South East Scotland Transport Partnership (SEStran), Fife Council & Clackmannanshire Council

Clackmannanshire – Fife – Edinburgh (CFE) STAG Study

STAG Appraisal Report

February 2010

Revision Schedule

Clackmannanshire – Fife – Edinburgh (CFE) STAG Study

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E.1 Introduction

E.1.1 South East Scotland Transport Partnership (SEStran), Fife Council and Clackmannanshire Council appointed Scott Wilson to carry out a STAG – based study to examine freight and passenger transport connectivity issues between Clackmannanshire, Fife and Edinburgh. This followed the Regional Transport Strategy, produced by SEStran, which had identified several projects for taking forward to improve transport connectivity in the area. As a result, this study considered a wide range of possibilities for transport enhancement, for both public transport and freight.

E.2 Issues, Opportunities and Consultation

E.2.1 An analysis of the key transport and travel patterns on the strategic network was undertaken. This reviewed the main issues involving both passenger and freight transport in the area, and also considered future development plans that could impact on transport. Other issues such as modal split and severance were also examined and conclusions drawn which distilled the problems, constraints and opportunities in the corridor.

E.2.2 An extensive consultation exercise was carried out, including a workshop with key stakeholders, freight operators and local businesses. The comments and views obtained from the consultation were used to identify the issues/opportunities in the corridor, from which a number of Transport Planning Objectives (TPOs) for the study were developed.

E.3 Option Development and Appraisal

E.3.1 The next stage was to identify options that were likely to meet the TPOs and national transport objectives of the study. The analysis of the problems and opportunities, together with a preliminary assessment of travel patterns and demand in the corridor and also the results of the consultation undertaken, identified a total of 12 outline options and sub-options which were considered. These covered rail, express bus, waterborne and road options, with some of them having complementary freight facilities included.

E.3.2 The assessment was carried out in accordance with the Scottish Transport Appraisal Guidance (STAG). This included an initial evaluation of the 12 outline options, which sifted them down to a shortlist of proposals that were taken forward into a more detailed STAG appraisal. From the initial STAG, a short list of four options were identified as being worthy of further consideration. These were:

- Option A – use of the existing railway line from Alloa to Rosyth with both passenger and freight services, including stops at Clackmannan, Kincardine and Cairneyhill and with the Charlestown Chord in place. Services could be run on an hourly basis as an extension of the Glasgow-Stirling-Alloa service to Edinburgh, and vice versa;
- Option B – as option A but without the Charlestown Chord in place, requiring a switch-back operation and an additional rail service time of 15 minutes;
- Option C – this consisted of the rail freight option conforming to the rail alignment in option A, plus a new express bus service with an alignment

following the A985, stopping at Clackmannan, Kincardine, Cairneyhill and onto Edinburgh; and

- Option D – as for Option C, but with a new express bus service with an alignment following the A907 with stops at Clackmannan, Oakley and onto Edinburgh.

E.3.3 The layout of these options is shown overleaf.

E.4 Summary of the Detailed STAG Assessment

E.4.1 The Table below presents the results of the detailed STAG appraisal.

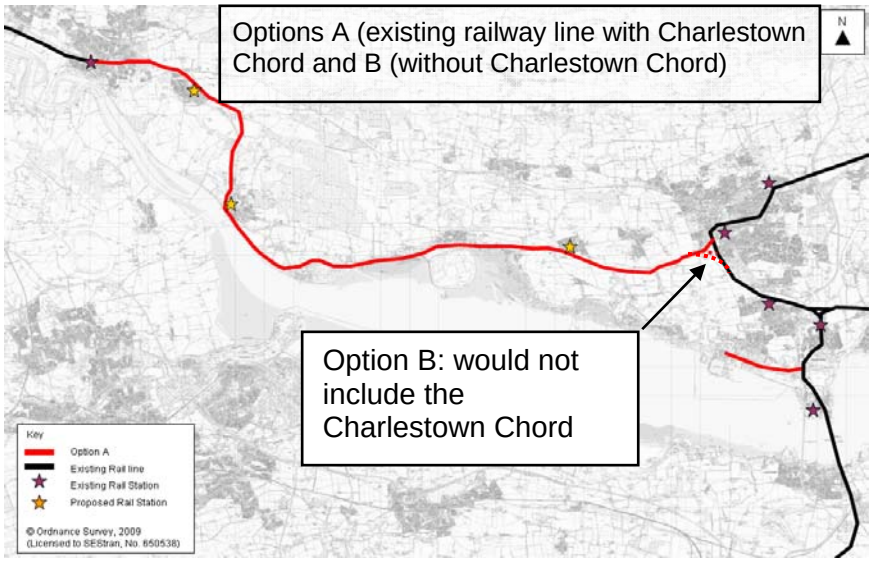
Criteria	Option			
	A	B	C	D
Objective 1 – Connectivity	✓✓✓	✓✓	✓✓	✓
Objective 2 – Freight Accessibility	✓✓	✓	O / ✓	O / ✓
Objective 3 – Accident Savings	✓✓	✓✓	✓	✓
Objective 4 – Local Environmental Impacts	✓	✓	O / ✓	O / ✓
Environment – Air Quality & noise	✓	✓	✓	✓
Environment – Other	✘✘	✘✘	✘✘	✘✘
Safety	✓	✓	✓	✓
Economy	✓✓	✓	O	✘
Integration	✓✓✓	✓✓✓	✓✓	✓✓
Accessibility/Social Inclusion	✓✓	✓✓	✓✓	✓✓
Technical Issues	✓✓	✓✓✓	✓✓	✓✓
Operational Aspects	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Public Acceptability	✓✓✓	✓✓✓	✓✓	✓✓
Cost to Government	✘✘	✘✘	✘	✘

E.4.2 The results suggested that option A performed the best, followed by option B.

E.5 Recommendations

E.5.1 The chief recommendation would be to select option A as the preferred solution. However, there are concerns with issues regarding train path availability. If this option is taken forward, then we recommend an operational assessment be carried out to find a potential solution as this may have an impact on journey times. Patronage forecasts would need to be considered again in light of any emerging operating plan. In addition, we have identified opportunities to reduce the cost assumptions supplied during the course of this study. This could improve the economic performance of option A.

E.5.2 However, it should be recognised that this project has not been properly considered within the Scottish Government's Strategic Project Review (STPR). It would therefore be prudent for SEStran, together with Fife and Clackmannanshire Council's, to engage in serious discussion with Transport Scotland on how this project may sit relative to current STPR projects and what proposals there may be to review the STPR in the future.


Options A (existing railway line with Charlestown Chord and B (without Charlestown Chord)
N
Option B: would not include the Charlestown Chord
Key
Option A
Existing Rail line
Existing Rail Station
Proposed Rail Station
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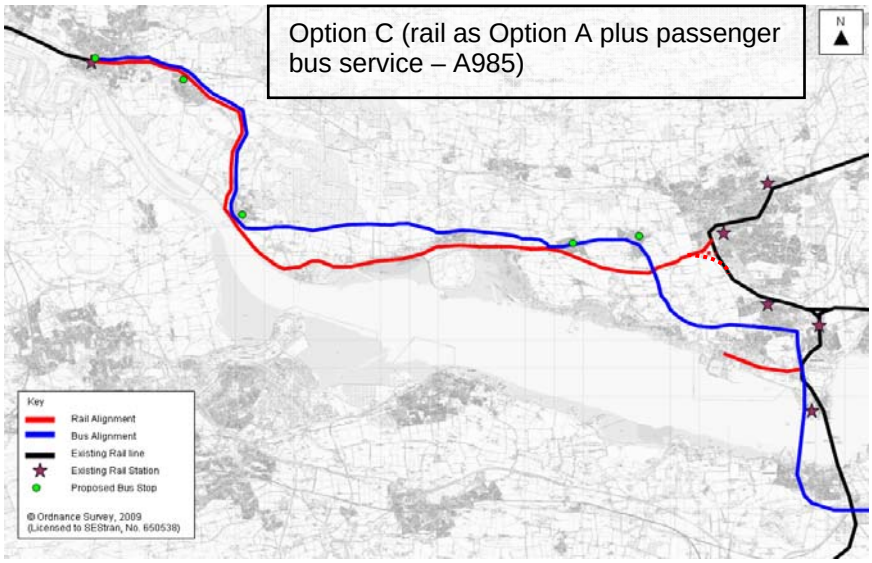
Option C (rail as Option A plus passenger bus service – A985)
N
Key
Rail Alignment
Bus Alignment
Existing Rail line
Existing Rail Station
Proposed Bus Stop
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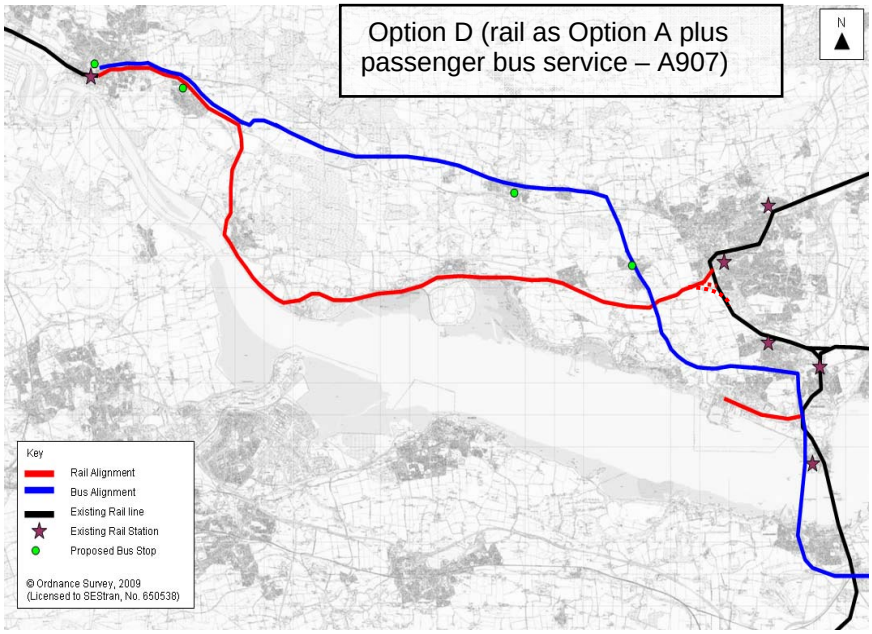
Option D (rail as Option A plus passenger bus service – A907)
N
Key
Rail Alignment
Bus Alignment
Existing Rail line
Existing Rail Station
Proposed Bus Stop
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1 Introduction

1.1 Background

1.1.1 South East Scotland Transport Partnership (SEStran), Fife Council and Clackmannanshire Council appointed Scott Wilson to carry out a STAG – based study to examine freight and passenger transport connectivity issues between Clackmannanshire, Fife and Edinburgh.

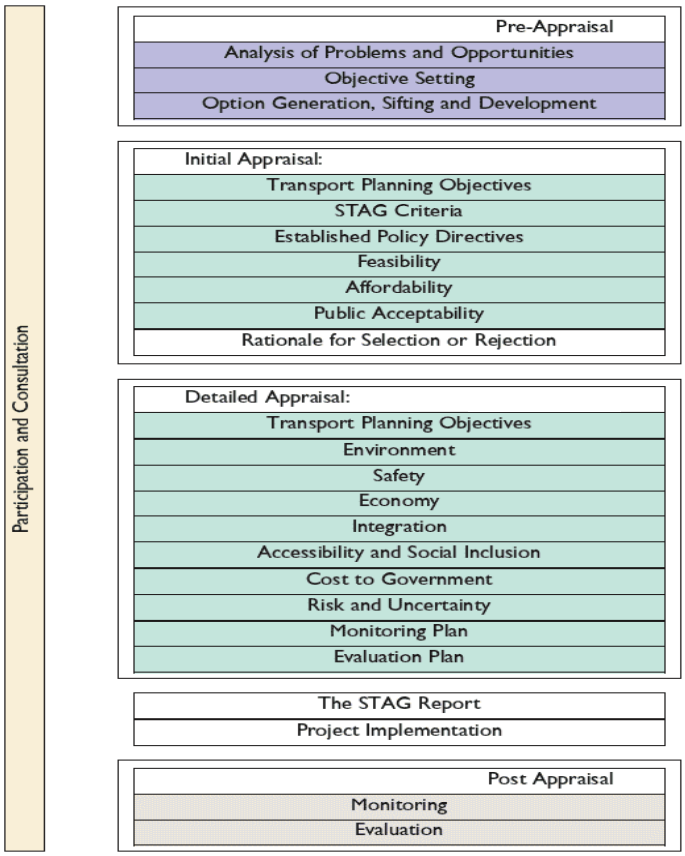
1.1.2 SEStran developed a Regional Transport Strategy (RTS) which identified several projects for taking forward to potential development. A number of these schemes are categorised within the network-based measures identified in the RTS, one of which is the identification of a number of corridors for prioritising investment. The Clackmannanshire – Fife – Edinburgh route is one of these priority corridors as transport connectivity is poor, and there may be opportunities to address modal shift to both freight and public transport.

1.1.3 The inauguration of the Stirling to Alloa railway, which opened in 2008 to passenger services and freight, was the signal for this particular study. However, the STAG appraisal process will consider a wide range of possibilities in addition to rail options, including road access improvement, water freight and bus-based public transport.

1.2 Scottish Transport Appraisal Guidance (STAG)

1.2.1 This report sets out the results of the evaluation of the opportunities identified following the application of the new STAG – based methodology, which examines the relative merits of investment in transport provision in the Clackmannanshire – Fife corridor, and to address the issues such investment may bring.

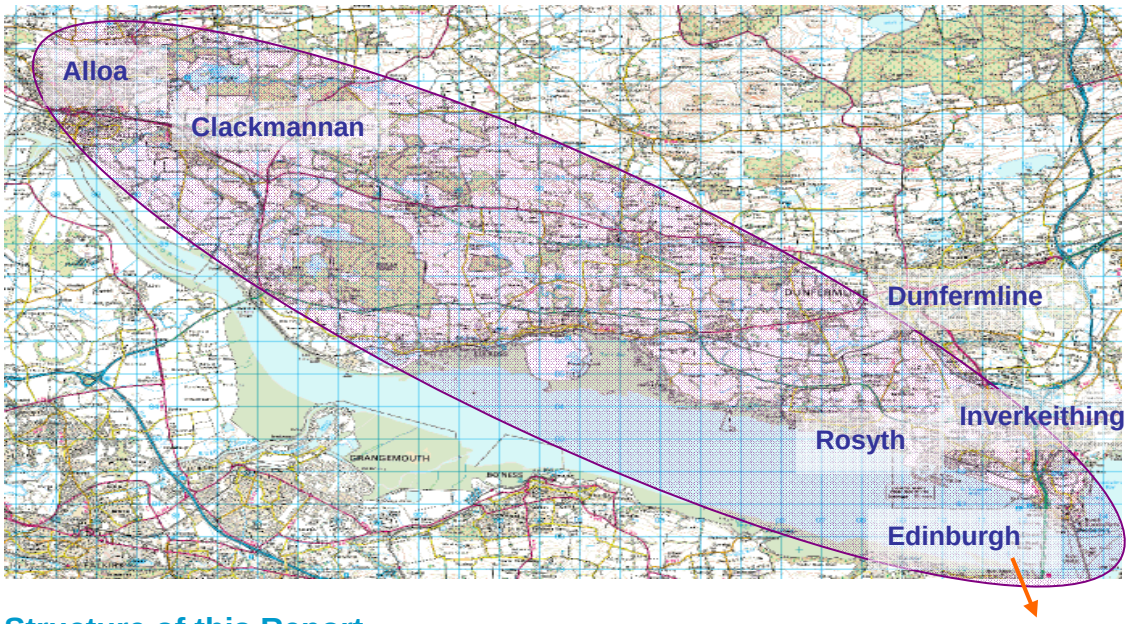
1.2.2 STAG is objective-led, and options should be based on the widest possible set of potential proposals, leading visibly from the Transport Planning Objectives. Before appraisal takes place, objectives should be agreed and options defined. The Figure (right, extracted from STAG) summarises the new STAG process, placing greater emphasis than the previous versions of STAG on environmental impacts, economics (Wider Economic Benefits), monitoring/evaluation plans and project implementation issues.



1.3 Overview of the Study Area

1.3.1 The study area is confined to the north shore of the Forth, a transport corridor bounded by the A907 to the north from the vicinity of Cambus/Tullibody eastwards to Crossgates, close to the Halbeath Lorry Park in Fife. The area boundary then follows south to the Forth at Dalgety Bay–Inverkeithing, and then proceeds westwards bordering the north shore of the Forth to the Kincardine Bridge, encompassing both the A985 trunk route and Dunfermline to Alloa rail line, before then finally linking Kincardine up with Alloa. The study area for this appraisal is shown in Figure 1.1.

Figure 1.1 – The Study Area



1.4 Structure of this Report

1.4.1 The overall structure of this report is as follows:

Chapter 2 – sets out the transport patterns and key issues in the corridor;
Chapter 3 – summarises the stakeholder consultation & the feedback received;
Chapter 4 – identifies the Transport Planning Objectives for the appraisal;
Chapter 5 – describes the process followed to identify initial options;
Chapter 6 – reviews and presents the results of the Initial STAG Appraisal;
Chapter 7 – describes the detailed development of the shortlisted options;
Chapter 8 – presents the Detailed STAG Appraisal;
Chapter 9 – presents the results of the risk and uncertainty appraisal;
Chapter 10 – sets out the plan to monitor and evaluate the study over time; and
Chapter 11 – presents the study conclusions and recommendations.

2 Analysis of Problems and Opportunities

2.1 Introduction

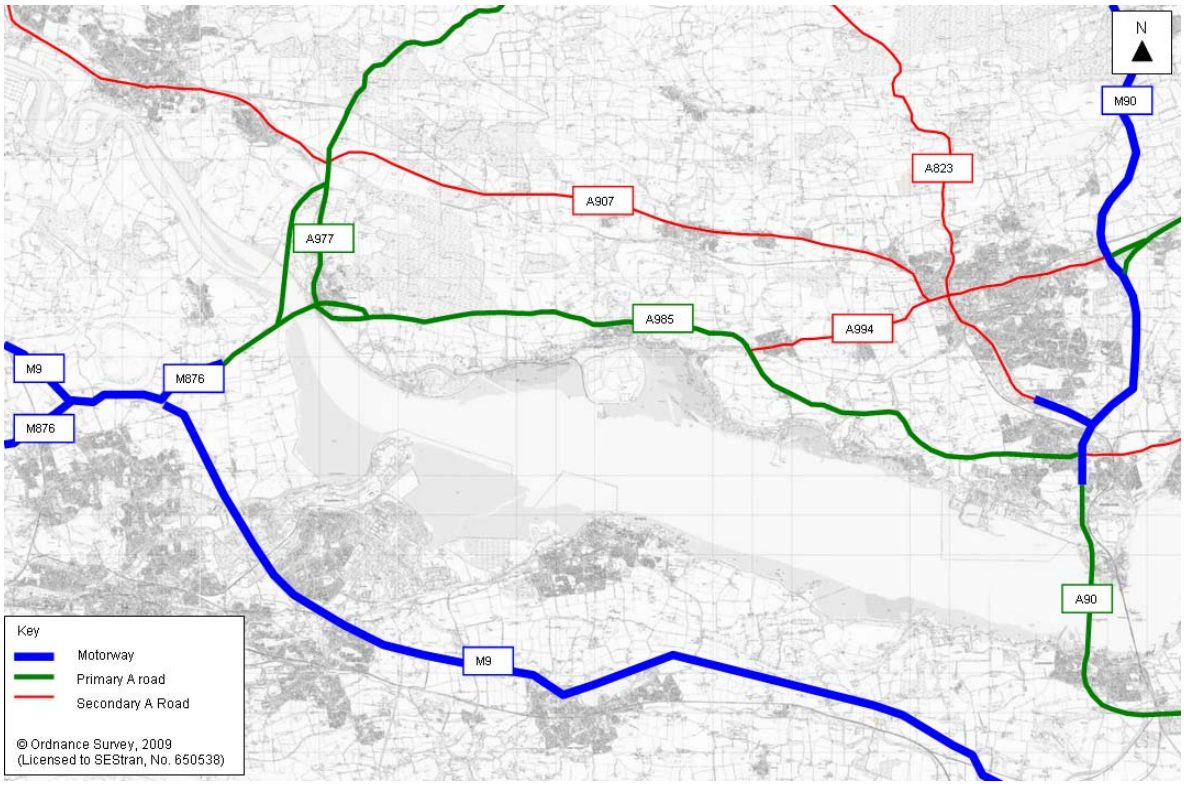
2.1.1 This Chapter provides a summary of the key transport and travel patterns on the strategic network. It discusses the main issues involving both passengers and freight, and also considers future development plans which could impact on transport. Other issues such as modal split and severance were also examined and the analysis concludes with a distillation of the problems, constraints and opportunities.

2.2 Passenger Transport

Road Transport

2.2.1 The principal routes in the west Fife to Clackmannanshire corridor are the A907 linking Dunfermline just north of the Forth Bridge with Clackmannan and Alloa, forming the northern boundary of the study area, and the A985 which links Inverkeithing to Rosyth and the Kincardine Bridge at Kincardine, forming the southern boundary. The A907 and the A985 are linked at the eastern end of the study area by the A823 through Dunfermline and Rosyth. At the western end of the corridor, the A907 and the A985 are linked by the A977 from the east of Clackmannan to Kincardine. Figure 2.1 shows the road network in the study corridor.

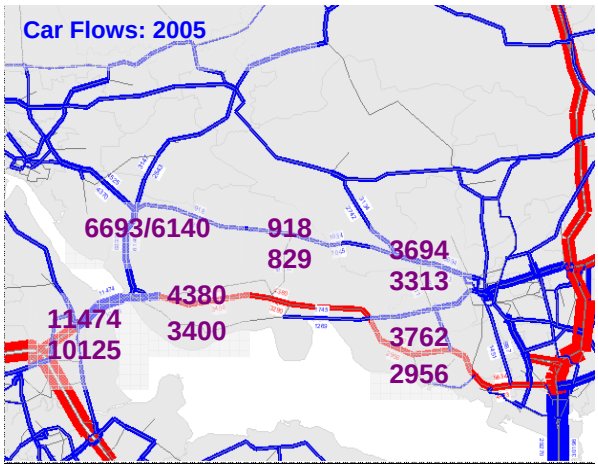
Figure 2.1 – Road Network in the Study Corridor

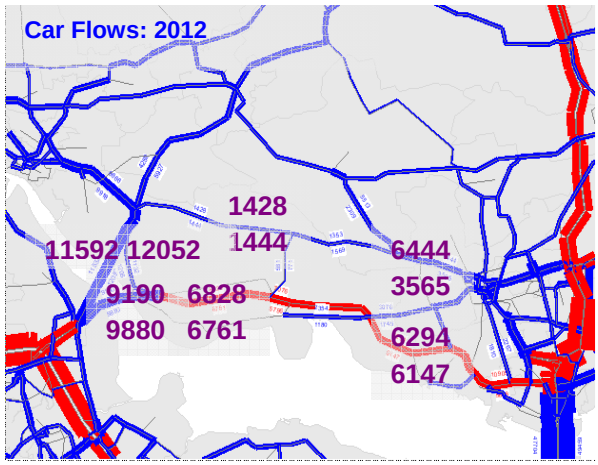


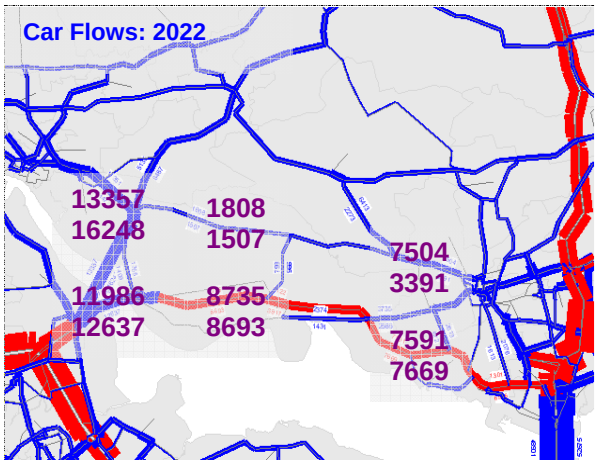
2.2.2 Figure 2.1 shows that the principal roads through the study corridor are aligned on an east-west axis, with the A985 as the predominant trunk route from Inverkeithing to the Kincardine Bridge, and with a link (the A994) to Dunfermline. The A907 borders the study area to the north linking Dunfermline with Clackmannan and Alloa. As noted, the A907 and the A985 are joined by the A977 in the west of the study area.

2.2.3 Transport movements and future forecasts were sourced from the Transport Model for Scotland (TMfS)[1], to show the travel patterns across the local network and how they are predicted to change in the future. Figure 2.2 shows the car traffic flows for the years 2005, 2012 and 2022 in the study corridor.

Figure 2.2 – Cars Traffic for 2005, 2012 and 2022, Annual Average Daily Flows







Key findings:

- 2005 to 2012 traffic growth on the main routes is 28%;
- 2005 to 2022 traffic growth on the main routes is 59%; and
- highest flow in the study corridor is circa 21,600 vehicles per day (two-way) in 2005.

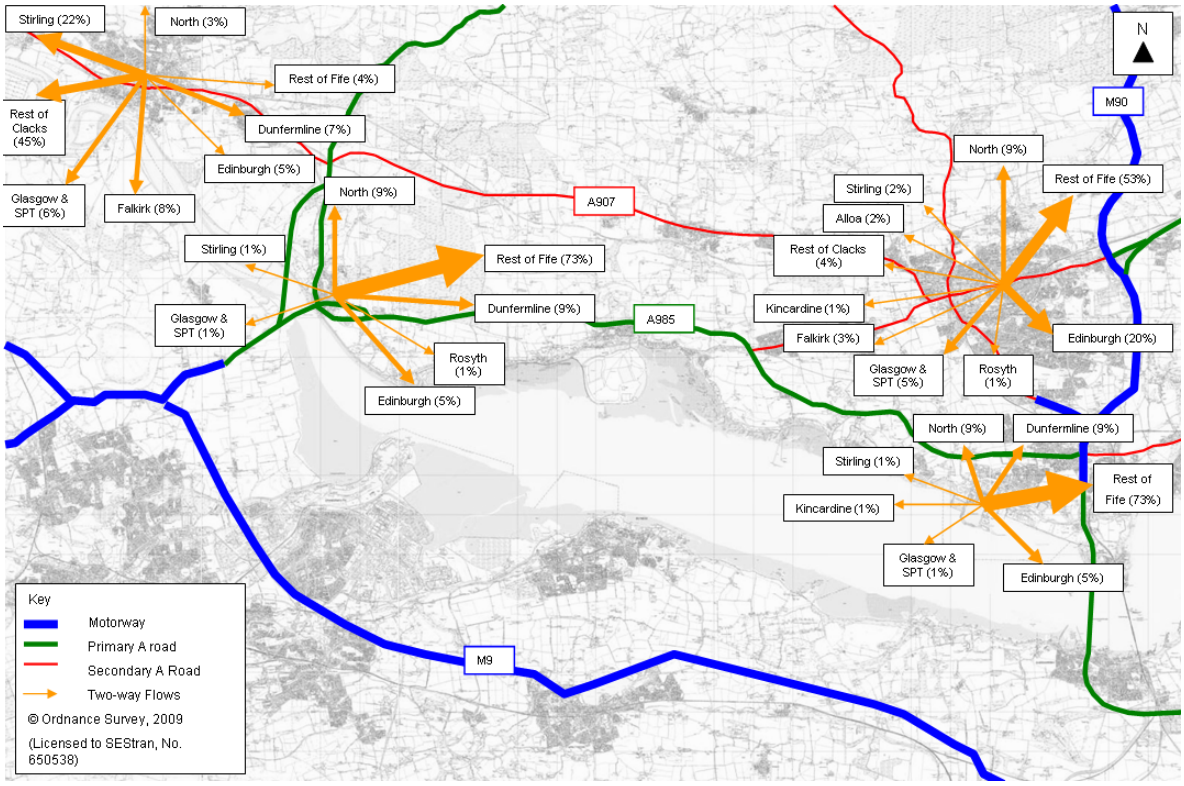
[1] Transport Model for Scotland (TMfS), version 05a:Q, Transport Scotland, 2009

2.2.4 From Figure 2.2, it is clear that car traffic flows are forecast to grow substantially, by up to 120% on some links on the major routes in the study, with the largest increases focused within the western half of the corridor.

2.2.5 Figure 2.3 indicates the distribution of flows, in 2005, from the major urban areas in the corridor. For those settlements in Fife, the largest proportions of car traffic flows are to other parts of Fife. For example, 73% of the traffic originating in Kincardine and Rosyth are destined for other parts of Fife, and for Dunfermline the equivalent flow is 53%. However, relatively little, from 5% to 20%, of the traffic demand originating in the study area is destined for Edinburgh.

2.2.6 The largest distribution of car traffic at 45% to and from Alloa, is within Clackmannanshire, and only relatively small proportions, 6% and 5% are to Glasgow and Edinburgh respectively.

Figure 2.3 – Distribution of Car Trip (Origins and Destinations) for 2005



2.2.7 Table 2.1 shows the ratio of flow-to-capacity (RFCs) for each road to give an estimate of route capacity in the corridor.

Table 2.1 – Annual Average Daily 2-Way Traffic Flows & RFCs (Cars Only)

	2005		2012		2022	
	AADTs	RFC	AADTs	RFC	AADTs	RFC
A907	4,377	0.20	6,441	0.30	7,105	0.33
A985	10,249	0.36	13,015	0.45	16,344	0.57

2.2.8 The A907 and the A985 are classified[2] as a rural single 6.0 meter carriageway and a rural single 7.3 meter carriageway respectively. The RFCs for both routes are well below capacity, even for the 2022 projected flows, therefore no capacity issues on the road network in the study are envisaged over the lifetime of the study. HGV traffic is not included in these figures, but volumes are low, and will not impact on these RFC values to any significant extent.

2.2.9 However, while the above strategic links are relatively free from congestion, information supplied by Clackmannanshire Council has suggested there are some known congested points including:

- A907/B910 roundabout; and
- A907 – Stirling Road /Kellie Place/Claremont.

Bus Transport

2.2.10 There are a number of bus services that serve the west Fife area with onward connections to key destinations over the Forth Bridge and to Clackmannanshire. The principal services are the 15, 24/X24, X26/X27, 71, 72, 74, 75, and the 78.

2.2.11 Table 2.2 shows the main bus services in operation within and through the west Fife – Clackmannanshire corridor. The majority of services are operated by Stagecoach, but the service number 72 is operated by Rennies, and the service number 15 is operated by FirstBus.

Table 2.2 – Main Bus Services (Clackmannanshire – Fife Corridor)

Service	Route	Main route used	Frequency – each direction	Major stops in Corridor	Average time between stops	Time within Study Corridor
15	Falkirk – Stirling *via Alloa*	A977/A907	1 per hour	• Kincardine • Clackmannan • Alloa • Cambus • Tullibody	8.3 minutes	33 minutes
X24/24	St Andrews – Glasgow	A994/A985	1 – 2 per hour	• Halbeath • Dunfermline • Cairneyhill • Kincardine	9.3 minutes	28 minutes
X26/X27	St Andrews - Glasgow	A994/A985	1 per hour	• Crossgates • Halbeath • Dunfermline • Cairneyhill • Kincardine	8.0 minutes	32 minutes
71	Dunfermline – Inverkeithing *via Cairneyhill & Rosyth*	A994/A985	1 per 1 – 2 hours	• Dunfermline • Cairneyhill • Limekilns • Rosyth • Inverkeithing	14.8 minutes	59 minutes
72	Dunfermline – Kincardine *via Oakley & Blairhall*	B9037/A907/ A985	3 per day	• Dunfermline • Kincardine	4.5 minutes	36 minutes
74	Dunfermline - Blairhall	A907	3 per hour	• Dunfermline • Oakley • Blairhall	12.5 minutes	25 minutes

[2] Design Manual for Roads and Bridges, Volume XV, Section 1, Part 1, Table 5/3/1: NESA Road Categories, Link Speeds & Link Capacities

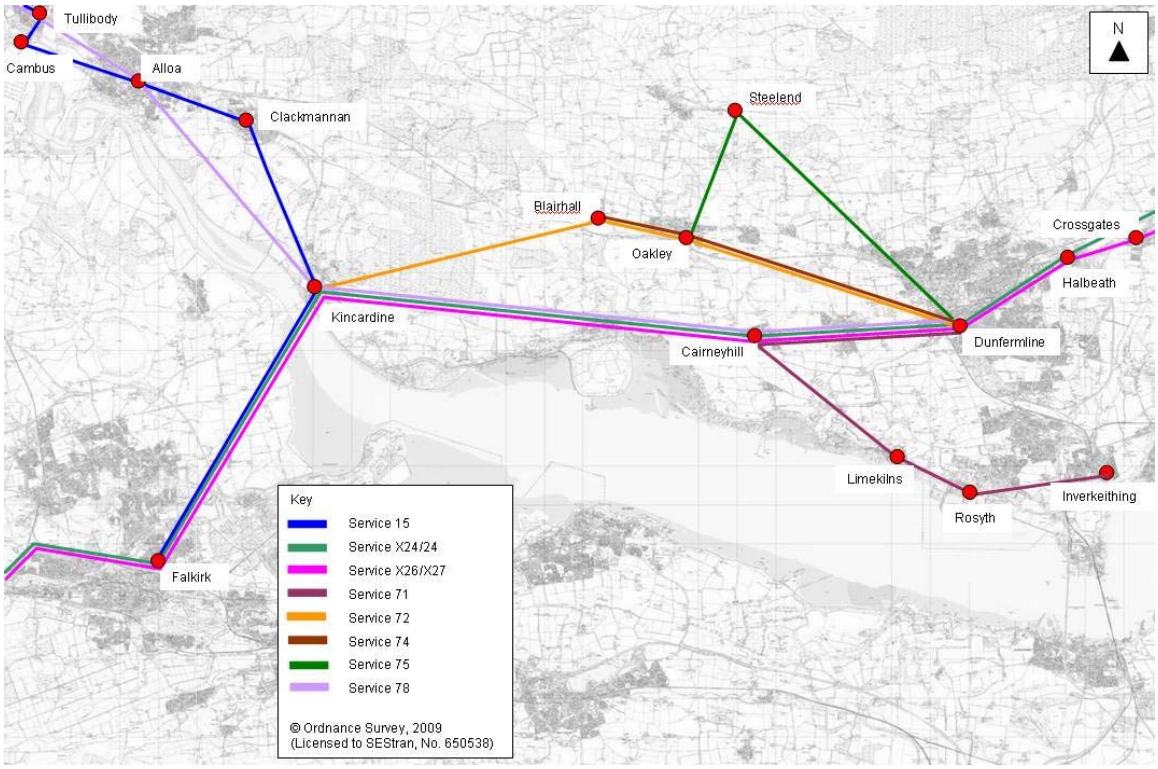
Table 2.2 – Cont.

Service	Route	Main route used	Frequency – each direction	Major stops in Corridor	Average time between stops
Dunfermline – Oakley *via Steelend*	A907	1 per hour	• Dunfermline • Oakley	5.2 minutes	26 minutes
Dunfermline – Stirling	A994/A985	4 per hour	• Dunfermline • Cairneyhill • Kincardine • Alloa • Tullibody	16.3 minutes	56 minutes

2.2.12 As the Table shows, with a combined service frequency of more than one bus every 15 minutes on the A994/A985, and at least one bus every 20 minutes or so at the eastern end of the A907, the corridor is reasonably well penetrated by public transport services, most of which are anchored either at Dunfermline in the east of the study area, or Kincardine in the west. Services linking onto the A985 to and from Dunfermline operate along the A994. However, it should be noted that there are no public transport services on the A907 west of Blairhall as far as the A977.

2.2.13 Figure 2.4 shows a representation of the main bus routes that operate through and within the study corridor.

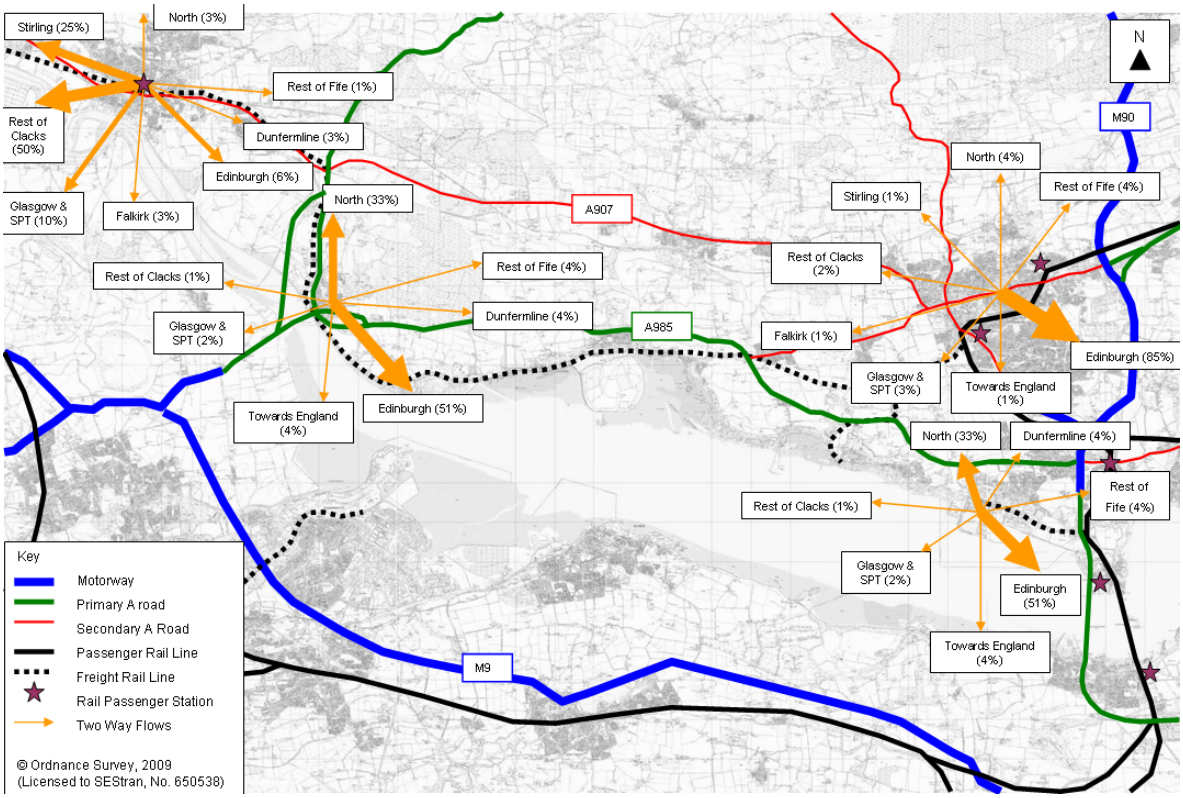
Figure 2.4 – Main Bus Routes Operating Within and Through the Study Corridor



2.2.14 A number of services, the X24/24, the X26/X27 are long distance services linking the study corridor to East Fife (St Andrews) and to Glasgow and Falkirk in the central belt. Only one service connects Dunfermline directly with Alloa (the 78) via Kincardine, which accounts for the route taking just under an hour to complete. There are no direct services from Clackmannanshire to Edinburgh passing through the study corridor, and passengers residing in the corridor need to change buses at Dunfermline to access Edinburgh.

