.2.12 Figure 12 shows the trunk road network subdivided by road type and base material. This shows that bituminous base material is more predominant in single carriageway roads than motorways and dual carriageways.

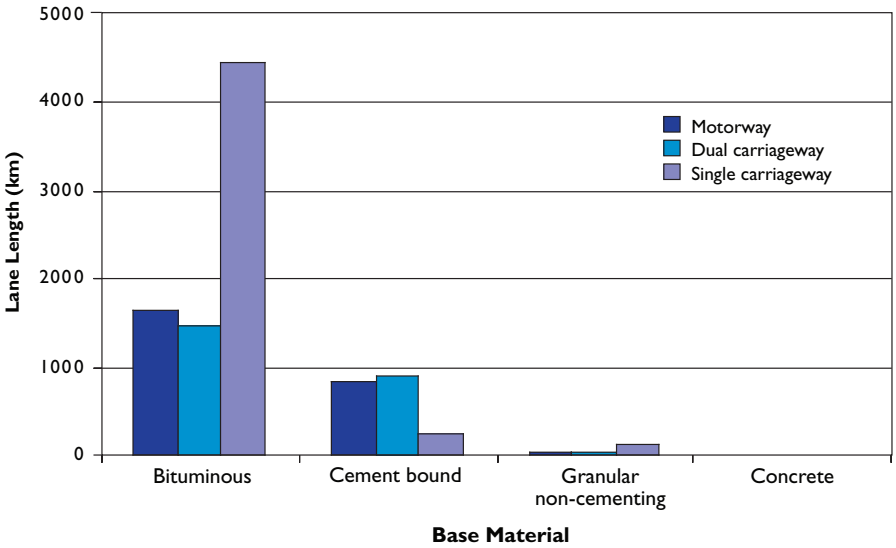


FIGURE 12 TRUNK ROAD SUBDIVIDED BY ROAD TYPE AND BASE MATERIAL

CARRIAGEWAY CHARACTERISTICS

3.2.13 The condition of trunk roads is monitored through Annual Condition Surveys which are undertaken for Transport Scotland by specialist contractors. The surveys are designed to provide information about the structural, surface and safety condition of the road surface. The former involves a slow moving vehicle that tests the structural strength by pushing a weight onto the road and measuring how much it deflects. This is then analysed to assess how much life is left in the road pavement. Figure 13 shows the residual life of roads surveyed between 2002 and 2006. When there is no residual life (shown in Figure 13 as having a 'residual life <0'), then the road requires close monitoring to ensure its overall condition does not deteriorate significantly before it is repaired.

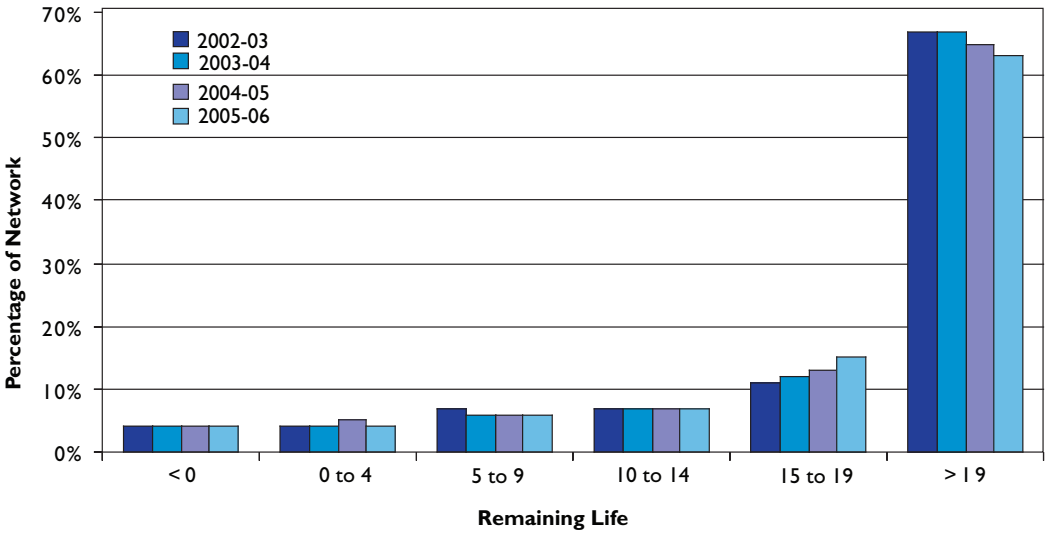


FIGURE 13 RESIDUAL LIFE OF PAVEMENTS AS PERCENTAGE OF SURVEYED NETWORK *(SCOTTISH TRANSPORT STATISTICS: NO 25)*

3.2.14 Figure 13 shows the trend for remaining life is generally constant over the last four years. However, there is a noticeable decline in the percentage of pavement with greater than 19 years remaining life. It will be important to investigate this, and assess the associated short and long-term implications, using the tools and techniques developed under the AMIP.

3.2.15 The statistics for motorways, dual carriageways and single carriageways from a survey undertaken in 2006, projected to 2007, are shown in Figure 14.

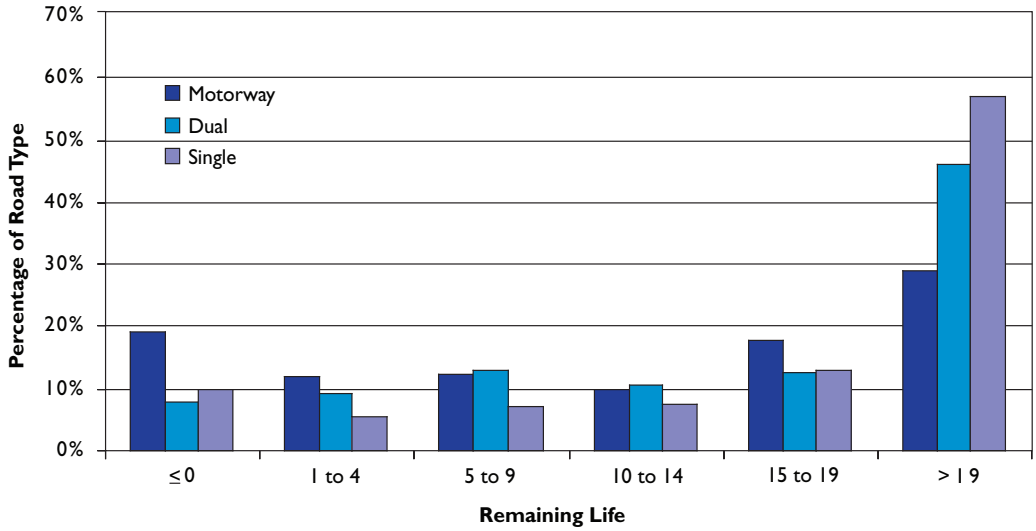


FIGURE 14 RESIDUAL LIFE OF PAVEMENTS AS PERCENTAGE OF ROAD TYPE

3.2.16 Figure 14 shows that motorways currently have a lower overall remaining life than dual and single carriageways, that is, motorways have a higher percentage with less than 0 years and lower percentage with greater than 19 years. It will be important to investigate the reasons for this, and assess the associated short and long-term maintenance and funding implications, using the tools and techniques developed under the AMIP.

3.3 BRIDGES AND OTHER ROAD STRUCTURES

3.3.1 This asset type covers all road structures over, under or alongside motorways and other designated trunk roads. Currently, the three main criteria used to classify a trunk road structure are structure type, construction form and construction material, all of which have a considerable impact on management strategy and maintenance activities.

TABLE 2 STRUCTURE TYPES AND QUANTITIES

3.3.2 The structure types and associated quantities are shown in Table 2; definitions for each of these are provided in BD63/07: Inspection of Highway Structures [10].

Table 2: Structure Types and Quantities

STRUCTURE TYPE	NUMBER	QUANTITY[1]
Bridge	1821	1,093,917m^2
Culvert	1933	58,220m
Retaining Wall	909	69,364m
Sign/Signal Gantry	238	3,746m
High Mast Light	620	16,255m
Footbridge	146	19994m^2

1 Quantity information not always available for gantry and high-mast lighting.

CONSTRUCTION FORM AND MATERIAL

3.3.4 Each structure type has a number of construction forms. These and their quantities are summarised in Appendix A. Construction forms for high mast lighting and footbridges were not available for this version of the RAMP, these will be presented in the next version RAMP. Work is ongoing on the identification of the construction materials and their quantities; these will be presented in the next version of the RAMP.

STRUCTURE AGE

3.3.5 Age profiles for the structure types is provided below. While age information is useful it does not necessarily translate directly to the condition and performance of the structure. We are therefore in the process of implementing the nationally accepted Condition Indicator for structures. We will present this condition information in the next version of the RAMP.

