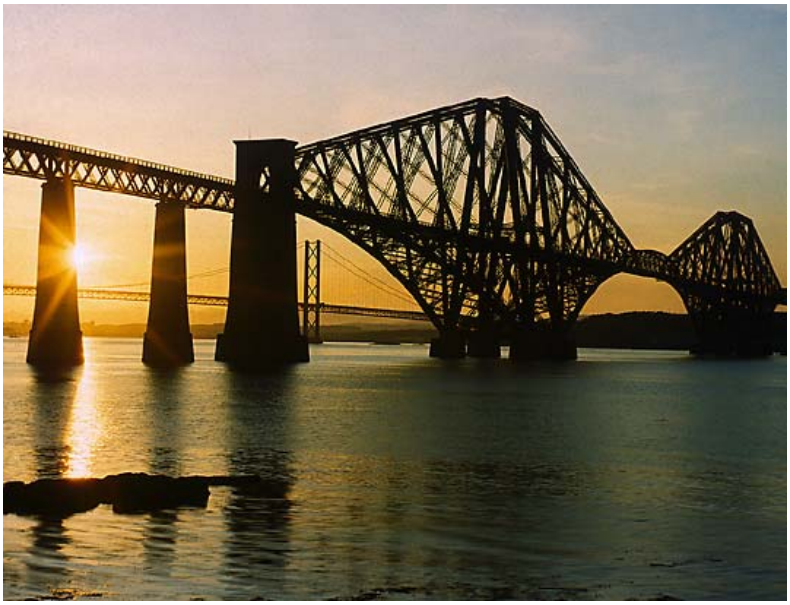

Scott Wilson

in association with

MVA

DAVID SIMMONDS CONSULTANCY
URBAN, REGIONAL AND TRANSPORT PLANNING

Hargest & Wallace Planning

SESTRAN

SESTRAN Integrated Transport Corridor Studies (SITCoS)

Queensferry Cross Forth Corridor Report

June 2005

SITCoS

SESTRAN INTEGRATED TRANSPORT CORRIDOR STUDIES

QUEENSFERRY CROSS FORTH CORRIDOR

CORRIDOR REPORT

TECHNICAL ANNEX (bound separately)
Volume 1 Pre-appraisal and STAG Part 1 Appraisal Process
Volume 2 Consultation and STAG Part 2 Appraisal Process

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SESTRAN INTEGRATED TRANSPORT CORRIDOR STUDIES

QUEENSFERRY CROSS FORTH CORRIDOR

CORRIDOR REPORT

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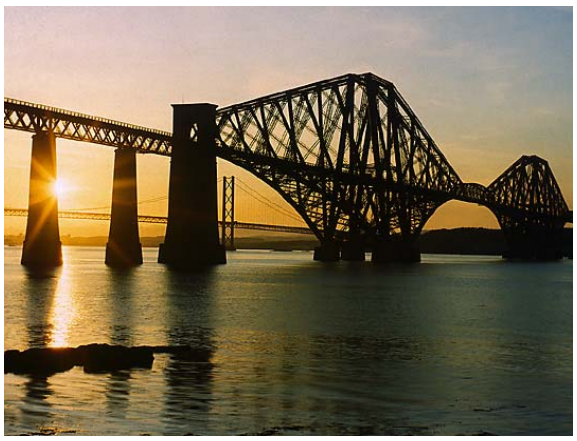

EXECUTIVE SUMMARY

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Introduction & Background

The SESTRAN partners appointed a consortium of consultants led by MVA and including Scott Wilson Scotland Ltd, David Simmonds Consultancy, Hargest & Wallace Planning Ltd and Systra Ltd to undertake Integrated Transport Corridor Studies on five corridors around Edinburgh and the Forth Valley.

This Report refers to the Queensferry Cross Forth Corridor. The extent of the Study area for this Corridor is shown on Figure 1, but it should be noted that the scope of the Study requires consideration of people, freight and vehicle movements starting or finishing outwith the Study area, but travelling across the Forth Estuary at Queensferry.

Given the size and complexity of the study area, the reporting has been split into a general Corridor Report (of which this is the Executive Summary) and a more detailed Technical Annex, presented in two volumes.

The approach adopted complies with Scottish Transport Appraisal Guidance (STAG), as follows:

- Pre Appraisal, identifying the current and future characteristics of travel in the Cross Forth area and its related problems, in order to inform the objectives for the study and the generation of wide-ranging options to address these objectives;
- Consultation, which was continuous throughout the study, with a regular series of meetings with a Corridor Steering Group and a Consultation Workshop involving a wide range of stakeholders;
- Initial (Part 1) Appraisal, giving a broad-based assessment of potential options identified following the pre-appraisal process, in order to identify those schemes worthy of further consideration; and
- Detailed (Part 2) Appraisal of those schemes with a view to recommending one, or more, that were likely to support the study objectives and address the problems originally identified.

Queensferry Cross Forth Study Area and Its Problems

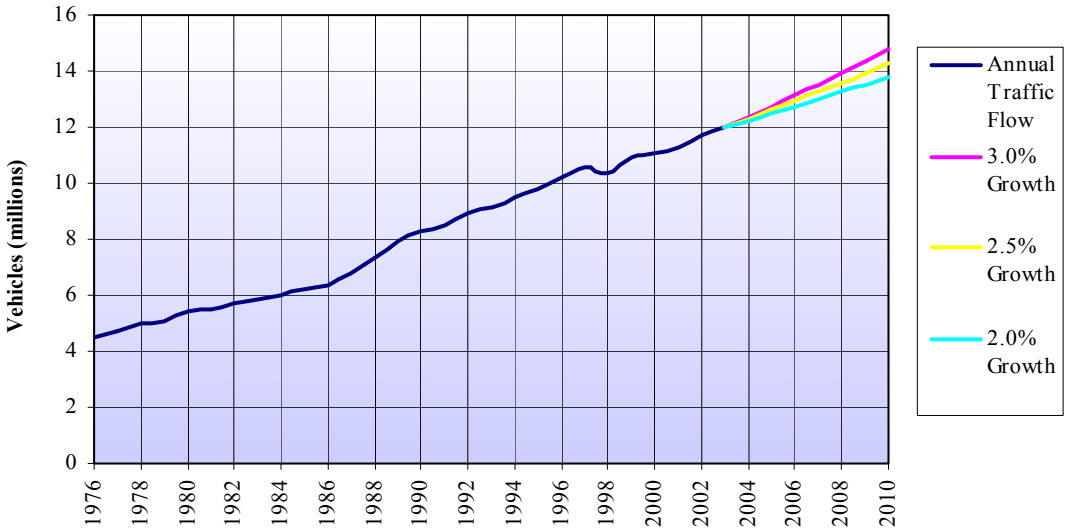
The study area comprises south Fife, the Forth Bridges, West Lothian and west and central Edinburgh. This encompasses the north-western quadrant of Edinburgh's journey-to-work zone, including West Edinburgh, South Queensferry, Inverkeithing, Rosyth and Dunfermline. The study area falls within Edinburgh's commuter catchment area, and this has exacerbated the difficulties in providing sufficient capacity to meet Cross Forth transport aspirations.

There is a very wide social mix and the local economy is similarly diverse, reflecting the continuing development of West Edinburgh and the expansion of housing in south Fife.

The continuing growth in the Edinburgh economy and the dispersal of housing into surrounding areas, coupled to background growth in car travel, has resulted in significant growth in traffic on the Forth Road Bridge, and it is anticipated that this will continue (see Figure 2). In addition the trend towards more dispersed patterns of employment opportunities (e.g. West Edinburgh as opposed to Central Edinburgh) has made the use of public transport for commuting less attractive, and contributed to the increasing use of Single Occupancy Vehicles (SOVs).

Scott Wilson MVA	SESTRANS INTEGRATED TRANSPORT CORRIDORS STUDY (SITCoS) QUEENSFERRY CROSS FORTH CORRIDOR	Figure 1 Corridor Study Area

Figure 2: Road Bridge traffic (1976-2010)



The Forth Road Bridge currently runs at, or near, capacity (approximately 3,500-3,600 vehicle per hour) southbound between 0600 and 0900 and northbound between 1700 and 1830 on most week-days, and for longer on Friday afternoons. As a result, any additional growth in commuter traffic will lead to peak-spreading. This is already in evidence, as both AM and PM peaks are perceived to be starting earlier and finishing later year-on-year. Vehicle occupancy rates are low.

Congestion on and around the Bridge is considerable, as illustrated in Table 1.

Table 1: Average Daily Congestion Bands, Forth Road Bridge (2003)

Northbound

Congestion Type	Speed Drop >	Vehicles Affected		Congestion Duration		Time lost per km	
		Number	%	Hours	% of day		
Mild	10%	3830	19.6%	4.00	16.7%	7.55	
Serious	25%	985	5.0%	1.00	4.2%	8.39	
Severe	50%	302	1.5%	1.25	5.2%	14.39	
	Total	**5117**	**26.2%**	**6.25**	**26.0%**	**30.33**	hours

Southbound

Congestion Type	Speed Drop >	Vehicles Affected		Congestion Duration		Time lost per km	
		Number	%	Hours	% of day		
Mild	10%	2318	11.2%	3.25	13.5%	3.84	
Serious	25%	241	1.2%	0.25	1.0%	1.31	
Severe	50%	644	3.1%	0.25	1.0%	22.40	
	Total	**3203**	**15.4%**	**3.75**	**15.6%**	**27.55**	hours

Data from the 2001 Census regarding modal split in south Fife shows that rail has an above average modal share from Dalgety Bay, Inverkeithing and North Queensferry (compared to Fife as a whole), whilst the modal share of bus is broadly equal across most of south Fife. Use of the car for commuting in Fife is significantly above the Scottish average; this is most marked in Kelty and Dalgety Bay.

The AM week-day peak PT mode-share from South Fife to central Edinburgh is high (at over 75%) but this drops significantly for trips to other destinations[1]. Trips to these other destinations therefore generate a significant proportion of the peak congestion but many are not-easily served by commercially-viable public transport. The study needed to consider this dispersed pattern of cross-Forth car travel and not simply assume that increasing cross-Forth PT frequency to central Edinburgh will solve the problems of traffic congestion in this corridor.

Rail also suffers from challenges posed by congestion, as evidenced by significant overcrowding on peak hour trains. This will be addressed in the short term by a programme of platform and train lengthening currently in hand.

In summary, the existing and future problems are:

- Increasing demand for Cross Forth movement of people and goods;
- Increasing economic activity in the Edinburgh area, particularly around West Edinburgh;
- Continuing development of housing in south Fife without adequate sustainable transport infrastructure;
- Increasing scarcity of road space;
- Over-crowded peak-hour trains;
- Inadequate interchange opportunities and capacities in Fife;
- Restricted rail capacity (frequency and train length); and
- Congested roads, resulting in delays, particularly for buses.

Planning Objectives

Based on the problems identified, the following scheme-specific Planning Objectives were agreed:

1. ***Reduce the number of people commuting in single occupancy vehicles within South East Scotland – especially for journeys to and from Edinburgh; but also for journeys to destinations outwith the SESTRAN area;***
2. ***Minimise the overall need for travel, especially by car;***
3. ***Maximise public transport provision and achieve public transport integration and intermodality;***
4. ***Improve safety for all road and transport users;***
5. ***Enhance community life and social inclusion;***
6. ***Maintain existing infrastructure properly in order that it can be fully utilised;***
7. ***Enhance movements of freight, especially by rail and other non-road modes;***
8. ***Sustain the economic health of the SESTRAN region;***
9. ***To stabilise (in the short term) and improve (in the long term) accessiblity to cross-Forth movement for people and goods; and***
10. ***Ensure land-use planning is integrated with transportation plans.***

The Planning Objectives were then used in conjunction with the Government's five transport objectives and other yardsticks to assess schemes generated through an Optioneering process.

[1] The corresponding proportion of trips from South Fife to West Edinburgh is about 43%, North Edinburgh is about 34% and for West Lothian the PT mode share is less than 5%.

Option Generation, Sifting & Development

An initial 66 options were identified at a brainstorming session, to which a further 4 were added later. These were then reviewed, to ensure they could all further the scheme's objectives, and sifted, to eliminate impractical suggestions and group those exhibiting similar characteristics.

As a result four broad packages were taken forward for initial, STAG Part 1, appraisal, viz:

1. *Bus Priority and High Occupancy Vehicle (HOV) Lanes;*
2. *Improved Heavy Rail Services;*
3. *Extension of Edinburgh trams across the Forth; and*
4. *Construction of a new Forth Bridge.*

Initial Appraisal (STAG Part 1)

Appraisal of each package was then carried out against the following yardsticks:

- The 10 Planning Objectives;
- The 5 Government Objectives:
  - Environment;
  - Safety;
  - Economy;
  - Integration;
  - Accessibility/Social Inclusion; and
- Implementability.

From the Part 1 Appraisal process it was evident that big improvements to rail frequencies were unlikely to be justifiable, because of the significant cost of infrastructure required – running more than 12 trains per hour across the Forth Rail Bridge would require considerable investment, not just in additional rolling stock but also in upgrading to 4-aspect signalling; even then, there would still be constraints in the Haymarket/Waverley area. However, it was concluded that there might still be opportunities to make better use of the existing Cross Forth infrastructure, and this would be investigated further as part of the STAG Part 2 process.

It was also evident that the extension of Edinburgh tramlines into Fife was unlikely to be justifiable in terms of economic viability, because many of the other benefits could be achieved adequately through cheaper options. Extending the planned Edinburgh trams, across the Forth into Fife, would not necessarily offer a step change in travel times/opportunities; in addition, a large proportion of predicted demand would be abstracted from parallel public transport services (bus and heavy rail) – modal shift from cars would be negligible. In

addition, given the predicted demand on the tram network additional trams would need to run between the city centre and the airport simply to cater for the generated Cross Forth demand, making the incremental cost of this extension very high.

Although consideration was given to developing the tram alignments as guided bus, in the first instance, this also appeared to offer poor value for money and was not pursued further.

As a result it was agreed to take forward the bus priority/HOV lanes, and new Forth crossing, for more detailed appraisal, along with the consideration of how to make best use of the existing rail infrastructure.

Consultation

In line with STAG recommendations, there was an ongoing programme of consultation with the client bodies throughout the study. This was supplemented by discussions with key stakeholders, particularly in the form of a Consultation Workshop, before completing the initial appraisal, to ensure "buy-in" to the schemes taken forward for more detailed appraisal.

In addition, as FETA was developing its draft Local Transport Strategy within the period of this study, opportunities were taken to liaise closely with the development of that document.

Detailed Appraisal (STAG Part 2)

More detailed appraisal required the disaggregation of the broad-based schemes from the initial appraisal, resulting in seven "themes" that were considered likely to further the study's objectives, arranged broadly in order of deliverability (short term first, long term last):

A	Making Public Transport More Attractive
B	Comprehensive Bus "Right-of-Way" & Priority Vehicle Lanes
C	Feeder Bus Services
D	Park & Choose
E	Optimisation of Rail Services
F	Demand Management
G	Forth Multi-modal Crossing & Road Space Reallocation

Making Public Transport More Attractive

A wide variety of best practices were identified, both from UK and European experience and it was recommended that an integrated package, combining these measures, should be implemented, taking effect over a period of up to 10 years. These would be supportive of other measures set out below, and in some cases would form an essential foundation for their success.

Comprehensive Bus "Right-of-Way" & Priority Vehicle Lanes

Two types of Priority Vehicle Lanes were identified:

- High Occupancy Vehicle Lanes, available for use by buses, HGVs and High Occupancy Vehicles; and
- Bus Priority Lanes, available for use only by buses.

A southbound HOV lane was recommended between Halbeath and the northern bridgehead. This would be supported by bus priority in south Fife and along the A90, utilised by an augmented range of bus services providing comprehensive links between south Fife and north, west and central Edinburgh.

Feeder Bus Services

As well as augmenting the Cross Forth bus network, in areas of lower demand it was appropriate to introduce feeder bus services to improve accessibility to principal Cross Forth public transport services (rail and bus) through a series of interchanges at Halbeath, Dalgety Bay, Ferrytoll and Rosyth. At the latter, improved accessibility would be provided by diverting existing local bus services past the improved station, which would feature a new interchange facility.

Park & Choose and Car Sharing

Park & Choose is a development of the Park & Ride concept, with parking opportunities concentrated around the key interchanges identified above, as well as an improved site at Inverkeithing.

Car Sharing would support the Park & Choose concept, encouraging Cross Forth travellers to group together to improve car occupancy rates across the Road Bridge and take advantage of the proposed differential tolls in favour of HOVs.

Note that car sharing is particularly relevant for trips to employment destinations that are difficult or impractical to reach by public transport. This applies to the majority of the weekday peak-hour southbound car traffic, since only about 12% of southbound car traffic on the Forth Road Bridge in the weekday peak is heading for central Edinburgh.

Park & Choose would therefore offer a flexible solution to Cross Forth travel needs, with travellers able to choose between local feeders or short-distance car journeys to an Interchange, with a choice of modes for their Cross Forth journey including rail, bus and car-sharing. It also offers an opportunity to "mix and match" on the Cross Forth journey, for example crossing southbound by car-sharing and returning, northbound, by train. This will help to address the problems related to car-based commuting, particularly in SOVs, identified at the start of the study.

Optimisation of Rail Services

Improvements to the quality and reliability of the existing rail services could be achieved by reviewing the pattern of services (so-called "splitting the circle") and introducing a clockface timetable. A theoretical maximum of 12 trains per hour could operate within existing infrastructure, and it was proposed to provide a pattern of up to 10 trains per hour once the Edinburgh Airport Rail Link opens.

A number of suggested sites for new rail stations were considered, but no obvious case existed to provide additional stations, except possibly in the area of "Dunfermline South" to serve proposed development to the west of Dunfermline.

It was identified that rail already played a major role in serving the travel market to central Edinburgh, but would be less well-placed to serve more dispersed demand south of the Forth. Rail over-crowding is already an issue, and would need to be addressed beyond the short-term palliatives offered by train/platform lengthening.

The popularity of rail has had particular disbenefits for Inverkeithing, from where Cross Forth rail services are cheapest, fastest and most frequent. To try and alleviate this problem, it was recommended that rail fares from all south Fife stations should be reduced to the Inverkeithing level.

Demand Management

Demand management focuses on "sticks" (measures to make the unsustainable mode less attractive, and hence encourage modal shift to more sustainable transport modes).

Car Parking charges, and varying tolling patterns for the Forth Road Bridge, were considered. There was little support for introducing parking charges at railway stations, and the overall sensitivity of demand to parking charges in central Edinburgh is reported in the overall SITCoS Report.

However, if a new Forth Crossing is not built then demand management will need to be considered in an attempt to contain existing and future demand for Cross Forth travel within existing infrastructure limits. Although improved public transport and, in particular, greater car occupancy may mitigate against congestion in the short and medium terms, the fact that trip ends are dispersed (see Figures 2.3 and 2.4) means that, in the absence of a new crossing, the only remaining long term option is to try and "choke off" future Cross Forth people movements, using demand management.

It appeared that demand management **alone** would have only a marginal role to play in addressing the problems of Cross Forth travel because it cannot force down existing peak period demand levels or even contain it at current levels. It is likely, however, that FETA will need to increase bridge tolls to provide funding for some, or all, of the recommendations of this study, and that demand management would form a component of a wider, balanced strategy to address Cross Forth travel problems.

Third Forth Crossing

If the measures set out above were unable to adequately cater for increasing Cross Forth travel demand, or if the existing Road Bridge appeared unlikely to be able to support even background growth rates (e.g. as a result of more intensive maintenance schedules), then it would be necessary to consider the case for a Third Forth Crossing. It was agreed, in the course of appraisal, that any Third Crossing should:

- Be capable of accommodating a future LRT system, through the provision of sufficient design strength and deck space; and
- Not lead to an increase in the number of lanes available to single occupancy vehicles.

Thus, a proposal was developed for a Forth Multi-Modal Crossing, capable of future upgrading but with two new road lanes, initially in each direction, giving a total of four lanes in each direction (including the existing Road Bridge). Half of these would be dedicated to HOVs, leaving two lanes for general traffic as present.

Other Issues Considered

Before reaching conclusions on the recommendations resulting from the detailed appraisal, a number of other issues were reviewed to identify those which should be taken into account, including:

- Alternative land-use scenarios in Fife, with the possibility of releasing additional development land, particularly in south Fife;
- Peak-spreading, particularly on the road network, where traffic which is unable to cross the river at the height of the peak is forced earlier or later in the day, resulting in the peak of demand spreading to longer and longer periods;
- Problems facing the strategic (trunk) road network;
- The opportunity to upgrade transport solutions in the future; and
- Economic impacts of new river crossings on the wider economy.

Recommendations

Short Term Recommendations

The following short-term measures are recommended for immediate delivery, with steps taken as soon as possible to plan implementation and secure requisite finance:

- Implement measures to make Public Transport More Attractive;
- Provide new, bus-based Park & Choose site at Halbeath and expand Rosyth into Park & Choose location;
- Provide a newly constructed southbound HOV Lane between Halbeath and the northern bridgehead;
- Introduce "quick win" bus priority measures in Fife on A907, A823 and around Rosyth;
- Procure additional bus services on key Cross Forth routes;
- Improve the integration of bus and rail in Fife, including enhanced local bus feeders to key rail stations particularly Rosyth, Halbeath and Dalgety Bay; and
- Make those land reservations required to support future plans (e.g. Dunfermline South station).

Medium Term Recommendations

Building on the short term measures, the following projects are recommended for implementation in the medium term:

- Revised rail patterns to maximise use of Cross Forth rail capacity, including "splitting the circle" to provide enhanced services throughout Fife on the existing line through Turnhouse, and providing two additional trains per hour both operating via Edinburgh Airport;
- Support for Park & Choose at key locations: Inverkeithing (extension of car park including access road), Ferrytoll (including the new overspill site) and Dalgety Bay, in addition to the site at Halbeath featured in the short-term recommendations; and

- Completion of the Bus "Right-of-Way" network between Fife and Edinburgh, predominantly bus priority work on the A90 south of the Forth.

Linking the Medium and Long Term Strategies

As a supplement to the Short and Medium Term Strategies, if demand for Cross Forth travel continued to rise in such a way that it could not be accommodated, particularly on the Forth Road Bridge, then it will be necessary to identify a strategy that links the Medium Term recommendations with a future Long Term Strategy that is capable of accommodating sufficient future traffic as to minimise adverse impact on the local economy.

Demand management offers a way of controlling demand for Cross Forth travel, supplementing the short and medium term recommendations with a regime focused on significant increases to Cross Forth tolls, viz:

- Peak hour - £2 per SOV each way (i.e. if one-way tolling is in place, as at present, the toll would be £4);
- Hour before and hour after Peak - £1 per SOV each way; and
- Inter-peak – 50p per SOV each way.

In addition, it encompasses the reduction of Cross Forth rail fares, so that fares between south Fife and Edinburgh are capped at the level applied at Inverkeithing.

Long Term Strategies

The Case For and Against a New Crossing

The study gave particular weight to investigating the case for and against a new crossing, and concluded that, by 2011, the palliative effects of all short and medium term recommendations (i.e. those described so far) would have been exhausted, and even demand management could not contain traffic at, or below, its 2001 levels.

The disbenefits of failing to provide long term enhanced Cross Forth capacity include:

- High peak period tolls to discourage peak hour use of the road bridge;
- Restrictions on any bridgehead economic development that places additional stress on Cross Forth travel;
- Increasing peak period delays for travellers and deteriorating reliability;
- Further peak spreading;
- Difficulty in conducting even routine maintenance on the road bridge;
- Considerable traveller disbenefits; and
- Possible adverse impacts on the SESTRAN economy.

Providing additional unrestricted road space, through a new crossing, would have immediate positive benefits for congestion, but was likely to lead to escalating growth in Cross Forth car trips; within just 10 years of opening the three bridges were predicted to be coping with person trips almost 55% greater than those in 2001. More tellingly, by 2026, southbound peak period traffic would have reached about 190% of 2001 levels; if this growth continued unchecked, by 2031 all the additional capacity would have been exhausted.

This emphasised the need to adopt a long-term strategy that addressed as many of the disbenefits listed above as possible, without encouraging rapid expansion in Cross Forth car travel that rapidly exhausted the additional capacity provided.

Alternative Long Term Strategies

The following two Long Term Strategies were identified:

- Roads-based Strategy; and
- Balanced Strategy.

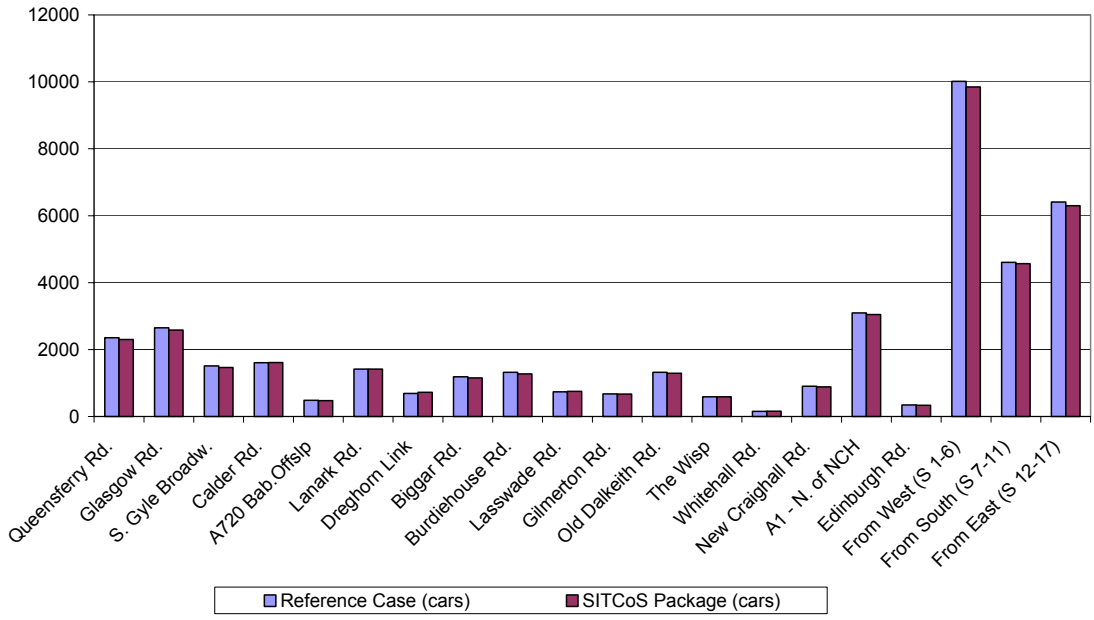
A Roads-based Strategy would build on the short and medium-term recommendations through the provision of a new road-only crossing and expansion in road capacity on the M90, effectively doubling the available Cross Forth road capacity available to all categories of vehicle. For reasons set out above this was not favoured.

The Balanced Strategy would supplement the short and medium-term recommendations with demand management and the provision of a Multi-Modal Crossing as described previously.

The target of the Long Term Recommendation is to facilitate future increases in Cross Forth people movements that support the development of the local economy, whilst ensuring that demand for travel is controlled sufficiently, so that road traffic to/from Edinburgh rises no faster than the underlying rate of growth.

The Balanced Strategy constitutes the long-term recommendation, forming part of the overall "SITCoS Package". Its impact on traffic into central Edinburgh is illustrated by Figure 3.

Figure 3: Car Traffic into Central Edinburgh (0700-0800) in 2021



Appraisal of the Balanced Strategy

This is summarised in the following figures and in Table 2. These show that the Balanced Strategy achieves a reduction in most emission levels, improved accident rates and a significantly positive Net Present Value (surplus of Benefits over Costs). It will also increase the number of jobs in the study area, particularly in Fife, and improve Cross Forth public transport journey times.

Figure 4: Changes in Emission Levels

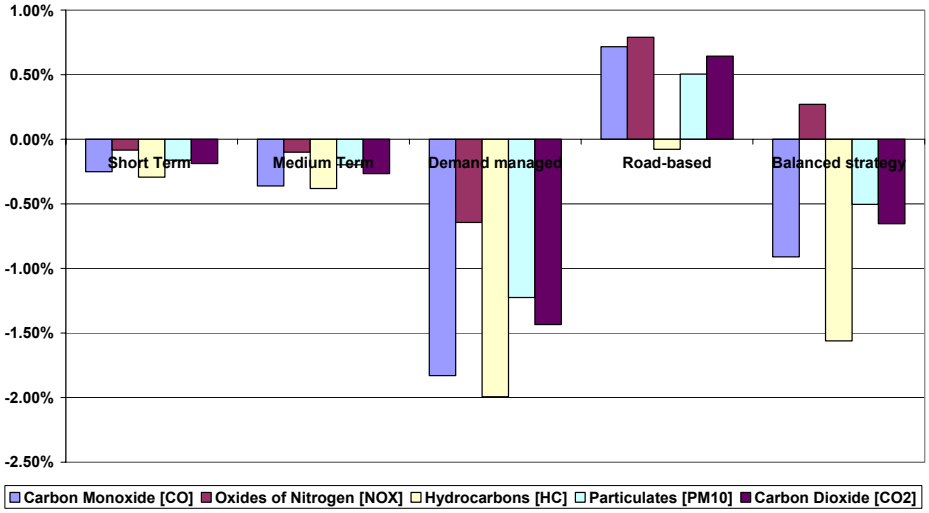


Figure 5: Accident Rates for each Package of Measures

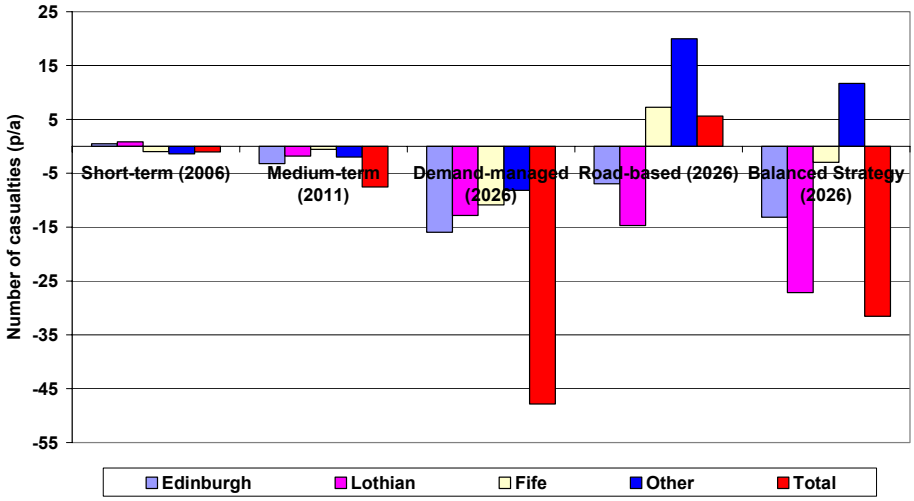


Figure 6: Transport Economic Efficiency (TEE)

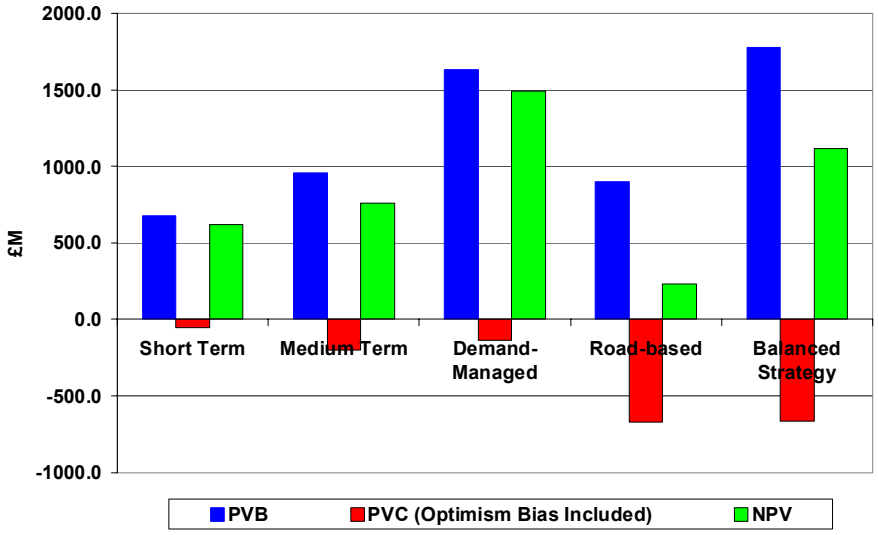


Figure 7: Impact of Measures on Jobs in the Study Area

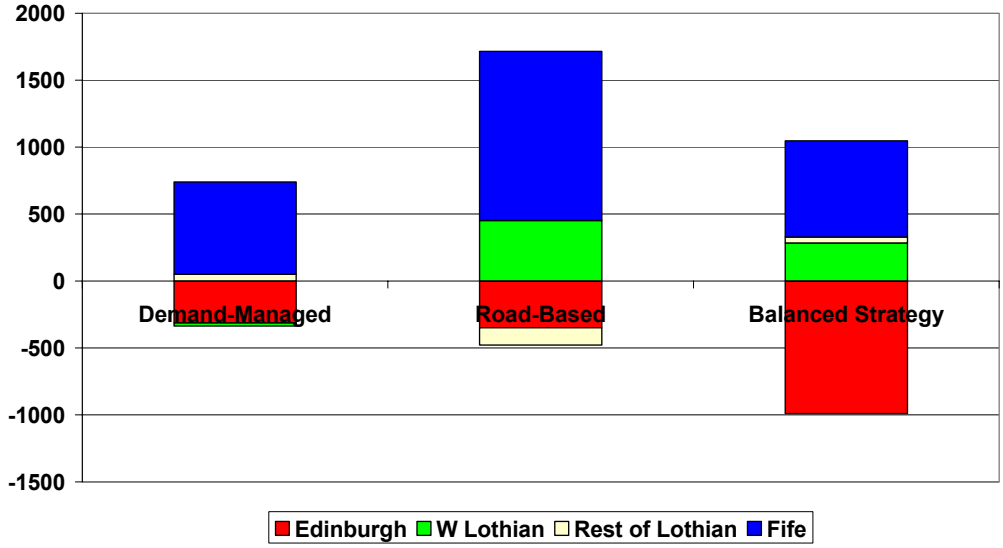
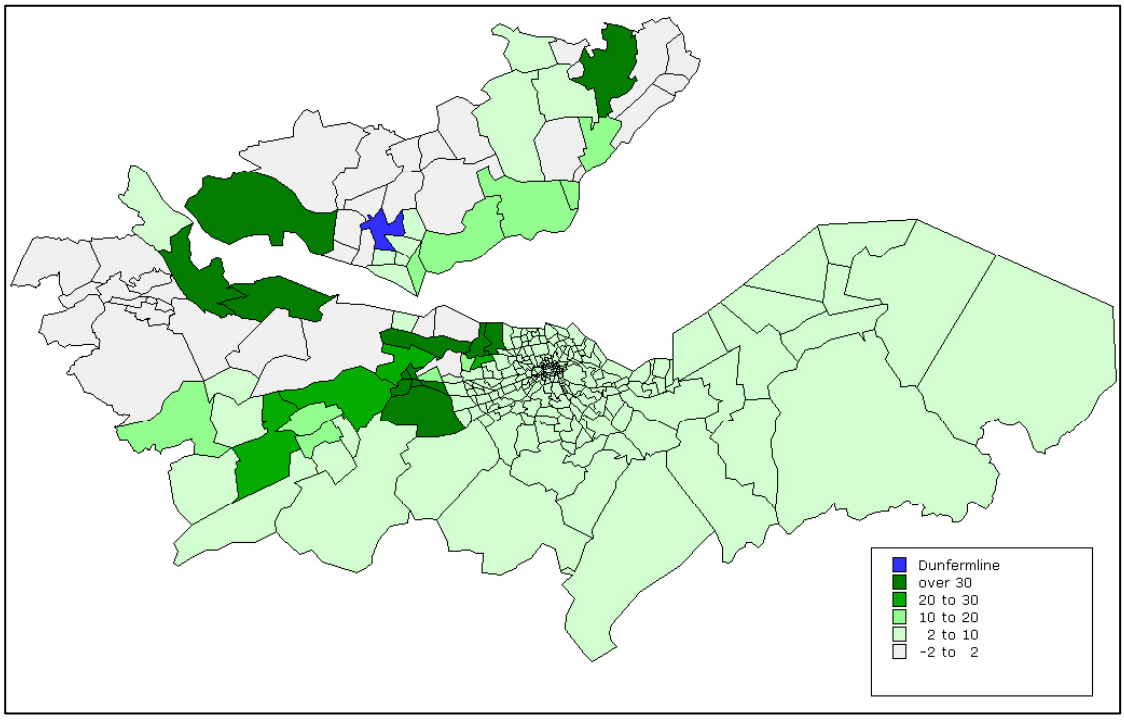


Figure 8: Public Transport Journey Time Savings from Dunfermline



As Figure 9 demonstrates, adoption of the Balanced Strategy facilitates an increase of around 45% in Cross Forth person trips between 2001 and 2026. This will be beneficial to the development of the SESTRAN region, without incurring the significant traffic congestion disbenefits associated with a Roads-based Strategy.

The latter is illustrated in Figure 10, which shows that under a Roads-based Strategy car trips in 2026 could reach 190% of their level in 2001, and effectively exhaust the additional capacity before 2031 if growth continued unchecked.

Figure 9: Cross Forth Person Trips (Southbound 0700-1000)

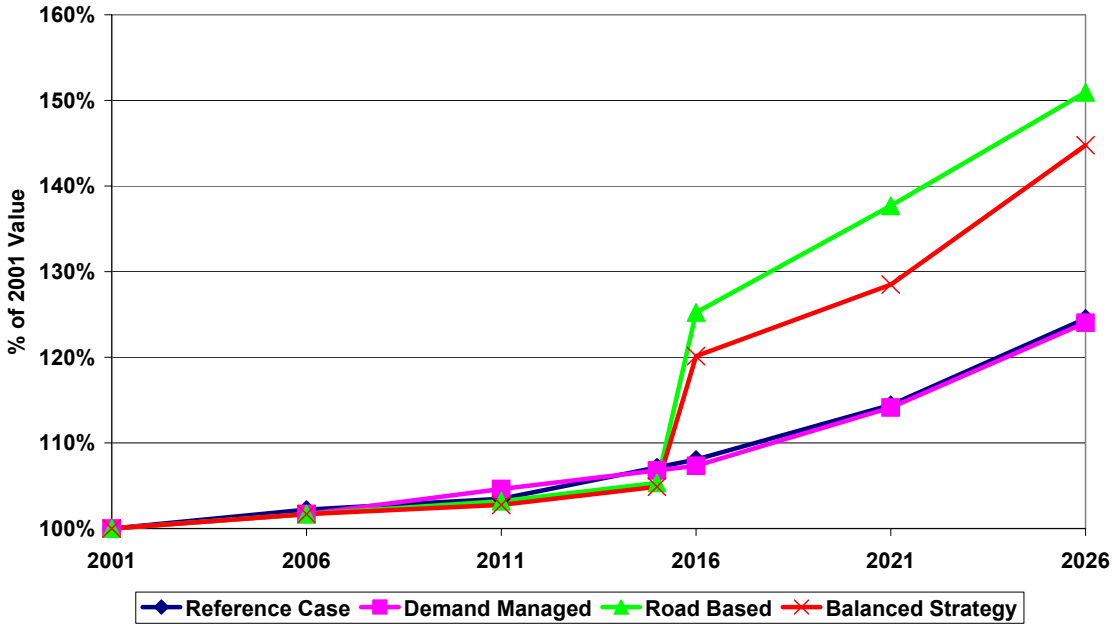
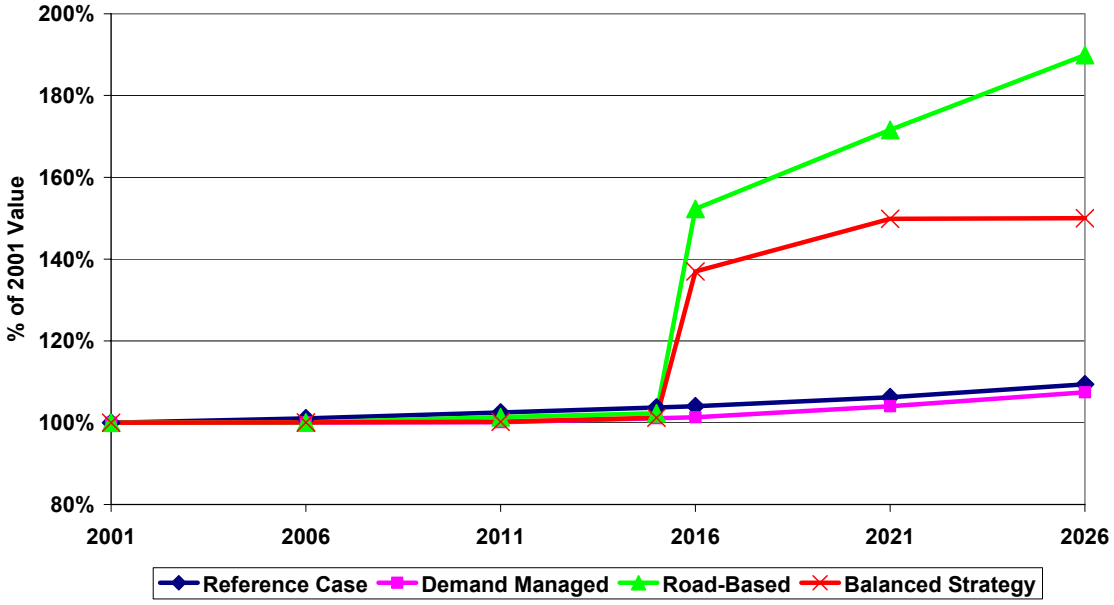


Figure 10: Cross Forth Car Traffic (Southbound 0700-1000)



To minimise such dangers, under the Balanced Strategy it is recommended that the demand management regime is retained in place indefinitely, and that it includes an increase in tolls **in real terms** year-on-year. The overall impact of the Balanced Strategy on peak-spreading (i.e. total peak period demand on the road system) is illustrated in Figure 11.

The Balanced Strategy would also have sufficient flexibility to accommodate the higher growth land-use strategies being considered in Fife, the potential impact of which is illustrated in Figure 12.

Figure 11: Peak Spreading under various Long Term Strategies – 2026

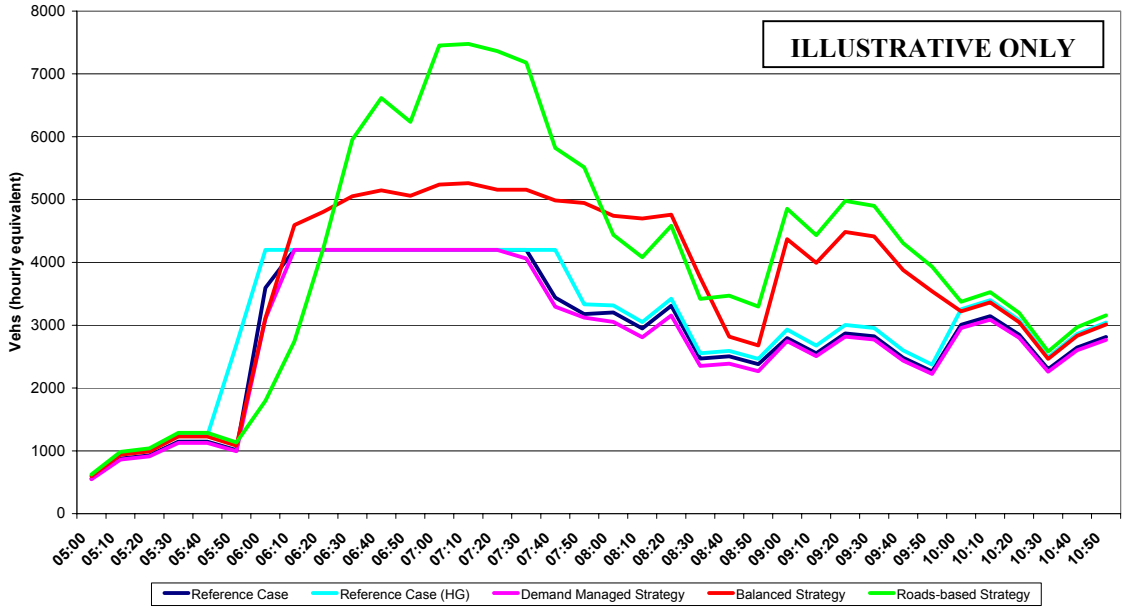
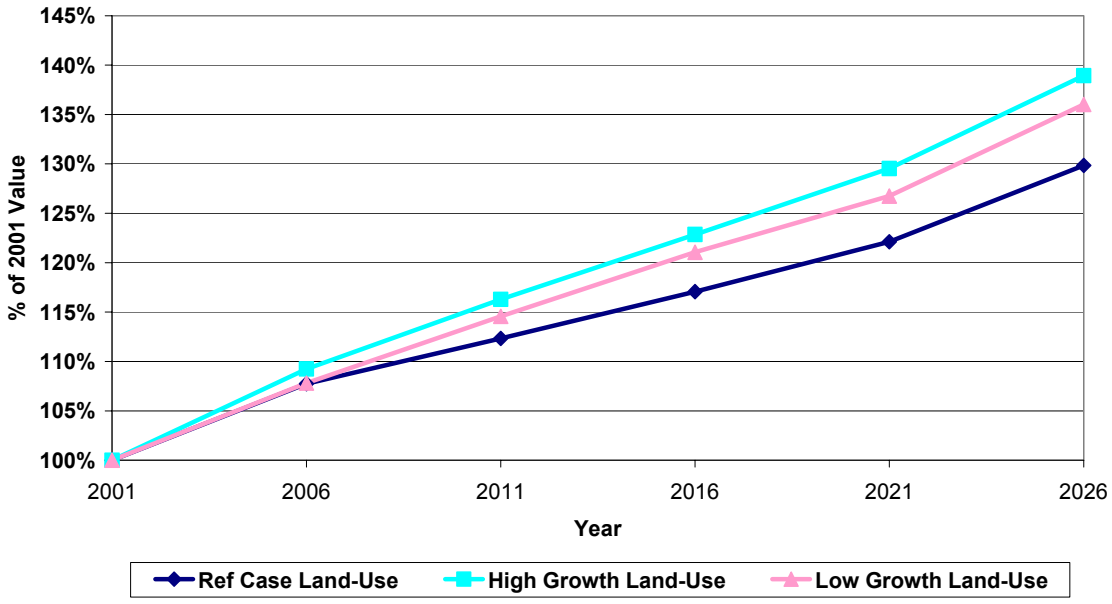


Figure 12: Growth in Cross Forth Person Trips (12-hour period, 0700-1900)



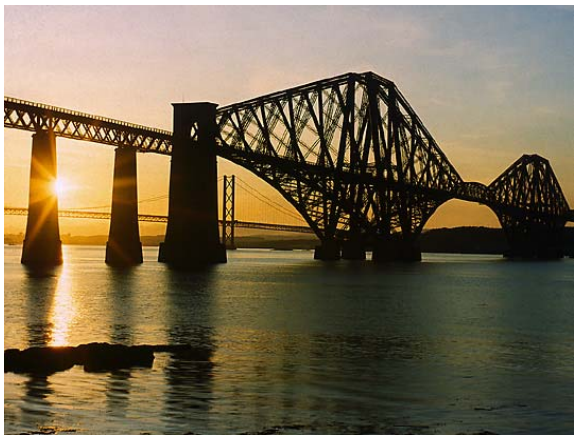
A comparison of the roads-based and balanced strategies against the Planning and Government Objectives is set out in Table 2, demonstrating that the Balanced Strategy offers the better long-term strategy. It fulfils the target that the long-term recommendation should support the development of the local economy by increasing capacity for Cross Forth people movements, whilst containing road traffic growth to/from central Edinburgh at the current underlying rates.

