EXECUTIVE SUMMARY

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.

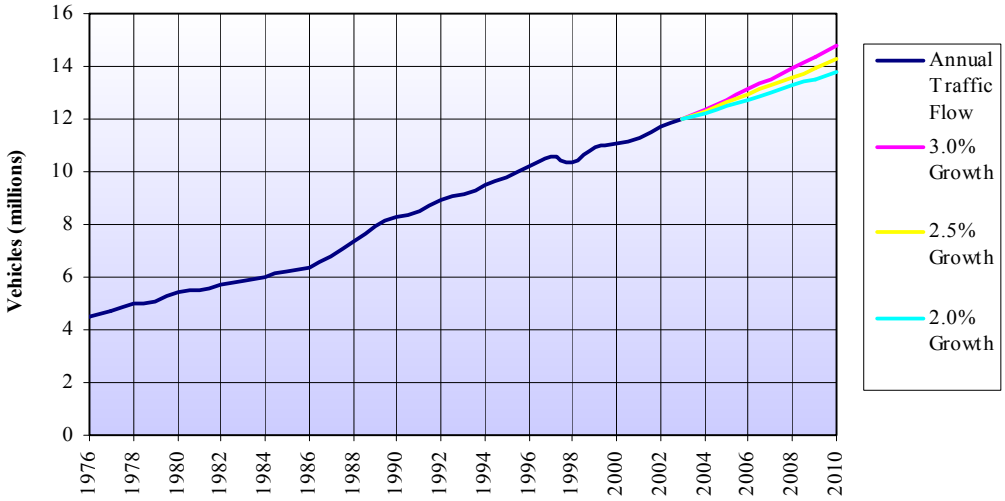
Queensferry Cross Forth Study Area and Its Problems

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).

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.

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 undercapacity 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.

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 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 trunk, 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.

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.

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 road capacity 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, 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.

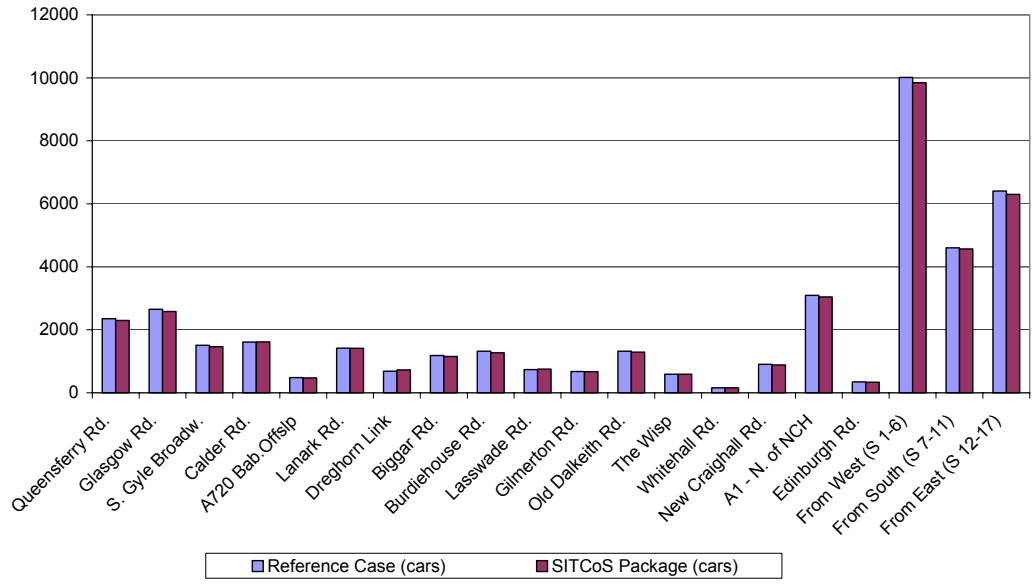
A Roads-based Strategy would build on the short and medium-term recommendations through the provision of a new road-only crossing and expansion in road capacity on the M90, effectively doubling the available Cross Forth road capacity available to all categories of vehicle. For reasons set out above this 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