2.2.15 Figure 2.5 indicates the distribution of bus passenger flows sourced from TMfS for the main settlement areas in the year 2005.

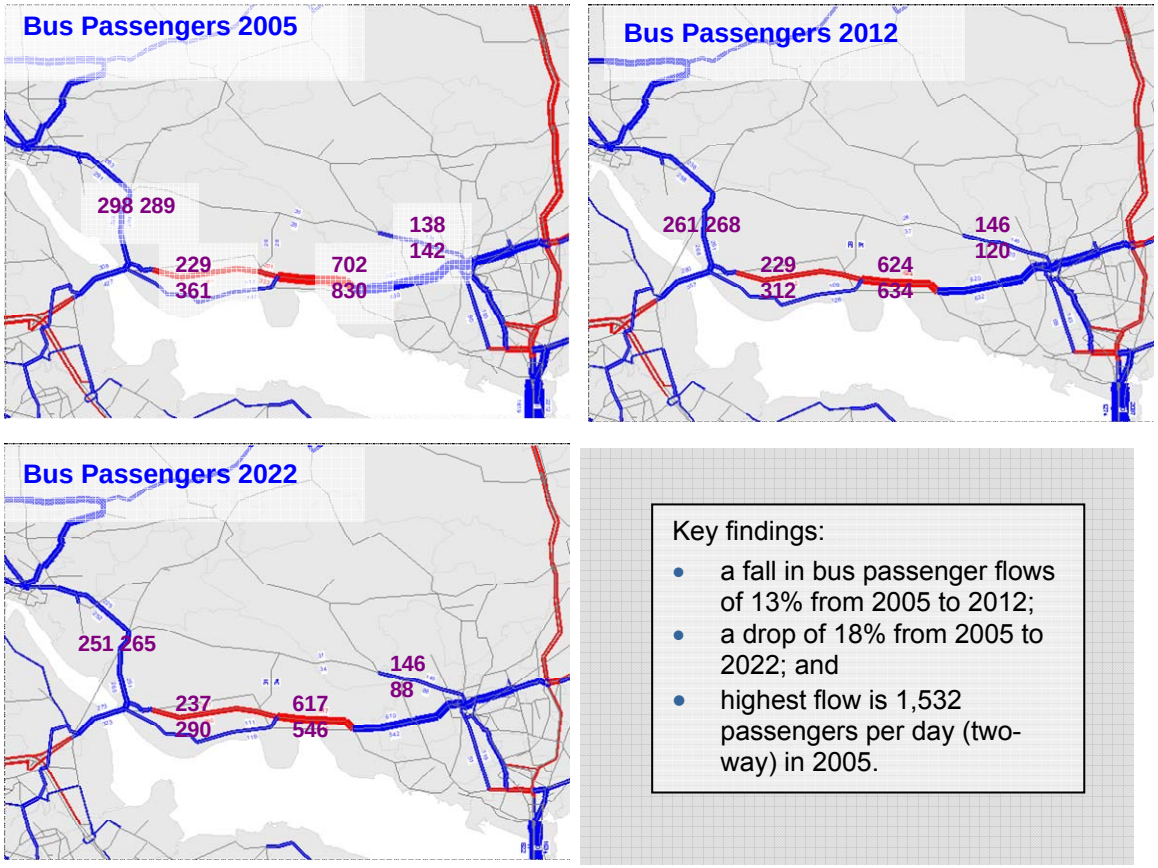
Figure 2.5 – Distribution of Origins and Destinations of Bus Trips for 2005



2.2.16 As can be seen from the above Figure, the largest distribution of bus journeys in 2005 were to and from Edinburgh, with 51% of trips from Kincardine and Rosyth each destined to and from the city and 85%, or more than 5 in 6 trips, between Dunfermline and Edinburgh. In contrast with the pattern for car use, relatively few (just 4%) of bus passenger trips originating in Fife are destined for other Fife locations outside the study corridor.

2.2.17 The trend in bus patronage is one of decline. Figure 2.6 overleaf shows this pattern clearly. Passenger numbers are estimated to decline by 21% on the A985, the main bus route through the corridor. Most of this fall in passengers is projected to occur in the period 2005 to 2012 (15%).

Figure 2.6 – Bus Traffic on the Road Network in the Study Corridor, 2005, 2012 and 2022, Annual Average Daily Passenger Flows

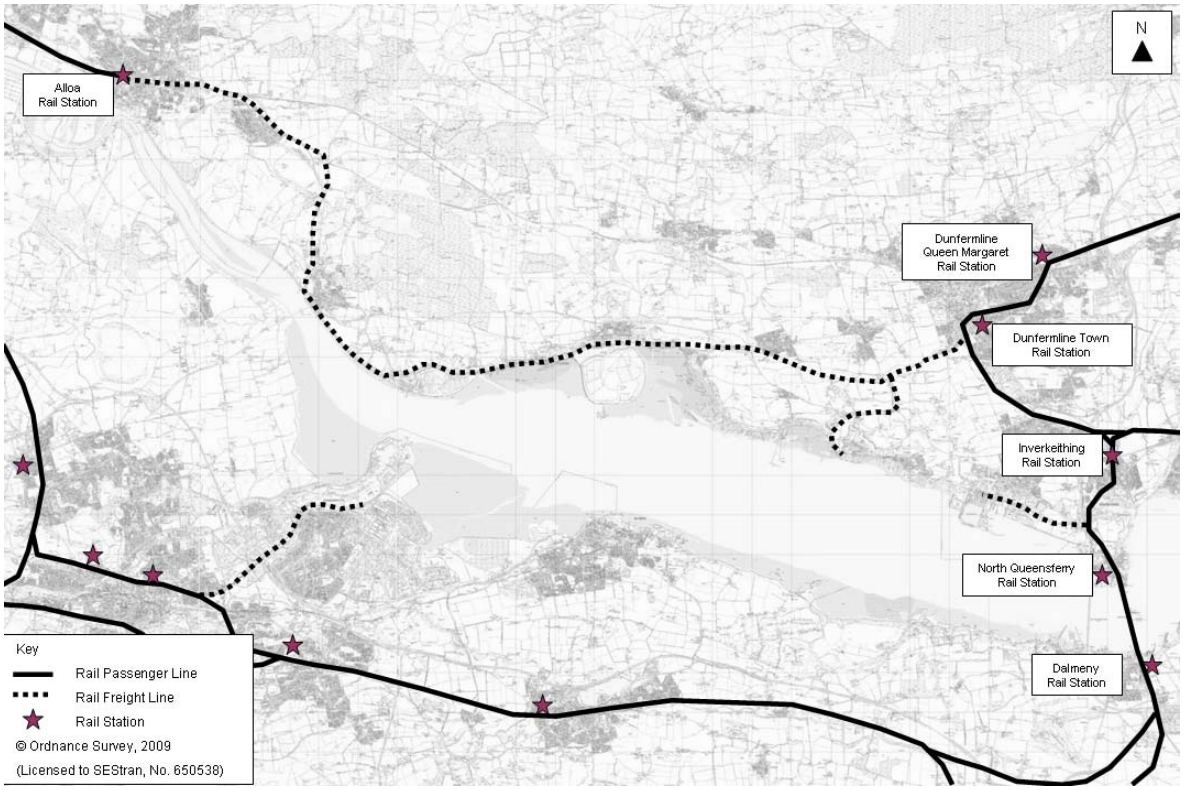


Rail Transport

2.2.18 Figure 2.7 overleaf shows the rail network in the study corridor. The existing heavy rail line is aligned east-west, from Dunfermline via Culross, Longannet power station and Kincardine through to Alloa, and Stirling, with onward destinations to and from the south and west.

2.2.19 However this rail line is not used for passenger traffic, and there are no rail passenger services currently passing through the study corridor. The only rail passenger services in the study area are on the periphery and connect the edge of the corridor with the wider region. Figure 2.7 overleaf shows the rail network in the area, together with the principal rail stations in and on the boundary of the study corridor.

Figure 2.7 – Rail Network in the Study Corridor



2.2.20 The majority of the stations on the periphery of the study corridor recorded an increase in passenger usage between 2007 and 2008, the latest years for which information is available from the Office of the Rail Regulator (ORR)[3]. This is shown in Table 2.3, (there is no equivalent data for Alloa, as this station opened only in 2008).This suggests that there has been substantial recent modal shift from other modes to rail, no doubt assisted by the new park and ride facilities at Ferry Hills on the north side of the Forth Bridge. The only decline in station usage has been at the Dunfermline Queen Margaret station.

Table 2.3 – Rail Usage/Growth for Key Stations within & around the Study Area

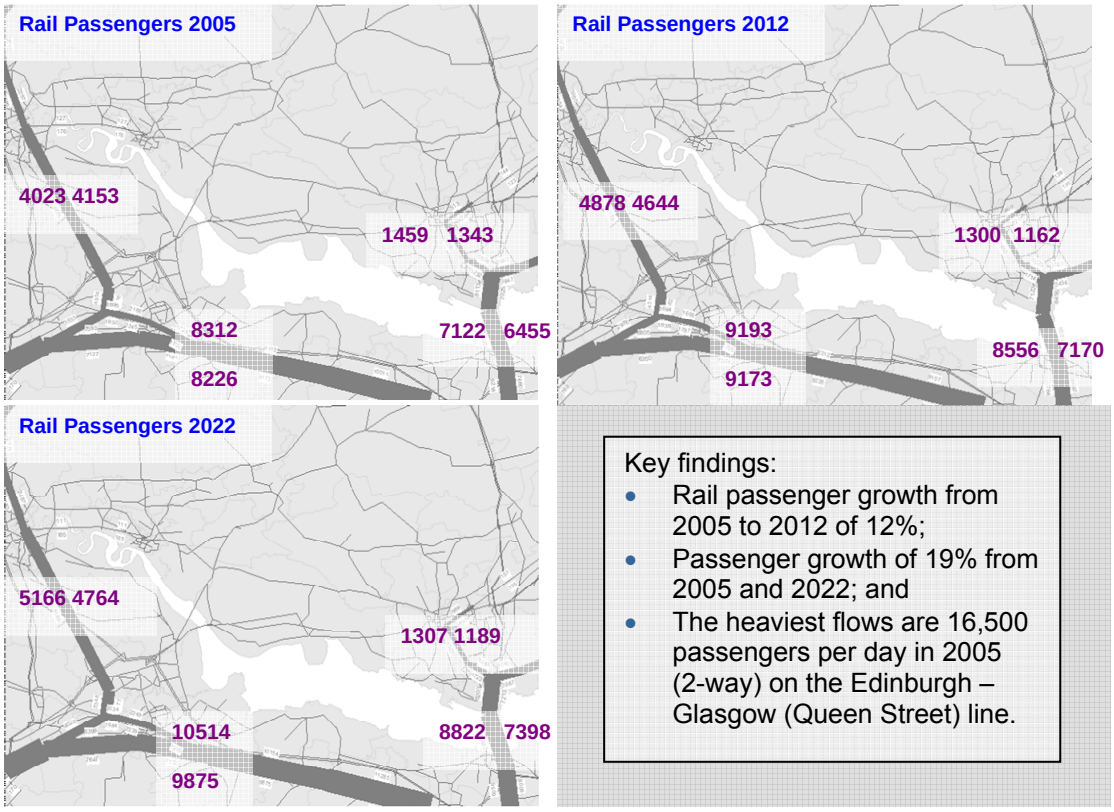
Station	County	Total Passenger usage (entries & exits) 2007-2008	Change in usage over one year
Dunfermline Queen Margaret	Fife	202,477	-4.2%
Dunfermline Town	Fife	637,917	1.0%
Inverkeithing	Fife	1,031,778	4.4%
North Queensferry	Fife	129,179	6.9%
Rosyth	Fife	237,028	8.8%
Stirling	Stirling	2,027,750	5.3%

2.2.21 There may be potential to open the rail line for passenger traffic between Alloa, where passenger trains currently terminate, and Dunfermline. This could present an opportunity to establish a commuter route through the corridor but would necessitate the opening or re-opening of railway stations in the dormitory communities of Clackmannan, Kincardine or Culross. However, there are a

[3] Station Passenger Usage Flows, Office of the Rail Regulator, 2009

number of constraints to this possibility, not least the current signaling system between Alloa and Dunfermline, which is unsuitable for use by passenger traffic.

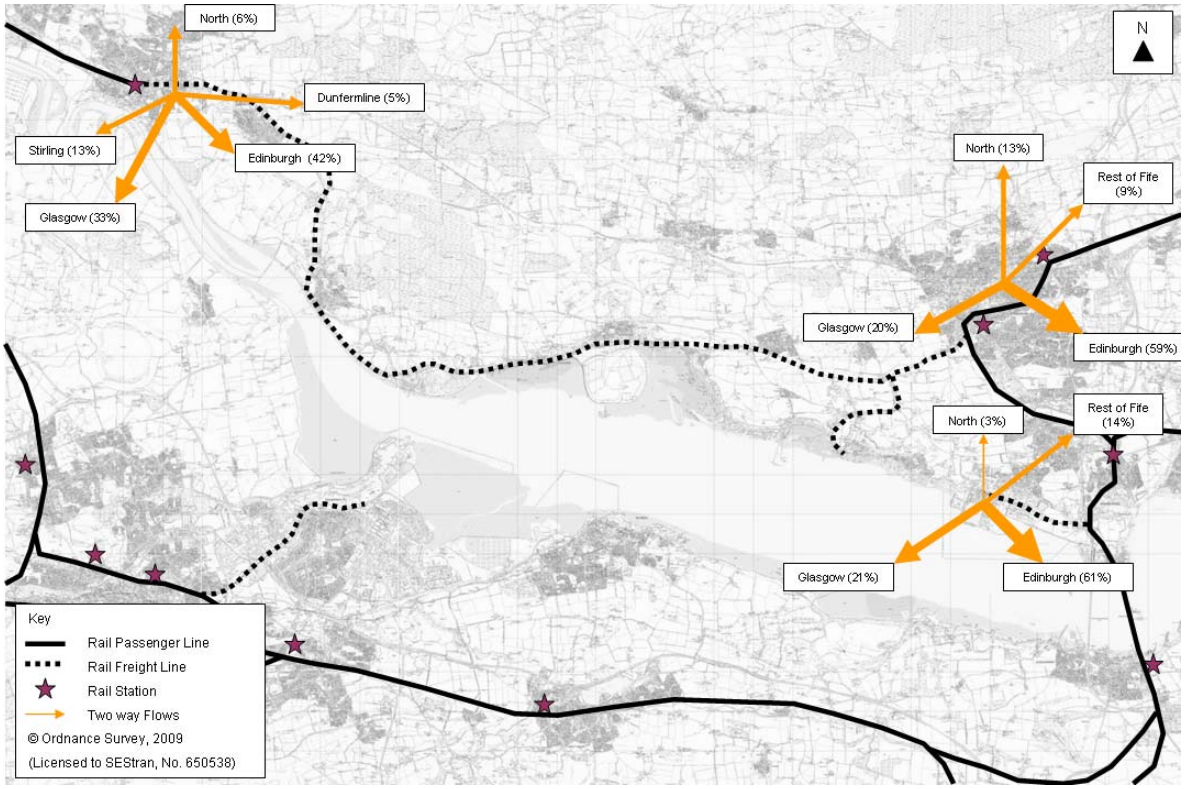
Figure 2.8 – Rail Passenger Flows on the Surrounding Rail Network (2005, 2012 and 2022), Annual Average Daily Passenger Flows



2.2.22 The heaviest passenger demand is, as expected, on the Glasgow – Edinburgh corridor on the southern side of the Forth. However a significant amount of passengers travel between Edinburgh and Fife, as Figure 2.8 above shows. There is a projected increase in demand for most of the rail passenger routes in the region surrounding the study area. However, passenger demand to and from Dunfermline across the Forth is projected to decline slightly to 2012, as a result of changes in land-use as modelled in TMfS, but is expected to remain static thereafter until at least 2022.

2.2.23 Figure 2.9 overleaf indicates the distribution of rail passenger flows for the year 2005. The Figure demonstrates the importance of both Glasgow and Edinburgh in terms of passenger demand for locations on the periphery of the study area.

Figure 2.9 – Distribution of Origins and Destinations of Rail Trips for 2005



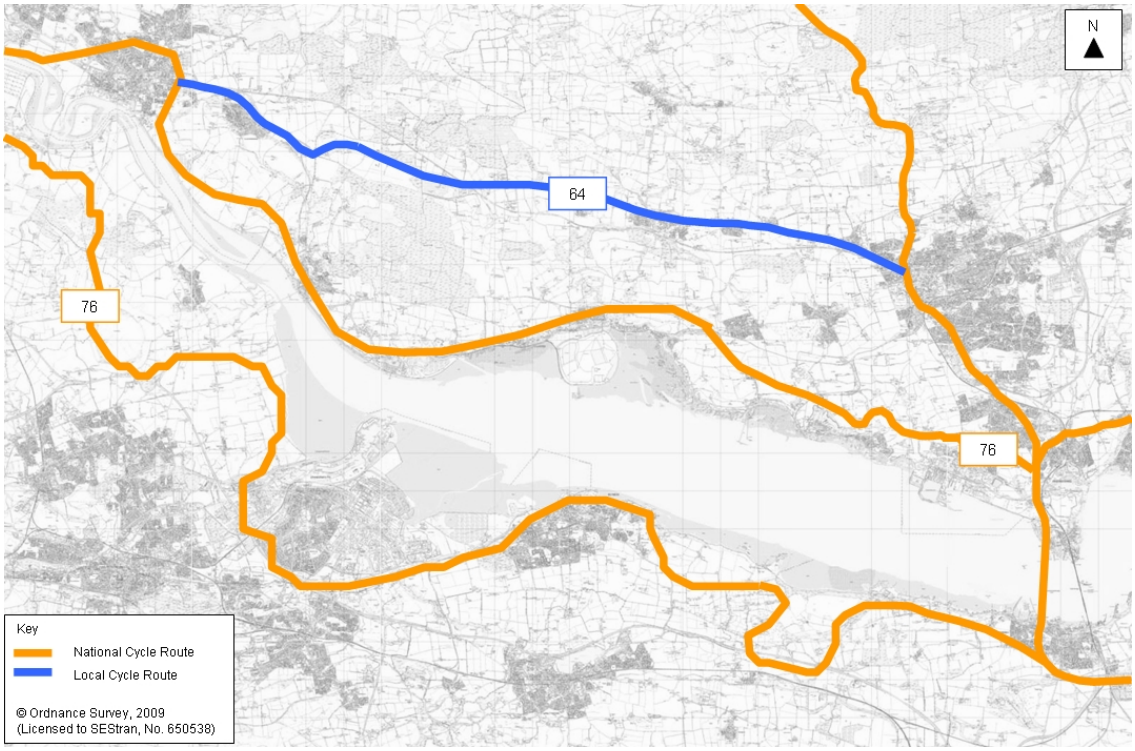
Passenger Transport by Sea

2.2.24 The Rosyth to Zeebrugge ferry service provided the only sea link for passengers between Scotland and the continent, and had been operated by a Greek-based company, Superfast Ferries, for six years. In the winter of 2005, Superfast ferries removed one of the two ships operating the link between Zeebrugge and Rosyth, thus turning the daily link from Belgium to Scotland into one operated only every other day, before folding completely in May 2008. The Dutch ferry company Norfolkline, a subsidiary of the Danish Maersk group, has revived the Rosyth to Zeebrugge route, the service started up again on 19 May 2009 using a new vessel and run on a robust commercial basis, with three sailings each week.

Cycling and Walking

2.2.25 The west of Fife and Clackmannanshire are hosts to a number of cycle routes, including the Round the Forth National Cycle Route number 76 which closely follows the north shore of the Forth Estuary, (see Figure 2.10 overleaf). This, as the name suggests, is a circular route around the Forth estuary and includes the towns of Grangemouth, Stirling, Alloa, Kincardine and Charlestown. It is planned to extend the route eastwards along the Fife coast to St Andrews. The region is also host to Route 64 which links Dunfermline with Clackmannan.

Figure 2.10 – Cycle Routes through the Study Corridor



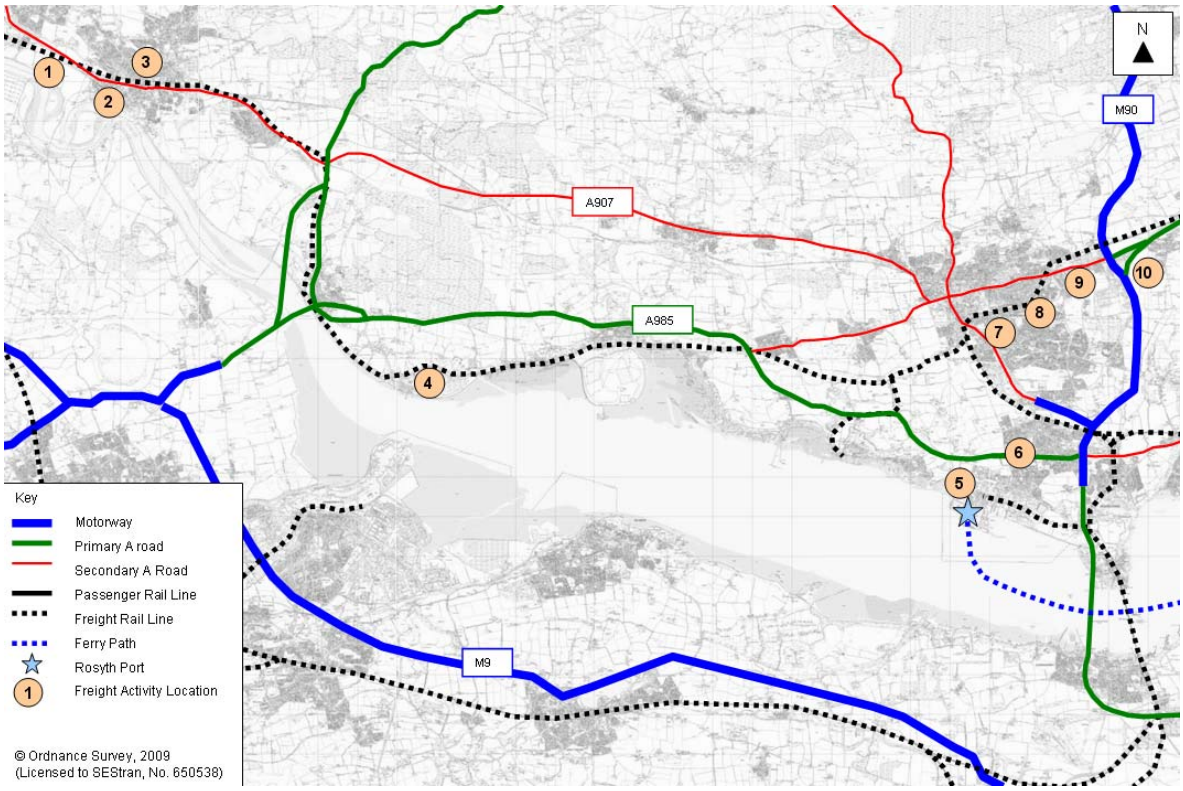
2.2.26 There are fewer dedicated facilities for walking than cycling in the west of Fife. However, the local cycling route between Dunfermline and Clackmannan (Route 64) follows the path of a disused railway line, and this doubles as both a cycle and long distance walking route.

2.3 Freight Transport

Overview of the Freight Network

2.3.1 Figure 2.11 overleaf illustrates the freight network in the study area, including the principal locations of freight activity. As can be seen from the Figure, the study corridor is well served by freight infrastructure, both with comprehensive internal connections, and with rail, road and shipping routes to the surrounding region and beyond.

Figure 2.11 – Freight Network in the Study Corridor



2.3.2 There are potentially a number of locations where freight traffic is generated / attracted but the main centres of current freight activity are as follows:

(1) Kelliebank Industrial Estate & Midas Cargo Village;
(2) Alloa Industrial estate, Business Centre & Castle Street Industrial estate;
(3) Trade Centre & Cooperage Way Business Village;
(4) Longannet Power Station;
(5) Rosyth Port;
(6) Dunfermline Business Centre;
(7) Lyneburn Industrial Estate;
(8) Phoenix Industrial Estate;
(9) Axis Point; and
(10) Halbeath Interchange.

2.3.3 The 10 locations above are shown in Figure 2.11.

Overview of Freight Demand

2.3.4 Scott Wilson undertook the Scottish Multi-Modal Freight Locations Study (SMMFLS) on behalf of the Scottish Government, Transport Scotland and Scottish Enterprise[4]. This was a national freight study which included the development of a nation-wide multi-modal Scottish Freight Model[5] (SFM). It was therefore considered beneficial to use this data and model.

2.3.5 Freight has different characteristics and the data collected for the SFM was disaggregated by commodity and cross-referenced [based on the Standard Index Classifications (SIC) codes] in order to allow modeling by commodity. Future forecasts of freight were produced for low and high growth scenarios, from a base year of 2007.

2.3.6 A significant element of the data provided is commercially sensitive and hence all information provided by stakeholders has to be treated in strict confidence. Consequently, the information cannot be presented at a very detailed level, but it is possible to present information in an outline format and aggregated for the main areas. The SFM was used under these conditions of operation, and current and future estimates of freight demand and traffic patterns are shown at the aggregate level in order to maintain the commercial sensitivities requested by stakeholders who provided the data.

2.3.7 Table 2.4 presents an overview of freight demand in terms of tonnage to and from the study area, and the growth associated with each freight commodity from 2007 to 2012, and to 2022, for both anticipated low and high growth scenarios.

Table 2.4 – Annual 2-Way Freight by Commodity in Study Area (x1000 Tonnes)

Sector*	2007**	2012 Low Growth	2012 High Growth	2022 Low Growth	2022 High Growth
Agriculture, fisheries & related	1,060	1,190	1,261	1,450	1,664
Construction	5,748	6,350	6,622	7,554	8,369
Food & Drink	2,777	3,149	3,388	3,894	4,613
Mining & Quarrying & mineral products	3,454	3,869	4,097	4,701	5,339
Sewage, sanitation & recycling etc	1,856	2,051	2,138	2,439	2,703
Retail and Wholesale trades	7,009	7,743	8,075	9,212	10,205
Fuel***	8,759	7,047	7,594	5,145	6,520
Other	2,287	2,527	2,635	3,006	3,330
Totals	***32,950***	***33,926***	***35,810***	***37,401***	***42,743***

*Notes: * - road element contains LGV tonnage movements*
*** - contains OD double counting*
**** - see paragraph 2.3.9*

2.3.8 Table 2.4 shows the predominance of the retail and wholesale trade and of the construction industry in terms of freight tonnage moved by road in both Clackmannanshire and Fife. Mining, quarrying products and food and drink are also significant sectors with regards to freight tonnage movements in the study area. Overall freight tonnage is projected to grow from a total of approximately 33 million tonnes to 37.4 million tonnes in the 2022 low growth scenario and 42.7 million tonnes in the 2022 high growth scenario. The category "other" covers manufacturing of metal and wood products, including furniture, paper and machinery equipment. The total tonnage of 33m tonnes in 2007 is equal to 7.7% of the Scottish total.

2.3.9 It should be noted that the only sector that sees a decline in tonnage moved is fuel, as an increasing proportion of this is being moved by pipeline. It is also worth noting however that the data supplied for sea freight through the port of Rosyth covers an area which is much larger than the harbour itself. This may have influenced the results, albeit slightly.

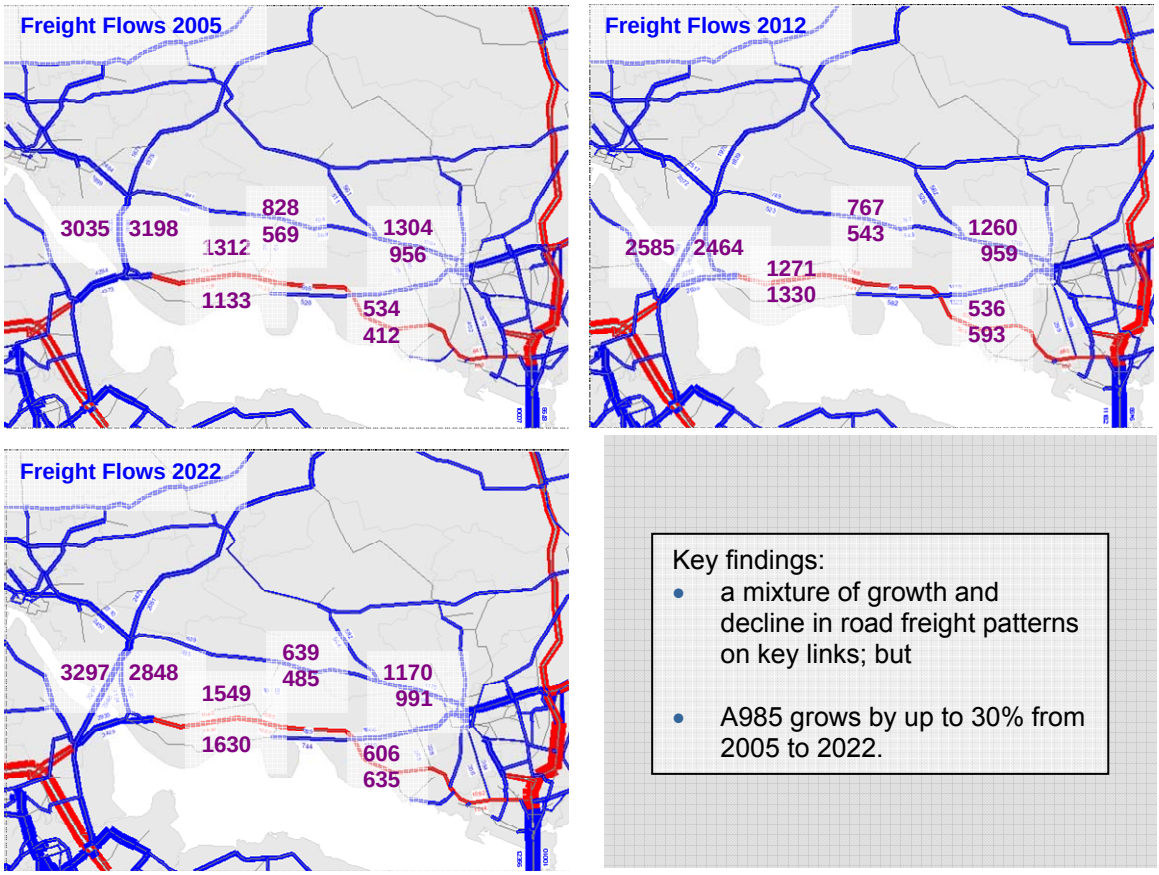
[4] Scottish Multi-Modal Freight Locations Study, Final Report, Scottish Enterprise, May 2009
[5] Scottish Freight Model – Technical Note, Scottish Enterprise, May 2009

Road Freight

2.3.10 Freight transport in the study corridor is primarily road freight, the majority of which passes through the region on the A985 trunk route between Dunfermline, Rosyth and Edinburgh.

2.3.11 TMfS was used to obtain network flows in the local study area for freight. Figure 2.12 shows freight traffic flows for 2005, 2012 and 2022. Freight flows are relatively light on the A907 in the western half of the study corridor, but towards Dunfermline it is a great deal heavier. This suggests that much of the freight traffic is local to Dunfermline, principally in the adjacent region west of the town. However, the opposite is true on the A985, where the freight traffic is heavier towards Kincardine than the Forth Bridge.

Figure 2.12 – Road Freight Network Flows (2005, 2012 and 2022), Annual Average Daily Flows



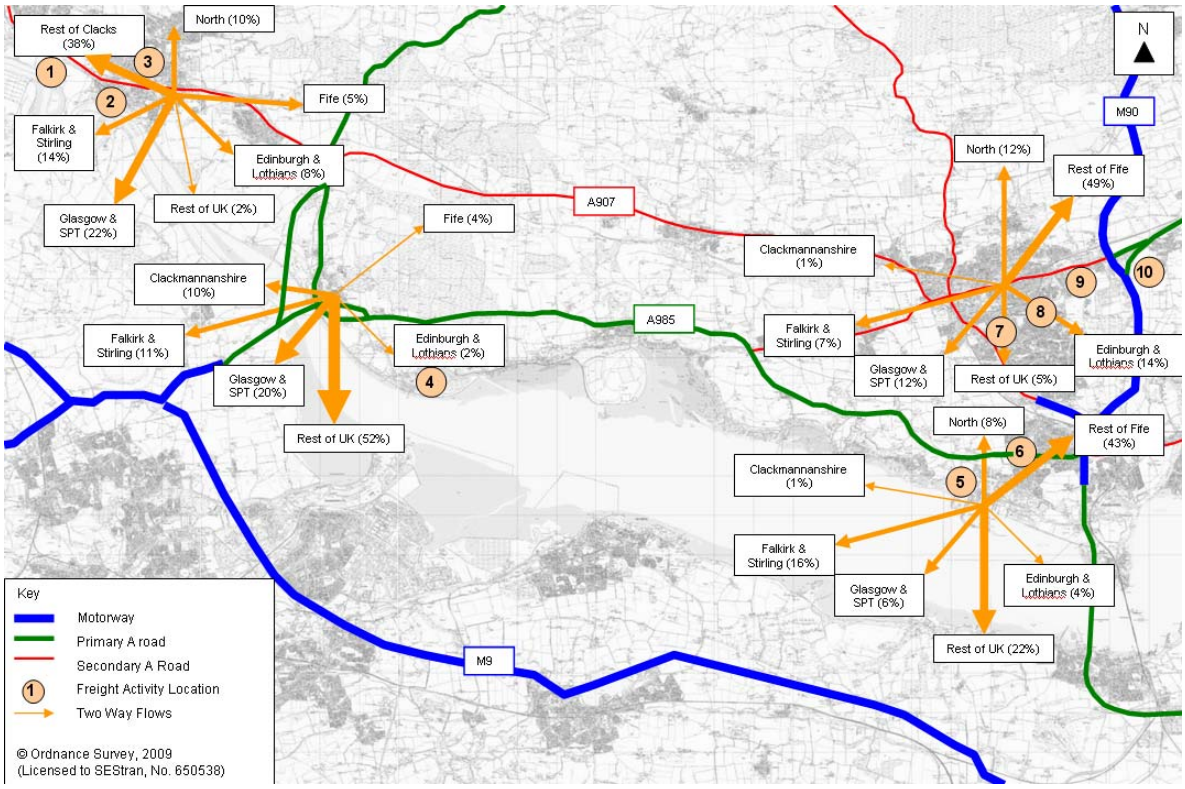
2.3.12 The Figure shows the projected growth in road freight traffic. Traffic densities on the A907 are projected to decline between 2005 and 2022 by an average of 11% over the 17 year period. On the other hand freight traffic on the A985 is expected to increase over the same time, by an average of 30%. However traffic between the A907 and the A985 on the A977 is projected to remain relatively constant over this interval.

2.3.13 Eastbound traffic is expected to decline between 2005 and 2012, before increasing by 2022, but remaining below 2005 levels. HGV traffic westbound is lighter, but expected to increase through the

appraisal period. In total terms, HGV traffic is expected to increase to over 1,400 vehicles a day in both directions by 2022.

2.3.14 Figure 2.13 indicates road freight distribution in the Dunfermline and Alloa ends of the study corridor, and within the corridor itself, at Kincardine and at Rosyth harbour. This is based on more detailed data sourced from the Scottish Freight Model for 2007 surveys.