It should be noted that the HOV lanes on the new Multi-Modal crossing and the M90 are predicted to provide sufficient spare capacity for High Occupancy Vehicles up to 2026 and beyond, even under High Growth land-Use assumptions.

Table 2: Summary of Long Term Strategies against Objectives

	Yardstick		Roads Based Strategy	Balanced Strategy
			A	B
Planning Objectives	Reduce the number of people commuting in single occupancy vehicles within South East Scotland – especially for journeys to and from Edinburgh; but also for journeys to destinations outwith the SESTRAN area;		✘✘✘	✘
	Minimise the overall need for travel, especially by car;		✘	✓
	Maximise public transport provision and achieve public transport integration and intermodality;		O	✓
	Improve safety for all road and transport users;		✘	✓✓✓
	Enhance community life and social inclusion;		✘	O
	Maintain existing infrastructure properly in order that it can be fully utilised;		✓✓✓	✓✓✓
	Enhance movements of freight, especially by rail and other non-road modes;		O	O
	Sustain the economic health of the SESTRAN region;		✘	✓✓
	To stabilise (in the short term) and improve (in the long term) accessiblity to cross-Forth movement for people and goods;		✘	✓
	Ensure land-use planning is integrated with transportation plans.		O	✓
Government Objectives	Environment;	Noise & Vibration	✘	✘
		Air Quality	✓	✘
		Water quality, drainage & flood defence	✘✘	✘✘
		Geology, Agriculture & Soils	✘✘	✘✘
		Biodiversity	✘✘	✘✘
		Visual amenity	✘✘	✘✘
		Cultural Heritage	✘	✘
		Landscape	✓	✓
	Safety;		✘	✓✓✓
	Economy;		✘	✓✓
	Integration;		✘	O
	Accessibility/Social Inclusion;		✘	O
	Implementability		✘✘	✘✘

✓✓✓	Major Benefit
✓✓	Moderate Benefit
✓	Minor Benefit
O	No Benefit or Impact
✘	Small Minor Cost or Negative Impact
✘✘	Moderate Cost or Negative Impact
✘✘✘	Major Cost or Negative Impact



Chapter 1

INTRODUCTION & BACKGROUND

1. INTRODUCTION & BACKGROUND

1.1 Introduction

1.1.1 The SESTRAN partners appointed a consortium of consultants led by MVA and including Scott Wilson Scotland Ltd, David Simmonds Consultancy, Hargest & Wallace Planning Ltd and Systra Ltd to undertake Integrated Transport Corridor Studies on five corridors around Edinburgh and the Forth Valley.

1.1.2 This Report refers to the Queensferry Cross Forth Corridor. The extent of the Study area for this Corridor is shown on Figure 1.1, but it should be noted that the scope of the Study requires consideration of people, freight and vehicle movements starting or finishing outwith the Study area, but travelling across the Forth Estuary at Queensferry.

1.1.3 The approach for the overall Study was discussed at Inception Meetings on 29th September and 24th October 2003, and confirmed in the Inception Report dated 20th October 2003.

1.1.4 To supplement the overall Study inception meetings, specific "start-up" meetings took place on 10th November 2003 with officers of Fife Council and Forth Estuary Transport Authority (FETA). Throughout the study there was a need to liaise closely with FETA who were in the process of developing their Local Transport Strategy.

1.2 Report Structure

1.2.1 The general process for producing the Final Report is set out in Figure 1.2 below. STAG recommends that reports should consider their principal audience as the public[1]. Nevertheless, there is a requirement to provide a wealth of supporting detail, and in a corridor of this size and complexity this detail could be in danger of obscuring the principal issues and potential solutions, particularly for the general reader.

1.2.2 Accordingly this summary report is presented, focusing very much on the lay reader, with a more-detailed supporting Technical Annex containing the detail required to support the synopsis set out herein. The Technical Annex formally represents the STAG Appraisal that is the essential background to this report and its recommendations.

1.2.3 The Technical Annex itself is split into two volumes, as follows:

Volume 1 Describes the pre-appraisal identification of existing and future problems, the setting of Planning Objectives for the study, the generation of options, and the subsequent sifting and STAG Part 1 appraisal of those options.

Volume 2 Sets out the wide-ranging consultation following the initial selection of schemes after Part 1 appraisal, followed by a detailed assessment of the identified schemes as meriting STAG Part 2 appraisal. Concluding recommendations are set out for the corridor study.

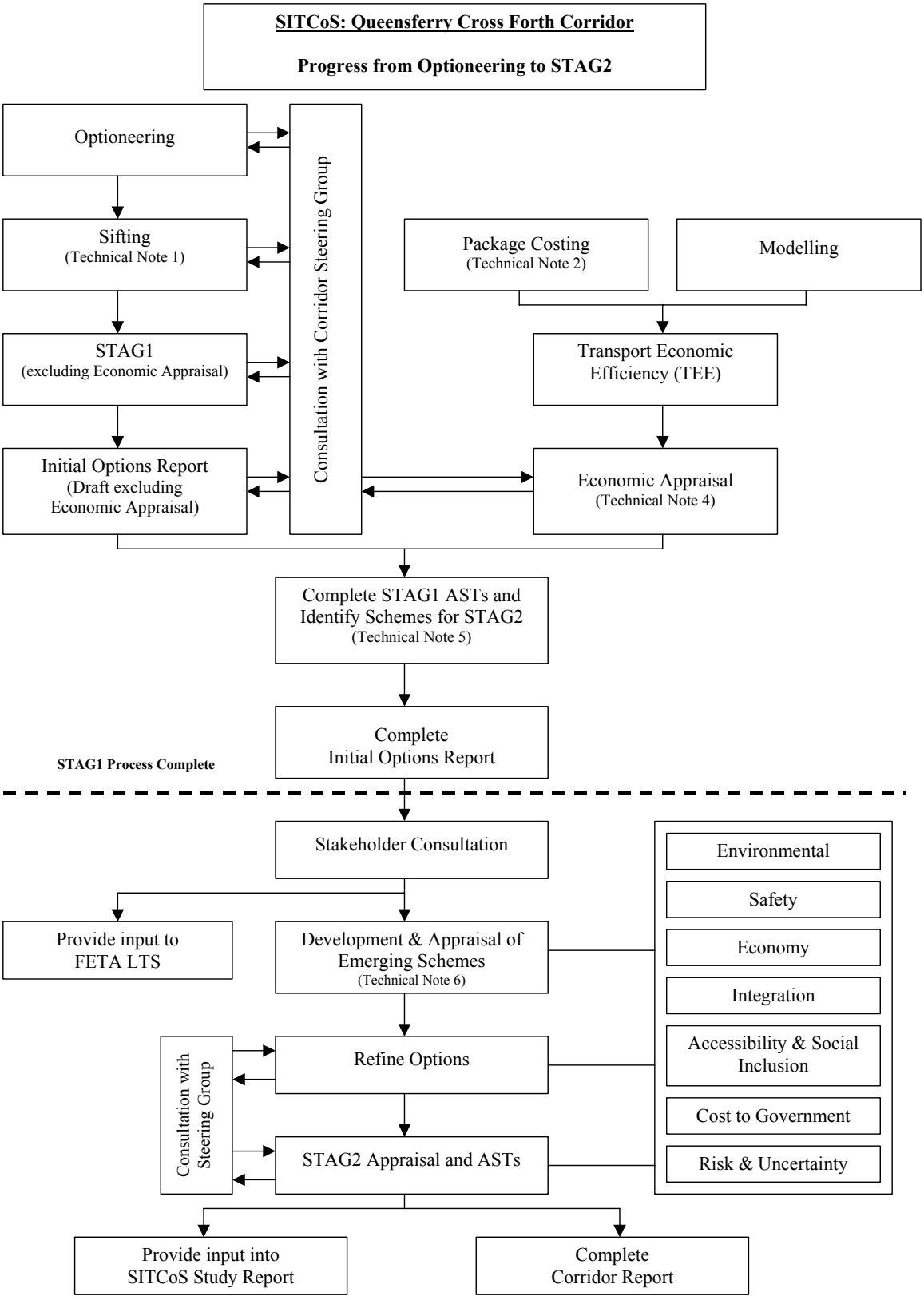
[1] Scottish Transport Appraisal Guidance (Scottish Executive, September 2003), section 14.1.3

SESTRANS INTEGRATED TRANSPORT
CORRIDORS STUDY (SITCoS)
QUEENSFERRY CROSS FORTH CORRIDOR

Figure 1.1

Corridor Study Area

Figure 1.2: Structure of Study Reporting



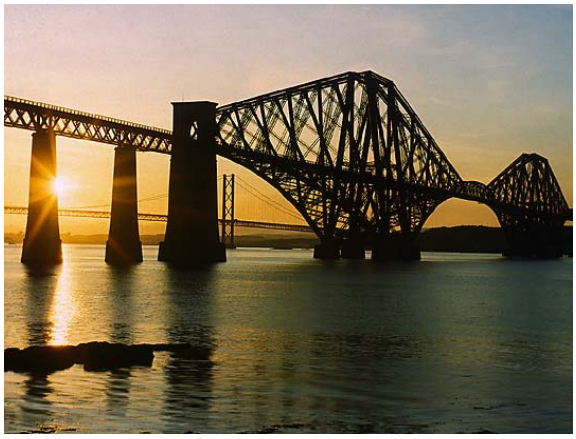
1.2.4 The format of this report follows that recommended by STAG, albeit that much of the supporting detail has been reported in the accompanying Technical Annex. The structure can be summarised as follows:

Chapter 2	An introduction to the study area, its existing transport-related problems, and the anticipated future problems.
Chapter 3	A description of the setting of Planning Objectives for the study.
Chapter 4	Sets out the option generation, sifting and development process.
Chapter 5	An overview of the initial appraisal of the options, and identification of those worthy of more detailed assessment.
Chapter 6	Describes the consultation undertaken throughout the study process.
Chapter 7	A summary of the detailed development and appraisal of schemes to address the objectives of the study area, and the anticipated future problems.
Chapter 8	Provides a resumé of potential risk and uncertainty associated with the proposed schemes.
Chapter 9	Suggests a monitoring and evaluation regime.
Chapter 10	Details the study's conclusions and recommendations for future strategy, throughout short, medium and long terms.

1.3 Definitions

1.3.1 Throughout this Report the following definitions are used.

Options	All of the competent ideas raised at the Optioneering Workshop
Schemes	Those Options taken forward for sifting prior to STAG Part 1
Packages	Groups of Schemes appraised under STAG Part 1
Reference Case	A collection of projects outwith this Study remit which are either committed to be built in the future, or assumed to be almost certain to go-ahead. The appraisal of identified measures takes place against the background of this assumed Reference Case.
'Outside World' Transport Changes	Transport schemes beyond the scope of this Study's recommendations, but which could have a significant impact on demand in the study area if they occur
Scenario	Group of all the necessary Reference Case assumptions regarding land-use development, economy and 'outside world' transport changes
HOV (High Occupancy Vehicle)	A High Occupancy Vehicle for the purposes of this report is assumed to include all buses, coaches and HGVs, as well as taxis and private cars with more than one occupant.



Chapter 2

QUEENSFERRY CROSS FORTH STUDY AREA AND ITS PROBLEMS

2. QUEENSFERRY CROSS FORTH STUDY AREA AND ITS PROBLEMS

2.1 Study Area

Geographic Context

2.1.1 Figure 1.1 shows an outline of the area. In summary this covers south Fife, the Forth Bridges, West Lothian and west and central Edinburgh. This encompasses the north-western quadrant of Edinburgh's journey-to-work zone, including Western Edinburgh, South Queensferry, Inverkeithing, Rosyth and Dunfermline. The impact of falling within Edinburgh's commuter catchment area has been to exacerbate the difficulties associated with providing sufficient capacity to meet Cross Forth transport aspirations.

Social Context

2.1.2 The size of the Corridor results in a very diverse social mix. The area to the west of Edinburgh is predominantly suburban, with above average levels of owner occupied housing and high car availability. However the Corridor does include a Social Inclusion Partnership (North Edinburgh: Granton, Pilton and Muirhouse) which together with the Granton Waterfront area forms the focus of NEAR (North Edinburgh Area Renewal).

2.1.3 North of the Forth the Fife towns of Dunfermline, Inverkeithing, Rosyth, Dalgety Bay and Cowdenbeath are similarly diverse, including Abbeyview, one of Fife's regeneration areas. Generally the south Fife area has a mixture of established communities (which have suffered from the economic decline of Fife) and new developments such as the Dunfermline Eastern Expansion and in Dalgety Bay (where a significant proportion of residents are commuting to Edinburgh).

Economic Context

2.1.4 West Edinburgh's economy has grown rapidly, particularly with financial sector companies, and this growth looks set to continue albeit at a lower rate. Economic growth in the South of Fife has been more restrained, although there has been considerable expansion in housing as a result of over-heating in the Edinburgh housing market, as well as development of Rosyth Europarc facility, and the Rosyth – Zeebrugge ferry service.

2.1.5 Expansion of housing in south Fife, most recently in the Dunfermline Eastern Expansion area (DEX), has often taken place without due consideration to the impact on the existing transport infrastructure, and without the implementation of sustainable transport stategies to support public transport over the private car.

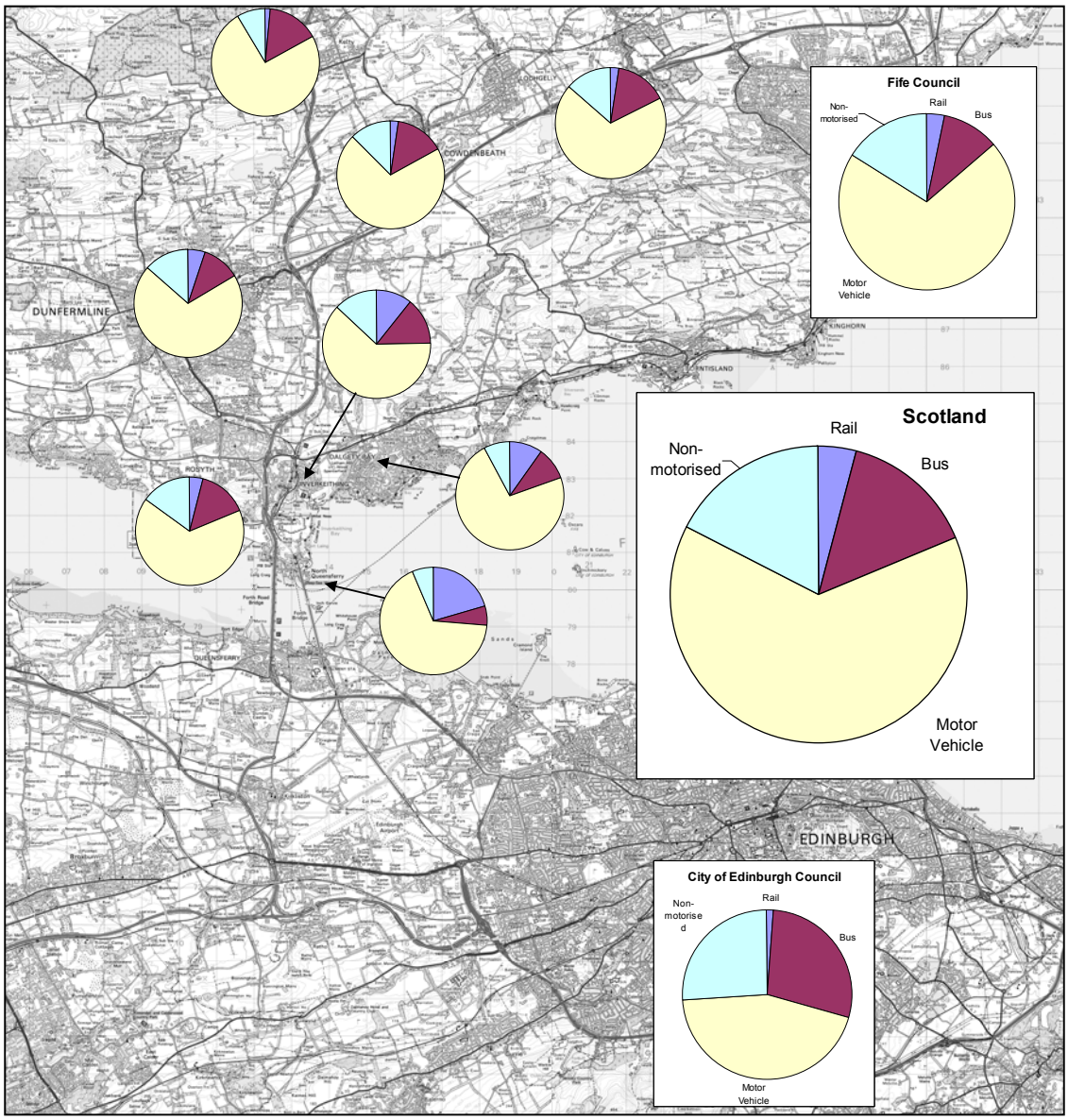
2.1.6 Figure 2.1 and Table 2.1 summarise the data relating to Travel to Work or Study from the 2001 Census.

Table 2.1: Travel to Work and Place of Study by Council Area, Settlement and Locality, 2001

Council area	All people aged 16-74 in employment or studying	Percentage of people aged 16-74 in employment or studying who											Average distance (km) travelled to place of work or study[1]	Percentage of public transport users in households[2]	
		Work or study mainly at or from home	Travel to place of work or study by												
			Underground, metro, light rail, tram	Train	Bus, minibus or coach	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Taxi or minicab	Bicycle	On foot	Other		With car or van	Without car or van
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*
SCOTLAND	**2,510,494**	**6.07**	**0.43**	**3.45**	**13.95**	**0.46**	**50.03**	**8.29**	**0.77**	**1.44**	**14.07**	**1.04**	**12.58**	**63.18**	**36.82**
Fife	**172,118**	**5.57**	**0.04**	**3.06**	**10.11**	**0.59**	**55.52**	**9.53**	**0.43**	**1.36**	**12.97**	**0.82**	**13.00**	**72.37**	**27.63**
Edinburgh, City of	**252,414**	**5.82**	**0.06**	**1.34**	**26.24**	**0.55**	**36.06**	**4.79**	**0.47**	**3.25**	**20.81**	**0.62**	**8.34**	**55.48**	**44.52**
Inverkeithing | Dalgety Bay	15,392	4.67	0.05	7.67	11.84	0.98	54.05	9.17	0.44	1.28	9.04	0.81	13.67	75.95	24.05
Dalgety Bay	*5,814*	*5.42*	*0.07*	*9.44*	*9.13*	*0.72*	*60.97*	*6.71*	*0.12*	*0.96*	*5.47*	*0.98*	*16.13*	*91.33*	*8.67*
Rosyth	*6,277*	*3.49*	*0.06*	*3.90*	*14.32*	*1.24*	*50.71*	*11.04*	*0.69*	*1.70*	*12.08*	*0.76*	*11.43*	*68.36*	*31.64*
Inverkeithing	*2,693*	*4.60*	*0.00*	*10.21*	*13.37*	*0.97*	*46.97*	*10.92*	*0.56*	*1.23*	*10.66*	*0.52*	*12.77*	*60.25*	*39.75*
North Queensferry	*608*	*10.03*	*0.00*	*18.42*	*5.26*	*0.82*	*53.78*	*5.59*	*0.33*	*0.16*	*4.77*	*0.82*	*18.05*	*89.58*	*10.42*
Dunfermline	20,139	3.95	0.03	5.14	10.80	0.67	55.87	10.20	0.36	0.89	11.44	0.64	12.15	69.03	30.97
Halbeath | Crossgates	1,455	3.57	0.00	2.06	12.44	0.69	61.92	11.27	0.34	0.41	7.01	0.27	11.60	73.33	26.67
Crossgates	*1,146*	*3.84*	*0.00*	*2.27*	*12.13*	*0.61*	*63.96*	*11.43*	*0.26*	*0.44*	*4.71*	*0.35*	*12.67*	*77.44*	*22.56*
Halbeath	*309*	*2.59*	*0.00*	*1.29*	*13.59*	*0.97*	*54.37*	*10.68*	*0.65*	*0.32*	*15.53*	*0.00*	*7.71*	*58.70*	*41.30*
Cowdenbeath	8,294	3.75	0.04	2.33	14.38	0.57	53.00	12.89	0.58	0.37	11.57	0.52	11.45	66.71	33.29
Lochgelly	*2,985*	*3.52*	*0.03*	*2.38*	*14.81*	*0.50*	*53.43*	*11.86*	*0.34*	*0.34*	*12.40*	*0.40*	*11.96*	*64.97*	*35.03*
Cowdenbeath	*5,309*	*3.88*	*0.04*	*2.30*	*14.15*	*0.60*	*52.76*	*13.47*	*0.72*	*0.40*	*11.11*	*0.58*	*11.16*	*67.73*	*32.27*
Kelty	2,440	3.16	0.16	1.48	15.00	0.57	57.17	13.44	0.74	0.20	7.30	0.78	14.92	68.72	31.28
Townhill	634	2.68	0.16	3.47	14.83	0.32	61.04	9.15	0.63	0.63	6.47	0.63	11.18	73.50	26.50
Crossford (Fife)	1,406	5.55	0.07	4.20	9.60	1.07	67.43	7.97	0.14	0.50	2.42	1.07	13.90	93.85	6.15
Cairneyhill	1,466	3.21	0.14	3.82	11.19	0.75	68.28	6.55	0.07	0.82	4.30	0.89	16.47	94.59	5.41
Limekilns	704	7.81	0.28	5.54	10.09	0.71	64.91	4.55	0.28	1.14	3.84	0.85	18.20	92.86	7.14
Aberdour	840	7.14	0.12	15.83	7.98	0.12	56.55	3.81	0.00	0.48	6.90	1.07	16.61	85.57	14.43
Burntisland	2,649	5.93	0.00	6.19	10.38	0.72	52.81	8.46	0.34	0.64	13.33	1.21	15.29	70.78	29.22
Kinghorn	1,340	5.37	0.00	6.34	8.66	0.82	61.79	7.91	0.22	0.67	7.09	1.12	15.38	76.12	23.88

Source: *GROS Census 2001, KS15 for Settlements and Localities*

Figure 2.1: Travel to Work or Place of Study, Modal Split for Selected Census Localities



Source: 2001 Census data

2.1.7 As can be seen modal split for Fife as a whole is very similar to the Scottish national pattern, but there are some localised differences within south Fife. Settlements and localities along the estuarial coastline have higher proportions of public transport modal share, principally as a result of above average rail modal share. In contrast, places served by trains on the north side of the Fife Circle rail line have below average rail modal share, and whilst they have higher bus modal share than the estuarial locations the overall public transport mode share is lower at the inland locations. As a result these inland places (such as Dunfermline and Cowdenbeath) have above average reliance on cars for commuting. An important exception to this generalisation is Rosyth, which despite its location on the estuary displays low rail modal share.

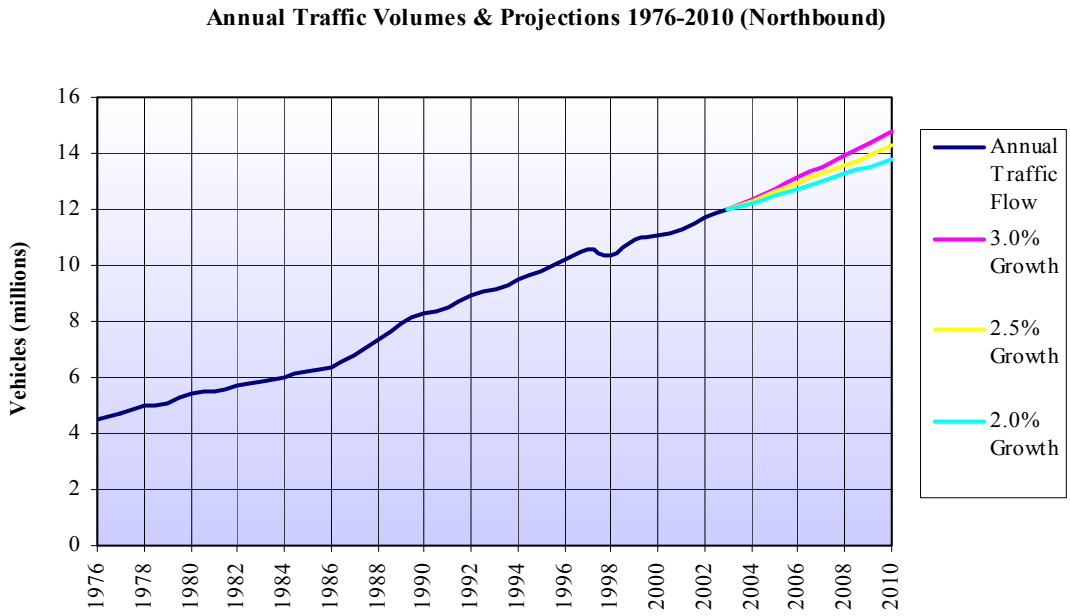
2.1.8 Further observations on mode share are set out in later sections.

2.2 Existing and Future Problems

Traffic on the Forth Road Bridge

2.2.1 Figure 2.2 graphically illustrates the ongoing rise in traffic across the Forth Road Bridge, along with projections of future levels to 2010, based on FETA internal data.

Figure 2.2: Road Bridge traffic (1976-2010)



2.2.2 The Forth Road Bridge currently runs at or near capacity (approximately 3,500-3,600 vehicle per hour) southbound between 0600 and 0900 and northbound between 1700 and 1830 most week-days, and for longer on Friday afternoons. As a result, any additional growth in commuter traffic will lead to peak-spreading. This is already in evidence, as both AM and PM peaks are perceived to be starting earlier and finishing later year-on-year[2].

2.2.3 Other data regarding trunk road congestion is set out in the Technical Annex, Volume 2, but in summary congestion on and around the Forth Road Bridge[3]:

- Results in 0.4 million additional travel hours per annum;
- Costs the Scottish economy more than £4.3 million per annum;
- Means that about 21% of vehicles crossing the Forth face some form of delay each weekday; and
- Lasts for up to 6.25 hours each weekday.

2.2.4 Figure 2.3 provides an illustration of some of the current issues facing the Forth Road Bridge.

[2] Draft FETA Local Transport Strategy (*SIAS/WSP for FETA*, June 2004), section 3.4
[3] Based on data in "Congestion on Trunk Roads 2003" (*Scottish Executive*, April 2005)

Figure 2.3: Congestion on the Forth Road Bridge in 2003

Northbound

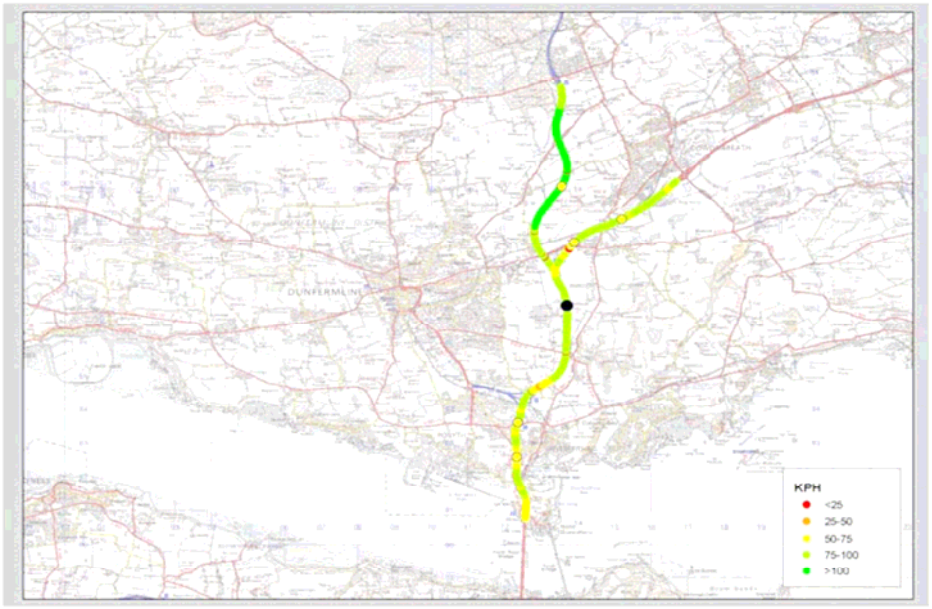


Fig 1 - Typical AM Peak Speed Variation on route

Congestion Type	Speed Drop >	Vehicles Affected		Congestion Duration		Time lost per km
		Number	%	Hours	% of day	
Mild	10%	3830	19.6%	4.00	16.7%	7.55
Serious	25%	985	5.0%	1.00	4.2%	8.39
Severe	50%	302	1.5%	1.25	5.2%	14.39
	Total	**5117**	**26.2%**	**6.25**	**26.0%**	**30.33** hours

Southbound

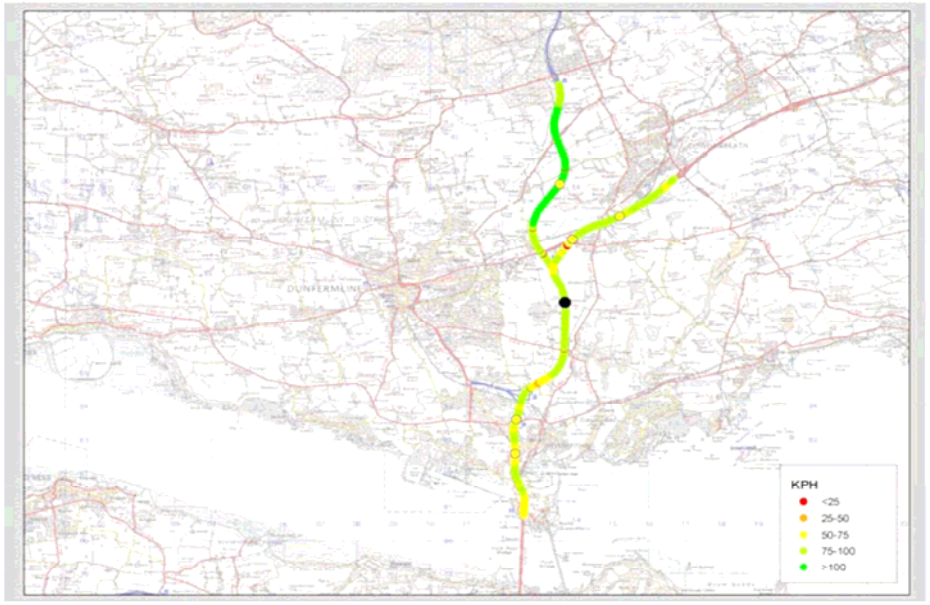


Fig 1 - Typical AM Peak Speed Variation on route

Congestion Type	Speed Drop >	Vehicles Affected		Congestion Duration		Time lost per km
		Number	%	Hours	% of day	
Mild	10%	2318	11.2%	3.25	13.5%	3.84
Serious	25%	241	1.2%	0.25	1.0%	1.31
Severe	50%	644	3.1%	0.25	1.0%	22.40
	Total	**3203**	**15.4%**	**3.75**	**15.6%**	**27.55** hours

2.2.5 Vehicle occupancy rates for private cars crossing the Forth remain relatively low in absolute terms, as shown by these RSI survey figures from 2000:

- AM peak – 1.18 occupants per car;
- Off peak – 1.40 occupants per car; and
- PM peak – 1.28 occupants per car[2].

However it is worthwhile noting that the average vehicle occupancy rate for Fife as a whole is 1.17 (the same as the national average), so these figures are not unusually low in a local or national context.

2.2.6 Figures 2.3 and 2.4 illustrate the pattern of southbound movement in the morning peak, based on a RSI survey carried out on 24th March 2004.

Figure 2.3: Origins of Cross Forth travel – Morning peak from south Fife across Road Bridge

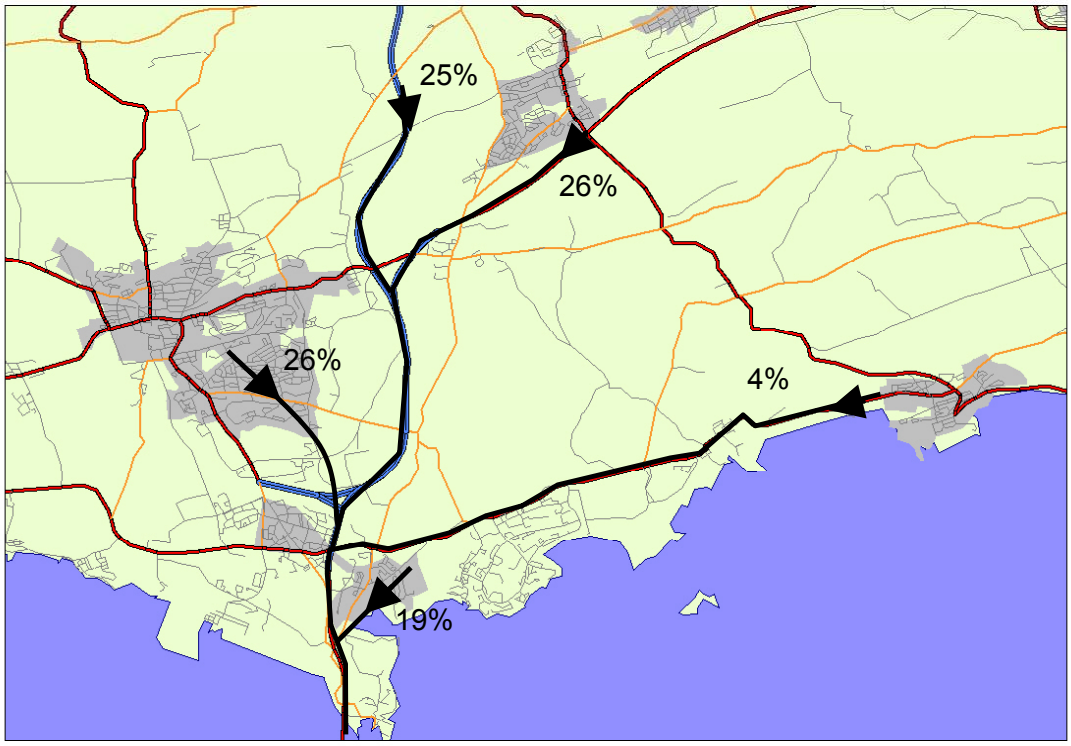
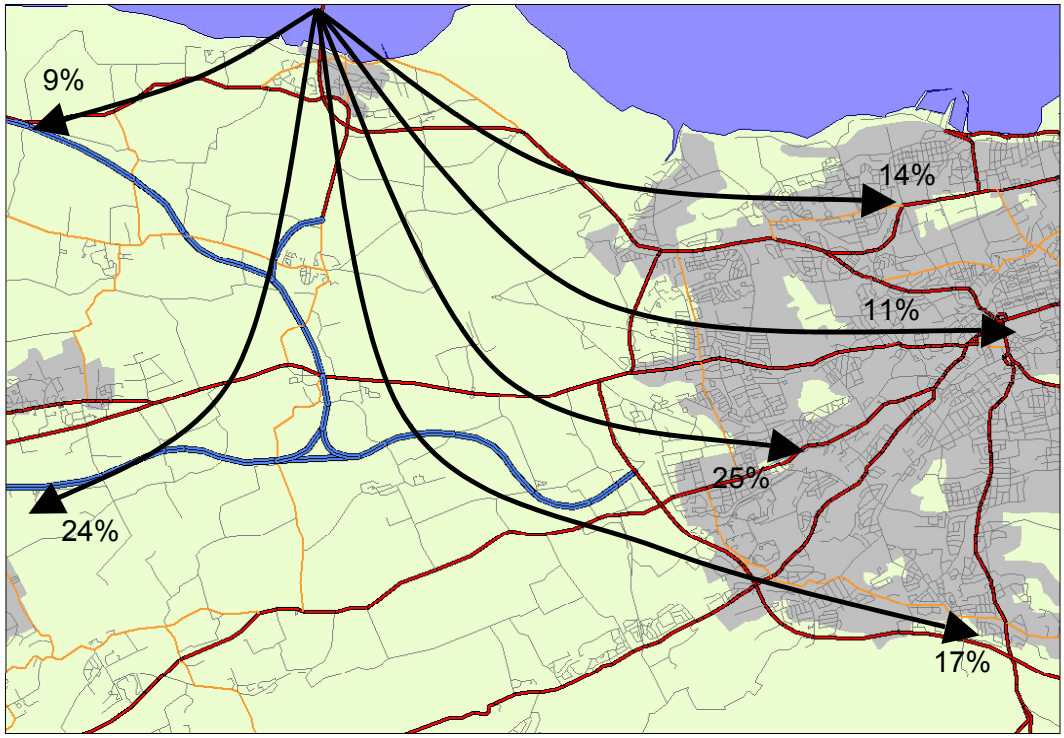


Figure 2.4: Dispersal of Cross Forth travel – Morning peak into Edinburgh and the Lothians



Modal Split and Traffic Origins/Destinations

2.2.7 Figure 2.1 has presented data from the 2001 Census regarding modal split in south Fife, which shows that rail has an above average modal share from Dalgety Bay, Inverkeithing and North Queensferry (compared to Fife as a whole), whilst the modal share of bus is broadly equal across most of south Fife. Use of the car for commuting in Fife is significantly above the Scottish average, and this is most marked in Kelty and Dalgety Bay; many areas also display above average modal share for rail as already discussed in section 2.1.7.

2.2.8 Figure 2.3 shows that flows from Dunfermline, the M90 past Kelty and from the A92 are broadly equal, and that a relatively small proportion of journeys are originating east of Dalgety Bay along the A921. All of these origins are reasonably well served by public transport at present. Reference to Figure 2.4 shows a wider variety of morning peak destinations south of the Forth, with 33% of destinations being to the west of the bridgehead and, possibly, too dispersed to serve readily by public transport. Similarly, the 17% of traffic with destinations around the southern section of the A720 City By-pass may be difficult to serve by public transport. The proportion travelling into central Edinburgh (11%) has an excellent public transport service from most parts of south Fife, whilst the remaining proportions travelling to central and northern Edinburgh have some public transport provision, albeit fairly limited.

2.2.9 Successful attempts have been made by Fife Council to encourage Cross Forth commuting by public transport with the introduction of a bus-based Park & Ride site at Ferrytoll, where the 500 existing spaces are regularly filled each weekday. Expansion of the site to 1040 spaces is already underway.

Rail Passengers

2.2.10 The Forth Rail Bridge has a theoretical maximum capacity of 12 trains per hour in the peak periods, but this is currently constrained further by the disparate mix of trains using the bridge, ranging from long distance and regional passenger trains, through local stopping services to freight trains, predominantly coal trains to/from Longannet. In recent years additional capacity for rail passengers has been accommodated by new stations (at Dalgety Bay and Dunfermline Queen Margaret), platform lengthening, and the introduction of longer trains.

2.2.11 Although re-opening of the Stirling – Alloa – Kincardine line will remove the coal trains from the bridge, the different stopping patterns of passenger services will remain a constraint on maximising use of the bridge. Without major infrastructure investment it seems likely that an additional two trains per hour could be accommodated across the Rail Bridge, and this is matched by plans in the Waverley Station upgrade project to allocate two additional train paths between Waverley and Haymarket to Fife trains.

2.2.12 A significant proportion of rail commuting is provided through Park & Ride, particularly at Inverkeithing from where trains offer a high frequency of service into central Edinburgh.

2.2.13 Until recently, insufficient seating capacity was provided to ensure all passengers using rail services could be sure of a seat, but recent funding to increase rolling-stock and platform lengths should have ameliorated this problem, at least in the short term.

2.2.14 Previously attempts had been made to discourage use of the Cross Forth rail network by disproportionate fares increases between Edinburgh and Fife, effectively pricing commuters off the over-crowded trains, but the overall impact has been likely to increase the relative attractiveness of car-based commuting. Fife Council has been supporting enhancements to rail capacity on Cross Forth services since 1999.

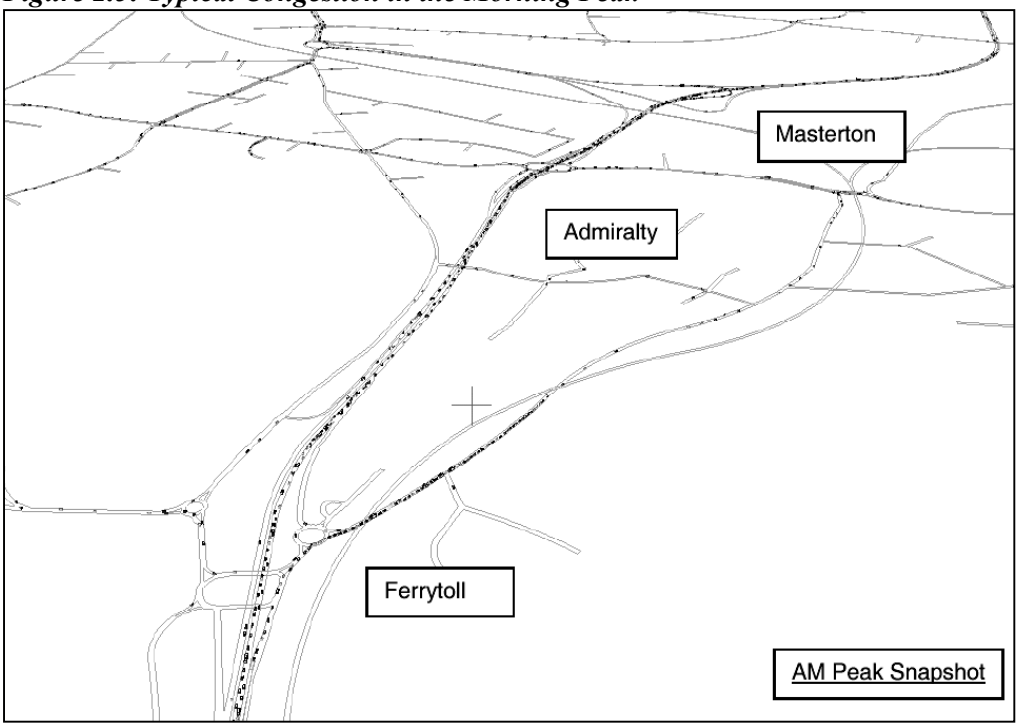
2.2.15 Nevertheless like buses, rail services provide the basis for a very sizeable proportion of commuting into central Edinburgh, with cars more likely to be used for journeys to more peripheral areas such as west and north Edinburgh, Edinburgh Airport and West Lothian.

2.3 Summary of Problems

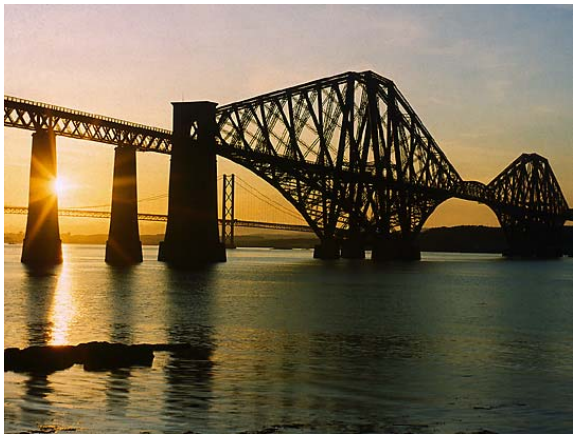
2.3.1 In summary, the existing problems are:

- Increasing demand for Cross Forth movement of people and goods;
- Increasing economic activity in the Edinburgh area, particularly around West Edinburgh;
- Continuing development of housing in south Fife without associated sustainable transport infrastructure;
- Increasingly scarce road capacity;
- Over-crowded peak-hour trains;
- Inadequate interchange opportunities and capacities in Fife;
- Restricted rail capacity (frequency and train length); and
- Congested roads, resulting in delays for buses (see illustration in Figure 2.5).

Figure 2.5: Typical Congestion in the Morning Peak[4]



[4] FETA Interim Action Plan (*SIAS/WSP for FETA*, March 2003), Figure 2.10



Chapter 3

PLANNING OBJECTIVES

3. PLANNING OBJECTIVES

3.1 Consultation

3.1.1 Meetings with officers from Fife Council, FETA, City of Edinburgh Council and West Lothian Council took place on 2nd December 2003 and 8th December 2003, following which the following ten Planning Objectives were agreed for the Corridor.

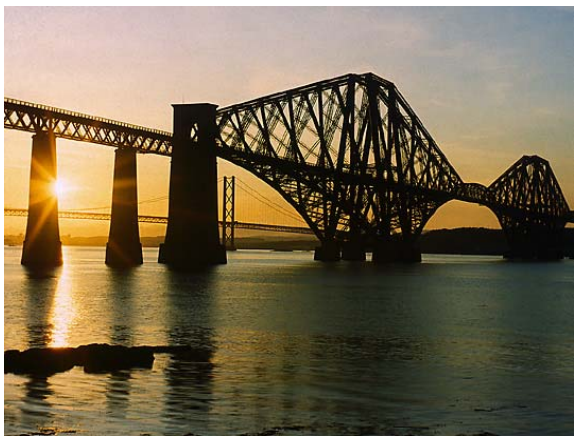
3.2 Planning Objectives

1. ***Reduce the number of people commuting in single occupancy vehicles within South East Scotland – especially for journeys to and from Edinburgh; but also for journeys to destinations outwith the SESTRAN area;***
2. ***Minimise the overall need for travel, especially by car;***
3. ***Maximise public transport provision and achieve public transport integration and intermodality;***
4. ***Improve safety for all road and transport users;***
5. ***Enhance community life and social inclusion;***
6. ***Maintain existing infrastructure properly in order that it can be fully utilised;***
7. ***Enhance movements of freight, especially by rail and other non-road modes;***
8. ***Sustain the economic health of the SESTRAN region;***
9. ***To stabilise (in the short term) and improve (in the long term) accessiblity to cross-Forth movement for people and goods; and***
10. ***Ensure land-use planning is integrated with transportation plans.***

3.2.1 Planning Objectives 1 to 7 are identical with those of SESTRAN's Regional Transport Strategy[5], and Objectives 1 to 8 provide an overall umbrella for the five Corridors forming part of the Study. Objectives 9 and 10 are specific to this corridor and reflect the analysis set out in Chapter 2.

