



Scottish Strategic Rail Study

Final Report

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SCOTTISH STRATEGIC RAIL STUDY

Final Report

March 2003

Prepared for:

Scottish Executive &
Scottish Strategic Rail Study Project Steering Group

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Summary

Study Approach

1. Steer Davies Gleave has been appointed to help prepare a rail investment strategy for Scotland - the Scottish Strategic Rail Study (SSRS). The area for study stretches south from Inverurie & Aberdeen in the North East to include all of the Central Belt, with a southern boundary stretching from Ayr on the west coast and Dunbar on the east. The study does *not* include the Highland Main Line to Inverness but it takes account of the implications of services that cross all of the study boundaries including those to England.
2. Our brief was to identify the costs and benefits of potential improvements to *passenger* rail services in Central and North East Scotland and to outline the strategic priorities for the railways in this part of the Country. The aim is to provide a strategy that prioritises schemes according to their achievement of objectives and their relative costs and benefits.
3. Our approach has therefore been to ask what it is the stakeholders are hoping to achieve and how we would measure achievement, *before* considering the types of schemes that could help us achieve these objectives. We begin by defining high level “overarching objectives” for the railway system. This can be thought of as a ‘*vision for rail*’.

The Vision for Rail

The rail system will fully support the economic, social and environmental aspirations of the study area’s citizens. Rail passenger services will be of a scale and quality that rail will increasingly become a more viable, practical, affordable and attractive travel choice for passengers in and between the urban areas of Central and North East Scotland, and will become at least as attractive as the private car for an increasing proportion of travel over the next ten years and beyond. As a consequence, the rail network will carry an increasing proportion of peak and off peak travel within the context of sustained growth in travel demand. Rail freight services will similarly be enhanced to play an increasing role in the primary and secondary distribution of goods. The development of rail will represent value for money for users, operators and the taxpayer.

4. We then defined the *strategic outcomes* –the things that must be achieved to attain the vision, from which more tangible *planning objectives* have been developed. Targets or *benchmarks* that allow us to assess performance against these objectives were prepared for four geographical areas of SPT, SESTRAN, NESTRANS and Tay and for Inter Regional services which link these areas.
5. Once we had defined our objectives and a framework for measuring their achievement we considered a range of projects and/or policies that could be tested against them. The projects have been combined into a number of *scenarios* (High, Medium and Low Resource) in order to test their interactions.
6. The High Resource Scenario is based on achieving a step change in rail capacity and includes a number of major capacity enhancing ‘facilitating’ projects such as the Edinburgh Waverley capacity upgrade and City Tunnel proposals in Glasgow, plus a package of schemes that could be delivered with these major facilitating projects.

7. The Medium Resource Scenario: includes the best performing capacity facilitating project in each area and a package of schemes associated with that major facilitating scheme. The results from the high resource scenario are used to inform the composition of the Medium Resource package.
8. The Low Resource Scenario does not have any capacity upgrades to the rail network. The low resource scenario concentrates primarily on what could be done within the constraints of current track capacity.

Future Demand For Rail

9. Under our central case assumptions, the number of rail journeys within the study area is expected to increase by 35% - from around 48m¹ in 2000 to over 65m by 2020, as a result of background economic, demographic and social change. Simply addressing the current infrastructure constraints and providing the system capacity to cope with this growth will require a significant commitment of resources.
10. However, we have noted that this predict and provide approach is not appropriate if the strategy is to meet the objectives of the Scottish Executive and the stakeholders in the rail industry, and that further investment will be needed if the vision for rail is to be achieved.
11. We have used our three scenarios (high, medium and low) to test what might be achieved with different scales of investment. While the scenarios were developed to enable us to understand the *relative* performance of various packages of schemes and that they do not, in the round, represent an ‘optimal’ investment package, they do indicate the scale of impact that might be achieved.
12. The schemes considered within the low resource scenario would add only another 2m trips in 2020 but would improve the travelling conditions for existing peak period travellers significantly. If the schemes in the medium resource scenario were implemented they would add another 20m trips per year by 2020 to those in the low resource scenario, while if the schemes tested in the high resource scenario were implemented as tested, demand would grow by a further 9 million per year. The total number of journeys by rail could therefore reach as high as 96m by 2020, or just over double the current number of rail trips within the study area.

TABLE S1 ANNUAL PASSENGER JOURNEYS WITHIN THE STUDY AREA (M PA)

	2000	2010	2020
Do Minimum	47.8	54.8	65.2
Low Resource Scenario		56.0	66.9
Medium Resource Scenario		72.3	87.6
High Resource Scenario		79.6	96.3

¹ There are various caveats associated with the estimation of current levels of usage and the economic performance of the scenarios –see main text for details.

Scale of Investment

13. The scale of investment to realise this additional demand varies greatly between the scenarios. The low resource scenario is estimated to cost £43m in present value (PV) terms and delivers just under 2m more passenger journeys in 2020 over the do-minimum. The medium resource scenario would cost £651m and delivers just over 22m additional trips in 2020 and the high resource scenario £1,534m and delivers 31m more trips than the do-minimum.

Key Findings

14. The key issue in the *SESTRAN* area is the scale of upgrade to provide at Waverley station as this project determines most of what can be achieved elsewhere in the area and also influences many of the decisions on Inter Regional traffic. Our analysis suggests that the option that delivers 11 extra peak hour train paths would generate the highest level of achievement against planning objectives and the best economic case of the packages considered.
15. Linked to this is the decision on whether to provide the Edinburgh airport rail link. The most extensive proposal which would provide a sub-surface station at the airport in conjunction with the full Waverley upgrade would add significant capability to the system, and would do particularly well against planning objectives but is very expensive. Conversely, more modest schemes to provide an Airport shuttle service would take up a significant proportion of the additional capacity provided by an enhanced Waverley and limits the scope for other Inter Regional and new Edinburgh to Glasgow services such as a re-opened Airdrie-Bathgate route. The decisions on the airport rail link are therefore highly germane to the future rail strategy.
16. The key issue in the *SPT* area is the central area capacity problem and any decision on the two capacity facilitating projects – the underground City Tunnel link and the surface level City Union scheme –that have been considered here. The lower cost City Union appears to offer a stronger value for money case than the City Tunnel project, but the latter makes a much greater contribution to planning objectives, not just in the west of the Central Belt, but for the Inter Regional, Tay and NESTRANS areas as well.
17. These are not competing schemes. Their relative costs, and the scale of their impacts are of different orders of magnitude. Fundamentally, there is relatively little scope to increase peak service frequencies in the SPT area without addressing the Glasgow Central High Level capacity constraint. The City Tunnel project would do that, the City Union project, whilst a worthwhile project in its own right, would not, particularly if the Glasgow airport shuttle service is introduced.
18. The key issue in both the *Tay and the NESTRANS* area is developing a means of linking the proposals for Crossrail projects in Dundee and Aberdeen into a joint package of faster, limited stop, express and Inter City services.
19. Both Crossrail services perform well against the planning objectives for their respective areas, but less well in value for money terms when assessed as stand alone

projects. The best prospect for delivering these two projects is to consider them as 'enabling' projects which, through a service recast into distinct express and local services, allow improvements in Inter Regional express journey times to be achieved. This may prove to be the most cost-effective way of obtaining faster Inter Regional services whilst at the same time meeting the planning objectives for the Tay and NESTRANS areas.