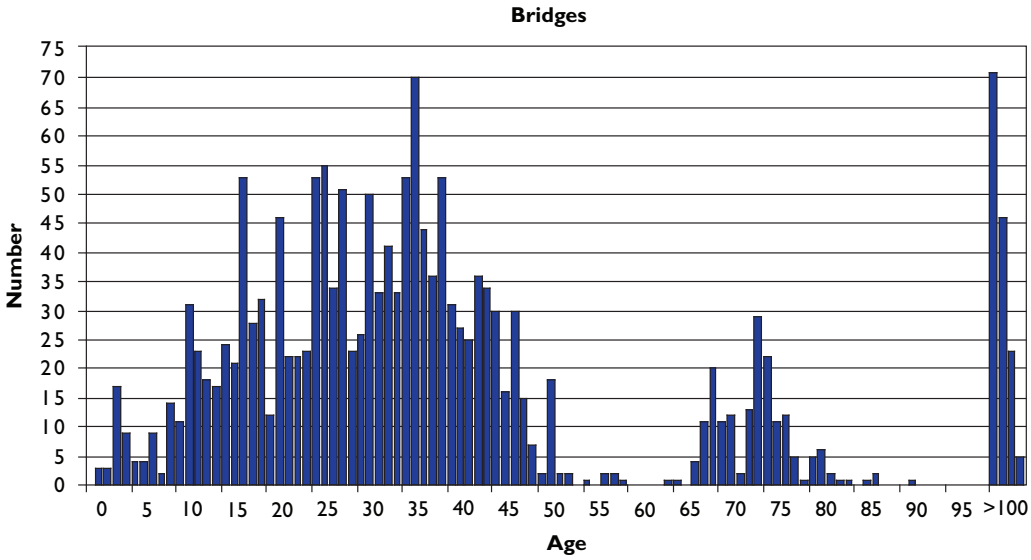


FIGURE 15 AGE PROFILE FOR BRIDGES

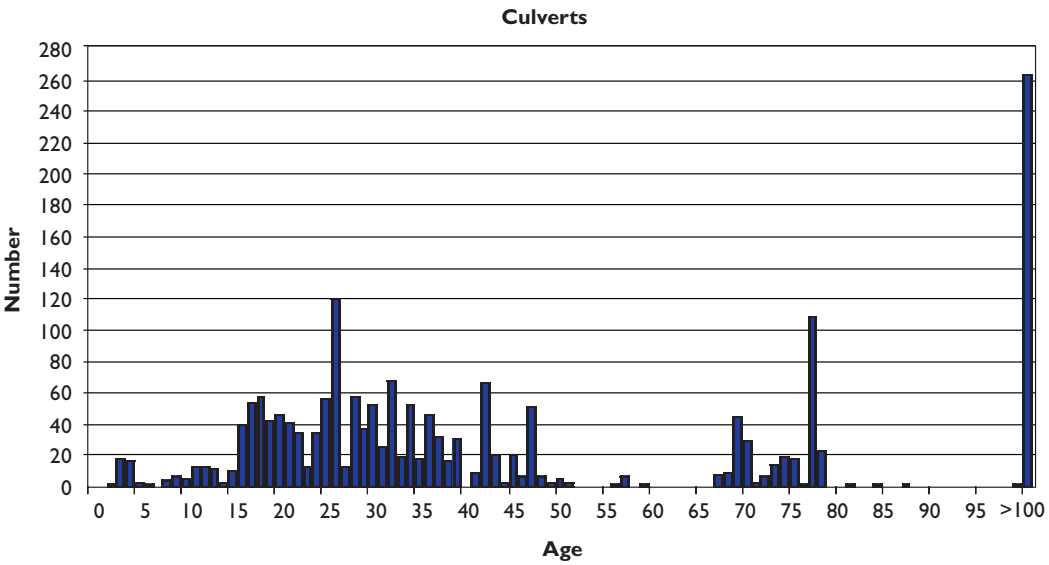


FIGURE 16 AGE PROFILE FOR CULVERTS

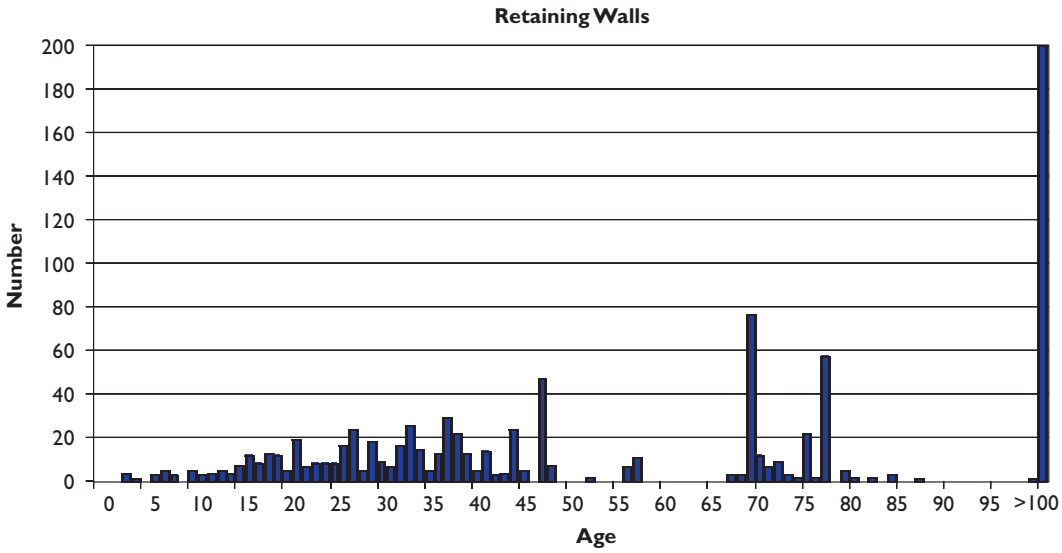


FIGURE 17 AGE PROFILE FOR RETAINING WALLS

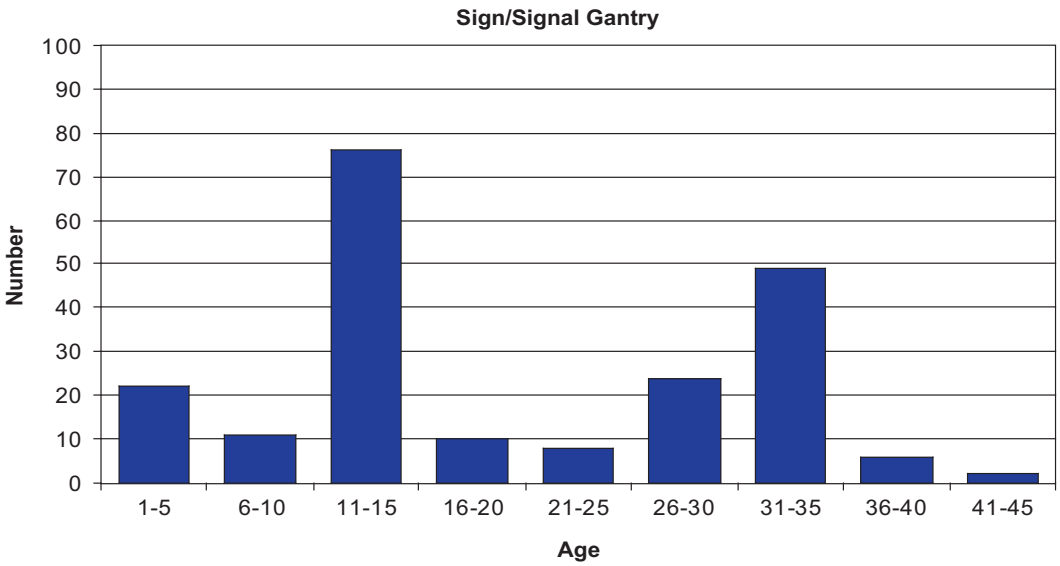


FIGURE 18 AGE PROFILE FOR SIGN/SIGNAL GANTRIES

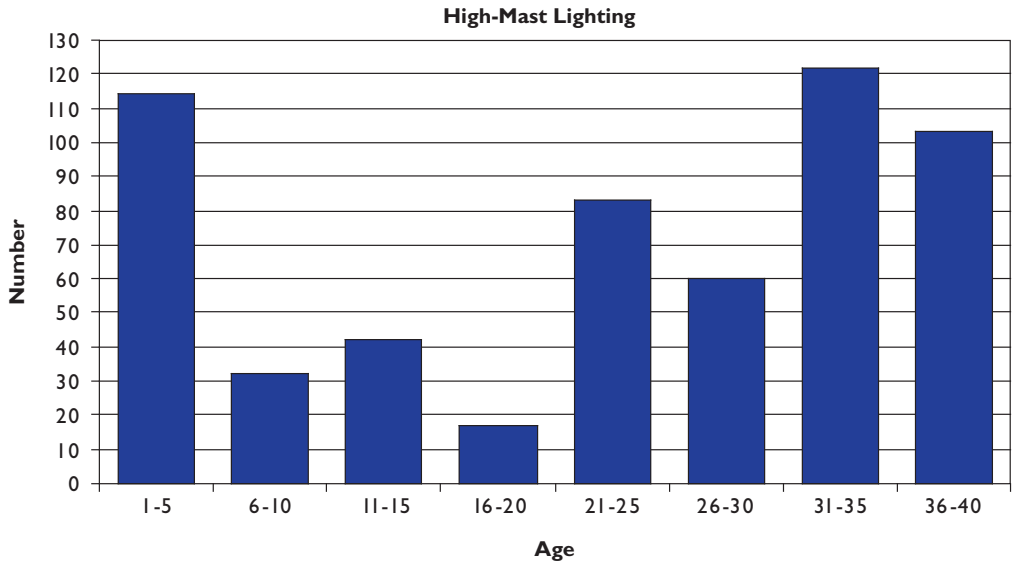


FIGURE 19 AGE PROFILE FOR HIGH-MAST LIGHTING

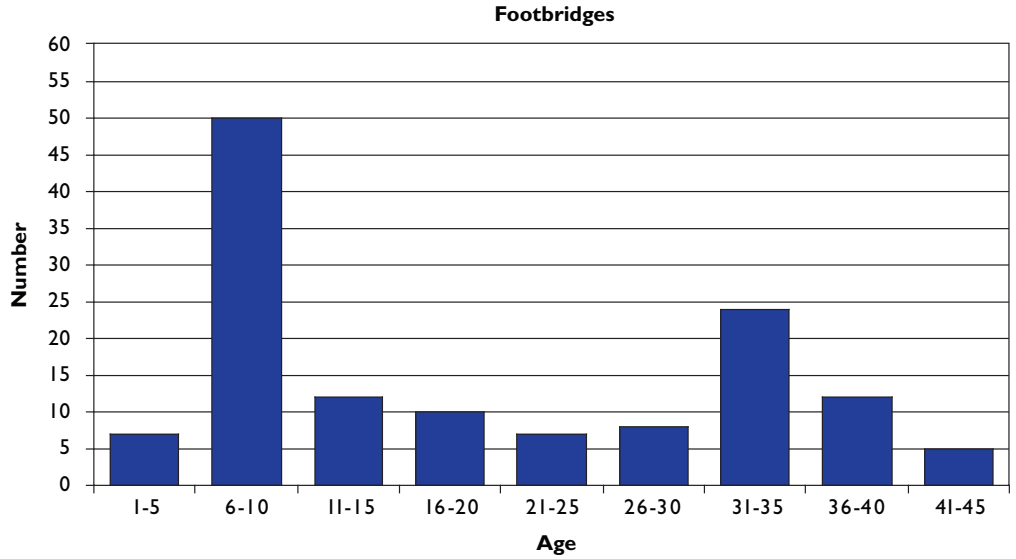


FIGURE 20 AGE PROFILE FOR FOOTBRIDGES

3.3.6 The above graphs show that many of the structures were constructed in the 1960's to 1980's period, an era of major trunk road construction in Scotland. Highway structures are long life assets and in general they have relatively slow rates of deterioration. Therefore it could be argued that the relative young age of many of our structures has resulted in low maintenance demands thus far (although there are specific examples of structure types and materials used in the aforementioned era that have resulted in high maintenance needs). As the structures age and the quantity of new construction decreases it will be fundamental to understand the maintenance needs, especially if these are increasing. The tools and techniques developed under the AMIP will be vital to understanding and identifying these needs.

4 ASSET MANAGEMENT PRACTICES

This section provides an overview of the asset management approach we are developing in Transport Scotland. This includes an overview of our asset management ethos, the asset management roles and responsibilities, and our asset management framework.

4.1 OUR ASSET MANAGEMENT ETHOS

4.1.1 The following sets out the philosophy and principles that underpin the asset management ethos we are developing and disseminating within Transport Scotland. It also sets out how we will deal with any associated changes to working practices and how we will keep abreast of the latest developments in asset management.

WHOLE LIFE PHILOSOPHY

4.1.2 Asset management is applied to the whole life of assets and determines the optimum way of managing assets to achieve the desired outcomes. The stages of an assets life are illustrated below, the deterioration and maintenance cycle is expanded because this is a core area for long life transport infrastructure assets.

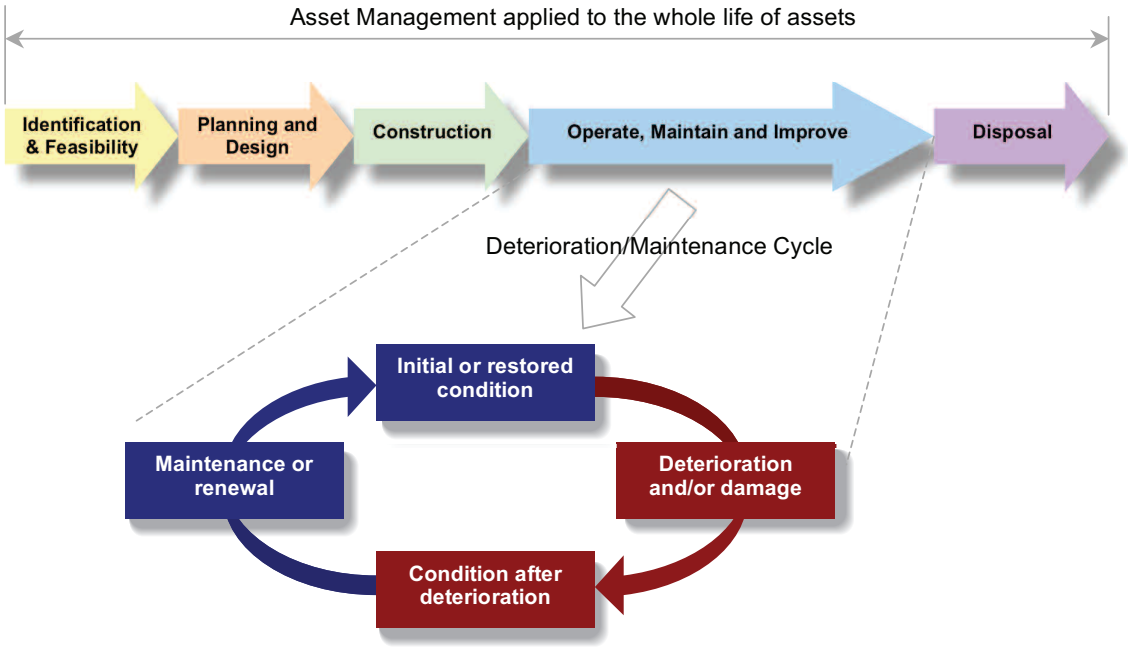


FIGURE 21 ASSET MANAGEMENT APPLIED TO THE WHOLE LIFE OF ASSETS

ASSET MANAGEMENT PRINCIPLES

4.1.3 We have studied asset management practices across different industry sectors, both private and public, attended training events and reviewed recognised asset management guidance across the world. From this we have identified ten core asset management principles; we believe all ten are relevant to our business and should be adhered to. Table 3 presents these ten core principles of asset management aligned with our trunk road management objectives of providing Customer Service, Value for Money and Effective Management (Competing for Better Roads, The Future Management and Maintenance of Scotland's Trunk Road Network, A Consultation Paper. The Scottish Office, December 1994). This illustrates that adopting an asset management approach will fully support the delivery of our trunk road management objectives.

TABLE 3 PRINCIPLES OF ASSET MANAGEMENT ALIGNED TO OUR OBJECTIVES

TRANSPORT OBJECTIVES	CORE PRINCIPLES OF ASSET MANAGEMENT
Customer Service – to enable a customer orientated approach to be further developed in the way roads are managed and maintained	*Customer Focused* – explicit consideration is given to customer requirements in defining goals, objectives and Levels of Service, and where appropriate customers are consulted. Where customers include the asset owner, public, private and business users, community, etc. *Strategic* – a planned and considered approach that takes a long term view of customer service requirements and business objectives and uses this information to inform and appropriately target expenditure, resources and works.
Value for Money – to achieve the maximum efficiency in the use of the substantial sums of money expended on the maintenance of the network	*Whole Life Considerations* – the whole life/lifecycle of the asset is considered and the whole life costs are minimised or the whole life value is maximised. *Targeted* – allocation of resources is based on a rigorous assessment of needs and benefits using prioritisation and Value Management processes. *Sustainable* – the asset base is preserved and replenished in a sustainable and cost effective way that will not impose an undue burden on future generations.
Effective Management – to encourage innovation and skilful management to maximise trunk road capacity and gain the best use of the network	*Integrated* – 'joined-up' processes and decision making across all organisational/ management levels and all asset types comprising the transport infrastructure. *System-based* – the asset base is treated as a 'networked system' with emphasis on maximising the performance of the entire system. *Holistic* – the best, or the most favourable, course of action(s) is selected by considering the wider economic, social and environmental impact of the action in addition to the direct impact on the service or operation. *Performance based* – the condition, functionality and other performance characteristics of the assets are measured, managed and linked to strategic aims and objectives. *Risk based* – the likelihood and consequences of asset failure or loss of performance are assessed and managed.

CHANGING WORK PRACTICES

4.1.4 Adopting an asset management approach will require some changes to the way we work in order to make best use of the improved data, processes and systems. These changes, along with the improved data, processes and systems, mean that some staff are likely to be influenced by asset management. It is important that these changes are formally managed and staff provided with appropriate guidance, training and support in a manner that:

- enables all staff to gain an appreciation of the asset management approach and how it is likely to influence them; and
- forms a logical starting point for those staff that will be required to develop a more detailed understanding of asset management and apply it.

4.1.5 For each new or amended practice developed through the *Asset Management Improvement Programme* we will produce associated guidance and training material to ensure it is fully utilised and that it is embedded as a new way of working. We recognise this will be challenging in some cases, and therefore the risks to implementation will be identified for each part of the Asset Management Improvement Programme and suitable management and mitigation activities put in place.

ASSET MANAGEMENT KNOWLEDGE AND INNOVATION

4.1.6 There is a considerable body of guidance available on asset management, and it is an area of active research and development. Our staff are actively involved in national and international asset management committees and groups, including UK Roads Liaison Group, CSS/TAG Asset Management Group and the World Road Association (PIARC). Our staff will continue to be actively involved in these groups to ensure that we keep abreast of the latest developments and innovations in asset management and adopt those best suited to Transport Scotland. We will also seek to share our asset management developments and innovations with other organisations, including Scottish Local Authorities.

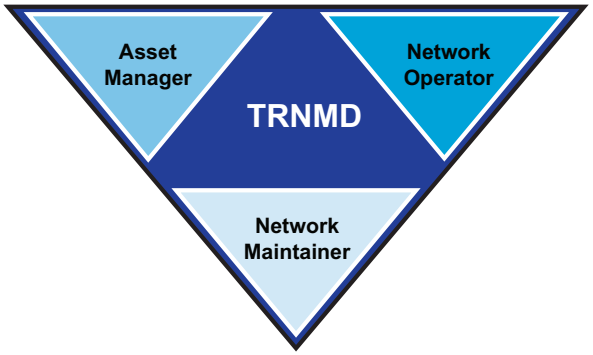
4.2 ASSET MANAGEMENT ROLES AND RESPONSIBILITIES

4.2.1 Section 1.3 introduced the overall organisational structure of Transport Scotland. The following describes the specific roles and responsibilities relating to the operation and maintenance of the trunk road network, covering:

- Trunk Roads: Network Management Directorate (TRNMD)
- Operating Companies (OCs)
- Design, Build, Finance and Operate (DBFO) Companies
- Performance Audit Group (PAG)

TRUNK ROADS NETWORK MANAGEMENT DIRECTORATE

4.2.2 The business of the Directorate is to provide people and businesses using trunk roads with a safe, efficient, reliable and environmentally acceptable system of strategic routes throughout the country. The Trunk Roads: Network Management Directorate (TRNMD) is primarily responsible for the management, maintenance and operation of the trunk road network. These are interrelated disciplines that need to work together in order to deliver the best service on the network. This interrelationship is shown in the diagram below. The key responsibilities associated with each discipline are:



- **Network Operator** – providing real-time information services via Traffic Scotland; accident investigation and prevention; development control.
- **Asset Manager** – asset management, long-term planning and budget forecasting; financial co-ordination and monitoring; business planning.
- **Network Maintainer** – managing the Operating Company contracts to ensure delivery of work programmes (inspection, maintenance and repair) and infrastructure improvements, maintenance programming, budget management.

4.2.3 The organisational structure of TRNMD is shown in Figure 22.

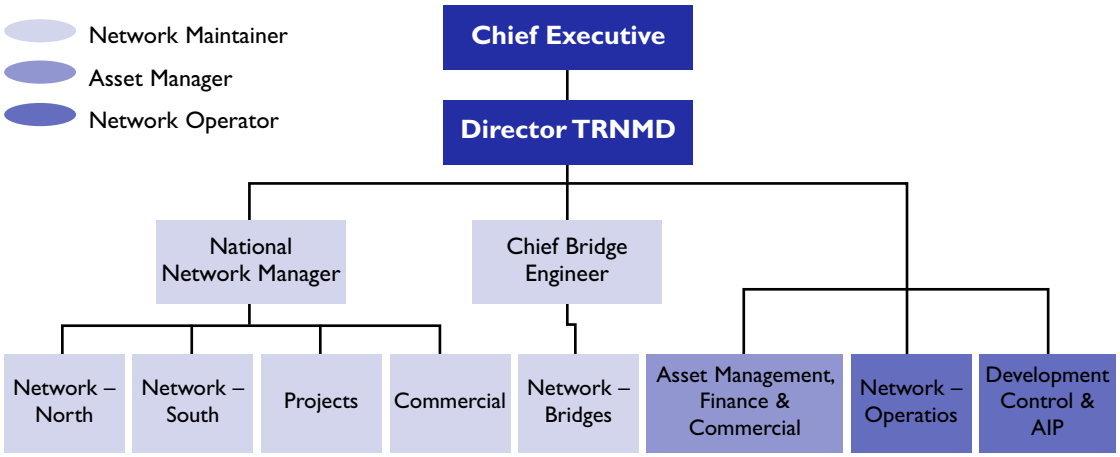


FIGURE 22 TRNMD ORGANISATION STRUCTURE

OPERATING COMPANIES

4.2.4 The trunk road network is managed and maintained by private sector companies, Operating Companies (OCs), who are contracted by Transport Scotland on behalf of the Scottish Government. They carry out day-to-day inspection, management, maintenance and repairs to the trunk road network under five to seven year contracts. The Scottish trunk road network is separated into four areas: the North West, North East, South West and South East, each area is managed and maintained under a separate contract.

- **North West** – Scotland TranServ (a joint venture between Balfour Beatty and MouchelParkman). The five-year contract runs from 1st April 2006 to 31st March 2011. Option to extend until 31st March 2013.
- **North East** – BEAR Scotland (a joint venture between Babtie, Ennstone and Raynesway). The five-year contract runs from 1st April 2007 to 31st March 2012. Option to extend until 31st March 2014.
- **South West** – Amey. The five-year contract runs from 1st April 2006 to 31st March 2011. Option to extend until 31st March 2013.
- **South East** – BEAR Scotland. The five-year contract runs from 1st April 2007 to 31st March 2012. Option to extend until 31st March 2014.

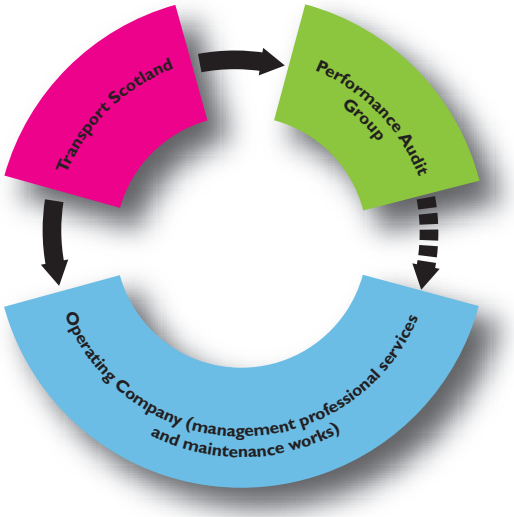
DESIGN, BUILD, FINANCE AND OPERATE

4.2.5 As well as the Operating Companies there are individual 'Design, Build, Finance and Operate' (DBFO) contracts for:

- the A74(M) from Junction 12 to the English Border – Autolink Concessionaires (M6) Plc awarded 30-year contract in July 1997.
- the M77 from Junction 5 to Fenwick – Connect M77/GSO Plc awarded 32 year contract in April 2003.