3.2.2 The Planning Objectives were then used in conjunction with the Government's five transport objectives and other yardsticks to assess schemes generated through an Optioneering process.

[5] SESTRAN Regional Transport Strategy (Final Draft, 2003)



Chapter 4

OPTION GENERATION, SIFTING & DEVELOPMENT

4. OPTION GENERATION, SIFTING & DEVELOPMENT

4.1 Option Generation

4.1.1 An Optioneering Workshop took place in Glenrothes on 2nd December 2003 involving representatives of all affected Authorities in addition to Consultants MVA and Scott Wilson. This included a brainstorming session that resulted in the identification of 66 potential measures, to which a further 4 were subsequently added following reflection by the Steering Group.

4.1.2 These were then reviewed, the intention being to:

- Identify any scheme which should be considered to form part of the Reference Case, rather than Options to be assessed;
- Identify any 'Outside World' changes which lie beyond the scope of this study's recommendations but which would/could impact significantly on the Corridor; and
- Exclude schemes that were inappropriate for consideration in this Study, for example because they fall outwith the scope of the Study/Corridor.

Reference Case Schemes

4.1.3 The following schemes were identified as forming part of the Reference Case:

Table 4.1: Reference Case Schemes

	Assumed Year of Opening
Electronic tolling on Forth Road Bridge	2006
Double Dalgety Bay Park & Ride to 200-spaces	2006
Rosyth Port Strategic Link Road	2006
Re-opening of Stirling-Alloa-Kincardine rail line to provide alternative freight route	2006
Upgrading of A8000 (M9 Spur Extension)	2007
Edinburgh Tram Lines 1 and 2	2011
A720 bus priority and additional orbital services	2011
Edinburgh Airport Rail Link	2011

"Outside World" Transport Changes

4.1.4 This category comprises all schemes which are beyond the scope of this Study's recommendations, but which could have a significant impact on demand within the Corridor if they occur, and are as follows:

Table 4.2 "Outside World" Transport Changes

	Assumed Year of Opening
Congestion Charging in City of Edinburgh	2006
Increased Car Parking Charges in City of Edinburgh	2006
'Hearts and Minds' campaign affecting mode choice	2006
Edinburgh Waverley capacity upgrade	2011
Rosyth Bypass	2011
Airdrie – Bathgate rail-line (4/hr)	2011
Cross Forth Ferry: Kirkcaldy – Leith	2011

4.2 Option Sifting

4.2.1 Having identified those Options forming the Reference Case or part of the "Outside World" category, and eliminated any others which were outwith the scope of the Study Corridor, the 49 remaining Options were sifted using Criteria developed to reflect Planning Objectives 1 to 9 (Objective 10 being set aside for later consideration after the sifting).

Table 4.3: Relationship of Objectives to Criteria

Objectives:	1	2	3	4	5	6	7	8	9
Criteria:									
Congestion	✓	✓	✓	✓	✓			✓	
Predictability			✓		✓		✓	✓	✓
Maintainability						✓	✓	✓	✓
Social Inclusion					✓				
Economic Health of the Region					✓		✓	✓	✓
Sustainabilty & the Environment	✓	✓	✓	✓	✓		✓		✓
Implementability	Sense check on all Objectives								

4.2.2 To assist in this initial sifting, broad-brush outline alignments for various infrastructure schemes were developed.

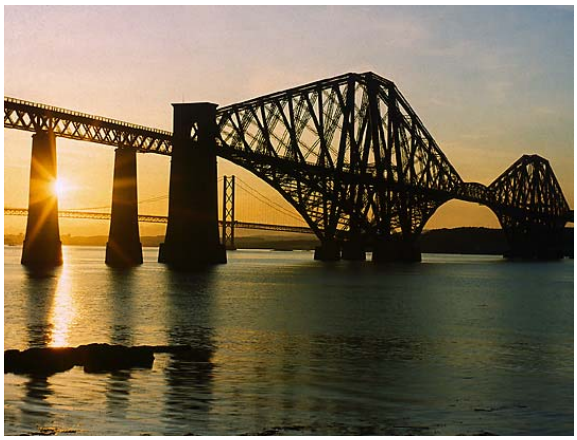
4.2.3 Each Scheme was considered in turn against each of the criteria. Scores were awarded based on the following range:

Significant Benefit	+5
Neutral	0
Significant Disbenefit	-5

4.2.4 In order to maximise debate, and avoid the constraints inherent in a round-table discussion, each consultant carried out the scoring independently. The resulting range of scores was then moderated with a view to achieving a consensus.

4.2.5 As a result of this sifting process a number of schemes were set aside at this point as being unlikely to fulfil the aims of the Planning Objectives, or as being so difficult to implement as to be unworthy of further consideration.

4.2.6 Given the considerable number of remaining schemes it was decided to group them into a series of Packages against which the STAG Part 1 appraisal would take place. This grouping is described in Chapter 5.



Chapter 5

INITIAL APPRAISAL (STAG PART 1)

5. INITIAL APPRAISAL (STAG PART 1)

5.1 Definition of Packages

5.1.1 Following the sifting, it was decided to carry out STAG1 Appraisals on the following Packages (representing one or more Schemes):

Table 5.1: Summary of Packages for STAG1 Appraisal

I.	**Bus Priority and HOV Lane**	Comprehensive Bus Priority Scheme between Fife and Edinburgh utilising A90 corridor and incorporating a Priority Vehicle Lane from Halbeath to Forth Road Bridge.
II.	**Improved Rail Services**	Increased (or longer) trains, facilitating Park & Ride expansion and reduced rail fares.
III.	**Extension of Edinburgh Trams**	Extensions to Edinburgh tramlines 1 and/or 2 across Forth into Fife
IV.	**New Crossing**	New multi-modal crossing with subsequent road space reallocation

5.1.2 The Packages are arranged in chronological order of likely deliverability, with Bus Priority considered as deliverable in the short-term, improved rail services in medium term, and tram extensions and a new crossing delivered in the long-term. However components of each Package may be deliverable in shorter time periods, as set out in Table 5.2. The numbering reflects the order in which options were identified at the Optioneering Workshop, and is retained for consistency throughout the reports.

5.1.3 The relationship between Schemes and Packages is set out in Table 5.2 below.

5.1.4 Figures 5.1 to 5.6 show the alignments used to assess these packages for STAG Part 1 purposes.

Figure 5.1: Bus and Rail Options used for Initial Appraisal

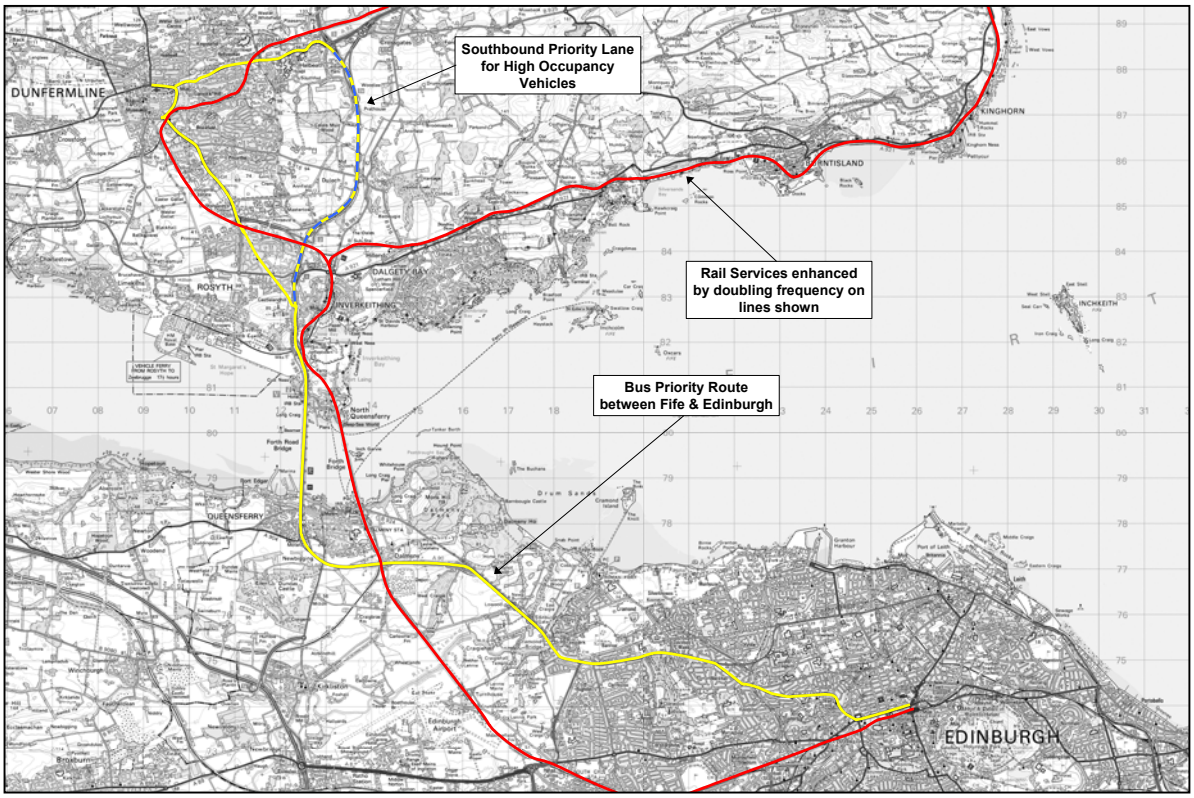


Figure 5.2: Extension of Edinburgh Tramline 1 used for Initial Appraisal

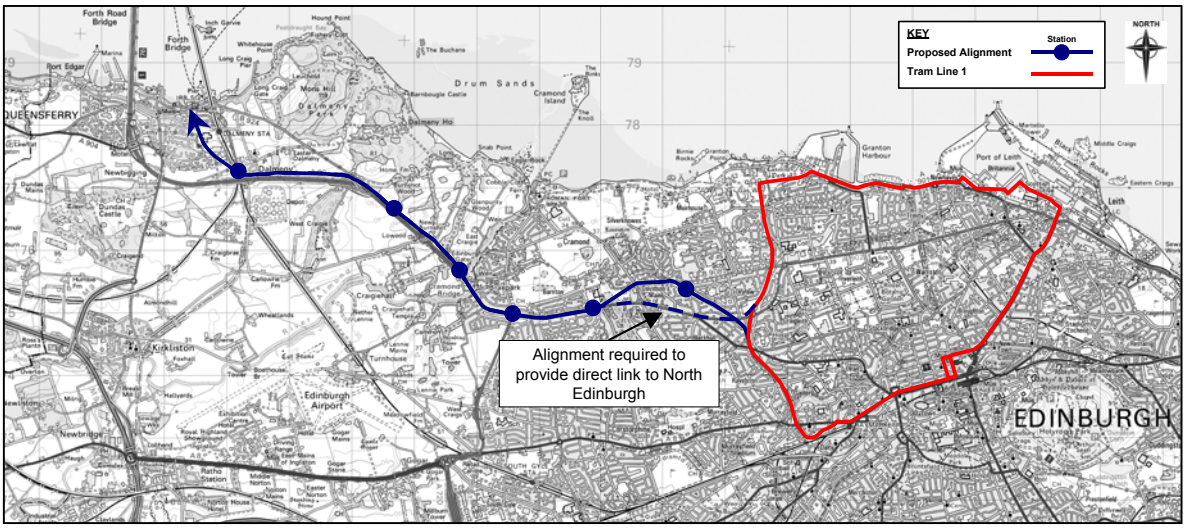


Figure 5.3: Extension of Edinburgh Tramline 2 used for Initial Appraisal

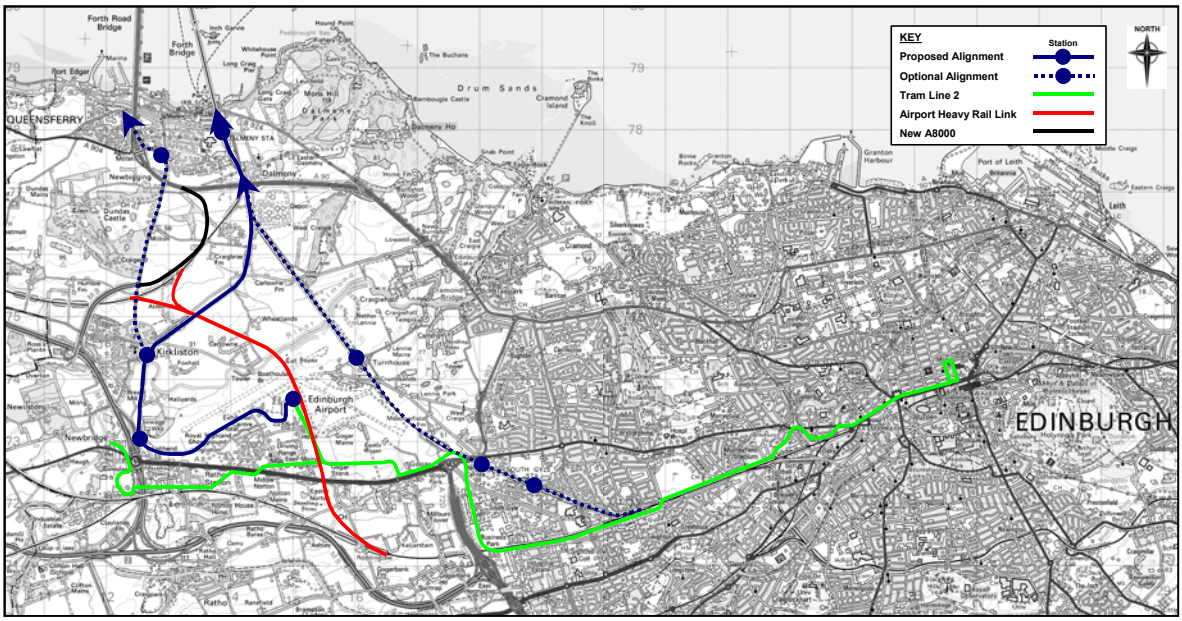


Figure 5.4: LRT alignment in Fife used for Initial Appraisal

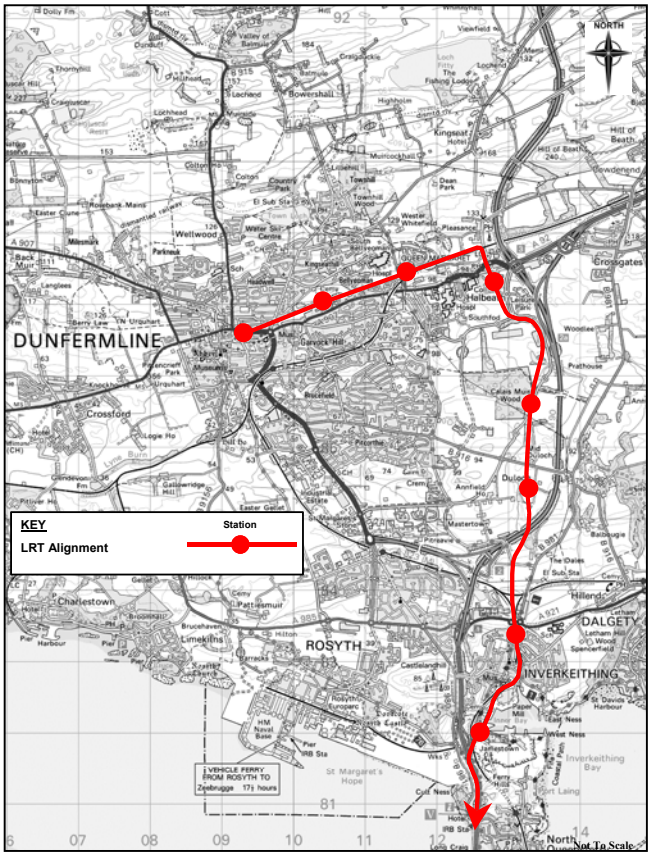


Figure 5.5: Possible Third Forth Crossing used for Initial Appraisal

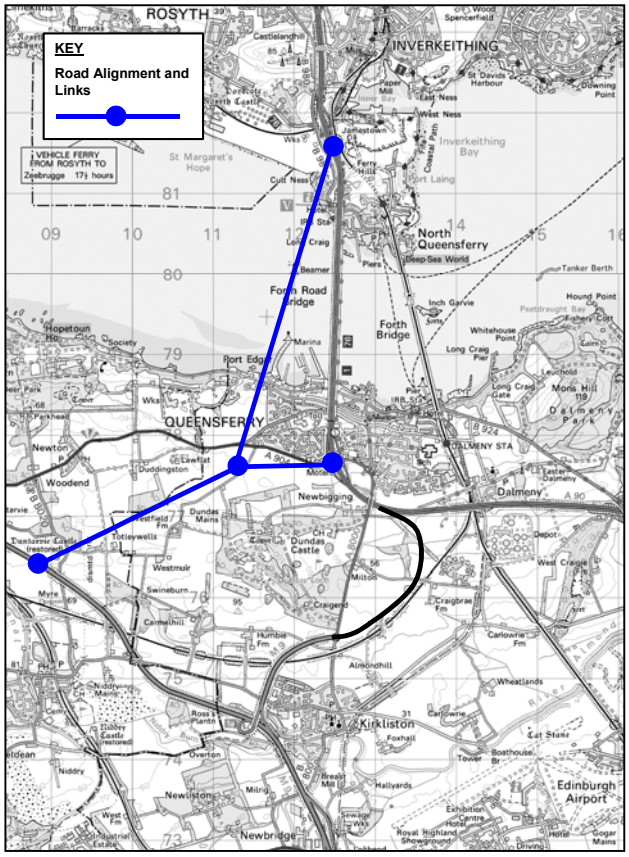


Table 5.2: Combination of Schemes into Packages for STAG1 Appraisal

				Bus & HOV Priority Measures	Improved Rail Service	Extensions to Edinburgh Tramlines 1 and/or 2 across Forth into Fife	New Multi-modal Crossing with subsequent road space reallocation	Dropped from further consideration
				I	II	III	IV	
Initial Schemes		**Term**		*Short*	*Med*	*Long*	*Long*	
2	Road space reallocation on existing Road Bridge	*Short*						✓
4	Comprehensive two-way bus priority between Fife and Edinburgh along A90/A823 Corridor	*Short*		✓				
5	Priority vehicle lane – Halbeath to Road Bridge	*Short*		✓				
7	Halbeath Park & Choose	*Short*		✓	✓			
8	Rosyth Park & Choose	*Short*		✓	✓			
9	Dalgety Bay Park & Choose expansion	*Short*			✓			
10	Selective junction closures on Road Bridge approaches	*Short*		✓				
11	Queue management	*Short*		✓				
12	Differential tolling (including southbound)	*Short*		✓	✓	✓	✓	
13	Car Sharing	*Short*		✓	✓	✓	✓	
14	Charging for parking at Inverkeithing and Ferrytoll	*Short*			✓			
16	Reduce/Reprofile PT fares	*Short*		✓	✓			
20	Increase/relocate parking at Inverkeithing (including "Travelator")	*Short*			✓			
27	Demand Responsive Transport	*Short*		✓	✓	✓	✓	
28	Feeder buses to employment centres	*Short*		✓	✓	✓		
29	Company transport links to interchange points	*Short*		✓	✓	✓		
31	Bus links to West Lothian from Fife	*Short*		✓				
33	Northbound Park & Ride	*Short*		✓	✓	✓		
34	PT information provision plus marketing	*Short*		✓	✓	✓		
35	Integrated Ticketing	*Short*		✓	✓	✓		
36	Feeder buses to Fife interchanges	*Short*		✓	✓	✓		
38	Cycle access/facilities at Interchanges	*Short*		✓	✓	✓		
41	Management of freight/deliveries/trunking	*Short*		✓			✓	
42	Improve South Gyle station	*Short*			✓	✓		
46	Greater provision of disabled taxis for access to PT	*Short*		✓	✓	✓		
49	Increase Edinburgh car parking charges in real terms	*Short*		✓	✓	✓	✓	
17	Longer trains & associated infrastructure	*Med*			✓			
18	Increase rail frequency	*Med*			✓			
19	Reallocate rail capacity on approaches to Edinburgh	*Med*			✓			
21	Haymarket as "turn back" for rail	*Med*			✓			
30	Dalmeny Interchange	*Med*		✓	✓	✓		
32	Improved PT rolling-stock and travel environment	*Med*		✓	✓	✓		
37	New road links to existing Park & Ride sites	*Med*		✓	✓	✓		
40	Other Cross Forth ferries	*Med*						✓
43	Ferrytoll rail station	*Med*			✓			
44	Change patterns of rail services	*Med*			✓	✓		
45	Dunfermline – Stirling rail link + Dunfermline chord	*Med*			✓	✓		
50	Expansion of Ferrytoll P&R and new Ferryhill P&R	*Med*		✓	✓			
1	New multi-modal crossing at Queensferry	*Long*					✓	
3	Road space reallocation after new crossing opened	*Long*					✓	
6	Off line PT through North Edinburgh	*Long*						✓
22	Fife only guided bus or tram	*Long*				✓[1]		
23	Extend Edinburgh Tramline 2 to Fife	*Long*				✓		
24	Tram on A90 corridor to North Edinburgh	*Long*				✓[1]		
25	Tram on A90 corridor to Edinburgh City Centre	*Long*				✓[1]		
26	Tram on A90 corridor to Edinburgh City Centre & North	*Long*				✓[1]		
47	Convert north Fife Circle to LRT/joint running	*Long*				✓		
48	Convert south Fife Circle to LRT/joint running	*Long*				✓		

Note 1: Also appraised as Guided Bus

5.2 STAG Part 1 Appraisal

5.2.1 Appraisal of each package then took place against the following yardsticks:

- The 10 Planning Objectives;
- The 5 Government Objectives:
  - Environment;
  - Safety;
  - Economy;
  - Integration;
  - Accessibility/Social Inclusion; and
- Implementability.

5.2.2 Greater detail on the STAG Part 1 appraisal process and results is given in Volume 1 of the Technical Annex.

5.2.3 Table 5.3 summarises the outcome of this appraisal. Note that the 10th Planning Objective (related to integrating transport and land-use planning) was completely covered by appraisal within the Government Objective for Integration, but was included as a specific Planning Objective to emphasise its particular importance to the Corridor.

Table 5.3: Summary of Part 1 Appraisal Results

	Yardstick	Bus & HOV Priority Measures	Improved Rail Service	Extensions to Edinburgh Tramlines 1 and/or 2 across Forth into Fife	New Multi-modal Crossing with subsequent road space reallocation
		I	II	III	IV
Planning Objectives	Reduce the number of people commuting in single occupancy vehicles within South East Scotland – especially for journeys to and from Edinburgh; but also for journeys to destinations outwith the SESTRAN area;	✓✓	✓✓	✓✓	Depends on road space allocation
	Minimise the overall need for travel, especially by car;	O	O	O	✘
	Maximise public transport provision and achieve public transport integration and intermodality;	✓	✓✓	✓✓✓	✓
	Improve safety for all road and transport users;	✓	✓✓	✓✓	✓
	Enhance community life and social inclusion;	✓	✓✓	✓✓	✓
	Maintain existing infrastructure properly in order that it can be fully utilised;	✘	O	Depends on crossing	✓✓✓
	Enhance movements of freight, especially by rail and other non-road modes;	O	✓	✓	✓✓✓
	Sustain the economic health of the SESTRAN region;	✓✓	O	O	✓✓✓
	To stabilise (in the short term) and improve (in the long term) accessiblity to cross-Forth movement for people and goods;	✓	✓✓	✓	✓
	Ensure land-use planning is integrated with transportation plans.	Part of Govt Objective	Part of Govt Objective	Part of Govt Objective	Part of Govt Objective
Government Objectives	Environment;	O/✓	✓/O	✘/O	✘✘/✘
	Safety;	✓	✓✓	✓✓	✓
	Economy;	✓✓	✘✘	✘✘✘	✓✓✓
	Integration;	✓✓	✓✓	✓✓	✓✓
	Accessibility/Social Inclusion;	✓	✓✓	✓✓	✓
	Implementability	✓✓✓	✓✓	✘✘	✘

✓✓✓	Major Benefit
✓✓	Moderate Benefit
✓	Minor Benefit
O	No Benefit or Impact
✘	Small Minor Cost or Negative Impact
✘✘	Moderate Cost or Negative Impact
✘✘✘	Major Cost or Negative Impact

5.3 Schemes Set Aside after Part 1 Appraisal

5.3.1 From the Part 1 Appraisal process it was evident that big improvements to rail frequencies were unlikely to be justifiable because of the significant cost of infrastructure required – running more than 12 trains per hour across the Forth Rail Bridge would require considerable investment, not just in additional rolling stock but also in re-equipping to 4-aspect signalling, and would still be constrained in the Haymarket/Waverley area. However it was considered that there might still be opportunities to make better use of the existing Cross Forth infrastructure, and this would be investigated further as part of the STAG Part 2 process.

5.3.2 It was also clear that extension of Edinburgh tramlines into Fife was unlikely to be justifiable in terms of economic viability, because many of the other benefits could be achieved adequately through other cheaper options. Extending the planned Edinburgh trams across the Forth into Fife would not necessarily offer a step change in travel times/opportunities and a large proportion of predicted demand was abstracted from parallel public transport services (bus and heavy rail) – modal shift from cars was negligible. In addition there were implementability concerns regarding the feasibility of extending the trams north of the Forth, and of accommodating additional demand without increasing frequencies on the planned tramlines south of the Forth.

Reappraisal of Tram Extensions as Guided Bus Alignments

5.3.3 It had been agreed that in the event of the LRT Package not being recommended for consideration in STAG Part 2, the alignments proposed would be reappraised assuming Guided Buses in place of Trams.

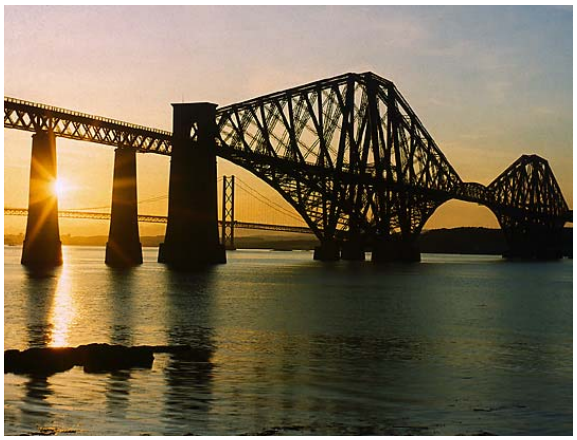
5.3.4 The Transport Economics Efficiency (TEE) for Fife tram schemes were typically in the region of 0.3 (i.e. the discounted costs were around three times greater than the predicted benefits).

5.3.5 An outline study of the impact of substituting **guided** buses for the LRT option suggested that both capital and operating costs were likely to be 60% lower than for LRT. However it appeared likely that enhanced bus services across the Forth would be a useful and relatively inexpensive supplement to existing public transport provision, and this was considered further in the detailed (STAG Part 2) appraisal reported below.

5.4 Schemes Taken Forward to More Detailed Appraisal (STAG Part 2)

5.4.1 Following discussion it was agreed that the overall recommendations regarding the STAG Part 1 Packages were as follows:

Package I (Bus Priority and HOV Lane)	Components recommended for more detailed appraisal in STAG Part 2.
Package II (Improved Rail Services)	Recommended for more detailed appraisal in STAG Part 2, but only on the basis of making best use of existing Cross Forth infrastructure.
Package III (Extension of Edinburgh Tramlines)	Not recommended for further consideration.
Package IV (New Crossing)	Components recommended for more detailed appraisal in STAG Part 2.



Chapter 6

CONSULTATION

6. CONSULTATION

6.1 Initial Consultation

6.1.1 Following initial inception meetings with the SESTRAN partners, and the definition of an over-arching Steering Group for the SITCoS study, a specific Steering Group for this corridor was constituted, comprising appropriate officers of the SESTRAN authorities plus representatives of MVA and Scott Wilson. This met regularly at monthly intervals throughout the course of the study, in addition to other ad hoc meetings as necessary.

6.1.2 Feedback from all meetings was used to shape the definition of study objectives and the options to be appraised at both Part 1 and Part 2 levels, and agreement was obtained for each step in the study process culminating in the production of the Final Report.

6.2 Consultation Workshop

6.2.1 Two Consultation Workshops took place in Dunfermline on 5th and 7th May 2004 involving "professional" stakeholders and elected members respectively. The Workshops took place to jointly consider emerging ideas for this study corridor and the FETA Local Transport Strategy. Greater detail on this exercise is set out in Volume 2 of the Technical Annex, and summarised into Table 6.1 below.

6.3 Linkages to FETA Local Transport Strategy

6.3.1 The Study Brief had highlighted the need to work in parallel with FETA's production of a draft Local Transport Strategy (LTS), the timescale for which did not allow for its preparation once the recommendations of this Corridor Study were known.

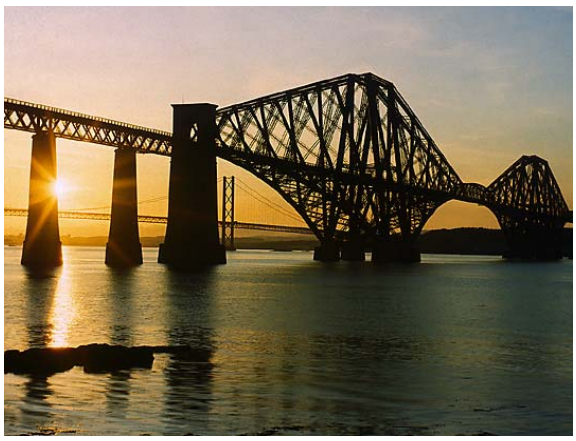
6.3.2 Accordingly, the consultants and Steering Group from this study liaised closely with FETA and it's consultants throughout the study period, and provided early indications of emerging results from the STAG appraisal to help inform the preparation of the FETA LTS. This included convening a joint consultation workshop, described in section 6.2 above and in Table 6.1 below.

6.3.3 The outcome of this close liaison is that the draft FETA LTS has been able to draw on the emerging recommendations of this study, albeit taking into account FETA's narrower remit and the different considerations applying to preparation of a LTS. The "fit" between FETA LTS and each of the emerging schemes has been assessed as part of the Integration Appraisal for STAG Part 2.

Table 6.1: Summary of Consultation Responses

Consultation Topic	Professional Stakeholders' Response	Elected Members' Response
Priority for HOVs	• Priority Vehicle Lane good incentive to increase car occupancy; • Bus Priority a good idea (but would many people be encouraged to shift?); • Enforcement needs to be considered; • Congestion would still occur on the road bridge; • Reduced congestion might encourage modal shift from public transport.	• Supportive, but need to consider how buses can deal with dispersed trip ends; • Enforcement of HOV lane might be difficult; • HOV Lane not worth supporting if expensive and take-up low.
Optimisation of Rail Services	• Park & Ride worth encouraging, but modal shift still small (e.g. 4% reduction in traffic due to Ferrytoll); • Better services to stations other than Inverkeithing would be useful; • Rail serves very limited destinations; • Difficulties of paths into Waverley; • Dunfermline – Stirling line is unattractive.	• Links to Edinburgh Park important; • Flat fare for Fife stations – Edinburgh and increase frequencies north of Inverkeithing to reduce dominance of Inverkeithing; • Charging for car parking at stations would be detrimental.
Additional Road Capacity	• New bridge can incorporate latest design standards; • May encourage more businesses to locate in Fife, and hence reduce Cross Forth demand; • May simply move bottlenecks elsewhere; • Contrary to encouraging public transport; • Controversial for the public.	• Additional capacity required to meet forecast growth; • Reduced congestion will make Fife more attractive; • Traffic will expand to fill capacity available; • Simply moves bottleneck elsewhere; • Will only be promotable with associated public transport measures.
Park & Choose and Car-Sharing	• Park & Ride must be as flexible as possible (i.e. Park & Choose); • Encourages driving on congested roads to reach interchange; • Need to be sited carefully; • Poor rail service possible at Halbeath; • Services need to be dispersed beyond central Edinburgh; • Charging for parking will discourage Park & Ride; • Car-Sharing supported but may be difficult to facilitate.	• Halbeath supported; • More feeder buses essential; • Need to avoid penalising Inverkeithing any further; • Buses preferred to trains for the "Ride" element.

Consultation Topic	Professional Stakeholders' Response	Elected Members' Response
Demand Management	• Implementability of HOV tolling considered difficult; • Need to look at overall impacts of some proposals (e.g. junction closures); • Many proposals unlikely to have significant impact on Cross Forth travel.	• Toll increases "just tinkering at the edges".
Demand Responsive Transport	• Massive improvement in flexibility; • Socially inclusive; • Connections at interchanges need to work properly; • Unlikely to be provided commercially; • Would it be trips new to public transport or just redistribution?	• Seen as beneficial enhancement to current services; • Need to work out under which legislation to provide suitable services.
Additional Bus Services	• May make significant contribution to increasing public transport mode share; • Needs to be combined with bus priority, otherwise buses affected by congestion; • Dispersed trip ends may be difficult to serve; • Use Bus Route Development Grant to kick-start.	• Small subsidies to kick-start services acceptable, but loadings must be seen to be justifiable; • Reliable journeys mean tackling congestion; • Suitable marketing/promotion important.
More attractive public transport	• Fares need to be a lot cheaper to have any impact; • Need to be able to cater for increased demand; • May have unintentional adverse impacts (e.g. if it becomes cheaper to travel to Edinburgh than Dunfermline); • Politically difficult to subsidise "wealthy" commuters; • Security important issue (e.g. at car parks); • Information needs to be marketed and disseminated better; • Integrated ticketing highly beneficial; • Mixed views about benefits of improved disabled access to network (taxis may be more appropriate means of delivery); • Many schemes have disproportionate costs to benefits (e.g. cycling provision).	• Integrated ticketing is supported, but must be at an attractive fare; • General awareness of existing integrated tickets needs to be raised; • Should consider further increases to central Edinburgh parking charges; • Disabled access should be improved across all public transport.



Chapter 7

DETAILED SCHEME APPRAISAL (STAG PART 2)

7. DETAILED SCHEME APPRAISAL (STAG PART 2)

7.1 Definition of Schemes for Appraisal

7.1.1 As described in Chapter 5, the initial appraisal proceeded on the basis of four broadly based Packages of Schemes. Following the initial appraisal it was decided that one of these Packages (Extension of LRT) would be set aside, and another (Rail Service Improvements) limited to making best use of existing Cross Forth infrastructure and planned enhancements (e.g. Waverley Station upgrade).

7.1.2 The initial appraisal considered each scheme in its own right, however only those schemes that formed part of a successful Package appraisal would be taken forward for more detailed appraisal.

7.1.3 Those Schemes not taken forward for detailed (STAG Part 2) appraisal are highlighted in Table 7.1.

7.1.4 This left 35 Schemes requiring to be considered in the STAG Part 2 appraisal process.

7.1.5 The detailed definition of schemes for Part 2 appraisal is described in the sections that follow.

7.1.6 To simplify reporting and appraisal the Schemes to be assessed in Part 2 were grouped into Themes, presented broadly in order of deliverability with short term Themes first, followed by medium term Themes and culminating in long term Themes. These groupings were as follows, and the allocation of Schemes to Themes is also highlighted in Table 7.1 using the following key:

A Making Public Transport More Attractive
B Comprehensive Bus "Right-of-Way" & Priority Vehicle Lanes
C Feeder Bus Services
D Park & Choose
E Optimisation of Rail Services
F Demand Management
G Forth Multi-modal Crossing & Road Space Reallocation

Table 7.1: STAG1 Packages taken forward to STAG2 Appraisal

Shaded schemes not taken forward to STAG2

				Bus & HOV Priority Measures	Improved Rail Service	Extensions to Edinburgh Tramlines 1 and/or 2 across Forth into Fife	New Multi-modal Crossing with subsequent road space reallocation	Dropped from further consideration
				I	II	III	IV	
Initial Schemes		**Term**		*Short*	*Med*	*Long*	*Long*	
2	Road space reallocation on existing Road Bridge	*Short*						✓
4	Comprehensive two-way bus priority between Fife and Edinburgh along A90/A823 Corridor	*Short*		**B**				
5	Priority vehicle lane – Halbeath to Road Bridge	*Short*		**B**				
7	Halbeath Park & Choose	*Short*		**D**	**D**			
8	Rosyth Park & Choose	*Short*		**D**	**D**			
9	Dalgety Bay Park & Choose expansion	*Short*			**D**			
10	Selective junction closures on Road Bridge approaches	*Short*		**F**				
11	Queue management	*Short*		**F**				
12	Differential tolling (including southbound)	*Short*		**F**	**F**	✓	**F**	
13	Car Sharing	*Short*		**D**	**D**	✓	**D**	
14	Charging for parking at Inverkeithing and Ferrytoll	*Short*			**F**			
16	Reduce/Reprofile PT fares	*Short*		**A**	**A**			
20	Increase/relocate parking at Inverkeithing (including "Travelator")	*Short*			**D**			
27	Demand Responsive Transport	*Short*		**B/C**	**B/C**	✓	**B/C**	
28	Feeder buses to employment centres	*Short*		**C**	**C**	✓		
29	Company transport links to interchange points	*Short*		**C**	**C**	✓		
31	Bus links to West Lothian from Fife	*Short*		**B**				
33	Northbound Park & Ride	*Short*		**D**	**D**	✓		
34	PT information provision plus marketing	*Short*		**A**	**A**	✓		
35	Integrated Ticketing	*Short*		**A**	**A**	✓		
36	Feeder buses to Fife interchanges	*Short*		**C**	**C**	✓		
38	Cycle access/facilities at Interchanges	*Short*		**A**	**A**	✓		
41	Management of freight/deliveries/trunking	*Short*		✓			✓	
42	Improve South Gyle station	*Short*			**A**	✓		
46	Greater provision of disabled taxis for access to PT	*Short*		**A**	**A**	✓		
49	Increase Edinburgh car parking charges in real terms	*Short*		**F**	**F**	✓	**F**	
17	Longer trains & associated infrastructure	*Med*			**E**			
18	Increase rail frequency	*Med*			**E**			
19	Reallocate rail capacity on approaches to Edinburgh	*Med*			✓			
21	Haymarket as "turn back" for rail	*Med*			**E**			
30	Dalmeny Interchange	*Med*		**D**	**D**	✓		
32	Improved PT rolling-stock and travel environment	*Med*		**A**	**A**	✓		
37	New road links to existing Park & Ride sites	*Med*		**D**	**D**	✓		
40	Other Cross Forth ferries	*Med*						✓
43	Ferrytoll rail station	*Med*			**D**			
44	Change patterns of rail services	*Med*			**E**	✓		
45	Dunfermline – Stirling rail link + Dunfermline chord	*Med*			✓	✓		
50	Expansion of Ferrytoll P&R and new Ferryhill P&R	*Med*		**D**	**D**			
1	New multi-modal crossing at Queensferry	*Long*					**G**	
3	Road space reallocation after new crossing opened	*Long*					**G**	
6	Off line PT through North Edinburgh	*Long*						✓
22	Fife only guided bus or tram	*Long*				✓1		
23	Extend Edinburgh Tramline 2 to Fife	*Long*				✓		
24	Tram on A90 corridor to North Edinburgh	*Long*				✓1		
25	Tram on A90 corridor to Edinburgh City Centre	*Long*				✓1		
26	Tram on A90 corridor to Edinburgh City Centre & North	*Long*				✓1		
47	Convert north Fife Circle to LRT/joint running	*Long*				✓		
48	Convert south Fife Circle to LRT/joint running	*Long*				✓		

Note 1: Also appraised as Guided Bus

7.2 Detailed Appraisal of Schemes for STAG Part 2

7.2.1 The depth of appraisal applied to each Theme varied with regard to the precision of its definition, the accuracy of data used for modelling, and the likely contribution it could make to achieving the study's planning objectives.

7.2.2 The structure of this section of the report broadly follows the recommendations set out for "Final Appraisal Summary" in GOMMMS[6], with illustrations taking the place of text wherever possible.

7.3 Making Public Transport More Attractive

7.3.1 The intention of this Theme is to encourage the maximum number of Cross Forth travellers to make use of public transport. This includes both existing public transport services as well as additional services that may be recommended as a result of this study. The target is to ensure that most efficient use is made of the sustainable transport options provided, and hence to minimise the growth in car traffic with a view to eventually stabilising traffic levels. In this way longer term measures, with potentially adverse impacts, may be delayed or the need for them eliminated altogether.

7.3.2 This approach is summed up in PAN57[7]:

> *"Quality of public transport provision has to be high if motorists are to be enticed out of their cars. Routes and services provided have to accord with main travel desire lines, and factors such as interchange, real-time information, reliability, cost, comfort and cleanliness, require detailed attention. The arrangement of park-and-ride facilities, quality of vehicles and waiting areas, together with provision for integrating walking and cycling with public transport will all be crucial to influencing motorists to choose to change mode."*

7.3.3 The Department for Transport recently published research into changing travel habits, and listed the following typical UK schemes to improve the attractiveness of public transport[8]:

- Travel Plans, Company Travel Plans, etc.;
- Initiatives on Ticketing and Fares;
- Improved Marketing and Travel Information, including personalised travel planning and travel awareness campaigns;
- Car sharing and car pools/clubs; and
- Teleworking, teleconferencing and home shopping.

7.3.4 To these could be added the following typical measures outwith the scope of the particular DfT study:

- Improvements to the general travel experience;
- Enhanced access to public transport for disabled users; and
- Introduction of facilities for cycle access to the network.

[6] Guidance on the Methodology for Multi-Modal Studies, Volume 1 (*DETR*, March 2000), section 6.6.6
[7] Planning Advice Note 57: Transport and Planning (*Scottish Office Development Department*, April 1999), paragraph 26
[8] Smarter Choices – Changing the Way We Travel (*Department for Transport*, July 2004), section 1.1

7.3.5 Recent research for the Scottish Executive has investigated barriers to modal shift[9]. As this research is readily accessible it is not intended to revisit it in detail and the following table outlines the factors considered to encourage modal shift.

Table 7.2: Factors Encouraging Modal Shift

Hard Factors	Soft Factors	Complementary Factors
Improvements to alternatives	**Improvements to alternatives**	**Technology, Information & Marketing**
Infrastructure changes Service Changes Park & Ride sites/services Land use planning	Facility and site improvements Regulatory measures	Business and marketing
Making car travel less attractive	**Management & Administration**	
Road user charges Parking charges Infrastructure Network management	Institutional support including travel plans Financial incentives Alternative work schedules Support for public transport users	
	Technology, Information & Marketing	
	Electronic communications Intelligent transport systems Business and marketing Public transport information	

7.3.6 A postal survey was undertaken as part of this research, and amongst the results was the following ranking of priorities for commuters[10]:

1. Better maintenance of trains and stations;
2. CCTV on trains and at stations;
3. Reduce bus journey times by 20%;
4. Real time information at bus stops;
5. Better maintenance of buses and bus stops;
6. Up-to-date timetables, including at bus stops;
7. More car parking space;
8. Trained security staff on trains and at stations;
9. Reducing bus stop "dwell" times through conductors or "smart card" ticketing;
10. CCTV on buses and at bus stops;
11. More flexible payment methods covering rail **and** bus;
12. Reduce bus fares by 20%;
13. Next stop information onboard buses;
14. Discounts for group travel; and
15. Trained security staff on buses.

[9] Barriers to Modal Shift (*Derek Halden Consultancy for Scottish Executive*, 2003)
[10] ibid, Tables 8 & 9

7.3.7 Many of the factors highlighted above are discussed as part of this section on "making public transport more attractive". However one of the major issues (that of reducing bus journey times, ranked 3rd overall in the survey) is discussed further as part of the "Bus Right-of-Way" concept later.

7.3.8 The same survey reported the following potential modal shares if these high priorities were implemented:

Table 7.3: Percentage Likely to use Public Transport if High Priorities Implemented

Trip Purpose	Train	Bus
Commuting, education and work journeys	28%	31%
Other trip purposes	73%	73%
Total	**75%**	**74%**

7.3.9 Clearly the results of such surveys need to be treated with some care, and the "aspirational" modal shares set out above are likely to be at the highest bound of realism; nevertheless, they give some idea of potential **maximum** figures that could be targeted for Cross Forth travel, and the 15 priorities set out in section 7.3.6 give a good basis for considering ways of making public transport more attractive.

7.3.10 The Scottish Executive publication "Transferability of Best Practice in Transport Policy Delivery"[11] carried out a comprehensive survey of European and North American transport policies, highlighting case studies of where these had succeeded in their objectives. Although there was a wide variety of policy objectives identified, for the purposes of this study the most relevant case studies are considered to be those authorities where an increase in public transport modal share was actually being achieved.

7.3.11 The authors of the study concluded that this was rarely the case, although many authorities were increasing public transport ridership. Within their report only two locations demonstrated success in increasing public transport mode share (Jönköping and Stockholm, both in Sweden). These two cited the following factors as being "very important" in delivering their success:

Table 7.4: Success Factors in promoting increased PT mode share

Success Factor	Jönköping	Stockholm
Regional transport body	✓	✓
Political consensus on tackling congestion	✓	✓
Investment in PT infrastructure		✓
Tendering of local PT operations	✓	✓
Land-use transport integration		✓
Integrated Ticketing	✓	✓

7.3.12 The issues relating to a regional transport body, political consensus and tendering of operations really relate to control and deliverability of transport policies, and whilst these are relevant to this study they are only part of the "background" to making public transport more attractive, and will not in themselves achieve that aim.

[11] Transferability of Best Practice in Transport Policy Delivery (*CBP for Scottish Executive*, July 2003)

7.3.13 Investment in public transport infrastructure and integrated ticketing are already featured in the list presented in section 7.3.6. However it does appear that the following measure would be worthy of addition:

- Land-use transport integration.