1. INTRODUCTION

Study Brief

1.1 Steer Davies Gleave has been appointed by a client group², led by the Scottish Executive, to help prepare a rail investment strategy for Scotland, known as the Scottish Strategic Rail Study (SSRS). Our brief is to identify the costs and benefits of potential improvements to **passenger**³ rail services in Central and North East Scotland and to inform the development of the strategic priorities for the railways in this part of the Country. The client group's aim is to move from a position of predict and provide to a strategy that prioritises schemes according to their achievement of objectives and their relative costs and benefits. The Executive's consultation paper sets out the factors that will need to be taken into consideration:

- Ensuring that rail projects compete effectively for resources with other claims on transport spending;
- Taking a network perspective –both ensuring that projects do not compromise the effectiveness of the broader network but also favouring schemes that will generate wider network benefits;
- Demonstrating 'fit' with the wider policy context.

Study Area

1.2 The area for study (Figure 1.1 over) stretches from Inverurie & Aberdeen in the North East, southwards through Dundee and Perth in the Tay Estuary and includes all of the Central Belt -the Edinburgh, Glasgow, Stirling and Falkirk hinterland. The southern boundary stretches from Ayr on the west coast to Dunbar on the east. The study does **not** include the Highland Main Line to Inverness, or services covered by the Highland Rail Partnership, but it necessarily has to take account of the implications of services that cross these boundaries, particularly the implications of those that originate from outside the area. In this context, decisions on both the East Coast Main Line (ECML) and West Coast Main Line (WCML), as well as longer distance services from the north, (from Inverness to the Central Belt and from Inverness to Aberdeen for example), will have implications for the study area network.

1.3 Within the study area, local authority groupings of SESTRAN and NESTRANS, plus Strathclyde Passenger Transport (SPT) and the authorities around the Tay Estuary form an area that is broadly, (although not exactly), contiguous with the study boundaries. Figure 1.1 illustrates the area and the rail network contained within it. There is considerable diversity in the characteristics of the use of this network from long distance to very local services, but clearly a major factor is the substantial urban network around Glasgow – which, with over 40 million passengers per year and 180 stations is the largest commuter network in Great Britain outside of London.

² Scottish Executive, SPT, SRA, Railtrack, & local authorities in the SESTRAN, NESTRANS and Tay Areas

³ Although rail freight does not form part of this study we make reference to it on a number of occasions throughout the report in terms of the planning objectives for the network and in the context of the track capacity calculations undertaken by Railtrack



Scottish Strategic Rail Study
 Figure 1.1: Study Area and Regional Groupings

- 1.4 This diversity has led us to develop an approach which considers the strategic options for the railways at a sub-regional level, but under the umbrella of a set of overarching objectives for the national rail network. By focusing at the sub-regional level we are able to reflect not only the different states of development of the network throughout the study area, but also recognition that each area has different needs and priorities for their part of the network. The interactions between the areas are brought together in our analysis when we consider the Inter Regional links between them.

Parallel Studies

- 1.5 The study has been carried out in parallel with a number of other major studies. The most significant are the Central Scotland Transport Corridor Study and the Rail Links to Edinburgh and Glasgow Airports Study, both for the Scottish Executive; the Central Scotland Rail Capacity Study for the Strategic Rail Authority (SRA) and the Waverley Station upgrade study by the SRA/Railtrack. To ensure consistency, the SSRS steering group includes representatives from the steering groups of the other four studies, and wherever possible the same planning data has been used.
- 1.6 There are a number of other on-going or recently completed studies – such as those for the Caledonian Express (Shotts Line), the Tay Estuary Rail Strategy (TERS), and the Borders (Galashiels) route – which are being prepared by promoters of these schemes. This report is more strategic than these more detailed scheme-specific studies. The appraisals presented later in this report are necessarily more broad-brush and are not meant to replace or supersede the promoters’ own analysis. However, by taking a network wide view this study is able to assess the interactions of the various projects under consideration throughout the study area.

Report Structure

- 1.7 Following this introduction the remainder of this report is organised as follows. **Chapter Two** describes the current network, its usage, and key capacity constraints. **Chapter Three** presents a view of what will happen if nothing is done to improve the network, based on our forecasts of the underlying growth in the demand for rail travel, and the consequences of this growth in terms of overcrowding. This is the ‘without strategy’ scenario, or as it tends to be described in appraisals, the ‘do-minimum’ scenario.
- 1.8 In **Chapter Four** we describe our approach to developing a strategy, and in **Chapters Five to Eight** we describe the results of testing strategy options for each of the SESTRAN, SPT, Tay and NESTRANS areas to identify the strategic priorities in each area.
- 1.9 **Chapter Nine** then turns to look at Inter-Regional links and the services that link the four areas with themselves and with the rest of the country.
- 1.10 **Chapter Ten** summarises our findings.

1.11 Eight Working Papers support this report and provide much of the detail:

- WP1 Scenarios;
- WP2 Modelling Approach;
- WP3 Approach to Strategy Development;
- WP4 Background Growth;
- WP5 Option Development;
- WP6 High Resource Scenario;
- WP7 Medium Resource Scenario;
- WP8 Low Resource Scenario.