Figure 2.13 – Distribution of Road Freight Origins and Destinations for 2007



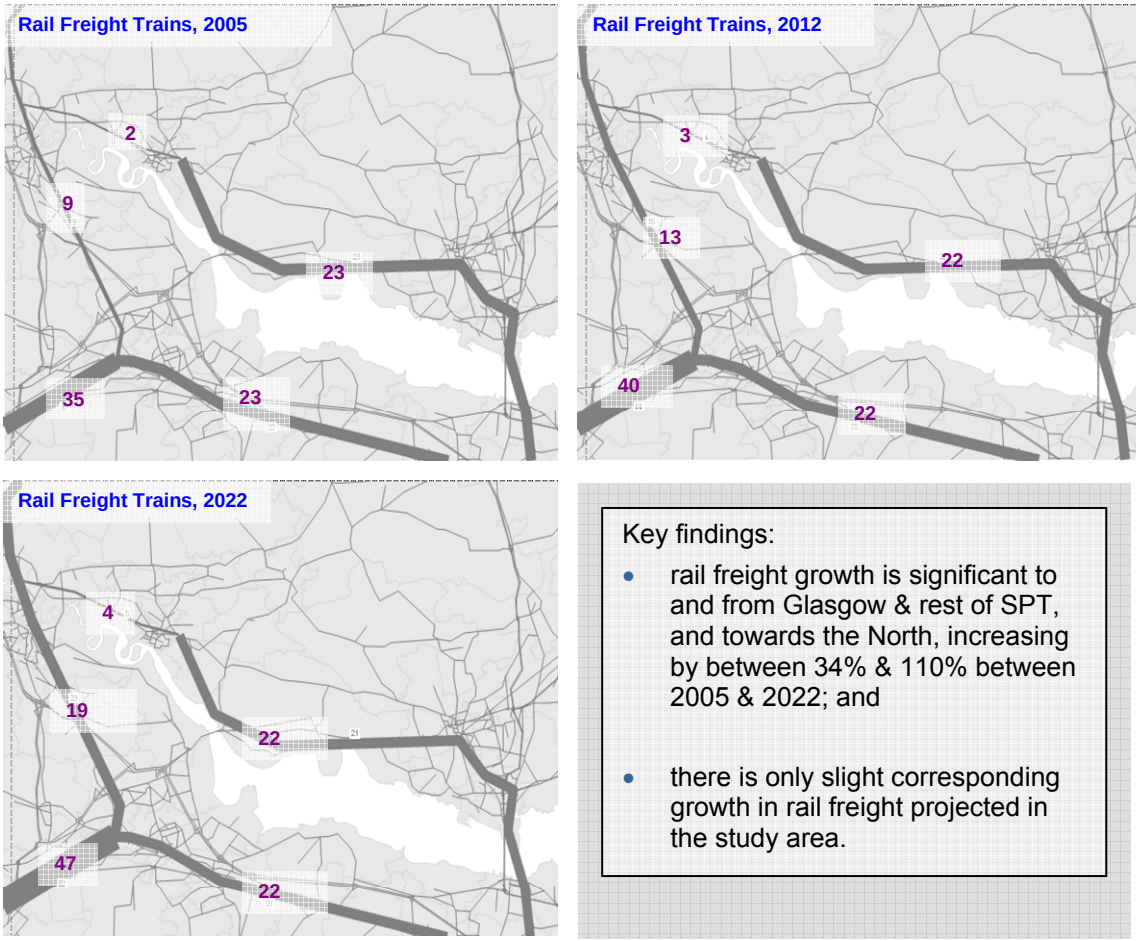
2.3.15 The largest distribution of road freight from the eastern end of the corridor, at Dunfermline, is internal to Fife (49%). Flows westward to destinations in the corridor and beyond are comparatively light, with 1% destined for Clackmannanshire and 19% to Glasgow and the rest of the SPT area. Distribution in the western end of the corridor, at Alloa, is primarily within Clackmannanshire (38%), to and from Glasgow and rest of the SPT region (22%) and to and from Falkirk and Stirling (14%). Road freight flows to and from Edinburgh and to and from Fife are comparatively light, only 8% and 5% respectively.

2.3.16 A large distribution of road freight to and from Kincardine and Rosyth is between these towns and the rest of the UK (52% and 22% respectively). A relatively large distribution is also transported between Rosyth and the rest of Fife (47%), with relatively little freight going elsewhere. However, it should be noted that these values are in tonnage terms, and the vast majority of freight by volume is overseas trade through Rosyth to mainland European destinations, and elsewhere, discussed in the Sea Freight section later in this Chapter.

Rail Freight

2.3.17 Figure 2.14 shows the rail freight intensity in terms of the number of trains per day using the rail network through the study corridor and in adjacent areas for the year 2005, and expected to do so for the years 2012 and 2022[6].

Figure 2.14 – Rail Freight Trains Per Day (2005, 2012 and 2022)

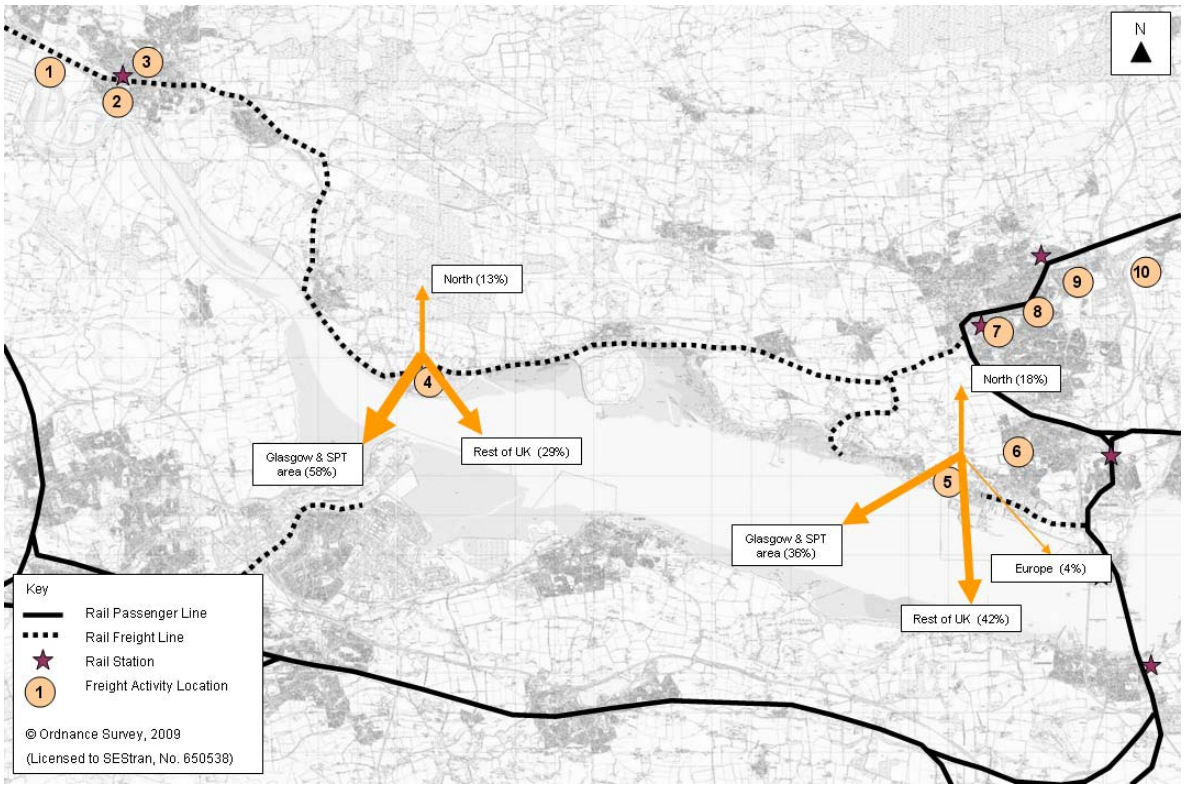


2.3.18 The above suggests there is significant rail freight growth anticipated to/from the west of the study area and the North between 2005 and 2022. There is only a slight corresponding growth in rail freight projected within the study area, presumably due to the limited facilities in the area.

2.3.19 Figure 2.15 overleaf shows the distribution of rail freight to/from the study corridor. This is based on more detailed data sourced from the Scottish Freight Model from 2007 surveys.

[6] Adapted from Freight Transport Association – Rail Freight Group Data, 2006

Figure 2.15 – Destination of Rail Freight Origins and Destinations for 2007



2.3.20 The above suggests the main destinations for rail freight are the west of Scotland and England and Wales, via both the West Coast Main Line (WCML) and East Cost Main Line (ECML). There is also some significant demand to/from the north of Scotland and also some modest demand to Europe, via the Channel Tunnel.

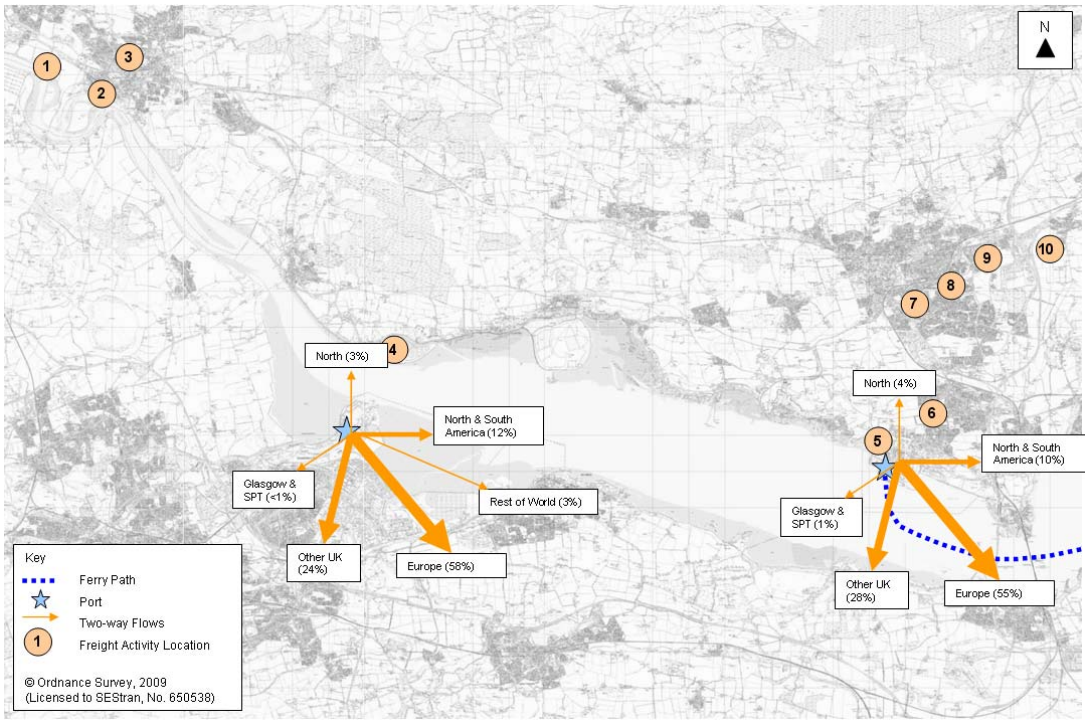
Sea Freight

2.3.21 Rosyth harbour, one of eastern Scotland's principal ports, is situated at the eastern end of the study corridor and attracts significant volumes of freight traffic annually. These volumes are expected to increase over the next 3 years or so with the level of current investment in expansion of freight handling capacity, including deep water facilities and growth in storage area at the site.

2.3.22 Most of this freight traffic in terms of freight tonnage originates from the north east of Scotland and currently accesses the port using the M90 via Dunfermline, but some of which originates from the Central Belt, and uses the Forth Road Bridge to access the port. It should be noted though that freight accessing Rosyth covers a larger area. Total freight tonnage movements through Rosyth was approximately 7.95 million tonnes in 2007, although this is projected to decline slightly by 2020 to 7.57 million tonnes because of the trend of increasing volumes of petroleum products transferred by pipe rather than shipped.

2.3.23 Figure 2.16 overleaf shows the two-way freight flows to and from Rosyth and Grangemouth ports. Clearly the most significant flows, 55% of the total, are between Rosyth and Continental Europe, and the biggest proportion of these flows is between Rosyth and Rotterdam, with lesser sea freight flows to and from Zeebrugge and Hamburg. Nearly a third of freight flows (32%) goes to and from Scottish or other UK destinations, the vast majority of which is trade with the latter.

Figure 2.16 – Distribution of Sea Freight Origins & Destinations for 2007



2.3.24 Figure 2.16 illustrates that:

- nearly a third of sea freight is distributed on domestic routes to and from the port of Rosyth, the majority of which is liquid bulk fuel, principally petroleum products;
- over half of freight originates is destined for Europe (the majority of this to Rotterdam);
- the rest of the freight is distributed as intercontinental traffic, mainly to and from North and South America; and
- Grangemouth port follows a similar pattern to Rosyth.

2.4 Other Transport Issues

Modal Split

2.4.1 Table 2.5 shows the modal split, based on the TMfS05 model, between car trips and bus trips undertaken on the key public transport routes within the study area. Clearly the vast majority of trips are undertaken by car, and this proportion rises from 94% of trips in 2005 to 97% of trips by 2022. There is also a corresponding decline in public transport usage over the same period, but most of the decline occurs between 2005 and 2012.

Table 2.5 – Modal Split between Public Transport & Car Trips

Mode	2005	2012	2022
Car	94%	96%	97%
PT	6%	4%	3%

2.4.2 This suggests the mode share of private car is set to increase at the expense of public transport. By 2022, public transport's mode share will be circa half the level it was in 2005. This corresponds with the estimated growth in car trips identified earlier in this Chapter.

2.4.3 This can be compared to the national average mode shares (sourced from TMfS) to give an idea of how the corridor is performing in relation to the Scottish average as shown in Table 2.6.

Table 2.6 – National Averages Modal Split between Public Transport & Car Trips

Mode	2005	2012	2022
Car	84%	85%	87%
PT	16%	15%	13%

2.4.4 From this we can see that the corridor has much higher car usage than the national average (around 10%) and lower PT uptake. This could be attributed to the limited choice and alternatives to car along the corridor.

2.4.5 In terms of freight transport, Table 2.7 shows the modal split for freight, by tonnage. It should be noted that some of the road and rail freight feed into sea freight, so there will be an element of double counting.

Table 2.7 – Freight Modal Shares

Scenario	Tonnes (x1000)	Distribution per Mode					
		Road		Sea		Rail	
2007 Base	32,950	21,268	*65%*	8,615	*26%*	3,067	*9%*
2012 Low Growth	33,926	23,496	*69%*	6,717	*20%*	3,713	11%
2012 High Growth	35,810	24,501	*68%*	7,065	*20%*	4,244	12%
2022 Low Growth	37,401	27,951	*75%*	4,446	*12%*	5,004	13%
2022 High Growth	42,743	30,966	*72%*	5,177	*12%*	6,599	15%

Note: Actual figures may not add up exactly due to rounding

2.4.6 As with public transport, road freight's mode share is anticipated to increase in the future. In addition, rail freight is also set to increase its share with a doubling in tonnage moved by 2022 in the High Growth forecasts.

2.4.7 Sea freight, however, is anticipated to lose some of its share primarily due to the continued trend for fuel and oil to be piped rather than shipped. There are plans to develop Rosyth Port and provide a new Container Terminal which could go some way to increasing the level of tonnage through the harbour. However, at the time of this analysis, there were no details published so the sea freight tonnes above do not include any potential demand arising from the new plans at Rosyth.

Road Safety

2.4.8 To assess the road safety of the study corridor, four roads were investigated. These were the A907, A985, A823 and the A977. Accident information for the five year period from 2004 to 2008 inclusive was gathered from STATS 19 data, provided by Fife Council, and annual daily flows on the roads were derived from TMfS. The Personal Injury Accidents (PIA) per million vehicle-kilometres were then calculated for each stretch of road, given the average accidents over five years and the annual vehicle kilometres.

2.4.9 These were then compared to the national average for combined link and junction accident rates, reflecting the data supplied. These rates were taken from the NESA manual[7], which helped to identify those with accident rates above the national average. Table 2.8 overleaf shows the results.

[7] The NESA Manual, Volume 15 Section 1 Part 6, Table 6/5/2, July 2005

Table 2.8 – Accident Rates and Severity on Key Roads in the Study Area

Road	Fatal	Serious	Slight	PIA	PIA / M.Veh-km	Level Above the National Average
A907	1	25	114	118	0.527	Significantly Higher
A985	5	12	44	33	0.157	Slightly Lower
A823	1	9	61	58	0.577	Significantly Higher
A977	2	3	12	9	0.136	Lower

2.4.10 As can be seen from the above table, the A907 and A823 are currently experiencing average accident rates which are significantly above the national average. To explore this issue further, the level and type of casualties experienced on the roads were then examined. The same accident data supplied by Fife Council was used to estimate the ratios of PIA which resulted in Fatal, Serious and Slight casualties. These are compared to the national averages from the NESA manual for each road, shown in Table 2.9 below.

Table 2.9 – Comparison of Casualty Rates with National Averages

Road	Ratio Fatal	Ratio Serious	Ratio Slight	Level Above the National Average		
				Fatal	Serious	Slight
A907	0.008	0.215	0.965	Below	Below	Below
A985	0.136	0.364	1.333	Significantly Higher	Higher	About Equal
A823	0.017	0.149	1.054	Below	Below	Slightly Below
A977	0.167	0.333	1.333	Significantly Higher	Slightly Higher	About Equal

2.4.11 These results show that higher than average casualties occur in all types of severity on the A985 and A977. The A907 and A823 have lower than average casualties but higher accident totals overall, indicating a higher frequency of accidents albeit with lower level of casualties. This can be attributed to the geometry of the roads which encourages slow driving conditions or low vehicle occupancy.

Journey Times

2.4.12 Using outputs from TMfS, it is possible to identify the average travel times to/from key destinations within the study corridor and to key external locations. Table 2.10 shows the analysis for 2005 comparing times both private cars and public transport.

Table 2.10 – Comparison of Travel Times for Cars & PT

Car (Mins)	Alloa	W Dunf.	Rosyth	Stirling	Edinburgh	Glasgow
Alloa	-	20.89	28.32	14.94	49.56	59.67
W Dunf.	20.77	-	12.83	31.96	31.91	66.59
Rosyth	28.28	10.05	-	34.27	26.69	68.41

PT (Mins)	Alloa	W Dunf.	Rosyth	Stirling	Edinburgh	Glasgow
Alloa	-	55.0	68.9	31.2	108.9	121.7
W Dunf.	55.0	-	21.3	85.3	58.7	141.2
Rosyth	68.9	21.3	-	90.5	48.2	146.4

PT/Car (Ratio)	Alloa	W Dunf.	Rosyth	Stirling	Edinburgh	Glasgow
Alloa	-	263%	243%	209%	220%	204%
W Dunf.	265%	-	166%	267%	184%	212%
Rosyth	243%	212%	-	264%	181%	214%

2.4.13 The above, suggests public transport takes much more time than travel by private car, in the absence of traffic congestion. Public transport journey times are between 166% and 267% longer than their corresponding car journey times.

Pedestrian Severance Impacts

2.4.14 The level of severance can be measured using the standard PV^2 calculation. This involves multiplying pedestrian crossing flows against the corresponding vehicle traffic flows at key locations such as shopping streets, employment locations or residential areas. TMfS includes walking trips for a limited number of locations, and hence it is possible to estimate severance indicators to obtain a high-level indication of current severance levels at key locations in the study area. Table 2.11 shows the analysis for 2005 examining locations in Alloa and West Dunfermline on the road sections leading to the A907 and A985.

Table 2.11 – High-Level Severance Indicators

2005		P (2way)	V (2way)	$PV^2 / (10^7)$
Dunfermline	A - East Port	46	808	3.0
	B - New Row	55	769	3.3
	C - Urquhart Cut	64	801	4.1
Alloa	D - B908, Sunnyside Road	22	725	1.1
	E - Mar Place	21	716	1.1
	F - Glasshouse Loan	30	309	0.3

2012		P (2way)	V (2way)	$PV^2 / (10^7)$
Dunfermline	A - East Port	43	799	2.7
	B - New Row	40	778	2.4
	C - Urquhart Cut	64	791	4.0
Alloa	D - B908, Sunnyside Road	22	723	1.2
	E - Mar Place	40	890	3.2
	F - Glasshouse Loan	31	299	0.3

2022		P (2way)	V (2way)	$PV^2 / (10^7)$
Dunfermline	A - East Port	39	714	2.0
	B - New Row	38	926	3.3
	C - Urquhart Cut	63	710	3.2
Alloa	D - B908, Sunnyside Road	22	783	1.3
	E - Mar Place	40	1008	4.1
	F - Glasshouse Loan	30	298	0.3

2.4.15 A PV^2 value of greater than $1x10^7$ is generally regarded as being statistically significant and hence the threshold when pedestrian and locals can be bothered by traffic levels. The above suggests all locations are above the threshold suggesting there are potential issues of segregation. This is likely to increase as traffic is estimated to increase by up to 120% on some road sections by 2022.

Environmental Baseline

2.4.16 There are various environmental and cultural constraints located within this Study Area and these are summarised in the following paragraphs. Figure 2.17 overleaf also shows an environmental baseline map. Given the Scale of the Study Area it has not been possible to map all the constraints, but they are described below.

2.4.17 Large areas of the Firth of Forth coast are designated as Special Protection Areas (SPA), Ramsar Sites, and Sites of Special Scientific Interest (SSSI).

2.4.18 There are a number of watercourses located within the Study Area, the main ones being the Black Devon River, Bluther Burn, Lyne Burn, Crossford Burn, Tower Burn Comrie/Grange Burn and Baldridge Burn. The water quality of these watercourses generally varies from moderate to good (Not shown on Environmental Constraints Map). The SEPA Water Quality Classification classifies the water quality of the upper Forth Estuary as poor and the middle and lower as moderate (Not shown on the Environmental Constraints Map). Both the Firth of Forth and the watercourses listed above are shown to be risk of Flood events (with a probability of 0.5% per year) on the SEPA interactive Flood Map (Not shown on the Environmental Constraints Map).

2.4.19 There are a number of wildlife sites – referred to as Sites of Importance for Nature Conservation (SINCs) located around Fife at Valleyfield Wood, Devilla Forest Mires, Moor Loch, Blairhall Bing, Comrie Dean Woodland, Oakley and Blair Castle. The Devon Gorge Wildlife Site is located within the Clackmannanshire Local Authority area (Not shown on the Environmental Constraints Map).

2.4.20 Large areas of Ancient Woodland are interspersed throughout the Study Area. There are a number of areas subjected to Tree Preservation Orders (TPOs) in Alloa, Cairneyhill, Crossford, Culross, Blairhall, Dunfermline, Kincardine and Rosyth (Not shown on the Environmental Constraints Map).

2.4.21 There are historical Conservation Areas in Alloa, Charlestown, Clackmannan, Culross, Dunfermline, Kincardine, Limekilns, North Queensferry, Inverkeithing, and Pattiesmuir. There are also a number of Listed Buildings within these Conservation Areas, and located throughout the Study Area. A number of Scheduled Ancient Monuments (SAM) are located within the Study Area, with the majority located within Alloa and Dunfermline. There are also many National Monument Records of Scotland (NMRS) located within the Study Area. These have not been mapped due to extensive numbers.

2.4.22 There are a number of Historic Gardens and Designed Landscapes (HGDLs) within the Study area – Tulliallan, Dunimarle, Culross Abbey House, Valleyfield and Pittencrieff Park.

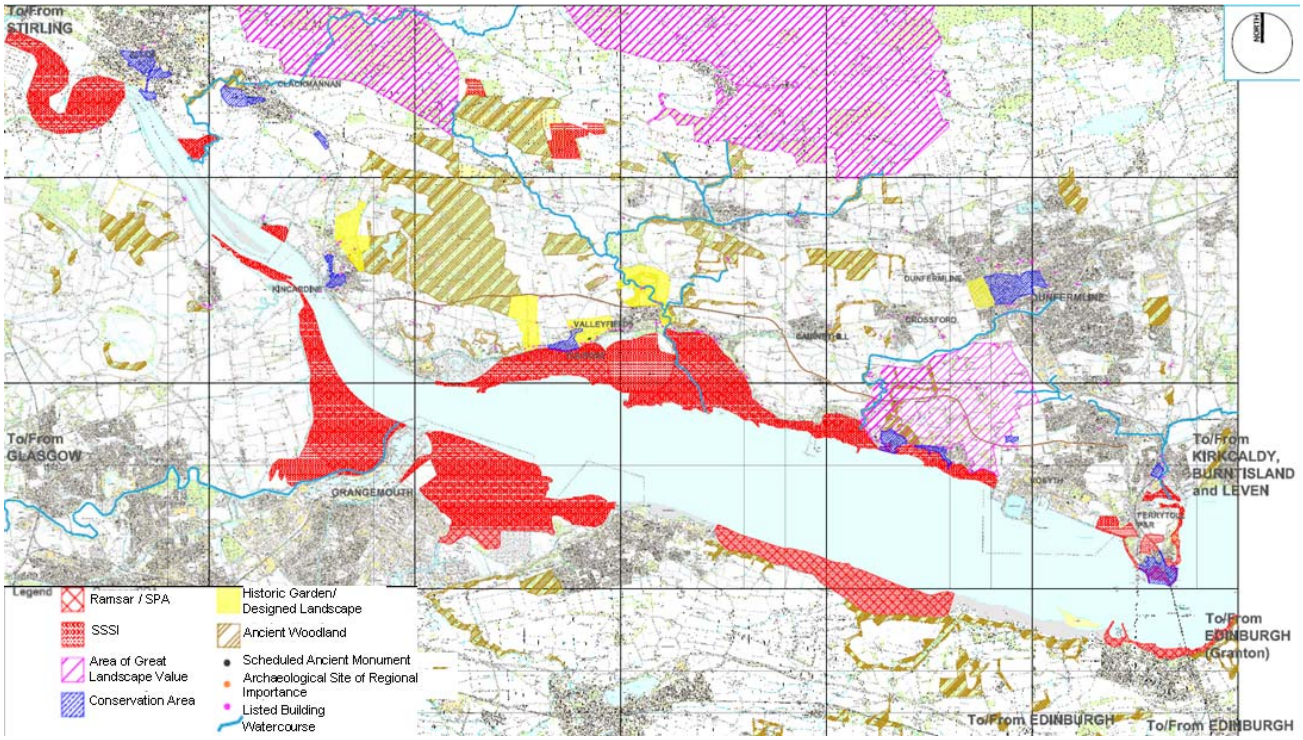
2.4.23 In geological terms the Study Area mainly consists of Upper Carboniferous, Millstone Grit and Carboniferous Limestone.

2.4.24 There is an Area of Great Landscape Value (AGLV) at Broomhall/Belleknowes which is a mixed agricultural and wooded area stretching down to the coast at Limekilns and Charlestown to the south west of Dunfermline. The Forest AGLV is located to the east of Alloa and to the north of Clackmannan. The Cleish Hills AGLV is located beyond the north of Study Area, to the north of Oakley.

2.4.25 The landscape character assessments for the Study Area identified a variety of landscape types located within the Study Area including - Coastal Flats, Coastal Hills, River Valley, and Lowland Hills and Valleys (Not shown on Environmental Constraints Map).

2.4.26 There is a large area of Prime Agricultural Land around Clackmannan (Not shown on Environmental Constraints Map overleaf).

Figure 2.17 – Environmental Baseline Issues



2.4.27 There are various environmental and cultural constraints located within this Study Area including, Special Protection Areas (SPA), Ramsar Sites, and Sites of Special Scientific Interest (SSSI), Sites of Importance for Nature Conservation (SINCs), and a number of areas subjected to Tree Preservation Orders. Furthermore there are historical Conservation Areas, a number of Listed Buildings within these Conservation Areas, a number of Scheduled Ancient Monuments (SAM), and a number of Historic Gardens and Designed Landscapes (HGDLs) within the Study area.

2.4.28 The corridor also has an Area of Great Landscape Value (AGLV) and consists of a variety of landscape types including - Coastal Flats, Coastal Hills, River Valley, and Lowland Hills and Valleys.

2.5 Proposed New Land-Use Developments

2.5.1 Fife and Clackmannanshire Councils provided details of current and future land-use proposals within the study corridor up to 2012 and 2022. These included details of additional housing dwellings, office/business facilities and retail outlets. Table 2.12 overleaf summarises the total development identified in the study corridor and Appendix F contains plans and more detailed information.

Table 2.12 – Future Land-Use Developments

Development Type	Completed by 2012	Completed by 2022	2022 Cumulative
Clackmannanshire			
Housing	2,000	2,500	4,500 units
Industrial	0 ha	64.5ha	64.45 ha
Offices	5,287 sqm	6,038 sqm	11,325 sqm
Retail	8,359 sqm	0 sqm	8,359 sqm
Fife			
Housing	1,600	900	2,500 units
Industrial	3.6 ha	133.5 ha	137.1ha
Offices	6.9 ha	19.7 ha	26.6 ha
Retail	4.0 ha	0 ha	4.0 ha

2.5.2 The information supplied by Fife Council for proposed office and retail development is the total land take allocation whereas the corresponding information supplied by Clackmannanshire Council is the actual size of the development. In order to obtain the total planned development which would produce/attract travel we have assumed 30% of the Fife Council office and retail land allocation will be developed for actual business and commercial activity (i.e. the rest is for access roads, parking spaces etc). Applying this factor then converting to square metres and adding to the Clackmannanshire data gives the grand total developments (see Table 2.13).

Table 2.13 – Total Planned Land-Use Developments

Development Type	Completed by 2012	Completed by 2022	2022 Cumulative
Totals			
Housing	3,600	3,400	7,000 units
Industrial	3.6 ha	198.0 ha	201.5 ha
Offices	25,987 sqm	65,138 sqm	91,125 sqm
Retail	20,359 sqm	0 sqm	20,359 sqm

2.5.3 The above suggests there is significant development planned within the study corridor. This will result in significant pressure for transport facilities and services, and will increase current demand levels.

2.6 Emerging Issues

2.6.1 The analysis has raised a number of emerging issues including:

Passenger Transport

- car traffic flows are forecast to grow substantially, by up to 120% on some links on the major routes in the study, with the largest increases focused within the western half of the corridor. Examining the distribution of flows in 2005 from the major urban areas in the corridor, for the settlements in Fife, the largest proportions of car traffic flows are to other parts of Fife, 73% in the case of Kincardine and Rosyth, and 53% in the case of Dunfermline. However, between 5% to 20% is destined for Edinburgh. Similarly, 45% of car traffic to/from Alloa is within Clackmannanshire, but 6% and 5% are to Glasgow and Edinburgh respectively;
- a number of bus services are long distance services linking the study corridor to Glasgow and other parts of the central belt. Only one service connects Dunfermline directly with Alloa, taking just under one hour. There are no direct services from Clackmannanshire to Edinburgh passing through the study corridor, and passengers residing in the corridor need to change buses at Dunfermline to access Edinburgh;

- the largest distribution of bus journeys in 2005 were to and from Edinburgh, with 51% of trips from Kincardine and Rosyth each destined to and from the city and 85% between Dunfermline and Edinburgh;
- the trend in bus patronage is one of decline. Passenger numbers are estimated to decline by 21% on the A985, the main bus route through the corridor. Most of this fall in passengers is projected to occur in the period 2005 and 2012;
- there are no rail passenger services through the study corridor, but rail passenger growth on adjacent services (i.e. passing by) is estimated to be 12% from 2005 to 2012 and 19% from 2005 and 2022;
- analysis of the distribution of rail passenger flows demonstrates the importance of both Glasgow and Edinburgh in terms of passenger demand, particularly Edinburgh, for each of the conurbations on the periphery of the study area;
- the recently re-opened Rosyth to Zeebrugge ferry service provides the only sea link for passengers between Scotland and the continent;
- the West of Fife and Clackmannanshire are host to a number of cycle routes, including the Round the Forth Cycle route (National Cycle Route number 76) which closely follows the north shore of the Forth Estuary. This is a circular route around the Forth estuary and includes the towns of Grangemouth, Stirling, Alloa, Kincardine and Charlestown. It is planned to extend the route eastwards along the Fife coast to St Andrews. The region is also host to Route 64 which links Dunfermline with Clackmannan;

Freight Transport

- analysis of freight transport suggests that the retail, wholesale trade and construction industry are dominant in terms of freight tonnage moved. Mining, quarrying products and food and drink are also significant sectors. Overall freight tonnage is projected to grow from a total of approximately 31.5 million tonnes to 35.5 million tonnes in the 2022 low growth scenario and 40.6 million tonnes in the 2022 high growth scenario. The total tonnage in 2007 is equal to 7.7% of the Scottish total;
- the only sector that sees a decline in tonnage moved is fuel as an increasing proportion of this is being moved by pipeline, reflecting lower volumes passing through Fife by road and rail and through the ports in the Fife area;
- freight traffic on the A985 is expected to increase over time, by an average of 30%;
- the largest proportion of road freight from the eastern end of the corridor, at Dunfermline, is internal to Fife (49%). Flows westward to destinations in the corridor and beyond are comparatively light, with 1% destined for Clackmannanshire and 19% to Glasgow and the rest of the SPT area. Distribution in the western end of the corridor, at Alloa, is primarily within Clackmannanshire (38%), to/from Glasgow and rest of the SPT region (22%), and to/from Falkirk and Stirling (14%). Road freight flows to/from Edinburgh and to/from Fife are 8% and 5% respectively;
- a relatively large proportion of road freight to/from Rosyth is between the port and the rest of the UK (22%) and a larger proportion is also transported between Rosyth and the rest of Fife (47%). However, the vast majority of freight by volume shifted through Rosyth is overseas trade, between the port and mainland European destinations;
- rail freight growth is significant to/from Glasgow & rest of SPT, and towards the North, increasing by between 34% & 110% between 2005 & 2022. There is only slight corresponding

growth in rail freight projected in the study area. There is also some significant demand to/from England and Wales, via both the West Coast Main Line (WCML) and East Cost Main Line (ECML), and also some modest demand to Europe, via the Channel Tunnel;

- nearly a third of sea freight is distributed on domestic routes to/from the port of Rosyth, the majority of which is liquid bulk fuel, principally petroleum products. Over half is destined for Europe (the majority of this to Rotterdam) and the rest is distributed as intercontinental traffic, mainly to and from North and South America;

Other

- according to TMfS the mode share of private car is set to increase at the expense of public transport. By 2022, public transport's mode share will be circa half the level it was at 2005. This corresponds with the estimated growth in car trips identified earlier;
- road freight's mode share is anticipated to increase in the future. In addition, rail freight is also set to increase its share with a doubling in tonnage moved by 2022 in the High Growth forecasts. Sea freight, however, is anticipated to lose some of its share primarily due to the continued trend for fuel and oil to be piped rather than shipped;
- the A907 and A823 are currently experiencing average accident rates which are above the national average. In addition, there are higher than average casualties in all types of severity on the A985 and A977. The A907 and A823 have lower than average casualties but higher accident totals overall, indicating a higher frequency of accidents albeit with lower level of casualties. This can be attributed to the geometry of the roads which encourages slow driving conditions or low vehicle occupancy;
- a comparison of private car versus public transport journey times suggests public transport takes much longer than travel by private car. Public transport journey times are between 166% and 267% longer than their corresponding car journey times;
- an analysis of highway severance indicators suggests there are a number of locations which are above the threshold suggesting there are potential issues of segregation. This is likely to increase as traffic is estimated to increase by up to 120% on some road sections by 2022;
- there are various environmental and cultural constraints located within this Study Area including, Special Protection Areas (SPA), Ramsar Sites, and Sites of Special Scientific Interest (SSSI), Sites of Importance for Nature Conservation (SINCs), and a number of areas subjected to Tree Preservation Orders. Furthermore there are historical Conservation Areas, a number of Listed Buildings within these Conservation Areas, a number of Scheduled Ancient Monuments (SAM), and a number of Historic Gardens and Designed Landscapes (HGDLs) within the Study area. Also, the corridor consists of a variety of landscape types including - Coastal Flats, Coastal Hills, River Valley, and Lowland Hills and Valleys; and
- there is significant new land-use development planned within the study corridor. This will result in significant pressure for transport facilities and services, and will increase current demand levels.

2.6.2 Having completed the identification of current and future problems and issues in the study area, a detailed stakeholder consultation exercise was carried out. This helped glean further information based on local experiences. This is set out in the following Chapter.

3 Stakeholder Consultation

3.1 Introduction

3.1.1 This chapter provides an overview of the consultation carried out, and the comments and views obtained from key stakeholders. The data provided by the stakeholders is commercially sensitive and hence the consultation was carried out in accordance with the Market Research Society Code of Conduct (MRSCC) and the Interviewer Quality Control Scheme (IQCS). All information provided by stakeholders was treated in strict confidence, which was important since it facilitated a free and candid exchange of views, which otherwise might not have been available.

3.2 Consultation Process & Consultees

3.2.1 The consultation consisted of end-user telephone surveys, detailed surveys of public and freight operators and carriers, a series of workshops with key stakeholders and a targeted number of one-to-one meetings with those stakeholders who could not contribute to the other surveys. The questionnaire was agreed with the study steering group.

3.2.2 Computer Aided Telephone Interviews (CATI) were used to canvas the opinions of freight end user surveys and origin–destination (OD) surveys and a number of one–to–one interviews were also carried out.

3.2.3 A major aspect of the appraisal was to involve key stakeholders in the "Pre-Appraisal" element of the STAG appraisal. A STAG Workshop was held with key local stakeholders including representatives of Fife Council. In addition a consultation exercise was also carried out which included comments from other local stakeholders.

3.3 STAG Workshop

3.3.1 A STAG Workshop was held on Wednesday 22nd April 2009 at the SEStran offices in Edinburgh. The workshop was held with a number of stakeholders to identify the key issues in the study area, discuss transport planning objectives and identify options which could be taken forward for onward development through the STAG Part 1 process.

3.3.2 The workshop was facilitated by Scott Wilson and representatives from the following organisations attended:

- Scott Wilson;
- Fife Council; and
- SEStran.

3.3.3 Minutes of the workshop are included in Appendix A.

Current Transport Infrastructure and Services

3.3.4 The discussion and feedback at the STAG Workshop raised the following issues:

- there is a need to improve connectivity to/from Clackmannanshire from the west and east;
- connectivity should be improved for south and west Fife to Edinburgh;
- connections for passengers and freight should be improved to serve the emerging plans from National Planning Framework 2 (NPF2) and Freight Action Plan (FAP);
- connectivity from Dunfermline and west Fife to Clackmannanshire, Stirling and west Scotland should be improved;

- road safety could be improved along the A907 and A985;
- carbon usage by both road and rail should be reduced to correspond with national transport objectives;
- local environmental impacts should be minimised (e.g. severance and noise);
- the sustainability of freight distribution for local industrial areas could be improved; and
- for freight at a local level, connections to local freight generators/attractors could also be improved.