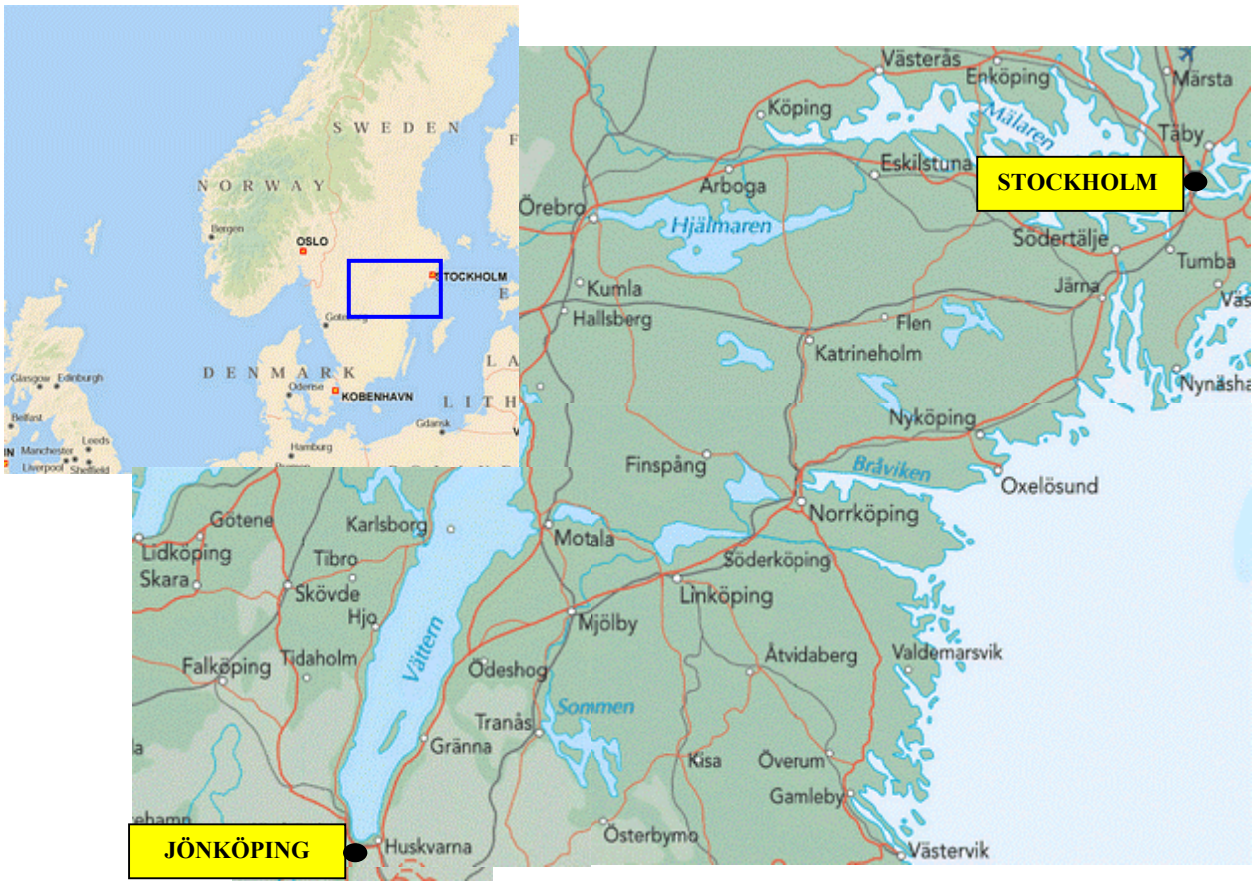
Best Practice Review

7.3.14 Before proceeding with a summary of the appraisal of these measures, it is worthwhile to review the cases of Stockholm and Jönköping to highlight the overall relevance of their approaches to this study area. Their locations are shown in Figure 7.1 below.

7.3.15 It is illuminating to note that in 1998 Sweden had more cars per head of population than the UK, yet in the same year car modal share in the UK had reached 88% whilst in Sweden it was circa 85%, suggesting that Swedes were less inclined to use their cars. In similar vein is the Commission for Integrated Transport's comparison between Edinburgh and Stuttgart (in Germany) where despite car ownership per head in Stuttgart being one third higher than in Edinburgh, car mode share in Stuttgart was just 47% compared to 57% in Edinburgh[12].

7.3.16 It will be useful, therefore, to identify how European Best Practice can be transferred to the UK and have a positive influence on Cross Forth travel.

Figure 7.1: Location Map of Sweden



7.3.17 ***Greater Stockholm*** has a population of 1.5 million, of which around 700,000 live in the city itself (q.v. 1.1 million in Fife, Edinburgh and the Lothians, of whom just under 450,000 are in the City of Edinburgh). Public transport is delivered for Greater Stockholm through a single regional body (Storstockholms Länstrafiken – SL). Most of its financial commitments have been to heavy rail schemes; bus service operating costs have been minimised through competitive tendering, although there is a recent acknowledgement that this may have resulted in unsustainably low tender prices, which in turn may mean costs need to rise or quality standards need to be lowered.

7.3.18 Average commuting distances in Stockholm were 13.2 km in 1998[13], compared to 13.0 km for Fife in 2001[14] – closely comparable.

7.3.19 Bus-based innovations have included the high quality "Blåbussarna" with distinctively liveried buses operating on high frequency "tram-like" routes in the city (illustrated opposite and below).

7.3.20 According to study authors CBP, a typical Stockholm integrated season ticket costs the equivalent of £35 per month compared to £81 for the SESTRANS One Ticket equivalent. Subsidy per head of population runs at £141.33 in Stockholm, compared to £58.57 in the Edinburgh/Lothians region[15]. About 50% of public transport costs in Stockholm are covered by fares paid by passengers compared to at least 75% in Scotland[16].

7.3.21 In Sweden as a whole, approximately 55% of operating costs are met by fares' revenue compared to 68% in the UK[17]. In addition whilst in the UK most bus service subsidy is targeted on supporting off-peak and weekend services (through concessionary fares and support for uncommercial bus services) in Sweden public transport subsidy is generally channelled towards the busier peak hours, by providing enhanced frequencies and relatively low fares for commuters. This gives Swedish public transport a significantly different focus to its British counterpart.

[12] European Best Practice in the Delivery of Integrated Transport (*W S Atkins for Commission for Integrated Transport - CfIT*, November 2001), pages 16 & 21
[13] CfIT, November 2001, page 13
[14] 2001 Census data
[15] Although this excludes Bus Service Operators' Grant (BSOG) of approximately £11.35 per person (Scottish average 2003/2004)
[16] Based on approximate Scottish bus operating costs of £500 million (Scottish Transport Statistics) compared to £53 million BSOG, £27 million for tendered services and £49 million for Concessionary Travel (data from Financial Settlement for central and local governments)
[17] CfIT, November 2001, page 17

7.3.22 ***Jönköping*** is a major regional centre with a population of around 100,000 (similar to south Fife - Inverkeithing, Rosyth, Dunfermline, Cowdenbeath, Lochgelly and Kelty). Public transport is delivered by Jönköpings Länstrafiken, and like SL this is a regional body in this case covering around 1,100 square kilometres (slightly smaller than Fife Council).

7.3.23 Unlike SL, Jönköping has concentrated on providing most of its public transport needs by buses, although there is a low density heavy rail network. The cornerstone of Jönköping's transport system is a high frequency (every 10-minutes), high quality bus network based around the concept of "Think tram – use bus" (illustrated below).

7.3.24 Features include real time passenger information, "green wave" for city buses at highway junctions, dedicated bus-only roads to shorten route lengths and avoid congestion, and high quality bus stops. The local authority promotes a partnership approach with the public transport operator, who is incentivised to maximise quality but also allowed flexibility to innovate.

7.3.25 In Jönköping the high frequency bus routes are self-financing from fares paid, although overall the whole bus network only covers 70% of it's costs from fares. However since 1996 modal share of public transport has been increased from 19% to 22%.

7.3.26 It would appear that both Stockholm and Jönköping have relevant lessons that could be applied to this study area, and these will now be considered within this and subsequent sections. They can be summarised as follows, in order of importance[18]:

- Integrated Ticketing;
- Sufficient financial funding;
- Regional transport body;
- Tendering (to achieve best value for money for a specified network);
- Road space reallocation and/or parking restraint;
- Integrated transport and land-use planning; and
- Consistent delivery of long-term public transport policies.

Ticketing & Fares

7.3.27 Early investigations for the SITCoS study demonstrated that public transport demand was very price inelastic. In other words, even very large reductions in fare levels did not encourage significant modal shift. This was confirmed by Steer Davies Gleave in recent work for SESTRAN[19]. It is obvious, however, from CBP's review of best practices that integrated ticketing, a significant step along the road towards seamless public transport journeys, is important in increasing support of public transport and this was cited in the cases of both Stockholm and Jönköping.

7.3.28 Research for the Scottish Executive (see section 7.3.6) also suggested consideration should be given to reduction of bus fares and the extension of group discounts, as well as more flexible payment methods. The issue seems to be as much about ease of ticketing as the actual cost of travel *per se*.

7.3.29 The SESTRAN area is already covered by the "One Ticket" initiative for season tickets. It is likely that, in supporting a "more attractive public transport" scheme as well as the concept of Park & Choose set out later, the One Ticket scheme will need to be expanded (e.g. to include a one day ticket) and priced in such a way as to promote genuine multi-modal use (i.e. minimising penalties for travelling in one direction by bus and in the other by train). This is likely to require increasing levels of local authority financial support to compensate operators for revenue abstracted from single operator tickets.

Marketing & Travel Information

7.3.30 It is essential to the success of travel planning and fares initiatives that the target market (i.e. existing car users) is provided with attractive, understandable and updated information on the public transport alternatives available to them. Information must be provided in a way that users understand, and this may require market research to ensure that, for example, "traditional" bus and rail timetables provide the most appropriate medium of dissemination.

Welcome to Timetables Online

[18] CBP/Scottish Executive, July 2003, sections 3.15.7 to 3.5.19
[19] SESTRAN Upfront Buses Appraisal (*Steer Davies Gleave for SESTRAN Authorities*, May 2004)

7.3.31 There is anecdotal evidence that many non-public transport users (and indeed some existing users) fail to understand traditional timetables, and hence fail to comprehend the alternative options available. Provision of information must be a cornerstone of the success of travel planning. Information will need to be comprehensive, not operator or mode or local authority specific, and readily comprehensible explanations of any interchange requirements will be required. It is likely that information will need to be tailored to the requirements of specific employers or even specific individuals if any significant impact is to take place.

7.3.32 It will be useful to encourage operators to minimise and standardise the dates for changes to public transport services: this will make provision of comprehensive information more cost-effective, and also serve to give users confidence in a stable public transport network. These activities will therefore need resource and financial support from the SESTRAN authorities.

The General Travel Experience

7.3.33 Use of public transport should be made as simple, secure and attractive as possible. Car users with their experience of "private space", certainty of route and control over their own journey may be intimidated by perceived loss of certainty and control when switching to public transport, and will aspire to the same standards of comfort evident in their cars.

7.3.34 To address these concerns Cross Forth public transport will need to offer enhanced quality and standards of comfort and assurance typically found on car journeys. This is likely to include:

- Secure access and egress routes to all waiting areas;
- High quality, well maintained, secure waiting areas (e.g. quality shelters, CCTV, bright lighting);
- Adequate car parking at promoted "Park & Choose" sites;
- Real time information and CIS (Customer Information System) at waiting areas;
- Seamless interchange with connecting services regardless of mode;
- Easy accessibility (e.g. low/flat floors);
- Comfortable and clean travel environment in well maintained vehicles;
- Secure travelling environment (e.g. CCTV);
- Sufficient seating provision to minimise requirements to stand;
- Suitable secure luggage accommodation;
- Higher profile on-vehicle staff (e.g. conductors, security guards);
- Consideration to providing in-travel entertainment (e.g. sockets for personal stereos); and
- In-vehicle travel information (e.g. "next stop" indicators and announcements, estimated time to key destinations, network maps).

7.3.35 Each of these aspects has been introduced in the tram-like concepts introduced in Jönköping, and in Stockholm with it's Blåbussarna project, and illustrated below at a Stockholm bus/metro interchange station.

7.3.36 Enhancing the existing public transport product in this way is likely to require public sector support, at least through initial "pump-priming", to compensate operators for increased capital and/or operating costs. In addition the provision and maintenance of infrastructure such as bus stops, shelters and associated equipment will be the responsibility of local authorities. The newly established Bus Route Development Grant should be a suitable source of funding for such expenditure.

Travel Plans

7.3.37 Travel Plans are *"a package of measures tailored to the needs of individual sites and aimed at promoting more sustainable travel choices and reducing reliance on the car."*[20] They involve organisations such as employers or schools identifying non-car alternative travel options, and encouraging their use. This may be through carrots (e.g. providing cycle facilities such as appropriate storage and changing-rooms) and/or sticks (e.g. minimising parking availability). Comprehensive guidance is available through a Resource Pack[21], and a useful best practice checklist was recently published by the Chartered Institute for Logistics & Transport[22].

7.3.38 Considerable investigation of the role of Travel Plans (as well as other so-called "soft measures") has been carried out in the DfT "Smarter Choices" publication. Given that this research is readily available, it is not repeated in detail here but a summary of likely impacts and costs is presented later in this section[23].

[20] Travel Plans: An Overview (*Scottish Executive et al*)
[21] A Travel Plan Resources Pack for Employers (*SDG/AEA Technology*)
[22] Introducing Travel Plans at Business Parks (Hurdle, October 2004 in *Logistics & Transport Focus* Volume 6, Number 8, pp. 39-42)
[23] *Department for Transport*, July 2004 (available on DfT website)

7.3.39 The aim of a Cross Forth Travel Plan would be to identify peak-hour car users who have an alternative non-car transport option (although they may not be aware of it), and also those who do not currently have a suitable alternative but could be expected to switch modes if one was provided. The SESTRAN partner authorities would work together to identify these current car users, and initially target those with a viable alternative option by providing suitable information, and possibly incentives (e.g. discounted travel tickets).

7.3.40 In addition, the partner authorities would identify movements which took place in sufficient densities as to support some form of public transport, ranging from conventional fixed route buses, through flexibly routed services down to car-sharing, or even grouping travellers to make use of a subsidised minibus with one of the travellers driving (and possibly being paid).

7.3.41 The Cross Forth corridor lends itself to this approach because it is possible, with the support of FETA, to accurately identify Cross Forth travel patterns and target individual car users. Staffing and financial resources will need to be identified to support the development both of "individual" and "company" travel planning, and to identify any significant gaps in public transport provision. The possible costs of supporting this measure are set out later.

Disabled Access to the Network

7.3.42 As identified above, maximising the attractiveness of public transport will mean minimising the barriers to use. Many of these are already addressed through recent legislation (e.g. Disability Discrimination Act) or associated initiatives (e.g. the expansion of the low floor bus fleet).

7.3.43 Where significant barriers remain then steps should be taken to address these, either through capital investment (e.g. suitable access ramps, or low floor buses) or by providing suitable public transport alternatives. In many cases the best means of addressing this issue will be expanding disabled accessible demand responsive transport, such as taxis. This would require local authority funding.

Cycle Accessibility

7.3.44 In encouraging a modal switch to public transport it may be necessary to enhance accessibility to the network, and where stops/stations cannot be viably sited within walking distance of homes then cycling may provide an alternative to car use. In this case public transport nodes identified as acting as attractors for cyclists should be provided with suitable facilities for secure storage of cycles and associated equipment, and possibly even with facilities such as changing-rooms.

7.3.45 At the very minimum all key interchanges identified later in this report should be provided with cycle storage facilities, and the cost of these reflected in the infrastructure investment required. Interchanges should also feature improved linkages between key cycle routes and the interchange.

Attractive Public Transport & the Potential Impact of Best Practice

7.3.46 All of the measures set out above are evident in the two case studies described previously, and can therefore be considered to generally contribute to modal shift in favour of public transport. Work for the Scottish Executive on mode share in new developments, drawing on Dutch and US research, concluded that the following contributions to modal switch were possible:

- A plan containing only marketing and promotion is unlikely to achieve any modal shift;
- A plan with car-sharing and cycle measures may achieve 3-6% reduction in drive-alone commuting;
- A plan with the above measures plus large (30%+) discounts on public transport plus works buses will achieve around a 8-13% reduction in drive-alone commuting; and
- The combination of all of the above measures plus disincentives to car use can achieve a larger (15-20%+) reduction in drive-alone commuting[24].

7.3.47 CBP also concluded that modal shift in excess of 10% was only possible with some form of parking restriction. In the context of this corridor this either means employers reducing parking availability (e.g. as part of company travel plans), or a reduction in the supply of public parking (e.g. in local authority controlled car parks or on-street parking), or by increasing parking charges to prohibitive levels.

7.3.48 Specific case studies have cited significant reductions in single occupancy vehicle commuting, resulting in an 11% reduction in vehicle movements over 5 years at a Chester Business Park and a 20% reduction over a similar period at Stockley Park[25].

[24] Planning for Mode Share in New Development (*CBP for Scottish Executive*, July 2001)
[25] Hurdle, ibid

7.3.49 However recently published DfT work looking at a wide range of case studies[26] postulated that the impacts of various "soft measures" and their associated costs would be as set out in Table 7.5. This work identified two scenarios, one with moderate local authority support which was defined as broadly in line with current levels (Low Intensity Scenario) and one where considerable increases in resources and support were made available (High Intensity Scenario). The table illustrates the High Intensity Scenario and accordingly utilises the highest likely costs and benefits from the study.

Table 7.5: Likely Impacts and Costs of Soft Measures

Soft Measure	Possible Reduction in Road Traffic	Indicative Cost (pence/ vehicle km reduced)
Workplace Travel Plans	1.2%	1.1 pence
Personalised Travel Planning	1.9%	2.2 pence
Travel Awareness	0.7%	2.7 pence
Public Transport Information and Marketing	0.5%	4.3 pence
TOTAL	**4.3%**	**10.3 pence**

7.3.50 Although not entirely a like-for-like comparison this possible reduction in road traffic is broadly in the range identified by CBP's for impact on modal share at new developments described above. As a comparator the DfT report quotes 15 pence per vehicle kilometre as the likely benefits from decongestion (and up to 45 pence in heavily congested urban areas).

7.3.51 The DfT report concluded that *"these soft measures, in a favourable wider policy context, could be sufficiently effective in reducing traffic that they merit serious consideration for an important role in transport strategy for the foreseeable future, prima facie offering very good value for money, and few disadvantages."* It goes on to emphasise, however, that the *"traffic reduction identified ... should be seen as the potential that soft factor interventions offer, not a forecast of probable impacts. Particular attention would be needed to ensure the benefits from soft factor interventions are 'locked in', via demand management measures to control induced traffic."*[27]

7.3.52 It is worth bearing in mind, moreover, that the potential reduction in road traffic, even in the High Intensity Scenario used above, is equivalent only to circa three years of traffic growth on the Forth Road Bridge.

[26] Department for Transport, July 2004 – with particular reference to Chapter 13
[27] ibid, section 14.5

Land-use Transport Integration

7.3.53 Integration of land-use and transport planning was highlighted as an important factor in the Stockholm case study described above. The need for sustainable transport is emphasised in recent Scottish Planning Policy documents, notably SPP2, SPP3 and SPP17, for example:

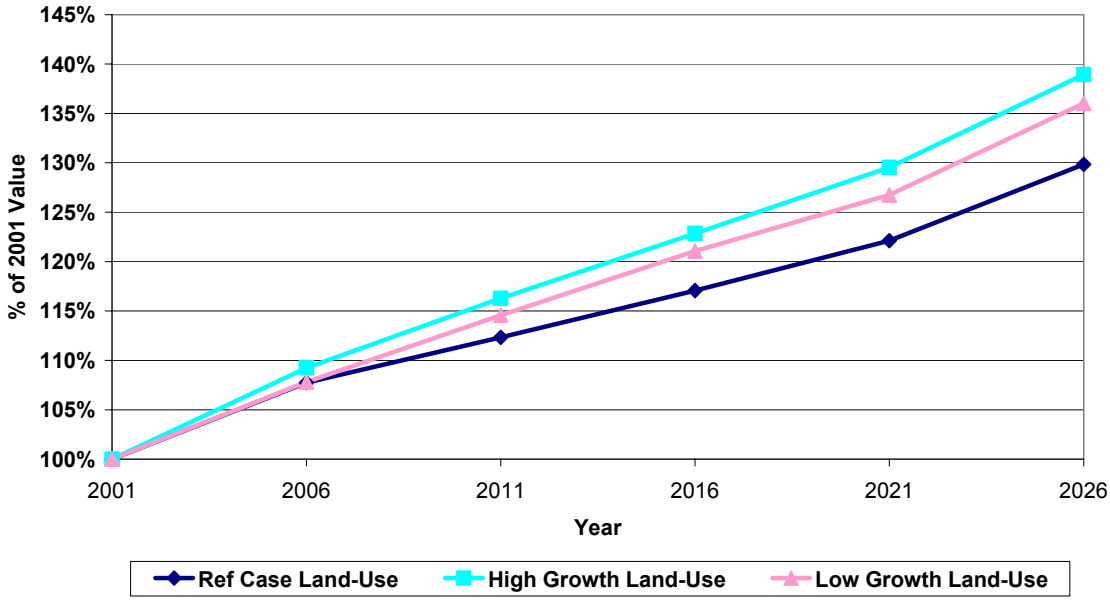
> *"New development areas should be easily accessible by public transport. Development plans should provide clear guidance on the requirements for public transport access to such areas."*[28]
>
> *"Wherever new [economic development] sites are being proposed, they should be accessible by walking, cycling and public transport."*[29]
>
> *"Patterns of Development should seek to reduce the demand for travel and reliance on the private car… Preference should be given to locations which can be well integrated with existing and proposed public transport networks. Such locations should be developed at higher densities."*[30]
>
> *"Extensions [to existing settlements] should not be dependent solely or mainly on car access. Sustainable transport options should be considered as an integral part of the development process and the aim should be to provide opportunities for non-car access before houses are occupied and patterns of travel established…. The internal road layout should allow easy access by buses."*[31]

7.3.54 Land use policies can have significant impacts on travel demand, and on the types of transport mode that are viable. Figure 7.2 below illustrates the predicted growth in Cross Forth person trips under three scenarios:

- "Reference Case" land-use, based on the existing Fife Structure Plan;
- **"**Low Growth" land-use, with minimal future development in the Bridgehead Area; and,
- "High Growth" land-use, with moderate future development in the Bridgehead Area and increasing the housing densities closest to the potential Priority Bus Network (see section 7.4), based on the recently published Consultative Draft Fife Structure Plan.

[28] Scottish Planning Policy 17: Planning for Transport – Consultation Draft (*Scottish Executive*, January 2004), paragraph 28
[29] Scottish Planning Policy 2: Economic development (*Scottish Executive*, November 2002), paragraph 35
[30] Scottish Planning Policy 3: Planning for Housing (*Scottish Executive*, February 2003), paragraphs 35 & 36
[31] ibid, paragraphs 44 & 45

Figure 7.2: Growth in Cross Forth Person Trips (12-hour period, 0700-1900)



7.3.55 As can be seen from Figure 7.2, the Low and High Growth land uses result in growth of Cross Forth person trips (in the weekday period 0700-1900) by between about 35% to 40% over the 25-years to 2026, whereas under existing Structure Plan policies, growth would be limited to 30%. This suggests that whilst the demand for travel arising from the land uses proposed in the Consultative Draft Fife Structure Plan will have some impact, this will only amount to up to a third of the additional person trips by 2026, and will be much less than this in the short term. Nevertheless, it will be important to mitigate these impacts and this may be achieved to some degree by integrating transport and land-use planning so that housing expansion in the northern bridgehead is at sufficient densities as to make sustainable transport viable – for example by ensuring easy access to rail stations and providing roads suitable for local bus services.

7.3.56 The impact of higher growth in development beyond that in the existing Structure Plan, particularly in south Fife, is considered further in Chapter 10. In the very long-term, housing densities might even be sufficient to support a possible LRT network. In the meantime higher density development would be served by a Bus Right-of-Way network (see section 7.4), ensuring that households have ready access to high quality public transport as soon as houses are occupied. Upgradability, and the relationship between a Bus Right-of-Way and a future LRT network, is covered further in Chapter 10.

7.3.57 The degree to which schemes integrate with land-use planning in this study forms part of the assessment against the Government "Integration" objective. However in "making public transport more attractive" it is necessary to create a virtuous circle where land-use planners incorporate suitably sustainable transport plans at the earliest possible stages of development, and (for example) ensure that development densities are such as to encourage viable public transport networks. Appraisal of this group of schemes assumes that this land-use planning sub-element is delivered for all new development locations in the study corridor.

Appraisal of Scheme

7.3.58 For the purposes of this appraisal it is recommended that a judicious combination of all the above measures will be implemented, taking progressive effect over a period of up to 10 years.

7.3.59 Such "soft" measures are difficult to realistically model, principally because of an absence of long-term research into innovative approaches. However the narrative set out above has given some idea of the possible impacts, and it is recommended that the measures described above are adopted on the corridor.

7.3.60 They will, in any case, be essential to the future success of other measures described later, in particular the need to address vehicle occupancy rates, for example through Car Sharing and HOV Lanes.

7.3.61 As well as the economic benefits of improved efficiency for Cross Forth travel, there will also be major benefits for transport integration and the proposals display a close correlation with local, regional and national policies and plans, including those related to land-use transport integration. By their very nature improvements to public transport tend to offer greatest benefits to the most vulnerable groups in society, and these proposals will therefore be beneficial in improving accessibility for such groups and promoting greater social inclusion.

Non-travel Impacts

7.3.62 The DfT study quoted earlier also looked at "non-travel" schemes, which focus on reducing the need for travel. These have not been specifically investigated as part of this Corridor Study, but could include:

- Teleworking;
- Teleconferencing; and
- Home Shopping.

7.3.63 The latter two schemes may have negligible peak-hour impact, and therefore have little contribution to make in facilitating Cross Forth commuting (which represents the current pinch-point for Cross Forth travel), but promoting teleworking may have some benefits. The DfT study identified possible reductions in road traffic of 2.2%, but was unable to identify costs because the means of delivering teleworking facilities was unclear at present. Accordingly, teleworking has been excluded from the appraisal set out above, but it remains a measure with some benefits in reducing the overall need to travel[32].

[32] Department for Transport, July 2004, Chapters 10 & 13

Summary regarding "Making Public Transport More Attractive"

More attractive public transport experiences will make existing car users more willing to try more sustainable modes. It is also important to make the travel experience as attractive as possible for future "car-sharers" particularly at Park & Choose interchanges (discussed later). This will require the identification of finance and resources to support:

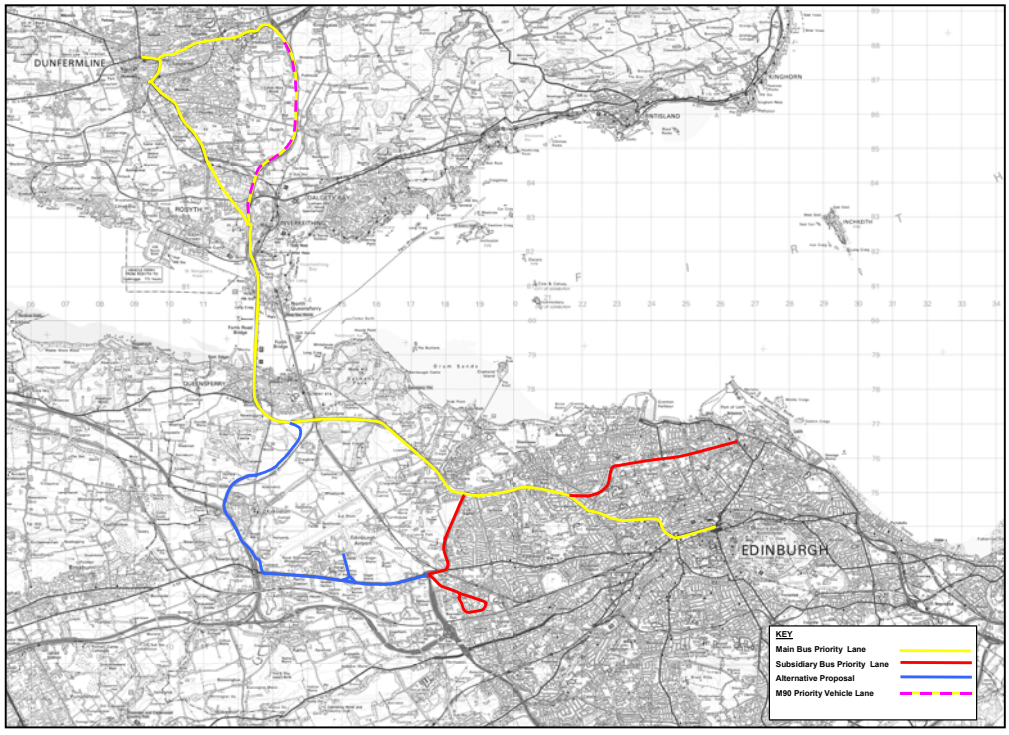
- Commuter priorities (outlined in section 7.3.7);
- Travel plans;
- More affordable Integrated Ticketing;
- Improved Marketing and Travel Information;
- Better accessibility for cyclists and the disabled; and
- Closer integration of transport and land-use planning.

The optimum mix of these factors will require more detailed investigation and a degree of experimentation to identify best practice for Fife, but they have been demonstrably beneficial in improving modal share for public transport in other countries (e.g. Sweden). The policies must be pursued in a stable manner into the medium and long terms for them to be effective.

7.4 Comprehensive Bus "Right-of-Way" & Priority Vehicle Lanes

7.4.1 The overall scheme for comprehensive bus priority between south Fife and Edinburgh that was assessed is set out below.

Figure 7.3: Comprehensive "Bus Right-of-Way" Scheme



7.4.2 Two types of Priority Vehicle Lanes have been distinguished:

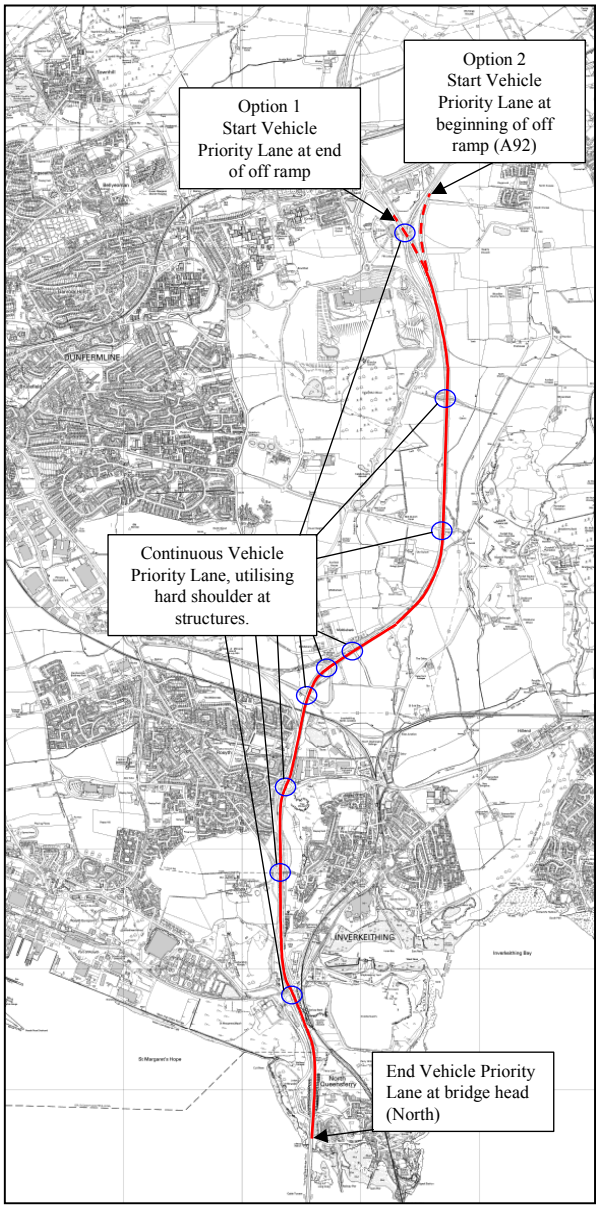
- High Occupancy Vehicle Lanes, available for use by buses, HGVs and High Occupancy Vehicles; and
- Bus Priority Lanes, available for use only by buses.

7.4.3 A southbound High Occupancy Vehicle Lane (for 2 or more passengers) is recommended between Halbeath interchange on the M90 (junction 2a) and the northern bridgehead, shown in more detail on Figure 7.4. This would utilise the existing hard-shoulder to create an additional traffic lane, together with the construction of a new, discontinuous hard-shoulder taking account of restrictions caused by existing structures (e.g. overbridges). For further detail refer to Technical Annex, Volume 2.

7.4.4 In the centre of Dunfermline and of Rosyth, and on the A907 and A823, bus priority lanes would be created to improve reliability for existing and new bus services, and junction improvements would improve reliability on the A90 into central Edinburgh. Investigations also took place regarding improved bus priority to north and west Edinburgh. Enhanced local bus services would complement the "Bus Right-of-Way" – these are set out in greater detail on Figure 7.6 and can be summarised as follows:

- 1: Dunfermline – Livingston (3 buses/hour peak, 2 buses/hour off-peak);
- 2: Dunfermline – Leith (4 buses/hour peak, 2 buses/hour off-peak);
- 3: Dunfermline – Craiglockhart (3 buses/hour peak, 2 buses/hour off-peak);
- 3A: Dunfermline – central Edinburgh (3 buses/hour peak, 2 buses/hour off-peak);
- 4: Dunfermline – central Edinburgh (4 buses/hour peak, 2 buses/hour off-peak);
- 5: Dunfermline – Currie (2 buses/hour peak, 1 buses/hour off-peak);
- 6: Dunfermline – Falkirk (2 buses/hour peak, 1 buses/hour off-peak);
- 7A: Kelty – central Edinburgh (2 buses/hour peak, 1 buses/hour off-peak): and
- 7B: Lochgelly – central Edinburgh (2 buses/hour peak, 1 buses/hour off-peak).

Figure 7.4: Priority Vehicle Lane and new discontinuous Hard Shoulder on M90



7.4.5 An example of a High Occupancy Vehicle Lane is shown in Figure 7.5 below, illustrating the recent trial scheme on the Stanningley Road in Leeds. This involved provision of a "2+ Lane" on the A647 along with associated other improvements for bus services (e.g. enhanced bus stop facilities). The "2+ Lane" is available for use by all vehicles with more than one occupant (although goods vehicles in excess of 7.5 tonnes are banned, whereas it is assumed HGVs might have access to Cross Forth HOV Lanes). A similar lane has also been provided by South Gloucestershire Council on the A4174 Avon Ring Road. HOV Lanes are widespread in other countries, most notably the United States.

7.4.6 In all cases at present, enforcement is provided by the local police who have the power to stop vehicles in apparent breach of the minimum number of occupants and where appropriate levy fines. In the case of the Leeds scheme, police enforcement costs are funded by the City Council. A HOV Monitoring (HOVMON) project is currently underway to identify ways of detecting non-HOVs in priority lanes, based on infra-red detection of human occupants, with a trial in hand on Stanningley Road in Leeds.

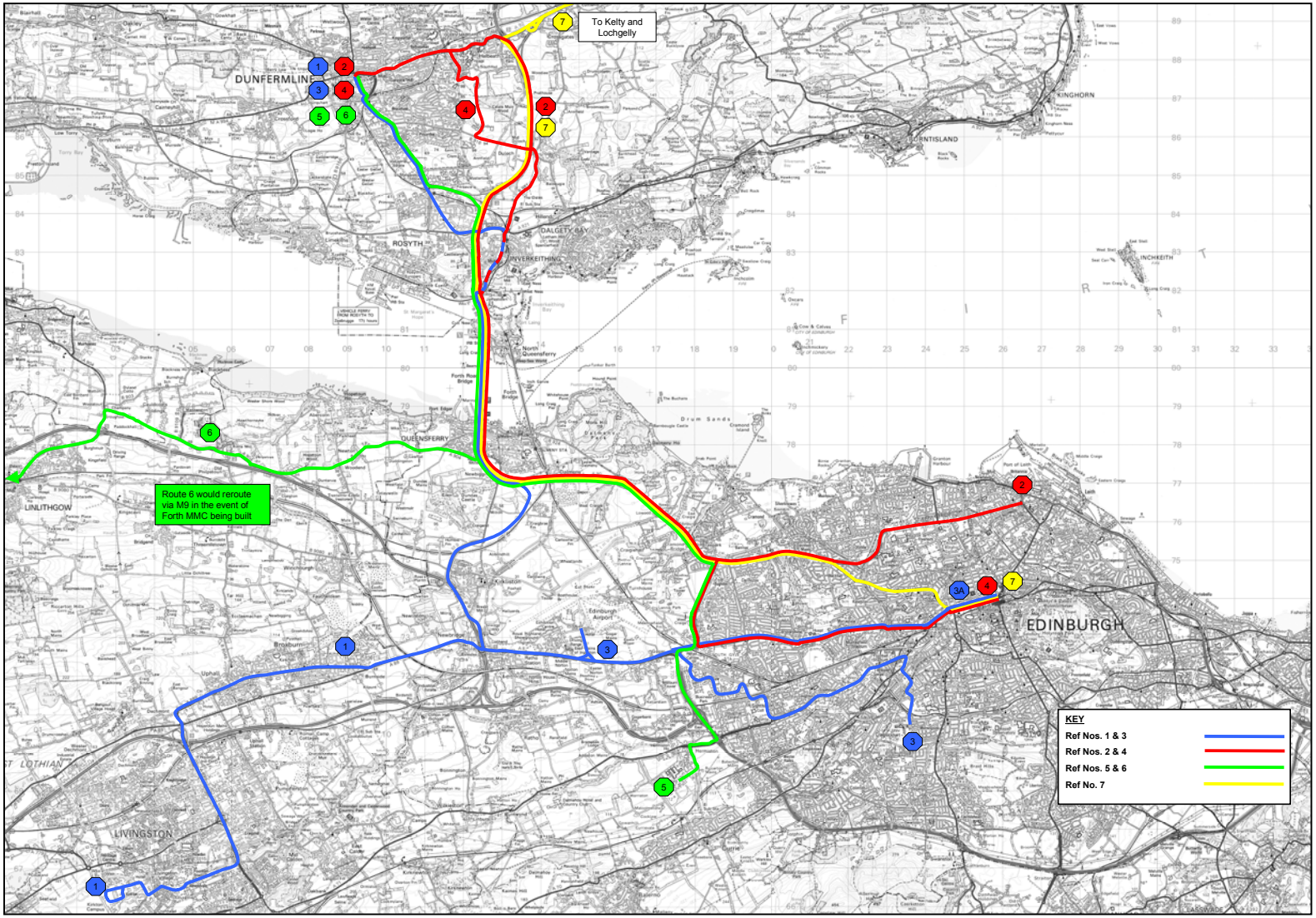
Figure 7.5: High Occupancy Vehicle Lane on Stanningley Road, Leeds

7.4.7 The "Bus Right-of-Way" aims to ensure unimpeded travel for buses between south Fife and Edinburgh, and would be complemented by the associated bus services shown in Figure 7.6 below. Bus priority measures would be implemented along the A90 and safeguarding alignments through new and existing developments, particularly around the northern bridgehead, are recommended.

7.4.8 Although developed independently of the Steer Davies Gleave work on appraising enhanced services to Edinburgh within the SESTRAN region, a good fit was observed between the proposals set out in Figure 7.6 and those identified within their report[33].

[33] Steer Davies Gleave, May 2004

Figure 7.6: Bus Services using Comprehensive Bus Right-of-Way



Appraisal of Scheme

7.4.9 The costs of improving bus priority and introducing the HOV Lane are relatively modest in comparison with the considerable economic benefits from improved Cross Forth travel. It is estimated that the HOV Lane would cost in the order of £12.6 million for construction, while the bus priority measures north of the Forth amount to around £1.4 million. In both cases there are no significant operating costs, and the measures could be introduced in the short-term. Bus priority along the A90 south of the Forth may take slightly longer to implement, but nonetheless should be achievable in the medium-term at a cost of around £5.6 million.

7.4.10 Modelling of resultant traffic flows showed considerable benefits would accrue to users of HOVs and bus passengers where priority measures were introduced.

7.4.11 Options involving land take to create more lanes on the A90 in the Cramond/Blackhall area appeared to have significant environmental disbenefits and are therefore not recommended. In addition whilst reallocating existing road-space on the A90 to buses has obvious benefits for bus service reliability, the adverse impact on other traffic greatly outweighs the benefits for public transport users (even after taking account of some resultant modal switch); accordingly options involving reallocation of road-space are also not recommended, leaving only minor junction improvements described in greater detail in Technical Annex Volume 2.

7.4.12 This Scheme was also considered to contribute moderately to improved integration between modes and is in line with relevant local, regional and national strategies/plans (e.g. SESTRAN Regional Transport Strategy). It will also support improved accessibility to travel for key, vulnerable social groups (such as low income families and the elderly) and hence contribute to promoting social inclusion.

7.4.13 On the basis of the above analysis, it seems sensible to pursue the "easy wins" for bus priority, as well as the southbound HOV Lane on the M90.

7.4.14 It is therefore recommended that the following measures are provided:

- Bus priority measures in the centre of Dunfermline and Rosyth, and on the A907 and A823;
- All those measures on the A90 corridor into central Edinburgh that can be achieved without significant land-take and without reducing road-space available to all users (for detail see Technical Annex Volume 2); and
- The southbound HOV Lane between Halbeath and the northern bridgehead, achieved by building a new, discontinuous hard shoulder and either redesignating the existing hard shoulder as a HOV Lane, or by redesignating the existing outside lane as a HOV lane and the existing hard shoulder as a general traffic lane. See Technical Annex Volume 2 for further details.

Summary of Bus "Right-of-Way" and Priority Vehicle Lanes

Priority Vehicle Lanes offer some "quick-win" opportunities to improve road space allocated to more sustainable modes such as buses and High Occupancy Vehicles (HOVs). The HOV Lane between Halbeath and the northern bridgehead appears to offer particular benefits and should be pursued as soon as practicable – it will be supportive of the recommended Park & Choose facility at Halbeath.

Bus Lanes on the A907, A823 and through Rosyth should also be pursued as soon as possible as they offer opportunities to improve bus service reliability north of the Forth, and these should be supplemented by the improvements on the A90 in favour of buses.

The improved bus service connections from Fife to west/north/central Edinburgh and West Lothian should be implemented as set out in Figure 7.6.

7.5 Feeder Bus Services

7.5.1 Consideration was given to supporting the existing public transport network, as well as the proposed network associated with the Bus "Right-of-Way", through a series of local feeder services.

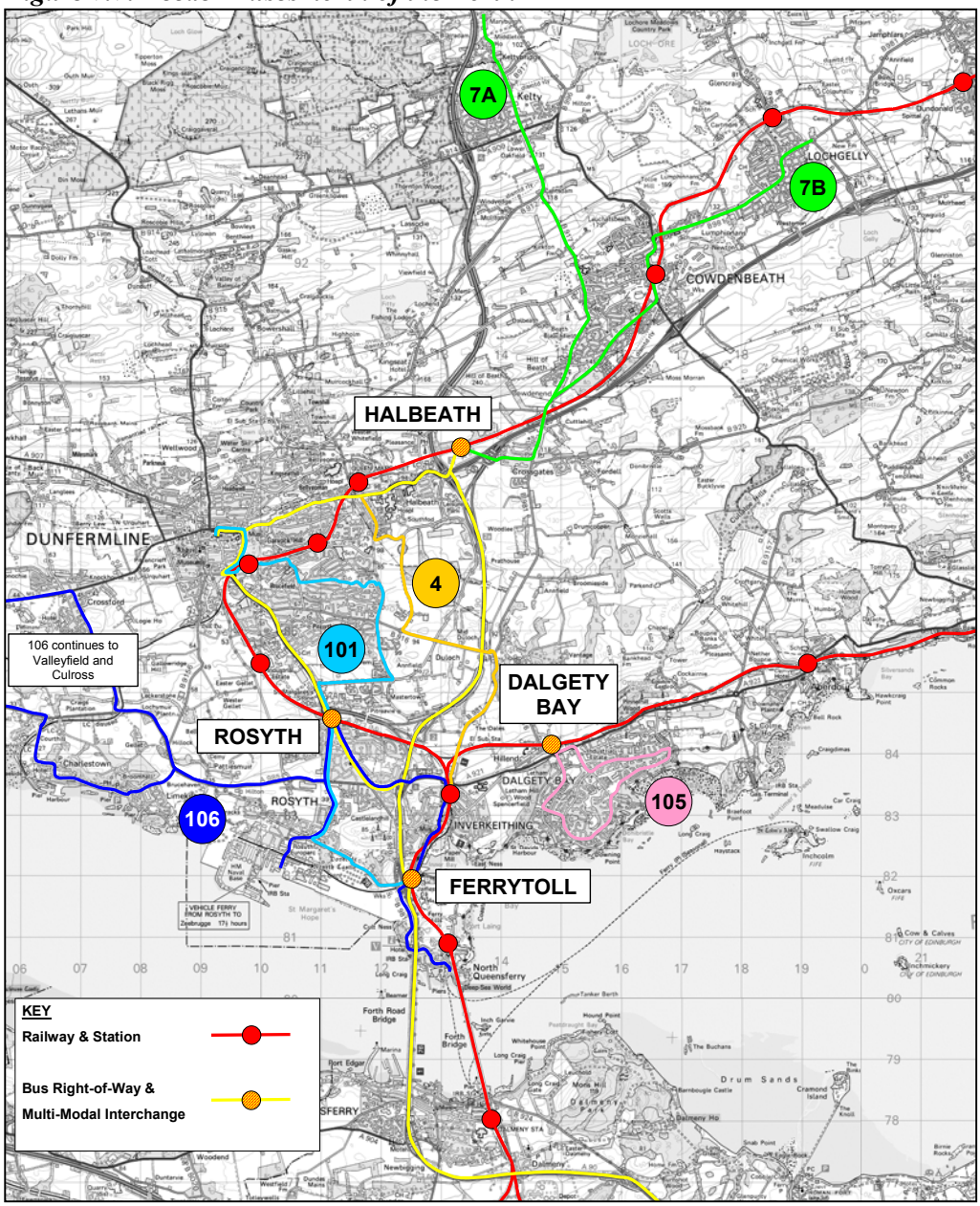
7.5.2 North of the Forth these would take the form of conventional fixed route bus services (set out in Figure 7.7, and described in more detail in Technical Annex Volume 2) although consideration should be given to operating these as "variable route" services, at conventional bus fares from fixed interchange points but with the ability to respond flexibly to maximise accessibility from major housing areas (i.e. filling the niche between conventional bus services and taxis).