PERFORMANCE AUDIT GROUP

4.2.6 The Performance Audit Group (PAG) is an independent private sector organisation funded by Transport Scotland that monitors the performance of the Operating Companies and the DBFO companies. PAG's current contract commenced in December 2002 and is programmed to operate for an initial term of seven years.



4.2.7 PAG audits, monitors and reports on the financial, technical and performance aspects of the OCs to a plan agreed with Transport Scotland. PAG also checks payment requests from the OCs, carries out inter-Unit comparisons and investigates if they are giving value for money when asked to do so by Transport Scotland. PAG also acts as the Scottish Ministers' Agent (SMA) for the M6 DBFO project. PAG's objectives are to:

- Make the most of public resources by delivering value for money
- Ensure the needs of customers are met
- Enable effective management of the trunk road asset
- Facilitate continuous improvement
- Encourage sustainability and reduce the impact on the environment.

4.2.8 PAG also audits the performance of the Trunk Roads: Network Management Division with respect to their role as trunk roads asset managers.

4.3 ASSET MANAGEMENT AND THE MANAGEMENT HIERARCHY

4.3.1 It is important that asset management aligns with, supports and improves the management processes we already use. The management processes in Transport Scotland can be broadly categorised into three levels: *Strategic, Tactical* and *Operational*. These three management levels are shown in Figure 23.

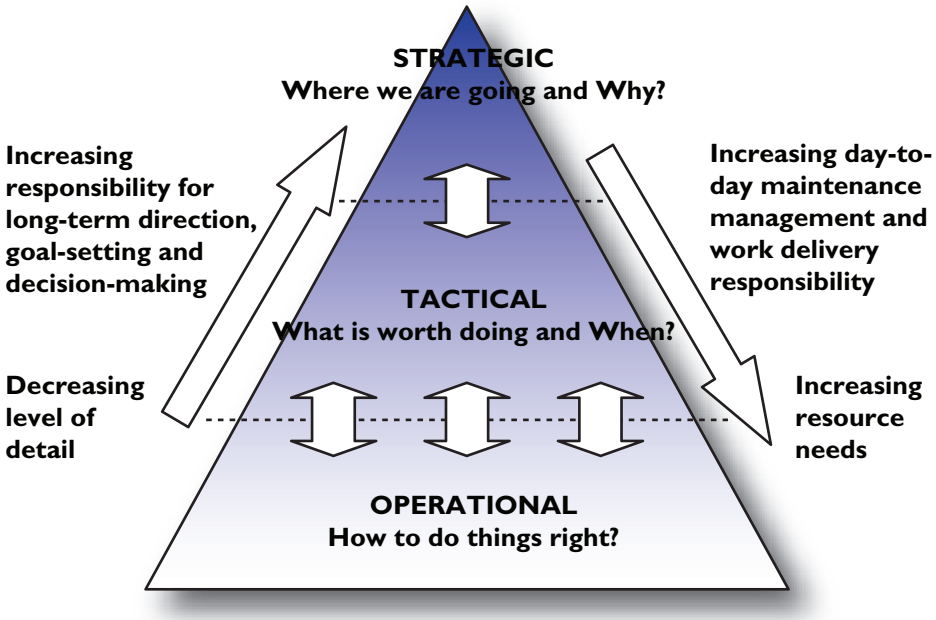


FIGURE 23 IDEALISED MANAGEMENT HIERARCHY

4.3.2 The broad scope of asset management functions in the three levels are summarised below:

- **Strategic – Where are we going and Why?** At the strategic level the Scottish Government and Transport Scotland set the overall long term direction for transport, e.g. policy, aims, objectives and targets, taking account of customer requirements and any internal/external requirements and/or constraints. The aims and objectives are set down in our Corporate and Business Plans.
- **Tactical – What is worth doing and When?** At the tactical level our asset managers translate the overall aims and objectives into specific plans and performance targets for the different asset types, aligning these with our Network Operator responsibilities. This includes processes for identifying the required, most beneficial and cost effective maintenance activities and when they should be carried out. The development of the RAMP is a tactical activity.

- **Operational – How to do things right?** At the operational level our network maintainers develop and implement detailed short-term work plans and schedules that align with the principles, processes and work volumes and phasing defined in the RAMP. Engineering processes include inspection, routine maintenance, scheme design, work scheduling and implementation. The focus is on choosing the right techniques, Value Engineering of schemes, carrying out the work in the most efficient way and scheduling works in consultation with our Network Operators.

4.3.3 Traditionally, our management and engineering practices have been well developed at the Strategic and Operational levels but our Tactical practices have not been fully developed. This has meant that the three levels, in terms of asset management planning and decision making, have not been fully integrated. Adopting good asset management practice at the Tactical level, through the delivery of the AMIP, will enable us to fully integrate the three levels, ensuring our overall strategic aims and objectives are translated into day-to-day operational activities and maintenance works.

4.4 ASSET MANAGEMENT FRAMEWORK

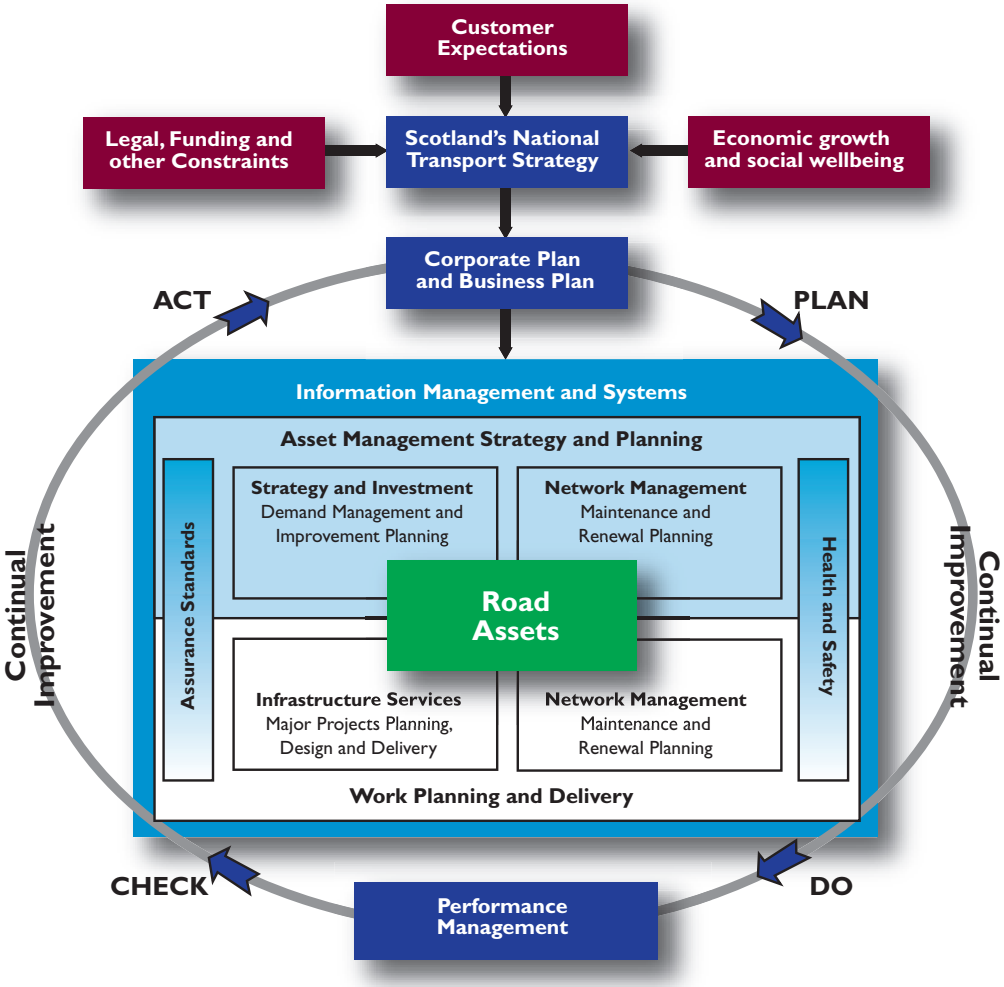
4.4.1 We fully recognise that adopting an asset management approach will impact on a wide range of existing working practices and in some circumstances require the introduction of new working practices. It is therefore important to have a clear understanding of how asset management aligns with our organisational activities.

4.4.2 Our vision for asset management is embodied in the asset management framework we have developed, shown in Figure 24. Our framework is based on a review of national and international asset management practice. The framework illustrates the customer focused nature of asset management and the linkage between the Strategic, Tactical and Operational management levels.

4.4.3 Central to our framework is a cycle of *Plan→Do→Check→Act*. We will use this cycle to continually monitor and seek improvement in our asset management practices. This will include systematically measuring performance and taking appropriate and timely corrective and improvement actions. The core components of the framework are:

- Asset Management Strategy and Planning
- Work Planning and Delivery
- Information Management and Systems
- Performance Management

4.4.4 Each component of the framework is summarised in the following.



Key
Strategy and Investment – Strategy and Investment Directorate
Network Management – Trunk Roads: Network Management Directorate
Infrastructure Services – Trunk Roads: Infrastructure and Professional Services Directorate

FIGURE 24 ASSET MANAGEMENT FRAMEWORK

STRATEGIC VISION

4.4.5 The strategic vision is encapsulated within the Scottish Government's and Transport Scotland's strategic documents and plans, namely the National Transport Strategy and the Transport Scotland Corporate and Business Plans. As part of the AMIP we are currently undertaking customer consultations in order to understand their needs and aspirations for the trunk road network (see Section 2.4).

ASSET MANAGEMENT STRATEGY AND PLANNING (INVESTMENT PLANNING)

4.4.6 Asset management planning is the logical and systematic process that we will use to produce the core information of the RAMP. Our approach to asset management planning is characterised by:

- Translation of strategic aims, objectives and targets into Levels of Service and in turn Performance Targets.
- Analysis of assets to determine performance gaps and identify long-term maintenance and improvement needs.
- Evaluation of the long-term work volumes, phasing and associated expenditure needed to deliver the agreed Levels of Service/Performance Targets.
- A strong link between long-term planning and short-term work planning and delivery. That is, in order to deliver the strategic aims, objectives and targets it is necessary to translate the work volumes and phasing described in the RAMP into detailed short-term work plans. This will be achieved by aligning the asset management planning process and the short-term maintenance planning processes.

4.4.7 An overview of the asset management planning process is provided in Appendix B. Through the AMIP we will develop and embed each component of the asset management planning process within our practices and supporting computerised tools.

WORK PLANNING AND DELIVERY

4.4.8 Work planning and delivery is concerned with the day-to-day management activities and the short-term (one- to three-year) planning, scheduling and delivery of works. Currently annual and three-year work plans are developed largely based on asset condition information and delivered by the Operating Companies. The activities the OCs undertake include:

- Routine and cyclic maintenance
- Emergency response
- Winter service
- Traffic management
- Design and supervision of infrastructure projects
- Maintenance of bridges and structures
- Routine management of the network
- Street lighting and traffic signals
- Structural pavement maintenance
- Road safety schemes
- Road markings

- Safety fence repairs
- Overseeing of works carried out by contractors and utility companies.

4.4.9 The intention is to improve the approach to short-term work planning by aligning with recognised good practice. This will include the development of detailed forward and annual work plans that align with the RAMP and which seek to make best use of resources.

INFORMATION MANAGEMENT AND SYSTEMS

4.4.10 Information management, in general, is a formal approach to the identification of information needs and the associated collection, storage, usage and maintenance of the information. Information management is a fundamental component of asset management.

4.4.11 Formal information management has become essential due to advances in technology that enable vastly increased volumes of information to be collected and stored. There are many examples of organisations using improved technology to collect large quantities of information and then not fully utilising the information and/or not allocating sufficient time and resources to maintain the information.

4.4.12 Our current and desired approaches to information management are summarised in Appendix C. Through the AMIP we will make some significant improvements to this practice, including the development of a Data Management Protocol and a Data Integration Protocol.

4.4.13 We operate a number of computerised systems that store data and support the management of the transport infrastructure, our two main systems are:

- *Scottish Executive Road Information System (SERIS)* – used for carriageway, footway, fences and barriers, road lighting, drainage and street furniture.
- *Trunk Road Bridges Database (TRBDB)* – used for bridges and other road structures.

4.4.14 Under the AMIP, and other initiatives, improvements/changes will be made to these systems to ensure they fully support asset management.

PERFORMANCE MONITORING, REVIEW AND FEEDBACK

4.4.15 Adopting an asset management approach involves improving current practices and introducing new practices. It is therefore important to have performance measures that assist systematic monitoring and assessment of the effectiveness of the new or improved practices. In this way, appropriate and timely corrective and improvement actions can be identified. Section 13 provides details of the approach we are using to monitor and review the performance of asset management practices.

4.4.16 In addition to the measures we will use to monitor asset management, PAG will continue to act as an independent auditor (see Section 4.2).

4.5 REALISING THE ASSET MANAGEMENT FRAMEWORK

4.5.1 The AMIP, described in Section 14, describes the activities we are undertaking to realise the Asset Management Framework.

5 CURRENT AND FUTURE DEMAND

This section summarises current network demand and predicted future demand, including the assumptions that support the predicted future demand. The impact of any changes in demand on the management of the network is discussed.

5.1 WHAT IS DEMAND AND WHY IS IT IMPORTANT?

WHAT IS DEMAND?

5.1.1 Demand refers to the traffic (vehicular, pedal cycle, pedestrian, etc.) requirements placed on the network, that is, volume and mix of traffic that use the trunk road network.

WHY IS DEMAND IMPORTANT?

5.1.2 Demand impacts on a number of key asset management issues, including:

- *Rate of Deterioration* – higher traffic volumes are normally associated with more rapid rates of deterioration.
- *Timing of Roadworks* – the demand placed on a route may necessitate roadworks to be carried out at off-peak times, e.g. at night.
- *Management Strategy* – that rate of deterioration and timing of works may necessitate a particular management strategy, for example more frequent minor works compared to less frequent major works.
- *Work Quantities and Funding* – all the above factors contribute towards the quantity of maintenance work required on the network and hence the level of funding needed to support this work.
- *Service Provided* – the Level of Service provided on the network will depend on all of the above, and it may be necessary to make trade-offs between network condition and frequency of intervention, for example, providing a slightly lower condition may mean less maintenance intervention and thereby less associated roadworks and congestion.

5.1.3 In order to produce a robust and accurate RAMP it is important to understand current and future demand and the impact they have on the above.

5.2 CURRENT NETWORK DEMAND

5.2.1 *Scottish Transport Statistics: No 25 – 2006 Edition*, provides information about road traffic, such as the total volume of traffic by type of road, by type of vehicle, and by council area. It also provides figures on traffic flows at selected points on the road network, statistics on delays and congestion, and information about petrol and diesel deliveries/consumption in Scotland and atmospheric pollutants.

TOTAL VOLUME OF TRAFFIC

5.2.2 The key statistics relating to traffic volume on Scotland's roads from 2001 to 2005 are shown in Figure 25, which shows that trunk roads and motorways take over 33% (one third) of vehicle kilometres in Scotland.

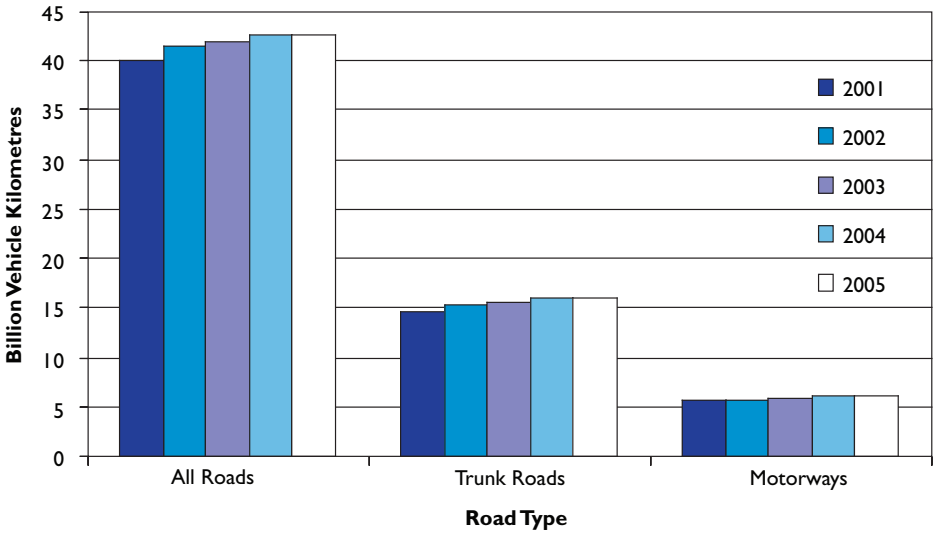


FIGURE 25 TRAFFIC VOLUME TRENDS FROM 2001 TO 2005

5.2.3 Over this five-year period the volume of traffic on all roads has increased from 40.0bvkm[2] to 42.7bvkm, an increase of 6.6%. On trunk roads it has increased from 14.7bvkm to 15.9bvkm, an increase of 8.1%, while on motorways it has increased from 5.6bvkm to 6.2bvkm, an increase of 10.5%.