New Developments

3.3.5 The following new developments in the area were discussed:

- Rosyth Bypass;
- rail upgrade / re-signalling between Larbert and Stirling;
- ScotRail have introduced 2 trains per day from Alloa to Stirling to Edinburgh and one train Edinburgh-Alloa;
- new Rosyth to Zeebrugge ferry service; and
- various new land-use plans are proposed.

SWOT Discussion

3.3.6 The stakeholder workshop provided an early opportunity for evaluating the Clackmannanshire – Fife – Edinburgh corridor in terms of the Strengths, Weaknesses, Opportunities and Threats (SWOT) assessment framework. These were discussed in turn.

3.3.7 The current strengths of the corridor were identified as follows:

Strengths

- well connected for businesses across Forth Estuary;
- international trade links via Rosyth; and
- 82% of Fife Council residents work in their council area (RTS Table 8.1).

3.3.8 Balanced against these perceived strengths there were a number of weaknesses which were:

Weaknesses

- limited choices of travel;
- not a largely self-contained corridor relying on employment elsewhere;
- significant congestion at East end of corridor;
- only 56% of Clackmannanshire residents work in the Council area (RTS Table 8.1); and
- 45% of total employment in SEStran is in Edinburgh area but only 31% of population, suggesting Edinburgh depends on its hinterland for employment catchment therefore reinforcing the need for Edinburgh to have good connectivity.

3.3.9 The development of the transport infrastructure/services would bring about a number of potential opportunities for the region, these were thought to include:

Opportunities

- potential to develop an intermodal freight hub at Rosyth;
- potential to create a barge network within the Forth;

- potential to lever funding from the Strategic Land Allocations for financing some improvements; and
- 84% of trips between Local Authorities in SEStran are made by car (RTS Table 8.2) so there is potential to reduce this dependence.

3.3.10 However, there were a number of threats identified that might compromise the effectiveness of any new developed options in the corridor:

Threats

- increasing travel distances;
- insufficient demand;
- new Forth Replacement Crossing (FRC) leading to increased car trips; and
- less than 4% of trips originating in Fife end up in Strathclyde and Central Scotland (Fife Council LTS Figure 4.3).

3.4 Key Stakeholder Interviews

3.4.1 A series of one-to-one telephone interviews were carried out with key stakeholders to gather their views and inputs to the study. These were questionnaire based interviews and were carried out with the following key stakeholders:

- Transport Scotland;
- Network Rail;
- First Scotrail;
- Freight Transport Association;
- Road Haulage Association;
- Forth Ports;
- Babcock;
- DB Schenker (formerly EWS railways);
- First Group;
- Stagecoach; and
- Mackie's of Alloa.

3.4.2 Copies of the interviews are included in Appendix A.

3.4.3 The main points raised within these interviews are summarised in Table 3.1 overleaf.

Table 3.1 – Consultations Summary Table

Organisation	When	Emerging Key Points
Freight Transport Association	25th May 2009	• The A985 is a poor road, requires serious upgrading, requires straightening, improved sight lines etc. • The access to Rosyth needs improved; in particular there should be proper rail freight access. • The Alloa-Kincardine rail line should be extended to Rosyth/Dunfermline, this would allow more rail services to operate and relieve road traffic. • As part of NPF2 and the development of Rosyth as a container terminal, and the possible increased frequency of the Rosyth to Zeebrugge ferry service to a daily service, a rail chord needs to be added to serve Rosyth. • Replacement Forth Crossing needs to be fully integrated with key transport system.
Road Haulage Association	27th May 2009	• The A985 could do with upgrading, especially to cope with increasing traffic from Kincardine bridges. • Road links into Rosyth could be upgraded to cater for 44 tonne trucks. • Road links between Rosyth and M90 could do with upgrading. • The Stirling – Alloa rail line could be extended further to Rosyth.
Network Rail	14th May 2009 and 25th May 2009 (Different Departments)	• There is adequate transport infrastructure for those wishing to transfer between Clackmannanshire and Fife. • There are good bus and road services through the corridor. • There are good freight transport services for coal service to Longannet and capacity for others to operate. • Network Rail's main concerns are about capacity over the Forth Bridge regardless of whether for freight or passenger services. • There will be capacity constraints on the single line between Charlestown Junction and Alloa and the current line speed of 35mph would require some investment to increase it.
First Scotrail	28th May 2009	• There is no passenger train line in the area, the current freight line has speed restrictions of 35mph and is unsuitable for passenger services. • Bus services in the area are subsidised, indicating a lack of demand in the area. The view is if the train line were to operate passenger services there would not be much demand for local services. • There is an existing freight line which is not used between Longannet and Dunfermline, showing little demand for freight transport on this route. • There is a high quality bus service from Dunfermline to Glasgow which suggests a demand for travel in this direction. • Commuting to Edinburgh may decrease as a result of the current economic downturn. • The current rail link to Rosyth is not used so would favour trains going into and out of Dunfermline rather than building the Charlestown Chord.

Table 3.1 – Cont.

Organisation	When	Emerging Key Points
DB Schenker	25th May 2009	• Lack of gauge clearance at moment, rail network cannot cater for large enough freight containers. • There are problems with the availability of efficient paths for freight services. • Would propose that potential for freight services to Diageo facilities in East Fife should be built into any strategic plans. • Bearing in mind the resumption of a passenger ferry service in Rosyth and the continued commercial operations within the port, retention of the rail link is also seen as prudent.
Forth Ports	28th May 2009	• The A985 is not ideal for freight; many drivers avoid this road and take the M9 to the Forth Road Bridge instead to access Rosyth. • The A977 to Kinross is not suitable for the level of HGV traffic it carries. • There needs to be an improvement in the infrastructure and more dual carriageways and avoidance of villages. • There should be an extension of the Kincardine – Alloa freight line to allow more intra-Scottish freight traffic.
Babcock	27th May 2009	• The A985 could benefit from upgrading, particularly at Rosyth and link into the Rosyth bypass. There is also an opportunity at present to integrate with the new Forth crossing and Clackmannanshire bridge. • The upgrading of the Stirling-Alloa-Kincardine line has been encouraging, and could be continued to Dunfermline. • Most people within the corridor are dependant on personal transport, but if public transport was increased this may encourage people to use other modes. • Improving accessibility of Rosyth by public transport would be better and potential rail connection to Rosyth would be helpful. • In the longer term rail improvements should be addressed, possibly connecting in with the forth crossing.
First Group	27th May 2009	• Bus service provision is limited. • Rail routes which serve the area are circuitous. • Through traffic from Alloa to Dunfermline is very small, (First pulled out of this area previously as the services were not commercially viable). • The road layouts are such that it is hard to join places together (e.g. Clackmannan and Culross). The company previously experienced a high number of accidents with the large buses on these routes.
Stagecoach	–	• No feedback by the time of writing this report.
Mackie's of Alloa	28th May 2009	• No comment at this time.

3.4.4 From these consultations the main issues/concerns relating to transport infrastructure and services within the corridor are:

- the A985 & A977 could be upgraded to address safety issues and also to cope with increased freight movements along the corridor. This would involve straightening of the road and improved sight lines;
- passenger transport in the area could benefit from improvements. There are no alternatives to the bus at present, and a rail line was mentioned by stakeholders;
- improvements to rail access at Rosyth Port would be beneficial for freight transport in the area, providing an alternative to road transport, encouraging intra-Scottish rail freight;
- there are currently capacity constraints on some of the rail lines. These include gauge clearance and also speed restrictions, these could be addressed; and
- the proposed container terminal at the Port of Rosyth will require improved road and rail links in order to meet future freight demand.

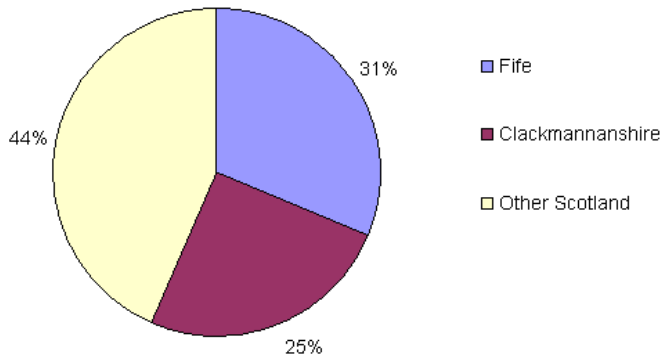
3.5 Local Business Interviews

3.5.1 Interviews were conducted with 30 local businesses in order to canvas their opinions on transport issues in the area. Surveys were carried out via Computer Aided Telephone Interviews (CATI) and a summary of the main results are shown below.

Location of Businesses

3.5.2 The business sample was focused on the Clackmannanshire-Fife-Edinburgh study corridor. However, businesses in nearby areas such as Stirling and in East Fife were also considered. The location of businesses was split as 31% in Fife, 25% in Clackmannanshire and 44% just outside the corridor, as shown in Figure 3.1.

Figure 3.1 – Locations of Businesses in sample

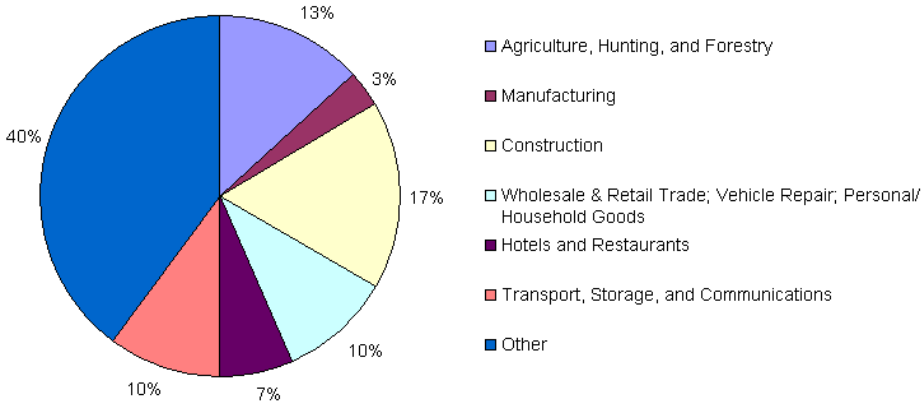


Business Type

3.5.3 The type of businesses canvassed was also very important to the study in order to get an overview of the needs and requirements of the businesses. These were split into 7 broad categories, reflecting the nature of the business. The main industries to note are Agriculture, Hunting and Forestry (13%), Construction (17%), Wholesale and Retail Trade (10%) and Transport, Storage and

Communications (10%). A large proportion of the sample (40%) was classed as Other, examples including legal professions, IT services and care services.

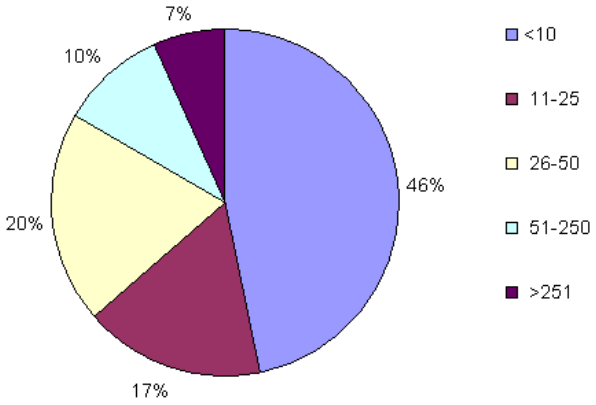
Figure 3.2 – Split by Business Type



Number of Employees

3.5.4 The survey also asked for information on the number of employees employed by the firm, this would give an indication of the size of the businesses. The sample produced a good spread of business sizes, ranging from less than 10 to over 250, as shown in Figure 3.3.

Figure 3.3 – Number of Employees

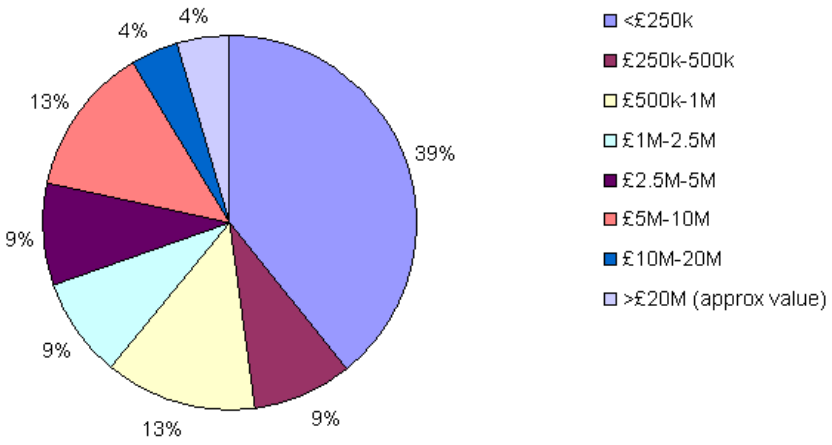


3.5.5 The largest proportion (46%) had less than 10 employees, representing small firms, although a fifth of the sample had between 26-50 employees. A small proportion (7%) had greater than 250 employees.

Annual Turnover

3.5.6 Annual turnover was also requested, which again would give an indication of the size of the business and scale of dealings/production. Figure 3.4 illustrates this.

Figure 3.4 – Range of Annual Turnover

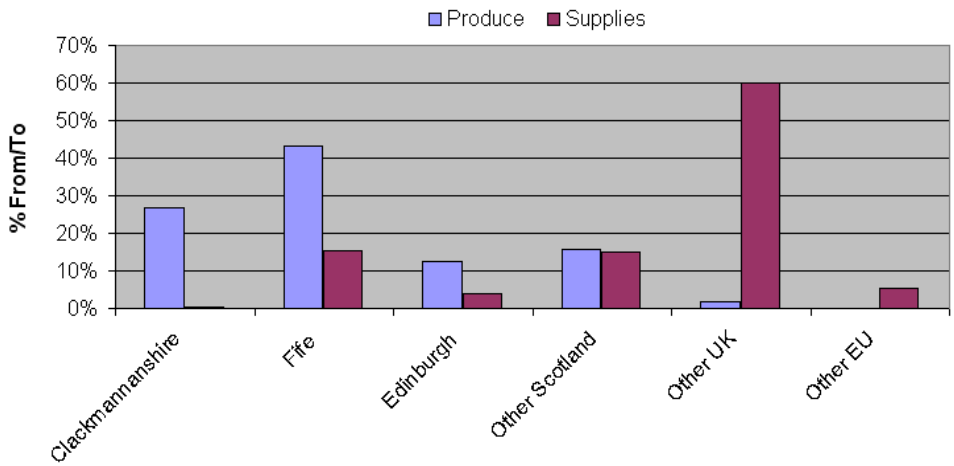


3.5.7 There is a significant range in turnover, ranging from less than £250 thousand to greater than £20 million. The largest proportion (39%) have an annual turnover of less than £250 thousand, with significant businesses (13% respectively) turning over between £500 thousand to £1 million and £5million to £10 million.

Deliveries and Supplies

3.5.8 Also important to this study was the movement of produce and supplies to/from the businesses, thus giving an idea of traffic movements within the corridor. Figure 3.5 shows the movement of produce/supplies from key areas.

Figure 3.5 – Deliveries To/Supplies From Area



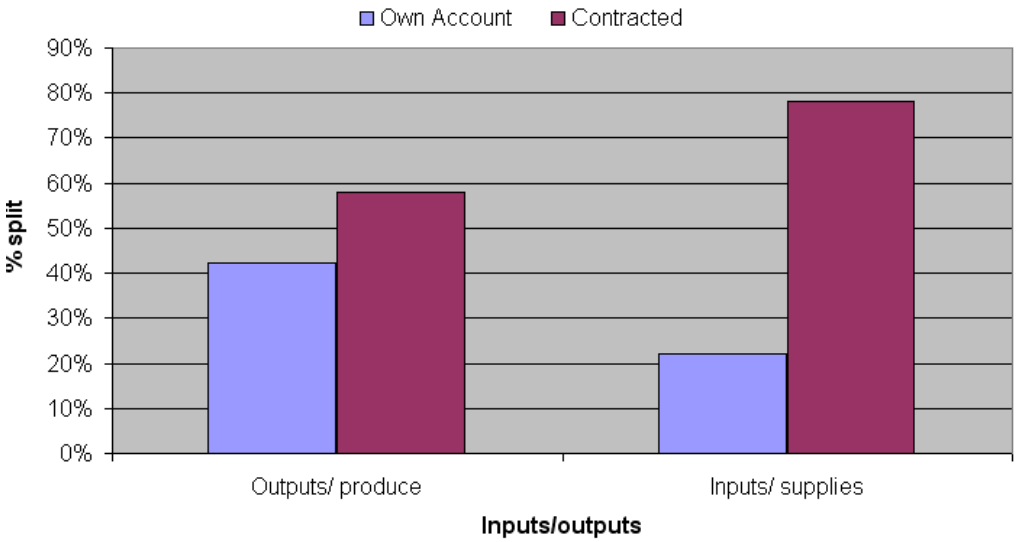
3.5.9 With regards to production, the largest proportion is delivered to Fife (43%) and Clackmannanshire (27%), accounting for 70% in the corridor. Other proportions are Edinburgh (12%) and Other Scotland (16%).

3.5.10 Supplies are mainly coming from other areas of the UK (60%) and Other Scotland and Other Fife (15% respectively). A small proportion comes from other areas of the EU (5%).

Methods of Transport

3.5.11 Examining further the delivery of products/supplies, this can be broken down by the businesses own transport and that contracted out to others. Figure 3.6 shows this relationship.

Figure 3.6 – Transport by Own Account and Contracted Out

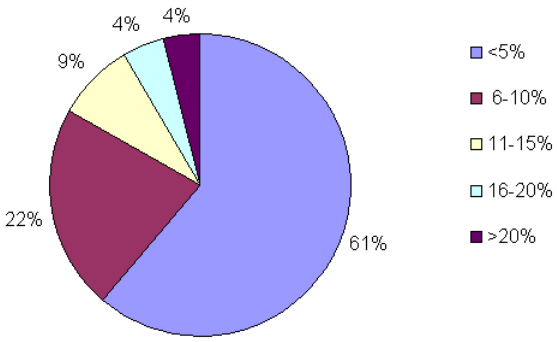


3.5.12 Outputs/produce from the businesses show a relatively even split of 42%, 58% in favour of contracting out deliveries to other companies. However, supplies are heavily biased towards outside contractors providing deliveries at 78%, this could be due to the fact revealed earlier that most supplies are coming from other areas in the UK, out with Scotland covering long distances where as produce is mainly going to the local area.

Amount Spent on Transport

3.5.13 The businesses were also asked how much of there budget was spent on transport costs. This ranged from less than 5% to greater than 20%, as shown in Figure 3.7 overleaf.

Figure 3.7 – Percent of Budget Spent on Transport Costs

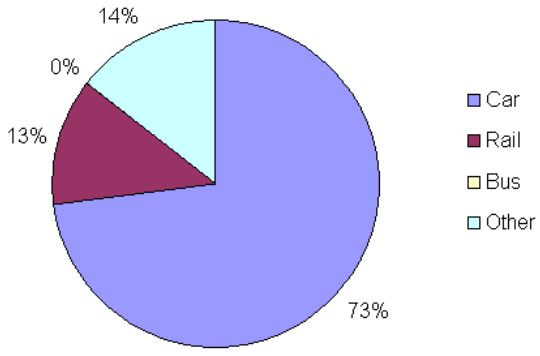


3.5.14 The vast majority (61%) spent less than 5% of their turnover on transport costs, with 22% spending between 6-10%. Very few businesses spend over 15% of turnover on transport costs.

Business Trips

3.5.15 The questionnaire also asked about the modes used for business trips. The largest proportion (73%) used private car transport to reach their destinations. A small percentage (13%) used rail transport for their journeys whilst no one used the bus. 14% of trips were recorded as other with this mainly being noted as air transport, suggesting longer distances are involved.

Figure 3.8 – Modal Split for Business Trips



3.5.16 Based on the frequency of business trips (from the surveys), average journey times (from the model) and values of time sourced from webTAG[8], the value of these trips in terms of their contribution to local economic activity can be estimated.

3.5.17 This gave a Gross Value Added figure of circa £776,100 per annum for two way trips at 2002 prices. Applying a growth factor of 3.5% per annum to this figure, this would equal circa £987,400 at 2009 prices.

[8] Values of Time and Operating Costs, WebTAG Unit 3.5.6, Department for Transport, February 2007

Additional Comments

3.5.18 Some additional comments were made at the end of the survey by the businesses including:

- the improvement of transport links between Fife and Clacks would be a big commercial benefit to businesses making the interchange of businesses and consumers to those markets more likely;
- transport improvements would also increase the likelihood of staff who commute to work being able to use a rail service;
- there is delivery congestion on the road network especially at bridge accesses in Fife and also maximum weight limits;
- the new bridge at Kincardine has been useful, but it is smaller villages that are the pinch points;
- traffic calming in the area increases repair bills for vehicles; and
- due to the above points it takes longer to get between jobs affecting profitability.

3.6 Freight Operators Interviews

3.6.1 Freight operator interviews were based on those collected for the Scottish Multi-Modal Freight Locations Study with those businesses in the local and surrounding area selected. This gave a sample of 15 freight operators and their views of transport in the area.

3.6.2 These surveys were carried out using Computer Aided Telephone Interviews (CATI) to canvas the opinions of freight operators.

3.6.3 Having processed the results of the consultation exercise, we have further distilled the main findings and discounted those issues that have not been supported by the data obtained from other sources, including information gleaned from the analysis of our surveys for this study.

3.6.4 This led to 7 key issues being identified as relevant that fit the criteria outlined above, as shown in Table 3.2.

Table 3.2: Relevant Freight Issues Identified

Reference	Relevant Freight Issues
1	Time delays causing freight to be diverted to another distribution centre
2	Capacity constraints on key corridors
3	Transport infrastructure viewed as poor by some operators
4	Lack of infrastructure and associated facilities for multi-modal freight interchange
5	Level of service and availability / choices of alternative modes
6	Open access standards to allow as many potential freight users as possible
7	Interchange facilities should be provided on strategic links

3.7 Public Consultation

3.7.1 A PR strategy was devised whereby the public were consulted on the transport issues in the corridor through a local people's panel and via the websites of SEStran, Clackmannanshire and Fife Councils, with awareness of both consultation processes advertised through a prior press release. Questionnaires were issued on the website which asked for views on issues relating to transport infrastructure and services within the corridor, and for comments on the extent to which transport needs of the local population were met.

3.7.2 From the consultation exercise we received 282 responses. The sample consulted indicated that:

- 69% of west Fife residents regard themselves regular travellers to Edinburgh, and 18% regular travellers to Clackmannanshire;
- choice of transport mode from west Fife to Clackmannanshire is overwhelmingly by car, accounting for 85% of trips, with bus a distant second, at 11%;
- although most people drove to Edinburgh from west Fife, the proportion (41%) was much lower than that to Clackmannanshire, and a sizeable proportion went by rail (30%) also almost as many as this went by bus(26%). This suggests that public transport, unsurprisingly given the availability of services, was far more important for journeys between west Fife and Edinburgh than between west Fife and Clackmannanshire;
- of those who offered an opinion, just under 10% said that transport services between west Fife and Edinburgh were either poor or very poor, but this proportion jumps to 41% when considering transport services between west Fife and Clackmannanshire;
- similar proportions of the sample interviewed stated that the worst performing mode of transport was road between west Fife and Edinburgh and between west Fife and Clackmannanshire, 49% and 44% respectively. Rail services also attracted similar proportions, with 45% and 43% of the sample respectively. Bus services seem to be regarded more favourably than car or rail, with only 6% and 13% of the sample regarding these as the worst performing mode of transport.

3.7.3 Other important points arising from the consultation included:

- the existing heavy rail line running westwards from Dunfermline to Alloa, and places south and west is not used for passenger traffic and is said to be unsuitable due to the present signaling system;
- prior to the opening in May 2008 of the line to Kincardine from Stirling, the heavy coal trains supplying Longannet used the line between Dunfermline and Longannet. Since these freight trains weighed over 1000 tons, hauled by locomotives exceeding 100 tons mass, the line must be structurally suitable for the DMUs usually used for passenger transportation;
- if the railway opened for passenger traffic between Alloa (where passenger trains terminate) and Dunfermline, and if stations at the dormitory communities at Clackmannan, Kincardine and Culross opened, passenger trains would be well patronised. At present, if using the railway to travel between Dunblane and Dunfermline passengers must interchange at Haymarket and on occasions a journey that can be completed by car in a little under an hour can take up to 2 hours by train; and
- there is substantial commuter traffic on the A907 during the week.

3.7.4 It is noted that the many of the major issues were iterated by a significant number of respondents and had a common theme. In terms of rail, significant concern was expressed over accessibility to

rail stations, overcrowding on trains, frequency and timetabling of rail services. Bus services attracted criticism for their lack of ability to integrate with rail services at important transport junctions, and the general lack of direct bus services to significant settlements, particular to the west of the corridor. It was also noted that a significant number of bus trips run almost or entirely without passengers, suggesting that bus services operate on routes or at times of very low levels of demand. In addition both rail and bus services are heavily criticised for their relative cost compared with the apparent costs of road transport.

3.7.5 Road transport is regarded as the best transport mode both to and from destinations east and west of the study corridor. However, the greatest concern rests with the perceived bottlenecks at both ends of the corridor, both at the Forth Road Bridge and at Kincardine, and the major trunk route connecting the two (the A985) becomes heavily congested at peak times.

3.8 Other Key Issues

3.8.1 From the consultations, several other key points emerged including:

- the A907 and A985 are the key roads linking Alloa to Dunfermline but require some upgrading. This point was made by several key stakeholders and was also apparent in the accident analysis with higher accident rates than national averages;
- the villages along these roads act as pinch points for freight travelling along the corridor;
- the level of provision of public transport in the area is currently low and could do with improving. There is currently no alternative to the bus which takes considerable time to travel along the corridor;
- the rail network in the area is poor, offering no passenger facilities and is limited for freight transport. Improvements could be made to the lines to address this; and
- public transport usage in the corridor is currently low due to lack of options, if more options were available and the corridor better connected, modal shift could occur.

4 Objectives Setting

4.1 Introduction

4.1.1 STAG differentiates between *Transport Planning Objectives* and *Government Objectives*. Transport Planning Objectives (TPO) are specific to the study, whilst Government Objectives are over-arching criteria against which competing schemes for public funding may be measured. More details on Government Objectives are set out in section 4.3.

4.1.2 STAG section 2.2 (Objective Setting: Key Points) recommends that where appropriate any existing established sets of objectives or data resulting from surveys or consultation exercises within the study area should be re-used. The STAG Workshop held on Wednesday 22nd April 2009 and attended by various key representatives from Fife Council and SEStran identified a number of issues/opportunities in the corridor, upon which Transport Planning Objectives could be based. These objectives would be worthy of inclusion in the STAG Appraisal. Details of the workshop are covered in Chapter 3 as part of the consultation exercise.

4.2 Outline Transport Planning Objectives

4.2.1 STAG allows for a scheme's local planning objectives to be considered in addition to the Government's five main objectives of environment, safety, economy, integration and accessibility/social inclusion. The workshop provided an opportunity to enhance the STAG analysis by allowing the key stakeholders to identify local transport issues.

4.2.2 The following issues/opportunities were identified along the corridor during the course of the workshop:

- connectivity along the corridor requires improvement, particularly to and from Clackmannanshire from the east and west, to and from south and west Fife to Edinburgh, and from Dunfermline and west Fife to Clackmannanshire, Stirling and west Scotland;
- the sustainability of freight distribution for local industrial areas should be improved as could the connections to local freight generators/attractors;
- connections for passengers and freight should be improved to serve the emerging plans from the National Planning Framework[9] (NPF2) and Freight Action Plan[10] (FAP);
- local environmental impacts should be minimised (e.g. severance and noise);
- road safety could be improved along the A907 and A985; and
- carbon usage by both road and rail should be reduced to correspond with national transport objectives.

4.2.3 These issues can be split into four broad categories namely, safety, environment, public transport and freight. The public transport and freight categories are both closely related to the connectivity of the transport network. These can then be directly compared to the objectives described in the Clackmannanshire Local Transport Strategy[11] (C-LTS) and Fife Local Transport Strategy[12] (F-LTS), split down into the categories as overleaf.

[9] National Planning Framework 2, Scottish Government, December 2008
[10] The Freight Action Plan for Scotland, Scottish Government, December 2006
[11] Clackmannanshire Local Transport Strategy 2006-2009, Clackmannanshire Council, October 2006
[12] Local Transport Strategy for Fife 2006-2026, Fife Council, August 2006

Public Transport

- reduce social exclusion and increase access to jobs by providing an integrated public transport system (C-LTS);
- work in partnership with transport providers to improve the quality of transport corridors (C-LTS);
- to work with passenger transport operators to develop an integrated public transport system (F-LTS);
- to improve access to all key needs and services for all (including employment, education, health and leisure opportunities) (F-LTS);
- to widen travel choice through the provision of integrated transport networks (F-LTS);

Freight

- work with local businesses to develop the transport network to improve freight transport in Clackmannanshire (C-LTS);
- to promote efficient movement of freight and encourage transfer of goods from road to rail, sea and pipeline (F-LTS);

Safety

- to improve safety for all forms of transport (F-LTS);

Environment

- reduce community severance by heavily trafficked roads (C-LTS); and
- to encourage more sustainable travel for new and existing developments (F-LTS).

4.2.4 Improving the connectivity of the transport network will have significant impacts on the regional and national context. Investment in improving the transport links along the corridor, targeting accessibility and improvements to local freight transport movements would also help meet other objectives such as safety and environment as detailed in the respective LTS.

4.2.5 Given the above policies and feedback/discussion at the STAG workshop, the outline Transport Planning Objectives identified were:

- Objective 1: Improve connectivity along the corridor to/from Clackmannan to east and west, from south and west Fife to Edinburgh, and from Dunfermline and west Fife to Clackmannanshire, and further west;
- Objective 2: Improve connections for freight to serve the emerging plans from the National Planning Framework (NPF2) and Freight Action Plan (FAP), and encourage the transfer of movement of goods, produce and materials from road to more sustainable distribution;
- Objective 3: Improve road safety along the A907 and A985; and
- Objective 4: Minimise the environmental issues of severance / noise at strategic locations along the corridor, and reduce carbon emissions to correspond with government targets.

4.2.6 These outline Transport Planning Objectives will need to be further refined, including making them SMART (Specific, Measurable, Achievable, Realistic and Time-bound) in order to conform to STAG. This is described in Section 4.5.

4.3 Role of the Government Objectives

4.3.1 Government Objectives are over-arching ways of assessing capital expenditure proposals competing for central government funding on a consistent basis. Furthermore these objectives are

reflected in government policy, through such documents as the Scottish Transport White Paper[13] and the National Transport Strategy (NTS)[14] which has a vision of:

> *"an accessible Scotland with safe, integrated and reliable transport that supports economic growth, provides opportunities for all and is easy to use; a transport system that meets everyone's needs, respects our environment and contributes to health; services recognised internationally for quality, technology and innovation, and for effective and well-maintained networks; a culture where fewer short journeys are made by car, where we favour public transport, walking and cycling because they are safe and sustainable, where transport providers and planners respond to the changing needs of businesses, communities and users, and where one ticket will get you anywhere".*[15]

4.3.2 To help achieve the above, the NTS has set five high-level objectives for transport. The *Transport Planning Objectives* for the development of the Clackmannanshire-Fife-Edinburgh corridor have been nested within the NTS high-level objectives. This is shown in the following section.

4.4 Nesting of Transport Planning Objectives and Government Objectives

4.4.1 The Initial STAG appraisal requires *"an initial appraisal of the likely impact of options against the STAG Criteria,*[16]*"* which are the Government Objectives of:

- Environment;
- Safety;
- Economy;
- Integration; and
- Accessibility and Social Inclusion.

4.4.2 STAG recommends that, where possible, if there is a relationship between any of the Transport Planning Objectives derived and the STAG Criteria then this should be clearly identified[17]. For the purpose of this study the Transport Planning Objectives are "nested" with the Government Objectives. This is intended to highlight synergies between objectives as well as simplifying the reporting process. The four local Transport Planning Objectives identified in Section 4.2 closely fit within the Government's five over-arching objectives. For this study they have been nested as shown in Table 4.1.

Table 4.1 – Relationship of Transport Planning Objectives to Government Objectives

STAG Criteria	NTS Objectives	Outline Transport Planning Objectives
Environment	Protect our environment and improve health by building and investing in public transport and other types of efficient and sustainable transport which minimise emissions and consumption of resources and energy	• ***Objective 4:*** Minimise the environmental issues of severance / noise at strategic locations along the corridor, and reduce carbon emissions to correspond with government targets.

[13] Scotland's Transport Future, Scottish Government, June 2004
[14] Scotland's National Transport Strategy, Scottish Government, December 2006
[15] Para 5 of the National Transport Strategy
[16] Scottish Transport Appraisal Guidance: Chapter 3 Part 1 Appraisal, paragraph 3.1.4-5, Scottish Government, May 2008
[17] Scottish Transport Appraisal Guidance: Chapter 2 Pre-Appraisal, paragraph 2.2.24, Scottish Government, May 2008

Table 4.1 – Cont.

STAG Criteria	NTS Objectives	Outline Transport Planning Objectives
Safety	Improve safety of journeys by reducing accidents and enhancing the personal safety of pedestrians, drivers, passengers and staff	• ***Objective 3:*** Improve road safety along the A907 and A985.
Economy	Promote economic growth by building, enhancing managing and maintaining transport services, infrastructure and networks to maximise their efficiency	• ***Objective 2:*** Improve connections for freight to serve the emerging plans from the National Planning Framework (NPF2) and Freight Action Plan (FAP), and encourage the transfer of movement of goods, produce and materials from road to more sustainable distribution.
Integration	Improve integration by making journey planning and ticketing easier and working to ensure smooth connection between different forms of transport	• *No specific Transport Planning Objective identified – appraisal will be against Government Objective*
Accessibility & Social Inclusion	Promote social inclusion by connecting remote and disadvantaged communities and increasing the accessibility of the transport network	• ***Objective 1:*** Improve connectivity along the corridor to/from Clackmannan to east and west, from south and west Fife to Edinburgh, and from Dunfermline and west Fife to Clackmannanshire, and further west.

4.4.3 During the Initial STAG Appraisal discussed later, each option was appraised against each of the *Government Objectives* and *Transport Planning Objectives*.

4.5 Development of SMART Transport Planning Objectives

4.5.1 At this stage of the appraisal, it is considered appropriate to measure potential transport improvements against the Transport Planning Objectives for a future year of 2022 to fit in with the future analysis year in the Strategic Transport Projects Review[18] (STPR). Hence, based on the nested objectives described above and the analysis of the key issues in Chapter 2, the following SMART Transport Planning Objectives have been identified for appraising each potential option:

- ***Objective 1:*** improve overall connectivity along the corridor in terms of journey time by 2022. This includes journey times through the two ends of the study corridor by 15 minutes, from Clackmannan to the East and West by 15 minutes, from South-West Fife to Edinburgh by 15 minutes, and from Dunfermline and West Fife to further West by 15 minutes;
- ***Objective 2:*** improve connections to serve the emerging plans from the National Planning Framework (NPF2) and Freight Action Plan (FAP) at Rosyth Harbour. In effect, this means improving rail connectivity illustrated by an absolute reduction of more than 50,000 train kilometers across the whole Scottish rail network, and a modal shift to more sustainable movements of freight deliverable by the transfer of 10% of road freight to rail by 2022;

[18] Strategic Transport Projects Review, Transport Scotland, December 2008

- ***Objective 3:*** improve road safety on the key road links within the study corridor in terms of reducing Personal Injury Accidents (PIA) by 33% by 2022, as required as a target under the National Road Safety Plan; and
- ***Objective 4:*** reduce local environmental impacts in terms of reducing severance by 5%, road traffic noise by 0.5 dB(A) by 2022, and reduce the amount of transport generated carbon in the study corridor with an annual 4.5m vehicle-km reduction in traffic movements by 2022.

4.5.2 The above SMART planning objectives have been taken forward into the STAG Appraisal of potential options.

5 Options Generation and Sifting

5.1 Introduction

5.1.1 The next stage of the process was to undertake Optioneering in order to identify options that were likely to meet the Transport Planning Objectives set out in Chapter 4. Following on from the initial assessment of travel patterns and demand in the corridor, a number of outline options for improvements to the transport infrastructure were developed.

5.1.2 An optioneering workshop was subsequently carried out on 5 June 2009 with the relevant local authorities, SEStran and Scott Wilson, to discuss the issues found during the STAG pre-appraisal and the feedback from the various discussions with key stakeholders, local businesses, freight operators and the local community. This helped define the outline options into a more focussed list of options for testing in the initial STAG appraisal.

5.1.3 From this the following options were discussed and agreed with the local authorities and SEStran to be taken forward in the assessment:

Rail

- ***Option 1a:*** Passenger and freight services on the existing railway (freight) line from Alloa to Rosyth which might also require development of the Charlestown Chord;
- ***Option 1b:*** As Option 1a but with a straightened section from Longannet to north of Kincardine to provide a slightly faster running time; and
- ***Option 1c:*** Re-open disused railway line from Alloa to Rosyth (currently Local Cycle Route 64) for passenger and freight services then tie-in using the BRT/LRT reserve corridor as part of the eastern expansion or an alternative connecting route between Local Cycle Route 64 and the rail network.

Express Bus Options

- ***Option 2a:*** Express service from Alloa to Rosyth with limited stops (B9037/A985);
- ***Option 2b:*** Express services from Alloa to Edinburgh via M9;
- ***Option 2c:*** Express services from Dunfermline to Glasgow via M876/M80; and
- ***Option 2d:*** Express service from Alloa to Rosyth (A907).