7.5.3 The Feeder Bus Services can be summarised as follows (see Technical Annex Volume 2 for more information):

- 101: Dunfermline – Ferrytoll (4 buses/hour peak, 2 buses/hour off-peak);
- 105 Dalgety Bay Circular (4 buses/hour peak, 2 buses/hour off-peak); and
- 106: Culross/Rosyth – Ferrytoll/North Queensferry (4 buses/hour peak, 2 buses/hour off-peak).

7.5.4 In addition some of the enhanced Cross Forth bus services would have a dual role as local Feeders – for example Service 4 through the Dunfermline Eastern Expansion area and Service 7A from Kelty.

Figure 7.7: Feeder Buses north of the Forth



7.5.5 In addition around Rosyth it was assumed that existing local bus services would be diverted in order to adequately serve Rosyth station, which would be upgraded to form one of the key local transport interchanges in south Fife featuring more parking spaces, improved interchange facilities and more closely integrated bus feeders. The possibility of an improved rail service (to three trains each hour) was also considered, and is described in section 7.7 "Optimisation of Rail Services".

7.5.6 South of the Forth it was considered that destinations were relatively dispersed, and that therefore additional fixed route public transport services beyond those existing (or planned for future years, such as the Edinburgh tram) were not suitable. However consideration could be given to a series of flexible route feeder services south of the Forth, taking the form either of buses available to the general public and linking destinations such as West Edinburgh to appropriate interchanges, or dedicated works

buses linking specific workplaces to appropriate interchanges. Such plans should develop out of the Travel Plans discussed in earlier sections.

Appraisal of Scheme

7.5.7 The improved accessibility for Rosyth station and the other feeder bus improvements described above are readily implementable in the short-term. Their modest cost (estimated at approximately £1.3 million of investment in additional buses, together with £0.9 million of annual operating costs) means that they are readily justifiable on the basis of benefits (economic and social) from improved integration and positive impact on accessibility/social inclusion.

7.5.8 Given the speed with which these measures could be implemented and the value of their impact, it is recommended that these are implemented as soon as practicable.

> ***Summary of Feeder Buses***
>
> Feeder Buses will promote the development of key transport interchanges in Fife and support the concept of Park & Choose described later. They have modest capital and operating costs and it is recommended that the network set out in Figure 7.7 is implemented as soon as practicable. In addition the improved integration of bus and rail services at Rosyth should be pursued through the re-routing of existing local buses in the Rosyth area.

7.6 Park & Choose

7.6.1 The concept of Park & Ride has been long-established as a fundamental component of maximising use of public transport on corridors facing congestion and/or limited parking at destinations. In this study corridor it has been applied at various rail stations (notably Inverkeithing, Dalgety Bay and Dunfermline Queen Margaret), and more recently in the successful bus-based scheme at Ferrytoll (illustrated to the right).

7.6.2 Park & **Choose** takes this concept a stage further, revolving around a network of key interchanges north of the Forth, from which public transport services across the Forth would be available by both bus and rail. The intention is to offer a variety of public transport travel options, maximising the attractiveness and flexibility of the "ride" element of Park & Ride (e.g. travel to central Edinburgh by train, return by bus).

7.6.3 Passengers from, say, western Cowdenbeath could travel by car or public transport to the proposed Park & Choose interchange at Halbeath, from which they would be offered the choice of continuing their journey by Car Sharing or by public transport. On their return journey they would not be constrained by their outward travel mode, so that (for example) users who travelled into central Edinburgh in a shared car could return to the Park & Choose site by bus.

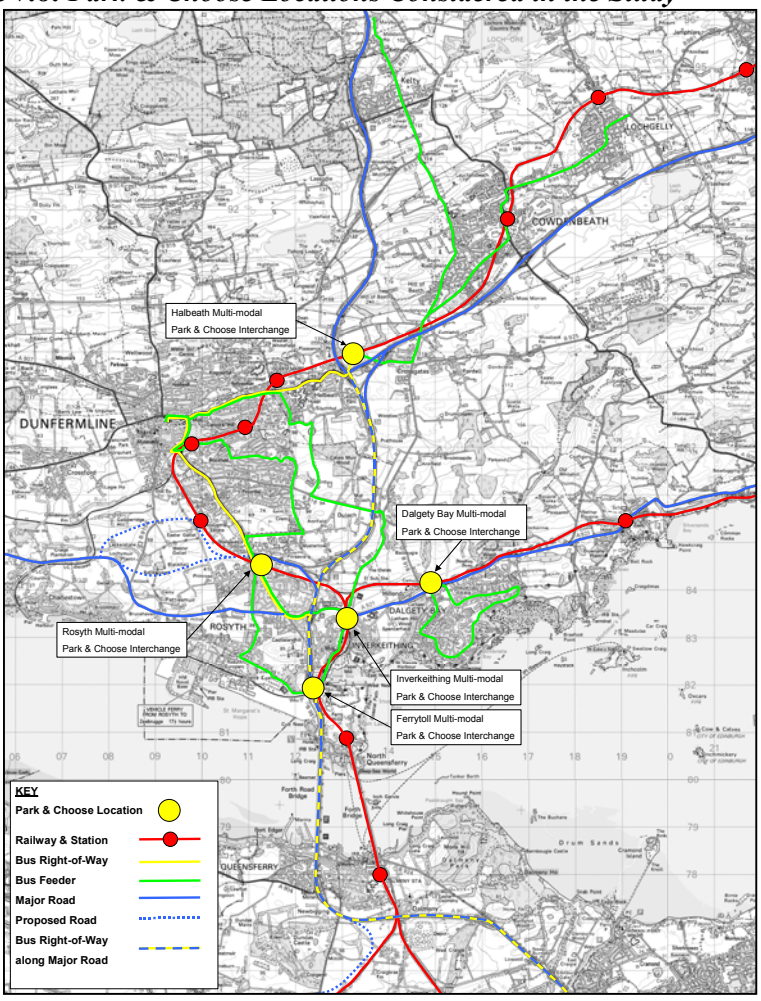
7.6.4 Park & Choose sites would also be points at which Car Sharing users would congregate to take advantage of the HOV lanes proposed in schemes discussed previously.

7.6.5 This should increase the attractiveness of Park & Ride and public transport usage by maximising its flexibility, opening up options to car share in one direction and return by bus or rail, or to mix public transport modes for outward and return journeys, and without the need to decide on the return mode until later in the day. This will facilitate use of HOVs/buses/trains by the widest range of commuters, who will still be able to alter their arrangements to accommodate flexitime, after work meetings, etc.

7.6.6 Park & Choose is a radical new concept for the UK, and in order to be successful in achieving modal shift will need to be supported by marketing and include a suitable branding for Park & Choose. This should, in turn, be part of a marketing family encompassing all non-car modes that emphasises the high quality alternatives on offer.

7.6.7 Finally Park & Choose sites would be important interchange points between existing and enhanced public transport services, again discussed elsewhere in this document. The Park & Choose sites considered are shown on Figure 7.8.

Figure 7.8: Park & Choose Locations Considered in the Study



7.6.8 At each location enhancements to infrastructure would be implemented, the aspiration being to provide seamless integration between the modes serving the site, including car-parking associated with Park & Choose as well as suitable accommodation for car-sharers to congregate. Where future demand is sufficient, parking must be expanded so as not to constrain demand for Park & Choose. Straightforward interchange between bus and rail would also be promoted where both modes serve the site, as well as interchange between local bus services. The anticipated locations are listed below, accompanied by the modes expected to be provided:

- Halbeath (Bus, Park & Choose);
- Rosyth (Rail, Bus, Park & Choose);
- Inverkeithing (Rail, Bus, Park & Choose);
- Ferrytoll – including overspill car park site (Bus, Park & Choose); and
- Dalgety Bay (Rail, Bus, Park & Choose).

7.6.9 Supporting Park & Choose are other schemes discussed elsewhere in this report, including making public transport more attractive, the improved public transport services (rail and bus) and demand management, as well as by car-sharing discussed below. Encouraging "mix and match" of modes for outward and return journeys requires the implementation of attractive pricing regimes for public transport fares, as discussed in the section regarding "making public transport more attractive".

Car Sharing

7.6.10 Like Park & Ride, the idea of travellers (especially commuters) coming together to share one car where otherwise two or more would have been used on near-identical journeys has been discussed for some time. However it has not been widely adopted in the UK, and most schemes have tended to focus on promoting the idea within a single employer. DfT research focused on two case studies, Buckinghamshire County Council and Milton Keynes Council, where schemes are targeted more at the general public[34].

7.6.11 Current Cross Forth car occupancy in the peak is extremely low (1.18 AM peak hour, 1.28 PM peak hour)[35], albeit this poor occupancy rate is in line with the Scottish average. Considerable reductions in car trips across the Forth could be achieved by simply raising average occupancy rates, as illustrated below using data from the FETA Interim Action Plan.

[34] Department for Transport , July 2004 – see particularly Chapter 9
[35] FETA Interim Action Plan (*SIAS*, March 2003)

Table 7.5: Impact of Increasing Car Occupancy Rates

Average Vehicle Occupancy Rate	Total Number of Vehicles in a.m. Peak Hour	Change in Cross Forth Vehicle Trips
1.18	3,952	
1.20	3,886	-2%
1.30	3,587	-9%
1.35	3,454	-13%
1.40	3,331	-16%
1.50	3,109	-21%
1.75	2,665	-33%
2.00	2,332	-41%

Average Vehicle Occupancy Rate	Total Number of Vehicles in p.m. Peak Hour	Change in Cross Forth Vehicle Trips
1.28	3,585	
1.30	3,530	-2%
1.35	3,399	-5%
1.40	3,278	-9%
1.50	3,059	-15%
1.75	2,622	-27%
2.00	2,294	-36%

7.6.12 European research into people's attitudes to car-sharing was undertaken in the ICARO (Increase in Car Occupancy through Innovative Measures and Technical Instruments) project[36]. This reviewed the impact of a variety of car-sharing approaches, and the following general conclusions were drawn:

- Most successful car sharing "pools" were focused on employees of a single employer;
- General "marketing" of the concept is unlikely to be successful – embedding the concept through Travel Plans is likely to be critical;
- Car Sharing attracts most support from existing car users, and does not abstract significantly from conventional public transport;
- Car occupancy rates can be significantly influenced by dedicated infrastructure (e.g. HOV Lanes);
- Car Sharing as a feeder to conventional public transport has limited appeal to car users; and
- Guaranteed "rides home", where the return journey cannot be achieved by Car Sharing and a taxi is provided at no additional cost above the public transport fare, do not appear to have a significant influence on behaviour.

7.6.13 Drawing on DfT and EC research, in order to maximise the use of Car Sharing across the Forth the following is proposed:

- Continue the recently initiated investigation of Car Sharing by SESTRAN[38];
- Raise awareness of the Car Sharing concept through a marketing campaign and in particular Travel Plans for targeted employers;

[36] ICARO – Final Report (*European Commission*, November 1999)

[38] Encouraging Journey Sharing across the Partnership Area (*SESTRAN* Paper, October 2004)

- Facilitate Car Sharing by producing a database of travellers wishing to share journeys and a web-based service to easily link potential "Car Sharers" together;
- Support the attractiveness of Car Sharing through dedicated HOV infrastructure;
- Identify popular origins and destinations from existing Road Side Interviews at the Forth Road Bridge, in order to target car sharing effectively; and
- Establish the concept of Park & Choose to facilitate "one-way" car sharing.

7.6.14 Evidence from the DfT case studies suggested mixed results, with the Milton Keynes scheme achieving average car occupancy rates of 2.25 and, based on car park surveys, it appeared that 8% of car-based commuting could be classified as car-sharing. This suggests an overall car occupancy rate of circa 1.30 (based on a rate of 1.20 in non-shared cars). The direct cost to the local authority of achieving this in Milton Keynes was estimated at over £70,000 per annum (2003 prices), equivalent to £65 per car-sharer per annum[39].

7.6.15 Other schemes appeared less successful in terms of achieving significant modal shift to car-sharing, and the study reported the following key factors for a successful scheme:

- Parking incentives/priority, financial incentives and road-space priority;
- Publicity;
- Critical mass; and
- A committed organisation promoting car-sharing.

7.6.16 In considering where car-sharing might work best the study suggested that it was most suited to medium-sized towns and/or where commuting distances were above national averages, and concluded that an important prerequisite was above average car ownership rates. Town size is not defined, but Milton Keynes had a population of 207,000 in 2001, broadly comparable to the whole of south and mid Fife. As illustrated in Table 2.1 commuting distances for Fife as a whole are slightly above the national average, and this is particularly the case in Dalgety Bay, North Queensferry and Kelty. 76% of households in Fife have at least one vehicle available for use, compared to the Scottish average of 71%[40].

7.6.17 This suggests that analogies between Milton Keynes and Fife may be illuminating.

Note on Modelling of Park & Choose and Car Sharing

7.6.18 The model used to predict the high-level responses from changes in transport infrastructure does not include a specific car-sharing response. As a result it cannot directly predict the impact of measures designed to give differential benefits to HOVs, but to overcome this limitation an additional step has been incorporated to simulate car-sharing and Park & Ride. As a result there is an inconsistency between any reported results covering the 3-hour peak period (e.g. 0700-1000) and the more detailed peak **hour** traffic forecasts. Peak hour graphs therefore **include** an estimate of car-sharing and Park & Ride impacts, but peak **period** graphs do not.

[39] Department for Transport, July 2004, Chapter 9
[40] Scottish Executive Statistical Bulletin TRN/2004/2 (February 2004), Table 1

7.6.19 In addition because the assessment of available road capacity occurs after the model has determined the time of travel, then in the model demand to travel in peaks is not constrained by congestion. In reality apparent increases in peak hour traffic shown on the graphs will be accommodated by peak-spreading, whilst reductions in traffic will result in a reduction in peak-spreading – more information on peak-spreading is discussed in section 10.2 and the Technical Annex.

7.6.20 It is important to bear these limitations in mind when reviewing the transport model predictions. Refer to Technical Annex Volume 2 for further information.

Car Pools/Car Clubs

7.6.21 Consideration could also be given to promoting the concept of "Car Pools" (often referred to as Car Clubs in the UK). These involve a central body (usually a local authority or group of authorities) providing a fleet of cars based at accessible locations across the community and available for short-term hire (e.g. in the region 1 to 12 hours). The intention is to facilitate journeys that cannot sensibly be made by public transport, but by reducing the need for car ownership there is a reduction in car usage when public transport is more sensible. A particularly successful example has been developed in Zürich, which is fully integrated into the "travel offer" of SBB – Swiss State Railway. Car Pooling in Switzerland has been so successful in attracting passengers that it is now facing competition from multiple providers[41].

7.6.22 Edinburgh has been an early British innovator through the "City Car Club", with 19 cars and 317 members by the middle of 2004[42]. In support of the concept City of Edinburgh Council "block book" nine cars during working hours each day to use instead of a conventional Council-owned car pool. Research was undertaken four years after introduction of the concept, which highlighted initial difficulties encountered by the scheme[43]. Nevertheless such a concept could well be worth considering for the south Fife area.

7.6.23 A ratio of between 15-20 scheme members to one car seems appropriate, but this is difficult to achieve in the initial stages, with Edinburgh only passing the 15:1 ratio in early 2004 almost five years after initial launch. In the Edinburgh scheme it is estimated that 5 privately-owned vehicles were given up for each car-pool vehicle, although it should be noted that a significant number of scheme members did not own a car, suggesting some abstraction from conventional public transport. Compared to other measures set out in this report, and drawing on the DfT research, the cost per vehicle kilometre saved appears quite high (circa 5 pence per kilometre saved)[44].

[41] See for example: Mobility Car-Sharing (*Kai Hockerts, INSEAD Foundation*, 2003)
[42] Department for Transport, July 2004, section 8.6
[43] Monitoring and Evaluation of the Edinburgh City Car Club (*NFO System Three for Scottish Executive*, 2001)
[44] Department for Transport, July 2004, sections 8.8 and 8.12

7.6.24 The DfT study concluded that the following were prerequisites for a successful Car Pooling scheme:

- Designated car park bays as an incentive;
- Suitable fleet of cars;
- Filling the vacuum of demand during the working-day (e.g. use as the local authority car pool);
- Car pooling planned into new developments;
- Fiscal incentives;
- Sufficient budget and staffing;
- Local presence and a "green culture";
- Customer Care; and
- Appropriate/sufficient publicity and local authority support.

7.6.25 Compared to the success of Car Sharing it should be noted that Car Pooling failed in Milton Keynes[45].

Appraisal of Scheme

7.6.26 Park & Choose is intended to have a radical impact in expanding the range of sustainable travel options available as an alternative to single occupancy car journeys. It relies upon, and at the same time reinforces, the issues explored under the "Making Public Transport More Attractive" theme recommended earlier in this Chapter. It will also play a vital role in supporting the effectiveness of the recommended M90 HOV Lane. It displays a close integration with local, regional and national policies and plans and is also highly supportive of transport interchange/integration.

7.6.27 Based on the above, it is recommended that the following are pursued:

- Development of Car Sharing (which needs to be strongly supported by many of the measures set out previously under the "Making Public Transport More Attractive" theme);
- Development of Park & Choose at existing P&R locations such as Rosyth and Ferrytoll, to support Car Sharing (and again, in turn supported by the soft measures); and
- Development of Halbeath as a key location for Park & Choose, and particularly as a locus for Car Sharing.

Summary of Park & Choose

Park & Choose offers an important opportunity to improve the attractiveness of public transport by tackling the inflexibility currently existing in choice of modes for outward and return journeys. The locations shown in Figure 7.8 would also act as important congregating points to support the concept of car-sharing and improved car occupancy rates to take advantage of the HOV Lane proposals.

Therefore the five locations identified on Figure 7.8 should be developed as soon as feasible to support car-sharing and modal switch to public transport in general. This includes provision of the new interchange at Halbeath at the northern end of the HOV Lane.

The concept of Car-Sharing should also be supported through appropriate resources and finance, and promoted as part of the Travel Plans discussed earlier. Achieving improved vehicle occupancy rates across the Forth Road Bridge can make a significant impact on future congestion, albeit only in the short and medium terms.

[45] ibid, section 8.14

7.7 Optimisation of Rail Services

7.7.1 Although the initial (STAG Part 1) appraisal identified that significant increases in rail frequency had very limited impact on Cross Forth travel by rail (primarily because rail already has a very high modal share of travel into central Edinburgh), it was still considered worthwhile to review the options for making better use of the existing rail service and infrastructure (taking account of planned improvements outwith the scope of this study, principally the planned Waverley upgrade programme and the Edinburgh Airport Rail Link).

7.7.2 Previous studies of Cross Forth rail services had suggested that "splitting" the existing Fife Circle service would offer opportunities to achieve more flexible scheduling, introduce a more evenly spaced "clockface" timetable and enhance the services to/from Markinch. Although there were costs associated with this option, notably providing additional train sets/crews and building a "turnback" siding or platform at Markinch to facilitate trains terminating at Markinch without obstructing the main line, it appeared likely that the overall benefits were sufficient to cover these costs and for the purposes of this study it is assumed that a revised pattern of service will be offered on the Fife rail services effective from the same date as revised services associated with Edinburgh Airport Rail Link (EARL)[46].

7.7.3 It was identified that a theoretical 12No. train paths per hour could be accommodated within existing Cross Forth infrastructure. At present, there are only 9No. passenger trains crossing the Forth Rail Bridge between 0730 and 0830 (being the critical time for arrivals into Edinburgh between 0750 and 0850). One of these paths is utilised for the Kirkcaldy – Glasgow service, which does not serve the Edinburgh commuter market. The overall pattern of service is not particularly attractive for travellers starting their journey by rail north of Inverkeithing, especially on the section of line between Rosyth and Cowdenbeath. This may contribute to making Inverkeithing a "honeypot" for Park & Ride.

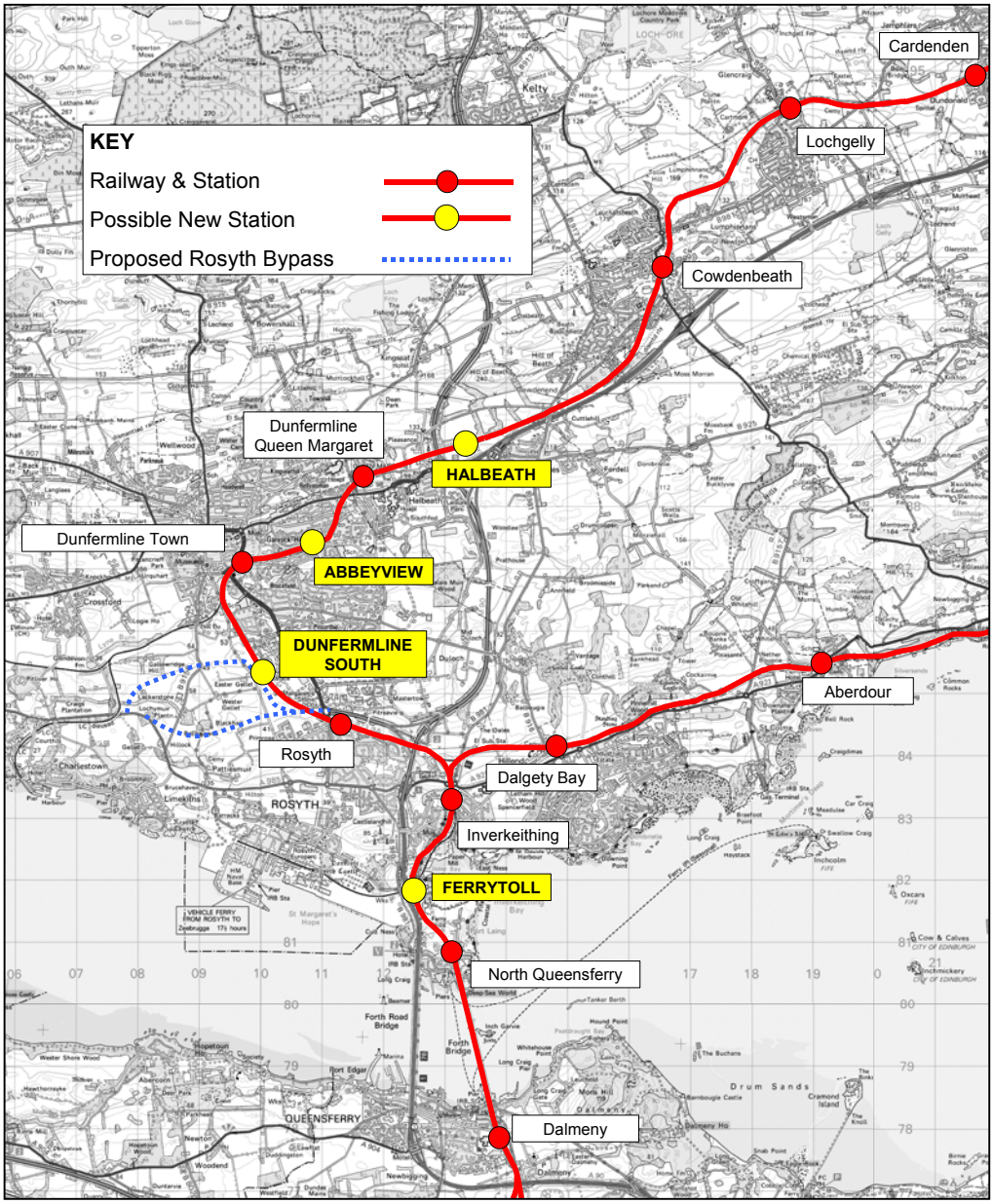
7.7.4 Based on the above it appeared possible to provide some additional trains in the peak hour without any infrastructure work. These additional services would need to utilise the two additional paths between Haymarket and Waverley stations allocated to Fife trains as part of the Waverley Upgrade project. Whilst it would be possible to accommodate even more trains over the Forth Rail Bridge the constraints of pathing under the more complex post-EARL junction arrangements means it is not certain that these could be accommodated between Dalmeny and Haymarket, and in any case they would need to terminate at/start from Haymarket due to insufficient paths into Waverley.

7.7.5 Accordingly the recommendation is to operate two additional trains each hour, as described in more detail below following consideration of the other rail options and challenges.

[46] South Fife and Forth Estuary Public Transport Study (*MVA*, September 1999)

7.7.6 New interchange stations, supporting the Park & Choose concept, were considered at Halbeath and Ferrytoll, and consideration was also given to building additional rail stations on the north line, at Abbeyview and at Dunfermline South. These are all shown on Figure 7.9.

Figure 7.9: Possible New Rail Stations in Fife



7.7.7 Inserting additional stations at Abbeyview and Dunfermline South is problematic as they are extremely close to existing rail stations. In addition the potential catchment area of Abbeyview overlaps significantly with those of Dunfermline Town and Dunfermline Queen Margaret stations and it is poorly located to attract Park & Choose demand from the Dunfermline Eastern Expansion area (DEX). As a result it was decided not to consider Abbeyview any further.

7.7.8 However, the location of Dunfermline South station was considered to be attractive in the event that the western expansion of Dunfermline is pursued, and with a view to a potential interchange site adjacent to the alternative alignment for the proposed Rosyth Bypass. It is feasible to insert an additional station stop within the proposed rail pattern described in section 7.7.4. Accordingly it is recommended that a suitable site be safeguarded to provide a Park & Choose interchange at Dunfermline South.

7.7.9 Building a rail station at Ferrytoll was extremely expensive (in excess of £8 million), principally as a result of the railway running on a viaduct high above the existing bus-based Park & Choose site. It was also thought likely that additional rail demand generated by building a station at this location would result in significant abstraction from existing bus services, undermining their viability. Inserting additional station calls at Ferrytoll into existing trains would also be problematic. Accordingly it was not considered appropriate to provide a new rail station at Ferrytoll, although it could be strengthened as a bus interchange point by an enhanced network of bus services (see Figure 7.6).

7.7.10 Halbeath was identified as a key focal point for Car Sharing, at the junction of the M90 and A92 which is passed by more than half of Cross Forth traffic (see Figure 2.3), and hence as a Park & Choose interchange location initially to be supported by the range of enhanced bus services previously described. Provision of a railway station was also considered, but was rejected for the following reasons:

- Total demand for Park & Ride was predicted to be low and could be adequately (and more cheaply) served by buses (although Park & Choose would boost this demand);
- Journey times between Halbeath and central Edinburgh would not be attractive as the railway pursues an east-west alignment at this point, as opposed to a north-south desire line for travel demand; and
- There would be adverse journey time impacts for existing and future rail users east of Halbeath.

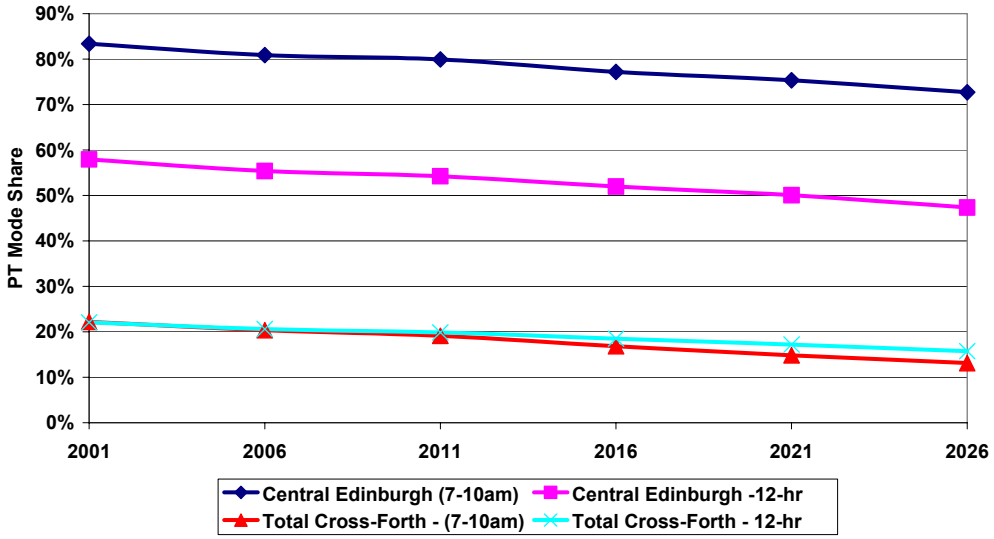
7.7.11 Finally, previous studies had identified value in providing a direct rail service from south Fife to Linlithgow and Glasgow, but this had now been over-taken by the interchange possibilities opened up by train services as part of Edinburgh Airport Rail Link, which would allow interchange between frequent Fife – Edinburgh Airport and Edinburgh Airport – Glasgow services. Accordingly it was considered that there was no merit in considering a frequent direct Fife – Glasgow service, and indeed withdrawing the service once EARL opens would help to free Cross Forth capacity for the additional trains to Edinburgh recommended.

The Challenge for Cross Forth Rail Services

7.7.12 Public transport already plays a dominant role in facilitating Cross Forth travel into central Edinburgh. This is illustrated by Figure 7.10 below, which shows that at present public transport has a mode share approaching 80% for morning peak period journeys into central Edinburgh. The success of public transport, and particularly rail services, has resulted in problems of over-crowding and these are discussed further in later paragraphs.

7.7.13 The considerable success of public transport in achieving such a high modal share is not reflected in total Cross Forth travel. As Figure 7.10 shows, in the morning peak period less than 20% of **total** Cross Forth travel uses public transport and this is forecast to decline under the Reference Case scenario. The challenge for the corridor is to identify measures to increase the penetration of public transport into the total Cross Forth travel market; given the penetration of the central Edinburgh market this will mean targeting travel to other areas, particularly west and north Edinburgh. Figures 2.3 and 2.4 offer further information on the origins and destinations of Cross Forth travel.

Figure 7.10: Public Transport Mode Share (Reference Case)



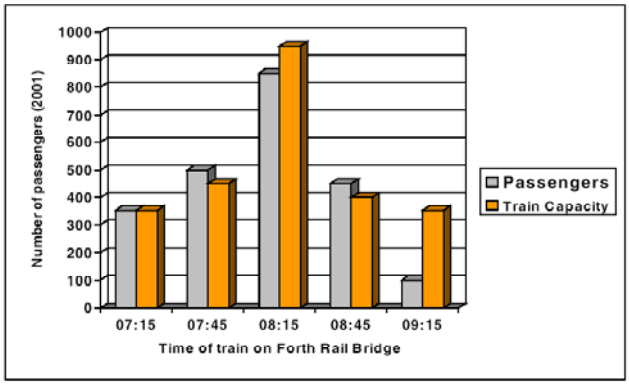
7.7.14 Rail plays a major role in serving the central Edinburgh market. It is less well placed to serve other, more dispersed destinations south of the Forth, and for this reason a range of non-rail measures has already been proposed in earlier sections, including improved bus services to west and north Edinburgh and West Lothian, and more flexible solutions such as car sharing supported by priority for HOVs. Thus whilst rail will continue to have an important role to play in serving existing Cross Forth travel, its role in achieving further modal shift away from single occupancy cars is less pivotal.

Rail Overcrowding

7.7.15 Existing rail overcrowding is required to be addressed under the terms of the renewed Scottish Rail Franchise, and is currently being facilitated by a policy of lengthening platforms to accommodate 6-car trains and providing additional rolling stock to operate longer trains where these are identified as being over-crowded. Although some peak-hour trains regularly carry passengers in excess of their seating capacity, this is not true of all Cross Forth trains, as illustrated Figure 7.11 below[47]. It is anticipated that following committed platform and train lengthening all **existing** passengers should have a seat on Cross Forth trains.

[47] Taken from FETA Interim Action Plan (*SIAS/WSP*, March 2003), Figure 2.7

Figure 7.11: Cross Forth Train Capacity and Loadings – AM Peak Hour



7.7.16 The current plans and future potential utilising up to 6-car trains on First ScotRail services is summarised in Table 7.6 below. This demonstrates that although there is a need to tackle existing overcrowding and accommodate future growth in passenger demand, it is feasible to more than double the number of seats provided to meet these needs without further platform lengthening. It is possible that individual trains within the proposed peak hour timetable could still experience over-crowding, but the totally revised timetable envisaged can be tailored in such a way as to minimise this likelihood by focusing additional capacity on the busiest times (e.g. 0815 in Figure 7.11).

7.7.17 At present Virgin Trains provide an additional Cross Forth train southbound in the AM peak, but given the changes to the Cross Country franchise, this has been excluded from the analysis at present.

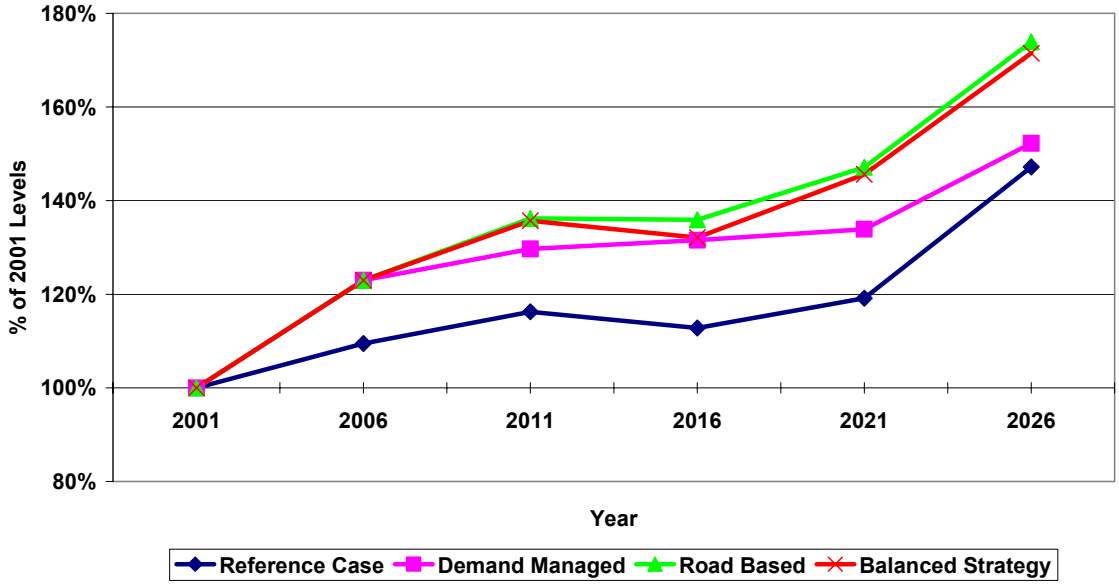
Table 7.6: Seating Capacity of Morning Peak Hour Cross Forth Trains

Morning Peak Train (or equivalent in future plans)	Situation in May 2003 Timetable	Situation after Platform & Train Lengthening	Situation after Provision of Additional Trains	Situation Assuming all Trains formed by 6-cars[48]
0614 Perth – Edinburgh (0758)	ΠΠ 145	ΠΠΠ 212	ΠΠΠ 212	ΠΠΠ ΠΠΠ 380
0622 Edinburgh – Edinburgh (0817)	ΠΠΠΠ 290	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠΠ 424
0705 Perth – Edinburgh (0824)	ΠΠΠ 190	ΠΠΠ 190	ΠΠΠ 190	ΠΠΠ ΠΠΠ 380
0733 Glenrothes – Edinburgh (0833)	ΠΠΠΠ 290	ΠΠΠ ΠΠΠ 424	ΠΠΠ ΠΠΠ 424	ΠΠΠ ΠΠΠ 424
0731 Kirkcaldy - Edinburgh (0841)	ΠΠΠΠ 290	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠΠ 380
0755 Kirkcaldy – Edinburgh (0845)	ΠΠΠΠ 290	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠ 348	ΠΠΠ ΠΠΠ 380
0643 Carnoustie – Edinburgh (0850)		ΠΠΠ 190	ΠΠΠ 190	ΠΠΠ ΠΠΠ 380
0600 Aberdeen – Edinburgh (0855)	ΠΠΠΠ 272	ΠΠΠ 190	ΠΠΠ 190	ΠΠΠ ΠΠΠ 380
New train circa 0700 Markinch – Dunfermline – Edinburgh (0812)			ΠΠ 136	ΠΠΠ ΠΠΠ 380
New train circa 0743 Kirkcaldy – Edinburgh (0828)			ΠΠ 136	ΠΠΠ ΠΠΠ 380
TOTAL SEATS (% increase on current situation)	**1767**	**2250** +27%	**2522** +43%	**3888** +120%

7.7.18 Figure 7.12 below illustrates predicted changes in rail passenger flows across the Forth, compared to a 2001 base. Under a long-term balanced strategy (described fully in Chapter 11) this shows that by 2026, when all proposed measures are assumed to be in place including a new Multi-Modal Crossing, demand for rail services in the AM peak will be just over 70% higher than in 2001.

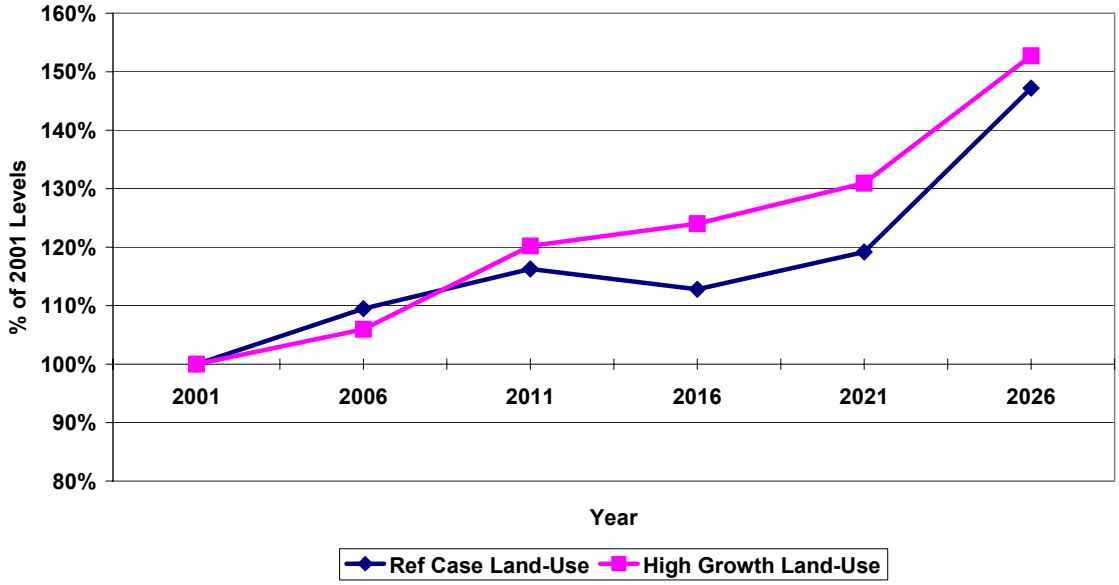
[48] Assumes all trains formed of two Class 170 units, except 2 existing formations using Class 170S – greater capacity achievable using more Class 170S units

Figure 7.12: Cross Forth Rail Passengers (AM Peak Hour Southbound)



7.7.19 This would clearly be augmented in the case of the High Growth Land Use Scenario ("Fife Option 8B"), illustrated in Figure 7.13 below. This could boost demand by a margin of 7%, suggesting the highest likely rail demand in 2026 could be 75%-80% higher than in 2001, an annual growth rate of around 1.2% per annum.

Figure 7.13: Cross Forth Rail Passengers under High Growth Scenario (AM Peak Hour Southbound)



7.7.20 When compared to predicted demand for rail travel, once planned enhancements to Park & Choose and the other measures described above take place, it should still be possible to accommodate this demand within existing platform lengths, although at the cost of significant investments in additional rolling stock (estimated at £23 million). These costs have been included in the economic appraisal of rail optimisation. However it is clear that by 2026 rail capacity within existing platform

lengths will be approaching its upper limits, particularly under a High Growth land-use scenario, and consideration will need to be given to enhancing capacity. This may involve one, or more, of the following:

- Platform lengthening to 8-cars at all or selected stations;
- Increased Cross Forth heavy rail frequencies, requiring investment in resignalling between Haymarket and Inverkeithing; and/or
- Consideration of an investment in Cross Forth LRT.

Impact of Edinburgh Airport Rail Link and Edinburgh Park

7.7.21 For the purposes of this study it has been assumed that EARL is completed and open by 2011, and as discussed above that it will be served by the two additional Cross Forth trains from that time (existing trains remain on the current line through Turnhouse). The consideration of passenger demand has excluded demand originating at the Airport in the morning peak, or alighting at the Airport in the evening peak. It is possible that such passengers will exacerbate any predicted over-crowding, but this cannot be clarified until the demand modelling for EARL is completed (not within the timescale of this study). However the predicted surplus of seats over demand, even by 2026, seems likely to be sufficient to provide for EARL passengers over and above those identified in this study.

7.7.22 The new train services utilising EARL will also improve transport links to/from Edinburgh Park, but these have been taken into account in modelling future demand for rail.

Rail Fares

7.7.23 Because of the previous history of over-crowding on Cross Forth trains, there has been a policy of raising fares in real terms to attempt to "choke-off" demand and avoid the need for costly lengthening of trains and/or providing additional trains. Notwithstanding this there has been increased over-crowding on Cross Forth trains as already described.

7.7.24 One of the consequences of this approach has been an increasing use of Inverkeithing as a Park & Ride railhead as travellers minimise the rail fare element of their total journey costs. This, in turn, has made the bridgehead roads around Inverkeithing increasingly congested.

7.7.25 To overcome the "honeypot" problem of Inverkeithing, as well as providing enhanced rail services upstream of Inverkeithing, it is recommended that rail fares from south Fife are capped at the Inverkeithing level[49]. This should encourage travellers to access the nearest convenient railhead, rather than driving to Inverkeithing to minimise rail travel costs. The cost of this approach, in terms of lost revenue for First ScotRail, will be balanced by additional passengers carried as a result of capping the fares.

[49] Inverkeithing fares would continue to increase in line with current franchise assumptions (i.e. RPI+1%)

Appraisal of Scheme

7.7.26 Rail is already making a significant contribution to meeting the demand for sustainable Cross Forth travel, although there is concern that this has been constrained by a lack of capacity and the (associated) increase in fares in real terms. Additional capacity has been injected into the network already (partly funded by Fife Council) and further steps are in-hand through the lengthening of trains and platform infrastructure. The new franchisee, First ScotRail, are also obliged to tackle over-crowding as it arises in the future.

7.7.27 Nevertheless it is clear from the discussions regarding rail optimisation set out above that further steps can be justified economically through reorganising the existing pattern of service to improve its marketability and enhance the service to Markinch, as well as by providing additional hourly services via both Dunfermline and Kirkcaldy. The overall net cost of these enhancements is estimated at £6.5 million of capital investment (including £4.5 million to provide the Markinch interchange and third platform) with a further ongoing annual cost of circa £1.1 million[50].

7.7.28 These costs will be offset by additional operator revenue, and will have significant benefits for improving accessibility to travel for vulnerable groups and promoting social inclusion, as well as modest positive impacts on overall integration.

7.7.29 Based on the results of appraising the various rail options it is recommended that the following are adopted:

- When EARL opens, existing rail timetable is recast to "Split the Circle" providing a more regular frequency between Inverkeithing and Edinburgh as well as enhanced services to Markinch;
- At the same time two additional services are introduced, each running hourly:
  - Edinburgh – Edinburgh Airport – Glenrothes;
  - Edinburgh – Edinburgh Airport – Kirkcaldy; and
- Direct Kirkcaldy – Glasgow service is withdrawn, because of improved journey opportunities via Edinburgh Airport.

7.7.30 On the basis of the data set out in Table 7.6 it is clear that all forecast rail demand is capable of being accommodated within 6-car trains and platform lengths without resulting in overcrowding (in the Reference Case and High Growth Scenario, by 2026 and without providing a new crossing). However by 2026 it would appear that the capacity of trains that can be operated within existing infrastructure (i.e. platform lengths and signalling constraints) would be close to being exhausted, and it is likely that consideration would need to be given to means of catering for this excess of demand in the longer-term.

[50] South Fife and Forth Estuary Public Transport Study (*MVA*, September 1999)

Summary of Rail Optimisation

Previous studies highlighted the benefits of enhancing Fife local rail services by "splitting the circle" and improving facilities at Markinch, and this should be pursued. In addition, once the Edinburgh Airport Rail Link is opened two additional trains each hour should be provided between Fife and Edinburgh, both serving the airport. The Kirkcaldy – Glasgow train will be rendered unnecessary by the interchange opportunities at the airport and its withdrawal will facilitate the provision of additional trains into central Edinburgh. Existing Fife – Edinburgh trains would continue largely unchanged.

The density of existing stations makes provision of new rail stations generally unnecessary although a site at Dunfermline South would be worth safeguarding in the expectation of future expansion of Dunfermline to the west.

Existing and recommended trains can be lengthened to 6-car lengths within existing infrastructure and this will be sufficient for likely demand even by 2026. However increasing demand for rail travel is likely to require further capital investment in longer trains and platforms at some time beyond 2026.

There would be benefits from capping fares in south Fife at the Inverkeithing level.

7.8 Demand Management

7.8.1 Schemes set out so far are traditionally described as "carrots" (i.e. measures to make the preferred transport modes more attractive). Demand management focuses on "sticks" (measures to make the unsustainable mode less attractive, and hence encourage modal shift to more sustainable transport modes).

7.8.2 The following have been identified:

- Car Park Charging at railway stations north of the Forth;
- Parking charges in central Edinburgh; and
- Varying tolling patterns on the Forth Road Bridge.

Car Park Charges north of Forth

7.8.3 Concern has been expressed regarding the current demand for parking in the area immediately around the northern bridgehead, particularly at Inverkeithing rail station. This is considered to exacerbate traffic congestion in the northern bridgehead and also to have an adverse impact on the general environment in Inverkeithing. When demand for car parking was modelled without constraints (i.e. without limiting the physical spaces available and assuming parking was free-of-charge) the results confirmed that Inverkeithing was the most popular location for parking, even abstracting from Ferrytoll.

7.8.4 In order to offset the perceived problems caused by the Inverkeithing "honeypot" (the largest of the three car parks is illustrated in the adjacent photograph) it was decided to test the impact of introducing car park charges in the northern bridgehead area, the intention being to force parking demand further upstream (for example through Park & Choose at Halbeath, Rosyth or Dalgety Bay).