TRAFFIC VOLUME BY VEHICLE TYPE

5.2.4 In 2005, cars accounted for nearly four-fifths (77%) of the total volume of traffic on the trunk road network, light goods vehicles for 11% and heavy goods vehicles for 10%.

5.2.5 The trends of how these traffic volumes have changed over a period of five years, from 2001 to 2005, are shown in Figure 26.

2 Billion Vehicle Kilometres, where a billion is one thousand million

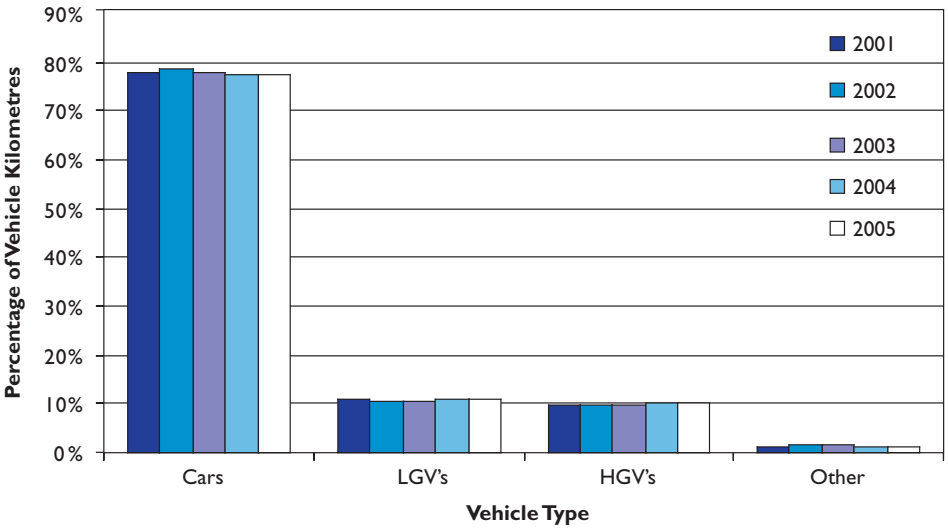


FIGURE 26 VOLUME OF TRAFFIC BY VEHICLE TYPE FROM 2001 TO 2005

TRAFFIC FLOW MEASUREMENT SITES

5.2.6 Information on traffic flows is measured at selected points across the trunk road network (37 such sites are shown in Figure 6.1 of the Scottish Transport Statistics 2006 Edition). Of the sites measured, examples include:

- *A720 Dreghorn* – annual average daily traffic of 76,308 vehicles in 2005. The Monday-Friday average was 82,171 vehicles per day, and the Monday-Friday peak hourly flows were 6,951 vehicles in the morning and 7,263 vehicles in the evening.
- *A835 Aultguish* – annual average daily traffic of 1,610 in 2005. The Monday-Friday average was 2,367 vehicles per day, and the Monday-Friday peak hourly flows were 170 vehicles in the morning and 165 vehicles in the evening.
- *A75 Carsluith and A77 Glen App* – in 2005, 27% and 21% respectively of vehicles on these roads were HGVs (30% and 25% respectively on weekdays).

5.2.7 This information will be used to inform asset management planning, for example, rate of deterioration and suitable management strategies.

5.3 PREDICTED FUTURE DEMAND AND IMPACT

5.3.1 It has been assumed that vehicular traffic volume and mix will continue to increase by the trends shown in Figure 25 and Figure 26.

5.4 IMPACT ON NETWORK MANAGEMENT

5.4.1 The methodology and supporting computerised tools that will be used to assess the impact of changing demand are still under development. The predicted future demand is not taken into account by this version of the RAMP because it only covers the period April 2007 to March 2009. The next version of the RAMP will look at the implications of the above predicted increases on the criteria presented in Section 5.1.

6 PERFORMANCE MANAGEMENT FRAMEWORK

This section explains how your expectations and our strategic aims, objectives and targets will be translated into Levels of Service Performance Targets that inform asset management planning.

6.1 OVERVIEW

6.1.1 The general relationship between customer expectations, corporate aims, objectives and targets, Levels of Service and Performance Targets is shown in Figure 27.

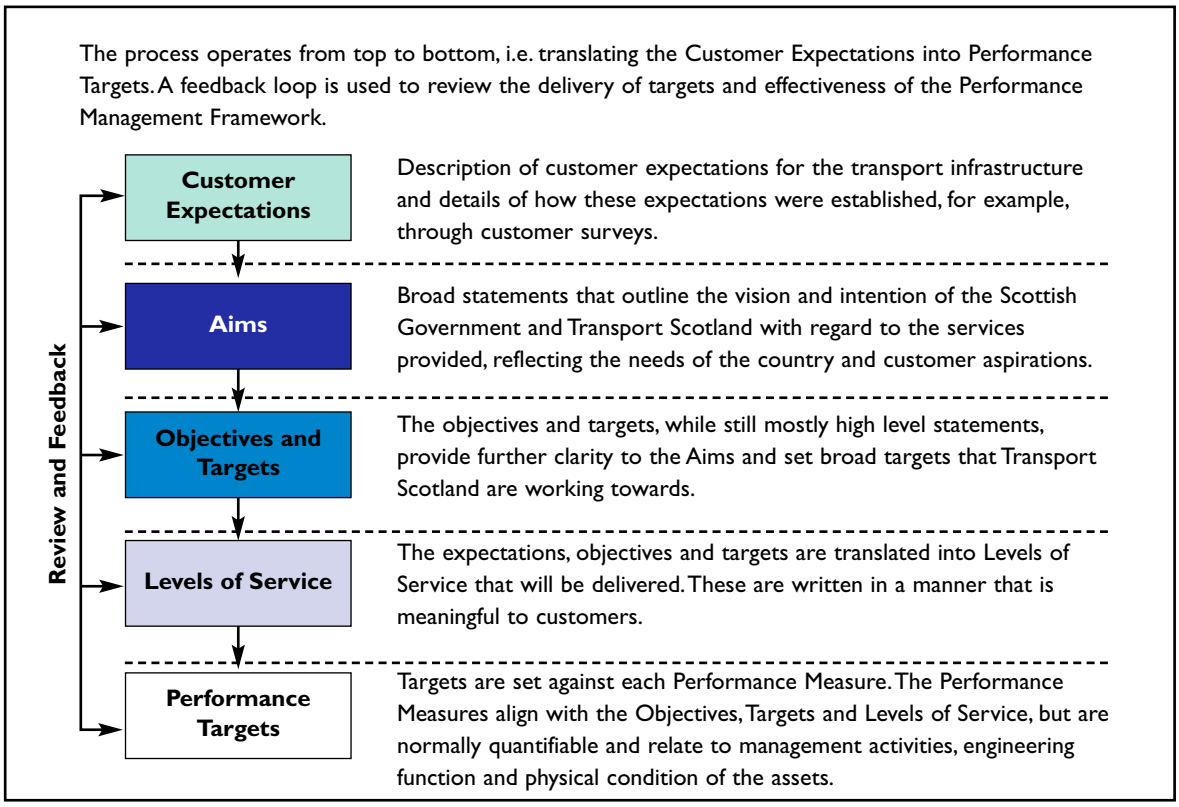


FIGURE 27 DEFINING PERFORMANCE

6.1.2 The translation of Customer Expectations and Corporate Aims into Performance Targets is a fundamental requirement of asset management planning. Establishing a relationship between these enables our asset managers to understand the performance (in an engineering context) required from their assets in order to deliver your needs and our long-term vision.

6.1.3 The corporate Aims, Objectives and Targets and the Customer Expectations are presented in Section 2. The following provides an introduction to Levels of Service and Performance Measures/Targets and how we will link them to the Aims and Expectations.

6.2 LEVELS OF SERVICE

6.2.1 Level of Service is the term used to describe network performance in a manner and language that is meaningful to customers. A formal definition for Level of Service is [1]:

A statement of the performance of the asset in terms that the customers can understand. They cover the condition of the asset and non-condition related demand aspirations, i.e. a representation of how the asset is performing in terms of both delivering the service to stakeholders and maintaining its physical integrity at an appropriate level. Levels of Service typically cover condition, availability, accessibility, capacity, amenity, safety, environmental impact and social equity.

6.2.2 Levels of Service for transport networks are commonly grouped under headings, examples include:

- Safety, e.g. road safety, emergency management, customer's perception, resident's perception.
- Availability/Accessibility, e.g. journey time reliability, congestion, network and/or route availability, customer's perception.
- Condition, e.g. actual road condition, customer's perception, resident's perception.

6.2.3 Through our customer surveys (described in Section 2) we will identify Levels of Service for the trunk road network. We will also take account of on-going research by the Department for Transport which is investigating the link between customer perceptions of service provision and the engineering standards actually provided.

6.3 PERFORMANCE MEASURES

6.3.1 Performance measures are used to inform us about the services we provide and the processes we use to deliver them. They are a tool to help understand, manage, and improve the delivery of trunk road services. Performance measures let us know:

- How well we are performing;
- If we are meeting our aims, objectives, targets and Levels of Service;
- If our customers are satisfied;
- If we have control of our processes and delivery.

6.3.2 Performance measures are quantitative indicators of how well (or poorly) an activity meets a specific objective. Features of good performance measures are:

- quantifiable,
- have a specific target,
- indicate when that target has been reached, or
- measure the degree of improvement toward the target when it has not been reached.

6.3.3 Achieving targets does not necessarily guarantee economical or optimal management of services nor does achieving targets guarantee ongoing sustainable services. It does however provide a good indication of performance, and this information can be used as a basis for decision making. Performance Measures should adopt the following principles, as set down by the UK Government [11]:

- *Relevant* – to what the organisation wants to achieve
- *Avoid perverse incentives* – not encourage waste/wrong practice
- *Attributable* – can the activity being measured be influenced
- *Well-defined* – to enable data collection, calculation and use
- *Timely* – produce output at an appropriate frequency to be useful
- *Reliable* – accurate enough for its intended use
- *Comparable* – with past scores or similar measures elsewhere
- *Verifiable* – clearly documented so the process can be checked

6.3.4 We currently have a wide range of performance measures, many of which are used to help us manage the Operating Company Contracts; these can be found in Schedule 5 Part 3 of the 3rd Generation Term Contract [12]. As part of the AMIP we will review the existing measures and align them with the aims, objectives, targets and Levels of Service. Where appropriate we will introduce new Performance Measures. All Performance Measures will be fully documented, describing their purpose, data requirements and calculation technique.

6.4 PERFORMANCE TARGETS

6.4.1 Performance targets represent the required or desirable performance. Once a full set of Performance Measures has been developed and documented we will assign targets against each measure. The targets will be informed by the customer expectations and corporate aims and where appropriate will be presented over a period of ten years.

6.4.2 We will adhere to recognised good practice in setting our performance targets and follow the SMART (Specific, Measurable, Achievable, Relevant, Time Bound) criteria.

6.5 EFFICIENCY IMPROVEMENTS

6.5.1 In November 2004 the Scottish Government published the Efficient Government Plan aimed at attacking waste, bureaucracy and duplication. The plan required and challenged public bodies to identify efficiency improvements; where an efficiency improvement is any activity which improves the ratio of outputs to resource inputs. Such improvements may arise:

- by producing the same outputs with fewer inputs. For the purposes of the Efficient Government Plan these are termed cash releasing savings; or
- by producing more or better outputs for the same inputs. For the purposes of the Efficient Government Plan these are termed time releasing savings.

6.5.2 The key efficiency improvement set for the TRNMD is to deliver more trunk road maintenance with the same resource. This is to be achieved and measured through the development and implementation of the AMIP, which includes the development of this RAMP.

7 RISK MANAGEMENT

This section describes our approach to risk management, at strategic, tactical and operational level. Explaining how we identify, analyse, assess and manage risks associated with service delivery, and in some cases to determine the service required.

7.1 OVERVIEW

7.1.1 Risk management is the process of identifying, analysing, assessing and managing risk, where risk is the threat that an event or action can adversely affect an organisation's ability to achieve its objectives. A simpler definition might be 'the chance of something happening that will impact on safety or service'. In more quantitative terms, risk is the combination of the frequency or probability of occurrence and the consequences of a specific hazard being realised.

7.1.2 Risk management plays an integral part in the successful management of health, safety and environment ensuring that decisions on the control and management of risks are made in an informed, rational and structured manner.

7.2 TRANSPORT SCOTLAND CORPORATE RISK MANAGEMENT STRATEGY

7.2.1 Risk is relevant to all parts of our business and as such it is important that a consistent and joined up approach is used across all Transport Scotland Directorates. We are developing a Corporate Risk Management Strategy to align and provide synergy between the directorates approach to risk management, the strategy will set out a clear system for identifying, managing and mitigating risk and will incorporate:

- Existing risk management arrangements.
- An up-to-date Corporate Risk Register.
- Appropriate measures in place to mitigate risk.
- Regular reviews by the senior management team of the risk register.
- Prioritised risks in order to escalate them to appropriate levels within Transport Scotland, the wider Scottish Government and Scottish Ministers so that any necessary action can be taken.
- An annual review and updating if appropriate of the risk management strategy.

7.2.2 We have already developed and populated the Corporate Risk Register. The Corporate Risk Register sits above and is informed by the risk registers held by each directorate. The Corporate Risk Register and the supporting risk registers have been developed by following recognised guidelines [13].

7.3 RISK MANAGEMENT FOR ROADS

7.3.1 We have a number of risk management practices for trunk roads, all of which form part of the asset management approach, these are summarised in the following.

RISK-BASED INSPECTION REGIME

7.3.2 The establishment of an effective inspection regime is a fundamental component of road maintenance. The Operating Companies are required to undertake the following inspections at regular intervals:

- Roads
  - Safety Inspections – at frequencies not exceeding 7 days
  - Safety Patrols – at intervals not exceeding 7 days midway between Safety Inspections
  - Detailed Inspections – generally undertaken every 12 months
- Structures
  - Safety Inspections – at frequencies not exceeding 7 days
  - General Inspections – undertaken every 2 years
  - Principal Inspections – undertaken every 6 years
  - Special Inspections – undertaken at specified intervals or as and when the need arises.

7.3.3 The above inspection regimes are specified in our Operating Company Contracts. These regimes are based on past experience, recognised best practice and risk assessment. There is an increasing need to justify inspection regimes through a robust risk assessment approach and we will be investigating this under the AMIP. The inspection regime has also been defined in the context of our overall policy and maintenance strategy.

RISK-BASED MAINTENANCE PLANNING

7.3.4 Risk is utilised in two ways to support maintenance planning (1) response time to defects; and (2) assessing maintenance priorities.

7.3.5 The inspection regime identifies a wide range of defect types, some of which may require immediate attention because they represent an immediate risk to public safety. The response time to different defect types have been determined by experience, best practice and risk assessment. Examples of response times to safety critical defects, sometimes referred to as Category 1 Defects, are:

- Category 1 Defects on carriageways: no later than 6 am following identification
- all other Category 1 Defects: within 24 hours of the identification.

7.3.6 Maintenance needs that are not classified as urgent/safety critical are scheduled on a needs basis using our value management approach (see Section 9.2). Central to value management is explicit consideration of the risks associated with the maintenance need.

EMERGENCY RESPONSE PLANS

7.3.7 The Emergency Response Plan sets out the steps to be followed by the employees of the Operating Company when responding to an emergency incident. An emergency is an unforeseen situation or sudden occurrence which constitutes an immediate or imminent hazard and demands immediate action.

7.3.8 As part of its contractual obligations, the Operating Company has undertaken to comply with the Scottish Ministers' Requirements relating to Emergency Incidents, as detailed in our Operating Company Contracts. The principal requirements are as follows:

- To ensure that, in the event of an emergency occurring on or affecting the road, a response is initiated as quickly as possible in order to minimise the danger to all parties and disruption and delay to the road user.
- To provide sufficient resources, available for call out 24 hours on every day, capable of attending at any location on the Unit within the Emergency Response Times stipulated in the Operating Company Contract, and with due regard to the safety of all parties at all times.