2. CURRENT POSITION

Routes & Services

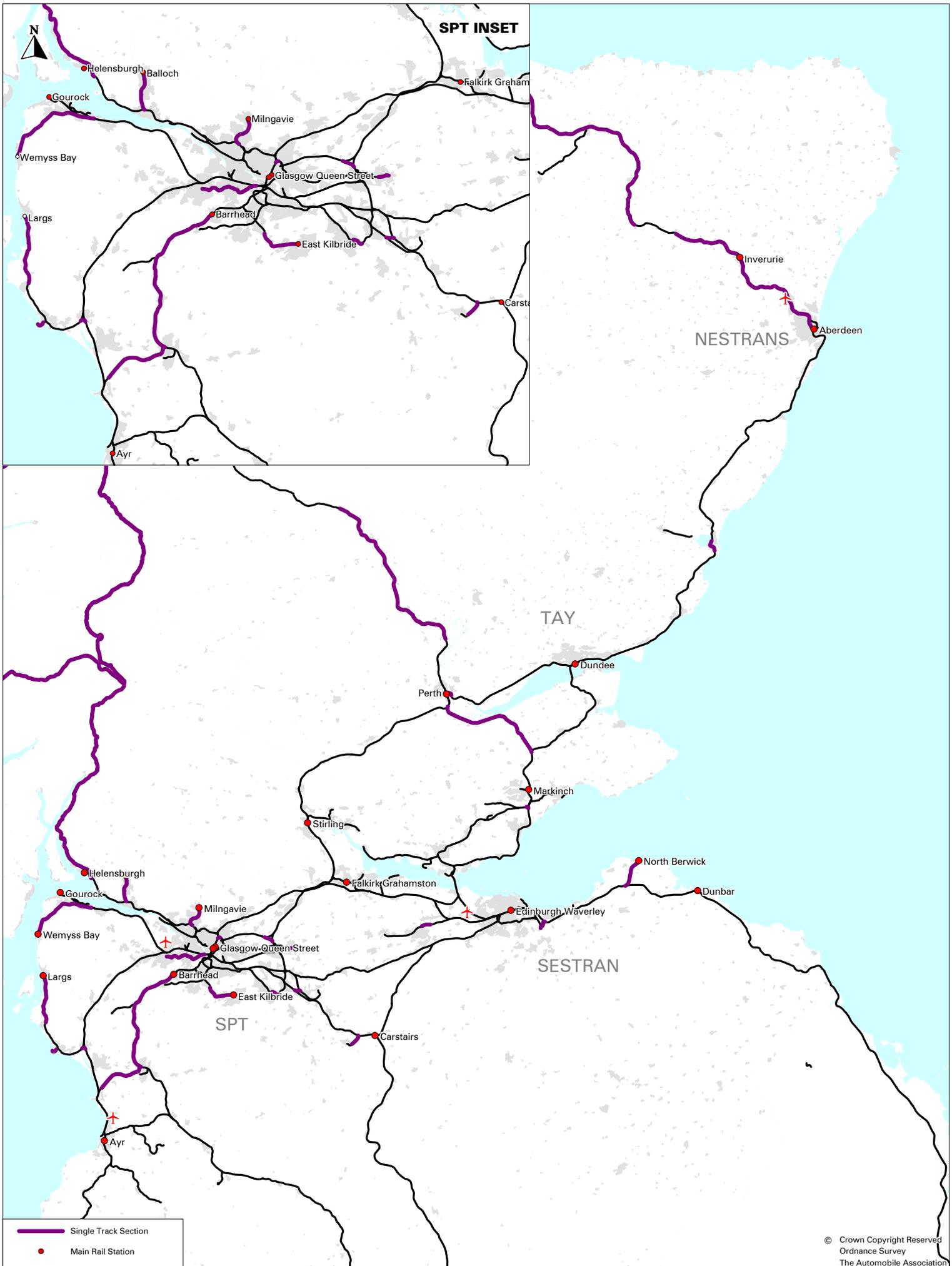
- 2.1 We begin with a brief review of the current network and the services that are operated over them.
- 2.2 Figure 1.1 previously, showed the extent of the network and those sections that have been electrified. Figure 2.1 illustrates which sections of the network are single track.

SESTRAN Area

- 2.3 The SESTRAN area is focused on Edinburgh Waverley station, which comprises four through platforms, (two of which are split in the middle to form two platforms each) and eight bay platforms (seven at the western end, one at the eastern end).
- 2.4 To the east of Waverley the route is the electrified East Coast Main Line, carrying InterCity services to/from England, from which there are branches to North Berwick (electrified) and Newcraighall.
- 2.5 To the west, the line branches several times to form five routes from Edinburgh – clockwise; the electrified line via Carstairs carrying trains from London, the line to Glasgow via Shotts, a partially single track branch to Bathgate, the main line to Glasgow via Falkirk carrying the 15 minute interval Glasgow Queen Street – Edinburgh service and services to Dunblane, Perth and Inverness, and towards the north, the main line via the Forth Bridge carries local services to Fife, along with inter regional express and through services onto Dundee and Aberdeen.
- 2.6 Local rail services operate from Edinburgh Waverley to North Berwick and to Glenrothes or Markinch via Dunfermline or Kirkcaldy (the Fife Circle). The recently introduced Edinburgh Crossrail service runs from Newcraighall to Bathgate and Dunblane. A local service stopping at all stations runs to Glasgow via Shotts.
- 2.7 Inter Regional services comprise a 15 minute interval service to Glasgow Queen Street, with services running most hours to Aberdeen and 6 times a day to Inverness (one each onwards to Thurso and Wick). An hourly service operates south to Birmingham and South Western England, as well as an hourly to half hourly service to London (three starting in Aberdeen, one in Inverness and eight at Glasgow Central). Seven trains a day also run from Edinburgh to the West Coast Main Line, and onwards to the English South Coast via Birmingham.

SPT

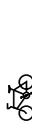
- 2.8 The extensive SPT network is illustrated in Figure 2.2 (reproduced from an SPT produced map). Most of the network is double track, with a number of single lead junctions and single track stretches on branch lines. Sixty-four percent of the network is electrified (Figure 1.1). Inter-regional passenger services (GNER, Virgin, Caledonian Sleeper) share tracks on the West Coast Main Line in the SPT area. The same applies to rail freight.