7.8.5 In the consultation workshops there was little support for a policy of introducing car park charges at south Fife interchanges. Whilst the principle of encouraging interchange further upstream was understood, it was felt that "mixed messages" would result from introducing a parking charge element into successful Park & Ride functions. Nevertheless given the "honeypot" nature of Inverkeithing, and the adverse impacts associated with this situation, it is recommended that a modest car parking charge could be introduced complementing the capping of south Fife rail fares at Inverkeithing levels. The money collected from parking at Inverkeithing should be "hypothecated" for use in projects of direct local benefit to the residents of Inverkeithing who suffer from its growing congestion.

7.8.6 In the event of implementing parking charges at railway stations in the northern bridgehead it would be essential to simultaneously introduce residential parking schemes to control migration of parking from the station car parks.

Parking Charges in Central Edinburgh

7.8.7 This option considered the possible impact of increasing central Edinburgh parking charges in real terms, to discourage the use of cars for journeys into the city centre, and hence encourage greater take-up of Park & Choose.

7.8.8 The possibility of increasing the cost of penetrating central Edinburgh inherently interacted with the Edinburgh Congestion Charging issue. Accordingly, the option of increasing the total cost of driving into central Edinburgh was assessed through the Congestion Charging sensitivity testing described in the full SITCoS report, but clearly this was later overtaken by the rejection of Congestion Charging in the local referendum.

Toll Patterns on the Forth Road Bridge

7.8.9 Again as a means of encouraging Cross Forth use of public transport when suitable alternatives were being made available, the impact of various tolling regimes was considered, based on five time-of-day differential tolling profiles, as follows:

- **Low Flat Tolls** (Reference Case) – 50p per crossing for cars, £1.25 for HGVs in all time periods;
- **Double Flat Tolls** - £1 per crossing for cars, £2.50 for HGVs in all time periods;
- **'Moderate' Time of Day Tolling** – 50p/£1.25 for cars/HGVs in off-peak and inter-peak, rising to 80p/£2 in near-peak flows and £1/£2.50 in peak conditions); and
- **'Aggressive' Time of Day Tolling** - £1/£2.50 per crossing for cars/HGV's in off-peak and inter-peak conditions, rising to £2/£5 per crossing in near peak and to £4/£10 per crossing in the peak times.

7.8.10 In the case of the two Flat Toll scenarios, southbound tolling would not be required and the specified tolls would therefore be collected with existing northbound tolling infrastructure. The two Time of Day Differential Tolling variants were tested with both one-way tolling and two-way tolling variants. In the case of one-way tolling version, the stated tolls were doubled, but only the northbound demand profiles were used to determine the toll.

7.8.11 In the event that southbound tolling was reintroduced this would either require electronic tolling (which currently rules out southbound tolling related to vehicle occupancy because technology is not currently available to count occupants) or the provision of a southbound toll plaza in the northern bridgehead area at Welldean. The costs of such schemes are £0.5 million and £10 million respectively.

7.8.12 Given the overall support offered to public transport as a means of addressing Cross Forth travel congestion, it would seem sensible to assume that buses are exempt from the toll increases suggested, and there may be benefit in reducing or eliminating tolls for local service buses.

Impact of Tolling Regimes

7.8.13 It is likely that the suggested car tolls would be applied differentially, with the higher tolls only levied on Single Occupancy Vehicles (SOVs). The following two graphs (Figures 7.14 & 7.15) give an indication of the likely impact on SOVs using the Forth Road Bridge of SOV Tolls and SOV Time Increases respectively.

Figure 7.14: Impact of SOV Tolls on SOVs using Forth Road Bridge

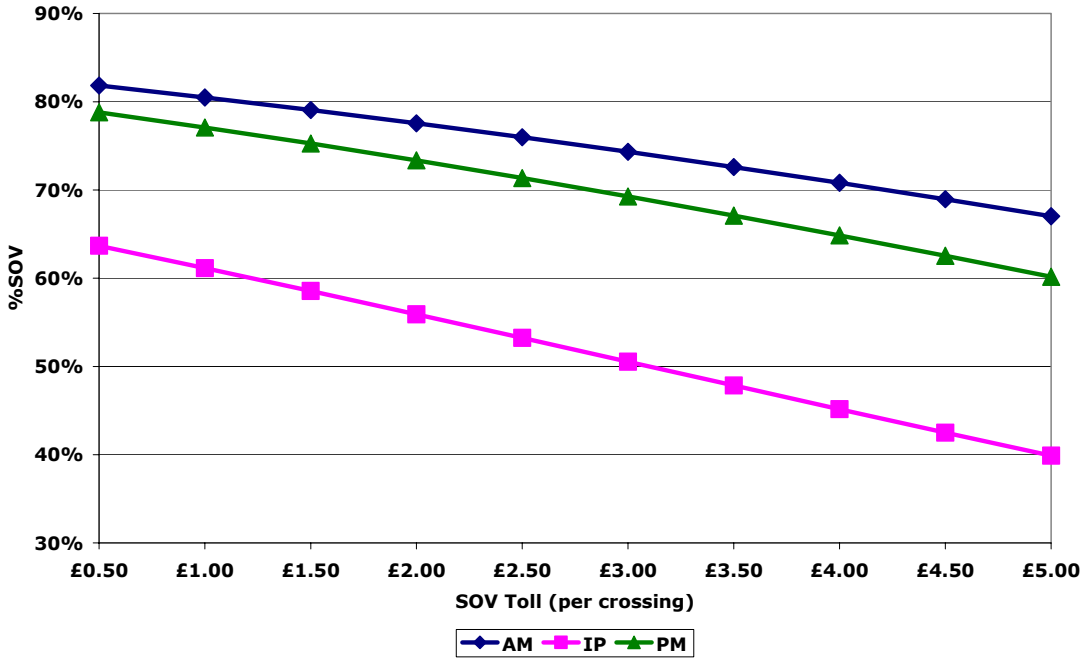
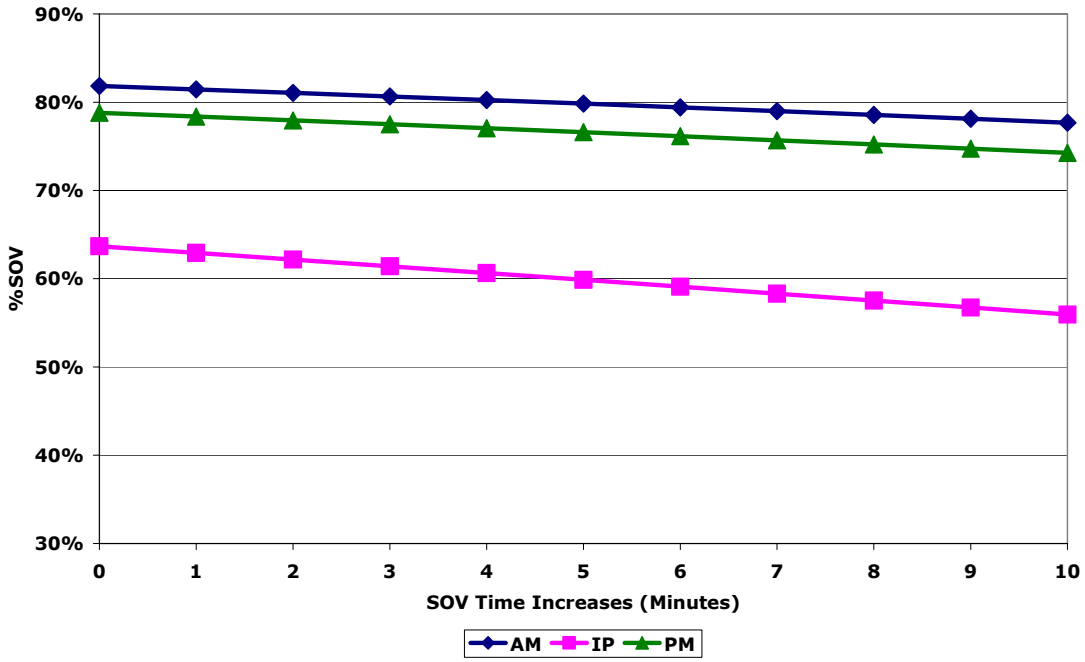


Figure 7.15: Impact of SOV Time Savings on SOVs using Forth Road Bridge



7.8.14 This demonstrates that Cross Forth SOV use is relatively price elastic in the Inter-Peak (IP) period, and less elastic in the peaks. Nevertheless an increase in one-way toll from 50p to £2 would be expected to reduce the proportions of SOVs in the AM peak from 82% to 78%, with increasingly higher impacts with higher tolls. Use of SOVs seems much less sensitive to increases in travel time (Figure 7.15) – to achieve the same reduction as an increase in one-way toll to £2 would require journey times for SOVs to increase by 10-minutes.

7.8.15 It is therefore concluded that if a Demand Managed strategy is pursued then the principal component of such a strategy must be the tolling regime.

Appraisal of Scheme

7.8.16 The results of the tolling tests can be summarised as follows: All increased tolling tests create net traveller disbenefits (i.e. the pain of the extra toll is not offset by the resulting decongestion benefits). This is not a problem (from a cost-benefit point of view) if the additional toll revenue is then used to buy schemes with a positive Net Present Value.

7.8.17 If it is decided that a new crossing is required along with a source of funding, then it is necessary to identify the tolling regime that maximises the ratio of extra revenue to traveller pain. Of the various tolling strategies tested the one that appears the best (i.e. raising the most additional revenue per £1 of traveller 'pain') is **Significant SOV tolling (2-way)** where 2-way tolling is reintroduced and SOVs charged £2 in peak and £1 in near-peak conditions **in each direction**. (NB This analysis includes the cost of building and operating the southbound toll plaza, but excludes any additional delays caused by the southbound tolling collection).

7.8.18 For one-way northbound-only tolling options (i.e. without providing a new toll plaza) there is not much to choose between simply **Double Flat Tolls** and **Significant Time of Day Tolling (1-way)** (i.e. £4 in peaks, £2 in near-peaks and £1 in inter/off peak).

7.8.19 Two-way tolling without differential SOV/HOV tolls reduces AM peak southbound traffic in 2006 by between 2 and 3 % (relative to the corresponding double toll charged northbound only) - this reduction decreases over time, so that by 2016 there would be no significant difference in AM peak southbound traffic between 1-way and corresponding 2-way tolling - it is therefore not worth pursuing 2-way tolling on its own.

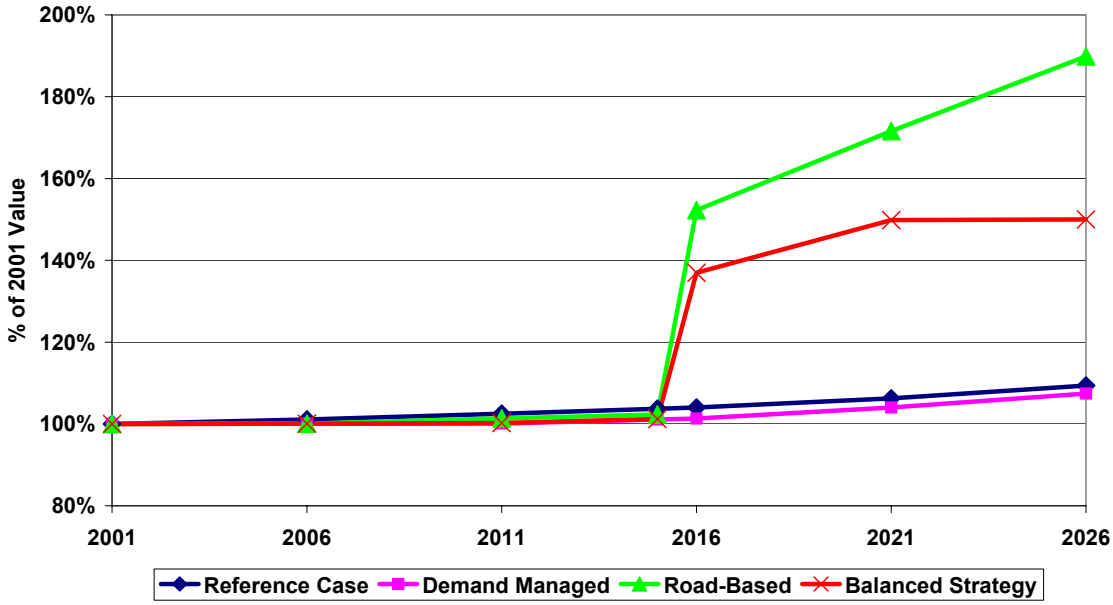
7.8.20 It should be noted that the modelling is not able to predict the effect of differential SOV/HOV northbound-only tolls on southbound car-sharing (since there is no easy way to link behaviour in the two directions in the car-sharing model).

Conclusions on Tolling

7.8.21 If the results of the long-term strategy require consideration of a new bridge and funding is unlikely to be available from existing sources, then it will be necessary to increase tolls. Increasing tolls will cause traveller pain and have limited impact on AM peak southbound flows. The tolling regime which raises most tolls per £ of traveller pain (assuming the toll collection does not add significantly to southbound delays) is to re-introduce southbound tolling and implement differential SOV tolls by time of day.

7.8.22 The levels of these differential tolls should be set (and maintained) just high enough to generate enough revenue to pay for the new bridge, since any tolls higher than this will generate additional traveller disbenefits with nothing much to show for the additional “pain”.

Figure 7.16: Cross Forth Car Flows (Southbound 0700-1000)



7.8.23 Figure 7.16 above demonstrates that the short and medium term measures (promoting more attractive public transport, a more comprehensive bus network, improved rail services and better vehicle occupancy rates) successfully contains peak car flows on the Forth Road Bridge below the Reference Case.

7.8.24 It should be remembered that although these are modelled predictions, given the current congested situation at the peaks increases in flows above the 2001 level are likely to result in peak-spreading as it is physically impossible for more cars to cross the bridge in the peak hour. Similarly reductions in flows below the current levels will result in a shortening of the "peak-spreading" effect rather than less cars crossing the bridge in the peak hour. Section 10.1 discusses peak-spreading in more detail.

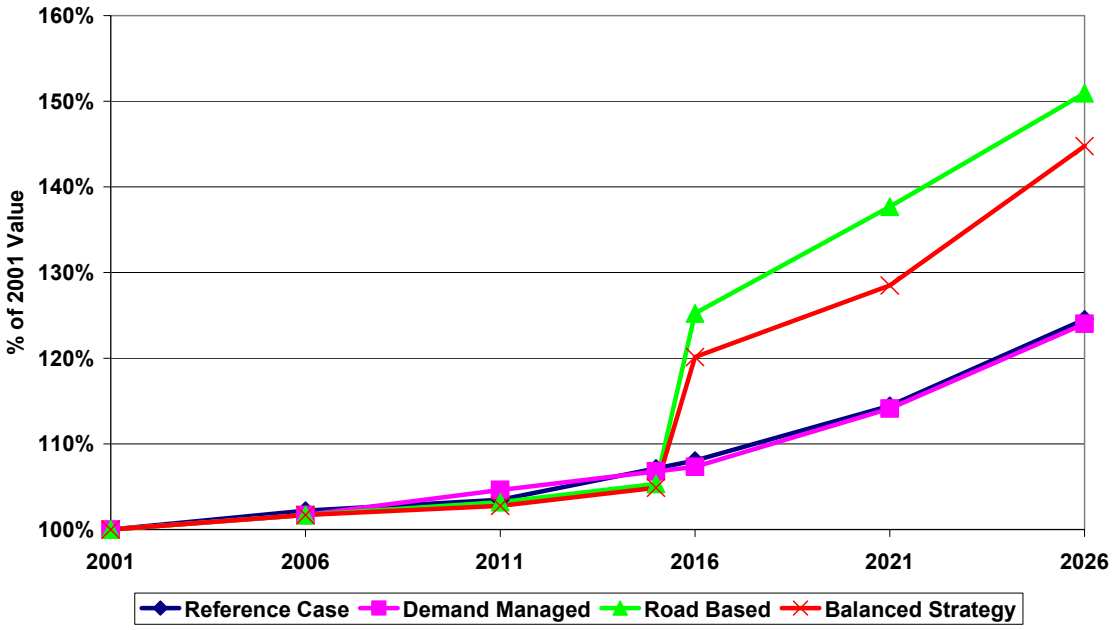
7.8.25 In the long-term, if a new crossing is not provided but demand management based on significant SOV tolling is introduced, then peak traffic remains contained below the Reference Case level. At the other extreme, if a road crossing is provided without road space reallocation in favour of HOVs, then peak traffic flows escalate rapidly and by 2026 will be approaching 190% of their 2001 levels.

7.8.26 Alternatively if it is feasible to promote a "balanced strategy" of demand management, combined with a new Multi-Modal Crossing **and** improved public transport, then peak period flows still grow beyond their 2001 levels but from a lower base, so that by 2026 they are 50% higher than in 2001 (of which 10% is accounted for by underlying growth that was predicted even in the Reference Case). This suggests the need to consider measures to ensure the newly created capacity under such a strategy is not rapidly filled up. The case for a "balanced strategy" is discussed further in Chapter 11.

7.8.27 There is clearly a balance to strike between restricting Cross Forth travel in order to minimise congestion, and the adverse impact that travel constraints may have on the economic well-being of the study area. Figure 7.17 below illustrates the overall impact of each long-term measure on Cross Forth person trips in a 3-hour morning peak period (0700-1000).

7.8.28 As can be seen the demand managed approach results in Cross Forth travel growing at around the same rate as it would without intervention in the market (i.e. in the situation described as the Reference Case). A road-based approach facilitates a 50% increase in Cross Forth person trips, but with the disbenefits associated with significantly increased car flows shown in Figure 7.16. On the other hand a "balanced strategy" is more successful in containing growth in car travel, whilst still facilitating a 45% growth in Cross Forth person trips by 2026.

Figure 7.17: Cross Forth Person Trips (Southbound 0700-1000)



7.8.29 In short, whilst increased tolling may well be a prerequisite to funding a new crossing, the modelling suggests that it may not be the best method of providing a long-term solution to future travel needs in the Cross Forth corridor. It may, however, have a contributory role to play as part of a suite of "balanced" measures including promotion of many of the measures already discussed above, through the introduction of significant SOV tolling based on the following:

- Peak hour – equivalent to £2 per SOV each way;
- Hour before and hour after Peak - equivalent to £1 per SOV each way; and
- Inter-peak – equivalent to 50p per SOV each way.

Summary of Demand Management

If a new Forth Crossing is not built then demand management will need to be considered in an attempt to contain existing and future demand for Cross Forth travel within existing infrastructure limits. Although improved public transport and, in particular, greater car occupancy may mitigate congestion in the short and medium terms the fact that trip ends are dispersed (see Figures 2.3 and 2.4) means that, in the absence of a new crossing, the only remaining long term option is to try and "choke off" future Cross Forth SOV trips using demand management. Constraining Cross Forth travel in this way may, however, have adverse impact on the overall economic development of the study area.

Increasing tolls on SOVs may have a role to play as part of a wider, balanced strategy of public transport, HOV and demand management measures.

There was little support during consultation for introducing car parking charges at rail stations in the northern bridgehead area, although it would appear equitable to consider this in certain key locations (e.g. Inverkeithing).

It would appear that demand management **alone** may have only a marginal role to play in addressing the problems of Cross Forth travel because it cannot force existing peak period demand levels down nor even contain it at current levels.

It is likely, however, that FETA will need to increase bridge tolls to provide funding for some or all of the recommendations of this study.

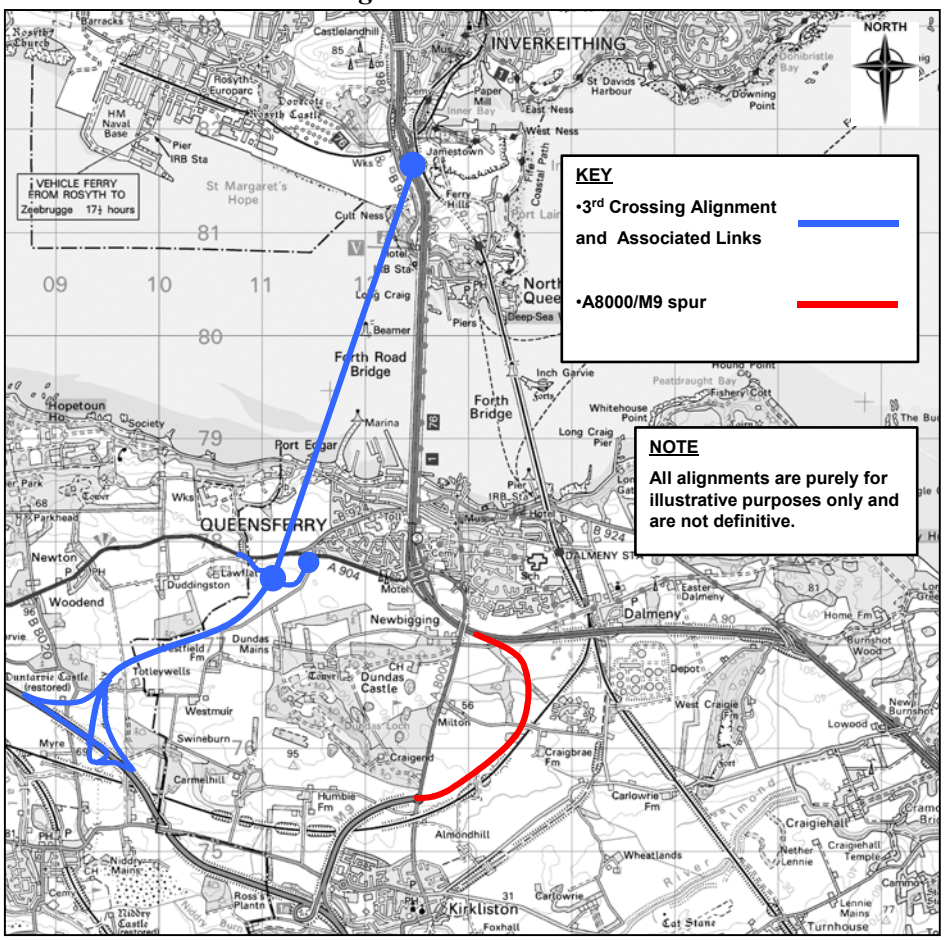
7.9 Forth Multi-modal Crossing & Road Space Reallocation

7.9.1 In parallel with this corridor study, FaberMaunsell carried out a review of their most recent work relating to providing a third Forth Crossing. The general alignment of this bridge has been established for some years, and is shown in Figure 7.18 below.

7.9.2 The estimated cost of works shown in blue on Figure 7.18 is £382 million (further details in Technical Annex Volume 2).

7.9.3 If it was decided that the structure should be designed as a Multi-modal Crossing, with the design strength capability to add LRT at a future date, an additional £60 million would be required taking total scheme cost to £442 million. Upgradabaility is discussed later, in Chapter 10.

Figure 7.18: Third Forth Crossing



Appraisal of New Forth Crossing

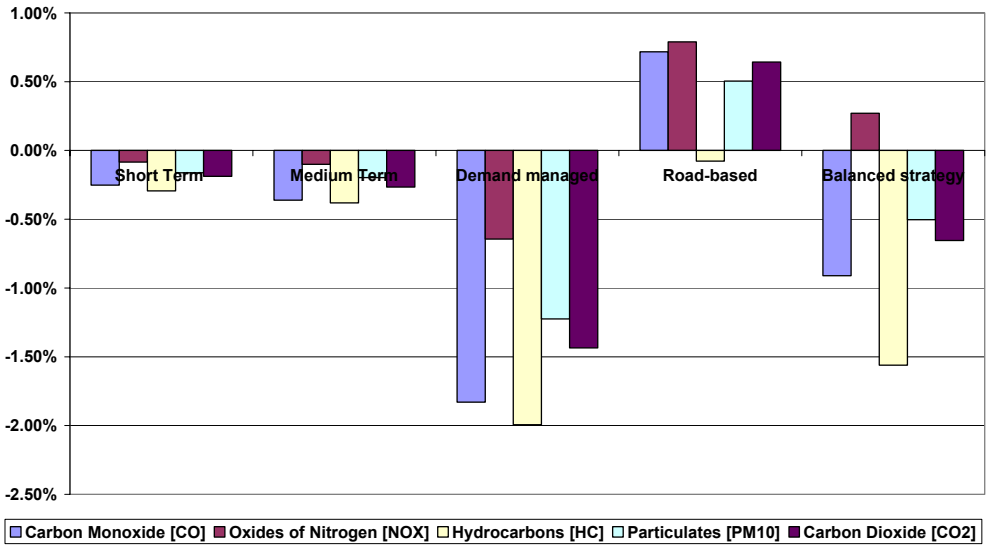
7.9.4 Responsibility for road space provision is shared between the local roads authorities and the Scottish Executive, the latter being responsible for the strategic road network. Although there are requirements placed on local authorities to pursue road traffic reduction, this is not the case for the strategic road network, leaving local authorities and regional transport partnerships needing to react to increasing demand for travel on strategic roads, but endeavouring to do so in a sustainable manner.

7.9.5 In the event that a new crossing was provided with all Cross Forth road space open to all users (including single occupant vehicles) then the impact on Cross Forth car flows was illustrated in Figure 7.16. This showed that the application of demand management in the absence of a new crossing contained flows below the Reference Case situation. The Balanced Strategy was also successful at restraining flows in the short and medium terms, and even by 2026 peak period flows between 0700 and 1000 were expected to be 50% above 2001 levels, whereas provision of a new crossing without road space reallocation would result in this increase in movements approaching 90% within 10 years of a new road bridge opening. Nevertheless it is clear that even the Balanced Strategy results in growth rates higher than the Reference Case.

7.9.6 This will result in peak-spreading (for further information see section 10.2). The particular difficulties facing local authorities in producing sustainable strategies for road traffic reduction are discussed later, in section 10.3, but in summary there is split responsibility for managing traffic and road-space between local roads authorities and the Scottish Executive (the latter having control over the Trunk Road network). Roads authorities have to react to increasing demand for travel on strategic roads, but are required to do so in a sustainable manner.

7.9.7 There will be an adverse impact on the environment resulting from a road-based strategy. This is illustrated by Figure 7.19 below, which shows that emissions are improved under both the demand managed and "balanced" strategies, but are significantly worsened under a road-based strategy.

Figure 7.19: Changes in Emission Levels



7.9.8 In addition the following impacts are likely:

- 0.5% boost to Fife economy, plus 0.1% boost to the Lothians' economy;
- 0.8% increase in Fife employment (circa 1000 jobs) plus small increase in Lothians; and
- Negligible increase (<0.1%) in CO_2 emissions in the local bridgehead area (free-flowing traffic has lower emissions than congested traffic).

7.9.9 However, in addition to these benefits, a new crossing with unrestricted road space allocation may itself become congested within a foreseeable (albeit long-term) timescale. Providing such a crossing would be expensive, but will be fundable based on the future toll revenue stream – tolls will need to rise to fund the necessary investment.

7.9.10 As an alternative to unrestricted road space allocation it was therefore decided to evaluate the potential contribution to long-term strategy that could be played by a third crossing incorporating road space reallocation.

Road Space Reallocation

7.9.11 This would only be implemented following completion of a Forth Multi-modal Crossing.

7.9.12 The scheme comprises provision of the following HOV lanes:

HOV Lane across the Road Bridge to link into existing A90 and new A8000, plus HOV Lane from A90/new A8000 junction northwards across Forth Road Bridge to M90 junction 1;

And HOV Lane on northern bridgehead approach roads onto new Forth MMC, and across the Forth MMC to link into M9, plus HOV Lane from proposed M9 junction northwards across new Forth MMC to M90 junction 1.

7.9.13 The number of lanes would be the same under the Multi-Modal Crossing as under the road-only crossing, but some of the lanes provided would be allocated permanently to HOVs. There is therefore no additional capital cost associated with this reallocation of roadspace in favour of HOVs. The overall impact will be that there is no net increase in unrestricted road space compared to the existing situation (two unrestricted lanes available for general use in both directions), but considerable additional provision for HOVs (two HOV Lanes in each direction). This will augment the support for HOVs started by the Halbeath – Road Bridge HOV Lane.

Appraisal of New Multi-Modal Crossing with Road Space Reallocation

7.9.14 Apart from positive economic benefits resulting from a new crossing (discussed in greater detail in Chapter 10), the Multi-Modal Crossing would bring benefits in terms of improved accident rates (shown in Figure 10.9 below) and would be neutral with regard to integration and accessibility/social inclusion.

7.9.15 There would, however, be clear adverse environmental impacts, discussed in greater detail in the Technical Annex. The question, therefore, is whether the economic benefits for the SESTRAN region are sufficient to outweigh these environmental disbenefits?

7.9.16 In the event that a third Crossing was pursued then it is recommended that this should be a Multi-Modal Crossing, providing for new HOV Lanes on both the new bridge and existing Road Bridge, no additional road space for single occupancy cars, and future upgradability to facilitate a Cross Forth tram system. The combination of a new crossing with road space reallocation contains the increase in Cross Forth peak period car flows to around 40% more than the Reference Case by 2026, as illustrated on Figure 7.16.

7.9.17 If a new crossing is not provided then it will be necessary to restrict Cross Forth car demand, particularly in the peaks, by introducing high peak-period tolls to try and manage demand and by restricting bridgehead development that might add to existing bridge traffic. Even with such measures it is likely that the bridgehead area will suffer increasing peak delays and peak spreading, reliability of travel across the road bridge will deteriorate, routine bridge maintenance will become more difficult and traveller disbenefits will escalate. It is possible that the overall SESTRAN economy may suffer as a result.

Summary of the Case for a New Crossing

Public Transport improvements and higher car occupancy are able to offer palliative measures to offset existing congestion and cater for growth in demand for Cross Forth travel in the short to medium term. In the absence of additional Cross Forth capacity in the long term then the only alternative is to accept increasing congestion and "peak spreading" and make efforts to "choke off" travel through demand management. This will constrain growth in Cross Forth car flows but at the expense of relatively low growth in Cross Forth person trips, which may impact adversely on economic development of the study area.

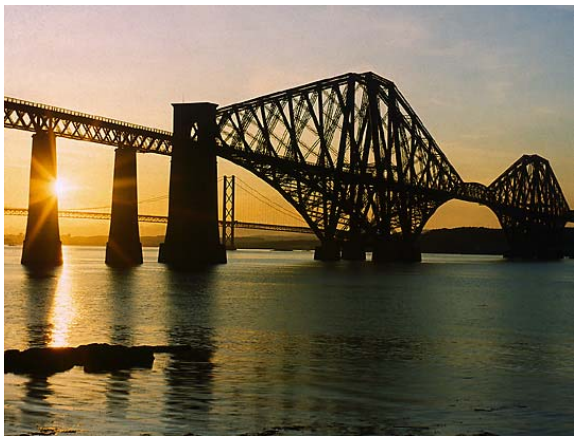
The dispersed nature of trip ends for Cross Forth travel coupled to increasing trends towards more flexible working hours makes it increasingly difficult to serve all of the Cross Forth travel demand through conventional public transport, and this will need to be extended to encompass car-sharing and the promotion of higher car occupancy.

In addition local authorities/regional transport partnerships can only adopt a "reactive" approach to increasing traffic on the strategic roads network, where the Scottish Executive is under no obligation to pursue traffic reduction policies. This places strain on local authorities through growing traffic decanting onto their roads from the Strategic Road Network. There is, of course, a two-way inter-relationship, because most of the traffic on the Strategic Road Network has originated on local authority roads. It is therefore essential that all Roads Authorities, Regional Transport Partnerships, FETA and the Scottish Executive work together to address the growing problem.

Given these pressures it will therefore be necessary to consider the provision of a third crossing of the Forth. A new crossing offering unrestricted road space to single occupancy vehicles will undo the positive impacts of improved car occupancy and public transport achieved in the short to medium terms, and will result in repeated congestion within a foreseeable timescale.

It is recommended that a new Forth Multi-Modal Crossing be provided. In combination with the existing Road Bridge, the Multi-Modal Crossing would offer increased road space allocation to High Occupancy Vehicles and no additional road space to single occupancy cars. It would also be upgradable to facilitate a Cross Forth tram system should extension of Edinburgh's LRT network to Fife be promoted in the future.

Although there will be environmental disbenefits associated with the building of a new crossing, some of these exist only during construction and others can be offset against the adverse environmental impact of increasing congestion around the existing bridgeheads if no third crossing is provided. The remaining environmental disbenefits may be outweighed by considerable other benefits, particularly for the continued economic development of the SESTRAN region.



Chapter 8

RISK & UNCERTAINTY

8. RISK & UNCERTAINTY

8.1 Introduction

8.1.1 STAG recognises that *"in appraisals there is always likely to be some difference between what is expected, and what eventually happens, because of biases unwittingly inherent in the appraisal, and risks and uncertainties that materialise."*[51]

8.1.2 In order to take account of these risks and uncertainties transport appraisals incorporate Optimism Bias and risk-adjusted "expected values" along with an allowance for contingencies. Generally in the earliest stages of appraisal very broad-brush factors for Optimism Bias will be applied. As schemes progress through the appraisal process their detail becomes more defined with appropriate contingencies identified and uncertainties clarified, and accordingly the application of broad-brush uplift factors becomes unnecessary.

8.2 Optimism Bias for Initial (STAG Part 1) Appraisal

8.2.1 The schemes identified as part of this study vary widely in scale and complexity, from non-infrastructure measures (such as improved travel plans and public transport marketing) through modest infrastructure improvements (e.g. bus priority lanes) up to major new structures (e.g. the new Forth MMC). Scheme definition for STAG Part 1 was necessarily low, and accordingly the default levels for Optimism Bias were applied, viz.:

- Capital and Operating Costs – 44%

8.3 Optimism Bias for Detailed (STAG Part 2) Appraisal

8.3.1 The same levels of Optimism Bias were adopted for the purposes of STAG Part 2 appraisal.

8.3.2 Although more detailed designs have been prepared for each of the schemes considered, in no case are these designs sufficiently far advanced as to include the calculation of contingencies and hence expected values. Accordingly the Optimism Biases described above have not been netted off against any other risk related values and hence there is no double-counting of risk.

8.4 Sensitivity Analysis

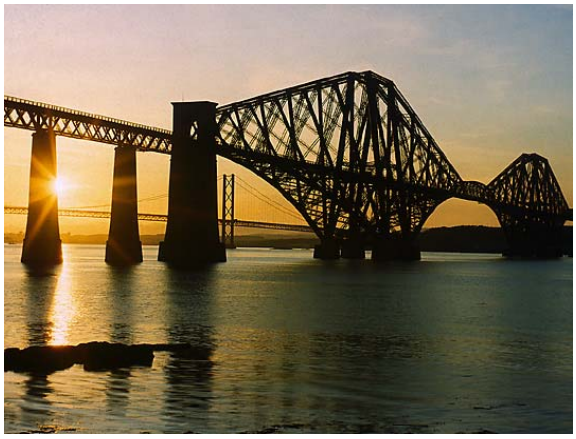
8.4.1 *"The future is inherently uncertain. Therefore it is also essential to consider how future uncertainties could affect the choice between options."*[52]

8.4.2 For the purposes of this study the following sensitivity tests were carried out:

- Introduction of Congestion Charging in Edinburgh; and
- Failure to provide Edinburgh Airport Rail Link.

8.4.3 These sensitivity tests were applied at the SESTRAN level, that is globally to all five corridors in the study area, rather than on an individual corridor-by-corridor basis. The results are therefore reported in the overall SITCoS Study Report.

[51] STAG, section 12.1.1
[52] STAG, section 12.7.1



Chapter 9

MONITORING & EVALUATION

9. MONITORING & EVALUATION

9.1 Explanation

9.1.1 The two processes can be distinguished as follows:

Monitoring An on-going process to measure progress towards a set of agreed targets.

Evaluation A specific one-off activity to investigate project performance in depth.

9.2 Monitoring

9.2.1 *"Monitoring is the process of gathering and interpreting information on the performance of a project. This process should be an on-going one and may take place in conjunction with other information gathering exercises..."*[53]

9.2.2 The scale of the corridor, and the varying timescales involved, poses challenges in devising a suitable monitoring regime, and in sustaining the production of time-series data over long periods. A six monthly monitoring programme is described in the Technical Annex, based around key performance indicators (KPI's) related to most of the Planning Objectives. The principal focus will be on stabilising and then reducing congestion on Cross Forth movements, whether by rail or road.

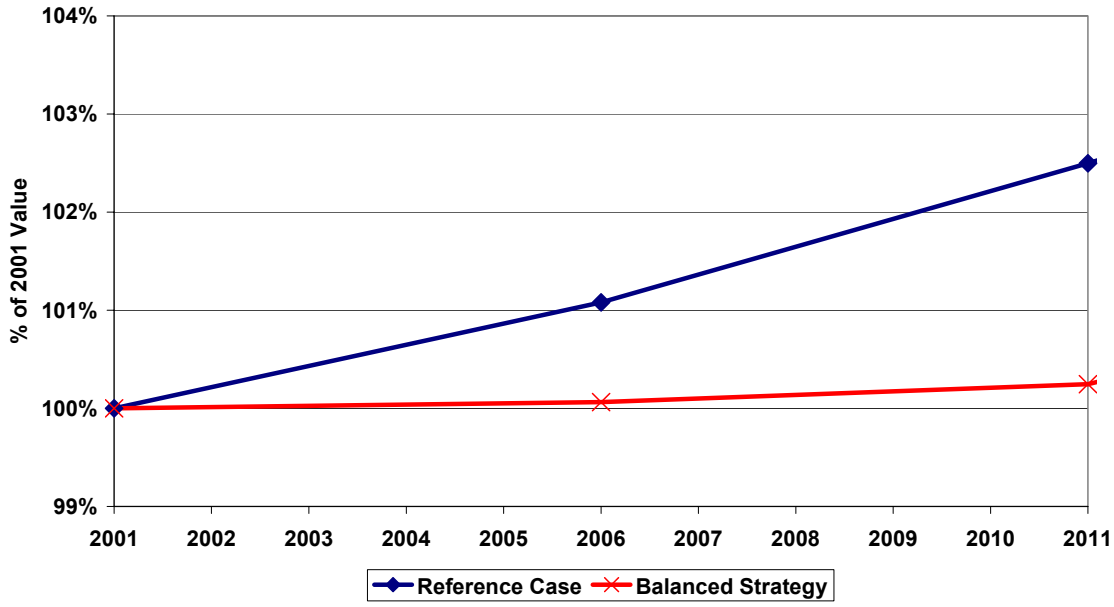
9.2.3 As discussed later, in Chapter 11, a package of measures encompassing short and medium terms will be proposed, the intention being to minimise the adverse impacts of growing congestion until a long-term scheme can be identified and delivered.

9.2.4 However this approach requires the need for very careful monitoring of trends such as peak hour traffic on the Road Bridge. There will be a need to determine yardsticks that trigger the inception of long-term projects in sufficient time so that they can contribute to preserving the overall aim to minimise Cross Forth congestion.

9.2.5 The impact of some of these short-term measures can be illustrated graphically below in Figure 9.1, which shows that although each individual measure may not be able to stabilise or reduce congestion by itself, the cumulative impact of all short and medium term schemes in a balanced strategy will contribute towards achieving this aim.

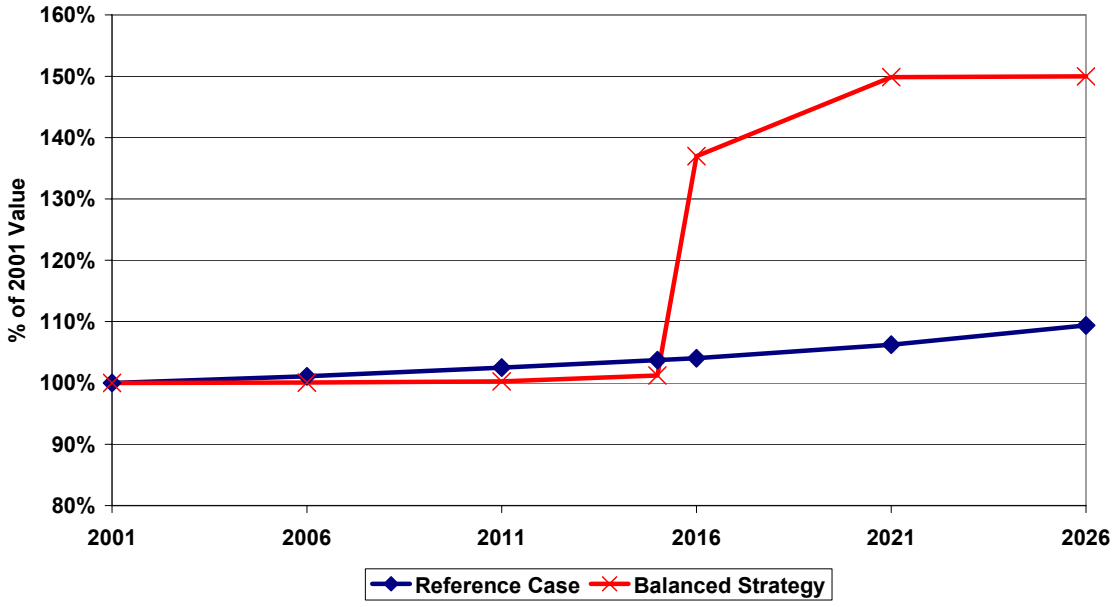
[53] STAG, section 15.3.1

Figure 9.1: Cross Forth Car Flows (Southbound 0700-1000) 2001 - 2011



9.2.6 However there may be other adverse impacts, such as the level of ongoing background growth. In Figure 9.2 the cumulative impact of the short and medium term schemes is to restrict peak period traffic below the Reference Case levels through until 2015 (when the Forth Multi-Modal Crossing is assumed to open).

Figure 9.2: Cross Forth Car Flows under Reference Case Land Use Scenario (Southbound 0700-1000)



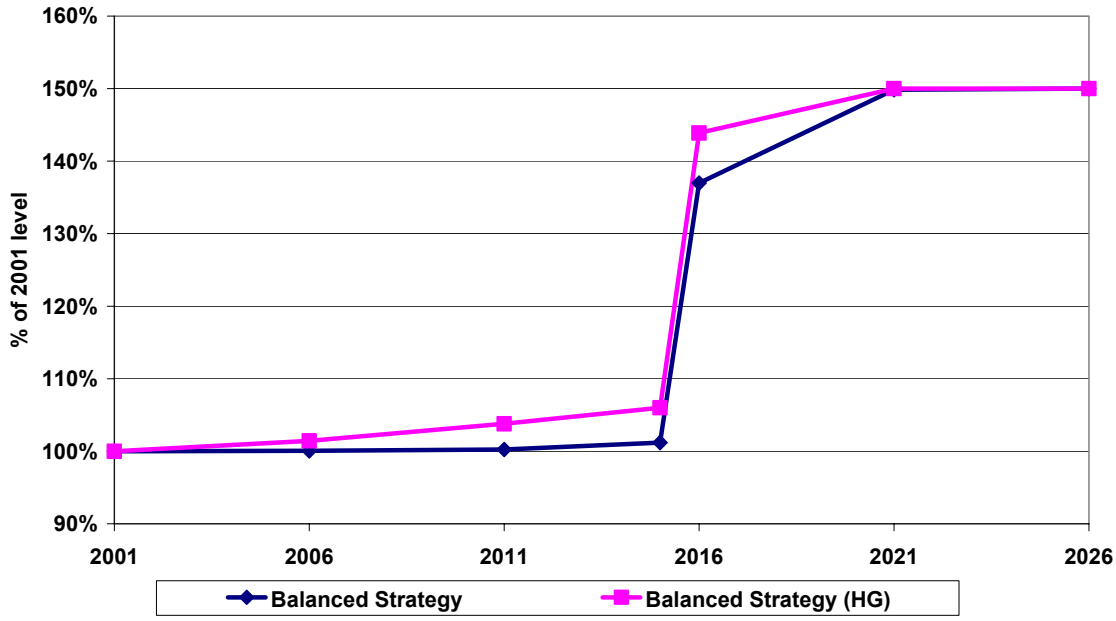
9.2.7 Any short-term reductions in car flows during the peak will be absorbed by:

- A reduction in Peak-Spreading – drivers unable currently to use the Forth Road Bridge in the peak hour due to congestion will take advantage of the reducing demand for car travel to concentrate their own travel at more "convenient" times; and/or
- Latent Demand – users currently discouraged from crossing the Forth by car due to congestion will take advantage of the reduction in demand from existing users.

9.2.8 As a result in the AM peak hour it is unlikely that any reduction in car use will be observed.

9.2.9 With High Growth as shown in Figure 9.3 the benefits of the schemes are more rapidly eroded, and longer-term mitigation measures will need to be identified.

Figure 9.3: Cross Forth Car Flows under High Growth Land Use Scenario (Southbound 0700-1000)



9.2.10 The comparative impact of Reference Case and High Growth on Cross Forth car flows and public transport demand is illustrated in Figures 9.4 and 9.5 respectively. This highlights the fact that High Growth only creates around 5% more car trips and public transport demand across the Forth in the AM peak, and therefore the greatest impact will come from underlying traffic growth and existing Structure Plan commitments. There will also be peak-spreading impacts – see section 10.2.