7.3.9 Incidents likely to create the need for implementing the Emergency Response Plan include:

- Hazards resulting from road traffic incidents
- Hazards resulting from severe weather conditions
- Threats of a security nature

ALIGNING WITH THE CORPORATE RISK MANAGEMENT STRATEGY

7.3.10 It is important that the risk management practices used for trunk roads align with the Corporate Risk Management Strategy. The aforementioned practise, and others, will be reviewed, and where appropriate amended, to ensure they align with and take on board the requirements of the corporate Risk Management Strategy.

8 LIFECYCLE PLANS

This section describes the procedure that we are developing for lifecycle planning. This procedure aligns with industry best practice and will form the basis of our long-term asset management planning predictions.

8.1 OVERVIEW

8.1.1 A lifecycle plan is a long-term strategy for managing a group of assets with the aim of providing the required Levels of Service while minimising whole life costs. Levels of Service are described in Section 6. A lifecycle plan should address all stages of an asset's life, as shown in Figure 28.

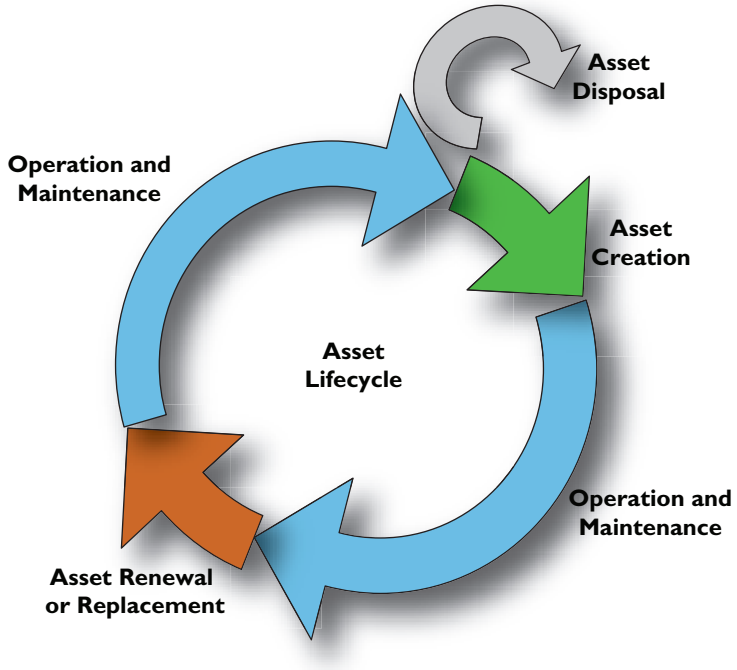


FIGURE 28 LIFECYCLE PHASES OF AN ASSET

8.1.2 As part of the AMIP we will develop lifecycle plans for each asset group/sub-group defined in Section 3. Our lifecycle plans will align with Figure 28 and describe asset creation and disposal, operation and maintenance (including inspection, testing, routine maintenance, programmed maintenance and reactive maintenance) and asset renewal and replacement. The lifecycle plans for each asset group/sub-group will take into consideration:

- Expected deterioration mechanisms
- Rates of deterioration for the material type concerned
- Component service lives
- Required Levels of Service
- Maintenance techniques
- Influence of maintenance on future deterioration rates

- Maintenance unit costs
- Risks to safety and service loss
- Disposal techniques
- Sustainability and environmental contributions and impacts.

8.1.3 This requires a sound understanding of asset behaviour and computerised tools that support the development and comparison of alternative lifecycle plans for each asset group/sub-group. As part of the AMIP we intend to develop a number of alternative lifecycle plans for each asset group/sub-group and compare them in terms of whole life costs to identify the optimal strategy. As well as improving our management and maintenance practices, developing lifecycle plans will enable us to:

- Provide a formal audit trail for our maintenance plans, including the recording of assumptions, data sources and engineering judgements.
- Assist knowledge transfer, for example, our engineers and supply chain have a wealth of expert and practitioner knowledge that needs to be retained and passed on to other and future staff. The full recording of lifecycle plans provides an important knowledge capture and transfer mechanism.

8.1.4 The following sets out the general approach we will use to develop the lifecycle plans. Work started on the lifecycle plans in May 2007 and we will present the initial plans in the next version of the RAMP.

8.2 DEVELOPING A LIFECYCLE PLAN

8.2.1 The following steps broadly outline the approach we will use to develop lifecycle plans:

- **Step 1** – identify the required asset performance.
- **Step 2** – identify the deterioration mechanisms and establish deterioration rates and service lives.
- **Step 3** – identify the inspection and maintenance options and costs.
- **Step 4** – undertake option appraisal to identify the optimal solution.

8.2.2 The following sub-sections describe the activities involved in each of the above steps.

STEP 1: REQUIRED ASSET PERFORMANCE

8.2.3 The starting point for developing a lifecycle plan is to understand the performance required from the asset. Section 6 describes how corporate goals are translated to asset specific performance measures and targets. The performance targets are used to define the asset requirements, including:

- Condition, e.g. required road surface condition.
- Capacity, e.g. bridge load carrying capacity.
- Availability, e.g. road must not be closed during the day.
- Standard, e.g. minimum lighting level.

8.2.4 These targets are used to assess when a maintenance intervention may be required, that is, they help to define the maintenance intervention thresholds.

STEP 2: DETERIORATION MECHANISMS, RATES AND SERVICE LIVES

8.2.5 A wide range of deterioration mechanisms influence road assets. The relevant deterioration mechanisms will be identified through local engineering records and experience and recognised literature sources, the former being fundamental because each network/asset has its own specific characteristics. The initial list may include a wide range of possible deterioration drivers and mechanisms. This will be refined to produce a list of key drivers and mechanisms that are specific to the characteristics of the trunk road network.

8.2.6 The identified deterioration mechanisms will inform the selection/determination of deterioration rates and service lives. Knowledge of the deterioration rates and service lives provides the basis for determining when (in time) a maintenance intervention is required, and frequently what type of maintenance intervention is required. This is shown schematically in Figure 29, along with an intervention threshold.

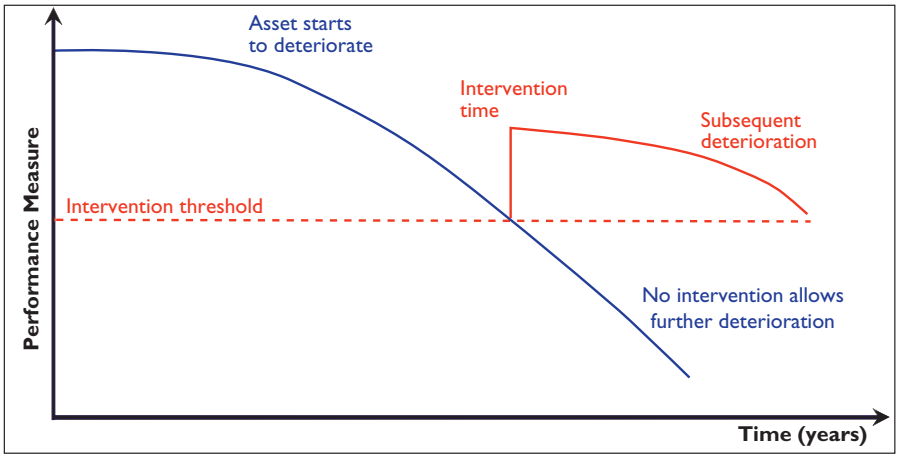


FIGURE 29 DETERIORATION PROFILE AND INTERVENTION THRESHOLD

8.2.7 Figure 29 illustrates how knowledge of the intervention threshold and the deterioration rate enables the intervention time to be identified. If we define a different performance target for the asset, then the intervention threshold will change, giving a different intervention time. This illustrates that the corporate aims and objectives, once translated into performance targets, can have a considerable influence on the maintenance activities required.

STEP 3: INSPECTION AND MAINTENANCE OPTIONS AND COSTS

8.2.8 Inspection and maintenance activities for most assets can be broadly categorised under the following headings:

- **Inspection, Testing, Monitoring and Assessment** – regular/cyclic activities that determine if an asset is safe for use and/or provide more detailed information for assessment of maintenance needs.
- **Routine Maintenance** – regular/cyclic activities, such as cutting of vegetation and cleaning of drainage systems, that helps maintain the safety, condition and functionality of an asset and/or to reduce the need for other, normally more expensive, maintenance.
- **Programmed Maintenance** – moderate to major work that maintains the safety, condition and functionality of the asset and is planned one or more years in advance, and normally has long time intervals between activities on a given asset (e.g. carriageway resurfacing and replacement of bridge components).
- **Reactive Maintenance** – covers a range of unplanned activities that may arise on a road network, including essential maintenance (e.g. potholes) and emergency work (e.g. bridge strikes).
- **Asset Creation** – a new asset is constructed, e.g. new road/bypass, or an existing asset that is replaced.
- **Asset Disposal** – the disposal of an existing asset, e.g. if it is no longer required or if it is to be replaced by a new asset.

8.2.9 Based on current and past practice, there will be a number of feasible options for each asset type/group under each of the above maintenance headings; the characteristics (e.g. cost and effect) of each option will be determined. The deterioration mechanism and rate (described in Step 2) influences the selection of the maintenance treatment, and the maintenance treatment in turn influences the deterioration rate. Therefore Steps 2 and 3 are iterative and interrelated.

8.2.10 Figure 30 illustrates that the application of different maintenance options can have a pronounced effect on maintenance intervention, compared to that originally shown in Figure 29. It may also be feasible to use combinations of options, e.g. preventative combined with essential treatments.

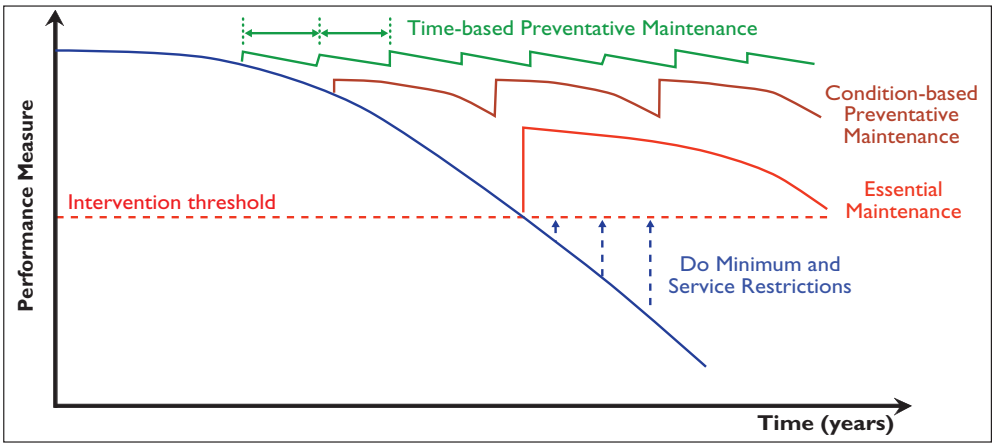


FIGURE 30 ALTERNATIVE MAINTENANCE STRATEGIES

STEP 4: OPTION APPRAISAL

8.2.11 The output from Steps 1, 2 and 3 are combined to support the identification of the optimal solution for each asset group/sub-group. The optimal solution is identified by comparing, where appropriate, a series of feasible management options, such as those shown in Figure 30. The options are compared on the basis of whole life cost and delivery of the required performance targets, where the whole life costs include the direct costs of the work and associated criteria converted to monetary figures, for example:

- Direct costs of maintenance and renewal, i.e. plant, material and labour.
- Access costs and traffic management costs.
- Risk of service loss costs, e.g. indicative costs related to road user delays, diversions, loss of access to facilities, etc.
- Risk to safety, e.g. indicative costs related to risk of loss of life, injury, litigation, adverse public opinion, etc.
- Sustainability and environmental contributions and impacts.

8.2.12 The whole life costs are assessed over a minimum period of 30 years and discounted to Net Present Value (NPV). Figure 31 shows how the cost may build up over time for three alternative maintenance strategies; the strategy with the lowest discounted NPV represents the preferred option.

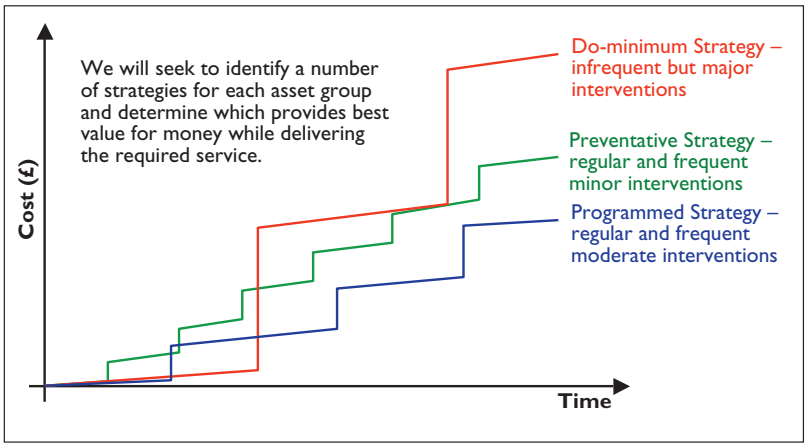


FIGURE 31 OPTION APPRAISAL USING WHOLE LIFE COSTS

8.2.13 The identification and comparison of alternative maintenance strategies is complex and potentially time consuming. In order to streamline the activity, and support and encourage our staff and the Operating Companies to develop lifecycle plans, we will develop appropriate computerised tools and provide training as part of the AMIP.

8.3 USING A LIFECYCLE PLAN

8.3.1 The lifecycle plans are used to evaluate the work types, work volumes and funding requirements for the next 30-year period. A 30-year period is used because it aligns with accepted Whole Life Costing principles and provides a sufficient time horizon over which to assess the suitability of the proposed plan of work, for example, does the plan of work sustain asset performance, minimise whole life costs and prevent the accumulation of backlog. When a suitable plan is identified and agreed then the work plan information for the next five- to ten-year period will be presented in the RAMP.

8.3.2 In due course the lifecycle plans will be embedded into computerised models that support 'what-if' analysis of funding levels and maintenance strategies. These models will be used to assess the impact of a wide range of funding levels on asset performance and maintenance backlog, and to justify the funding required to deliver the agreed Levels of Service. These models will be developed as part of the AMIP.

8.4 CONTINUAL CHALLENGE AND IMPROVEMENT

8.4.1 The core components in our lifecycle plans are deterioration rates, services lives and the impact of maintenance activities on these. Through the application and usage of lifecycle plans our understanding of these will improve. We will therefore adopt an approach of continuously challenging the lifecycle plans when new information becomes available. Through this continual challenge we expect to improve the accuracy and robustness of our lifecycle plans over time.

8.5 LIFECYCLE PLANS

8.5.1 We are currently in the process of developing our lifecycle plans. The next version of the RAMP will provide a high level summary of our assumptions and our preferred lifecycle plans.

9 DECISION SUPPORT

This section provides an overview of the key decision-making activities we currently use, or intend to use, in our asset management approach. These are Whole Life Cost/Value, Value Management and Value Engineering, and Network Analysis.

9.1 WHOLE LIFE COST AND VALUE

9.1.1 Whole Life Costing (WLC) and Whole Life Value (WLV) are techniques used to assess and compare alternative construction projects and lifecycle strategies. Whole Life Costing is defined as:

An economic assessment considering all agreed projected significant and relevant cost flows over a period of analysis expressed in monetary value. The projected costs are those needed to achieve defined levels of performance, including reliability, safety and availability [14].

9.1.2 Where as Whole Life Value is defined as:

The optimum balance of stakeholders' aspirations, needs and requirements, and whole life costs [15].

9.1.3 As such, Whole Life Costing is a subset of Whole Life Value. We currently use Whole Life Costing to assess carriageway maintenance options. The analysis is carried out in our computerised pavement management system (SERIS). The user can enter a range of costing options and for each option they enter the timing, extent and type of treatments and required traffic management arrangements. Once entered the discounted and non-discounted works and user costs are calculated, together with the Whole Life Cost of the option (such as shown in Figure 31).

9.1.4 As part of the AMIP we are reviewing our Whole Life Costing approach and assessing the feasibility and challenges of adopting a Whole Life Value approach. We are also investigating the application of a common Whole Life Cost approach across all asset types (pavements, structures, lighting, etc.) in order to provide cross discipline consistency and comparability.

9.2 VALUE MANAGEMENT AND VALUE ENGINEERING

9.2.1 It is not unusual that maintenance budgets are unable to address all the identified maintenance needs. This means different maintenance needs are competing for the same money. It is important that the money is allocated in a transparent and objective manner to where it is most needed (e.g. to safeguard road users) and/or to where it provides the greatest benefit (e.g. reduced whole life costs). Value management is a formalised technique that is used for prioritising the allocation of funding to competing maintenance needs.

9.2.2 Value management provides a consistent approach for assessing the benefits of undertaking maintenance and the associated risks of not undertaking maintenance. The value management process is completed to ensure that maintenance schemes are assembled into programmes of work that best align with the objectives of Transport Scotland and deliver best value. The value management process yields a prioritised list of maintenance actions that can then be taken forward to the value engineering process.