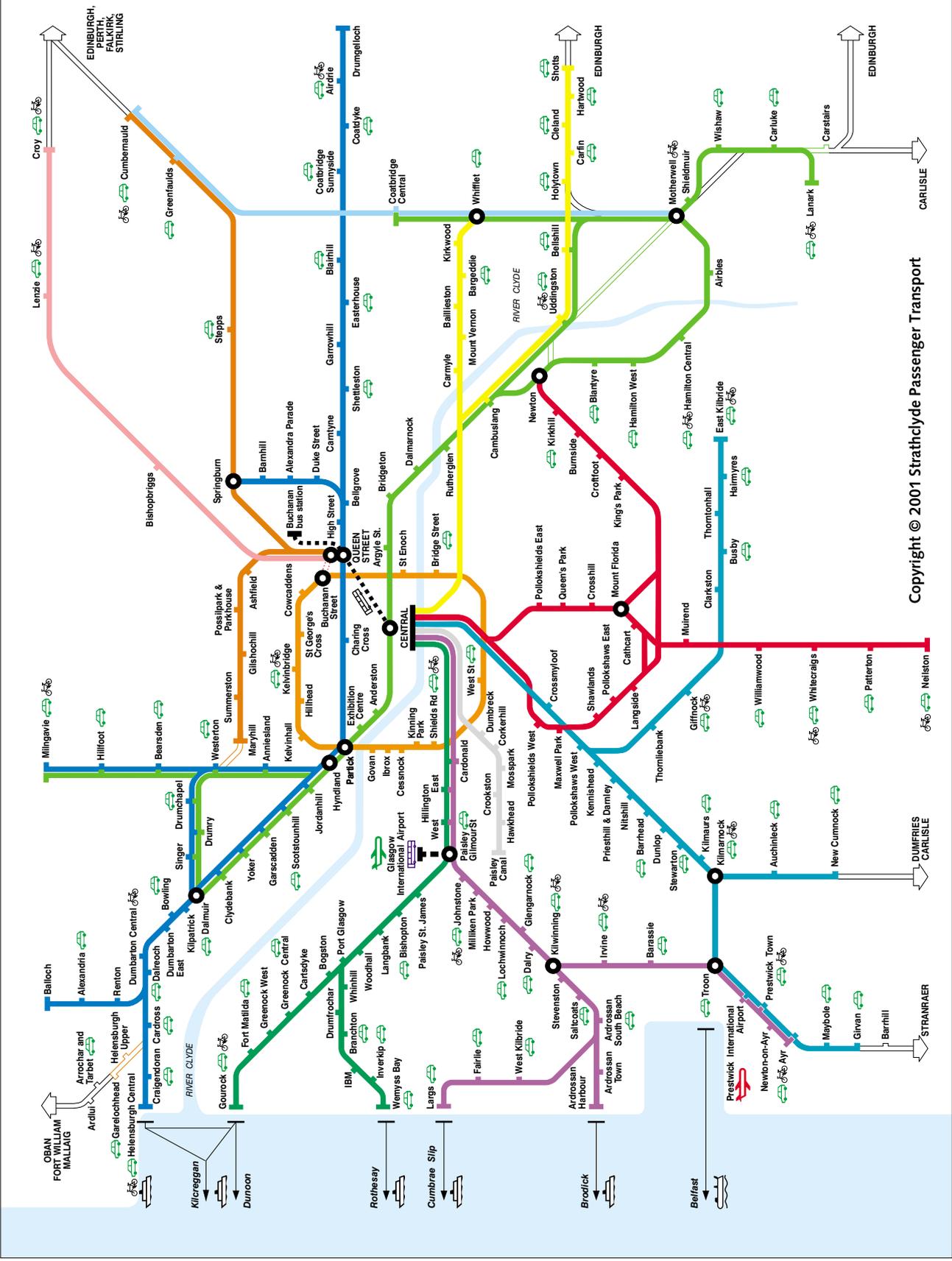


Scottish Strategic Rail Study
Figure 2.1: Single Track Passenger Lines

SPT

Rail network

-  SPT Underground
-  Travelator link between Buchanan Street and Queen Street
-  Airlink bus between Paisley Gilmore Street and Glasgow International Airport
-  Inter-terminal bus link
-  Interchange with ferries
-  Catamaran Troon to Belfast
-  Park-and-Ride station car parks
-  Cycle lockers for hire



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Figure 2.2
SPT Rail Network

- 2.9 Other routes are the Croy Line (shown as pink in the SPT Map in Figure 2.2), which carries trains to Edinburgh via Falkirk, Stirling, Perth, Aberdeen and Inverness, and the Shotts Line (yellow), which runs to Edinburgh. Other lines, which are outside the scope of this study but which are tied into the network are the single track West Highland Line to Oban, Fort William and Mallaig, the predominantly single track line past Ayr to Stranraer, and the mostly double track railway to Carlisle via Dumfries, often used as a diversionary route to the WCML.
- 2.10 The services form an extensive network as shown on Figure 2.2. Most routes are served at a minimum of hourly and many are half hourly, with the exception of the line through Helensburgh Upper (the lower end of the West Highland Line, which was not considered in the study), Carlisle to Carstairs, Kilmarnock to Troon, Kilmarnock to New Cumnock, Ayr to Barnhill and Ardrossan Town to Ardrossan Harbour. Hourly services operate between Greenfaulds and Coatbridge Central, Shotts to Bellshill, Lanark to Motherwell, Langside and Mount Florida to King's Park, Ardrossan South Beach to Ardrossan Town and Port Glasgow to Wemyss Bay.
- 2.11 Long distance services from Glasgow Central run to Edinburgh (8 trains, to London), two trains a day run to Stranraer and eight to Carlisle via Dumfries. Services to England comprise seven trains a day to London Euston and seven to Birmingham New Street (then onwards to either the South or South West of England). ScotRail express services from Glasgow Queen Street comprise a 15 minute interval service to Edinburgh Waverley, an hourly service to Aberdeen and three trains a day to Inverness (one onwards to Kyle of Lochalsh).
- 2.12 There are also three trains per day to Mallaig and Oban.

Tay

- 2.13 The Tay area comprises lines from Dundee towards Perth, Aberdeen and Markinch via the Tay Bridge (thence to the Fife Circle and Edinburgh), and from Perth towards Stirling, Markinch and Inverness. As Figure 2.1 shows, the line from Perth to Ladybank is single track. There is also a single track section from Perth station to Barnhill, across the Tay. There is no electrification in this area.
- 2.14 No local services operate in the Tay area, all stations are served by Inter Regional services. Services from Edinburgh and Glasgow to Aberdeen call at stations around Dundee. These include three trains between Aberdeen and London, and two from Aberdeen and a further four to six from Dundee to Birmingham New Street and onwards to the English South Coast or South Wales. Three trains run between Aberdeen and London. Four trains run only between Dundee and Edinburgh, and one from Carnoustie to Edinburgh.
- 2.15 Perth is served by an hourly service to Aberdeen, and 10 trains a day to Inverness. Additionally, three trains run from Perth to Edinburgh and two from Perth to Glasgow.

NESTRANS

- 2.16 The rail network in the NESTRANS area is principally the main line through Aberdeen. The line south from Aberdeen towards Dundee is double track aside from a

short section between Usan and Montrose, and is single track north of Aberdeen towards Inverness, as shown on Figure 2.1.

- 2.17 No local rail services operate in the NESTRANS area, Inter Regional services operate approximately half hourly towards Dundee, providing an hourly service to Glasgow Queen Street and an approximately hourly service to Edinburgh, with five trains running into England and Wales (three to London, one to Cardiff and one to Bournemouth). Ten trains a day run north to Inverness.