Waterborne Options

- ***Option 3a:*** Passenger service (Alloa – Kincardine – Bo'ness – Rosyth – Granton); and
- ***Option 3b:*** Freight service (Alloa – Grangemouth – Rosyth – Leith – Kirkcaldy – Leven/Methil Docks).

Road Options

- ***Option 4a:*** Upgrade A985 (A977);
- ***Option 4b:*** Upgrade A907 (A823); and
- ***Option 4c:*** Upgrade A985 and A907.

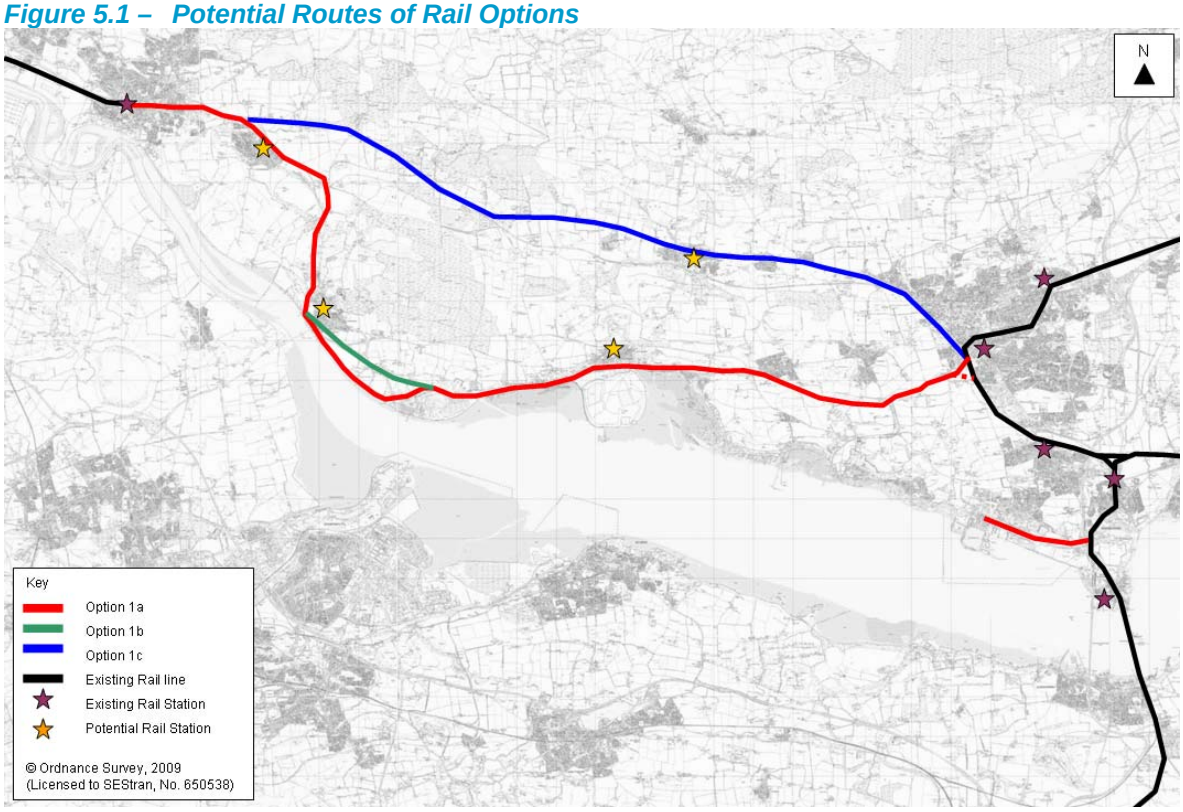
5.1.4 Cycling options were also discussed but ultimately discounted since there are two existing cycle routes (Local Route 64 and NCN76) which provide good east-west connections. Furthermore, walking was discounted as the study area is too large to walk for the purposes of the study objectives.

5.2 Overview of Options

Rail Options

5.2.1 The first set of options which could improve the accessibility and connectivity of the area are rail options. Three options have been considered to cater for passenger and freight demand; all would be running as an extension of the Stirling-Alloa line and would therefore have the same service frequency as the current operations. Figure 5.1 below displays these options.

Figure 5.1 – Potential Routes of Rail Options



Option 1a – Passenger and freight services on the existing railway line (Alloa –Rosyth)

5.2.2 Option 1a proposes the enhancement of the existing railway line in the area from Alloa to Rosyth. The line is currently only open to freight trains with speed restrictions of 35 mph along its length. Furthermore, the signalling block used on the line is not suitable for passenger trains.

5.2.3 Under this proposal the line would be re-opened to shared passenger and freight services, with line and signalling upgrades. Following the current alignment new passenger stations could be added in at Clackmannan, Kincardine and either Culross, Valleyfield or Cairneyhill. However, services could also run direct from Alloa to Rosyth with no intermediate stops. This could be investigated at a later stage when the transport modelling has identified potential demand.

5.2.4 The line would be an extension of the Stirling – Alloa service and would tie-in to the existing railway network at Dunfermline. With regards to joining into the main rail network at Dunfermline, this could be more problematic and could involve the construction of a new chord at Charlestown junction.

Option 1b – as option 1a but with new straightened section to bypass Longannet

5.2.5 Option 1b would follow the same route as 1a with the only difference being the addition of a new stretch of railway to allow passenger and freight trains to bypass Longannet. This would lead to time savings on the straightened stretch.

Option 1c – re-open disused railway Alloa to Dunfermline

5.2.6 Fife Council have studied options for developing a potential bus rapid transit (BRT) / light rail transit (LRT) network connecting Dunfermline to nearby areas and proposed new land-use developments[19]. This study identified a potential BRT / LRT corridor west of Dunfermline, from Rumblingwell (at the Cycle Route 64) to Rosyth Rail Station via Urquhart Cut. This BRT / LRT corridor has been identified for inclusion in the forthcoming update of the Local Plan.

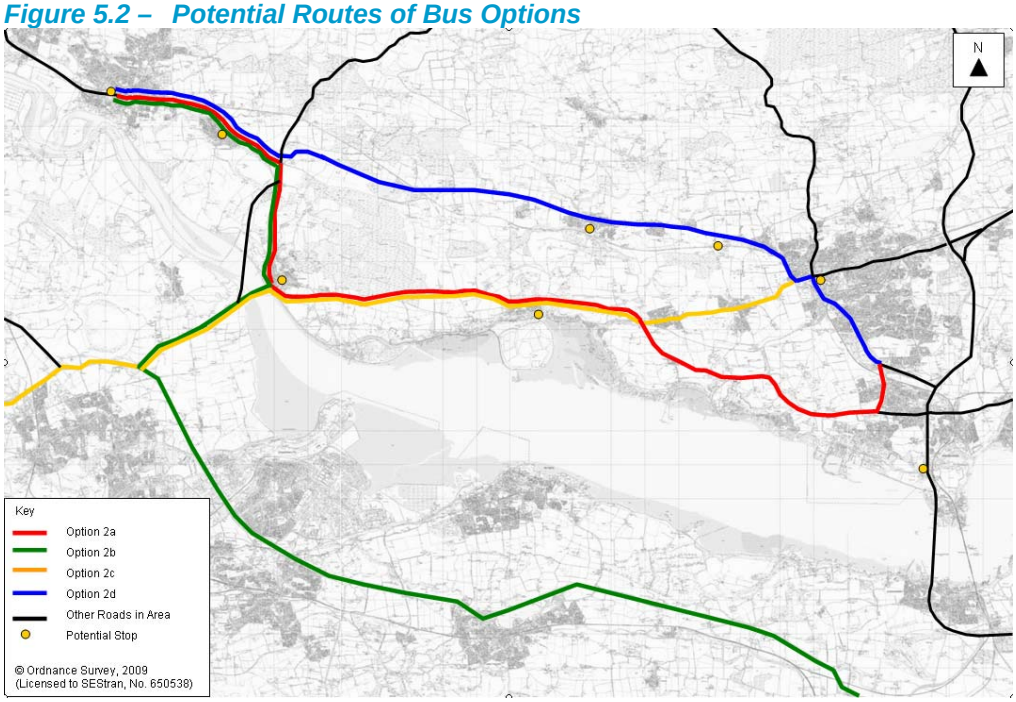
5.2.7 Hence, it is possible to use the BRT / LRT corridor and re-open Cycle Route 64 (which was previously a railway line) as a new segregated rail line to connect Alloa to Edinburgh via Dunfermline West. The route would follow the existing line out of Alloa before branching off at Clackmannan and following the old railway alignment. This would incorporate stops at Clackmannan and Oakley along the line before tying in with the proposed BRT / LRT corridor, which would have to be operated as a dual-running section. Under this proposal the service would again run as an extension of the Stirling-Alloa service.

5.2.8 The line would require rebuilding along with associated site clearance and earthworks. However, the alignment has the advantage of being straighter than the existing (freight) railway line and hence could provide faster running speeds and hence journey times.

Bus Options

5.2.9 Four possible express bus options were identified during the optioneering workshop. This included services between Alloa and Rosyth and services to Glasgow and Edinburgh out with the corridor. Figure 5.2 depicts the options followed by a description of each route.

Figure 5.2 – Potential Routes of Bus Options



[19] Dunfermline BRT / LRT Study, prepared for Fife Council and SEStran by Scott Wilson Scotland Ltd, November 2008

Option 2a – Express service from Stirling to Edinburgh via Alloa and Rosyth (B9037/A985)

5.2.10 The first option would connect key areas along the corridor, running from Stirling to Rosyth using the existing A985 and B9037 roads, via Alloa. The bus would run as an express service with limited stops to reduce journey times. Possible stops along the route include, Clackmannan, Kincardine with additional stops at either Culross or Valleyfield and also Crossford or Cairneyhill with the exact details of the service to be determined later in the analysis. Service frequency has been assumed to be 20 minutes, as per the current average of bus services in the study area.

Option 2b – Express service from Alloa to Edinburgh via M9

5.2.11 The next option would be an express service from Alloa to Edinburgh using the M9 motorway. This would provide a fast service, avoiding some of the local roads in the corridor. The service would have limited stops, primarily Alloa and Edinburgh, although intermediate stops at Clackmannan and Kincardine could be considered. The details of the service would be determined later. Service frequency has been assumed to be 20 minutes, as per the current average of bus services in the study area.

Option 2c – Express service Dunfermline to Glasgow via M876/M80

5.2.12 Option 2c would connect Dunfermline to Glasgow via the M876/M80 with a more frequent service than occurs at present. This would provide a regular connection to Glasgow and the surrounding areas, linking the corridor to the west of Scotland, with service frequency assumed to be 20 minutes.

Option 2d – Express service Stirling to Edinburgh via Alloa (A907)

5.2.13 The final option would be similar to Option 2a in that it would run between Stirling and Rosyth via Alloa connecting the two ends of the corridor. However this service would run along the A907, which is a lower trafficked road and therefore possible stops could include Clackmannan, Blairhall, Oakley, Carnock, Gowkhall and Crossford. The final stops and frequencies would be determined later in the process. Again, service frequency has been assumed to be 20 minutes, as per the current average of bus services in the study area.

Water Options

5.2.14 Two options were drawn up for water transport, reflecting the two user groups of passengers and freight. This included a passenger ferry service and freight barge service running along the Firth of Forth. The routes for the options and possible stops are shown in Figure 5.3.

Figure 5.3 – Routes of Water Options

Option 3a – passenger service (Alloa – Kincardine – Bo'ness – Rosyth – Granton)

5.2.15 The passenger ferry service would connect Alloa with Granton in Edinburgh. Intermediate stops on route could include Kincardine, Bo'ness and Rosyth. The service would utilise the existing ports at these locations and provide a frequent link to Edinburgh, avoiding road congestion. Frequency of the service has been assumed to be 1 per hour.

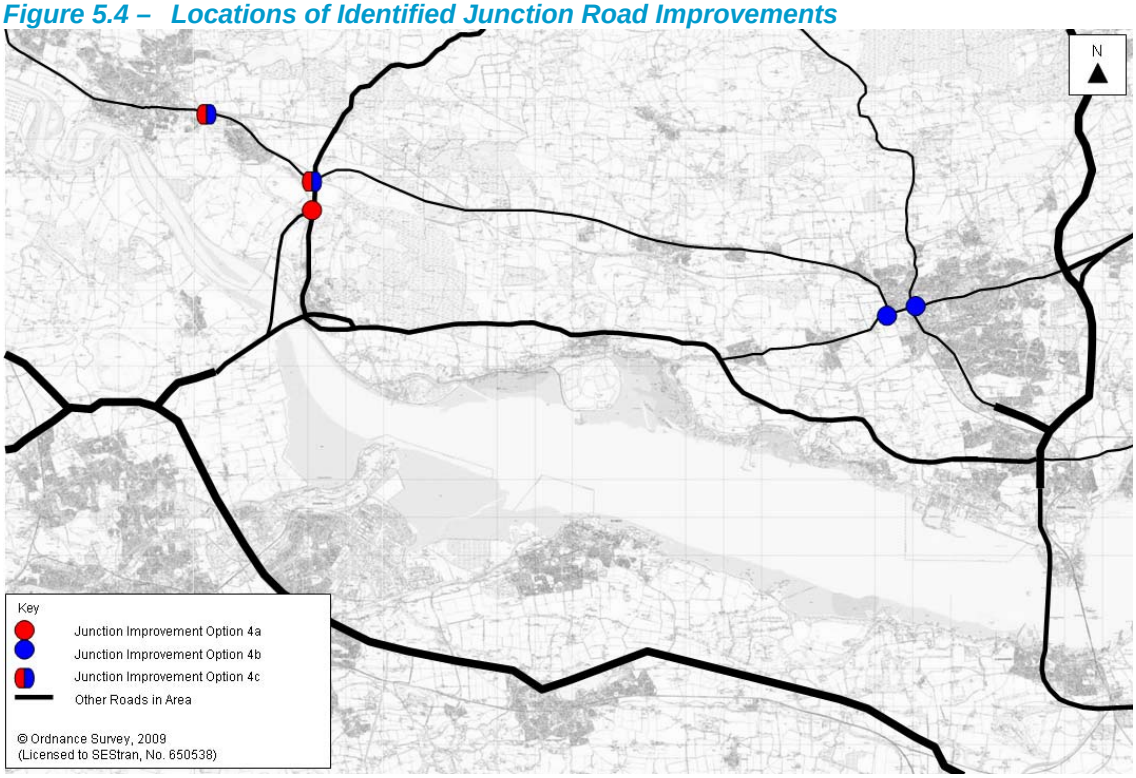
Option 3b – freight service (Alloa – Grangemouth – Rosyth – Leith – Kirkcaldy – Leven/Methil Docks)

5.2.16 The freight service would involve a barge vessel running between Alloa and Leven/Methil Docks. Intermediate stops on route could include Grangemouth, Rosyth, Leith and Kirkcaldy. The barge vessel would be able to transport freight from the existing ports to other strategic locations around the corridor. This would be particularly useful in the case of Rosyth where freight is being imported and exported to/from other areas of Europe. This could remove significant HGV kilometres from the roads and reduce congestion.

Road Options

5.2.17 The road options were borne out of estimated future congestion pinch-points at key junctions in the area. To identify future congestion pinch-points, the ratio of flow-to-capacity (RFC) of road sections and junctions was estimated for the 2022 AM Peak Hour time period from the Transport Model for Scotland (TMfS) used in the demand analysis for this appraisal. Those junctions along the key roads (A985/A977, A907/A823 or both) with an RFC of over 85% were identified as potentially benefiting from enhancement and small-scale capacity improvements were identified (e.g. widened entry widths, entry flares, traffic signals). Figure 5.4 shows the locations of the junctions identified as potentially benefiting from improvements.

Figure 5.4 – Locations of Identified Junction Road Improvements



5.2.18 Five junctions were identified for improvements on the road network in the study. These were:

1) Clackmannan – A907 (Clackmannan Road) / B909: remedial measures are required to reduce vehicle queuing on the B909, which will take the form of a widened entry (flared extra lane) to provide two lanes for separate left and right turning movements;
2) Gartarry Roundabout – A977 northbound towards the roundabout: remedial measures are required on the A977 on the approach to the Gartarry Roundabout which will take the form of a widened entry (flared extra lane) to provide two lanes in order to separate left turning movements from other turning movements;
3) Clackmannanshire Bridge New Roundabout – A977 / North Approach Road: remedial measures are required on the North Approach Road on access to the roundabout which will take the form of a widened entry (flared lane) to prevent queuing on the North Approach Road;
4) A907 (Pittencrieff Street) / Chalmers Street / (A907) Glen Bridge: in order to prevent an excessive build-up of traffic on Chalmers Street at the junction with the A907, the traffic signal system needs to be demand-responsive at the specific junction; and
5) A907 (Carnegie Drive) / A823 (St. Margaret's Drive) – at the approach from Townhill Road: an additional lane is required on Holyrood Place on the approach to Sinclair Gardens Roundabout to allow the segregation of left hand turning traffic movements onto A907 (Appin Crescent) from other traffic, and thus prevent a build-up of traffic on Holyrood Place.

5.2.19 The combinations depend on the options being considered.

Option 4a – Improvements to the A985 / A977

5.2.20 This option involves junctions 1), 2) and 3) described above and addresses the pinch-points for traffic (including freight).

5.2.21 The junction improvements would address key accident sites along the road. Although the accident rate is at present lower than the national average, the number of fatalities along the road is currently significantly higher than the national average, and the proposed remedial measures would address this issue.

Option 4b – Improvements to the A907 / A823

5.2.22 This option involves junctions 1), 2), 4) and 5) and addresses the pinch-points for traffic (including freight). As with option 4a, the measures will also address accident concerns. However in this case the A907 has, at some of the locations, higher than average accident rates than the national average, albeit most with damage only accidents. Therefore the measures required in some cases are different from those proposed in options 4a.

Option 4c – Combination of both Options 4a and 4b

5.2.23 The final option would combine the two options and involve improvements on both the A985 and A907, and would involve implementing all 5 junction improvements. This would address the safety concerns on both routes and their suitability for traffic. These improvements covering both options may have to be carried out in stages to ensure the strategic routes through the corridor are accessible throughout the period the junction improvement works are required.

6 Initial STAG Appraisal

6.1 Introduction

6.1.1 The STAG process requires that an initial appraisal be undertaken that examines the following:

- Transport Planning Objectives;
- STAG Criteria;
- Established Policy Directives;
- Feasibility, Affordability and Public Acceptability; and
- Selection or rejection of options.

6.1.2 The initial STAG appraisal sifts through a number of potential options following the option generation and sifting exercise. The initial STAG appraisal is set out in this chapter and Appraisal Summary Tables (ASTs) abstracts of each option can be found in Appendix C.

6.2 Assessment against the Transport Planning Objectives

6.2.1 STAG requires the consideration of a scheme's local planning objectives in addition to the Government's five main objectives. These were derived at a workshop undertaken to allow the key stakeholders to identify the local transport issues discussed in previous chapters of this report. These issues covered safety, environment, public transport and freight. The public transport and freight categories are both closely related to the connectivity of the transport network, and can be directly compared to the objectives described in both the Fife and Clackmannanshire Local Transport Strategies.

6.2.2 The outline Transport Planning Objectives identified are shown in Table 6.1.

Table 6.1 – Transport Planning Objectives

Objective	Description of Outline Transport Planning Objective
Objective 1	Improve connectivity within the corridor & between the corridor & other areas.
Objective 2	Improve freight connectivity & encourage modal transfer from road distribution.
Objective 3	Improve road safety on the major road links.
Objective 4	Minimise severance, noise and reduce carbon emissions.

6.2.3 The objectives have been designed to encapsulate the transport problems and opportunities in the study area. Consequently the performance of the options against the study objectives are a measure of their ability to address the local problems and take advantage of the local opportunities presented. In Table 6.2 overleaf the options are scored against the objectives using the standard seven-point scale assigned to indicate the likely impact, and outlined below:

✓✓✓	major beneficial impact	✗✗✗	major adverse impact
✓✓	moderate beneficial impact	✗✗	moderate adverse impact
✓	minor beneficial impact	✗	minor adverse impact
		O	neutral impact

Table 6.2 – Assessment of Options against Transport Planning Objectives

Option	Transport Planning Objectives				
	Objective 1	Objective 2	Objective 3	Objective 4	Sum
Option 1a (Rail)	✓✓✓	✓✓✓	✓✓	✓✓	✓✓ (9)
Option 1b (Rail)	✓✓✓	✓✓✓	✓✓	✓✓	✓✓ (9)
Option 1c (Rail)	✓✓✓	✓✓✓	✓✓	✓✓	✓✓ (9)
Option 2a (Express bus)	✓✓	O	✓	✓	✓ (5)
Option 2b (Express bus)	✓✓	O	✓	✓	✓ (5)
Option 2c (Express bus)	✓	O	✓	✓	✓ (4)
Option 2d (Express bus)	✓✓	O	✓	✓	✓ (5)
Option 3a (Waterborne)	✓	O	✓	✓	✓ (3)
Option 3b (Waterborne)	✓	✓✓	✓	✓	✓ (5)
Option 4a (Road)	✓	✗	✓	✗	O
Option 4b (Road)	✓	✗	✓	✗	O
Option 4c (Road)	✓	✗	✓	✗	O

6.2.4 The three rail options all score very well in meeting Transport Planning Objective 1, improving connectivity, owing to the significant demand for the rail services within and between the study area and Edinburgh. The express bus options also perform well, but option 2c, the service between Dunfermline and Glasgow is not expected to perform so well with this objective, as passenger demand is much lower.

6.2.5 The rail options perform very well with Transport Planning Objective 2, freight connectivity, as might be expected from the opportunities presented by opening up the corridor to freight access. The bus options on the other hand have no freight capacity and therefore will have a neutral score, as will the water-borne option 3a, which only caters for passengers. Option 3b on the other hand scores moderately well in providing a freight link along certain parts of the corridor. However, the road options will see a minor disbenefit meeting this objective where road improvements are expected to generate additional traffic, which in turn adds to congestion, impeding freight flows.

6.2.6 Transport Objective 3, improving road safety is met by most of the options that reduce traffic on the main routes through the study corridor. The rail options perform well here, scoring two ticks for each sub-option. The bus and water-borne options score one tick for this objective, as do the road options as the safety benefits associated with improved road layouts are expected to slightly outweigh the heavier traffic generated with these options.

6.2.7 The rail options perform the best in meeting Transport Objective 4, minimising severance, noise and reducing carbon emissions, and score two ticks for each sub-option. This is because these options are expected to remove the most traffic. The express bus and water-borne options score a single tick, indicating a minor positive impact, but the additional traffic generated with the road options are in conflict with this objective, and hence score a cross indicating a minor adverse impact.

6.3 Anticipated Impacts on the STAG Criteria

6.3.1 As with appraisal against the Planning Objectives, a score is assigned to each STAG sub-criterion to indicate the likely impact.

Environmental Appraisal

6.3.2 As a mechanism for promoting sustainable development, the options offer opportunities to enhance the quality of the environment. Much of the study corridor has at least some level of environmental protection (see Environmental Baseline in Chapter 2).

6.3.3 Almost the entire coastal element of the study corridor between Rosyth and Culross is host to SSSIs. There is also a significant area to the west and south west of Dunfermline as far as Rosyth which constitutes an Area of Great Landscape Value. There is also a large area of ancient woodland, Devilla Forest, that buttresses onto Kincardine and extends as far as Clackmannan, and further patches of ancient woodland permeate the whole corridor between Alloa and Dunfermline. Furthermore there are a number of conservation areas and Historic Gardens/Designed Landscapes in the region.

6.3.4 A summary of the environmental impacts is shown in Table 6.3 below, and more details are provided in Appendix B. These are an average of the impacts associated with both the implementation and operation of each option. A number of assumptions have been made about the proposals for each option.

Table 6.3 – Assessment of Options against Environmental Criteria

Option	Environmental Criteria								
	Noise and Vibration	Air Quality	Hydro-logy	Geology & Soils	Bio-diversity	Land-scape	Visual Amenity	Land Use	Cultural Heritage
Rail option 1a	✓✓	✓✓	✗	✗✗	✗	✗✗✗	✗✗	✗✗	✗✗
Rail option 1b	✓✓	✓✓	✗	✗✗✗	✗	✗✗✗	✗✗	✗✗✗	✗✗
Rail option 1c	✓✓	✓✓	✗✗	✗✗✗	✗	✗✗	✗✗	✗✗✗	✗✗✗
Bus option 2a	✓✓	✓✓	O	O	O	O	✗	O	O
Bus option 2b	✓✓	✓✓	O	O	O	O	✗	O	O
Bus option 2c	✓✓	✓✓	O	O	O	O	✗	O	O
Bus option 2d	✓✓	✓✓	O	O	O	O	✗	O	O
Waterborne option 3a	✓	✓	✗✗	O/✗	✗	✗	✗/✓	O/✗	O/✗
Waterborne option 3b	✓	✓	✗✗	O	✗	✗	✗/✓	O	O/✗
Road option 4a	✗✗	✗✗	✗	✗	✗	✗✗	✗✗	✗/✗✗	O/✗
Road option 4b	✗✗	✗✗	✗	✗	✗	✗✗	✗✗	✗/✗✗	O/✗
Road option 4c	✗✗	✗✗	✗	✗	✗	✗✗	✗✗	✗/✗✗	O/✗

6.3.5 Option 1a would have moderate adverse impacts in terms of visual amenity, land use and cultural heritage (e.g. Culross Conservation Area) if the option involves widening of the route to accommodate an additional line. If the option were to run services using the pre-existing infrastructure then these impacts would be reduced. However there are likely to be moderate beneficial impacts in terms of air quality as a result in a switch from private vehicles to rail. The impacts of Option 1b are similar to Option 1a above, but the construction of the realigned section of railway could present major adverse impacts in terms of geology and soils and landscape due to construction. However there are likely to be moderate beneficial impacts in terms of air quality as a result in a switch from private vehicles to rail. The impacts of Option 1c are similar to Option 1b

above, where there are likely to be environmental impacts associated with increased land-use due to a new rail line being constructed, but also the loss of the existing cycle route (Local Cycle Route 64).

6.3.6 Option 2a, 2b, 2c and 2d would result in minor adverse impacts due to the construction of bus related infrastructure (i.e. shelters). However there are likely to be moderate beneficial impacts in terms of noise and vibration and air quality as a result of a switch from private vehicles to bus.

6.3.7 Option 3a could have potentially minor adverse impacts as a result of construction of waterborne transport infrastructure. In particular there is a risk of pollution discharges during construction and operation into the Firth of Forth of which large areas are designated as SPA/Ramsar/SSSI. However there are likely to be minor beneficial impacts in terms of air quality as a result in a switch from private vehicles to waterborne public transport. The impacts of Option 3b are similar to Option 3a above.

6.3.8 Options 4a, 4b and 4c would result in minor to moderate adverse impacts for most of the environmental criteria as a result of junction lane widening or changes to the existing road infrastructure. These options may result in increased noise and vibration and reduced air quality to local receptors where they exist, especially during construction.

6.3.9 In addition to the above:

- construction disruption is likely to affect residential, commercial, and industrial properties, though this will largely be temporary and not result in any permanent impacts, however, clearance of vegetation will result in permanent negative impacts;
- impacts, during both construction and operation, are likely to be experienced with respect to air quality, noise and vibration, water quality, biodiversity, and geology and soils. However, some of these impacts could be suitably mitigated, and some will be temporary;
- there may be a number of direct and indirect adverse impacts on cultural heritage and landscape features in the area;
- any building work may affect the Firth of Forth SPA/SSSI/ Ramsar site with potential for significant adverse impacts upon wildlife. The operation of a ferry passenger or freight service also has the potential to affect wildlife in the Firth of Forth. However, some of these impacts could be suitably mitigated and would be examined in an Environmental Impact Assessment; and;
- all of the options (excluding the bus-based options) may affect landscape designated areas depending on the location, scale and design of the works.

6.3.10 Most of the options have minor impacts in total, with the exception of the rail and road options, which generally have minor to major negative impacts.

Safety Appraisal

6.3.11 The Safety objective identified within STAG is concerned with reducing the loss of life, injuries and damage to property resulting from transport accidents and crime. Two sub-objectives are considered, namely accidents and security.

Accidents

6.3.12 All of the options would be expected to reduce the accident rates on the corridor road network. The main reason insofar as the rail, water-borne and express bus options are concerned is the removal of road vehicular traffic that all these would predicate. The road options are anticipated to marginally increase traffic on the local roads, but on the flip-side they should be engineered to the

latest safe design standards. Therefore, it would be reasonable to expect that these options would have a minor positive impact with respect to lowering accidents.

Security

6.3.13 In terms of security, it is anticipated that the rail and water-borne options would include stations and termini which would be designed to standard engineering guidance and hence would include adequate security facilities for passengers and freight. However, by making these facilities secure for users do not increase the overall security for these people, hence all options are scored as neutral for security.

6.3.14 Table 6.4 summarises the overall impacts of each option for the Safety Appraisal criterion.

Table 6.4 – Assessment of Options on Safety Appraisal

	Rail	Express Bus	Water-borne	Road
Accidents	✓	✓	✓	✓
Security	O	O	O	O
Average	✓	✓	✓	O

Economy Appraisal

6.3.15 The Economy objective identified within STAG is concerned with improving the economic efficiency of transport and the efficiency of economic activities, with the key aim of supporting sustainable economic activity and returning good value for money. The economic appraisal is composed of three elements:

- Transport Economic Efficiency (TEE);
- Economic Activity and Location Impact (EALI); and
- Wider Economic Benefits (WEBS).

6.3.16 For the purposes of the initial STAG appraisal, only the first two sub-objectives are examined.

Outline TEE Appraisal

6.3.17 This section presents a high-level Transport Economic Efficiency (TEE) appraisal based on the results obtained from a high-level Restricted Cost/Benefit Analysis (RCBA). The emphasis on this high-level appraisal is to allow for a comparison of the differences between the different options, thereby helping to understand which options are likely to perform better than others. Hence the options are worthy of taking forward into the detailed STAG Appraisal in Chapter 8, where a more detailed conventional TEE appraisal is undertaken.

6.3.18 Transport analysis modelling was applied to estimate changes in travel conditions and used to help indicate the likely level of assessment for the initial STAG appraisal. This is summarised in Appendix D. From this, the difference in average travel conditions before and after the proposals are implemented is ascertained to determine how people are potentially affected by the changes.

6.3.19 Table 6.5 overleaf shows the benefits covering the estimated revenues, other benefits (including vehicle operating cost savings, time benefits, sensitive lorry mile savings, etc), operating costs for each option and a revenue-to-cost ratio value for the 12 options. This is considered to be sufficient for the purposes of an Initial STAG Appraisal. Monetised values are in 2008 prices.

Table 6.5 – Summary of Outline TEE Appraisal – 2008 prices (£million)

Options		Revenues	Other Benefits	All Benefits (AB)	Operating Costs (OC)	AB / OC
Rail	Option 1a	£2.03m	£2.51m	£4.54m	£2.49m	1.83
	Option 1b	£2.05m	£2.72m	£4.76m	£2.46m	1.94
	Option 1c	£2.34m	£3.94m	£6.28m	£2.23m	2.82
Bus	Option 2a	£0.20m	£0.25m	£0.45m	£0.86m	0.52
	Option 2b	£0.17m	£0.34m	£0.50m	£0.74m	0.68
	Option 2c	£0.24m	£0.31m	£0.54m	£0.75m	0.72
	Option 2d	£0.06m	£0.06m	£0.12m	£0.75m	0.16
Ferry	Option 3a	£0.07m	£0.05m	£0.12m	£0.63m	0.19
	Option 3b	£0.09m	£0.14m	£0.23m	£0.76m	0.31
Road	Option 4a	n/a	£0.03m	£0.03m	£0.04m	0.68
	Option 4b	n/a	£0.02m	£0.02m	£0.09m	0.19
	Option 4c	n/a	£0.04m	£0.04m	£0.10m	0.42

6.3.18 Clearly, as a project moves towards the Detailed STAG Appraisal in Chapter 8, more information will become available, and a detailed breakdown of capital costs will be undertaken for those options selected for the detailed STAG appraisal. These costs together with an examination of the benefits will form the full TEE Appraisal for each option examined in the detailed STAG appraisal.

EALI Appraisal

6.3.19 The EALI analysis describes the impacts on the economy in terms of the income and / or employment of the different options.It is intended to identify how and under what circumstances the proposal might have impacts on the economic performance of the study area in different sectors, capturing those economic impacts that Transport Economic Efficiency (TEE) appraisals fail to capture.

6.3.20 EALIs are of particular importance where the case for investment rests on economic development arguments. Investment in the local transport infrastructure and network increases access to employment, markets and supply chains, and reduces travel times and other costs. Thereby increasing the attractiveness of the Clackmannanshire – West Fife – Edinburgh corridor for businesses and employment.

6.3.21 The economic aims of the scheme are several. By improving links to and from the Clackmannanshire – West Fife corridor, opportunities exist to:

- facilitate business access to markets and inputs (forward and backward linkages) by reducing the costs of transportation;
- reduce unemployment in the study area by facilitating access to job opportunities elsewhere in the Fife and Clackmannanshire local authority areas and further afield;
- reduce business (and private) costs of travel (including commuting costs), and so securing the commitment of the local workforce to remain in the Clackmannanshire – West Fife area, preserving the level of local expenditure; and
- encourage inward investment.

6.3.22 It is essential to identify whom the likely gainers and losers might be from improvements to the local transport network, where they are based and what their likely response is in terms of economic behaviour. In the Clackmannanshire – Dunfermline – Edinburgh corridor, the stakeholders who are most likely to benefit are:

- local businesses that depend on freight movements;

- local businesses that depend on customers or employees with access from outside the area;
- transport operators that would use or operate the new transport services;
- local and regional commuters; and
- business based outside the region and who invest in the Clackmannan – West Fife area.

6.3.23 There may be some displacement activity at the local level but this is unlikely to have a large impact on local business. Most of the displacement activity would be expected to occur between local and regional transport operators, and in the case of the rail and bus-based options, the losers are likely to be local bus companies haemorrhaging customers to the new rail and express bus services on the longer routes.

6.3.24 Some local transport hauliers may also lose out as a result of greater quantities of freight being moved by rail to and from Rosyth and further afield, and to the proposed barge (Option 3b) linking the main points of economic activity on the north shore of the Forth. However, these impacts are anticipated to be small, as many resident companies move their goods and supplies under 'own account' arrangements (in-house transport fleet).

6.3.25 By removing existing local transport constraints, the potential overall net effect of improving the transport infrastructure and implementing new services is to permit business expansion in the study area, allowing growth in both employment and investment. The challenge is to achieve this impact at the least cost to public resources. It is expected that both the rail options and water-borne freight option would realise significant benefits in terms of freight connectivity for the largest companies in the region. In terms of business accessibility and commuting, the express bus options also perform well.

6.3.26 For the rail freight sector there will be some beneficiaries with a national reach. This is because rail freight access to Rosyth from the south of Scotland and England will be improved with significant time savings, potential savings on vehicle operating costs, and broader environmental benefits for the communities in the study area.

6.3.27 Table 6.6 shows a summary of the results of the EALI appraisal.

Table 6.6 – Summary of EALI Impacts

Option		Major Impacts by Geographical Spread		
		Local to Study Area	Regional	National
Rail Options	Gainers	• Facilitate business access to markets & suppliers • Facilitate business access to customers • Facilitate access to job opportunities • Enable commuters to remain in area • Provide wider opportunities for shoppers • Encourage tourism to area	• Enable business access to markets & suppliers • Facilitate business access to customers • Facilitate access to job opportunities • Enable commuters to remain in area • Enable increase in freight delivery to and from Rosyth and further afield • Encourage tourism to area • Encourage potential inward investment	• Enable quicker freight delivery to and from Rosyth from further afield – especially to & from west & parts of the south of Scotland

Table 6.6 – Cont.

Option		Major Impacts by Geographical Spread		
		Local to Study Area	Regional	National
	Losers	• Some local public transport operators • Some local retail impacts	• Some regional public transport operators • Some regional freight transport operators	• No significant impacts
Express Bus Options	Gainers	• Facilitate access to job opportunities • Enable commuters to remain in area • Provide wider opportunities for shoppers	• Facilitate access to job opportunities • Enable commuters to remain in area • Encourage tourism to area • Facilitate business access to customers	• No significant impacts
	Losers	• Some local public transport operators • Some local retail impacts	• Some regional public transport operators	• No significant impacts
Water-borne Options	Gainers	• Facilitate business access to markets & suppliers • Facilitate business access to customers	• Facilitate freight delivery to and from Rosyth and elsewhere along the Forth Estuary	• No significant impacts
	Losers	• No significant impacts	• Some regional freight transport operators	• No significant impacts
Road Options	Gainers	• Facilitate business access to markets & suppliers • Facilitate business access to customers • Local transport operators	• Facilitate business access to markets & suppliers • Facilitate business access to customers • Regional transport operators	• No significant impacts
	Losers	• No significant impacts	• No significant impacts	No significant impacts

6.3.28 From the Table it is evident that all the rail options capture benefits associated with freight movements as well as passenger service availability, which set these options apart from the others. Only the water borne options also have both a direct freight and passenger impact, but speed constraints and limited regional penetration of these options limit the benefits for passenger traffic. In terms of national impacts, these will be limited to some freight benefits associated with better connectivity between Rosyth in particular and parts of the south and west of Scotland, and also

possibly from England. Although there will be benefits from implementation of the road options, these would be very minor compared to the expected benefits from the other options.