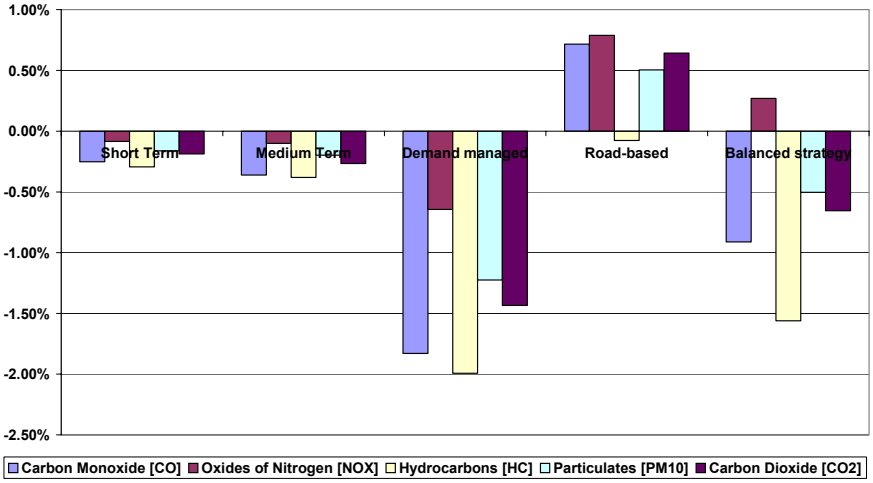


Figure 5: Accident Rates for each Package of Measures

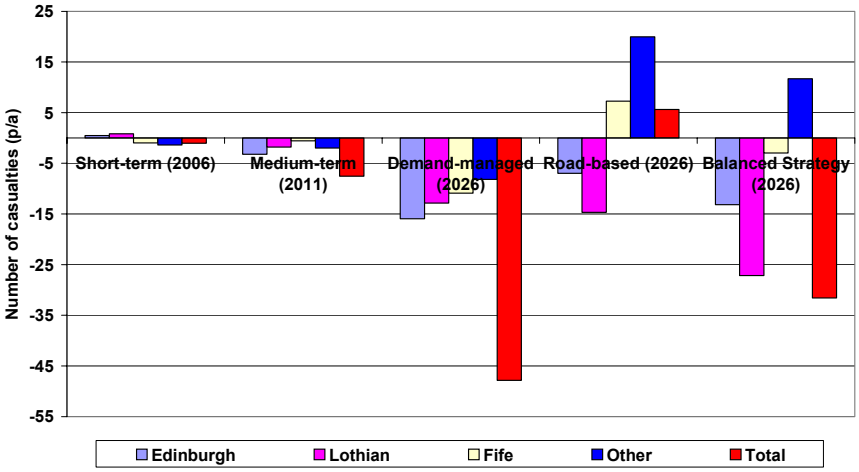


Figure 6: Transport Economic Efficiency (TEE)