Capacity 'Hotspots'

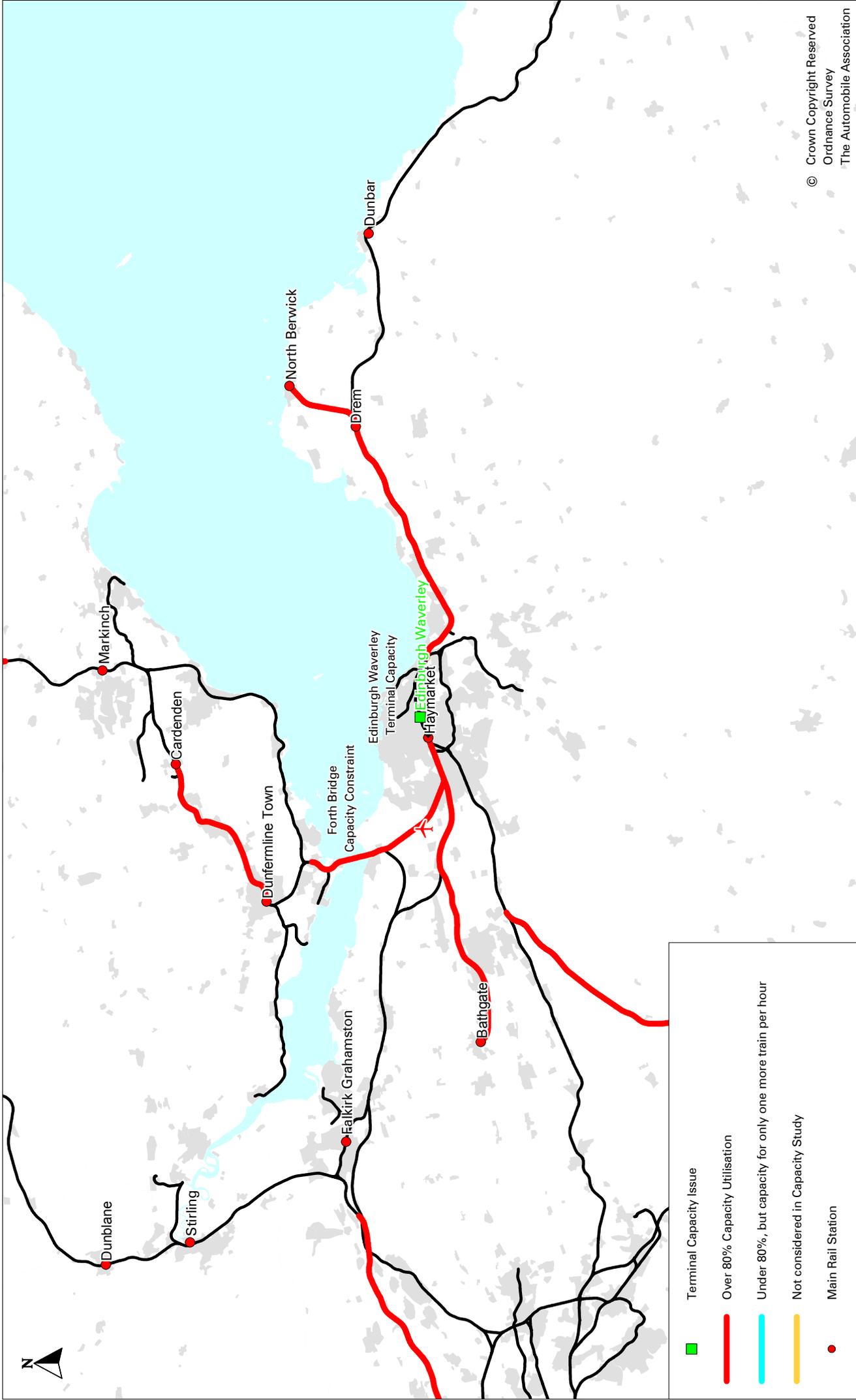
- 2.18 Railtrack in the parallel Capacity Study undertook an analysis of capacity 'hotspots'. This forms the basis of our consideration of capacity constraints on the network. Track sections with over 80% utilisation were identified as 'hotspots.' Similarly, those sections with under 80% utilisation but which can only accommodate an extra train path an hour (for example, sections capable of accommodating three trains an hour and currently carrying two) are highlighted in this section.

SESTRAN

- 2.19 Figure 2.3 shows capacity utilisation in the SESTRAN area. The layout of Edinburgh Waverley station, with a limited number of through platforms, is a major capacity constraint, as are the single track sections of the Bathgate and North Berwick Lines. The lines from Haymarket to Newbridge Junction and the Forth Bridge, from Midcalder Junction to Carstairs, and much of the East Coast Main Line from Edinburgh to Drem are operating at over 80% capacity, along with much of the western half of the Fife Circle.