9.2.3 Value engineering is a formalised process for identifying the optimal solution and to maximise the efficiency of the design, construction and maintenance of schemes. Value engineering involves the use of lifecycle plans to identify the whole life cost of treatment options, and the combination and synchronisation of schemes for completion to achieve best value.

9.2.4 We have recently completed a review of our value management and value engineering practices and made several recommendations for improving the efficiency, effectiveness and robustness of these processes. These recommendations have been categorised as either quick wins or long-term improvements. A number of the quick wins are already underway and include:

- *Submission template* – produce a standard template for submissions in order to establish a consistent approach that can be more readily reviewed and assessed.
- *Visual survey template* – produce a standard template that illustrates in an easily understood manner the results of the visual condition survey.
- *Presentation of survey data* – develop a tool that can extract pavement condition data from SERIS and present it in a standard format to allow straightforward comparison of different data sources.
- *Value for Money timeline* – establish a formal timeline for scheme submissions and the review of these submissions with clearly defined roles and responsibilities.
- *Whole life cost training* – provide technical training in the use of the SERIS whole life cost module.

9.2.5 Quick wins will be implemented in the next 12 months as part of the AMIP and will have an immediate and beneficial impact on our business.

9.3 NETWORK ANALYSIS

9.3.1 A core objective of the AMIP is to translate the asset management planning process (see Section 4.4) into a highly automated computerised solution that supports long-term network level analysis. This would enable a wide range of 'what-if' scenarios to be modelled at network level, for example:

- The impact of different levels of funding on future network condition.
- The budget required to provide a predefined Level of Service and/or safety both now and in the future.
- The impact of alternative maintenance management strategies on journeys.
- The appropriate allocation of funds between asset types, e.g. roads, structures and lighting.

9.3.2 Our pavement management system (SERIS) already contains a network analysis module. Through the AMIP we will improve the functionality of this module to enable improved 'what-if' analysis and extend it to cover all asset types. The key areas of functionality that we will be addressing are:

- Deterioration modelling
- Maintenance intervention triggers
- Maintenance options, effects and costs
- Prioritisation of works
- Application of constraints (e.g. budgets, congestion) and targets (e.g. condition).

9.3.3 We fully understand that in order to gain the full benefits of the AMIP it is fundamental that we translate the asset management planning process into a user friendly computerised tool that can be readily used by our staff.

10 WORK PLAN

This section, when fully developed, will describe the volumes of work required over the next ten-year period. The work volumes will be presented by asset group and work type.

10.1 OVERVIEW

10.1.1 Our current practice is for our service providers, under the Operating Company Contracts, to develop and propose annual work plans for the following financial year based on inspection and survey information. We assess these work plans and they, combined with our knowledge and experience of network maintenance needs, form important inputs to the annual maintenance funding bid. Table 4 shows some of the statistics from previous years, grouped by work/maintenance type.

TABLE 4 CARRIAGEWAY WORKS *(SCOTTISH TRANSPORT STATISTICS: NO 25)*

WORK TYPE	ESTIMATED LANE-KILOMETRES			
	2002-03	2003-04	2004-05	2005-06
New roads constructed/opened	9	24	89	108
Reconstructed	58	86	105	133
Strengthened	304	319	256	277
Surface dressed	178	34	121	63
Total	**549**	**463**	**571**	**581**

10.1.2 The short-term look ahead provided by the annual plans does not provide visibility of significant increases/decreases in the annual work volumes. This is highly undesirable because our supply chain (e.g. Operating Contracts and material providers) need to cater for the potential uncertainty in work volumes, and this is normally reflected in reduced value for money maintenance activities.

10.1.3 Adopting an asset management approach, that provides long-term visibility of work volumes, will helps us to move to a 'steady state' maintenance regime, that is, similar volumes of work are undertaken each year. This forward visibility will provide our supply chain with increased confidence in the future work volumes and, by working in partnership with our supply chain, we believe this will result in improved value for money maintenance activities.

10.1.4 Once we have developed our lifecycle plans (Section 8) and decision support tools (Section 9) we will be able to produce a five- to ten-year work plan. As such the following sections, although not complete in this version of the RAMP, are included for completeness and to illustrate the information we intend to include in future versions.

10.2 WORK VOLUMES

10.2.1 A table showing work volumes will be presented for each asset type, and split into asset groups, maintenance activities and year of activity. The detailed information that has been used to build up the work volumes will be held in supporting records outside the RAMP.

10.2.2 It is important to note that these tables, in general, will not provide details of specific projects. It is the purpose of the short-term (one- to three-year) work plans to identify specific projects while aligning the overall volume of work delivered by these projects with the work volumes presented in the RAMP.

11 FINANCIAL PLAN

This section, when fully developed, will provide details of the finances required to deliver the work plan described in Section 10. The financial information is presented by asset group and work type. A summary of the asset valuation information is also provided.

11.1 OVERVIEW

HISTORICAL AND FUTURE SPEND

11.1.1 Current practice is to submit an annual bid for maintenance funding, which is based on the work identified by our Operating Company service providers and our own knowledge and experience of the network. Table 5 shows some of the statistics from previous years and for the current (2007/08) financial year, grouped by work/maintenance type.

TABLE 5 EXPENDITURE ON MOTORWAYS AND TRUNK ROADS *(SCOTTISH TRANSPORT STATISTICS: NO 25)*

DESCRIPTION		£ MILLION AT OUTTURN PRICES					
		02/03	03/04	04/05	05/06[3]	06/07[4]	07/08[5]
Capital[1]	New construction and improvements	43	73	70	95	142	126
Capital[1,2]	Routine and winter maintenance etc.	63	76	80	67	55	52
	Structural maintenance	64	66	82	68	63	60
	Improvements	50	57	71	57	46	40
	Design, build, finance, operate payments	26	27	22	25	35	42
Total	**Capital and Current**	**246**	**299**	**325**	**312**	**341**	**320**

1. Includes reconstruction, new road surfaces, maintenance of bridges and other road structures
2. Includes minor repairs
3. Provisional
4. Forecast
5. Estimated

11.1.2 A short-term look ahead does not provide visibility of any significant increases or decreases in funding needs. For example, public money is divided between a broad range of activities (including health, policing, environment, communities and transport), all competing for a proportion of the available money. If funding needs for any of these significantly fluctuate over time, with limited forewarning, it places pressures elsewhere. It is therefore important to have long-term visibility of financial needs and, where possible, to maintain a steady state of expenditure.

MAINTENANCE BACKLOG

11.1.3 *The Scottish Government: an overview of the performance of transport in Scotland* (Audit Scotland, September 2006) reported that an estimated £325 million is required to bring the trunk road network up to an acceptable standard (defined as above the threshold requiring close monitoring).

11.1.4 Questions have been raised about the methodology used to calculate backlog, and whether or not it is appropriate and accurate. Through our *AMIP* we intend to investigate this issue, and if required develop and document a robust and transparent procedure for calculating backlog.

11.2 FINANCIAL PLANS

11.2.1 Once we have developed our lifecycle plans (Section 8) and decision support tools (Section 9) we will be able to produce a five- to ten-year financial plan. Therefore, this section, although not populated in this version of the RAMP, is included for completeness and to illustrate the information we intend to include in future versions.

11.2.2 The financial plans will be presented in tabular and graphical format by asset type and work type. This will illustrate if expenditure is steady state or otherwise.

11.3 ASSET VALUATION

11.3.1 Asset valuation is the calculation of the current monetary value of an asset, in this case the trunk road network. The current monetary value is evaluated as the Depreciated Replacement Cost (DRC), where:

DRC = Gross Replacement Cost – Accumulated Consumption

11.3.2 The Gross Replacement Cost (GRC) for the trunk road network is determined through a procedure using standardised construction Unit Rates and GRC models which represent the cost of reconstructing the asset. Assets are consumed during service due to ageing, usage, deterioration, damage, a fall in the Level of Service (assessed through appropriate Performance Measures) and obsolescence. The Asset Value of the trunk road network is calculated by the Roads Asset Valuation System (RAVS), a screen shot is shown below.

The Scottish Executive
ROADS ASSET VALUATION SYSTEM
All Routes Valuation Summary

Thursday, March 15, 2007

Year : 2007 **Rate Series : 2007 Valuation** **Indices : BAXTER** **BaseDate : 2006Q4**

Road Condition Data : 2007 Deflectograph

Gross Replacement Cost

Description	Non Wearable	Wearable	Cost	P&S %	Compensation %	Legal&Agent %	VAT %	Total
Roads	4,334,359,438	2,687,098,283	7,021,457,721	1,404,291,544			1,474,506,121	9,900,255,387
Structures			2,670,424,344	534,084,869			560,789,112	3,765,298,325
Communications			42,116,253	8,423,251			8,844,413	59,383,917
Land *			626,067,523		509,493,750	63,984,101	11,197,218	1,210,742,592
Land at Interchanges *			219,150,936		178,345,032	22,397,226	3,919,514	423,812,708
Totals			**10,579,216,777**	**1,946,799,664**	**687,838,782**	**86,381,327**	**2,059,256,379**	**15,359,492,929**

Nett Depreciated Cost

Description	Non Wearable	Wearable	Cost	P&S	Compensation	Legal&Agent	VAT	Total
Roads	4,334,359,438	1,786,635,048	6,120,994,486	1,224,198,897			1,285,408,842	8,630,602,225
Structures			2,080,118,796	416,023,759			436,824,947	2,932,967,502
Communications			16,433,901	3,286,780			3,451,119	23,171,800
Land *			626,067,523		509,493,750	63,984,101	11,197,218	1,210,742,592
Land at Interchanges *			219,150,936		178,345,032	22,397,226	3,919,514	423,812,708
Totals			**9,062,765,642**	**1,643,509,437**	**687,838,782**	**86,381,327**	**1,740,801,641**	**13,221,296,828**

*** Denotes elements which do not attract VAT**

FIGURE 32 SCREENSHOT OF RAVS

11.3.3 The above screen shot shows that, as of March 2007, the Gross Replacement Cost of the trunk road network was £15.36 billion, while the Depreciated Replacement Cost was £13.22 billion. As part of the *Asset Management Improvement Programme* we will review the procedures used to calculate the asset value of the trunk road network, to ensure it adequately reflects the condition and management of the network. If required, changes will be made to the valuation procedure.

12 RISKS TO THE RAMP & THEIR MANAGEMENT

This section describes the key risks to the achievement of the RAMP and how they will be mitigated or managed.

12.1 OVERVIEW

12.1.1 In future versions of the RAMP this Section will set out the key risks to:

- Achieving the agreed Levels of Service and Performance Targets.
- Delivering the agreed work and financial plans.

12.1.2 The above are not fully developed in this version of the RAMP and as such do not merit the development of a formal risk register, this will be included in the next version of the RAMP. Instead, this version of the RAMP deals with risks to the delivery of the second, fully populated, version of the RAMP.

12.2 RAMP RISK REGISTER

12.2.1 Table 6 presents the key risks, and the associated mitigation measures, to the delivery of the second version of the RAMP.

TABLE 6 RAMP RISK REGISTER

ID	RISK	MITIGATION MEASURE
1	Insufficient information on asset deterioration rates to support long-term work prediction	Identify gaps in the information and hold expert elicitation workshops to close the gaps (covered by work package 6 in Section 14.2). Put in place practices to systematically collect this information from site so that more robust rates can be evaluated in the future (covered by work package 5 in Section 14.2).
2	Insufficient information on maintenance unit rates/costs to support robust financial planning	Identify gaps or weaknesses in existing unit costs and put in place practices to improve these, e.g. more detailed capture of scheme outturn costs (covered by work packages 5 and 6 in Section 14.2).
3	Difficult to translate strategic aims/objectives to meaningful performance targets and Levels of Service	Learn from work undertaken elsewhere and develop a comprehensive Performance Management Framework that links aims and objectives to performance measures (covered by work package 4 in Section 14.2).
4	Whole Life Cost tools not suitably developed/used to support lifecycle planning	Review functionality of current tools and make improvements, or provide necessary training, to ensure they support the business needs (covered by work package 7 in Section 14.2).
5	Network "what-if" analysis tool not developed	Ensure a programme is in place for translating the appropriate AMIP developments into a computerised tool (covered by work package 12 in Section 14.2).

13 MONITORING, REVIEWING & CONTINUAL IMPROVEMENT

This section describes how the performance of the RAMP will be monitored and the results fed back into our asset management practices. In particular, monitoring will assess the effectiveness and efficiency of the RAMP in delivering the agreed Levels of Service. It is also described how we will review our asset management practices and strive for continual improvement.

13.1 MONITORING

13.1.1 The RAMP does not set out detailed work and financial plans, instead it sets out high level work and financial plans that identify the general work volumes and phasing and associated expenditure for different asset types and maintenance activities. It is therefore important to monitor that the work volumes/phasing and expenditure have been appropriately translated into detailed work plans and that these detailed work plans are in turn delivering the criteria set down in the RAMP, e.g. Levels of Service, Performance Targets, output rates and output costs. This requires suitable measures to be put in place to monitor the delivery of the RAMP work and financial plans and the efficiency and effectiveness of the delivery.

13.1.2 Through the AMIP we will develop a balanced suite of measures to monitor RAMP Delivery and RAMP Efficiency and Effectiveness.

13.2 ASSET MANAGEMENT REVIEW AND CONTINUAL IMPROVEMENT

ASSET MANAGEMENT IMPROVEMENT PLAN

13.2.1 Our current Asset Management Improvement Programme (AMIP) is summarised in Section 14, it covers the period from March 2006 to April 2009. We fully recognise that it is essential for the AMIP to be updated and developed over time in order to support an ethos of continual improvement in our asset management practices. To achieve this we will undertake two key activities on a regular basis (notionally each time the RAMP is updated); (i) Gap Analysis Update; and (ii) Benchmarking.

GAP ANALYSIS UPDATE

13.2.2 A Gap Analysis is a comparison of the current (As-Is) practices against the desired (To-Be) practices, where the desired practices should be a reflection of good/best industry practice. Activities to close any gaps are determined and developed into an Improvement Programme. The AMIP shown in Section 14 was developed using this approach. We will revisit and update the Gap Analysis annually. This will allow us to identify gaps that have been closed through the AMIP or other initiatives, up-date the Gap Analysis template with new/evolving best practice, and determine which gaps to address in the revised AMIP.

BENCHMARKING

13.2.3 Benchmarking is the comparison of one organisation's practices against another. Through the AMIP we will use benchmarking to assess our practices against comparable organisations. This will help us to identify industry best practice and to set standards of performance. It is our intention to use Benchmarking as an improvement tool through external benchmarking with similar organisations.

13.3 RAMP REVIEW AND UPDATE

13.3.1 This is the first version of the RAMP and as such the scope is limited and there are a number of significant gaps, especially the Levels of Service, Performance Targets, work plan and financial plan. It is our intention to provide an updated version of the RAMP in March 2009. Thereafter, we will update the RAMP every two to three years or more frequently if required.

14 ASSET MANAGEMENT IMPROVEMENTS

This section describes the planned improvements to asset management practices, i.e. people, processes, data and systems.

14.1 BACKGROUND

14.1.1 We undertook a review of our asset management practices in 2004, comparing them against best appropriate practice. This review, and a subsequent revision of the review in 2005, recommended a number of key improvements that we should make in order to progress towards best appropriate practice in asset management. Based on these recommendations we developed the Asset Management Improvement Programme (AMIP).

14.1.2 This AMIP is set out over a three year period, from May 2006 to April 2009, and is designed to provide real benefits both during and after the project. The improvements made through this project will provide a robust platform upon which asset management practices can be continually improved. The project is divided into 12 distinct but interrelated work packages:

1. Road Asset Management Plan
2. Network Hierarchy
3. Gap Analysis
4. Performance Management Framework
5. Information and Systems
6. Lifecycle Planning
7. Value Management
8. Risk Plans
9. Weigh-in-Motion
10. Asset Valuation and Depreciation
11. Process Mapping
12. Computerised Decision Support Tools

14.1.3 A description of the purpose, objectives and key deliverables for each work package are presented in Section 14.2.

14.1.4 These 12 work packages, when developed and implemented, will improve integration across the Asset Management Framework (see Figure 24 in Section 4.4) and provide a fully operational Asset Management Planning process. The AMIP will place us at the forefront of road asset management practice, but more importantly, it will provide tangible benefits to you and us.

14.2 DESCRIPTION OF WORK PACKAGES

14.2.1 The following sub-sections provide a brief summary of each work package, including the purpose, objectives and key deliverables.

WORK PACKAGE 1: ROAD ASSET MANAGEMENT PLAN

Purpose

The Road Asset Management Plan (RAMP) will describe the current and future expenditure required to deliver agreed Levels of Service. Development of the RAMP will provide the mechanism for setting, agreeing and documenting Levels of Service and associated expenditure.