6.3.29 The overall results of the economic appraisal are shown in Table 6.7.

Table 6.7 – Summary of Economic Benefits

Options		TEE Benefits	EALI Benefits	Average Economic Benefits
Rail	Option 1a	✓✓	✓✓	✓✓
	Option 1b	✓✓	✓✓	✓✓
	Option 1c	✓✓	✓✓	✓✓
Bus	Option 2a	O	✓	O/✓
	Option 2b	O	✓	O/✓
	Option 2c	O	✓	O/✓
	Option 2d	O	✓	O/✓
Ferry	Option 3a	O	✓	O/✓
	Option 3b	O	✓	O/✓
Road	Option 4a	O	O	O
	Option 4b	O	O	O
	Option 4c	O	O	O

6.3.30 Clearly both the TEE and the EALI results indicate that the rail options meet the economic objectives the most robustly. From the Table it can be seen that the rail options have ***moderate beneficial impacts***, the bus and ferry options have from ***neutral*** to ***minor beneficial impacts***, and the road options have ***neutral impacts***.

Integration Appraisal

6.3.31 An outline of the integration appraisal is given here, a fuller integration appraisal is provided in Chapter 8. In appraising the Government Objective STAG requires the consideration of:

- Transport integration;
- Transport land-use integration; and
- Policy integration.

6.3.32 In terms of transport integration, this is further broken down between

- Services and ticketing; and
- Infrastructure and information.

Transport Integration

6.3.33 In terms of services and ticketing, both the rail and express bus options will provide an opportunity for the integration of services with the existing bus and rail service network. Opportunities will arise within the corridor to share brand names, ticketing arrangements and to 'dove-tail' rail and bus timetables with existing service timetables, and this is true for all the rail and bus options being considered.

6.3.34 There is also significant opportunity for integrating the water-borne passenger services with, in particular, bus services at Granton for instance. Therefore this option also provides a good opportunity to mesh together water-ferry and local bus service timetables and ticketing.

6.3.35 The only options to which these benefits are not applicable are the road enhancement options (options 4a to 4d) and the freight transport options associated with rail and water (option 3b).

6.3.36 The rail options will provide the opportunity of introducing park and ride sites. Although the bus option does not have this potential, both the rail and the express bus options will have the opportunity for providing bus-rail interchange infrastructure at some of the key locations such as Rosyth, Kincardine and Clackmannan, and possibly at smaller locations in the corridor such as at Oakley and Valleyfield/Culross to facilitate modal switch.

6.3.37 The rail options do particularly well as they also offer potential multi-modal freight interchange facilities in addition to passenger interchange, which would not be available with the bus options. New infrastructure required for the water-borne option would also provide an opportunity for any new terminal to incorporate both bus and freight interchange facilities.

6.3.38 The rail, bus and water-borne facilities will also have the opportunity to provide cycle storage facilities. However, option 1c involves removing the existing Local Cycle Route 64 and the replacement with a new cycle route resulting in land take and environmental disturbance.

6.3.39 Based on the above, it is reasonable to assume that the rail options will have ***major beneficial impacts***, the bus options have ***moderate beneficial impacts***, and the water-borne options will have ***minor beneficial impacts***, and the road options, ***a neutral impact***.

Transport Land-Use Integration

6.3.40 Much of the Clackmannan – Dunfermline corridor is dominated by hilly arable and pastoral agricultural land punctuated by ancient woodland. The coastal strip to the south is preserved by SSSIs from Rosyth as far as Kincardine. The ends of the study corridor are characterised by major urban areas. To the east the corridor is bounded by the towns of Dunfermline, Rosyth and Inverkeithing, which present a largely contiguous urban area, and to the west Clackmannan, Alloa and further west still, Stirling, each being a discrete settlement.

6.3.41 There are a variety of developments in the area within which the proposed transport options are situated. As seen in Chapter 2 a total of 7,000 housing units are estimated to be completed by 2022; approximately two thirds of which will be in Clackmannanshire and the remainder in Fife, largely scattered over the area, and of which half of these will be built by 2012. In addition, over 200 hectares of industrial development, 88 hectares of offices and 20 hectares of retail development is anticipated.

6.3.42 It is anticipated that these developments will have no significant impact on any of the transport options, or visa-versa, and if fact there may be a complementary relationship between the developments and the options. Therefore in terms of land use integration, it is reasonable to assume that all the options provide ***minor beneficial impacts***.

Policy Integration

6.3.43 Reference was made to the following strategy documents:

- Strategic Transport Projects Review;
- Clackmannanshire and Fife Council's Local Transport Strategies;
- Fife Structure Plan (version 2);
- SEStran Regional Transport Strategy;
- Scottish Planning Policy (SPP) statement 17; and
- SPP1.

6.3.44 Transport improvements in the study area offer a major opportunity to implement local and strategic planning and transport policies as a mechanism for promoting sustainable development. This is explored in greater depth in the detailed STAG appraisal in Chapter 8 of this report.

6.3.45 The proposals would generally encourage a modal shift away from private car use, improve the quality of the environment, increase access for all to a public transport system serving areas of employment, housing and recreation, and would encourage social inclusion.

6.3.46 In addition, the freight transport improvements offered by the proposed investment in the rail and water-borne options in the study area offer a major opportunity to implement local and strategic planning and transport policies as a mechanism for promoting development on a more sustainable footing.

6.3.47 From the policy review, it is clear that all options identified can be reasonably expected to compliment local, regional and national policies. However, those options which provide opportunities for freight transport as well as public transport services will naturally satisfy additional policy objectives. The single water-borne freight option only carries freight, thus would not meet passenger related policies for the area. Based on the above therefore, it is reasonable to allow the rail options three ticks, ***major beneficial impact***, the bus and water-borne options two ticks, ***moderate beneficial impact*** and the road option no ticks, ***neutral impact***.

6.3.48 Table 6.8 summarises the results of the integration appraisal. Since option 1c will result in the loss of the existing cycle route (local route 64) the transport integration for this option is lower than for the other rail options which are based on the existing railway line.

Table 6.8: Transport Integration Appraisal

Option	Description of Scenario	Transport Integration	Land-Use Transport Integration	Policy Integration	Overall Average
1. Rail Options	1a - existing railway line from Alloa to Rosyth	✓✓✓	✓	✓✓✓	✓✓✓
	1b - as option 1a but with new section to bypass Longannet	✓✓✓	✓	✓✓✓	✓✓✓
	1c - re-open disused railway Alloa to Dunfermline	✓✓	✓	✓✓✓	✓✓✓
2. Express Bus Options	2a - Alloa to Rosyth with limited stops (B9037/A985)	✓✓	✓	✓✓	✓✓
	2b - Alloa to Edinburgh via M9	✓✓	✓	✓✓	✓✓
	2c - Dunfermline to Glasgow via M876/M80	✓✓	✓	✓✓	✓✓
	2d - Alloa to Rosyth (A907)	✓✓	✓	✓✓	✓✓
3. Water-borne Options	3a - passenger service (Alloa – Kincardine – Bo'ness – Rosyth – Granton)	✓	✓	✓✓	✓✓
	3b - freight service (Alloa – Grangemouth – Rosyth – Leith – Kirkcaldy – Leven/Methil Docks)	✓	✓	✓✓	✓✓
4. Road Options	4a - upgrade A985	O	✓	O	O
	4b - upgrade A907	O	✓	O	O
	4c - upgrade A985 and A907	O	✓	O	O

Accessibility & Social Inclusion Appraisal

6.3.49 STAG requires the consideration of two aspects as part of the Accessibility and Social Integration Government Objective, namely:

- Community Accessibility; and
- Comparative Accessibility.

6.3.50 In terms of community accessibility, the rail options will open up speedy commuter and tourism access between the study area and Dunfermline, Edinburgh, Stirling, Perth and Glasgow, and access for residents in the study area to facilities including retail, medical and educational destinations outside the immediate Clackmannanshire – west Perth region. The rail options also provide direct connections to the national rail network so significantly improving connectivity, although in terms of more distant destinations this might involve interchange penalties.

6.3.51 With respect to comparative accessibility – accessibility for specific groups in society, or for particular locations, the expense of rail may deter those on lower incomes without access to preferential fare rates. The rail options will assist commuters and those seeking work, those visiting further afield, tourists and businesses. They will also assist bulk freight movements through, into and out of the area. However the rail options will not be particularly suitable for very localised trips, typified by those that are made from one location in the study corridor to another. Therefore the rail options score two ticks for accessibility and social inclusion, or a ***moderate beneficial impact***.

6.3.52 The express bus options meet both the community and comparative accessibility criteria very well. All groups in the community will benefit; commuters, shoppers, those visiting community facilities and friends and relatives, both within the corridor and further afield. The relatively large number of stops in the corridor ensures high public transport penetration of the study area enabling people in relatively remote areas access to both other locations in the corridor and destinations further afield, including those in Edinburgh and Glasgow. The relative competitiveness of bus fares ensures that bus transport is within reach of almost all sections of society, with no discrimination between socio-economic groups. On the basis of these points, the bus options score three ticks for accessibility and social inclusion, indicating a ***major beneficial impact***.

6.3.53 The passenger water-borne transport option will be impeded in meeting the community and comparative accessibility sub-objectives owing to the relatively few destinations served and low general connectivity, lack of transport penetration within the study area and relatively low speed. All this will limit its appeal to certain markets, such as tourists, some shoppers and possibly commuters, and those others constrained by time. As a result this option only scores one tick signifying that it has a ***minor beneficial impact***. It should be noted that the freight water-borne option does not target this objective, and therefore has a ***neutral impact***.

6.3.54 The road options examine highway network engineering solutions over the study area, which are not directly applicable to community nor comparative accessibility, therefore they are considered to have a neutral impact.

6.3.55 Using the standard seven point scale, a summary of the anticipated impacts on the STAG criteria are shown in Table 6.9.

Table 6.9 – Accessibility & Social Inclusion Impact

	Rail	Express Bus	Water-borne	Road
Accessibility & Social Inclusion	✓✓	✓✓✓	✓	O

6.4 Impacts on Policy Directives

6.4.1 The SEStran Regional Transport Strategies (RTS) puts in place a number of key transport policies. The important relevant policies related to the options being considered are highlighted:

Bus Related Policies: Options 2a – 2d

- Policy 1 - there will be a general presumption in favour of schemes that improve the efficiency and effectiveness of public transport, and make it a more attractive option for existing car users; and
- Policy 2 - support will be given to the improvement of all aspects of bus services (services, vehicle quality, fares, infrastructure, bus rapid transit, and integration) as a means of reducing congestion and enhancing accessibility.

Rail Related Policies: Options 1a – 1c

- Policy 3 - encouragement will be given by SEStran to Transport Scotland for cost-effective investment and service support that builds an integrated rail-based regional transport network, including trams, fully integrated with existing and planned development; and
- Policy 4 - there will be a presumption in favour of supporting the targeting of rail investment to enhance the public transport capacity (including, where appropriate, station capacity) of existing heavily-used and congested rail corridors for passengers and/or freight.

Infrastructure, Freight and Modal Shift Related Policies: all Options

- Policy 14 - any additional capacity on commuter corridors that are congested, or forecast to become congested within the lifetime of the strategy, will normally be used to benefit space-efficient modes…..Such additional capacity on freight corridors may also be used to benefit HGVs;
- Policy 15 - new road capacity, to improve journey times and reliability, may be provided where it can be demonstrated that these benefits will not be eroded by induced traffic in the medium to long term, and that other alternatives have been evaluated and found to be less effective; and
- Policy 16 - SEStran will work with the freight transport industry to minimise the negative impacts of freight on the environment, including, where appropriate promoting greater use of rail and water-borne transport.

Accessibility: Options 2a – 2d, Options 1a – 1c & Option 3a

- Policy 17 - SEStran will seek to ensure that communities with poor access to employment by PT and low car ownership/high deprivation will be the subject of targeted measures to address this; and
- Policy 18 - in selecting interventions as part of the RTS, SEStran will seek to pay particular regard to the need to reduce problems caused by peripherality in rural and other areas of the region that are less well served by public transport.

6.4.2 All these policies strongly link the SEStran objectives to the National Transport Strategy and the high-level Government objectives for transport. Overall, it is clear that all of the study options are supported by established policy directives.

6.5 Feasibility, Affordability and Public Acceptability

Feasibility

6.5.1 Some of the options, especially the rail options and possibly the water-borne options are more demanding in terms of engineering and managerial requirements for construction and operation. However, all of the options being considered are based on tried and tested technologies, and are therefore not unique to this study, with the potential to use standard engineering processes for both construction and operation. Therefore, there is not anticipated to be any feasibility issues with any of the options.

Affordability

6.5.2 In terms of affordability, it is unlikely that the road options would require subsidy or support over and above normal route maintenance requirements. The express bus options are unlikely to attract sufficient demand to be able to operate commercially, and therefore may require on-going operational financial support. In addition, these services are likely to abstract substantial numbers of passengers from existing public transport services, to the extent that some of the services impacted upon could have their viability reduced.

6.5.3 It is unlikely that the rail options will show sufficient demand in terms of passenger services to operate without requiring subsidy. However the rail services will offer considerable wider economic benefits, not least those associated with freight movements and environmental impacts. Taking these into consideration, and converting them into monetised values, the total benefits are anticipated to outweigh operating costs.

6.5.4 It is likely that the water-borne options will require an element of financial support as there are unlikely to be a sufficient number of passengers attracted onto the services, leading to operating costs being higher than anticipated revenues. However, as with the rail options, other wider economic benefits may outweigh the operating costs of running the services.

Public Acceptability

6.5.5 It is evident from the consultation process that there is substantial stakeholder support for the objectives which the options are addressing. The workshop, discussed in Chapter 3, identified the need to improve connectivity between Clackmannanshire, the south and the west of Fife, and Edinburgh.

6.5.6 There was a view held by businesses that were interviewed that improvements to transport links between Fife and Clackmannanshire would provide significant commercial benefits to businesses, and also to consumers.

6.5.7 Residents in the study corridor maintained that public transport was very poor, with few options available to connect to adjacent regions. With the improvements to public transport services proposed in this appraisal, it is reasonable to assume there would be significant public acceptability to the options examined.

6.6 Participation and Consultation

6.6.1 The STAG workshop, carried out on the 22 April 2009, was pivotal in the discussion and selection of options being considered for the study. This workshop identified the transport problems facing the corridor, including the need to improve connectivity to the area, and recognising the opportunities presented by improving connectivity in light of the emerging plans from the National Planning Framework (NPF2) and improving the sustainable distribution of goods in light of the

Freight Action Plan (FAP). These issues were then discussed and agreed as being the starting point for the Transport Planning Objectives (TPO) used in the STAG appraisal.

6.6.2 A second workshop was held on 5 June 2009 with SEStran, Fife Council and Clackmannanshire Council to assist with the option identification, sifting and development process. From this workshop a number of options were discussed and were subsequently fleshed out in greater detail for review in this study.

6.6.3 The above workshops with key stakeholders were in addition to the other consultation exercises set out in Chapter 3. Hence, it is reasonable to conclude there has been sufficient stakeholder participation and consultation with the initial STAG appraisal.

6.7 Options Selected for Further Consideration

6.7.1 From the analysis presented in this Chapter, the following conclusions can be drawn;

- the water-based and road options produce the lowest levels of benefits and do not meet all the planning objectives. Therefore, it is reasonable to conclude these options should not be taken forward and can be discounted at this stage;
- the option using the existing railway line from Alloa to Rosyth (Option 1a) produces good economic and other benefits and is likely to be the cheapest of the rail options. These benefits are positive for both passengers and freight services. In addition, it has the lowest negative environmental impacts of the rail options. However, this option currently assumes the Charlestown Chord is in place and it is unclear whether similar benefits could be achieved without the new chord thereby reducing costs. Hence, it is worth looking at two variations of this option, one with the Charlestown Chord and one without;
- from the demand analysis the other rail options produce slightly better revenues but they are anticipated to have much higher capital and maintenance costs. Therefore, given the additional benefits are small compared to the anticipated significant costs and environmental disbenefits, it is considered appropriate to discount these at this stage;
- the bus options performed well in terms of minimal environmental impacts and good accessibility / social inclusion and integration benefits. However, on their own they do not assist with the freight planning objective. Nevertheless, it may be possible to obtain similar benefits to option 1a by testing a hybrid of the bus and rail modes, namely the rail freight component of option 1a and bus services for passengers. This has the potential advantage of providing some of the benefits but with slightly lower costs. The bus services could be run as a 'Virtual Branch Line', which integrates with the existing railway and is run as an extension to the current rail service. Different bus alignments should be examined for the A985 and A907 to identify the best route for serving the corridor.

6.7.2 Hence, it is recommended that the two variations of option 1a and the rail–freight / bus mode discussed above are taken forward for the detailed STAG appraisal in Chapter 8.

7 Option Development

7.1 Options Selected for Further Consideration

7.1.1 From the analysis presented in the previous Chapter, a short list of four options were identified as being worthy of further consideration. To avoid confusion with the previous nomenclature, from this Chapter forward, the options will be described as follows:

- Option A – existing railway line from Alloa to Rosyth with both passenger and freight services and also the Charlestown Chord in place. Possible stops include Clackmannan, Kincardine and Cairneyhill. There are also other settlements en route including Culross, Valleyfield and Newmills which might also warrant a stop at one of those locations. However, the demand model used in this study has a large, strategic zone system which does not allow for precise forecasting in these smaller settlements. Hence, for the purposes of this appraisal, we have allowed for a stop at Clackmannan, Kincardine and Cairneyhill only and this is reflected in our capital and operating costs in addition to revenue estimates. However, if the project were to go ahead, serious consideration should be given to providing an additional stop to serve the smaller settlements, possibly at Valleyfield. Furthermore, in terms of rail, no station has been identified that serves Dunfermline. Serious consideration should be given to a station serving Dunfermline West but this has not been allowed for in the modelling (due to the same limitations as above), or in the capital or operating cost calculations. If a new station at Dunfermline West was provided, there could be rail network impacts on the Fife Circle due to the concentration of stations in the area;

- Option B – as option A but without the Charlestown Chord in place, requiring a 'switch back' operation and an additional 15 minute journey service time. However, with this option, trains would not be stopping at Dunfermline station and hence serious consideration should be given to providing an additional stop at the proposed location for a Dunfermline West Station;

- Option C – this will consist of the rail freight option conforming to the rail alignment in option A, however the passenger services are replaced with a new express bus service running along the A985, stopping at Clackmannan, Kincardine, Cairneyhill, and possibly Crossford before going onto Edinburgh. As with option A, there are also settlements en route including Culross, Valleyfield and Newmills which might also warrant a stop at one of those locations. Again, due to the model limitations, we have not provided a stop at these smaller settlements, which is reflected in our costs analysis and revenue estimates; and

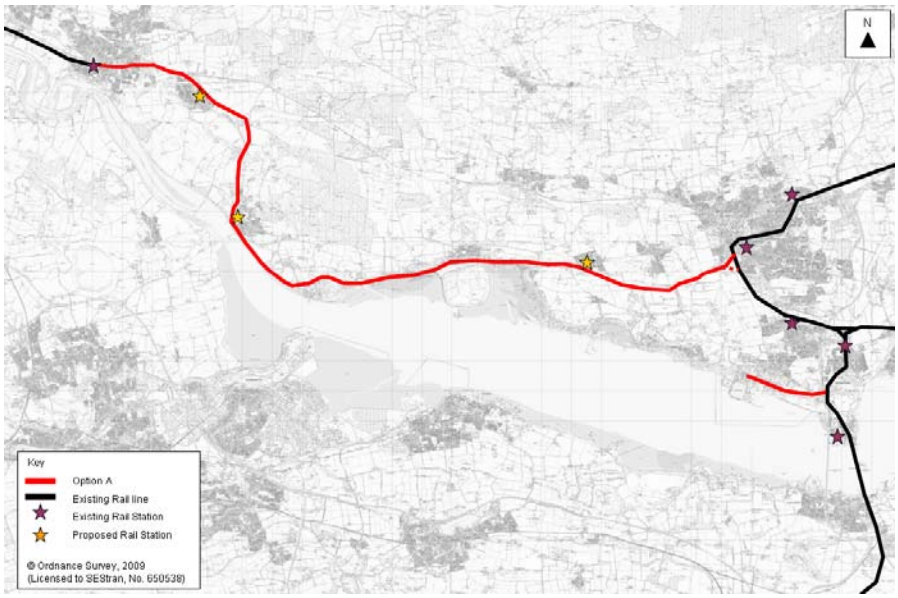
- Option D – as Option C but the new express bus service would run along the A907 and stop at Clackmannan, Oakley and possibly Crossford before going onto Edinburgh.

7.1.2 This chapter sets out these options further, including a more detailed description of the proposals and also a break down of the costs involved with each option. This then leads to the detailed STAG appraisal shown in Chapter 8.

7.2 Option A – Passenger and Freight Rail Services

7.2.1 Option A involves the re-opening of the existing railway line from Alloa to Rosyth, along the alignment shown in Figure 7.1 below.

Figure 7.1 – Option A (existing railway line from Alloa to Rosyth)



7.2.2 The existing line would be enhanced with upgrading of the signalling and other infrastructure such as passing loops to allow passenger services to run along the line in addition to freight services. During the stakeholder consultation, Network Rail has advised the track would also require some upgrading to raise the line speed which is currently limited to 35mph. It is suggested a suitable line speed of 60mph should be developed.

7.2.3 In terms of actual train services and rail operating plans, during the optioneering process it became clear that there was no need to run wholly new train services and that the objectives of the project could be met by extensions of existing services. Services could be run on an hourly basis as an extension of the Glasgow-Stirling-Alloa service to Edinburgh, and vice versa. New stations would be constructed along the route at Clackmannan, Kincardine and Cairneyhill to allow passengers to access the trains and traverse the corridor. Other stations to serve smaller settlements could also be needed but at this level of analysis cannot be examined, as explained earlier in Section 7.1.1.

7.2.4 With regards to freight trains in the corridor, the rail head at Rosyth Port is currently under utilised. At present for freight trains to access the Stirling-Alloa line they must drive into Dunfermline station then reverse back out on to the line. Therefore, the construction of a new chord, namely the Charlestown Chord, would be beneficial for freight trains and has also been included as part of this option. Furthermore new freight depots would require to be constructed at Clackmannan, Kincardine and Crossford to enable the distribution of freight along the rail network.

7.2.5 The total distance of the rail line included in this proposal is 29.52km, equivalent to around 34 minutes for the journey including stops from Alloa to Rosyth Station. This would give an average journey time from Edinburgh to Alloa of circa 60mins, direct and without any interchange, compared to the existing journey time of 75mins (average) which also involves an interchange.

7.3 Option B – Option A minus Charlestown Chord

7.3.1 Option B follows largely the same alignment as option A with the only difference being no Charlestown Chord would be included at Dunfermline. The alignment is shown in Figure 7.2.

Figure 7.2 – Option B (as option A but without Charlestown Chord)

7.3.2 The option would require signalling upgrades, line speed improvements, passing loops and new stations and freight facilities constructed at Clackmannan, Kincardine and Cairneyhill / Crossford, as with option A. Other stations to serve smaller settlements could also be needed but at this level of analysis cannot be examined as explained in Section 7.1.1. Services would again run as an extension of the Glasgow-Stirling-Alloa service, extended to Edinburgh and vice versa.

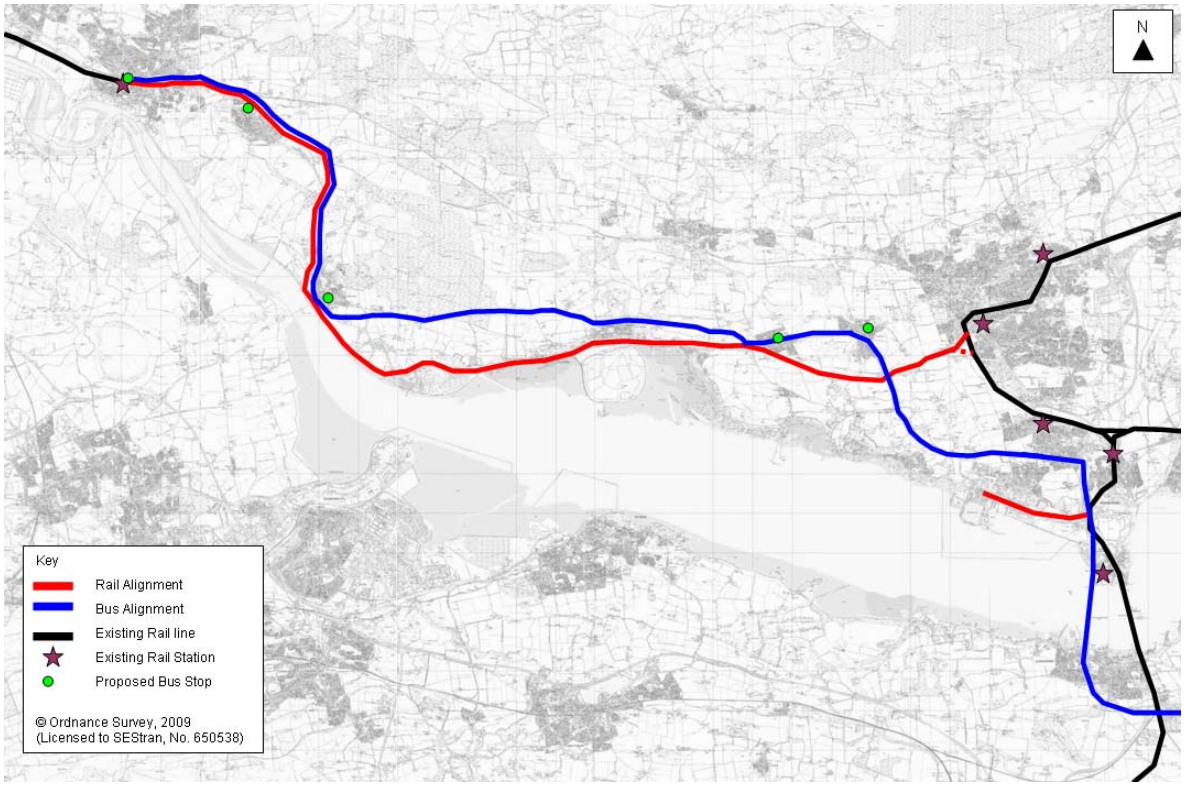
7.3.3 Without the construction of the Charlestown Chord on this option, the trains would run as a turn back service, thus leading to an additional 15 minutes on the journey time to allow for manoeuvring.

7.3.4 The overall length of the line would not differ significantly from option A, but would, however, take significantly longer due to the turn back involved. Therefore journey times could be expected to increase to around 49 minutes from Alloa to Rosyth Station. This would give an average journey time from Edinburgh to Alloa of circa 69mins, direct and without any interchange, compared to the existing journey time of 75mins (average) which also involves an interchange penalty.

7.4 Option C – Bus Passenger Services on A985 and Rail Freight

7.4.1 Option C will consist of a rail freight option conforming to the rail alignment in option A, but instead of a rail passenger service there would be a cheaper bus-based service. The passenger service would be a new express bus service running along the A985 and stopping at Clackmannan, Kincardine, Cairneyhill and possibly Crossford before going onto Edinburgh, as shown in Figure 7.3 overleaf.

Figure 7.3 – Option C (Rail as Option A and passenger bus service A985)



7.4.2 This option is separated into two distinct services, the rail service catering for freight and the bus service for passenger transport.

7.4.3 The rail freight service would follow the existing rail line and involve the construction of Charlestown Chord, like option A. As passengers would not be using the railway no new stations would be required, significantly reducing the cost, although freight facilities would still require to be constructed at Clackmannan, Kincardine and Cairneyhill. Some upgrading to the line would be required, as in Option A, including the signalling and other infrastructure.

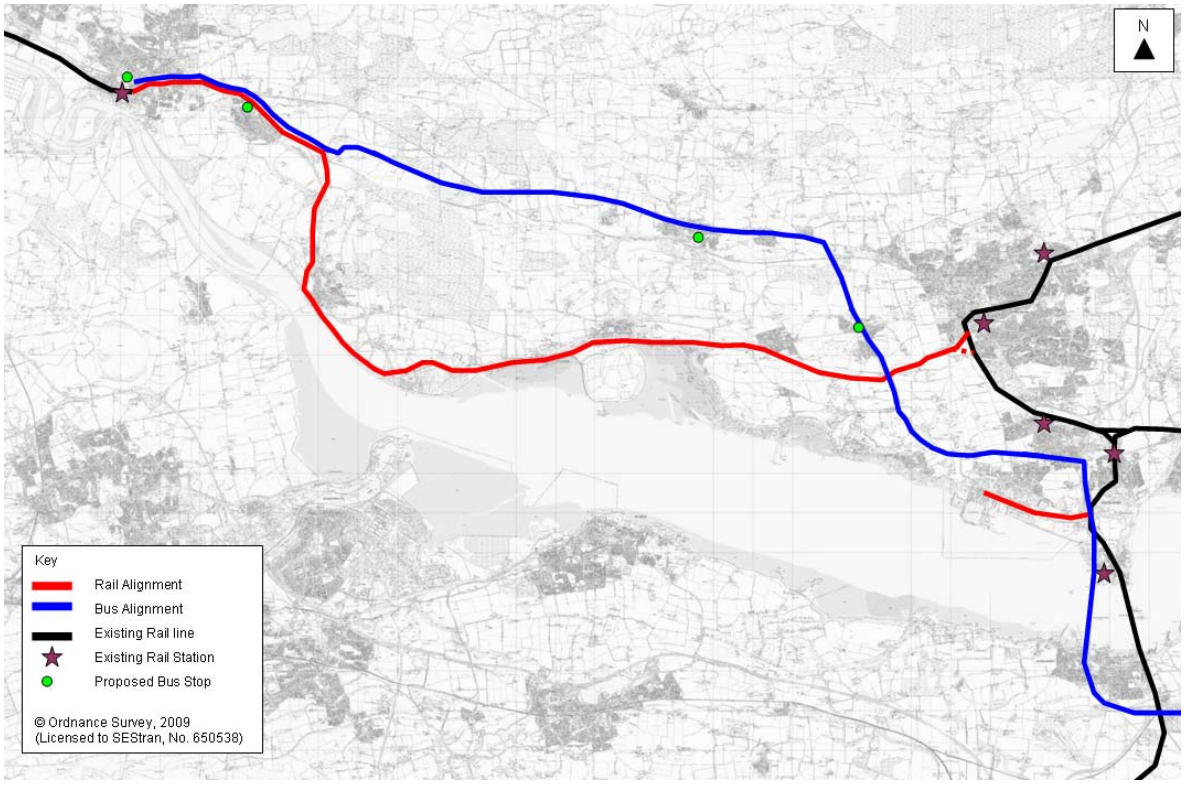
7.4.4 The express bus service would run from Alloa to Edinburgh via the A985. Stops would be incorporated into the service along the route at the main centres of population. These would include Clackmannan, Kincardine, Cairneyhill and possibly Crossford, dependant upon demand. Other stops may be required but at this level of appraisal cannot be modelled as explained in Section 7.1.1.

7.4.5 The total length of the bus route from Alloa to Edinburgh bus station would be 52.1km, taking approximately 73 minutes to traverse the route.

7.5 Option D – Bus Passenger Services on A907 and Rail Freight

7.5.1 Option D would again have two distinct services, rail for freight and bus for passengers, the bus service would follow the A907 alignment this time as shown in Figure 7.4 overleaf.

Figure 7.4 – Option D (Rail as Option A and passenger bus service A907)



7.5.2 The rail freight option would have identical characteristics to that of option C following the same alignment and requiring the same line upgrades.

7.5.3 The express bus option would run from Alloa to Edinburgh via the A907. Stops along the route would include Clackmannan, Oakley and possibly Crossford, dependant upon passenger demand.

7.5.4 The length of this bus route from Alloa to Edinburgh bus station would be 50.9km, taking approximately 72 minutes.

7.6 Demand Analysis

7.6.1 This section summarises the results of the transport modelling carried out to estimate patronage, revenues and area-wide benefits of the options appraised. It provides a brief overview of the transport model used for this exercise and then goes on to present the results of the forecasts by mode and for different years of the analysis.

7.6.2 For the purpose of this study and as per SEStran requests, the Transport Model for Scotland version 05.a (TMfS:05a) was used. This multi-modal transport demand and assignment model was previously used for the Strategic Transport Projects Review (STPR).

7.6.3 For the estimation of modal shifts in freight movements, output from the Scottish Freight Model (SFM) was used, as TMfS does not include rail and waterborne freight. The SFM was developed by Scott Wilson as part of the Scottish Freight Study and represents detailed patterns of freight movements across all modes (road, rail, sea, air).

Reference Case Scenario

7.6.4 Each of these shortlisted options was tested against a reference case, that is, they also incorporate improvements to the transport network relevant to the study area which are taken into account regarding the base case scenario for 2012.

7.6.5 The following major schemes are to be included in the 2012 Do Minimum:

2012 Reference Case Scheme

- Existing Forth Crossing and Tay Bridge – no tolls;
- M74 Completion;
- M9 Spur Extension;
- Finnieston Bridge;
- A68 Northern Bypass;
- Ferrytoll Link Road;
- Second Upper Forth Crossing;
- M8 Baillieston to Newhouse and Associated Improvements (Raith Interchange and adjacent Network Improvements);
- M80 Upgrade;
- Aberdeen Western Peripheral Road;
- A830 Arisaig to Loch Nan Uahm;
- A96 Fochabers to Mosstodloch (Bypasses);
- A90 Balmedie to Tipperty (Dualling);
- Stirling – Alloa – Kincardine Rail Link;
- Airdrie – Bathgate Rail Reopening;
- Edinburgh Tram Line Phase 1a;
- Glasgow Airport Rail Link;
- Borders Rail Service;
- Larkhall to Milngavie Rail Project;
- Edinburgh Waverley Station Upgrade;
- Scotland's Railway Short Term infrastructure:
  - new rail station at Laurencekirk with 1 service every two hours;
  - platform extension at Bishopbriggs with six-car trains on Glasgow to Dunblane services;
  - platform extension at Elgin and Insch with six-car trains on Aberdeen to Inverness services;
  - Lugton and Stewarton loop with two trains per hour between Glasgow and Kilmarnock;
  - Haymarket station (no modelled impact in TMfS); and
  - Gourock Transport Interchange (no modelled impact in TMfS).
- Cross Forth rail scenarios associated with Larbert-Stirling and Forth Bridge re-signalling:
  - additional park and ride capacity at Kirkcaldy, Markinch, Rosyth,
  - Perth, Cupar, Dunfermline Town, Leuchars, Markinch, and Dunfermline Queen Margaret;

- Edinburgh to Aberdeen express rail services;
- new Edinburgh to Dundee rail services stopping at Fife stations;
- hourly Edinburgh to Perth service; and
- Newcraighall services no longer integrated with Dunblane and Bathgate services and extended to Fife.

• Development Management led infrastructure:

- Heartlands;
- Pollock;
- A68 new roundabout at Newton St Boswells;
- A90 new interchange at Portlethen;
- A82 Strathleven Roundabout;
- Bishopton;
- A77 south of Whitlett dualling; and
- Glasgow East End Regeneration Route.

2022 Reference Case Scheme

• Cross Forth rail scenarios:

- hourly Edinburgh to Inverness service;
- reducing the number of stops at Dalmeny and North Queensferry on the Fife Circle services;
- extend Borders rail services to Inverkeithing stopping at all stations; and
- all Edinburgh to Dundee services to be operated by six-car trains.

7.6.6 Note the Reference Case does not include the Edinburgh-Glasgow Investment Programme (EGIP).

Overview of the Modelling Results

7.6.7 Estimates were produced for an assumed opening year of 2012 and a future design year of 2022. Appendix D provides a Technical Note on the modelling process and results.

7.6.8 Tables 7.1 and 7.2 overleaf show a summary of the results for both passengers and freight, for all four options including demand estimates, revenues and additional benefits due to the proposals.

Table 7.1 – 2012 Annual Results Summary

	Option A	Option B	Option C	Option D
Passengers				
Total Passengers	596,400	453,600	93,200	68,400
Revenue	£2.04m	£1.33m	£0.2m	£0.17m
Abstraction Bus	19%	19%	46%	31%
Abstraction Rail	68%	68%	34%	41%
Abstraction Car	13%	13%	20%	28%
Freight				
HGV reduction	18,400	15,800	5,581	5,581
HGV-km reduction	2,746,300	2,677,100	1,051,870	1,051,870
Sensitive Lorry Miles	£0.9m	£0.88m	£0.35m	£0.35m
Freight Revenue	£0.2,	£0.17m	£0.06m	£0.06m
Total Freight Benefits	£1.1m	£1.05m	£0.41m	£0.41m

Table 7.2 – 2022 Annual Results Summary

	Option A	Option B	Option C	Option D
Passengers				
Total Passengers	591,800	446,100	72,800	53,800
Revenue	£2.03m	£1.32m	£0.15m	£0.13m
Abstraction Bus	14%	14%	34%	23%
Abstraction Rail	76%	76%	38%	46%
Abstraction Car	10%	10%	28%	31%
Freight				
HGV reduction	26,100	24,200	7,144	7,144
HGV-km reduction	3,196,600	3,145,600	1,114,796	1,114,796
Sensitive Lorry Miles	£1.05m	£1.04m	£0.37m	£0.37m
Freight Revenue	£0.28m	£0.26m	£0.08m	£0.08m
Total Freight Benefits	£1.33m	£1.3m	£0.45m	£0.45m

7.6.9 Note the estimates of passenger trips in 2022 is lower than 2012. This is due to the planning assumptions within TMfS:05a. This is discussed further in Section 7.8.

7.6.10 From Tables 7.1 and 7.2 we can see the rail options achieve much higher demand than the bus options. Not having Charlestown Chord in place (option B) leads to a decrease of 25% in demand and 35% in revenue, due to the additional time reducing the attractiveness of the service.

7.6.11 It must be noted that these figures indicate the total revenues associated with each proposed service but do not take into account abstraction from the existing public transport service, and therefore do not reflect potential drops in revenue for other modes or services. This is particularly important for the rail options, where up to 76% of patronage is abstracted from the existing rail services to the south of the Forth.