Figure 9.4: Impact of High Growth Land-Use on Cross Forth Car Flows (Southbound 0700-1000)

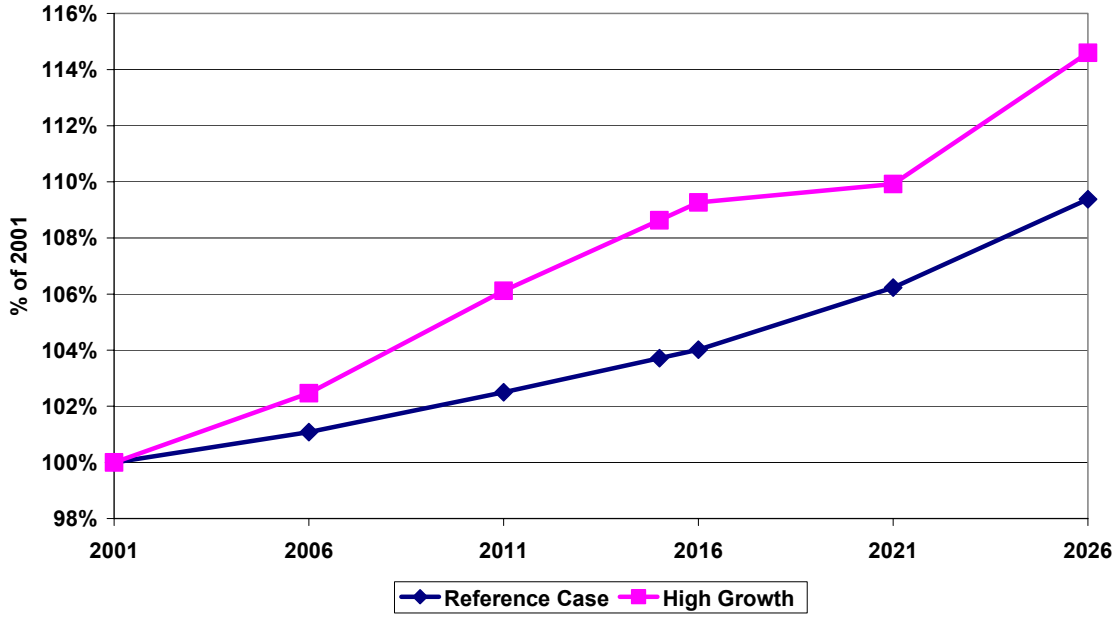
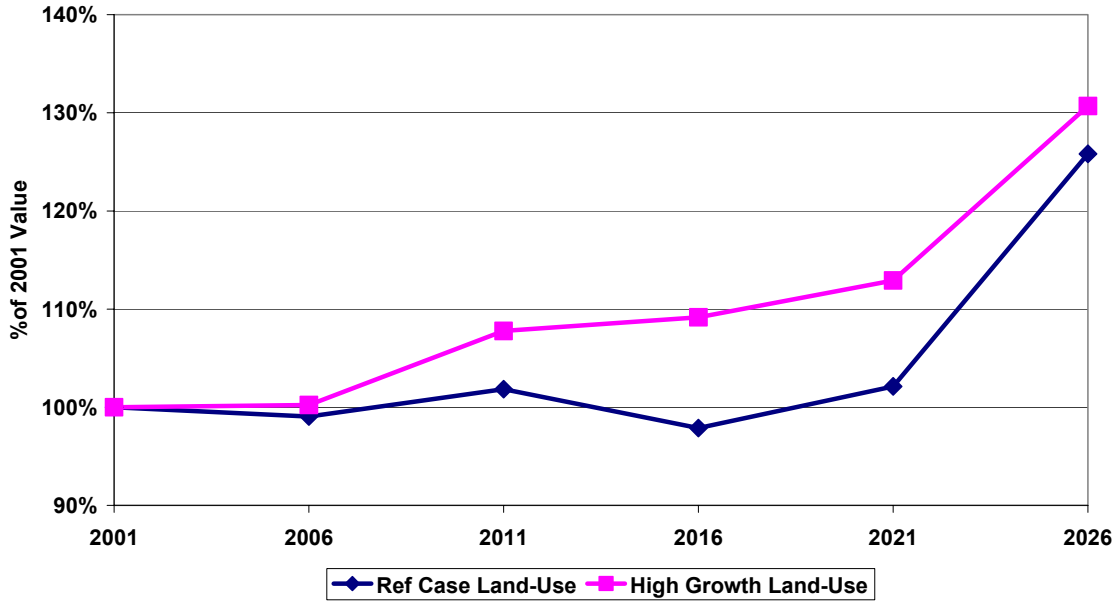


Figure 9.5: Impact of High Growth Land-Use on Cross Forth Passenger Transport Demand (AM Peak Hour southbound)



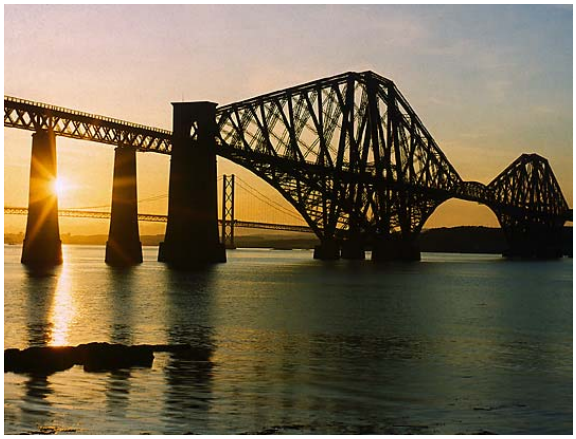
9.3 Evaluation

9.3.1 *"It is necessary to demonstrate at the post-implementation stage of a project how effectively that project has met the established objectives."*[54]

9.3.2 Given the long timescales pertaining to this corridor, it is unlikely that a meaningful outcome evaluation can be undertaken – this usually attempts to measure the "success" of the project, measured against the original objectives. However it may be worthwhile to carry out a so-called process evaluation, which tests the success of the implementation of each project component.

9.3.3 Because this study results in the recommendation of a package of measures, it is likely that the process evaluation and monitoring would be combined, with regular reports produced for SESTRAN and its local authority partners outlining progress with each measure and the degree to which targets are being achieved. This will allow informed choices about when to trigger inception of the long-term projects, if at all.

[54] STAG, section 15.8.1



Chapter 10

OTHER ISSUES TO BE CONSIDERED

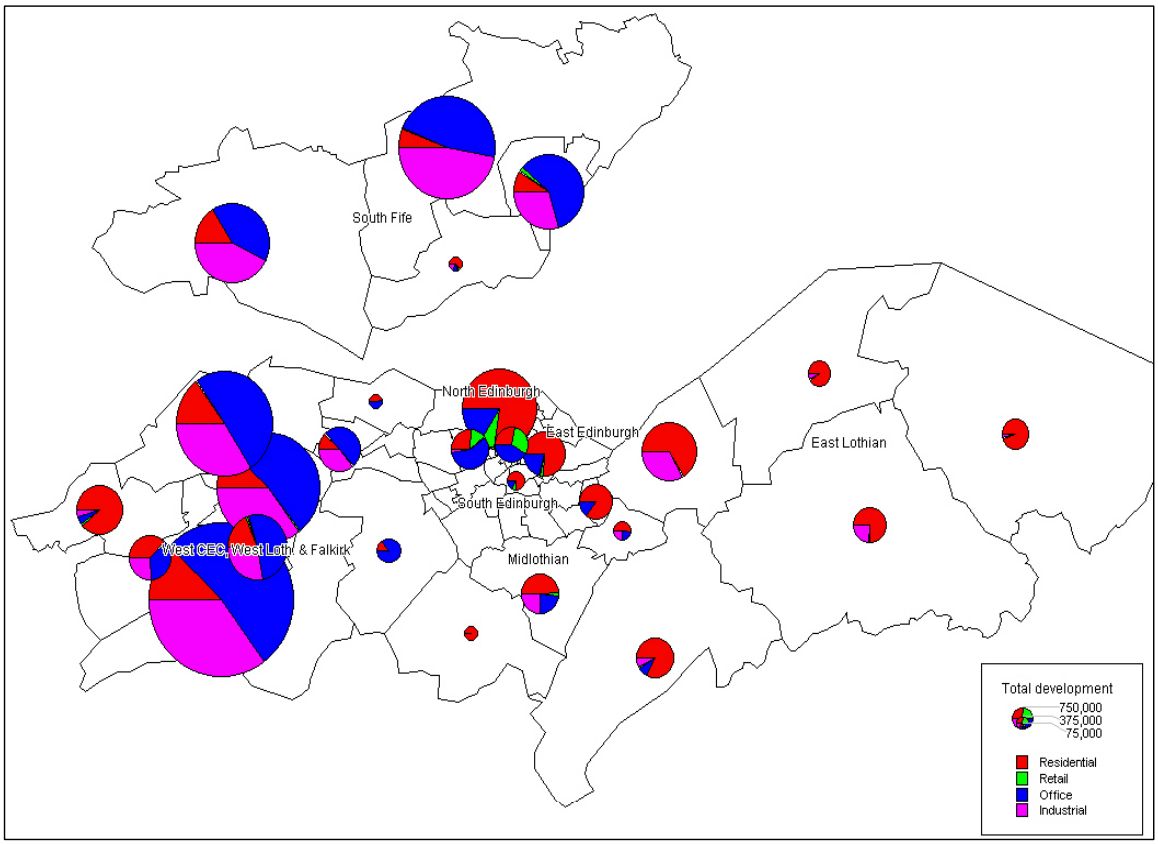
10. OTHER ISSUES TO BE CONSIDERED

10.1 Impact of Alternative Land Use Scenarios in Fife

10.1.1 The Reference Case, against which the impacts of the various strategies have been assessed, was based on the existing Approved Structure Plans for Fife[55] and Edinburgh & The Lothians[56]. These plans were reflected in the modelling undertaken for the study, which predicted how much (if any) of the available land would be utilised for development in each year of the study period.

10.1.2 Total development inputs are shown in Figure 10.1.

Figure 10.1: Total Development Input to SITCoS Reference Case 2001-2026



10.1.3 This demonstrates a particular concentration on development in west Edinburgh, West Lothian, south Fife and north Edinburgh. These developments are reflected in the predicted growth in Cross Forth trips shown throughout the Corridor Report and its Technical Annex – refer to the Technical Annex for further information. As discussed later, in fact this additional demand cannot be accommodated during the current peak hours within existing infrastructure and the result is "peak-spreading".

[55] Fife Structure Plan (*Fife Council*, July 2002)
[56] Edinburgh & The Lothians Structure Plan, Finalised Plan (*City of Edinburgh Council & others*, March 2003)

10.1.4 Fife Council have been reviewing their Structure Plan, and in doing so have included a variety of different options. This has included the possibility of releasing more development land in Fife, particularly for housing, and reviewing the geographical boundaries within which this land should be released.

10.1.5 During the course of the SITCoS study, two alternatives to the Approved Structure Plan emerged, viz:

- Option 6 – Releasing additional land beyond that envisaged in the Approved Structure Plan, principally in mid Fife (i.e. outwith the northern bridgehead area); and
- Option 8 – Also releasing additional land in mid Fife, but this time including some development in south Fife around the northern bridgehead.

10.1.6 Following further discussions, it was identified that in the event of development taking place in the northern bridgehead, as envisaged by Option 8, it would be important to maximise public transport mode share in south Fife in order to avoid over-burdening the Cross Forth infrastructure. This resulted in the development of a so-called Option 8B which incorporated concentrations of housing density around transport nodes in south Fife to encourage maximisation of public transport mode share. Option 8B is illustrated in Figure 10.2.

10.1.7 The impact of these land-use scenarios on person trips is illustrated in Figure 10.3.

Figure 10.2: Fife Council Land Use Option 8B Proposed Development

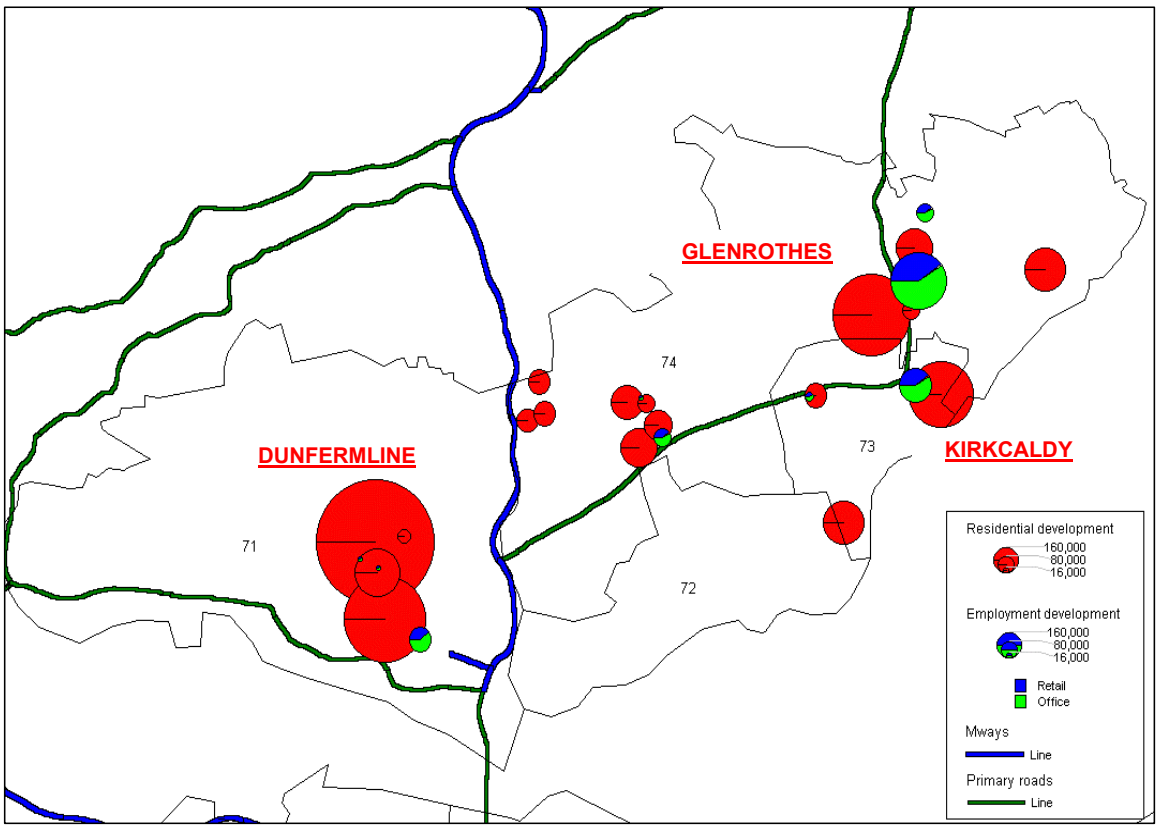
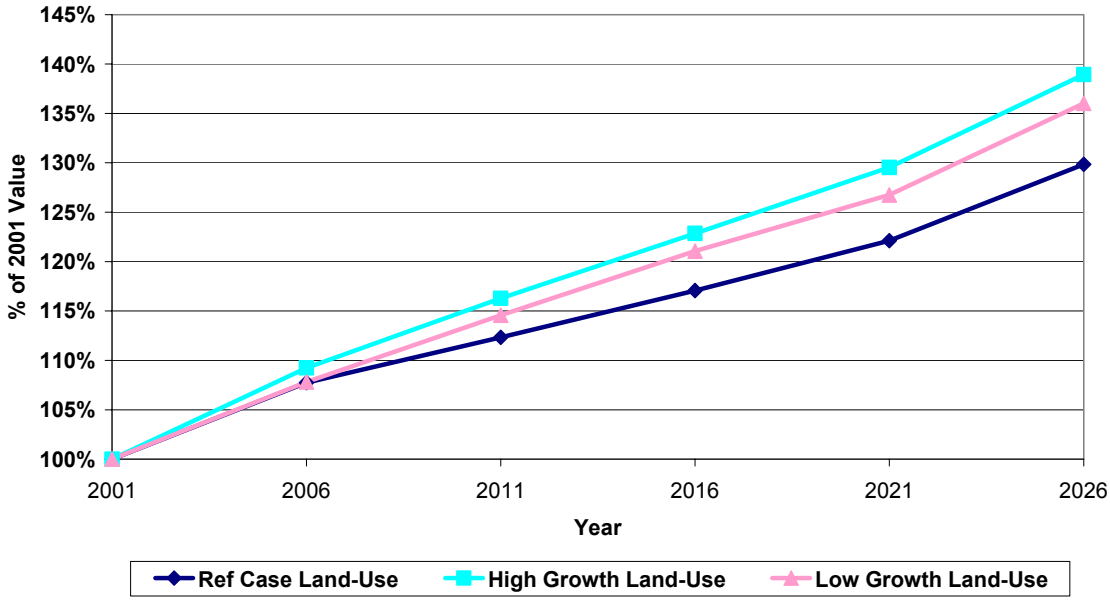


Figure 10.3: Growth in Cross Forth Person Trips (12-hour period, 0700-1900)



10.1.8 This shows that under the Reference Case (i.e. the current Approved Structure Plan) an increase in Cross Forth people movements of 30% is predicted between 2001 and 2026. In the event of the adoption of Option 6, with increased releases of land in the mid Fife area, then a "Low Growth Scenario" can be predicted, which anticipates an increase in Cross Forth movements of around 36% over the same period. Finally in the event that Option 8B is adopted, with release of additional land in south Fife, then a "High Growth Scenario" can be predicted anticipating about a 39% increase in Cross Forth movements from 2001 to 2026.

10.1.9 Unless stated otherwise the Corridor report and Technical Annex give comparisons with the Reference Case for each Strategy. The impact of a High Growth land-use scenario is discussed where appropriate, giving an upper bound for predicted traffic, for further discussion refer to Technical Annex.

10.1.10 Adoption of a High Growth land use scenario impacts on Cross Forth flows, and under Do-Minimum conditions (without the adoption of any of the strategies outlined in this study) the High Growth Scenario would generate **additional** person trips equivalent to about 7% of the 2001 level by 2026 over and above the Reference Case (i.e. the current Structure Plan).

10.1.11 In considering land use scenarios and their impact on demand for Cross Forth travel it would appear that by 2026 a High Growth Scenario would increase travel by:

- 3.9% for Public Transport; and
- 4.8% for Cars.

10.1.12 These factors need to be taken into account when reviewing the impact of the Strategies set out later, particularly the Long Term Strategies.

10.2 Peak-Spreading

10.2.1 The outputs from the modelling process do not directly simulate "peak-spreading", where traffic which is unable to cross the Forth Road Bridge at the peak periods when the bridge is running at maximum capacity "spreads" progressively into the peak shoulders, resulting in the bridge running at maximum capacity for longer periods each year.

10.2.2 A simple simulation of the impact of peak-spreading was prepared as described in the Technical Annex, and illustrated for a selection of scenarios in Figures 10.4 to 10.6 (more information is available in the Technical Annex – but it should be noted that these Figures are broadly indicative only, and not prepared to the same degree of accuracy as the other modelling outputs).

Figure 10.4: Peak Spreading in Reference Case

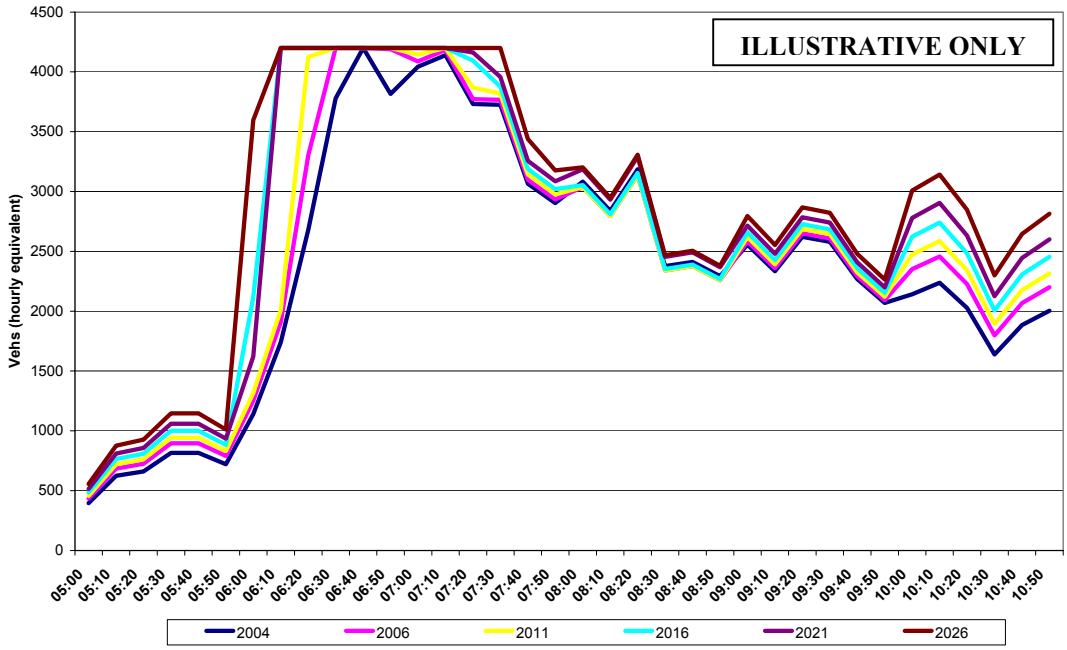


Figure 10.5: Peak Spreading under a long-term roads-based strategy, with a new Road Bridge

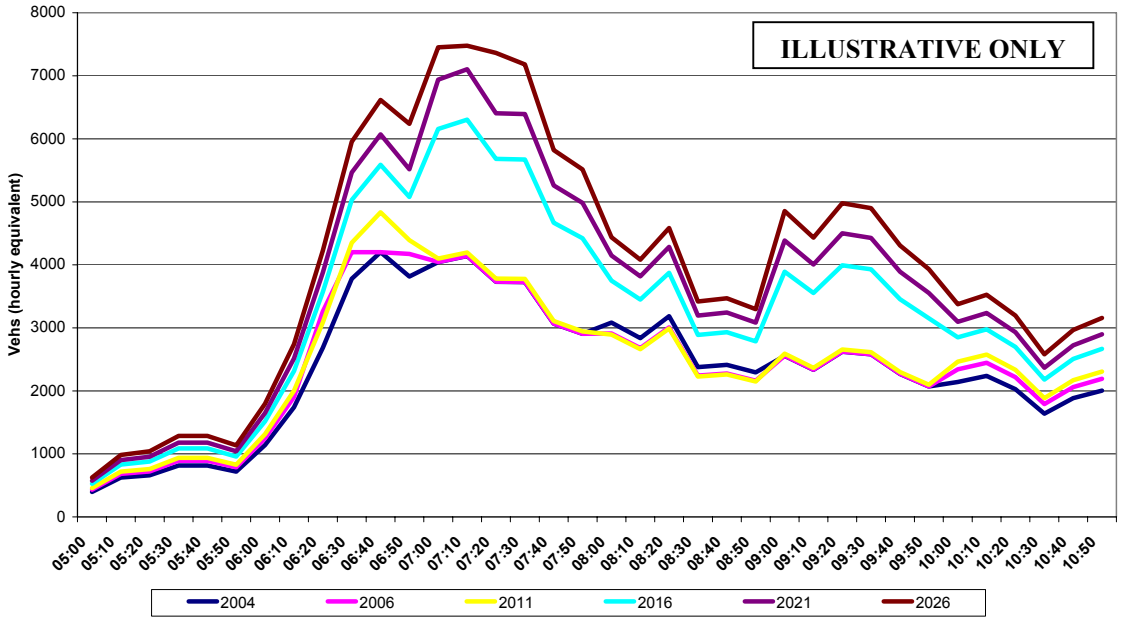
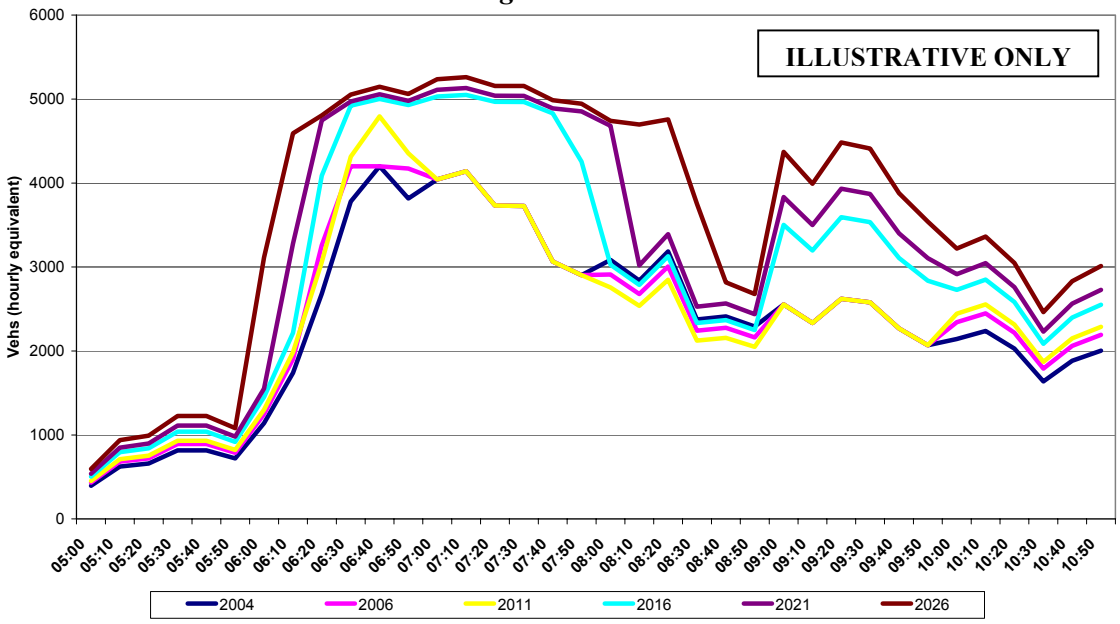
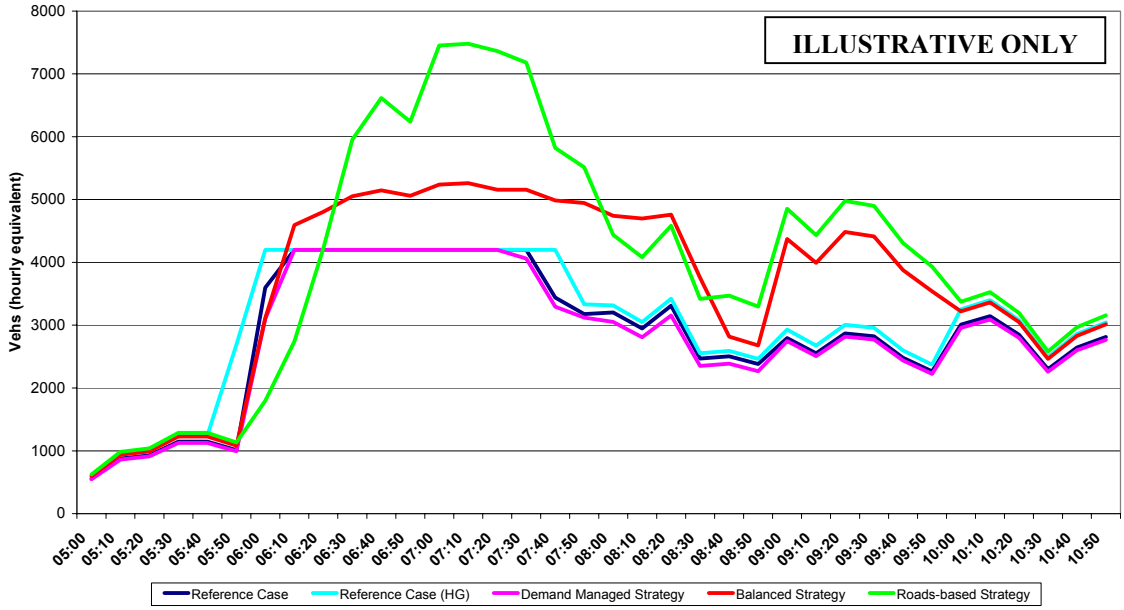


Figure 10.6: Peak Spreading under a balanced long-term strategy, including a new Multi-Modal Crossing



10.2.3 Figure 10.7 suggests that under the Reference Case situation in 2026 the Road Bridge will be running at equivalent hourly flows in excess of 3500 vehicles/hour from about 0600 to 0740; under the High Growth land-use scenario this period extends to about 0600-0750. Under a medium-term demand managed strategy, without additional road capacity of any kind, this period is about 0600-0740, similar to the Reference Case.

Figure 10.7: Peak Spreading under various Long Term Strategies – 2026



10.2.4 For a roads-based long-term strategy it should be noted that traffic would flow at volumes in excess of the current maximum (4200 vehicles/hour) from about 0620 until 0950 (with a short respite between 0830 and 0900). Traffic on surrounding roads would therefore be flowing at levels around the very height of the current AM peak for more than 3½ hours.

10.2.5 Under a balanced long-term strategy, with an additional crossing but extra lanes provided solely for HOVs, traffic flows in excess of 4200 vehicles/hour are reached around 0600 (about the same as under the Reference Case) and are sustained until about 0830, with a short secondary peak between 0900 and 0940. The peak flows are lower than under a roads-based strategy, but the peak is more spread out. Nevertheless it is clear that adopting a strategy based on an additional crossing of the Forth will place further stress on the surrounding road network (e.g. the M90).

10.3 Problems Facing the Strategic Road Network

10.3.1 There is a division in responsibility for roads within Scotland between the Scottish Executive, which controls the Strategic Road Network (i.e. the Trunk Roads), and local authorities, which control the remainder of the roads. This can create a "tension" particularly at the interface between Trunk and non-Trunk Roads, with local authorities needing to adopt road traffic reduction strategies on their own networks but unable to take action to reduce the traffic "decanting" onto their networks from the Trunk Roads. There is no obligation placed on the Scottish Executive to pursue road traffic reduction, although local roads authorities do have such obligations, and there is no formal National Transport Strategy.

10.3.2 There is a symbiotic relationship between traffic on local authority roads and the Trunk Road Network. Most traffic on the latter originates on the former, but traffic from Trunk Roads then usually decants onto local authority roads that act as local distributors. The Roads Authority involved at origin may, or may not, be the same one as that involved at the destination.

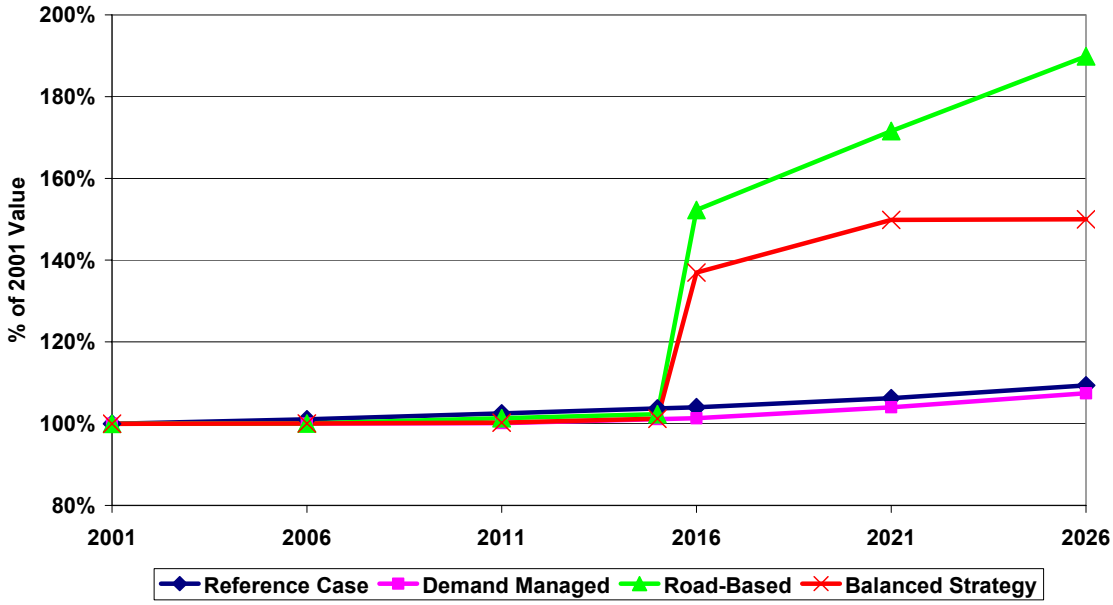
10.3.3 Local roads authorities must therefore take measures to react to increasing traffic on roads for which they are responsible, and do so in a sustainable manner, but without the ability to directly influence traffic on the Strategic Roads Network. This is a significant challenge for roads authorities, such as Fife Council, West Lothian and SESTRAN in the study area.

10.3.4 There are considerable mutual benefits to be gained through a constructive relationship between local Roads Authorities, Regional Transport Partnerships, FETA and the Scottish Executive that places overall traffic growth reduction at the core of all policies.

10.4 The Case For and Against a New Crossing

10.4.1 Chapter 7 has already set out a discussion regarding the merits of the case for providing a new Forth crossing. Taking account of the future impacts of the short and medium term measures it is likely that the palliative affects as regards Cross Forth travel congestion will have been largely exhausted by 2011. As can be seen in Figure 10.8 below, even the demand managed strategy cannot contain traffic at or below 2001 levels, although it is successful in restricting growth in traffic below that predicted in the Reference Case.

Figure 10.8: Southbound Cross Forth Car Traffic (0700-1000)[57]



[57] This graph is for cars (including light goods vehicles) – given that heavy vehicles constitute a very small proportion of total peak traffic, the situation for all vehicle types will be similar.

10.4.2 Accordingly it is essential to have a long term strategy defined that takes account of the finite impact of the short and medium term measures, and identifies a further solution able to take up the strain in the long term, unless the overall need (and desire) to travel can be reduced. In the review of best practice set out in Chapter 7, the two Swedish examples cited demonstrated a positive shift in mode share in favour of public transport, although this trend is not common anywhere in Europe. This suggests a need for a concerted suite of co-ordinated measures as described in Chapter 7.

10.4.3 In this study area one particular difficulty is that destinations south of the Forth are relatively dispersed (see Figure 2.4) and that rail is already achieving a high modal share on journeys into central Edinburgh. Thus improvements to existing public transport need to concentrate on more flexible responses such as the bus services proposed on Figure 7.6, but it must also be acknowledged that some origin/destination patterns are so dispersed as to make public transport facilities uncommercial and difficult to justify as good value-for-money for subsidies.

10.4.4 Demand Management would be introduced in the medium term to control Cross Forth people movements building on the short-term measures.

10.4.5 The long-term options once short/medium term measures are exhausted have been identified as follows:

- Building a new road crossing, effectively doubling the existing Cross Forth road capacity for all categories of vehicle (Roads-Based Strategy); or
- Building a Forth Multi-Modal Crossing to facilitate Cross Forth travel by all modes, with particular emphasis on High Occupancy Vehicles and, possibly, LRT in the longest term (a Balanced Strategy).

10.4.6 Figure 10.8 also gives an indication of the projected impacts of the various strategies up to 2026 (the limit of the current modelling). This highlights the danger that simply providing additional Cross Forth road capacity needs to be accompanied by other measures if the additional capacity is not to be rapidly exhausted.

What if no New Crossing is Provided?

10.4.7 Non-provision of a third Forth crossing will require a demand management regime based on optimum tolling. From the series of tolling tests undertaken, the optimum tolling regime to control Cross Forth traffic is:

- Significant SOV tolling
  - Peak hour £2 each way (i.e. if one-way tolling is in place, as at present, the toll would be £4);
  - Hour each side of Peak Hour £1 each way; and
  - Other times 50p each way
- HOV tolls unchanged from present

10.4.8 The disbenefits of failing to provide long term enhanced Cross Forth capacity have already been described in Chapter 7, but bear repeating here, viz.

- High peak period tolls to discourage peak hour use of the road bridge;
- Restrictions on any bridgehead economic development that places additional stress on Cross Forth travel;
- Increasing peak period delays for travellers and deteriorating reliability;
- Further peak spreading;
- Difficulty in conducting even routine maintenance on the road bridge;
- Considerable traveller disbenefits; and
- Possible adverse impacts on the SESTRAN economy.

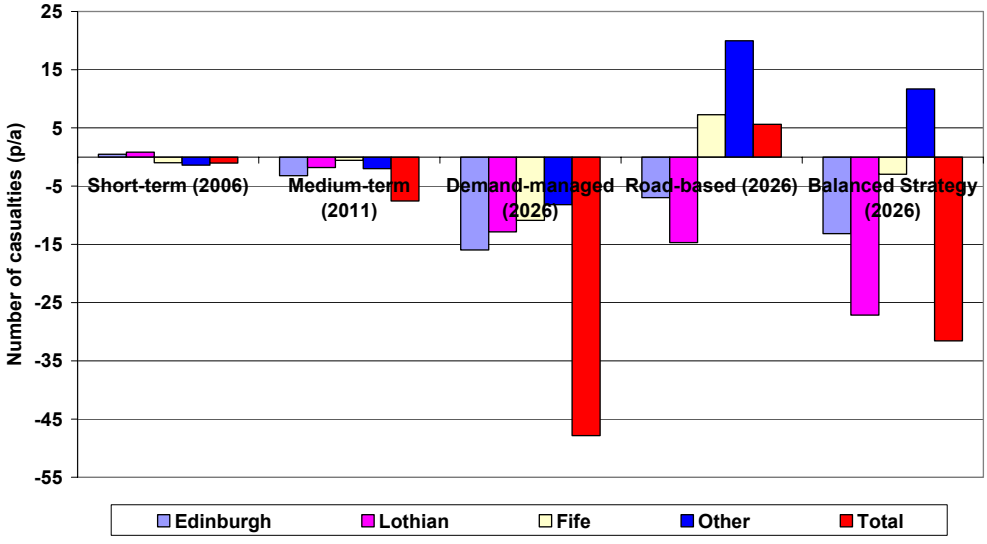
10.4.9 As a simple illustration of the situation that could result, with the existing Cross Forth infrastructure and current rates of traffic growth it is likely that congestion akin to the existing peak periods would persist all day in the bridgeheads. Figure 10.8 demonstrates that the demand management solution is able to make only a marginal impact on Cross Forth car movements in the AM peak.

What if a New Road Bridge is Provided?

10.4.10 Also as previously discussed, providing additional unrestricted road space through a new crossing will have immediate positive benefits for congestion but is likely to lead to escalating growth in Cross Forth car trips, and within just 10 years of opening the three bridges would be predicted to be coping with person trips almost 55% greater than those in 2001. More tellingly, reference to Figure 10.8 shows that by 2026 southbound peak period traffic would have reached about 190% of 2001 levels and that if its growth continued unchecked then by about 2031 all the additional capacity would have been exhausted.

10.4.11 It is clear that providing unrestricted additional road space will simply lead to a duplication of the existing congested situation at a foreseeable future moment in time, although (as discussed later in Chapter 11) this may not be at the existing Edinburgh pinch-points. Unrestricted additional road space will also have an adverse impact on accident rates as summarised in Figure 10.9 below.

Figure 10.9: Accident Rates for each Package of Measures



10.4.12 In contrast, the Multi-Modal Crossing (when offered as part of the Balanced Strategy incorporating measures favouring public transport, HOVs and Park & Choose) contains growth in peak traffic to around 50% by 2026 compared to 2001 (see Figure 10.8). It also offers significant improvements to accident rates (see Figure 10.9). This issue will be addressed in greater detail in Chapter 11.

10.5 Upgradability

10.5.1 The bus services set out in the Short Term recommendations are able to provide an immediate contribution to mitigating the worst aspects of Cross Forth road traffic congestion, and it is important that the provision of these bus services is fully integrated into wider transport-land use planning. Bus services, although they may lack the fixed route of rail-based public transport, can form significant transport corridors in their own right and they should not be viewed as some sort of "after-thought".

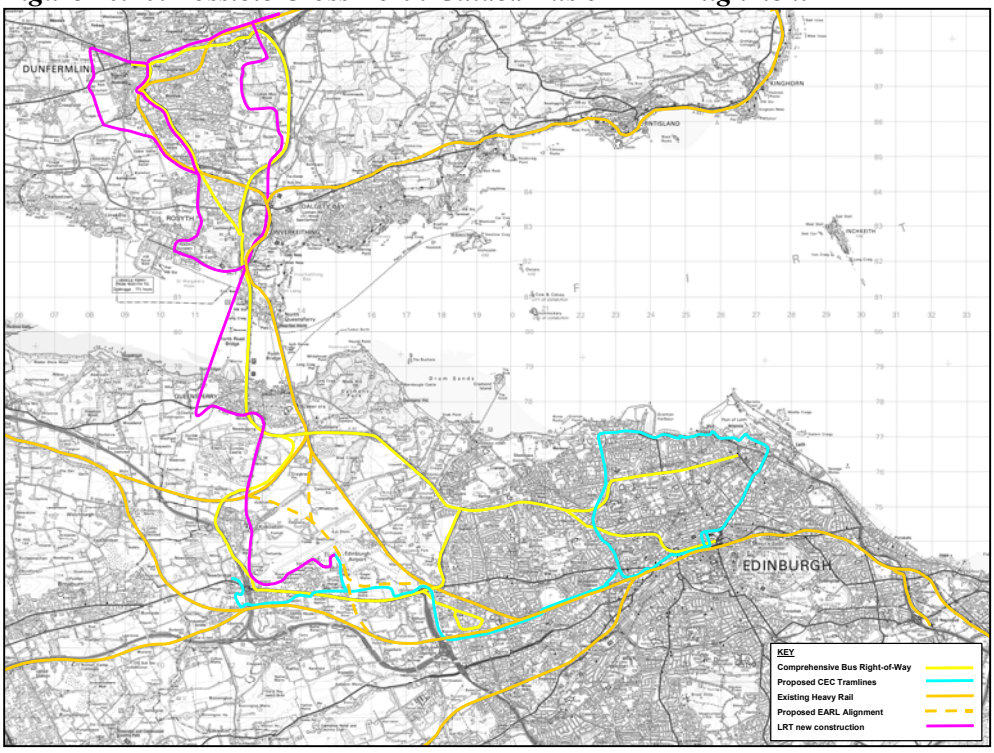
10.5.2 Development that focuses solely on car-based transport is likely to overload the transport infrastructure of south Fife and may therefore fail in its aim of encouraging expansion of the Fife economy. It is also likely to be a significant issue taken into account by the Reporter at any Public Inquiry into development proposals.

10.5.3 The need for sustainable transport is set out in SPP2, SPP3 and SPP17, to which reference has already been made. Reference to Figure 7.2 suggests that the underlying increasing demand for Cross Forth person trips, based on existing Structure Plans, accounts for about ¾ of the total anticipated demand resulting from the High Growth Land Use case in 2026.

10.5.4 Although the initial (STAG Part 1) appraisal of options for mitigating Cross Forth traffic congestion ruled out LRT as a medium-term proposition, it remains possible that developments both in longer term demand and in new technology would combine to make guided bus or LRT worth reconsidering at some point in the future; section 5.3.4 describes the possibility that a future business case could be made for a busway. Given the difficulties of retro-fitting busway/LRT schemes into existing developments, it is right to consider these future possibilities to ensure suitable public transport alignments for bus, LRT and heavy rail are identified and (where appropriate) safeguarded.

10.5.5 Figure 10.10 sets out the suggested alignments if future upgrading from Bus Right-of-Way to guided bus or LRT is pursued. For comparison the Bus Right-of-Way network is also highlighted. All sections of routes shown are worthy of consideration for safeguarding in future Local Plans, for initial development as bus-based corridors and possible future upgrading to LRT.

Figure 10.10: Possible Cross Forth Guided Bus or LRT Alignment



10.6 Dual Running

10.6.1 Dual Running (i.e. mixing heavy and light rail operations on the same tracks) had been considered at an early stage in the study. There are considerable operational and engineering obstacles to dual running including widely varying standards of signalling, track maintenance tolerances, platform infrastructure and provision of suitable overhead electrification for light rail.

10.6.2 Dual running has only been adopted once in the UK, on the Tyne & Wear Metro's Sunderland extension where tracks are shared between approximately 6 Metro trains and up to 3 other trains per hour. However it should be noted that the Tyne & Wear Metro has many characteristics of a heavy-rail service, including raised platforms and comprehensive signalling, and Metro trains are not suitable for on-street running; dual-running is not recommended for the Fife Circle.

10.6.3 In the event that in the future light rail was considered in south Fife it would be necessary to:

- **either** withdraw the existing heavy rail service on sections of the Circle (e.g. Inverkeithing – Dunfermline – Thornton Junction) and replace it wholly with a light rail operation, hence disrupting the long-established operation on the Fife Circle, particularly south and east of Dunfermline;
- **or** route the light rail alignment away from existing heavy rail lines, in which case alignments would be broadly similar to the proposed Comprehensive Bus Priority route (see Figure 10.10).

10.6.4 Alternatively it might be feasible to operate the heavy and light rail lines as parallel single-tracks using the existing double-track alignments, but this would severely constrain frequency and reliability on the single-track sections, and is not recommended.

10.7 Economic Impacts of New Crossings

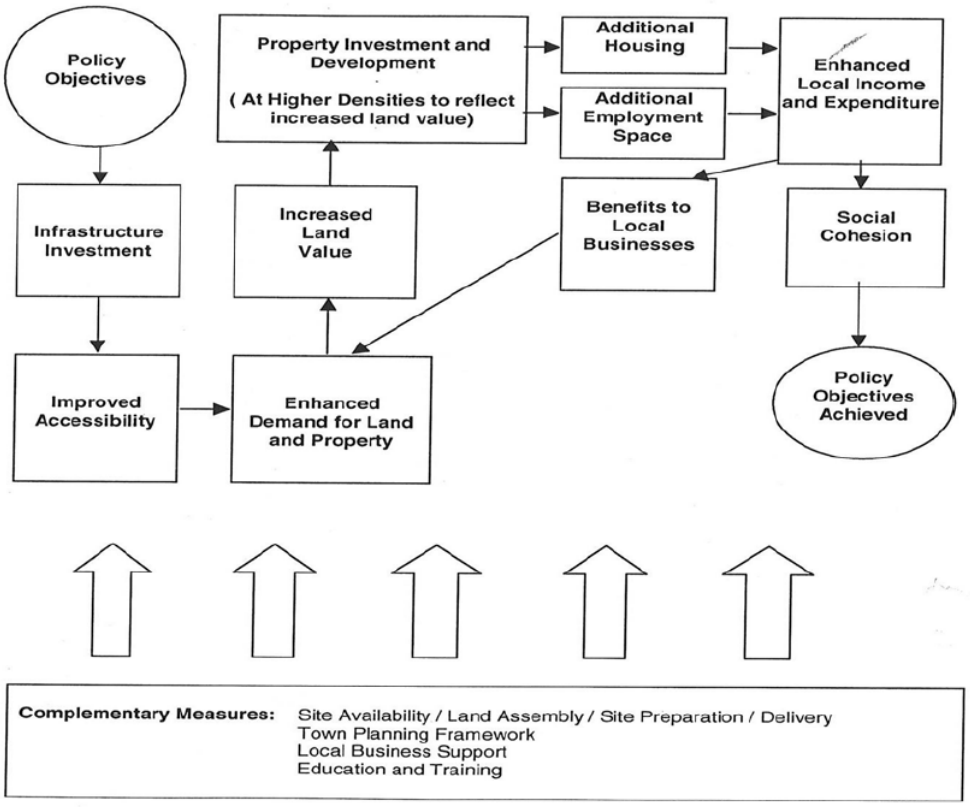
10.7.1 By their very nature, there are few new river crossings constructed in any given period of time. "Before and After" studies may not have been undertaken, and in any case each new crossing could have such uniquely localised impacts that the impact of one crossing cannot serve as indicator of possible impacts elsewhere.

10.7.2 Nonetheless it is simply commonsense to expect that providing a new crossing will have some sort of impact on the surrounding economy, and that in the event of a major crossing these impacts may be at the regional or even national scale. Similarly it is seems logical to conclude that provision of a second crossing parallel to an existing crossing will have a less marked impact that the original crossing.