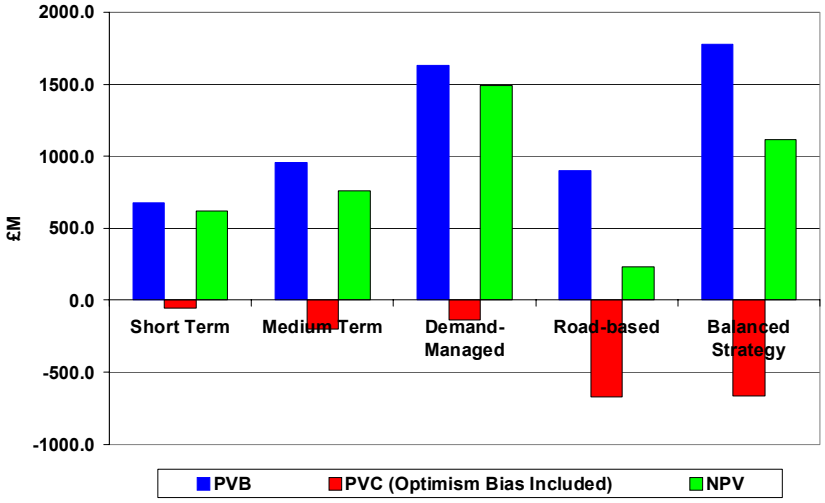


Figure 7: Impact of Measures on Jobs in the Study Area

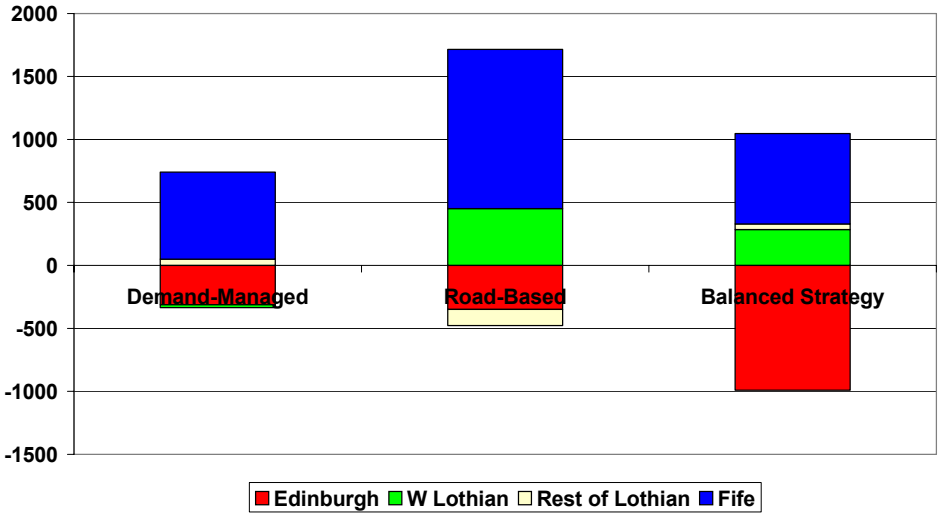
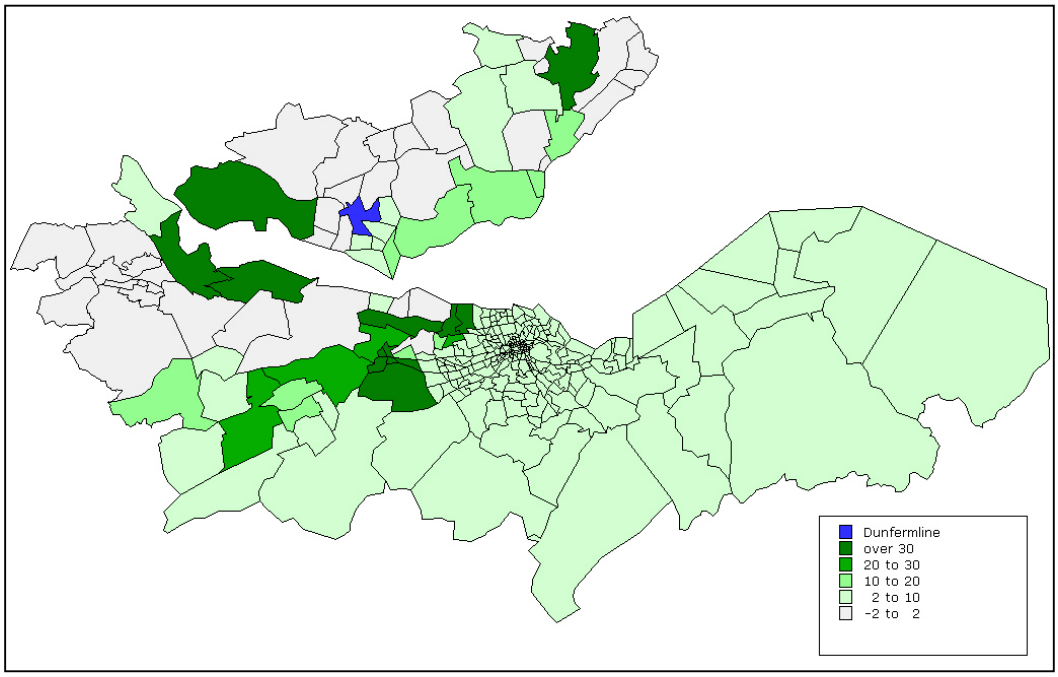


Figure 8: Public Transport Journey Time Savings from Dunfermline



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)