7.6.12 Regarding freight usage, the absence of the Charlestown Chord leads to a decrease of 14% in 2012 and 7% in 2022. However, this corresponds to a decrease of respectively 2.5% and 1.6% in HGV-kilometres reduction only. Results for options C and D are identical to option A as the scheme is the same for freight.

7.6.13 The above results are based on two new stations at Clackmannan and Kincardine. However, the study steering group requested an analysis of the potential for a further stop/station at the eastern end of the study area, at Crossford. While the results suggested there are additional trips, our investigations into the modelling results suggest these are all abstracted from other rail or bus services (mainly from services in Dunfermline) and hence there is no new net revenue or passenger gain. Given the fact there are likely to be additional capital and operational costs of a new stop/station at Crossford, it was concluded this option should be discarded from the rest of the study.

7.7 Option Cost Estimates

7.7.1 Having identified the potential demand for each of the options, the next stage is to estimate the costs involved in implementing and operating the new services. This is outlined in this section and is broken down into capital, operating and maintenance and renewals (OMR) costs. All costs are displayed in 2008 prices as this was the common year for the data.

Capital Costs

7.7.2 Capital costs involve the initial start up costs required to construct the infrastructure for the proposed options. For the rail options this would include the enhancement of lines, building of a new chord and construction of new passenger stations and freight depots, for bus services this involved upgrading existing bus stops into higher standard bus halts which could also include the provision of real time passenger information. A break down of these costs is shown below including contingencies at 15%.

Table 7.3 – Capital Costs of Options, 2008 prices

Cost Element	Option A	Option B	Option C	Option D
Infrastructure Costs				
Site Investigations & Clearance	£0.27m	£0.26m	£0.06m	£0.06m
Preliminaries	£0.04m	£0.04m	£0.08m	£0.08m
Track Renewal	£31.14m	£31.14m	£3.07m	£3.07m
Drainage	£1.56m	£1.56m	£0.31m	£0.31m
Signalling & Telecoms	£3.11m	£3.11m	£0.31m	£0.31m
Charlestown Chord	£3.14m	£0	£3.14m	£3.14m
Station Costs	£9m	£9m	£0	£0
Bus Halt Costs (& RTPI)	£0	£0	£1.35m	£1.06m
Freight Termini	£1.5m	£1.5m	£1.50m	£1.50m
General Works	£0.49m	£0.49m	£0.35m	£0.35m
Subtotal	***£50.26m***	***£47.1m***	***£10.08m***	***£9.79m***
Other Costs				
Management Contract & Design Costs	£1.51m	£1.41m	£0.30m	£0.29m
Client Cost & Planning Process	£1.26m	£1.18m	£0.25m	£0.24m
Site Supervision	£1.01m	£0.94m	£0.20m	£0.19m
Possessions & Compensation	£2.51m	£2.36m	£0.50m	£0.49m
Subtotal	***£56.54m***	***£52.99m***	***£11.34m***	***£11.01m***
Contingencies (@15%)	£8.48m	£7.95m	£1.70m	£1.65m
Grand Total	**£65.03m**	**£60.94m**	**£13.05m**	**£12.66m**

7.7.3 Option A has the highest capital costs of all the options as it includes new passenger stations and also the construction of the Charlestown Chord. Option B is slightly lower as it excludes the cost of constructing the Charlestown Chord. Options C and D have the lowest costs of all the rail options as they are freight only options and therefore the cost of track renewal is substantially lower.

7.7.4 Furthermore, as Options C and D are running bus services for passengers, the capital costs of setting up the passenger services would be relatively low, requiring the construction of higher standard bus halts at existing stops and the installation of loop detectors at busy junctions on route. Option C has a slightly higher cost reflecting the extra stop and loop detector involved on this route and the greater infrastructure required.

Operating, Maintenance and Renewals (OMR) Costs

7.7.5 The operating costs are the costs which are incurred to operate the service on a daily basis. This involves costs such as staff, fuel and maintenance. At this stage in the analysis the operating, costs

were taken as 3% per annum, of the total capital costs for Option A. For option B however, we have used 4% per annum for operating costs as the removal of Charlestown Chord results in a significantly longer journey length for the trains. In addition, 5% per annum for operating costs was also used for the bus elements for options C and D to take account of vehicle leasing costs and other variable costs not included in the capital cost estimates.

7.7.6 Maintenance costs are required throughout the year to ensure the safe running of services and upkeep of the infrastructure. Furthermore, a percentage of the total capital costs can be included each year to account for the renewal of rail infrastructure and also buses at the end of their lifecycle. Maintenance and renewals costs account for 10% respectively of the total Operations Maintenance and Renewals (OMR) costs; therefore given the operating costs we can apply these percentages to establish the maintenance and renewals costs. These are displayed in Table 7.4.

Table 7.4 – Operating Maintenance and Renewals Costs, 2008 prices

Cost Element	Option A	Option B	Option C	Option D
Operations	£2.25m	£2.81m	£0.75m	£0.74m
Maintenance	£0.28m	£0.26m	£0.06m	£0.05m
Renewals	£0.28m	£0.26m	£0.06m	£0.05m
Total OMR Costs	**£2.81m**	**£3.33m**	**£0.87m**	**£0.84m**

7.7.7 From this we can see Options A and B have the highest operating costs as they include passenger rail services and therefore incur staff conductor costs and station leasing fees. As options C and D are freight only rail services these would exclude these charges, reducing the operating costs involved. There would be additional costs for the bus services but these are small compared to rail components.

7.7.8 Since an exact estimate of OMR costs is outwith our study remit, we have used the above percentages as a means of estimating OMR values for the economic appraisal. However, as the project progresses forward, we would recommend a more detailed analysis and estimation of OMR costs be carried out.

7.8 Commentary on Demand Observations from Other Schemes

7.8.1 A number of recent surveys were carried out over five days during August 2008 on the Stirling-Alloa-Kincardine Rail extension line[20]. This extension to the rail network shares characteristics with the transport investment proposed for the Clackmannanshire to Edinburgh corridor including both passenger and freight services. The sample size relating to these surveys were statistically significant but varied depending on the day and time of day the surveys were undertaken, with response rates of up to 72%.

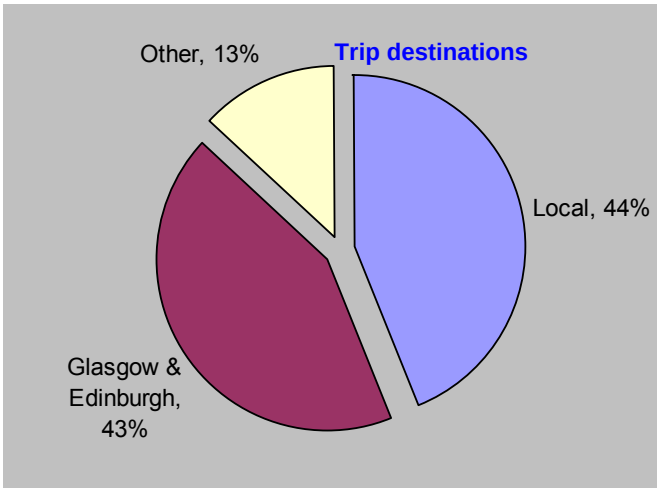
7.8.2 The surveys indicated that observed passenger flows were higher than modelled passenger flows by a factor of circa 2:1. Hence, it could be argued that TMfS is very conservative in estimating demand. The surveys also showed that 70% of rail passengers had made the same journey with the same origin and destinations before the rail line was re-opened using a different mode, and demonstrated that there was a 35% modal shift from car trips to rail and a 40% modal shift from bus trips to rail. This suggests that the provision of the rail link has improved accessibility.

7.8.3 Our estimates of modal shift from car range from 13% to 28% for 2012 and between 10% and 31% by 2022 depending on the options and modes being considered.

[20] Stirling – Alloa – Kincardine Rail Extension Surveys, JMP Consultants on behalf of SEStran, August 2008

7.8.4 The survey results indicated that, as shown in Figure 7.5 below, in terms of trip length and destination, 44% of trips were local in nature but a further 43% were either to Edinburgh or Glasgow, suggesting that there is a good mix of local and medium distance commuting journeys. A significant proportion of trips were for commuting and business purposes (about 20%) a little over and a little under a third of trips were for shopping and social and leisure reasons respectively, and 15% for visits to health or education facilities.

Figure 7.5 – Distribution of Stirling-Alloa-Kincardine Trips



7.8.5 The results of these surveys also showed that 42% of passengers were newly generated trips, in effect releasing previously suppressed demand for a new rail link and new services. The modelling procedures used in this appraisal, based on a fixed-trip matrix assignment, provide a conservative estimate of the potential new passenger demand for rail services within the Clackmannanshire – Fife – Edinburgh corridor.

8 Detailed STAG Appraisal

8.1 Introduction

8.1.1 A number of alternative transport options were initially identified and evaluated, the results of which were noted in Chapter 6. As a consequence of the evaluation, and from further consultation with the Study Steering Group, a shortlist of four options were confirmed, each of which serves to strengthen passenger and freight transport links throughout the scheme corridor, and between this region and adjacent areas. Although these have been fully described in Chapter 7, they are summarised below:

- Option A – use of the existing railway line from Alloa to Rosyth with both passenger and freight services, including stops at Clackmannan, Kincardine and Cairneyhill and with the Charlestown Chord in place;
- Option B – as option A but without the Charlestown Chord in place, requiring a switch-back operation and an additional service time of 15 minutes;
- Option C – this will consist of the rail freight option conforming to the rail alignment in option A, plus a new express bus service with an alignment based on the A985, stopping at Clackmannan, Kincardine, Cairneyhill and onto Edinburgh; and
- Option D – this will consist of the rail freight option described above, plus a new express bus service with an alignment based on the A907 with stops at Clackmannan, Oakley and onto Edinburgh.

8.1.2 The purpose of this Chapter is to present the results of the detailed STAG assessment of these four options against the local Transport Planning Objectives and the Government's five objectives for transport. As with the initial appraisal process, a score is assigned to each of the local Transport Planning Objectives and STAG criteria to indicate their likely impact. A detailed description of the results is only given where there is a marked difference between these and the results obtained at the initial assessment stage. If there is no distinct difference, then reference will be made to the appropriate initial appraisal result.

8.2 Transport Planning Objectives

8.2.1 Four Transport Planning Objectives (TPOs) were identified and described, the details of which are in Chapter 4, and to reiterate, are summarised as:

- ***Objective 1:*** Improve connectivity along the corridor to/from Clackmannan to east and west, from south and west Fife to Edinburgh, and from Dunfermline and west Fife to Clackmannanshire;
- ***Objective 2:*** Improve connections for freight to serve the emerging plans from the National Planning Framework (NPF2) and Freight Action Plan (FAP), and encourage the transfer of movement of goods, produce and materials from road to more sustainable distribution;
- ***Objective 3:*** Improve road safety along the A907 and A985; and
- ***Objective 4:*** Minimise the environmental issues of severance / noise at strategic locations along the corridor, and reduce carbon emissions to correspond with government targets.

8.2.2 The TPOs have been made SMART, as described in Chapter 4, section 4.5. The extent to which each objective is met by each option by the year 2022 is now reviewed in turn.

8.2.3 In terms of TPO 1, improving connectivity, Table 8.1 shows a summary of the assessment, in SMART terms.

Table 8.1 – Option Performance against Transport Objective 1

Option / Criteria	Transport Objective 1: Connectivity			
	Option A	Option B	Option C	Option D
Journey time reduced between Alloa and Edinburgh by 15 minutes by 2022	-16 minutes	-1 minutes	+2 minutes	-2 minutes
Journey time reduced between Clackmannan and Dunfermline by 15 minutes by 2022	-18 minutes	-18 minutes	-18 minutes	-18 minutes
Journey time reduced between Kincardine and Edinburgh by 15 minutes by 2022	-28 minutes	-13 minutes	-18 minutes	No change
Score	✓✓✓	✓✓	✓✓	✓

8.2.4 The scores are awarded according to the total minutes saved, with a tick for each 15 minutes saved. Therefore option A, which has a total saving of 62 minutes, achieves a score of three ticks, whereas option B which saves a total of 32 minutes, and C, which saves 34 minutes, score two ticks each. Option D on the other hand only saves a total of 20 minutes, and so scores only one tick.

8.2.5 Turning to TPO 2, meeting the improvements in rail freight access times to Rosyth harbour and transferring freight from road to rail, both requirements of the NPF2 and FAP objectives, Table 8.2 shows a summary of the assessment, also in SMART terms.

Table 8.2 – Option Performance against Transport Objective 2

Option / Criteria	Transport Objective 2: Freight Accessibility			
	Option A	Option B	Option C	Option D
Reduction in train-km by 50,000 by 2022	67,258	66,175	30,526	30,526
Transfer 10% of freight from road to rail by 2022	13.2%	7.6%	6.0%	6.0%
Score	✓✓	✓	O / ✓	O / ✓

8.2.6 Option B does not result in the same level of freight modal shift from road to rail as the other options, and therefore only scores one tick for this Transport Objective compared to two ticks awarded to the others.

8.2.7 TPO 3 seeks to improve road safety on the key road links within the study corridor. Table 8.3 summarises the results of the assessment in terms of reductions in Personal Injury Accidents (PIAs) for each option.

Table 8.3 – Option Performance against Transport Objective 3

Option / Criteria	Transport Objective 3: Accident Savings			
	Option A	Option B	Option C	Option D
Reduce Personal Injury Accidents by 33% by 2022	53%	48%	34%	33%
Score	✓✓	✓✓	✓	✓

8.2.8 The minimum criteria for reductions in PIA was 33%, therefore each option which met this scored at tick. For each extra 15% reduction above the minimum criteria an additional tick was awarded up to a maximum of three ticks. Therefore option A with an accident saving rate of 53%, and option B with an accident saving rate of 48%, score two ticks each respectively, but options C and D with accident savings rates of 41% and 40% only score one tick each respectively.

8.2.9 The results of the assessment for the final TPO 4, reducing local environmental impacts, which includes severance, noise and carbon production in the study corridor is shown, again in SMART terms. However, when taking into account the increases in rail-kms, the following scores can be made (see Table 8.4).

Table 8.4 – Option Performance against Transport Objective 4

Option / Criteria	Transport Objective 4: Local Environmental Impacts			
	Option A	Option B	Option C	Option D
Reduce severance by 5% by 2022	7.5%	7.5%	5.8%	5.8%
Reduction in road traffic noise by 1% by 2022	-1%	-1%	0%	0%
Reduce road vehicle kilometres by 4.5m per annum by 2022	4.975m	4.487m	1.730m	1.622m
Score	✓	✓	O / ✓	O / ✓

8.2.10 The reduction in road vehicle kilometres unequivocally results in the reduction in carbon usage, the prime measure of emission impacts. However the precise measurement of carbon reduction is complex, therefore changes in road vehicle distances are used as a proxy indicator for this impact. As illustrated in the Table, both options A and B achieve the largest reduction in road traffic kilometres owing to the greater modal shift from car to rail than from car to bus.

8.2.11 In terms of reducing road traffic noise, options A and B contribute to a fall of 1% in road traffic noise, measured in dB(A), affecting localities close to the west Fife trunk roads.

8.2.12 Table 8.5 shows a summary of the results of the assessment of the options against the SMART Transport Planning Objectives.

Table 8.5 – Summary of Option Performance against Transport Planning Objectives

Option → / *Transport Planning Objective* ↓	Option A Score	Option B Score	Option C Score	Option D Score
Transport Planning Objective 1	✓✓✓	✓✓	✓✓	✓
Transport Planning Objective 2	✓✓	✓	O / ✓	O / ✓
Transport Planning Objective 3	✓✓	✓✓	✓	✓
Transport Planning Objective 4	✓	✓	O / ✓	O / ✓
Average score	✓✓	✓✓	✓	✓

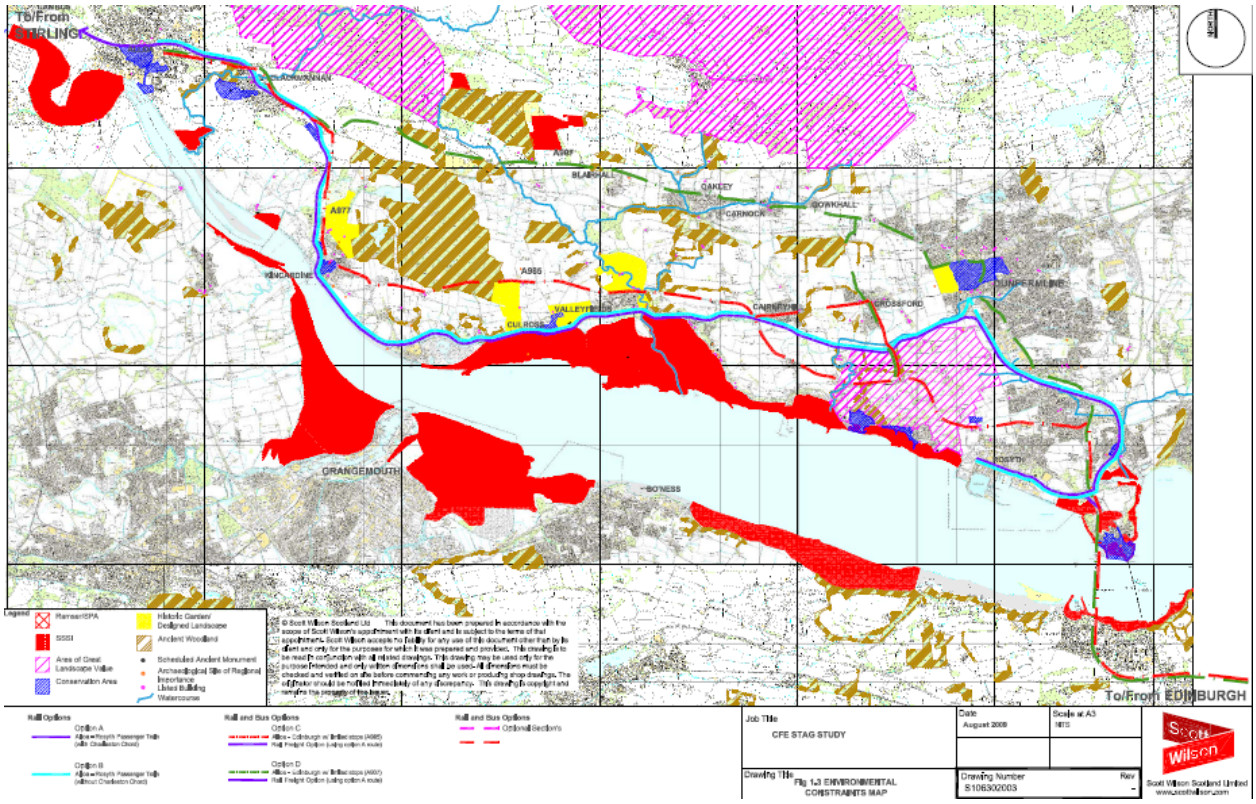
8.2.13 From the Table, it is evident that all the options meet the local SMART Transport Planning Objectives at least to some extent. However, options A and B do so the most completely, having attained the highest average scores, with two ticks each, signifying that they meet the Transport Planning Objectives at a level consistent with a ***moderate beneficial impact***.

8.3 Environmental Appraisal

8.3.1 As noted in Chapter 6, a great deal of the study corridor has some level of protection, particularly the coastal parts of the area. In fact almost the entire coast of the study corridor between Rosyth and Culross is host to Sites of Special Scientific Interest (SSSIs).

8.3.2 Inland from the coast, a substantial part of the area to the west and south west of Dunfermline as far as Rosyth is characterised as an Area of Great Landscape Value (AGLV). Further west, there is a substantial area of ancient woodland, known as Devilla Forest, which buttresses onto Kincardine and extends as far as Clackmannan, whilst further patches of ancient woodland permeate the whole corridor region between Alloa and Dunfermline. Furthermore there are a number of conservation areas and Historic Gardens/Designed Landscapes in the region.

Figure 8.1 – Environmental Constraints Affecting the Study Transport Corridor



8.3.3 Figure 8.1 clearly shows the widespread areas of the study corridor under environmental protection, and of particular note, the extent of the areas allocated as SSSIs, AGLVs and ancient woodland. The four options A through to D each have a rail alignment corresponding to the existing rail line close to the Forth estuary. This is the same alignment as the previous option 1a, and therefore the environmental impacts are almost identical between this option and options A through to D. A STAG Environmental Report is presented in Appendix E, the principal findings of which are summarised in turn.

Noise/Vibration & Air Quality Impacts

8.3.4 While there are anticipated to be noise/vibration impacts during the construction period, the operations period will produce a positive impact due to reduced vehicle-kms on the road network, although residential receptors adjacent to the railway line would experience negative impacts.

8.3.5 There are also anticipated to be air quality impacts during the construction period, but as with noise impacts, the operations period will produce a positive impact due to reduced vehicle-kms on the road network resulting from the modal shift from private vehicles to public transport. Both the road and rail options would contribute to the Scottish Governments target of reducing emissions (including CO_2) by 80% in 2050 from 2007 levels.

Water Quality, Drainage and Flood Defence

8.3.6 The impacts of construction and operation on the hydrological resource are likely to be low providing that the necessary mitigation measures are put in place to avoid pollution of watercourses.

8.3.7 The hydraulic capacity of the identified watercourses must be maintained, to minimise any impacts on upstream flooding. In particular, the design of any additional infrastructure required for the preferred option must preserve the hydraulic capacity of the watercourses and the floodplains.

8.3.8 A number of the watercourses are shown to be at risk from flooding events. Further assessment would be required to examine this issue further.

Geology, Agriculture and Soils

8.3.9 No designated sites have been identified at this stage. Overall the predicted effects are likely to be moderate/major impacts and local for Options A and B, although there could be potential major impacts to properties under Option A, C and D - further investigation will be required at the detailed design stage.

Bio-diversity and Habitats

8.3.10 The most likely impacts of these four route proposals on the ecological and nature conservation resources along each route are: the loss of areas of scrub and grassland habitat which have developed on site or adjacent to the site and will require clearing as part of the development works; loss of bat roosts within trees and structures to be demolished; the potential for pollutants entering sensitive and protected watercourses during both construction and operation stages; and the potential spread of invasive plant species.

8.3.11 Each route option has impacts of varying significance; however those options containing the express bus routes, options C and D, are likely to have the lowest ecological impact principally as a result of the majority of the required infrastructure being present already, thereby necessitating minimal construction works.

8.3.12 There is the potential for significant impacts on protected species, such as bats and to a lesser extent badgers, otters and water voles, and legal implications pertaining to invasive plant species for each route. However the likelihood and significance of impacts will not be known until detailed ecological field surveys are carried out on site. Surveys of protected species, including detailed inspection of any structures and trees to be demolished should be conducted at an appropriate time of year to allow the results to be incorporated into the proposals.

Landscape and Visual Amenity

8.3.13 All options will result in changes to the landscape and Options A and B may result in adverse effects on designated areas. The most disruptive elements are the proposed stations with park and ride facilities and the Charlestown Chord. The overall effects on the landscape character are likely to be relatively minor.

8.3.14 For all options the most sensitive receptors are those adjacent to the proposed works which will directly overlook the scheme from close range. There may be opportunities to reduce the effects by careful siting and design.

Cultural Heritage

8.3.15 The cultural heritage assessment identified those cultural and archaeological resources within a 200m corridor along the route of the proposed options. There are a number of Listed Buildings present within the corridor. There are also a number of Scheduled Monuments located within the 200m corridor.

8.3.16 There are unlikely to be any significant impacts to statutory designations due to the fact that the vast majority of the required infrastructure for the options is already in place. There could be moderate negative impacts related to the setting of Listed Buildings and an ASRI located to the south of the Charlestown railway chord proposed in Options A, C and D.

8.3.17 The possibility of uncharted archaeological remains was also investigated and accepted, given the nature of the Study Area and the need for further study at the next stage.

8.3.18 Construction and operational effects are considered to have a neutral to negative minor impact on any cultural heritage and archaeological resources within the Study Area.

Summary

8.3.19 A summary of the four shortlisted options' performance is shown in Table 8.6. As the Table illustrates, the average score for the environmental criteria for all the options is a ***minor adverse impact*** in terms of each option.

Table 8.6 – Summary of Option Performance against Environmental Criteria

	Option A	Option B	Option C	Option D
Noise and Vibration	✓	✓	✓	✓
Air Quality	✓	✓	✓	✓
Water Quality, Drainage and Flood Defence	✗	✗	✗	✗
Geology, Agriculture and Soils	✗✗	✗✗	✗✗	✗✗
Biodiversity and Habitats	✗	✗	✗	✗
Landscape	✗✗	✗✗	✗✗	✗✗
Visual Amenity	✗✗	✗✗	✗✗	✗✗
Cultural Heritage	✗	✗	✗	✗
Average Score	✗	✗	✗	✗

8.4 Safety

8.4.1 The Safety objective identified within STAG is concerned with reducing the loss of life, injuries and damage to property resulting from transport accidents and crime. As with the safety evaluation carried out for the Initial STAG appraisal in Chapter 6, two sub-objectives are considered, namely accidents and security.

Accidents

8.4.2 The rail and rail freight / express bus options, options A through to D, would be expected to reduce the accident rates on the corridor road network, by removing road vehicular traffic. Therefore, it would be reasonable to expect these options to have a minor positive impact with respect to lowering accidents.

Security

8.4.3 It is anticipated that all the options, which include a rail component, would include rail stations and termini and designed to standard engineering guidance and hence would provide adequate security facilities for passengers and freight this would also apply to bus halts. However, making these facilities secure does not necessarily increase the overall security for users. Hence, these options are scored a neutral impact over the current situation. This is reflected in the scoring in Table 8.7, which also includes the scoring for accident reduction and displays the average score, which reflects that all options will have a ***minor beneficial impact***.

Table 8.7 – Assessment of Options on Safety Appraisal

	Option A	Option B	Option C	Option D
Accidents	✓	✓	✓	✓
Security	O	O	O	O
Average	✓	✓	✓	✓

8.5 Economy

8.5.1 The Economy objective identified within STAG addresses the improvement in the economic efficiency of transport and the efficiency of economic activities, with the key aim of supporting sustainable economic activity and returning good value for money. Three sub-objectives are considered, namely:

- Transport Economic Efficiency (TEE);
- Wider Economic Benefits (WEBs); and
- Economic Activity and Location Impacts (EALIs).

Transport Economic Efficiency

8.5.2 The central principle of the TEE analysis is to estimate the welfare gain from the transport investment, as measured by the "willingness to pay" for these improvements and the financial impact on the private sector transport operators. The TEE does not include financial costs and benefits to the Government as these are quantified separately.

Development of TEE Appraisal Model

8.5.3 The Railways Economic Appraisal Model (REAM) was used to appraise the benefits and costs of the different options, with estimates of the remaining benefits and costs derived from the modelling results. The REAM program was adopted because it offered the following benefits:

- REAM is a railway specific model which is designed to take into account the specific economic features of railway operations, including both passengers and freight services and uses procedures from the railways industry's PDFH[21];
- REAM has been used on a number of railway projects appraisals including a number for Transport Scotland, to bring out the range of benefits of rail-based projects;
- the program is based on the requirements of DfT's web-based Transport Appraisal Guidance (webTAG[22]) and STAG, and has a long track-record in appraising other projects;
- the model has been developed over a number of years and is constantly being updated to reflect recent project appraisal experiences, feedback from Government agencies and appraisal guidance; and
- the analysis is transparent to users thereby helping to avoid potential 'black box' calculations.

8.5.4 REAM is also capable of modelling the impacts on other modes, including bus services, since it uses the same principles as set out above. The estimates of the remaining benefits and costs of the different options were derived from the modelling results for an assumed opening year of 2012 and a future design year of 2022. The summary results for the demand estimates were shown in Tables 7.1 and 7.2 which included the revenues and additional benefits due to the option proposals.

Application of TEE Appraisal Model

8.5.6 Specific economic assumptions and cost adjustments are consistent with the Scottish Government's STAG appraisal methodology. All monetary values are in 2002 market prices, unless explicitly stated otherwise, and values are discounted to the base year 2002, as adopted in the webTAG convention.

8.5.7 An appraisal period of 60 years has been adopted for the options. The appraisal discount rate is 3.5% for the first half of appraisal period and 3% for the remainder, as per STAG procedures, with an assumed first full year of appraisal of 2012 and with a final horizon year of 2071. The capital expenditure profiles for the options are assumed to be over two years, with a 40%:60% split.

8.5.8 The undiscounted costs for the options are shown in Table 7.3 in 2008 prices in Chapter 7. The costs detailed there included an allowance for contingencies but no allowance for risk, uncertainty and Optimism Bias (OB). The estimates for risk and Optimism Bias for the capital and operating, maintenance and renewals (OMR) costs are shown in detail with these adjustments in Chapter 9, Tables 9.1 and 9.2. Total capital and OMR costs including OB are summarised in Table 8.8.

Table 8.8: Costs Including Risk & Uncertainty and Optimism Bias

Costs Option	Capital Costs	Of which the following make up Optimism Bias	Operation and Maintenance Costs (per annum)
Option A	£93.64m	£28.61m	£3.96m
Option B	£87.75m	£26.81m	£4.70m
Option C	£18.79m	£5.74m	£0.87m
Option D	£18.23m	£5.57m	£0.84m

Note: all costs are in 2008 prices

[21] Passenger Demand Forecasting Handbook, Association of Train Operating Companies, version 4.2, 2002
[22] webTAG: web-based Transport Analysis Guidance, Department for Transport 2004

Summary of TEE Appraisal Results

8.5.9 The results of the TEE appraisal on monetised benefits and costs are summarised in Table 8.9. These show the tests of each of the preferred options, with and without the Charlestown Chord, and different public/freight transport mix. These can provide an insight into the relative economic efficiency of the options (see Appendix D for details of our modelling including the TEE appraisal).

Table 8.9: Summary of TEE Appraisal, £'000s

Option A		Car	PT	Freight	Total
Benefits	Reduced Accident Collisions Savings	£745			£745
	Times Savings	£8,498	£62,794	£17,212	£88,504
	VOC Fuel (including Taxation)	£35,209		£33,427	£68,636
	VOC Non Fuel	£19,446		£18,463	£37,909
	Revenues		£41,667	£5,802	£47,469
	Carbon Savings	£261		£172	£433
	Station Benefits		£4,373		£4,373
	SLM			£26,483	£26,483
	Present Value of Benefits	**£64,159**	**£108,834**	**£101,559**	**£274,552**
Costs	Investment (Capital) Costs		£57,787		£57,787
	Operating, Maintenance & Renewals		£58,998		£58,998
	Indirect Tax Revenues	£27,111		£25,739	£52,850
	Subsidy		£11,529		£11,529
	Abstraction Revenue		£31,992		£31,992
	Present Value of Costs	**£27,111**	**£160,306**	**£25,739**	**£213,156**
	Net Present Value (NPV = PVB - PVC)				£61,396
	Benefit to Cost Ratio (BCR = PVB /PVC)				1.29

Option B		Car	PT	Freight	Total
Benefits	Reduced Accident Collisions Savings	£669			£669
	Times Savings	£6,417	£47,758	£16,915	£71,090
	VOC Fuel (including Taxation)	£34,105		£31,447	£65,552
	VOC Non Fuel	£18,556		£16,622	£35,178
	Revenues		£27,049	£5,328	£32,377
	Carbon Savings	£235		£155	£390
	Station Benefits		£3,302		£3,302
	SLM			£26,028	£26,028
	Present Value of Benefits	**£59,982**	**£78,109**	**£96,495**	**£234,586**
Costs	Investment (Capital) Costs		£54,176		£54,176
	Operating, Maintenance & Renewals		£70,061		£70,061
	Indirect Tax Revenues	£26,261		£24,214	£50,475
	Subsidy		£37,684		£37,684
	Abstraction Revenue		£24,157		£24,157
	Present Value of Costs	**£26,261**	**£186,078**	**£24,214**	**£236,553**
	Net Present Value (NPV = PVB - PVC)				-£1,967
	Benefit to Cost Ratio (BCR = PVB /PVC)				0.99

Table 8.9 (Continued)

Option C		Car	PT	Freight	Total
Benefits	Reduced Accident Collisions Savings	£256			£256
	Times Savings	£2,767	£12,899	£6,088	£21,754
	VOC Fuel (including Taxation)	£1,016		£8,860	£9,876
	VOC Non Fuel	£936		£3,454	£4,389
	Revenues		£3,220	£1,624	£4,844
	Carbon Savings	£90		£59	£149
	Station Benefits		£0		£0
	SLM			£9,358	£9,358
	Present Value of Benefits	**£5,064**	**£16,119**	**£29,443**	**£50,626**
Costs	Investment (Capital) Costs		£11,598		£11,598
	Operating, Maintenance & Renewals		£18,157		£18,157
	Indirect Tax Revenues	£782		£6,822	£7,605
	Subsidy		£13,313		£13,313
	Abstraction Revenue		£1,712		£1,712
	Present Value of Costs	**£782**	**£44,780**	**£6,822**	**£52,385**
	Net Present Value (NPV = PVB - PVC)				-£1,759
	Benefit to Cost Ratio (BCR = PVB / PVC)				0.97

Option D		Car	PT	Freight	Total
Benefits	Reduced Accident Collisions Savings	£241			£241
	Times Savings	£2,629	£7,204	£5,784	£15,617
	VOC Fuel (including Taxation)	£917		£8,827	£9,744
	VOC Non Fuel	£885		£3,267	£4,152
	Revenues		£2,798	£1,624	£4,422
	Carbon Savings	£85		£56	£141
	Station Benefits		£0		£0
	SLM			£9,358	£9,358
	Present Value of Benefits	**£4,757**	**£10,002**	**£28,916**	**£43,675**
Costs	Investment (Capital) Costs		£11,257		£11,257
	Operating, Maintenance & Renewals		£17,622		£17,622
	Indirect Tax Revenues	£706		£6,797	£7,503
	Subsidy		£13,200		£13,200
	Abstraction Revenue		£1,770		£1,770
	Present Value of Costs	**£706**	**£43,849**	**£6,797**	**£51,352**
	Net Present Value (NPV = PVB - PVC)				-£7,677
	Benefit to Cost Ratio (BCR = PVB /PVC)				0.85

Notes: *all values are re-based and discounted to 2002 prices*
VOC = Vehicle Operating Cost
SLM = Sensitive Lorry Miles

8.5.10 The TEE Appraisal results show the relative performance of the preferred options in terms of the Benefit-to-Cost Ratio (BCR) and Net Present Value (NPV). As can be seen in the Table, option A, the use of the existing line from Alloa to Rosyth with both passenger and freight services is the only option to present a NPV value and a BCR of greater than 1, albeit at the highest capital cost outlay.

Sensitivity Test – High Growth Land-Use Assumptions

8.5.11 As explained in Chapter 7 (at the end of Section 7.6) the passenger forecasts for the public transport elements of the options are based on the low growth land-use planning assumptions in TMfS:05. Feedback from Fife and Clackmannanshire Councils suggests there could be significantly more development and hence population and travel patterns in the study area than has been assumed in TMfS, brought about by the various Structure / Development Plans for the area. Consequently, we have carried out sensitivity tests including land-use assumptions supplied by the Councils. Those tests would increase the NPVs and BCRs, with the results as follows:

- Option A: an NPV of £110.8m and a BCR of 1.50;
- Option B: an NPV of £58.8m and a BCR of 1.26;
- Option C: an NPV of £8.6m and a BCR of 1.16; and
- Option D: an NPV of £1.6m and a BCR of 1.03.

Wider Economic Benefits (WEBs)

8.5.12 The wider economic benefits (WEBs) relate to the notion of potential transport impacts on (industrial and business) agglomeration, that is, the increased connectivity between factor and product markets and the relationship between agglomeration and productivity.

8.5.13 Four discrete benefits have been identified by the Department for Transport (DfT)[23]:

- WEB 1: Agglomeration Economies: "*Economies of agglomeration describe the productivity benefits that some firms derive from being located close to other firms. This could be because proximity to other firms facilitates more sharing of knowledge or because locating close to other firms means access to more suppliers and larger labour markets"*;
- WEB 2: Increased Competition as a Result of Better Transport: Benefits arising from increased competition as a result of transport improvements were identified by DfT as theoretically possible;
- WEB 3: Increased Output in Imperfectly Competitive Markets: *"Where there is imperfect competition in a market, research has suggested that the value placed on additional production, the price, is normally higher than production costs. Firms and consumers would therefore be jointly better off if firms were to increase production. If better transport induces firms to increase production there are precisely such benefits … the value attached to time savings would underestimate the true benefits"*; and
- WEB 4: Wider Benefits arising from Improved Labour Supply: The DfT work has identified three distinct labour market effects which may contribute to welfare benefits through the tax take: these include more people choosing to work owing to reduced journey times and commuting costs, people choosing to work longer hours as commuting time falls and jobs relocating to higher productive areas where improved transport connections there increases the attractiveness of these areas for employment.

8.5.14 In terms of WEB 2, the increased competition as a result of better transport, the jury is out as to the existence and scale of these benefits, with for example, the DfT arguing that there will be no

[23] STAG Technical Database, Section 9, Transport Scotland, December 2008

significant benefits owing to increased competition. However, there is a view among analysts in Transport Scotland that due to geographical reasons this may not be the case within certain parts of Scotland, and research is in progress to determine if this is the case. In the absence of further information, the current position held by Transport Scotland is that WEB2 be treated as neutral[24], and is not factored in to the benefits of the scheme presented here.

8.5.15 With respect to WEB 4, although valid for inclusion in the wider economic benefits from a technical perspective, the data requirements for WEB4 are extensive and further guidance on the application within Scotland will be forthcoming[25]. This is therefore omitted from the WEBS appraisal here.

8.5.16 The appraisal is therefore restricted to the WEB 1 and WEB 3 components of the wider economic benefits analysis; that is, the agglomeration benefits and the increased output in imperfect competitive markets respectively.