SPT

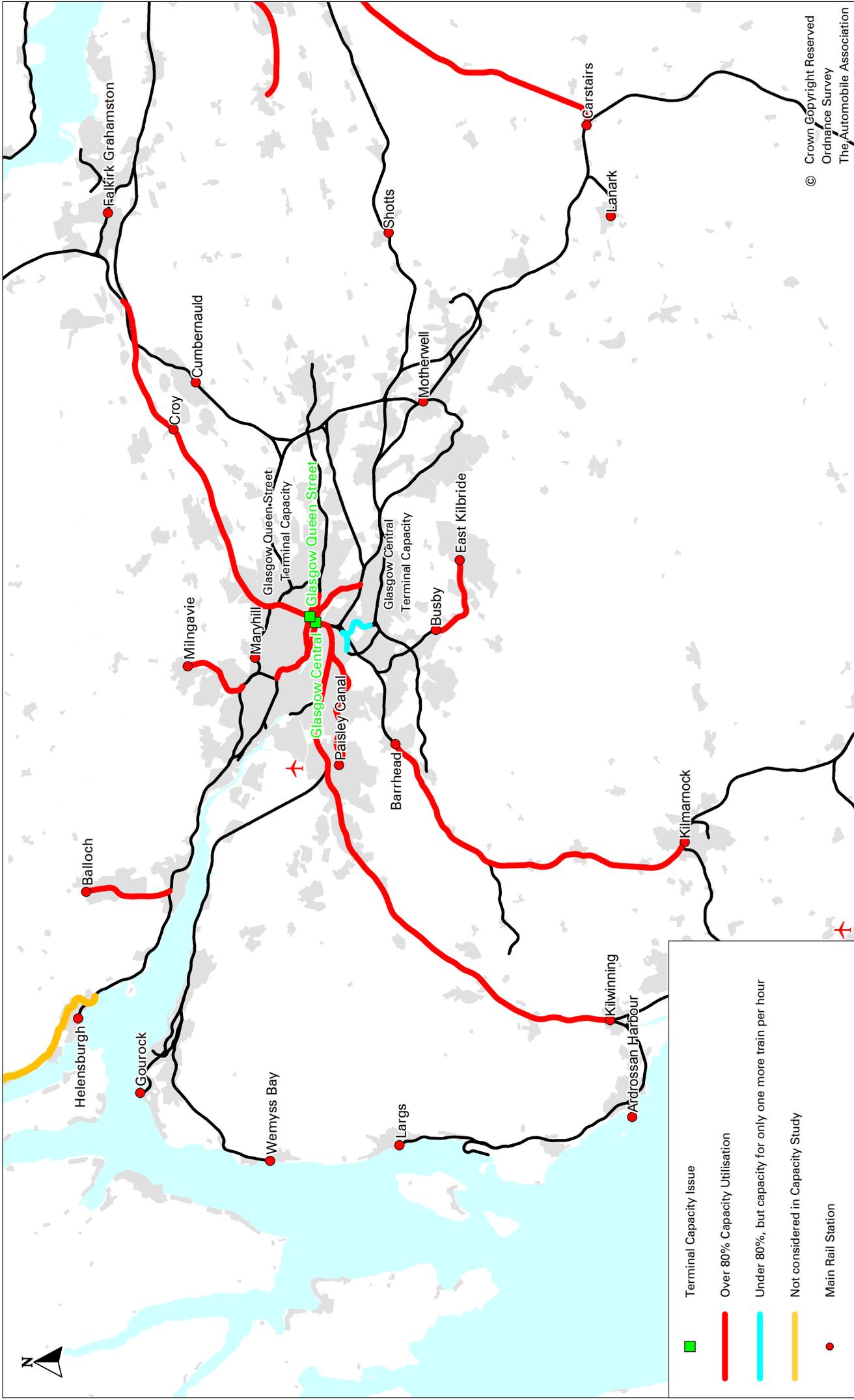
- 2.20 Both Glasgow Central and Queen Street stations have major capacity problems, both are terminal stations with no through platforms. While East – West local services have benefited from low level lines through both Central and Queen Street, which have allowed cross Glasgow services to operate, there has been no such provision on the North – South axis. Figure 2.4 shows the capacity utilisation across the SPT network.
- 2.21 A number of line sections are operating at over 80% capacity, including the central sections of both low level lines, the Milngavie and Balloch branches (both predominantly single track), from Cardonald to Kilwinning, Law Junction (near Carluke) to Carstairs, and Glasgow Queen Street to Croy. Single track sections from Barrhead to Kilmarnock and Thorntonhall to East Kilbride are also running at over 80% of capacity. In addition, the Paisley Canal branch and much of the Cathcart Circle only has capacity for one more train per hour.



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 Figure 2.3: Peak Capacity Utilisation: SESTRAN (source: Railtrack Capacity Study (2001))



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Scottish Strategic Rail Study
Figure 2.4: Peak Capacity Utilisation: SPT (source: Railtrack Capacity Study (2001))