Objectives

- To produce an asset management plan (the RAMP) that provides a holistic picture for the Scottish trunk road network.
- To document in the RAMP the current and future expenditure requirements for the maintenance and, where appropriate improvement, of the trunk road network.
- To clearly explain in the RAMP the linkage between different levels of expenditure and the Levels of Service provided on the network, including an explanation as to how the Levels of Service were derived.
- To initially develop the RAMP based on currently available information and then enhance it during the AMIP as data, systems and processes improve.
- To provide Transport Scotland staff with procedures to follow for the periodic updating and improvement of the RAMP.

Other objectives include establishing asset management principles, improving asset management practices, developing asset management skills and developing the Asset Management Planning process.

Key Deliverables

- *Basic RAMP* – the Basic RAMP will be based on currently available information.
- *Advanced RAMP* – this will be produced towards the end of AMIP and will be based on improved information, systems and processes.
- *Documented Asset Management Planning Process* – this will describe the planning process, explaining how the different activities (e.g. setting Levels of Service, Lifecycle Planning, Value Management, etc.) are brought together to produce the RAMP. A procedure for RAMP review/update will also be documented.

WORK PACKAGE 2: NETWORK HIERARCHY

Purpose

The management of an asset is directly related to the perceived importance of the asset. That is, if a road is considered to be of greater importance then it is likely that it will receive preferential expenditure over a road considered to be of lower importance. Importance is not always defined, but is normally implicit in decision making.

The purpose of this work package is to establish a robust and transparent hierarchy of road/route importance on the Scottish trunk road network. This will include the identification of all the key factors which influence the relative importance of a route. This will provide a robust and objective basis for decision making, allocation of resources and the adoption of management practices appropriate to route importance.

Objectives

- To define a hierarchy of strategic importance and provide the criterion to be used for allocating a route to a level of strategic importance.
- To subdivide the network into strategic routes based on origin and destination.
- To determine the strategic importance of each route and provide the reasons for arriving at that decision. The strategic importance of each route may change along its length.

Key Deliverables

- Report on the methodology for classifying the importance of routes on the trunk road network.
- Report on the proposed classification of each trunk road route.

WORK PACKAGE 3: GAP ANALYSIS

Purpose

The purpose of this work package is to undertake a detailed Gap Analysis of the data, systems and processes used for asset management (both current and required). This will benchmark the current position and support a number of activities in other work packages.

Objectives

- To identify the management decisions and functions that asset management must support at strategic, tactical and operational levels.
- To derive the required (To-Be) position of data, systems and processes from the management decisions and functions.
- To determine the current (As-Is) position of data, systems and processes.
- To identify, analyse and provide a register of the gaps, along with recommended actions for closing the gaps.
- To prioritise the closure of gaps based on an agreed set of criteria.

Key Deliverables

- To provide a report on the current and required positions of asset management.
- To provide a prioritised register of gaps and improvement actions.

WORK PACKAGE 4: PERFORMANCE MANAGEMENT FRAMEWORK

Purpose

The purpose of the Performance Management Framework is to link aims, objectives, Levels of Service and performance targets, i.e. linking strategic aims to operational performance targets and vice versa. This will include customer focused Levels of Service and performance measures that enable customer perception and aspirations to be captured and included in Level of Service/performance target setting.

Establishing this framework and its strategic to operational links is fundamental to successful asset management as it enables asset managers to assess and demonstrate the impact planned work will have on customer-focused Levels of Service and Performance Measures.

Objectives

- To review existing strategies and performance targets for the trunk road network.
- To develop a Performance Management Framework which incorporates Levels of Service and key performance measures that have been developed in consultation with customers.
- To benchmark Level of Service and performance against comparable organisations.

Key Deliverables

- Report on the review of existing strategies, performance targets and Business Plans for the trunk road network.
- Report on customer perceptions of the trunk road network.
- A Performance Management Framework, including customer-focused Levels of Service and performance measures, and supporting rationale for their selection.
- Report describing the benchmarking process and the results.

WORK PACKAGE 5: INFORMATION AND SYSTEMS

Purpose

The *2004 Asset Management Review* identified the need for improvements to information management practices and data integration and presentation on computerised systems. The purpose of this work package is to address these key improvement actions, in particular the production of a Data Management Protocol and a Data Integration Protocol.

Objectives

- To develop a Data Management Protocol relevant to the information needs for managing the trunk road network.
- To determine the existing frequency of asset inventory and condition data collection and recommend changes.
- To assess the data associated with Operating Company inspection regimes and make recommendations for change.
- To examine data collection processes, data field accuracy, frequency of data collection, collection techniques and responsibilities.
- To assess the existing and programmed level of data integration.
- To develop a Data Integration Protocol and develop a programme to implement changes.
- To undertake a technical assessment and make recommendations relating to a technical infrastructure that will sustain the recommendations outlined above.

Key Deliverables

- Data Management Protocol document describing the way in which the organisation appreciates information needs from policies and plans, specifies information and data needs and how the information should be managed.
- Data Collection Manual detailing the data collection procedures including definition of data fields, required accuracy, frequency of collection, collection technique and responsible party.
- Programme for collection of missing data.
- Data Integration Protocol for the computerised systems that support the management of the trunk road network assets and the presentation of data.

WORK PACKAGE 6: LIFECYCLE PLANNING

Purpose

A lifecycle plan is a long term strategy for managing an asset, or group of similar assets, with the aim of providing the required levels of performance while minimising Whole Life Costs or maximising Whole Life Value.

The purpose of this work package is to develop a lifecycle planning methodology appropriate for the trunk road network and then develop an initial set of lifecycle plans for the trunk road assets. These plans will support the identification of long-term maintenance needs, financial planning and 'what-if' Network Analysis.

Objectives

- To develop a lifecycle planning methodology suitable for the trunk road network.
- To compile the key information and assumptions that will support the development of lifecycle plans for the trunk road network.
- To assess the sensitivity of the lifecycle planning methodology to different criteria.
- To provide a basis for developing computerised models that will be integrated with, or linked to, existing systems.

Key Deliverables

- Report describing the lifecycle planning methodology and assumptions/criteria specific to the trunk road network, e.g. deterioration profiles.
- 'Proof of concept' computerised models that can be used to test the methodology.
- Manual describing how Transport Scotland staff should carry out lifecycle planning.

WORK PACKAGE 7: VALUE MANAGEMENT

Purpose

The reality for all infrastructure managers is that financial resources are normally limited and as such it is not always possible to carry out all of the work that is needed. It is therefore important to ensure that best use is made of the available finances, for example, where does expenditure best serve network safety, network performance and the reduction of whole life costs. This is done using an approach called Value Management.

The purpose of this work package is to review existing Value Management procedures for the trunk road network and if necessary develop a Value Management approach that can be linked to the lifecycle plans to support 'what-if' analysis.

Objectives

- To review existing Value Management practices for key asset types (roads, structures and lighting) and assess their suitability, for example, do they cover the necessary assessment criteria and are they comparable between asset types.
- If required, amend existing Value Management practices or develop new Value Management practices.

Key Deliverables

- Report on the review of the existing Value Management practices, including recommendations for amendments and/or developments.
- Implement the recommendations.
- Develop new and/or amended Value Management practices.

WORK PACKAGE 8: RISK PLANS

Purpose

The trunk road network has a number of strategic functions that can be at risk by natural or man-made disasters. Whilst it is not possible to eliminate all risks it is possible to identify potential risks and develop a minimisation strategy. The purpose of this work package is to develop risk minimisation strategies for each route and high value/risk assets which includes consideration of emergency response and alternative route plans.

Objectives

- To identify the key components of each route that could place the performance of the route at risk. These features may include bridges and tunnels, geotechnical issues, flooding potential and vertical and horizontal clearances.
- To develop risk minimisation plans for each route together with separate plans for major structures. Plans are to cover both risk identification in terms of potential level of risk and likelihood of occurrence.
- To develop Alternative Route Plans for each Route that is at or above a predefined importance level.

Key Deliverables

- Report identifying those key components of each route which could place the performance of the route at risk.
- Risk minimisation plans for each route together with major assets.
- Alternative Route Plans for each Route that is at or above a predefined importance level.

WORK PACKAGE 9: WEIGH-IN-MOTION

Purpose

The *2004 Asset Management Review* identified the non-collection of heavy vehicle loading data as a Gap. This information is required to inform asset consumption or remaining life of a pavement and to verify the deterioration mechanisms. The purpose of this work package is to investigate the suitability of the available Weigh-in-Motion equipment, develop procedures for the collection and analysis of data and investigate how this data can be integrated into SERIS and SRTDb.

Objectives

- To investigate the suitability of the available Weigh-in-Motion equipment to gather heavy vehicle loading data at normal traffic speed.
- To recommend the most suitable equipment for use in Scottish trunk road network conditions.
- To develop a procedure for the collection and analysis of heavy vehicle loading data across the network, including advising on the most appropriate locations for the collection of data.
- To prepare a specification for supply, installation, maintenance and data processing.
- To prepare a manual detailing the procedures for the collection and analysis of data.

Key Deliverables

- Report recommending the most appropriate Weigh-in-Motion equipment for the trunk road network.
- Specification for the supply, installation, maintenance and data processing of Weigh-in-Motion data.
- Manual detailing the procedures for collection and analysis of Weigh-in-Motion data.

WORK PACKAGE 10: ASSET VALUATION AND DEPRECIATION

Purpose

Asset valuation is the calculation of the current monetary value of an organisation's assets. Asset valuation provides a means for quantifying the capital employed in the assets and the cost of use of the assets in delivering services to the public. It is therefore important that the approach used for asset valuation provides a true and fair value that reflects the current condition and performance of the asset.

The purpose of this work package is to review the current approach used for asset valuation and depreciation of the pavement and, if necessary, recommend an alternate approach that aligns more closely with asset management principles.

Objectives

- To investigate the current method for calculating pavement depreciation and outline any proposals for changes.
- To take account of latest developments in Asset Valuation/Depreciation.
- To align, where possible, Asset Valuation/Depreciation with the principles of asset management.
- To ensure any changes fully align with accounting standards.
- To develop a procedure for calculating pavement asset depreciation that aligns with and complements asset management.

Key Deliverables

- Technical paper for submission to Transport Scotland outlining options for changes to the calculation of depreciation and pavement serviceability criteria with justification.
- Manual detailing the procedures for calculating pavement asset depreciation.

WORK PACKAGE 11: PROCESS MAPPING

Purpose

Efficient and effective running of an organisation depends on a clear understanding of the underlying processes, the tasks they involve and their associated roles and responsibilities. This work package will provide a full set of documentation, presented in a common format, on the asset management processes and procedures for trunk road asset management.

Objectives

- To review existing asset management processes and procedures related to the management of the various trunk road assets.
- To identify any deficiencies requiring clarification or enhancement in consultation with customers for each of these processes and upgrade documentation as necessary.
- To develop formal process maps and procedures to cover all stages of managing the various components of the trunk road assets through their lifecycle.
- To review current roles and responsibilities related to the management of the trunk road assets.

Key Deliverables

- Formal documentation for all key trunk road asset management practices and procedures.
- Development of Process Maps for all major steps, including tasks, roles and responsibilities, in the trunk road assets management processes from strategic planning to project delivery.

WORK PACKAGE 12: SPECIFICATION FOR A COMPUTERISED DECISION SUPPORT TOOL

Purpose

Work packages 1 to 11 will develop a wide range of manuals, processes and tools that are of considerable benefit to us and will improve our asset management practices. However, in order to gain the full benefits of this work it is essential for these to be embedded into our computerised asset management system/s. This will provide our staff with readily accessible support tools, thereby promoting and encouraging the use of asset management techniques.

The purpose of this work package is to produce a specification for a computerised Decision Support Tool (DST) that fully supports the asset management planning Process.

Objectives

- To provide linkage between deliverables from the other work packages.
- To provide a specification that will support 'what-if' analysis, i.e. the impact of different levels of funding on network performance.
- To provide a specification that describes how future performance/condition is modelled, including details of how this is done for varying levels of information, i.e. minimal data to comprehensive data.

Key Deliverables

- Specification for the asset management planning process.

15 REFERENCES

1. *Scotland's National Transport Strategy*, Scottish Executive, April 2006.
2. *Framework for Highway Asset Management, County Surveyors Society*, April 2004.
3. *PAS 55-1 Asset Management: Part 1: Specification for the optimized management of physical infrastructure assets*, The Institution of Asset Management and BSI, 2004.
4. *PAS 55-2 Asset Management: Part 2: Guidelines for the application of PAS 55-1*, The Institution of Asset Management and BSI, 2004.
5. *International Infrastructure Management Manual: UK Edition 2003*.
6. *Maintaining a Vital Asset*, DfT Publications, November 2005.
7. *Well-maintained Highways: Code of Practice for Highway Maintenance Management,* July 2005, TSO, ISBN 0115526439.
8. *Management of Highway Structures: A Code of Practice*, September 2005, TSO, ISBN 0115526420.
9. *Well-lit Highways: Code of Practice for Highway Lighting Management*, November 2004, TSO, ISBN 0115526323.
10. *BD63: Inspection of Highway Structures, Design Manual for Roads and Bridges Volume 3*, Section 1, Part 4.
11. *Choosing the Right Fabric, A Framework for Performance Measurement*, HM Treasury, Cabinet Office, National Audit Office, Audit Commission and Office for National Statistics, March 2001.
12. *3rd Generation Contract for Management and Maintenance of the Scottish Trunk Road Network,* Transport Scotland.
13. *The Orange Book: Management of Risk – Principles and Concepts,* HM Treasury, October 2004.
14. *Buildings and constructed assets – Service life planning – Part 5: Life cycle costing*, ISO DIS 15686-5.
15. *Achieving Whole Life Value in Infrastructure and Building*, BRE 2005, ISBN 1 86081 737 8.

A. ROAD STRUCTURES – CONSTRUCTION FORM

The following tables present the construction forms, and their associated quantities, related to the structures types listed in Section 3.3.

A.1 BRIDGES

CONSTRUCTION FORM	QUANTITY	
	NUMBER	AREA (m^2)
Beam and slab	340	420,484
Slab	539	252,572
Slab (with edge cantilevers)	135	147,003
Arch, filled spandrel	266	58,599
Box type structure	167	54,076
Spine beam (with edge cantilevers)	15	27,667
Pipe arch	46	21,093
Portal horizontal	73	17,867
Pipe	42	9,754
Beam and plating	13	3,287
Arch, open spandrel	5	3,165
Beam and troughing through type	7	2,920
Truss through	9	2,918
Beam and jack arch	7	1,809
Arch, bowstring (tied)	3	1,772
Truss deck	5	1,770
Beam and troughing deck type	7	1,245
Cable stayed	3	867
Other	139	65,049
Total	**1821**	**1,093,917**

A.2 CULVERTS

CONSTRUCTION FORM	QUANTITY	
	NUMBER	LENGTH (m)
Pipe	1000	40,107
Box	351	7,389
Arch	204	4,217
Pipe arch	39	1,964
Pipe multi	44	1,602
Slab, voided	98	1,327
Box multi	17	937
Pipe arch multi	10	354
Portal frame	7	79
Beam and slab	2	51
Beam, jack arching	2	25
Other	159	168
Total	**1933**	**58,220**

A.3 RETAINING WALLS

CONSTRUCTION FORM	QUANTITY	
	NUMBER	LENGTH (m)
Gravity wall	630	47,725
Cantilever wall	198	14,699
Sheet pile wall	15	1,660
Crib wall	14	1,657
Anchored plate wall	16	1,377
Reinforced soil wall	16	1,046
Bored pile wall	7	556
Anchored pile wall	16	183
Unknown	8	461
Total	**909**	**69,364**

A.4 SIGN/SIGNAL GANTRIES

CONSTRUCTION FORM	QUANTITY	
	NUMBER	SPAN (m)
Aluminium	5	36
Concrete	19	386
Glasgow gantry	98	1,961
Steel	77	1,322
Unknown	39	40
Total	**238**	**3,746**

B. ASSET MANAGEMENT PLANNING

This appendix provides an overview of the asset management planning process that is being developed to support long-term work and financial planning and the delivery of the corporate aims, objectives and targets.

B.1 ASSET MANAGEMENT PLANNING

B.1.1 Asset management planning is a logical and systematic process for translating strategic aims, objectives and targets into a fully resourced long-term work programme. We have reviewed recognised good practice and developed an asset management planning process suitable for the trunk road network; this is shown in Figure 33.