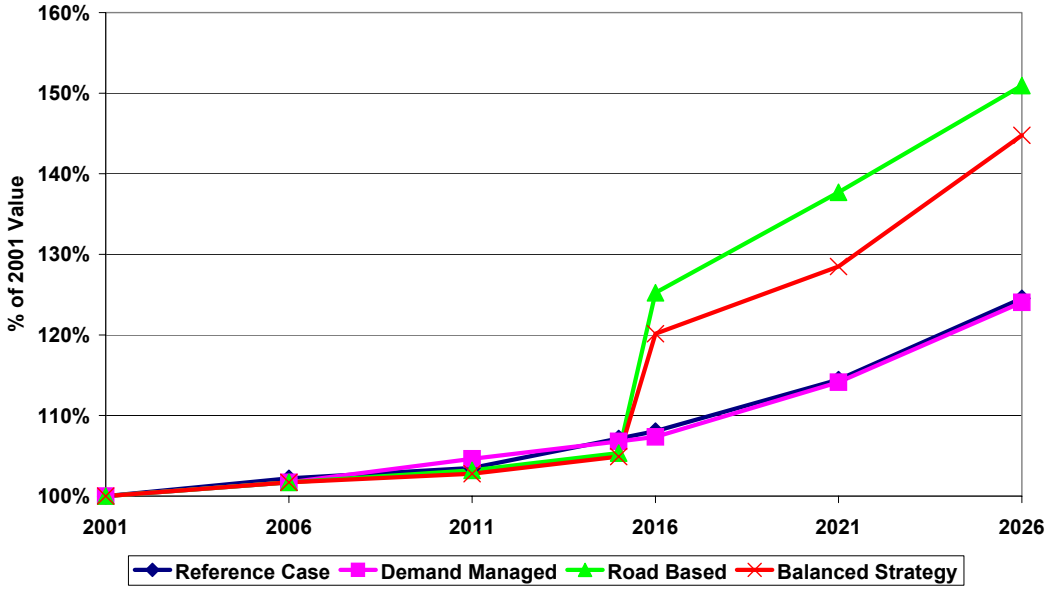
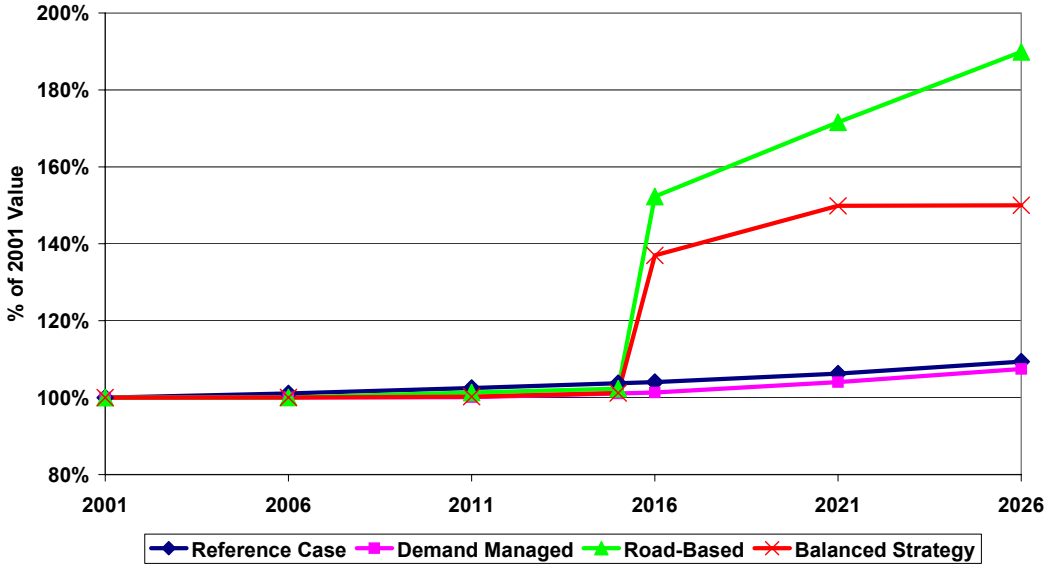


Figure 10: Cross Forth Car Traffic (Southbound 0700-1000)