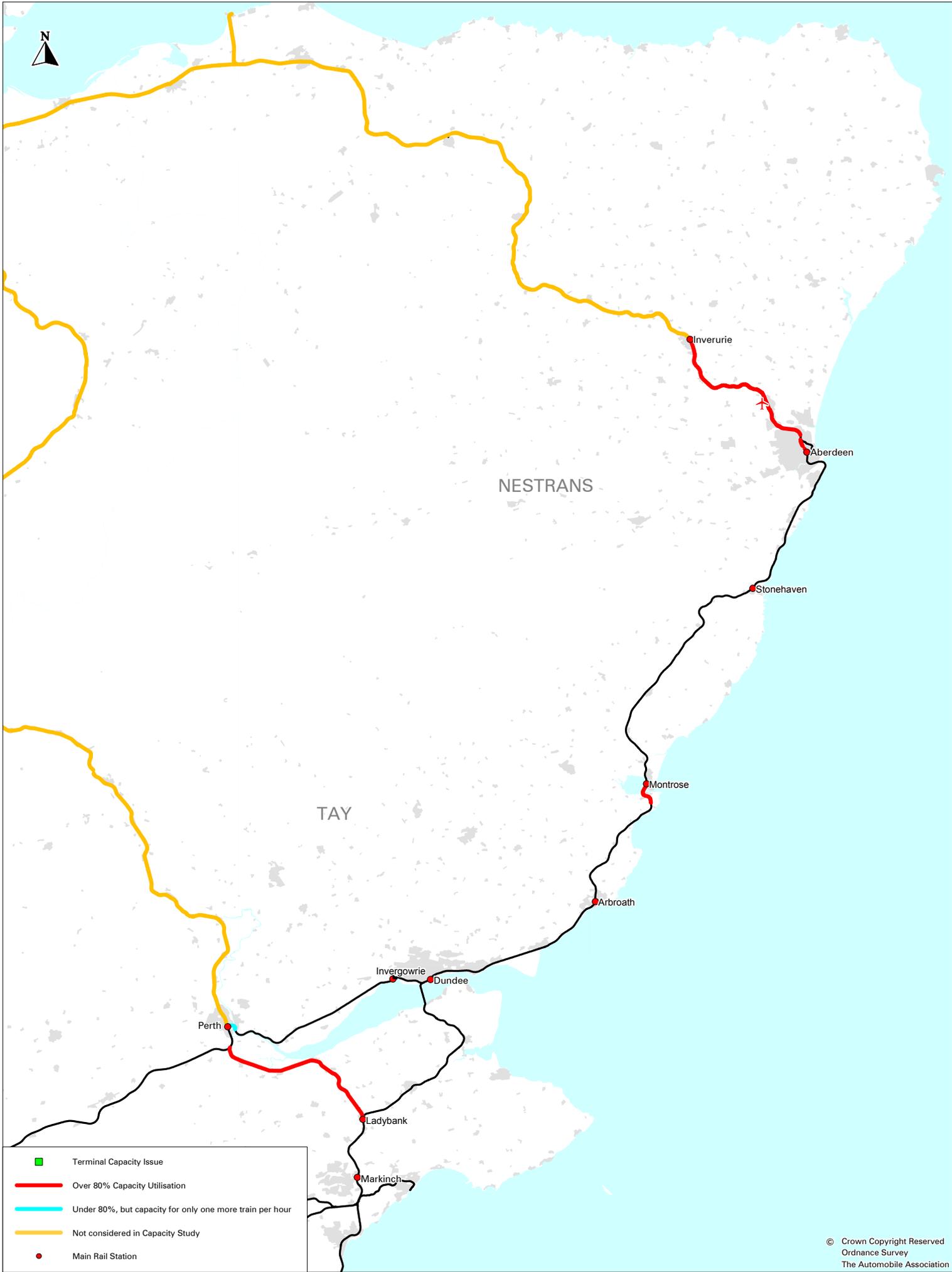
Tay & NESTRANS

- 2.22 In the Tay area, the single track lines from Perth to Ladybank and Usan to Montrose are operating at over 80% capacity, and the single track section from Perth to Barnhill (towards Dundee) only has capacity for one more train an hour.
- 2.23 The single track line from Aberdeen to Inverurie is operating at over 80% capacity. North of Inverurie was not considered in the Railtrack Capacity Study, but this route acts as a constraint to the development of enhanced services in the Aberdeen area.
- 2.24 Figure 2.5 shows the locations of capacity constraints in the Tay and NESTRANS areas.

Demand

- 2.25 Rail usage data has been extracted from the CAPRI database provided by ScotRail for the financial year 1999/2000⁴. This provides an overview of the main patterns of movement which we report in Table 2.1 below.
- 2.26 This shows that there were around 54 million rail journeys to/from and within the study area in 1999/2000 of which just under 48m are wholly within the study area. The western end of the central belt dominates the figures –with the SPT area accounting for nearly two thirds of the trips. Indeed this figure is an underestimate, as CAPRI data does not include multi-modal tickets in the SPT area, (eg Zonecard and Day Tripper). The study team were provided with an estimate of this market, equivalent to 2.7m trips per year, which are included in the table below and incorporated into all subsequent analysis (WP4). However, even this may prove to be an underestimate as Scottish Transport Statistics 1999/00 indicate that there are 43m trips within the SPT area alone – compared to the figure of just under 33m in Table 2.1 below (see footnote 5 for the implications of this).
- 2.27 Whilst trip making on the SPT network is very self contained, the two smallest networks, Tay and NESTRANS, unsurprisingly have the highest proportion of trips between themselves and other parts of the study area or beyond.

⁴ 1999/2000 data was selected in order to eliminate the distortions caused by the drop in rail usage in the aftermath of the Hatfield rail accident and the gauge corner cracking repair work by Railtrack during 2000 -2001



Scottish Strategic Rail Study
 Figure 2.5: Peak Capacity Utilisation: Tay & NESTRANS Areas (source: Railtrack Capacity Study (2001))

TABLE 2.1 1999/2000 ANNUAL DEMAND (000's) BY AREA

Origin	SPT	SESTRAN	Tay	NESTRANS	Rest of Scot	Eng & Wales	Grand Total
SPT	32,713	2,136	135	132	240	818	36,174
SESTRAN	2,136	8,046	288	165	110	1,401	12,147
Tay	135	288	421	118	33	144	1,139
NESTRANS	132	165	118	650	108	146	1,320
Rest of Scotland	240	110	33	108			492
England & Wales	818	1,401	144	146			2,509
Grand Total	36,174	12,147	1,139	1,320	492	2,509	53,782

Source: CAPRI data plus an allocated estimate of 2.7m passengers on various travel card types in the SPT area. NB there are estimated to be a further 10m of such passengers in the SPT area which are not included in these figures.⁵

- 2.28 In the east of the central belt, rail travel into the SESTRAN area and travel originating out of it is about 1/3 the scale of that to/from the SPT area. The rail network in terms of the Edinburgh travel to work area is a lot smaller and less dense than the equivalent for Glasgow, although the commuting and catchment area extends along the rail corridors both east and west in the central corridor and to the north into Fife.
- 2.29 Table 2.2 shows the journey purposes for which rail is used and the passenger miles carried. In terms of journeys made within Scotland, commuting and leisure travel are almost equivalent in scale, although when trips to from England & Wales are taken into account leisure travel begins to dominate. Business travel accounts for just under 8% of trips within Scotland.

⁵ The implications of this underestimation on the SSRS demand and benefit forecasts are described in WP2 and summarised below:

- i) Demand and benefit estimates for services that do not serve the SPT area will not be affected (i.e. Tay, NESTRANS, SESTRAN services).
- ii) Demand and benefit estimates for new stations will not be affected (as a separate trip generation model is used).
- iii) Demand and benefit estimates for the peak hour impact analysis and the level of capacity constraint will not be affected (in absolute terms). This model is independent of the CAPRI matrix in the SPT area as it has been developed from SPT train service counts.
- iv) Demand and benefit estimates for the rail links to the airports will not be affected as this data is derived from the airports study.
- v) Demand and benefit estimates for new links where data has been extracted from CSTM3 (e.g. cross-city tunnel) are partially affected. The demand itself will be unaffected (as it is extracted from an external source), however, the overall level of benefit will alter as there may be some re-distribution of benefit from new users to existing users.
- vi) Demand and benefits for improvements to SPT lines that already have existing SPT services will be affected (e.g. increases in frequency). A larger base demand will increase the absolute level of new users and therefore increase the absolute level of benefit.
- vii) The forecasts of the network overall uplift in demand will be affected. The exact effect is difficult to predict as there would be two opposite forces at work. The higher base demand will give rise to more new users for improvements to existing services (point (vi) above), whilst lowering the new users for schemes such as the Glasgow city tunnel where data has been extracted from the CSTM3 (point (v) above).

- 2.30 There is a great variation in average trip length from 15 miles for trips into Glasgow (from within Scotland) to 107 miles for all trips to Aberdeen from within the whole of Britain.

TABLE 2.2 SUMMARY OF EXISTING RAIL DEMAND (2000)

	2000 Existing Demand			
	Passenger Journeys		Passenger Miles	
	Annual Journeys between Study Area and all parts of Scotland in base year (millions)	Annual Journeys between Study Area and all parts of Scotland, England and Wales in base year (millions)	Annual Passenger Miles between Study Area and all parts of Scotland in base year (millions)	Annual Passenger Miles between Study Area and all parts of Scotland, England and Wales in base year (millions)
Total in Study Area	48.7	53.7	925.8	2,411.7
Commuting	22.6	22.7	337.7	375.0
Business	3.7	4.6	87.2	345.3
Leisure	22.4	26.4	500.9	1,691.4
Into Key Destinations				
Glasgow	20.6	21.2	313.5	511.8
Edinburgh	6.8	8.3	211.2	605.3
Aberdeen	0.9	1.0	58.8	107.5
Dundee	0.5	0.5	19.1	45.1

3. THE IMPLICATIONS OF DOING NOTHING

- 3.1 The starting point for the development of the strategy is to consider what the future would hold in the absence of the strategy and a key question to address is what level of demand for rail travel should we expect to have to cater for in the future? It is also necessary to define what changes to the infrastructure and services are expected to be in our do-nothing (or more strictly our ‘do-minimum’) future. This is set out in Table 3.1.