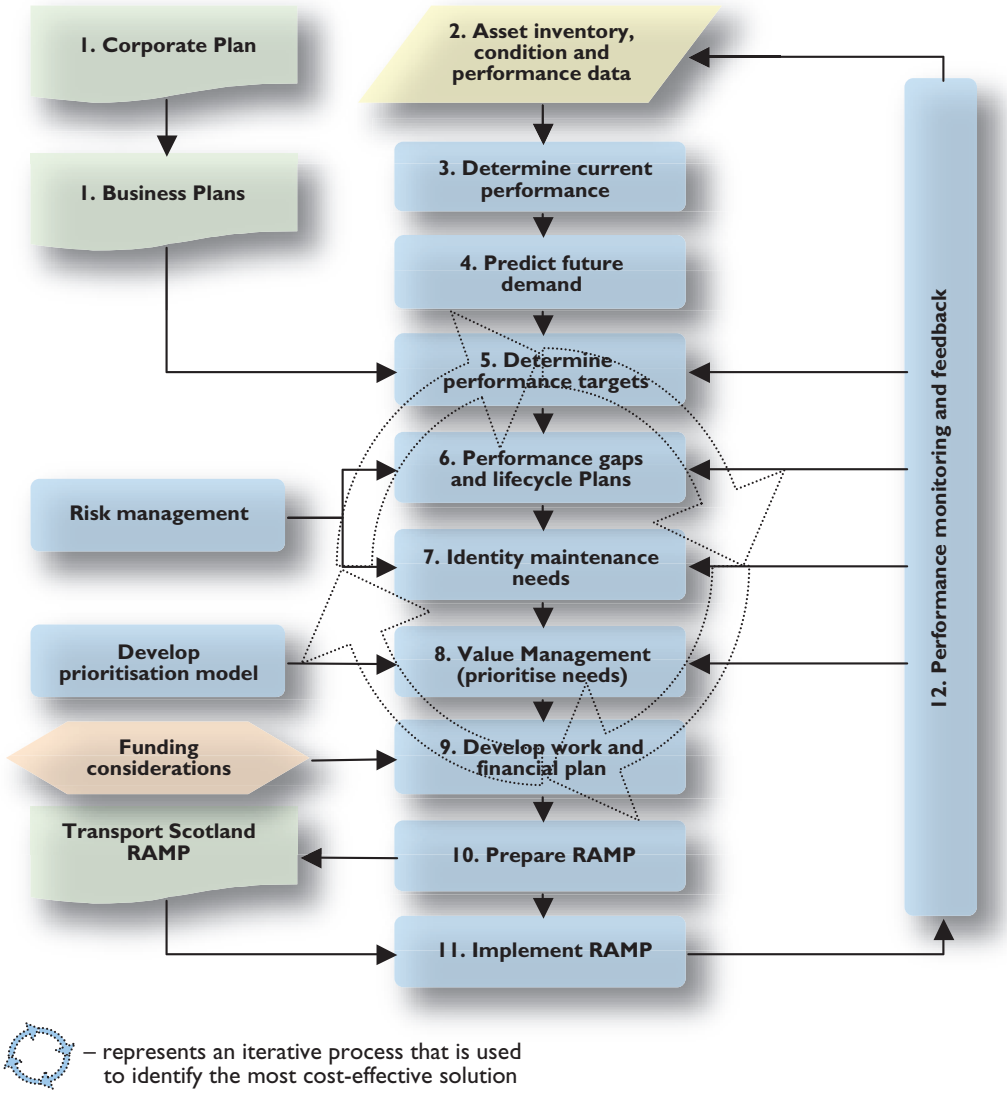


FIGURE 33 ASSET MANAGEMENT PLANNING PROCESS

B.1.2 Through the AMIP we will fully develop the components of the asset management planning process. A key function of the completed planning process will be to produce robust and reliable information for future versions of the RAMP. Each component of the asset management planning process is summarised in the following.

1. CORPORATE AND BUSINESS PLANS

B.1.3 The Transport Scotland Corporate and Business Plans, and the TRNMD Business Plan, provide the overall direction for the management of the trunk road network in terms of aims, objectives and targets. An overview of these is provided in Section 2. These place requirements and constraints on asset management practices, for example, the impact of congestion targets on maintenance activities. The corporate and business aims and objectives are generally broad statements and will need to be translated into quantifiable asset Performance Targets; we will achieve this by developing a comprehensive Performance Management Framework, see Section 6.

2. ASSET INVENTORY, CONDITION AND PERFORMANCE DATA

B.1.4 Good quality information forms the basis of asset management. The purpose of this step is to assess the quality, completeness and format of data and information, identify gaps, plan the closure of gaps and classify assets in a manner that streamlines asset management planning. Formalised asset classification supports and streamlines data analysis and mining. Classification also provides a logical progression between *Strategic*, *Tactical* and *Operational* data and the presentation of information. Existing asset classifications for carriageway and road structures are set out in Section 3. As part of the AMIP we will review our asset classification, using the generic approach shown in Figure 34 as a starting point.

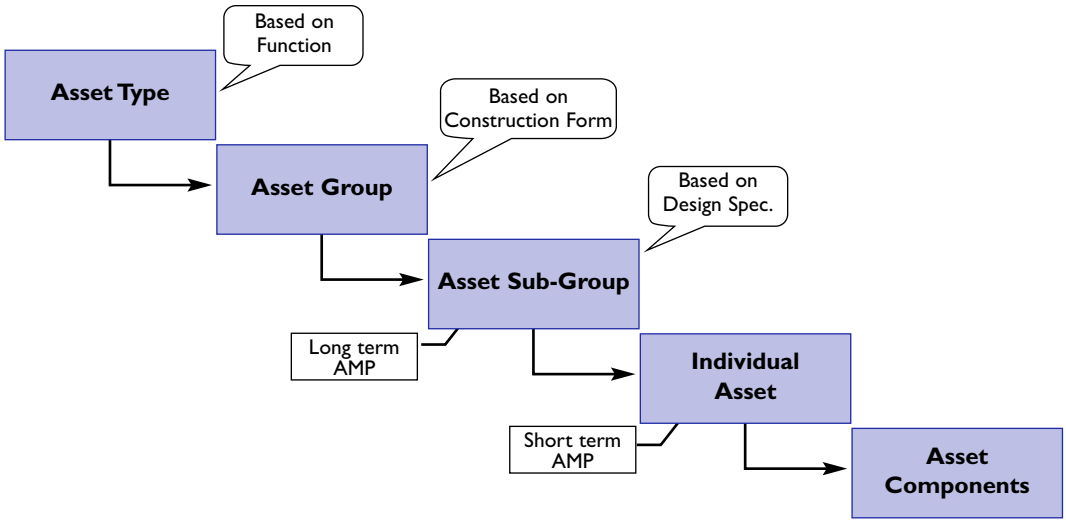


FIGURE 34 GENERAL SCHEMATIC FOR ASSET CLASSIFICATION

B.1.5 An important part of our classification will be to establish a network hierarchy that defines the importance of each section on the trunk road network. The management of an asset is directly related to its perceived importance; therefore, if a road is considered to be of greater importance then it is likely that it will receive preferential expenditure over a road considered to be of lower importance. Importance is not always defined, but is normally implicit in decision making. Through the AMIP we will establish a robust and transparent hierarchy of road/route importance for the trunk road network. This will include the identification of all the key factors which influence the relative importance of a route. The new hierarchy will provide a robust and objective basis for decision making, allocation of resources and the adoption of management practices appropriate to route importance.

B.1.6 Through the AMIP we will clearly identify and justify the inventory, condition and performance data required for each asset, including the regime for the on-going management of this data, for example, reviewing/updating frequency, collection method and required accuracy.

3. DETERMINE CURRENT PERFORMANCE

B.1.7 The purpose of this step is to determine the current, and where possible the past, performance of our assets. This provides a benchmark, and possibly trends, against which future network demand and maintenance and improvement works are identified. The current performance is described through appropriate asset Performance Measures, for example, Condition Indicators.

B.1.8 The evaluation of Performance Measures is a substantial task, and we will seek to do this in an efficient and effective manner using our computerised asset management systems. We also recognise that Performance Measures can provide perverse answers if not appropriately selected or developed. Section 6 describes the overall approach and principles we are adopting in order to develop a balanced set of meaningful Performance Measures.

4. PREDICT FUTURE DEMAND

B.1.9 The purpose of this step is to predict how the demand on the trunk road network is likely to change in the future, i.e. over the period of the RAMP, because this will have an impact on future management and maintenance practices. In general, change in demand may be classified as:

- *Changing traffic volumes and mix* – for example, changes in demand caused by population growth/shift, increasing/decreasing number of road users, changing modes of transport, increasing vehicle loads, etc.
- *Changing performance requirements* – how are the performance/service demands of the road users likely to change in the future, e.g. more reliable journey times, reduced congestion, improved ride quality, etc.

B.1.10 We have traffic growth models that will give an indication of changes in traffic volumes and mixes, and that take account of the impact of relevant Government policy and initiatives. Section 5 sets out our current and future network demand and the assumptions we have made about future events that may influence needs. It is likely that some of the demand predictions and assumptions will not materialise due to network, socio-economic and political changes. Given this inherent uncertainty, an important part of this step of the planning process will be to review and challenge these predictions and assumptions at subsequent revisions of the RAMP.

5. DETERMINE PERFORMANCE TARGETS

B.1.11 A balanced set of Performance Measures suitable for the trunk road network will be developed, as described under Step 3. Against each Performance Measure an appropriate Performance Target will be defined for the RAMP period that takes account of:

- The aims, objectives and targets set in the Corporate and Business Plans, see Step 1.
- Customer requirements and aspirations, for example, improved journey times.
- Future demand predictions, see Step 4.
- Legal and statutory obligations, for example, health and safety.
- Funding constraints.
- Resource constraints, e.g. people, equipment and materials.

B.1.12 Performance Targets, like Performance Measures, will be quantifiable and, in general, directly related to the actual performance or condition of the asset. This will enable targets to be determined for different asset types and for different aspects of asset condition and performance.

B.1.13 The Performance Targets will provide a clear focus for the asset management planning process and allow better targeting of investment to contribute to the delivery of the corporate aims and objectives. For some Performance Targets it is appropriate to use a risk assessment approach, as defined in *Well-maintained Highways: A Code of Practice for Highway Maintenance Management* [7], to determine a suitable target. Where appropriate, we will investigate this option and assess the risks to the public and the service, and then balance this against any associated cost savings. Further details of our approach to Risk Management are provided in Section 7.

6. PERFORMANCE GAPS AND LIFECYCLE PLANS

B.1.14 The performance gap is quantified as the difference between the current performance (Step 3) and the target performance (Step 5). Lifecycle plans are then used to analyse the closure of the performance gap, for example, how much maintenance work and funding is required to close a gap. A lifecycle plan is defined as a long-term strategy for managing an asset, or group of similar assets, with the aim of providing the required performance while minimising Whole Life Costs (or maximising Whole Life Value). Lifecycle plans are normally developed for the generic asset groups (as defined under Step 2) and give consideration to the full lifecycle of the asset, including asset creation, operation, maintenance, upgrade, renewal and disposal.

B.1.15 Lifecycle planning is a core asset management activity, and robust and meaningful lifecycle plans are fundamental to understanding the long-term behaviour of the network and the impact of different levels of funding on deterioration and maintenance needs. Section 8 provides further details of the approach we will use to develop our lifecycle plans, which forms a major part of our AMIP.

7. IDENTIFY MAINTENANCE NEEDS

B.1.16 The lifecycle plans will be used to identify the work required, over the RAMP period, to deliver the Performance Targets (see Step 5). As a minimum we will assess:

- The work needed to sustain the current performance over the RAMP period
- The work needed to close any current gap in performance
- The work needed to sustain the target performance over the RAMP period
- Any work arising from other schemes planned for the RAMP period, e.g. network improvement schemes.

B.1.17 Assessing these criteria across the trunk road network is a substantial task, and cannot be readily done by hand. Therefore, as part of the AMIP, we are seeking to develop a set of computerised models that will automatically run the lifecycle plans over the RAMP period, and beyond. These computerised models will enable us to assess the above scenarios and allow the user to readily assess other options and, if required, amend the lifecycle plans.

8. VALUE MANAGEMENT

B.1.18 The reality of managing a transport network is that funding is limited and normally not sufficient to allow all the work identified by Step 7 to be carried out. Given this constraint, it is important to have a means of identifying the most economic allocation of the available resources; the most commonly used approach is Value Management (VM).

B.1.19 VM is a formalised process for assessing the benefits of undertaking maintenance and the associated risks of not undertaking maintenance. VM enables the available/expected funding to be appropriately targeted to those areas which contribute most to the achievement of the Performance Targets. As part of the AMIP we are reviewing our current VM practices, which primarily focus on large schemes. This is a rigorous and partially workshop based VM process, and therefore not wholly suitable for asset management planning, because the VM used in the planning process is applied automatically (within the computerised models) to all maintenance works (both small and large). We will therefore seek to develop a more straightforward VM process for use in the asset management planning process, ensuring this aligns with the principles of our existing VM process and the STAG requirements.

9. DEVELOP WORK PLAN AND FINANCIAL PLAN

B.1.20 After the identified works are Value Managed (prioritised), they are developed into an optimised long-term Work Plan (normally ten years) which can be achieved by the available/expected funding. The Work Plan describes the volumes of work and their phasing while the Financial Plan describes the associated funding. The tools and processes that support the development of our work and financial plans will be developed under the AMIP.

10. PREPARE RAMP

B.1.21 Working through the asset management planning process provides the majority of the information required for the RAMP. By establishing the processes and systems that support the asset management planning process, through the AMIP, we will be able to readily update the RAMP in the future.

11. IMPLEMENT RAMP

B.1.22 The RAMP will be implemented by translating the long-term work plans into detailed annual work plans. The translation of the RAMP into detailed work plans will provide linkage between the strategic aims and objectives and the day-to-day work on the network. This is fundamental to the successful delivery of an asset management approach.

12. PERFORMANCE MONITORING AND FEEDBACK

B.1.23 It is important that the components of the asset management planning process are reviewed and improved over time. As part of the overall monitoring, review and feedback process (Section 13), suitable measures will be put in place for the planning process. In particular, to assess if the outputs of the planning process agree with the realities of network management, for example, work volumes and costs. We will use feedback to review and improve the planning process, in particular setting Performance Targets, lifecycle planning and Value Management.

C. INFORMATION MANAGEMENT

This appendix provides an overview of the approach we will use, through the AMIP, to improve our information management practices.

C.1 OVERVIEW

C.1.1 Work package 5, Information and Systems, is designed to address shortfalls in our current information management practices. A summary of the activities in Work package 5 are provided in Section 14.2.

C.2 CURRENT INFORMATION MANAGEMENT

C.2.1 Our current information management practices have evolved over time, for example, information needs are identified to support new/improving processes and current information is reviewed periodically. This has resulted in an approach that, while mostly adequate to date, has a number of deficiencies. It is for this reason that we are reviewing best practice and developing and implementing formal information management practices through the AMIP.

C.3 IMPROVING INFORMATION MANAGEMENT

C.3.1 The general approach we will adopt to improve our information management is as follows:

- **Needs** – we are undertaking a detailed analysis of our information needs, deriving our information needs from the management decisions we make, for example, we have identified the information we need to support long-term financial planning. This will enable us to identify and understand information flows and dependencies, highlighting critical information and allowing us to analyse the costs and benefits of holding particular items of information. Completing this exercise will provide a clear audit trail for information needs. We will establish a formal protocol for identifying information needs, and use this to periodically review our information needs.
- **Collection** – through the AMIP we will establish the procedures, standards and tolerances for each item of information, for example, resolution for photos, tolerance for measurements and terminology for asset descriptions. These may influence the techniques that we currently use to compile information. Procedures, standards and tolerances will also be set for information transfer, i.e. transfer of information collected on site into the computerised asset management systems. Again, these may influence the techniques that can be used to collect the information. Where appropriate, collection of any missing information will be streamlined by combining it with other activities, for example, combining it with condition inspections. Some information is collected to national formats, e.g. SCANNER, SCRIM, and no amendments to the collection format can be made.

- **Storage** – the majority of our asset information is stored in computerised management systems. Through the AMIP we will review our current storage procedures and seek to identify the most cost-effective storage arrangements that meet our requirements, e.g. security (including future-proofing), speed of access and information integrity.
- **Usage** – it is important that we make full and best use of the information collected, for example, analysis, presentation and sharing. We currently have a number of computerised management systems and are in the process of developing them further to improve information usage and sharing.
- **Maintenance** – for each item of information a suitable regime for maintenance will be identified, that is, frequency of review or update. For some items a review may be sufficient, e.g. check dimensions during inspection, while for others the information may need to be completely updated, e.g. update condition at each inspection. Where appropriate, the regime for maintaining information will be streamlined by aligning/combining data collection with other activities.

C.3.2 This formal approach to information management will provide accurate, reliable, trustworthy and useful information that fully supports asset management and reduces the whole life costs of information collection and maintenance. However, the greatest benefits derived from adopting formal information management will be through improved management of assets, e.g. greater visibility of asset condition and performance and greater ability to plan and coordinate works.

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