10.7.3 In work carried out for a possible new river crossing of the Thames ("The Thames Gateway Bridge") consultants for the Greater London Authority developed an explanatory model of the relationship between transport infrastructure and economic impacts such as regeneration. The diagram in Figure 10.11 provides a summary of this model – for more information refer to the source reports[58].

10.7.4 This flowchart suggests that improved accessibility will (indirectly) lead to property development and additional housing and employment space, enhancing local income and expenditure.

Figure 10.11: Economic Impacts of Transport Infrastructure



[58] Thames Gateway Bridge Regeneration Statement (*Greater London Authority*, July 2004), Figure 4.5

10.7.5 There is an assumption that "*physical access is required to open up sites for development – for sites to be attractive for employment uses they must be accessible for employees, customers and suppliers and for residential uses they need to have access to a range of employment, retail, leisure and social opportunities, including public and community services*"[59].

10.7.6 The report goes on *"the scale of the economic impacts of infrastructure investment depends on a number of factors related to the current economic situation and transport provision in the area around the proposed infrastructure. Previous studies … have identified significant potential for [economic] impacts from major transport infrastructure schemes, subject to a number of conditions*

- *The infrastructure provides genuine additionality in transport access – the area is not currently easily accessible anyway;*
- *The area contains a mix of uses for which transport provides a significant stimulus – certain employment uses and tourism and the potential for higher residential density;*
- *It is undertaken with the grain of the market and preferably in a location which already has some regeneration activity and market interest; and*
- *It is co-ordinated with other public investment and has a favourable public policy, including planning, framework.*[60]*"*

10.7.7 Applying this "test" to a third Forth Crossing:

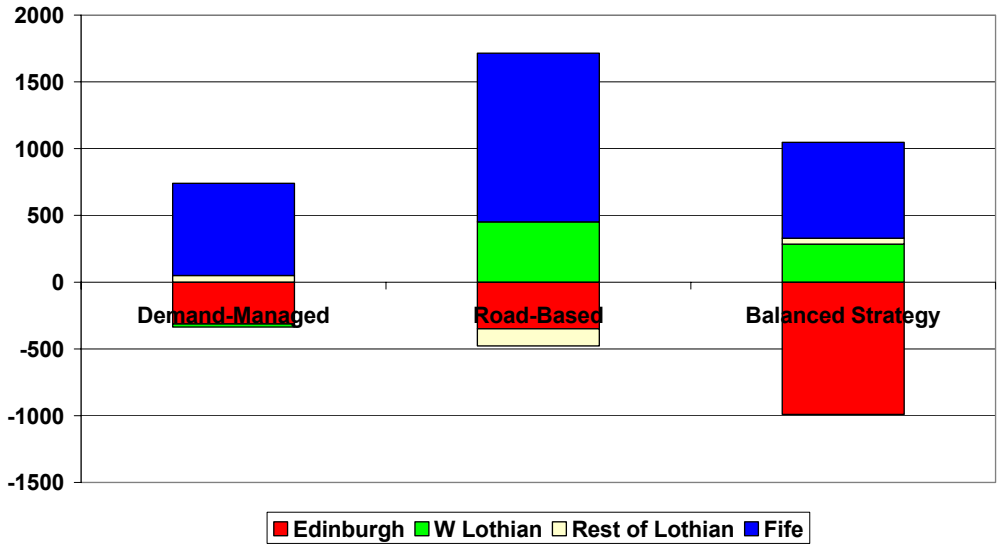
- It can be argued that Cross Forth movements are increasingly constrained and that the situation will deteriorate in the future;
- The bridgehead area contains a mix of uses and the potential for higher residential density;
- The bridgehead area has some regeneration activity; and
- The new crossing should be integrated with other public policies, as discussed previously in this report.

10.7.8 It therefore seems reasonable to conclude that a third Forth crossing may have some measurable economic impact on the bridgehead area, particularly south Fife.

10.7.9 The anticipated impact on jobs in the study area is illustrated in Figure 10.12 below. This shows benefits to the Fife economy are similar for both the Demand Managed and the Balanced Strategy options. Also, it is clear from the graph that there is a large disbenefit to the Edinburgh economy as a result of the Balanced Strategy, and the Road Based Strategy produces the largest benefit for Fife. Further information and analysis is contained in the Technical Annex, Volume 2.

[59] ibid., paragraph 114
[60] ibid., paragraph 120

Figure 10.12: Impact of Measures on Jobs in the Study Area



10.8 Cross Forth Ferry

10.8.1 In 2004 consideration was given to the viability of operating Cross Forth Ferry Services, linking south Fife with north Edinburgh[61]. This concluded that a route from Kirkcaldy to Leith offered the greatest potential for subsidy-free day-to-day operation and might, in part, be able to cover the capital costs of vessel acquisition. Subsequently the Stagecoach Group announced a willingness to consider the commercial operation of a Cross Forth Ferry.

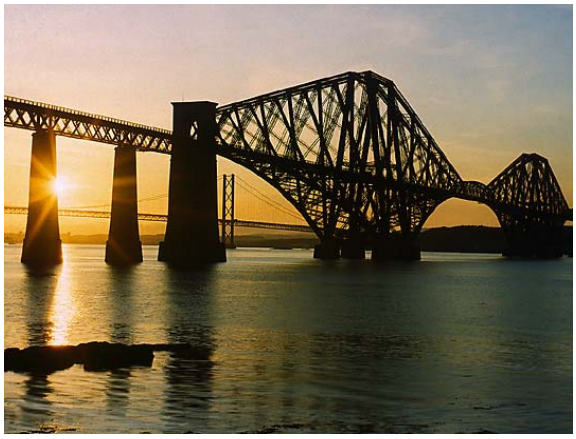
10.8.2 A sensitivity test was undertaken to assess the likely impact of such services on Cross Forth flows, the results being as set out below.

Table 10.1: Impact of Cross Forth Ferry on Southbound Traffic Flows (0700-1000)

	Reduction in Cars	Reduction in Rail Passengers
2011	Circa 1%	Up to 7%
2026	Less than 0.5%	Up to 13%

10.8.3 As with other public transport schemes it appears that a Cross Forth Ferry will appeal more to existing public transport users rather than contributing to modal shift from cars, but nevertheless it might have some benefits in addressing future crowding on Cross Forth rail services after 2026, as discussed in section 7.7.

[61] Options for a Cross Forth Passenger Service (*Halcrow*, May 2004).



Chapter 11

CONCLUSIONS & RECOMMENDATIONS

11. CONCLUSIONS & RECOMMENDATIONS

11.1 Conclusions

11.1.1 The results of the appraisals have been discussed in Chapter 7 under the various theme headings, and other relevant issues have been raised in Chapter 10. In summarising the recommendations these have been grouped into three timescales as follows:

Short Term (1 – 5 years)	Schemes that help deliver the study objectives, can be delivered relatively quickly and should be brought forward for earliest possible implementation.
Medium Term (5 –10 years)	More substantial cost-effective measures that it is recommended should be pursued to deliver their benefits over the next 5 – 10 years.
Long Term Vision (10+ years)	Considering future aspirations and likely requirements for Cross Forth travel.

11.2 Short Term Recommendations

11.2.1 Chapter 7 set out a wide range of short-term measures to improve the attractiveness of public transport, and to widen its definition to include such activities as organised Car Sharing and the use of High Occupancy Vehicle lanes. At the earliest possible time land use planning needs to take into account the potential long-term impact of developments on Cross Forth travel patterns, particularly in the event of high growth land-use scenarios in the northern bridgehead area (illustrated in Figure 7.2).

11.2.2 Therefore the following short-term measures are recommended for immediate delivery, with steps taken as soon as possible to plan implementation and secure requisite finance:

- Make Public Transport More Attractive based on detailed recommendations in Section 7.3;
- Provide new, bus-based Park & Choose site at Halbeath and expand Rosyth into Park & Choose location;
- Provide a newly constructed southbound HOV Lane between Halbeath and the northern bridgehead;
- Introduce "quick win" bus priority measures in Fife on A907, A823 and around Rosyth;
- Procure the additional bus services on key Cross Forth routes shown in Figure 7.6;
- Improve the integration of bus and rail in Fife, including enhanced local bus feeders to key rail stations particularly Rosyth, Halbeath and Dalgety Bay; and
- Make those land reservations required to support future plans (e.g. Dunfermline South station).

11.2.3 For more detailed descriptions of all of the above measures refer to Technical Annex Volume 2. Such an approach will require careful monitoring of Cross Forth travel trends, and this has been discussed in more detail in Chapter 9.

Benefits of Short Term Measures

11.2.4 The cost of the Short Term Measures has been estimated at £23.5 million of capital expenditure and £3.9 million per annum of ongoing operating costs (all figures quoted in this chapter are in 2004 prices and exclude optimism bias). The measures are likely to return a satisfactory Benefit Cost Ratio of 11.8 after allowing for Optimism Bias – for greater detail refer to Technical Annex Volume 2. The present value of benefits accruing from this package considerably outweighs the present value of costs, making this a highly recommended package.

11.2.5 The impact on public transport profitability would be an operating surplus (circa £0.5 million per annum) - this might be made up of a small reduction in profits for bus operations and small increase for rail (from increased Park & Ride using the feeder services).

11.3 Medium Term Recommendations

11.3.1 Building on the short term measures, the following projects are recommended for implementation in the medium term:

- Revised rail patterns to maximise use of Cross Forth rail capacity, including "splitting the circle" to provide enhanced services throughout Fife on the existing line through Turnhouse, and providing two additional trains per hour both operating via Edinburgh Airport;
- Support for Park & Choose at key locations: Inverkeithing (extension of car park including access road), Ferrytoll (including the new overspill site) and Dalgety Bay, in addition to the site at Halbeath featured in the short-term recommendations; and
- Completion of the Bus "Right-of-Way" network between Fife and Edinburgh, predominantly bus priority work on the A90 south of the Forth.

11.3.2 More details of each medium term project can be found in Technical Annex Volume 2.

Benefits of Medium Term Measures

11.3.3 The cost of these measures has been estimated at £11.6 million of capital expenditure and £1.1 million per annum of additional operating costs. The Short and Medium Term packages in combination are likely to return a satisfactory Benefit Cost Ratio of 4.8 after applying Optimism Bias, yielding a considerable surplus of present value benefits above the present value costs associated with the proposals.

11.3.4 The Medium Term package is likely to require a small annual subsidy to public transport operators (approx £1.5 million per annum).

11.4 Linking the Medium and Long Term Strategies

11.4.1 As a supplement to the Short and Medium Term Strategies, if demand for Cross Forth travel continued to rise in such a way that it could not be accommodated, particularly on the Forth Road Bridge, then it will be necessary to identify a strategy that links the Medium Term recommendations with a future Long Term Strategy capable of accommodating sufficient future traffic as to minimise adverse impact on the local economy.

11.4.2 As already discussed in Chapter 7 demand management offers a way of controlling demand for Cross Forth travel, albeit with limited impact on Cross Forth car movements. This builds on the provision of the Short and Medium Term recommendations, supplementing them with a demand management regime focused on significant increases to Cross Forth tolls:

- Peak hour - £2 per SOV each way (i.e. if one-way tolling is in place, as at present, the toll would be £4);
- Hour before and hour after Peak - £1 per SOV each way; and
- Inter-peak – 50p per SOV each way.

11.4.3 In addition it encompasses the reduction of Cross Forth rail fares so that fares between south Fife and Edinburgh are capped at the level applied at Inverkeithing.

11.4.4 Introduction of such demand management will be feasible in a relatively short timescale and certainly can be considered within the Medium Term, and hence as an adjunct to the Medium Term recommendations already set out.

11.4.5 The additional cost of introducing the Demand Managed Strategy compared to the medium-term package is relatively small, but results in very significant user benefits, resulting in a very satisfactory Benefit Cost Ratio of 12.1 and substantial Net Present Value. The need for subsidy, identified under the medium-term package, would be eliminated.

11.5 Alternative Long Term Strategies

11.5.1 The following two Long Term Strategies have been identified, based on the findings set out in Chapter 7:

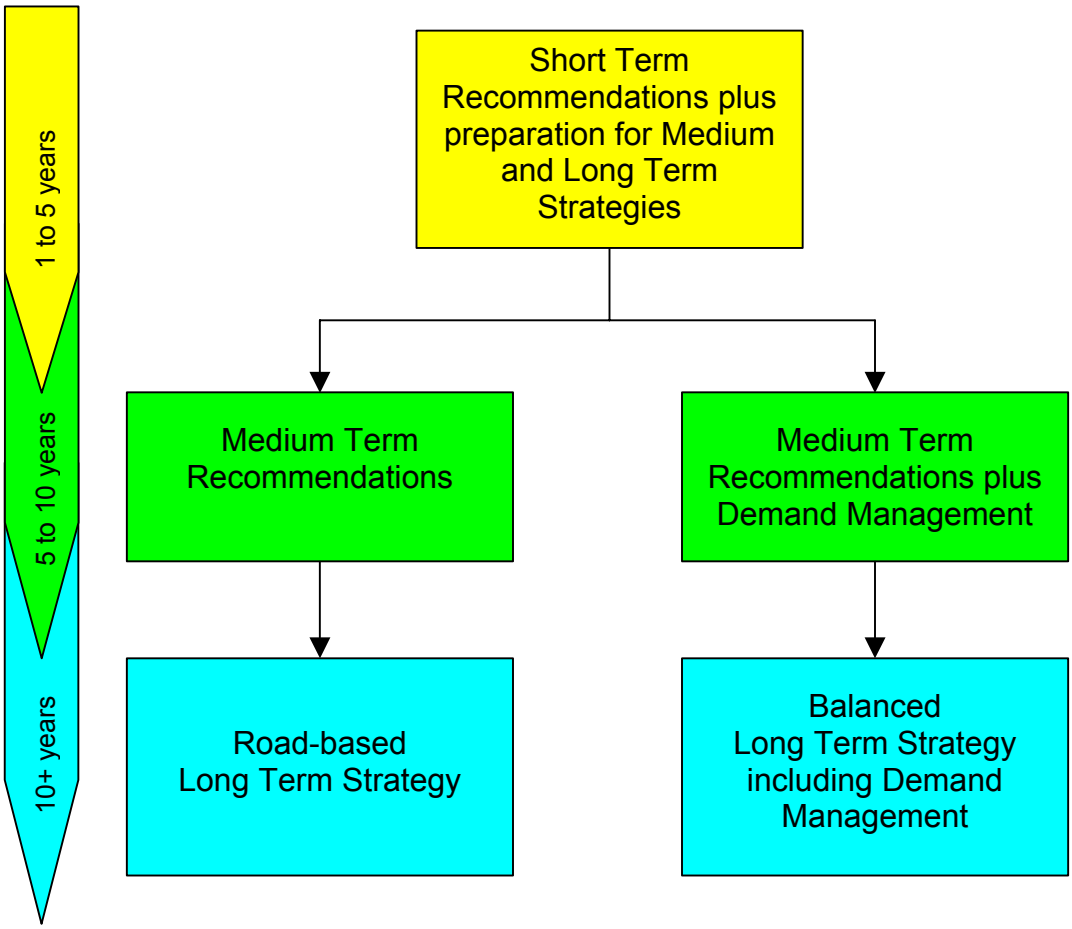
- Roads-based Strategy; and
- Balanced Strategy.

Choosing Between the Long Term Strategies

11.5.2 Both Long Term Strategies use the Medium Term recommendations as their foundation. In the case of the Roads-based Strategy, this utilises the "breathing space" made by the support for Public Transport to allow time to construct a new crossing available to all categories of traffic without limitation. The Balanced Strategy also incorporates a new crossing, but in this case with restrictions on Cross Forth travel by Single Occupancy Vehicles (which will have no increase in traffic lanes) and supplementing this with continuing support for Public Transport by retention of the demand management into the Long Term.

11.5.3 It is therefore clear that the Balanced Strategy will utilise the Short and Medium Term recommendations **and** demand management as its foundation, whilst the Roads-based Strategy would not encompass demand management. This approach can be summarised as shown below.

11.5.4 There may also be a need to consider whether any Long Term Strategy is required: i.e. whether the Medium Term Recommendations alone will be sufficient (particularly in conjunction with demand management), or whether it is necessary to identify a Long Term Strategy encompassing some form of new crossing.



Roads Based Strategy

11.5.5 This Long Term package builds on the provision of the Short and Medium Term recommendations, and supplements them with the building of a new road-only crossing and one additional general traffic lane each way on the M90 on the bridge approaches, at an estimated additional capital cost of £382 million with £1.3 million per annum of additional operating costs.

Balanced Strategy

11.5.6 As with the Roads-Based Strategy, the foundation of the Balanced Strategy is the Short and Medium Term recommendations, in this case supplemented by the building of a Multi-Modal Crossing, capable of upgrading to accommodate a future busway or LRT system, and enhanced by road space reallocation so that all additional road space is reserved for HOVs and there is no increase in Cross Forth lanes provided for SOVs. In addition the following measures would also be introduced:

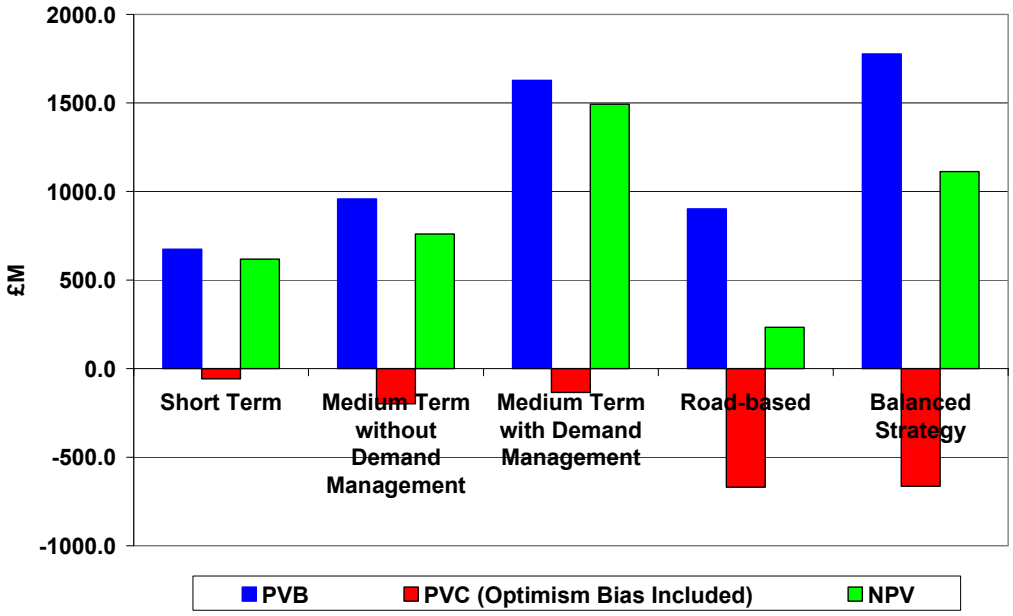
- Significant SOV tolling, in line with the Demand Managed Strategy; and
- Rail fares between Fife and Edinburgh would be capped at the Inverkeithing level, to encourage maximisation of the rail-based segment of Park & Choose trips.

11.5.7 The cost of providing a Forth Multi-Modal Crossing and associated highway links to existing roads has been estimated at £442 million of capital expenditure and £1.3 million per annum of additional operating costs.

Transport Economic Efficiency

11.5.8 A summary of the economic efficiency of the various alternatives is illustrated in Figure 11.1 below[62]. This shows that all of the Packages investigated offer a substantially positive Net Present Value (i.e. excess of benefits over costs), except a long-term strategy based on an additional road-only crossing which has only a small NPV. The Balanced Strategy offers greater NPV than the Roads-based Strategy, but nevertheless both have good rates of return with BCRs of 2.7 and 1.3 respectively. The medium-term Demand Managed Strategy achieves a BCR of 12.1 compared to a medium-term strategy without demand management, which has a BCR of 4.8.

Figure 11.1: Transport Economic Efficiency (TEE)



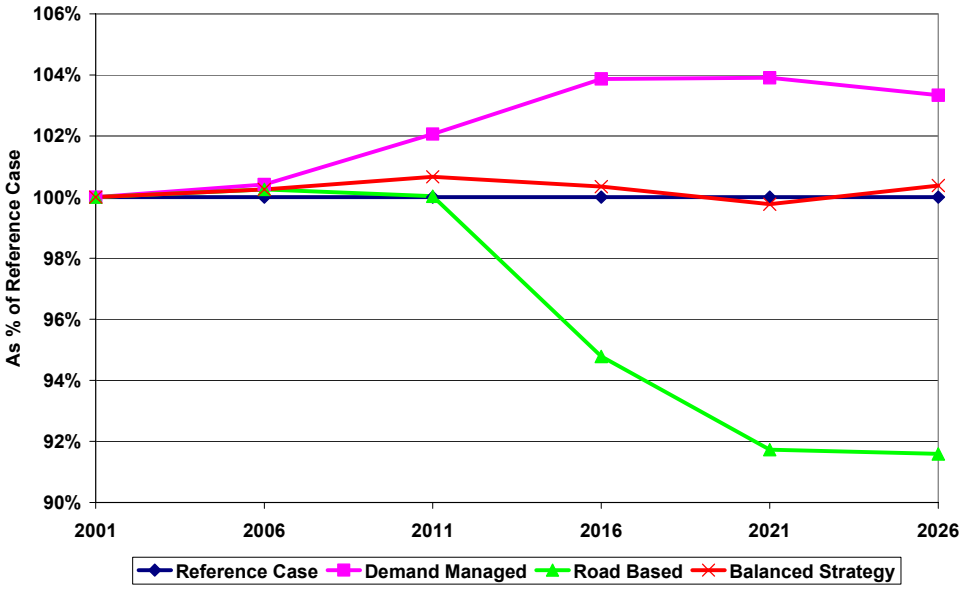
11.5.9 It is likely that the TEE analysis is not fully reflecting all the potential disbenefits of the Demand Managed strategy, for example the long-term constraints this might place on economic development in Fife. Such disbenefits are not fully reflected in the TEE approach, and should be borne carefully in mind when comparing the long-term strategies set out above.

11.5.10 The graph also demonstrates that the greatest benefits accrue from the Balanced Strategy (i.e. provision of a new Multi-Modal Crossing), although as a result of the high cost of this Package its Net Present Value is exceeded by the Demand Managed Strategy. Nevertheless there is a clear value-for-money case for supporting the Balanced Strategy, which brings with it the broader economic benefits already discussed in Chapter 10, and which would facilitate the high-growth land-use development strategy for south Fife.

[62] Costs and Benefits are cumulative. The Medium Term package includes all the costs and benefits associated with the Short Term package. Each of the Long Term packages incorporates all the costs and benefits associated with the Short and Medium Term packages.

11.5.11 The success of the Balanced Strategy (encompassing short, medium and long term recommendations) in supporting public transport is demonstrated in Figure 11.2 below, showing that the Balanced Strategy preserves public transport modal share at around the same level as the Reference Case. The Demand Managed Strategy achieves a better modal share for public transport but at the expense of constrained Cross Forth travel opportunities and probable adverse impacts on the SESTRAN economy.

Figure 11.2: Public Transport Mode Share – All Cross Forth Trips (Southbound 0700-1000)



11.5.12 The Road-based strategy would reduce Public Transport revenues by £1 million per annum, whilst Demand Managed and Balanced strategies both increase net Public Transport revenues by £4 million per annum

11.6 Long Term Recommendation

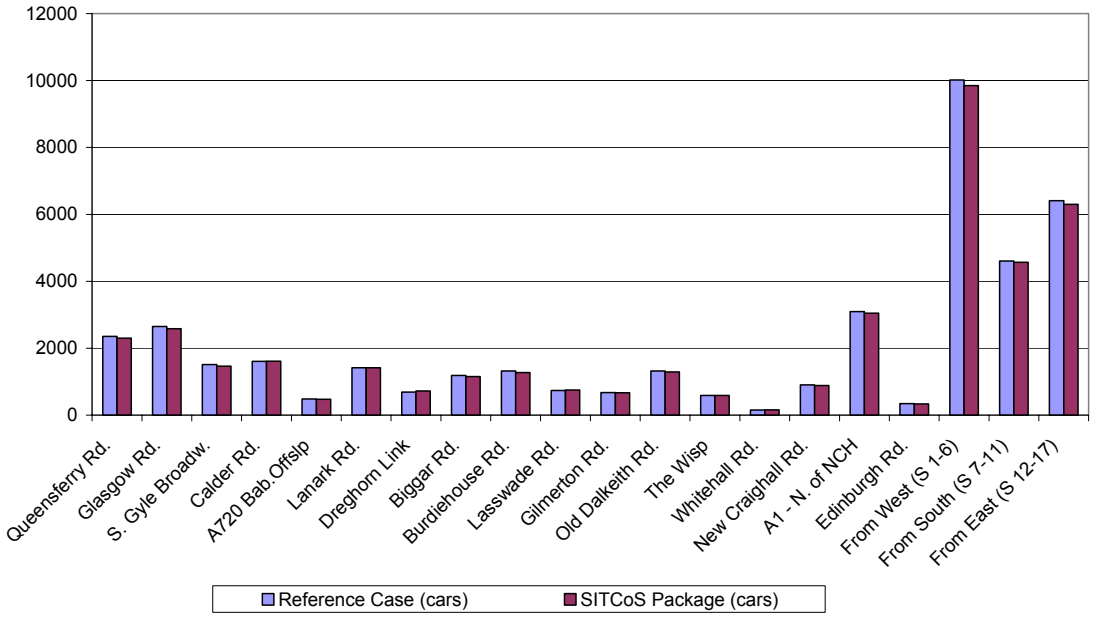
11.6.1 Based on the earlier discussions set out in Chapters 7 and 10 and in section 11.5, it would appear that the best approach would be to utilise the breathing space bought by implementing the short and medium term recommendations to ensure that once their benefits are exhausted a sustainable Long Term strategy is in place. This would need to accommodate growing demand for dispersed travel patterns, but without excessively adverse impact on the SESTRAN economy, or on the local environment.

11.6.2 The Long Term Recommendation comprises the Short and Medium Term Recommendations set out in Sections 11.2 and 11.3 respectively, supplemented by the building of a new Forth Multi-Modal Crossing to provide flexible capacity for long-term Cross Forth travel described in Chapter 10. This includes the potential to upgrade to a LRT system in the future – a subject discussed in more detail in Chapter 10. In addition this would be supported by the implementation of significant SOV tolling (see section 7.8) and the capping of south Fife rail fares at the Inverkeithing level (see section 7.7).

The clearly defined target of the Long Term Recommendation is to facilitate future increases in Cross Forth people movements that support the development of the local economy, whilst ensuring that demand for travel is controlled sufficiently that road traffic to/from Edinburgh rises no faster than the underlying rate of growth (i.e. the Reference Case).

11.6.3 The comparison with underlying growth is illustrated in Figure 11.3 below.

Figure 11.3: Car Traffic into Central Edinburgh by 2021 (0700-0800)



11.6.4 This snapshot shows that the Balanced Strategy (the "SITCoS Package") performs better than the Reference Case into the long-term. Compared to the Reference Case there is an overall reduction of 2.3% in car traffic on Queensferry Road (at the outer cordon point) by 2021, and overall traffic from the west is reduced by 1.7%. In the event that the Edinburgh Cordon Charging Scheme had been introduced, these figures would have risen to 7.9% and 12.0% respectively. More information is provided in the Technical Annex (Volume 2 – Appendix G).

11.6.5 Figure 11.3 demonstrates how important it is that the Multi-Modal Crossing is supported by road space reallocation in favour of HOVs and incorporating the potential for future upgradability. The Multi-Modal Crossing would result in no additional lanes for single occupancy vehicles compared to the present two-lane Forth Road Bridge, and would also be designed to allow possible future upgrading to include LRT crossing the Forth.

11.6.6 The provision of an additional Forth crossing will also considerably improve the flexibility available to FETA in addressing its ongoing need to provide for future maintenance of the existing Forth Road Bridge. The provision of a state-of-the-art river crossing allows full consideration to be given to over-coming some of the existing road problems, such as the need to exclude high-sided vehicles during high winds. This will have considerable benefits for the reliability of freight transport around the Firth of Forth and minimising additional costs associated with diversions, as well as improving the environment of places currently adversely impacted by diverted traffic such as the Crook of Devon villages.

11.6.7 The preferred HGV route across the Forth would be the new bridge, and examination of predicted traffic flows in 2026 shows that HGVs could be accommodated within the proposed HOV Lanes north of the Forth[63]. However it is acknowledged that driver perceptions of the attractiveness of HOV Lanes might be undermined if they were available to HGVs, and further consideration of the use of HOV Lanes by HGVs is suggested. There is no suggestion of allowing HGVs to use designated bus priority lanes in urban areas.

11.6.8 Building a new crossing will have an adverse impact on the environment further details of which are contained in the Technical Annex (Volume 2). However set against these environmental disbenefits should be the potential economic benefits for the SESTRAN region – despite its cost, the Multi-Modal Crossing yields a Net Present Value of £724 million in conjunction with the supporting short and medium term recommended packages, and the economic spin-offs have already been identified as follows:

- 0.5% boost to Fife economy, plus 0.1% boost to the Lothians' economy; and
- 0.8% increase in Fife employment (circa 1000 jobs) plus small increase in Lothians (see Figure 10.12).

11.6.9 Chapter 10 also set out a brief description of the potential economic benefits identified for other new crossings.

11.6.10 The benefits to the SESTRAN economy of the Long Term Recommendation have been illustrated previously and can be seen in Figure 7.14, which shows the degree to which the Balanced Strategy facilitates additional Cross Forth person trips over and above the Reference Case. This is in contrast to a Demand Managed approach without an additional crossing where peak period person trips are constrained below the Reference Case situation.

11.6.11 Finally the impact of the Balanced Strategy on Cross Forth accessibility can be demonstrated by Figures 11.4 and 11.5 below, showing greatest accessibility improvements are for public transport users especially to/from West Edinburgh.

[63] Modelling results for the M90 southbound HOV Lane in 2026 suggest 850 car pcu's + 267 HGV pcu's = 1117 total pcu's - i.e. 56% of a 2000 pcu capacity HOV lane.

Figure 11.4: Public Transport Journey Time Savings from Dunfermline

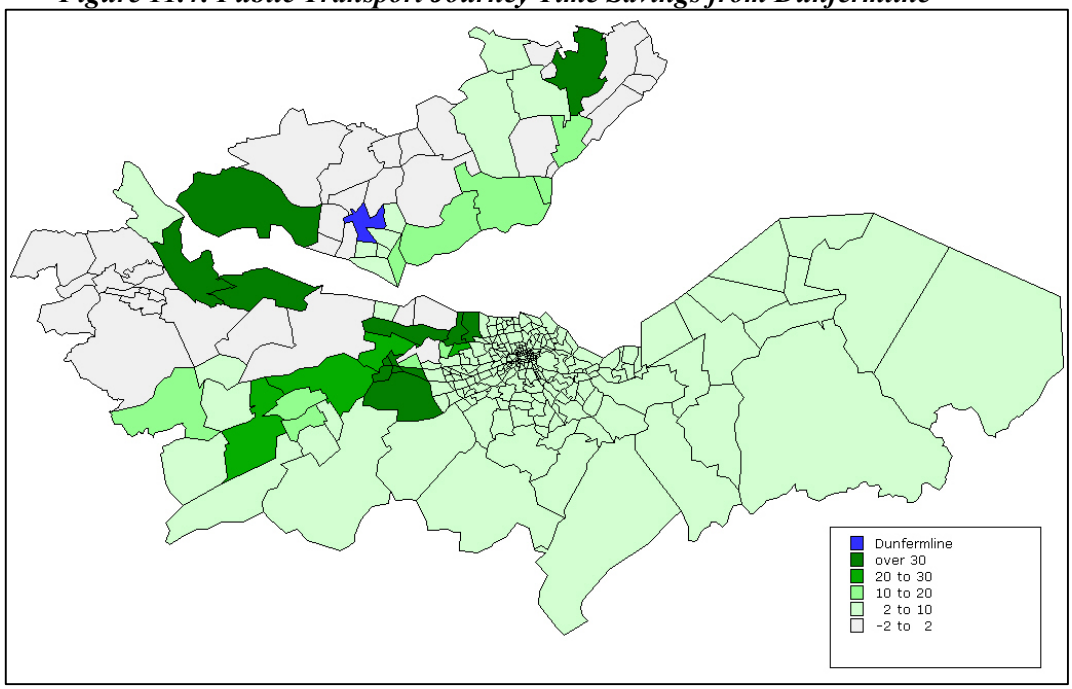


Figure 11.5: Private Vehicle Journey Time Savings from Dunfermline

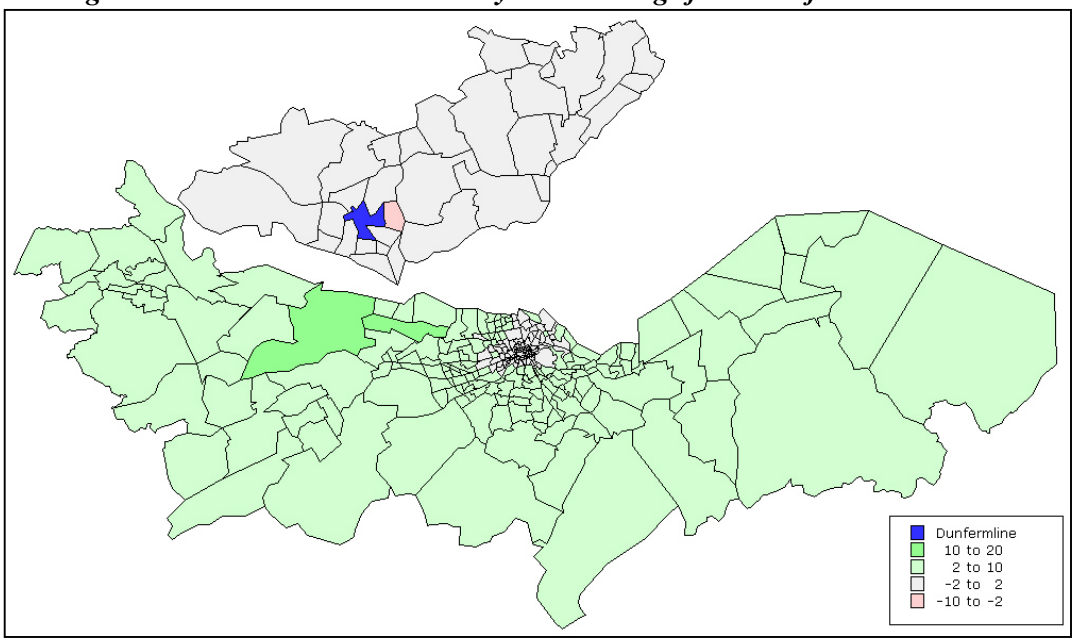


Table 11.1: Summary of Long Term Strategies against Objectives

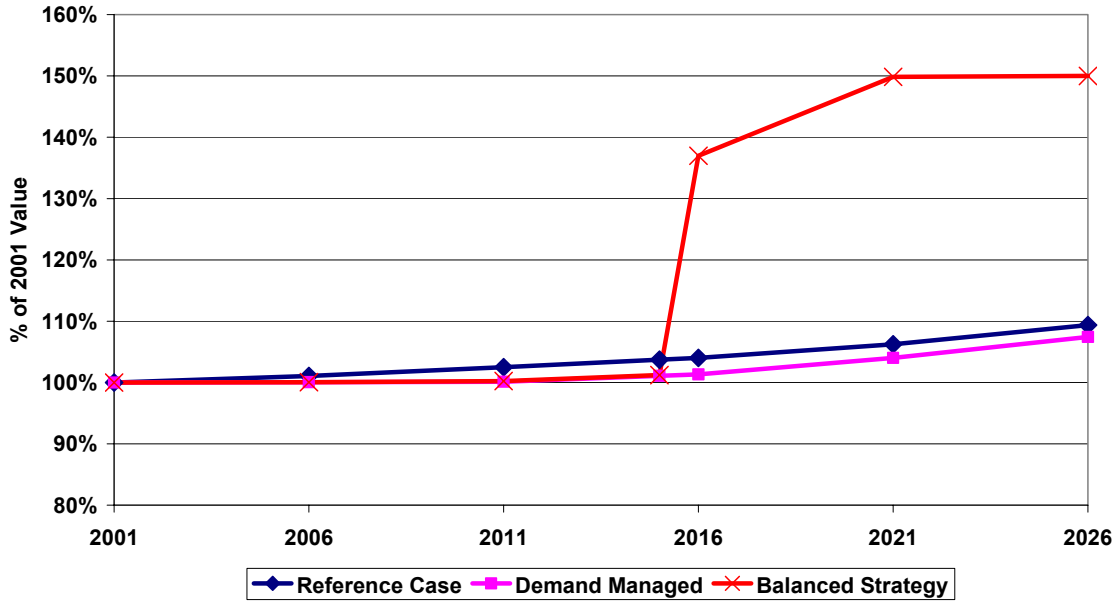
	Yardstick		Roads Based Strategy	Balanced Strategy
			A	B
Planning Objectives	Reduce the number of people commuting in single occupancy vehicles within South East Scotland – especially for journeys to and from Edinburgh; but also for journeys to destinations outwith the SESTRAN area;		✘✘✘	✘
	Minimise the overall need for travel, especially by car;		✘	✓
	Maximise public transport provision and achieve public transport integration and intermodality;		O	✓
	Improve safety for all road and transport users;		✘	✓✓✓
	Enhance community life and social inclusion;		✘	O
	Maintain existing infrastructure properly in order that it can be fully utilised;		✓✓✓	✓✓✓
	Enhance movements of freight, especially by rail and other non-road modes;		O	O
	Sustain the economic health of the SESTRAN region;		✘	✓✓
	To stabilise (in the short term) and improve (in the long term) accessiblity to cross-Forth movement for people and goods;		✘	✓
	Ensure land-use planning is integrated with transportation plans.		O	✓
Government Objectives	Environment;	Noise & Vibration	✘	✘
		Air Quality	✓	✘
		Water quality, drainage & flood defence	✘✘	✘✘
		Geology, Agriculture & Soils	✘✘	✘✘
		Biodiversity	✘✘	✘✘
		Visual amenity	✘✘	✘✘
		Cultural Heritage	✘	✘
		Landscape	✓	✓
	Safety;		✘	✓✓✓
	Economy;		✘	✓✓
	Integration;		✘	O
	Accessibility/Social Inclusion;		✘	O
	Implementability		✘✘	✘✘

✓✓✓	Major Benefit
✓✓	Moderate Benefit
✓	Minor Benefit
O	No Benefit or Impact
✘	Small Minor Cost or Negative Impact
✘✘	Moderate Cost or Negative Impact
✘✘✘	Major Cost or Negative Impact

11.6.12 It is clear from Table 11.1 that a Roads-based Long-Term Strategy is not supported by appraisal against the majority of Objectives set for this study. However the Balanced Strategy achieves positive appraisals against most Objectives. The long-term choice would therefore appear to come down to a choice between either persevering with a the Medium Term recommendations plus demand management, or adopting the Balanced Strategy with a new Forth crossing.

11.6.13 The long-term impact of the two alternatives, particularly on the bridgehead area, can be illustrated by Figure 11.6 below.

Figure 11.6: Cross Forth Car Trips (Southbound 0700-1000)



11.6.14 This shows that under the Reference Case (based only on existing Structure Plan development in south Fife) car trips continue to grow, by almost 10% between 2001 and 2026. The Demand Managed strategy has a modest impact on this growth, curtailing it to around 7% between 2001 and 2026. If this could be accommodated on the existing Road Bridge **without further impact on maintenance**, then there might be a case not to build a third crossing.

11.6.15 However, given that the Road Bridge cannot satisfy existing demand for Cross Forth peak travel then **ANY** future increase in demand will inevitably result in peak-spreading and a prolonging of the congested travel conditions already experienced between 0600 and 0740 (illustrated in Figure 10.7). In the event that the existing bridge is deemed unsuitable to cater for this future growth, even with the "favourable" impact of demand management, then there will be a case to consider a third crossing supported by all the other elements of the Balanced Strategy – this strategy has a positive NPV (including the highest PVB in absolute terms) and a BCR of 2.7, and therefore presents a positive economic case. It is important that this facilitation of an increase in the demand for Cross Forth person trips is carried out in a sustainable manner and supports the economy.

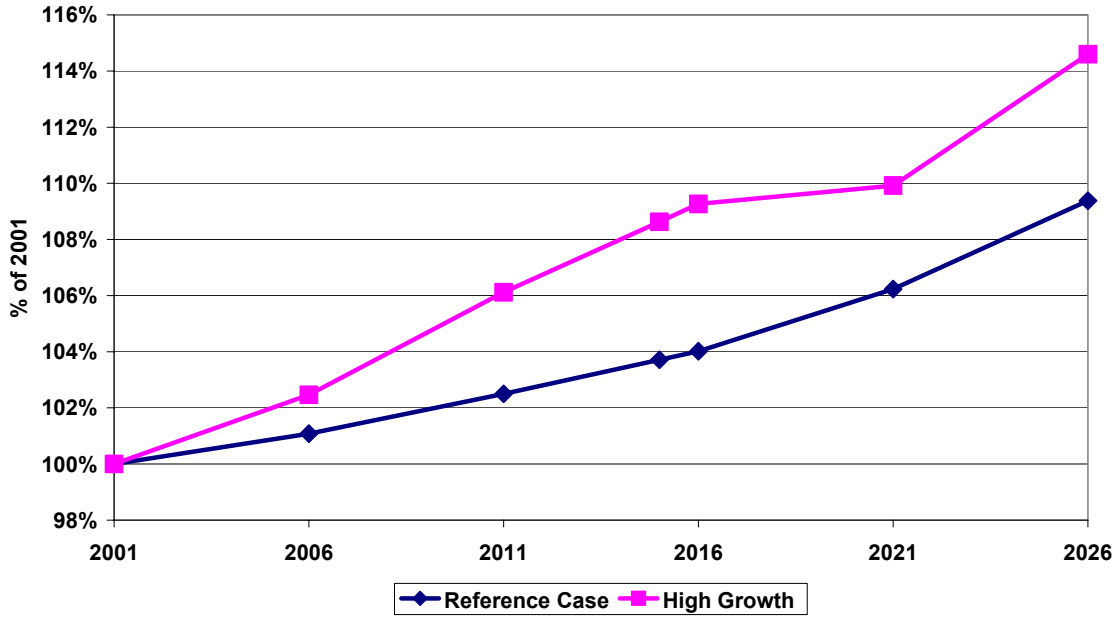
11.6.16 Failure to alleviate the existing stress on the Forth Road Bridge caused by increasing traffic volumes will have major implications for its maintenance costs and both scheduled and unscheduled closures, which in turn impact adversely on economies dependent on unrestricted road traffic across the Forth at Queensferry.

11.6.17 The need to consider the Balanced Strategy would be strengthened by adoption of higher growth scenarios for land-use planning in south Fife, as illustrated by Figure 11.7, which shows that pursuing a high growth land-use scenario in south Fife could result in a 15% increase in Cross Forth car trips between 2001 and 2026, when compared to a 10% increase in the Reference Case.

11.6.18 The future "maintainability" of the existing Road Bridge needs to be viewed in the light of such a scenario, placing further emphasis on the case for a Balanced Strategy. Compared to a Road-based Strategy, the Balanced Strategy provides additional Cross Forth capacity only for HOVs and therefore has the added advantage of building in slack that can be utilised for emergency maintenance, etc.

11.6.19 An approach to monitoring of the current situation, and the need for a "trigger" to stimulate commencement of the construction process associated with a third crossing has been set out in the Technical Annex, Volume 2 (Chapter 6).

Figure 11.7: Impact of High Growth Land-Use on Cross Forth Car Trips (Southbound 0700-1000)



11.6.20 The cost of funding the long-term strategies is summarised in Section 11.7.

11.6.21 Reference to Figure 11.6 demonstrates a continuing pressure from demand even under the Balanced Strategy. This means that it will be essential to retain in place **all** the short and medium term measures promoting modal shift towards more sustainable modes, including the demand management through tolling, and that it will be necessary to increase the tolls **in real terms** in order to restrict the growth in road traffic.

11.7 Funding of Forth Multi-Modal Crossing and Other Recommended Measures

11.7.1 The cost of the measures recommended is summarised in Table 11.2 below.

Table 11.2: Capital and Operating Costs for Recommended Measures

Measure	Capital Costs	Operating Costs (per annum)
HOV Lane - Halbeath - FRB	£12,600,000	nil
Bus Right of-Way Priority Measures in Fife	£1,400,000	nil
Extra Cross-Forth bus services - as per Fig 7.5	£5,280,000	£3,000,000
Halbeath bus-based P&R site	£2,900,000	nil
Diversion of existing buses via Rosyth station	nil	£100,000
Improved Car Parking at Rosyth station	£1,400,000	nil
Additional feeder buses to Fife stations (as per Fig 7.6)	£1,320,000	£750,000
Car Park Extension at Inverkeithing (plus access road and improved pedestrian access)	£4,400,000	nil
Revised Rail Services on Fife Circle - splitting circle (as per Technical Annex, Volume 2) and adding one additional stopping train from Glenrothes and one from Kirkcaldy, both via EARL - additional costs relative to existing Fife Circle with EARL	£4,000,000	£1,500,000
Turnback at Markinch	£4,040,000	£50,000
Savings from withdrawing Kirkcaldy – Glasgow Queen Street service	-£2,000,000	-£500,000
2-lane bridge with link roads - LRT compliant	£442,000,000	£1,250,000

11.7.2 The precise details of the year-on-year tolling regime are a matter for FETA to decide and outwith the scope of this study, however it is possible to make the following observations in the light of this study's recommendations.

11.7.3 It is likely to be necessary to raise tolls in order to finance the recommendations set out above, and particularly to provide sufficient investment for the proposed Multi-Modal Crossing. The tolling regime that raises most tolls per £ of traveller "pain" is to re-introduce southbound tolling and implement differential tolls for single occupancy vehicles with particular emphasis on the peak periods.

11.7.4 The levels of these differential tolls should be set (and maintained) at a level just high enough to generate enough revenue to pay for the new crossing and the other recommendations after taking account of other sources of funding (e.g. Scottish Executive, SESTRAN), and to sufficiently control demand as to avoid exhaustion of new Cross Forth capacity. Tolls in excess of this level will generate additional traveller disbenefits with no additional schemes to show for the "traveller pain".

11.7.5 In the event of differential southbound tolling proving unfeasible, the "next best" tolling regime is simply to increase northbound flat tolls year-on-year to generate the required flow of revenue.