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

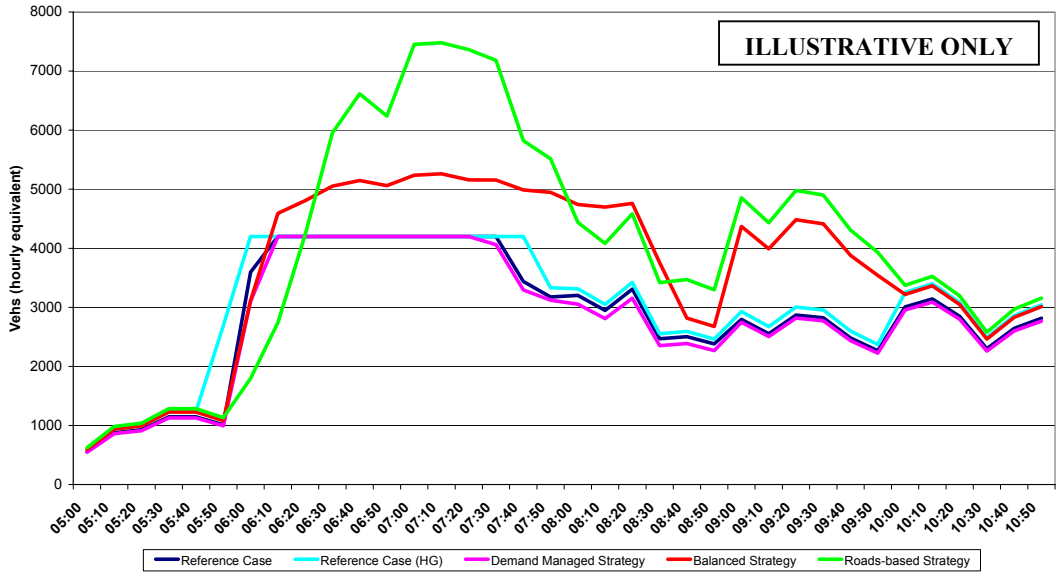
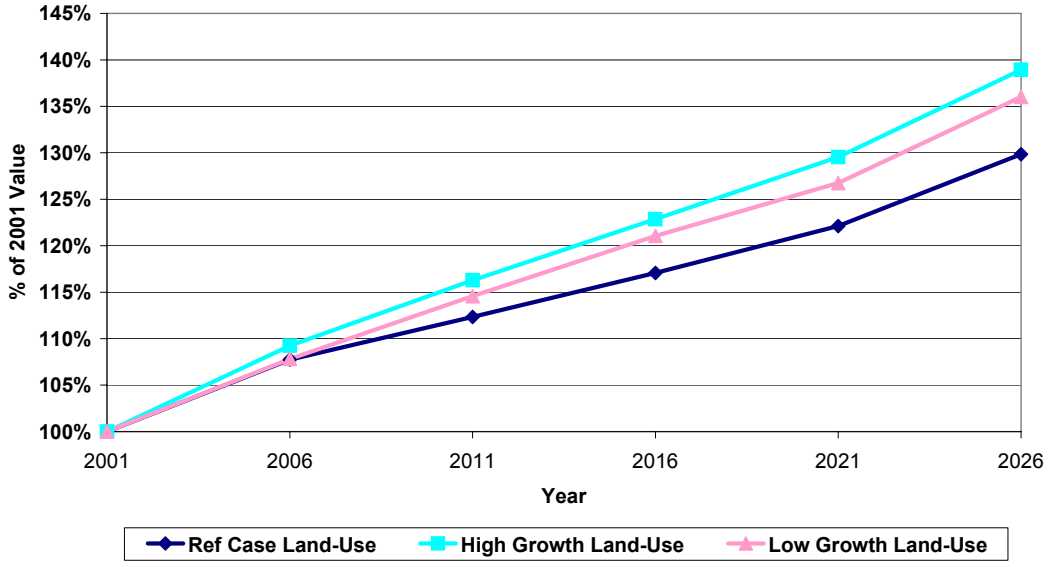


Figure 12: Growth in Cross Forth Person Trips (12-hour period, 0700-1900)



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.

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