8.5.17 The results from the Wider Economic Benefits calculations are presented as an additional sensitivity to the TEE results. The current position of Transport Scotland is that WEBs should not be included in the standard calculation of an NPV and BCR, but a second NPV (termed NPVweb) and a second BCR (termed BCRweb) that sum the standard TEE and WEB results, may be presented. This is illustrated in Table 8.10.

Table 8.10 – Summary of TEE Impacts Adjusted by Wider Economic Impacts

£000s	Option A	Option B	Option C	Option D
Present Value of Benefits	£274,552	£234,586	£50,626	£43,675
Present Value of Costs	£213,156	£236,553	£52,385	£51,352
Net Present Value (NPV)	£61,396	-£1,967	-£1,759	-£7,677
Benefit to Cost Ration (BCR)	1.29	0.99	0.97	0.85
Agglomeration Impacts WEB1	£32,837	£26,830	£3,285	£1,926
Imperfect Competition Impacts WEB3	£7,129	£5,417	£1,567	£983
Total Wider Economic Impacts	£39,966	£32,248	£4,852	£2,910
Adjusted NPV (NPVweb)	£101,363	£30,281	£3,093	-£4,767
Adjusted BCR (BCRweb)	1.48	1.13	1.06	0.91

8.5.18 These results clearly show that when the wider economic benefits are taken into account, Options B and C attain a positive NPV and a BCR greater than 1. However, the wider economic benefits strengthen the position of Option A as the option demonstrating the greatest benefits in total.

Economic Activity & Locational Impacts (EALI)

8.5.19 In terms of the EALI appraisal, the results for the original rail options were demonstrated comprehensively in Chapter 6, and illustrated in Table 6.6. As options A and B currently being appraised address both passenger and freight rail services, the EALI results for these options will be essentially the same as for the rail options illustrated in Table 6.6.

8.5.20 However, for options C and D, which incorporate only freight in the rail components of the options and address passenger services by inaugurating new express bus services, some of the gainers and losers by geographical region will be the same as for the rail options and express bus options described Table 6.6 in Chapter 6. A summary of the adjusted EALI impacts are shown in Table 8.11.

[24] ibid
[25] ibid

Table 8.11 – Summary of EALI Impacts

Option		Major Impacts by Geographical Spread		
		Local to Study Area	Regional	National
Options A & B	Gainers	• Facilitate business supplies and deliveries • Facilitate business meetings & activities • Facilitate access to job opportunities • Enable commuters to remain in area • Provide wider opportunities for shoppers	• Facilitate business supplies and deliveries • Facilitate business meetings & activities • Facilitate access to job opportunities • Enable commuters to remain in area • Enable increase in freight delivery to and from Rosyth and further afield • Encourage tourism to area • Provide wider opportunities for shoppers • Encourage potential inward investment	• The Study Corridor contains the new national freight facility, considered in the National Planning Framework 2, which is being constructed at Rosyth, and rail freight improvements will enable quicker freight delivery to and from these new facilities from both a regional and national context • The study corridor also contains the Longannet Power Station which is featured in the National Planning Framework 2, and the efficient operation of which depends on being reliably supplied by coal six days a week, 24 hours a day
	Losers	• Some local public transport operators • Some local retail impacts	• Some regional public transport operators • Some regional freight transport operators	• No significant impacts
Option C & D	Gainers	• Facilitate business supplies and deliveries • Facilitate access to job opportunities • Enable commuters to remain in area • Provide wider opportunities for shoppers	• Facilitate business supplies and deliveries • Encourage tourism to area • Enable increase in freight delivery to and from Rosyth and further afield • Encourage potential inward investment	• The Study Corridor contains the new national freight facility, considered in the National Planning Framework 2, which is being constructed at Rosyth, and rail freight improvements will enable quicker freight delivery to and from

Table 8.11 – Cont.

Option	Major Impacts by Geographical Spread			
		Local to Study Area	Regional	National
Option C & D	Gainers			• these new facilities from both a regional and national context • The study corridor also contains the Longannet Power Station which is featured in the National Planning Framework 2, and the efficient operation of which depends on being reliably supplied by coal six days a week, 24 hours a day
	Losers	• Some local public transport operators • Some local retail impacts	• Some regional public transport operators	• No significant impacts

8.5.21 Although all options realise the benefits associated with freight access and egress from the corridor, options A and B incur an additional advantage owing to the higher speeds and regional penetration of rail passenger services. This permits access to jobs and other opportunities such as retail activities between the CFE study corridor and a wider catchment area, including cities such as Glasgow and Edinburgh and their satellite settlements.

8.5.22 This is particularly important since feedback from Fife Council, as a major study stakeholder has suggested that settlements in west Fife show significant economic underperformance. Naturally, the Council wishes to see growth in employment in these areas, and this is supported by a growth strategy, as part of the Fife Structure Plan, targeting villages in the west, south-west and north of Dunfermline. The development plans provide for the introduction of approximately 4,000 new houses and the strategic allocation of up to 80 hectares of land to maximise employment opportunities for these communities.

8.5.23 It is clear, and is recognised by Fife Council, that these new developments will require local and strategic transport infrastructure in order to maximise the opportunities presented by these developments. Hence, the Council is keen to see strategic transport investment in the area. It is notable that all the options reviewed in Table 8.11 assist in meeting local economy and employment objectives.

Summary of Economic Impacts

8.5.24 Table 8.12 summarises the economic benefits associated with the four options to improve transport connectivity in the scheme corridor.

Table 8.12 – Summary of Economic Impacts

Options	TEE Benefits	TEE + WEBs Benefits	EALI Benefits	Average Economic Benefits
Option A	✓	✓✓	✓✓	✓✓
Option B	O	✓	✓✓	✓
Option C	✘	✓	✓	O
Option D	✘	✘	✓	✘

8.5.22 Clearly of the four options, option A (use of the existing railway line from Alloa to Rosyth offering passenger and freight services with the Charlestown Chord in place) returns the best economic results, scoring two ticks overall which indicates that this option would be expected to deliver ***moderate beneficial impacts***. Of the other options, option B (the same configuration as option A but without the Charlestown Chord) would be expected to deliver minor beneficial impacts. The remaining two options, options C and D, where passenger services are undertaken by express bus services, are expected to have from ***neutral*** impact (in the case of option C) to ***minor negative impact*** (with regards to option D).

8.6 Integration Appraisal

8.6.1 As discussed in Chapter 6, the appraisal of the integration objective requires the consideration of:

- Transport integration;
- Transport land-use integration; and
- Policy integration.

8.6.2 Transport integration is further broken down between:

- Services and ticketing; and
- Infrastructure and information.

Transport Integration

8.6.3 In terms of services and ticketing, as all four options include either rail or express bus components each of these options will provide an opportunity for the integration of services with the existing bus and rail service network. Opportunities will arise within the corridor to share brand names, ticketing arrangements and to 'dove-tail' rail and bus timetables with existing service timetables, these opportunities could be in the form of buses adapting their timetables to meet the train.

8.6.4 Options A and B, both rail options which include passenger services provide good potential car-rail, bus-rail and rail-rail interchange facilities at such locations as Rosyth, Kincardine, Clackmannan and Ferrytoll, including park and ride sites, along the corridor. Options C and D which depend on express bus services to meet passenger demand will offer fewer opportunities for interchange infrastructure, and the benefits will be less owing to lower levels of demand. However, all the options have a freight role and therefore do well in terms of offering potential multi-modal freight interchange facilities.

8.6.5 However there are significant concerns with issues regarding train path availability and access to Edinburgh. Prior to the recently completed Edinburgh Waverley Infrastructure Works project, the

capacity was 24 trains per hour at the western approach to Waverley Station, and usage was at this capacity limit. The scheme options would add additional trains, at a rate of 2 trains per hour, to the operational use of Waverley Station.

8.6.6 The issue of capacity was recently addressed with the re-modelling of the west end station throat to increase trains to 28 per hour. This included some associated works to convert the entire Edinburgh signalling centre control area to IECC operation with the capacity to accommodate the control of the planned enhancements in the area. However these additional train paths have already been allocated to other services, so there is still likely to be a need to investigate ways to allow options A and B to travel into Edinburgh. One possibility is to travel as far as Haymarket Station which is planned for redevelopment. We would therefore recommend further research be carried out in terms of identifying a suitable operating plan.

8.6.7 Assuming a satisfactory operating plan arrangement can be found at a later date, based on the performance of the shortlisted options, it is reasonable to assume that in terms of transport integration, options A and B will have ***major beneficial impacts*** and options C and D will have ***moderate beneficial impacts***.

Transport Land-Use Integration

8.6.8 There are a variety of developments in the area within which the proposed transport options are situated. As seen in Chapter 2 a total of 7,000 housing units are estimated to be completed by 2022; approximately two thirds of which will be in Clackmannanshire and the remainder in Fife, largely scattered over the area, and of which half of these will be built by 2012. In addition, over 200 hectares of industrial development, 88 hectares of offices and 20 hectares of retail development is anticipated.

8.6.9 It is predicted that these developments will have no significant impact on any of the four transport options, or visa-versa, and if fact there may be a complementary relationship between the developments and the options.

8.6.10 Each of the options promotes integrated public transport. Options A and B achieve this by providing rail services along the corridor that can be fully integrated with the wider rail network (including a railway station at Clackmannan as supported by Policy INF 1 of CLP). Options C and D achieve the same level of transport integration by providing a bus and rail service from Alloa through western Fife towards the South Fife Economic Development Zone and the International Gateway located at Rosyth.

8.6.11 As a result, land uses along the route corridor, including the Port of Rosyth, have the potential to be better linked together. The implementation of any of the options will provide additional transport links to development land particularly around Dunfermline and the core area around Alloa, achieving an integration of land uses with public transport. The options will thus promote transport objectives, by improving the quality and efficiency of public transport, reducing the need to travel by car and thereby contributing towards a reduction in CO_2 emissions.

8.6.12 Therefore in terms of land use integration, it is reasonable to assume that all the options provide ***minor beneficial impacts***.

Policy Integration

8.6.13 Reference was made to the following strategy documents:

- Strategic Transport Projects Review;
- Clackmannanshire and Fife Council's Local Transport Strategies;
- Fife Structure Plan (version 2);
- SEStran Regional Transport Strategy;

- Scottish Planning Policy (SPP) statement 17; and
- SPP1.

8.6.14 Transport improvements in the study area offer a major opportunity to implement local and strategic planning and transport policies as a mechanism for promoting sustainable development. The proposals examined in the initial STAG appraisal would generally encourage a modal shift away from private car use, improve the quality of the environment, increasing access for all to a public transport system serving areas of employment, housing and recreation and would encourage social inclusion. All the options, A to D, re-enforce this trend, where passenger connectivity by public transport in general is improved both within the corridor and between the corridor and the adjacent regions which in turn encourages modal shift from car to public transport usage.

8.6.15 In addition, the freight transport improvements in the study area offered by the proposed investment in all of the four options offer a major opportunity to implement local and strategic planning and transport policies as a mechanism for promoting development on a more sustainable footing.

8.6.16 From the policy review, it is clear that all options identified can reasonably be expected to compliment local, regional and national policies. Based on the above analysis therefore, it is reasonable to score all the options with three ticks, that is, they are expected to have a ***major beneficial impact***.

8.6.17 Table 8.13 summarises the results of the integration appraisal.

Table 8.13: Results of the Integration Appraisal

Option	Description of Scenario	Transport Integration	Land-Use Transport Integration	Policy Integration	Overall Average
Rail Passenger & Freight Options	Option A – existing railway line from Alloa to Rosyth with Charlestown Chord	✓✓✓	✓	✓✓✓	✓✓✓
	Option B – as option A but without Charlestown Chord	✓✓✓	✓	✓✓✓	✓✓✓
Rail Freight & Express Bus Options	Option C – rail freight as option A but with bus express services on A985	✓✓	✓	✓✓✓	✓✓
	Option D – rail freight as option A but with bus express services on A907	✓✓	✓	✓✓✓	✓✓

8.7 Accessibility & Social Inclusion Criteria

8.7.1 STAG requires the consideration of two aspects as part of the Accessibility and Social Inclusion Government Objective, namely:

- Community Accessibility; and
- Comparative Accessibility.

8.7.2 In terms of community accessibility, the rail passenger options (A and B) will open up speedy commuter and tourism access between the study area and Dunfermline, Edinburgh, Stirling, Perth and Glasgow, and access for residents in the study area to facilities including retail, medical and educational destinations outside the immediate Clackmannanshire – west Fife region. The rail passenger options also provide direct connections to the national rail network so significantly improving connectivity, although in terms of more distant destinations this might involve interchange penalties.

8.7.3 With respect to comparative accessibility, that is accessibility for specific groups in society, or for particular locations, the expense of rail may deter those on lower incomes without access to preferential fare rates. Furthermore, the rail options will not be particularly suitable for very localised trips, typified by those that are made from one location in the study corridor to another. Therefore

the rail passenger options score two ticks for accessibility and social inclusion, or provide a ***moderate beneficial impact***.

8.7.4 The options with express bus services to meet passenger demand, options C and D, provide both community and comparative accessibility criteria very well. All groups in the community should benefit; commuters, shoppers, those visiting community facilities and friends and relatives, both within the corridor and further afield. The relative frequency of stops in the corridor ensures high public transport penetration of the study area enabling people in relatively remote areas access to other locations in the corridor and destinations further afield, including those in Edinburgh and Glasgow. The relative competitiveness of bus fares ensures that bus transport is within reach of almost all sections of society, with no discrimination between socio-economic groups.

8.7.5 On the other hand, options C and D do not have the same opportunities for interchange that the rail passenger options have. On this basis, options C and D also score two ticks for accessibility and social inclusion, signifying a ***moderate beneficial impact***.

8.7.6 Using the standard seven point scale, a summary of the anticipated impacts on the STAG criteria is shown in Table 8.14.

Table 8.14 – Accessibility & Social Inclusion Impact

	Option A	Option B	Option C	Option D
Accessibility & Social Inclusion	✓✓	✓✓	✓✓	✓✓

8.8 Impacts on Policy Directives

8.8.1 The key transport policies relating to the SEStran Regional Transport Strategy were reviewed in Section 6.4 in Chapter 6. These policies remain largely in effect with the new options A through to D, but, because these options have been modified, a summary of the score relationship between the revised options and these policies are illustrated in Table 8.15.

Table 8.15 – Impact on Regional Transport Policies

Policy	Option A	Option B	Option C	Option D
Policy 1: Improvements to efficiency and effectiveness of Public transport	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Policy 2: Improvements to bus services to reduce congestion and enhance accessibility	O	O	✓✓✓	✓✓✓
Policy 3: Investment in an integrated rail-based regional transport network	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Policy 4: Rail investment to enhance public transport capacity for passengers and freight	✓✓✓	✓✓✓	✓✓	✓✓
Policy 14: Providing additional capacity on commuter corridors to benefit space efficient modes, including road traffic flows	✓✓✓	✓✓✓	✓✓	✓✓
Policy 15: Provide new capacity to improve journey times and reliability	✓✓✓	✓✓✓	✓✓	✓✓
Policy 16: Minimise the impact of the freight industry on the environment, including greater use of rail transport	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Policy 17: Provide transport measures to assist communities with high levels of deprivation & car ownership & with poor PT access to employment opportunities	✓✓	✓✓	✓✓✓	✓✓✓
Policy 18: Reduce peripherality in rural areas not well served by PT	✓✓✓	✓✓✓	✓✓✓	✓✓✓

8.8.2 As shown in the Table, all of the options meet the regional policies as expressed in the SEStran RTS well. However there are differences naturally between options A and B on the one hand and options C and D on the other. Options A and B have no bus component and therefore policy 2 is

irrelevant for these options, but options C and D have a ***major beneficial impact*** in meeting this policy objective.

8.8.3 However, in terms of providing additional passenger transport capacity, options A and B would be expected to have a ***major beneficial impact*** with respect to policies 4, 14 and 15, scoring better than options C and D which rely on express bus service provision, which would only have a ***moderate beneficial impact***. Not only would the rail passenger options A and B provide greater capacity, but they would also provide faster services.

8.8.4 Where options C and D would be expected to score higher is in meeting policy 17. The express bus services have better levels of rural penetration in the more remote areas of the study corridor and hence are able to meet the requirements of the population without access to private transport and who need to access employment and job opportunities. So options C and D are awarded three ticks to denote a ***major beneficial impact*** respectively for this policy.

8.8.5 In summary, Table 8.9 suggests that options A and B meet the RTS policies marginally more completely than options C and D, where the former score three ticks each for seven out of the nine policies compared with the latter options, which score three ticks for six out of the nine.

8.9 Scheme Implementability

8.9.1 In addition to the five main Government objectives, STAG also recommends that the capability of delivering an option should also be considered. This can highlight any potential "implementability" problems with any proposal.

8.9.2 In terms of the technical issues, the options considered in this study are relatively straight forward since they are all based on standard civil engineering practices and have been successfully implemented elsewhere. However, options A, C and D will require a greater amount of engineering work in establishing the Charlestown Chord just south of Dunfermline. Options C and D however will require very little physical infrastructure to implement the express bus services.

8.9.3 There are no foreseeable difficulties envisaged with operational aspects of the services for each option. However, attention will need to be paid to service articulation, such as timetabling and co-ordination, with other local services that extend out as onward rail/bus services at both ends of the study corridor.

8.9.4 There is significant public interest and direct local government support for transport improvements to the connectivity of the Clackmannanshire – Dunfermline – Edinburgh corridor, which allows the opportunity for improved access for both businesses, and the general population to the major urban areas at both ends of the corridor and to destinations beyond Stirling and Edinburgh. The Implementability appraisal results are summarised in Table 8.16.

Table 8.16: Summary of Implementability Appraisal

Option	Technical Issues	Operational Aspects	Public Acceptability
Option A	✓✓	✓✓✓	✓✓✓
Option B	✓✓✓	✓✓✓	✓✓✓
Option C	✓✓	✓✓✓	✓✓
Option D	✓✓	✓✓✓	✓✓

8.9.5 Options A, C and D, which, as a result of the additional railway chord have greater engineering requirements than option B, would be expected to have a ***moderate beneficial impact*** with regards to technical issues, whereas option B would be expected to have a ***major beneficial impact***, since it would be easier to implement, although there is nothing technically challenging with options A, C and D.

8.9.6 However the rail travel options are generally more popular with passengers than the bus options, even express bus services. As a result options C and D have been scored with two ticks for public acceptability, denoting a ***moderate beneficial impact*****,** whereas options A and B, which incorporate rail passenger services, score three ticks and are expected to have a ***major beneficial impact***.

8.10 Cost to Government

8.10.1 Table 8.17 shows the Government impacts of the project in terms of costs to Government. The TEE investment costs indicate the costs that have been adjusted and discounted back to 2002 prices.

Table 8.17: Summary of Investment & Public Sector Costs (£'000s)

Option	Investment Costs (from TEE Appraisal)	Grant/Subsidy (from TEE Appraisal)	Indirect Tax Revenues (from TEE Appraisal)	Score
Option A	£57,787	£11,529	£27,111	✘✘
Option B	£54,176	£37,684	£26,261	✘✘
Option C	£11,598	£13,313	£7,605	✘
Option D	£11,257	£13,200	£7,503	✘

Note: all values are discounted to 2002 prices

8.10.2 In terms of investment costs, both options A and B involve the highest Government costs. The Table above also shows that all of the options require grant or subsidy. Option A however requires the least subsidy, whereas the remaining options require significantly higher levels of revenue support. There are also substantial costs in terms of indirect tax revenue losses with respect to options A and B. This is associated with the expected degree of modal shift away from cars, thereby diminishing the on-road vehicle tax base, and, more importantly, a fall in revenues from fuel duty.

9 Risk and Uncertainty

9.1 Introduction

9.1.1 Estimates of project costs of the Clackmannanshire - Fife - Edinburgh transport proposals, as with all large infrastructure projects, are subject to a degree of uncertainty and change. This is due to changes in a number of factors including technical standards, the political environment, project interfaces, technological improvements or amendments required to obtain the necessary consents and approvals.

9.1.2 It should be stated at the outset that it is impossible to identify and manage all project risks. The objective of the Clackmannanshire – Fife – Edinburgh project management team is to reduce all identified financial and programme risks to a minimum level as is reasonably practical for each stage of the project lifecycle.

9.1.3 To reduce the level of uncertainty of the transport proposals, the project team has applied a level of optimism bias to each of the options based on the HM Treasury's Green Book and the Review of Large Public Procurement in the UK[26].

9.2 Optimism Bias

9.2.1 Optimism Bias (OB) is the tendency for a project's costs and duration to be underestimated and/or benefits overestimated. It is defined as a measure of the extent to which actual project costs (capital and operating costs), and project duration (planning to operations) exceed the expected benefits delivered by the project.

9.2.2 This section describes how Optimism Bias has been addressed within the framework of the risk management processes in place. The guidelines for the assessment of Optimism Bias are set out in the HM Treasury's Green Book and the Review of Large Public Procurement in the UK.

9.2.3 There are three drivers to the assessment and calculation of OB:

- an assessment of the project risks most likely to contribute;
- the classification of a risk by project type, which in turn determines the specific upper and lower bounds for the contributing factors to optimism bias; and
- a realistic assessment of the progress made towards the mitigation of project risks, measured by risk mitigation factors.

9.2.4 There are three aspects to OB which should be considered:

- contributing factors are divided into two main types of OB: capital costs and works duration;
- contributing factors are grouped into five overarching project risk areas; Procurement, Project Specific, Client Specific, Environment and External Influences; and
- each of the five overarching project risk areas are sub-divided into specific risk areas that may negatively impact capital expenditure and works duration forecasts.

9.2.5 Since the production of a Risk Register for each option and an exact estimation of OB is outwith the study approach Scott Wilson has used default values recommended by HM Treasury Green Book Guidance for identifying suitable levels of OB to apply in this appraisal.

[26] Mott MacDonald, July 2002

9.2.6 For the most part, the railway options follow a previous railway line and do not require any special design considerations due to space constraints, unusual output specifications or innovative construction methods. Similarly the bus options do not require any special design considerations or innovative construction methods. Based on this analysis the project was classed as a *Standard Civil Engineering* project and therefore from default Government OB values has Upper Boundary starting values, based on the assumption of no risk mitigation, of:

- 44% for capital costs;
- 41% for OMR costs; and
- 20% for work duration.

9.2.7 These values are based upon the values recommended in HM Treasury Green Book for Standard Civil Engineering projects. The above values have been taken forward into the analysis and calculations which are summarised in the following section.

9.3 Calculation of Adjusted Capital Costs

9.3.1 To estimate the effects of Optimism Bias on each of the options capital costs a standard engineering value of 44% was added to the total base capital costs for each of the options calculated in Chapter 7. The results of this are shown in Table 9.1.

Table 9.1 – Calculation of Adjusted Capital Costs

Option	Option A	Option B	Option C	Option D
Base Capital Costs	£65.03m	£60.94m	£13.05m	£12.66m
OB % Uplift	44%	44%	44%	44%
OB Value	£28.61m	£26.81m	£5.74m	£5.57m
Total Capital	£93.64m	£87.75m	£18.79m	£18.23m

9.3.2 The above values of capital costs are in 2008 prices and have been used in the economic appraisals in Chapter 8.

9.4 Calculation of Adjusted Operations, Maintenance and Renewals

9.4.1 To estimate the effects of Optimism Bias on each of the OMR costs a standard engineering value of 41% was added to the total base OMR costs for each of the options calculated in Chapter 7. The results of this are shown in Table 9.2.

Table 9.2 – Calculation of Adjusted OMR Costs

Option	Option A	Option B	Option C	Option D
Base OMR Costs	£2.81m	£3.33m	£0.86m	£0.84m
OB % Uplift	41%	41%	41%	41%
OB Value	£1.15m	£1.37m	£0.35m	£0.34m
Total OMR Costs	**£3.96m**	**£4.70m**	**£1.22m**	**£1.18m**

9.5 Calculation of Adjusted Works

9.5.1 The maximum Optimism Bias figure for duration of 20% obtained from the HM Treasury Guidance was used for delays to works. The projected construction period of 18 months results in a potential delay of approximately 4 months, giving a total of 2 years works duration which has been rounded up for ease of calculation and also to produce more robust results. This 2 year programme has been used for all options.

9.6 Sensitivity Tests

9.6.1 In order to analyse how sensitive the economic appraisal results are to key input variables, a number of tests have been carried out on the emerging preferred option (Option A). The sensitivity tests were identified by way of identifying potential risk areas associated with demand/revenue forecasts and costs estimates developed for the schemes. This section provides a summary of the risk areas identified and their estimated level of impact on the TEE results alone, excluding the wider economic benefits. The main risk areas identified and associated tests carried out can be summarised as:

- time savings in TEE Appraisal lower than predicted. A drop of 10% was tested;
- vehicle operating costs savings in TEE Appraisal lower than predicted. A drop of 10% was tested;
- forecast demand/revenue on the rail service is lower (e.g. affected by competitor response). A drop of 10% was tested;
- increase in capital costs (e.g. contractors tenders are higher than anticipated). An increase of 10% was tested;
- increase in operating costs (e.g. operators' tenders are higher than anticipated). An increase of 10% was tested; and
- increase in the construction programme (e.g. works duration delay). A delay of 1 year was tested.

9.6.2 A series of TEE Appraisals were undertaken to enable the impact of risks on the Net Present Value (NPV) and Benefit-to-Cost Ratio (BCR) to be understood. The summary results of the sensitivity tests are presented in Table 9.3.

Table 9.3 – Results of Sensitivity Tests (Option A Only)

Sensitivity Test	Identified Risks	NPV	BCR
	Base	£61.4m	1.29
(a)	Base minus 10% of time savings benefits	£52.5m	1.25
(b)	Base minus 10% of VOC benefits	£56.0m	1.27
(c)	Base minus 10% of revenues	£51.9m	1.24
(d)	Base plus 10% increase in Capital Costs	£55.6m	1.25
(e)	Base plus 10% increase in Operating Costs	£49.6m	1.22
(f)	Base plus 1 year delay to construction programme	£42.3m	1.20

9.6.3 As can be seen from Table 9.3, all sensitivity tests produced positive NPVs and BCRs greater than 1.0.

9.7 Risk Management Recommendations

9.7.1 As the project progresses forward, we would recommend a thorough investigation of the potential risks and resultant impacts on Optimism Bias to be carried out. In order to reduce the risks and uncertainty associated with the options and level of Optimism Bias required to be added to each option, we recommend several steps should be taken to address these issues. These are summarised below.

Risk Management Approach

9.7.2 A risk management approach as set out by key UK Government guidelines required for large transport infrastructure projects should be pursued as follows:

- the four stages central to the risk management process (that is to identify, assess, mitigate and monitor risk) should be implemented;
- risks should be identified for all stages of the project lifecycle;
- risks should be recorded in a Risk Register which, as a "live" document, should be continuously reviewed, revised and updated throughout the project lifecycle; and
- identified risks should be managed to a level as low as reasonably practicable for each stage of the project lifecycle.

9.7.3 Not all tools and techniques for risk management can be applied to all projects, so the most appropriate should be selected and utilised to reflect the characteristics of the Clackmannanshire – Fife - Edinburgh study corridor.

9.7.4 The selection of the correct tools and techniques allows the identification of likely risks generated by the transport proposals, and the upfront risk mitigation techniques to be applied to reduce the probability that such risks will occur.

Key Stages to be Followed

9.7.5 As has been identified above, there are four key stages to the risk management process which should be applied to this study:

- Risk Identification;
- Risk Assessment;
- Risk Mitigation; and
- Risk Monitoring.

9.7.6 The identified risks should be analysed by combining their probability of occurrence and their scale of impact on the proposed investment in the area's public transport system. They should be subsequently assessed in terms of overall risk of exposure and priority for action. Mitigation measures should then be developed, where suitable, for each risk and recorded in the Risk Register. These measures could be applied in proportion to the severity of the risk in question, which influences the time and cost required to address the relevant risk.

9.7.7 The risks and costs associated with these should be monitored on a regular basis by the project team. The Risk Register should include data which provides a current risk profile of the project, and represents a snapshot of the progress towards mitigation of all identified project risks.

Project Risk Register

9.7.8 The Risk Register is the key tool of the Risk Management process and should be set up and maintained throughout the project feasibility phases. It should record all identified risks as inputs and produce qualitative and quantitative information regarding these risks as outputs such as risk severity, mitigation process and capital expenditure contingencies. In summary, the Register should provide:

- a fully auditable track record of all identified risks;
- a central focus to the management of risks across all project workstreams;
- a management reporting tool to assist in delivering better performance of key project activities;
- motivation for all team members to assess and manage risks on a frequent and regular basis;
- assistance in facilitating purposeful action and management of threats to the delivery of key project activities as early as possible; and
- an interface with other key project reporting tools to ensure total transparency in the reporting of all identified risks.

9.7.9 The Register should provide the basis for risk prioritisation, mitigation action, risk control and risk reporting.

Other Activities

9.7.10 Risk identification, recording, monitoring and mitigation is not an isolated activity, but should be undertaken in conjunction with a number of other project activities, including:

- Construction Methodology;
- Environmental Impact Assessment (EIA);
- Demand Forecasting and Business Case; and
- Finance and Funding.

9.7.11 The construction methodology involves considerable potential for risk, and therefore account should be taken of the management processes applied to the mitigation of construction risks recorded in the Project Risk Register. The construction methodology will also have an environmental impact, the consideration of which will be in the EIA. Both these and the mitigation measures identified in the EIA should be entered into the Project Risk Register.

9.7.12 The Project Risk Register also shows the risks arising from the uncertainties surrounding forecasting of projected travel patterns and modal shift values used to develop the Business Case Appraisal for the scheme. Furthermore the Register highlights issues that may affect the level or likelihood of available funding to finance the project, where the assessment of risks is used to develop robust capital cost estimates informing the projects financial requirements.

9.8 Risk Mitigation Strategy

9.8.1 After producing a Risk Register the key risks can be identified and ranked. Furthermore a Monte Carlo simulation can be undertaken on each of the “high” level category risks identified and highlighted in the Risk Register to estimate the mean Risk Value Estimate and to give a risk profile and estimate of costs for each risk.

9.8.2 Following the above, a Risk Mitigation Strategy (RMS) can be developed and tasked with various actions to militate against the remaining risk factors. The intention of the RMS is to take into account the capital costing methodology employed in this study.

9.8.3 The key objective of the client or project sponsors is to improve mitigation factors and hence reduce further the Optimism Bias values calculated and the overall financial risk to the project. This should be done as the project progresses taking into account the increased knowledge and certainty gained from the outcomes of key decisions on, for example, the final procurement strategy, the commencement of advance works and the continued application of the risk management process.

9.8.4 Similarly, the Risk Register should be developed further and maintained as the project moves into further stages of development and more detail is available on construction methodologies and their associated risks.

10 Monitoring and Evaluation

10.1 Introduction

10.1.1 STAG requires consideration to be given to the monitoring and evaluation of the option or options recommended as an outcome of the study process. This is because a process of monitoring and evaluation will be required for projects receiving financial support, in whole or in part, from the Scottish Government. 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.

10.2 Key Performance Indicators

10.2.1 *"Monitoring is the process of gathering and interpreting information on the performance of a project post-implementation. This process should be on-going and will usually take place in conjunction with other information gathering exercises being undertaken by a local authority or other organisation implementing an option"*[27]. The focus of monitoring will be on outcomes and to assist in this it is necessary to establish key performance indicators (KPIs) to measure the impact of the options implemented. These KPIs should build on the study's *Planning Objectives* and be SMART. Table 10.1 sets out some suggested monitoring yardsticks for consideration

Table 10.1 – Suggested KPI's for Monitoring

Planning Objective/Criteria	*Key Performance Indicator*
Environment	• *Reduction in severance* • *Reduction in vehicle noise* • *Redution in veh-km*
Safety	• *Reduction in PIAs*
Economy	• *Rail freight access times* • *% freight transferred road to rail*
Integration	no specific Transport Planning Objective identified
Accessibility & Social Inclusion	• *Journey time reductions*

10.3 Evaluation

10.3.1 *"Evaluation is a specific post-implementation event designed to identify whether or not a project is performing as originally intended, whether, and to what extent, it is contributing to established policy directives and whether the implemented project continues to represent value for money"*[28]. Evaluation can be divided into two types:

Process Evaluation – Primarily concerned with how well the project has been implemented.

Outcome Evaluation – Examines the performance of the project after completion, and measures its "success". It therefore cannot take place until sufficiently long after implementation for success to be measurable.

[27] STAG, section 6.1.1
[28] STAG, section 6.2.1

10.3.2 Process evaluation is concerned with implementation, and can be carried out by assessing how well the implementation has been delivered at key stages throughout the process, so that (for example), decisions on the scope and scale of the project can be reassessed in the light of experience. Chapter 9 has discussed some potential issues to consider in terms of risk and uncertainty, and these could form the basis for outputs upon which the process evaluation could be based. In order to achieve this, it is recommended that the Project Risk Register be set-up at the start of the development and continuously maintained throughout the project development lifecycle.

10.3.3 Outcome evaluation looks at the results of a scheme once it has been implemented, and can only take place when the scheme has "bedded down" sufficiently for realistic results to be measurable. With large schemes, this will be inevitably a number of years after the opening. Outcome evaluation is often related to the so-called *"Four E's"*[29]:

Economy –	The costs of resources used, procurement and tendering issues.
Efficiency –	How well were inputs translated into outputs, and could more output have been achieved with less or different inputs or processes/management?
Effectiveness –	Did achieving the defined outputs then enable the wider policy objectives to be achieved; could these have been achieved through some alternative intervention or process?
Equity –	Were the gainers from the project, such as particular social groups or areas, as intended; is this in line with other policy intentions?

10.3.4 STAG sets out the following series of sequential steps for an outcome evaluation[30]:

- Step 1: definition of scope and purpose;
- Step 2: project rationale;
- Step 3: aims and objectives;
- Step 4: measures and indicators;
- Step 5: base case for comparison;
- Step 6: analysis and interpretation; and
- Step 7: reporting and recommendations.

10.3.5 Steps 1 to 3 should be carried forward from this STAG appraisal, along with the Base Case for Step 5. The analysis and interpretation of results could then form an "outcome evaluation" report structured around the suggested KPIs in Table 10.1, and culminating in recommendations for the future development of the project.

[29] STAG, section 6.2.10
[30] STAG, section 6.2.11

11 Conclusions

11.1 Findings of the Detailed STAG Part 2 Appraisal

11.1.1 In accordance with normal STAG practice, Appraisal Summary Tables have been prepared. These are shown in Appendix G. The results of these are summarised in Table 11.1, using the key shown below.

Table 11.1 – Summary of STAG Assessment

Criteria	Option			
	A	B	C	D
Objective 1 – Connectivity	✓✓✓	✓✓	✓✓	✓
Objective 2 – Freight Accessibility	✓✓	✓	O / ✓	O / ✓
Objective 3 – Accident Savings	✓✓	✓✓	✓	✓
Objective 4 – Local Environmental Impacts	✓	✓	O / ✓	O / ✓
Environment – Air Quality & noise	✓	✓	✓	✓
Environment – Other	✘✘	✘✘	✘✘	✘✘
Safety	✓	✓	✓	✓
Economy	✓✓	✓	O	✘
Integration	✓✓✓	✓✓✓	✓✓	✓✓
Accessibility/Social Inclusion	✓✓	✓✓	✓✓	✓✓
Technical Issues	✓✓	✓✓✓	✓✓	✓✓
Operational Aspects	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Public Acceptability	✓✓✓	✓✓✓	✓✓	✓✓
Cost to Government	✘✘	✘✘	✘	✘

Key

✓✓✓	Major Beneficial Impact	✘	Minor Adverse Impact
✓✓	Moderate Beneficial Impact	✘✘	Moderate Adverse Impact
✓	Minor Beneficial Impact	✘✘✘	Major Adverse Impact
O	Neutral Impact		

11.2 Preferred Option

11.2.1 The results of the Detailed STAG Appraisal suggest Option A, the existing railway line from Alloa to Rosyth with both passenger and freight services and also the Charlestown Chord in place, presents the best economic and overall performance of the four short-listed options, followed by option B. Hence, option A should be considered as the preferred option.

11.3 Recommendations

11.3.1 However, there are concerns with issues regarding transport integration, specifically with regards to train path availability and access to Edinburgh. An operational assessment would be required in order to find a potential solution and since this could have an impact on journey times, the patronage forecasts should be considered again in light of any emerging operating plan.

11.3.2 In addition, the capital cost estimates are sourced from conservative cost rates which were based on our initial consultation with Network Rail. The study remit did not include railway engineering analysis or detailed estimation of operating costs. Further investigation, therefore, might reduce the cost assumptions in this report, and hence lower the cost estimates. This would improve the economic appraisal results for option A, although as it stands the TEE results are positive and can be regarded as robust.

11.3.3 There are also some environmental impacts due to the new stations, freight facilities and the Charlestown Chord. These could be investigated with appropriate measures and the level of Optimism Bias could be scaled back with an appropriate quantified risk assessment (QRA). Both of these aspects were outwith the study remit but could further improve the results.

11.3.4 Hence, if the project were to go ahead, the following would be required:

- carry out a train path analysis and identification of a suitable operating plan;
- carry out an outline engineering assessment to refine the capital cost estimates;
- develop an environmental mitigation strategy for the new infrastructure elements;
- review the operating costs as a result of the feasibility work discussed above;
- prepare a quantified risk assessment to reduce the levels of OB; and
- update the patronage forecasts and the business case following the risk assessment findings.

11.3.5 However, it should be recognised that this project has not been properly considered within the Scottish Government's Strategic Project Review (STPR). It would therefore be prudent for SEStran, together with Fife and Clackmannanshire Council's, to engage in serious discussion with Transport Scotland on how this project may sit relative to current STPR projects and what proposals there may be to review the STPR in the future.