Do-Minimum Definition

TABLE 3.1 DO MINIMUM DEFINITION

Type	Definition
Service Levels	2002 Summer timetable ⁶ No change beyond above for all future years
Fare Levels	RPI-1% for regulated fares (up to 2010 – no change post 2010) No real change for other fares
Committed New Stations	Edinburgh Park (2005)
Committed New branches/routes	Stirling/Alloa (2010) Larkhall extension (2005)

- 3.2 In addition to the schemes detailed in Table 3.1 the do-minimum also includes an upgrade to Edinburgh Waverley to accommodate the ECML upgrade. This has been described as Edinburgh Waverley Option 1, and whilst it is necessary to facilitate the upgrade it does not create any more capacity. As a consequence this assumption has no implication for the demand forecasts, however, it does have an implication for the incremental capital cost of the scenarios examined. This issue is referred to in more detail in Working Papers 6 and 7.

Do-Minimum Background Growth Forecasts

- 3.3 When using the term ‘background growth’ we are referring to growth in demand which is due to factors external to the actions of the rail industry itself. It therefore includes socio-economic factors such as income growth, employment growth and demographic shifts, as well as competitive factors such as growth in car ownership, increases in congestion levels and the actions of the bus, coach and airline industries.
- 3.4 It therefore excludes the contribution that can be made by actions taken by the rail industry (service levels, pricing etc), and it excludes the impact of policy measures such as road pricing in the City of Edinburgh or other measures to restrain car traffic.

⁶ It is assumed that there is no change in service frequencies between Winter 2000 and Summer 2002 timetables due to a mixture of (a) Hatfield and (b) ScotRail industrial dispute. The exceptions are (i) twice daily Carstairs to Edinburgh service, and (ii) Edinburgh Crossrail

- 3.5 The forecasts presented here are therefore best thought of as a do-minimum scenario, ie “if we do nothing beyond what is already committed, this is what is expected to happen.”
- 3.6 In order to forecast background growth we have used the Rail Industry Forecasting Framework (RIFF) Model to develop a model for the study area. The RIFF Model was developed as a result of an extensive Association of Train Operating Companies (ATOC)/Railtrack funded study into rail growth trends, focusing particularly on understanding trends for the five years up to 1999.
- 3.7 The RIFF model is based upon a 1999/00 CAPRI demand matrix of 614 x 614 micro zones – groupings of stations - incorporating journeys and revenue from all UK rail stations split by five ticket types (full fare, seasons, reduced – walkup, reduced – advance, miscellaneous). Demand ‘drivers’, things that will result in changes in the demand for rail travel, that are explicitly recognised in the model are;
- Population;
 - Households;
 - Employment;
 - Car ownership;
 - GDP;
 - Road Congestion.
- 3.8 Working Paper (WP) 2 provides an overview of the model structure and WP 4 details the inputs and findings. The ‘planning data’ used in the Main Scenario model is consistent with the CSTCS analysis. A ‘variant’ scenario which used national planning data forecasts rather than the Glasgow & Clyde Valley Structure Plan data used in CSTCS was also prepared (WP1 for more details).

Unconstrained Growth

- 3.9 Table 3.2 shows the forecast growth (in percentage terms) between 2000 and 2020 throughout the study area.

TABLE 3.2 FORECAST GROWTH TO 2020 IN PASSENGER JOURNEYS AND MILES - MAIN SCENARIO

	Growth from 2000 to 2020 (%)			
	Passenger Journeys		Passenger Miles	
	Journeys between Study Area and all parts of Scotland	Journeys between Study Area and all parts of Scotland, England and Wales	Passenger Miles between Study Area and all parts of Scotland	Passenger Miles between Study Area and all parts of Scotland, England and Wales
Total Growth in Study Area	39%	41%	34%	61%
Commuting	12%	12%	7%	8%
Business	46%	47%	36%	58%
Leisure	64%	66%	51%	74%
Trips into Key Destinations				
Glasgow	46%	47%	41%	62%
Edinburgh	34%	42%	32%	79%
Aberdeen	13%	17%	25%	34%
Dundee	18%	21%	22%	37%

- 3.10 Overall, rail trips within and to/from the study area and the rest of Scotland are forecast to increase by 39% between 2000 and 2020 (41% if trips to/from England & Wales are included). Most of the growth is expected to come from the leisure market where growth in the order of 64% over 20 years is forecast. Commuting, on the other hand, is expected to grow at a much lower rate.
- 3.11 Within the study area, Glasgow is forecast to witness the highest passenger growth rates –fuelled largely by the economic planning assumptions within the Glasgow & Clyde Valley Structure Plan (GCVSP). In terms of passenger miles the growth in long distance travel to England & Wales gives Edinburgh the highest growth in passenger miles.
- 3.12 To test the degree to which the GCVSP economic planning assumptions are driving the forecasts a Variant Scenario was developed. This used the Department of Transport/Scottish Executive TEMPRO planning data assumptions throughout the study area. The background growth that RIFF forecasts when using this TEMPRO data is shown in Table 3.3. This shows how significant the GCVSP data is. With the TEMPRO data, overall growth in the study area would be much reduced at 19% with the growth in travel to Glasgow reduced from 46% to 26% and to Edinburgh from 34% to 19%. The latter figure might appear higher than expected given that the GCVSP planning data does not effect planning data in Edinburgh, but it reflects the fact that a significant proportion of travel *into* Edinburgh comes from areas in the west of the Central Belt (ie areas affected by the GCVSP forecasts).

TABLE 3.3 FORECAST GROWTH TO 2020 IN PASSENGER JOURNEYS AND MILES - VARIANT 1A (TEMPRO PLANNING DATA) SCENARIO

	Growth from 2000 to 2020 (%)			
	Passenger Journeys		Passenger Miles	
	Journeys between Study Area and all parts of Scotland	Journeys between Study Area and all parts of Scotland, England and Wales	Passenger Miles between Study Area and all parts of Scotland	Passenger Miles between Study Area and all parts of Scotland, England and Wales
Total Growth in Study Area	19%	22%	17%	47%
Commuting	8%	8%	6%	7%
Business	17%	22%	13%	42%
Leisure	30%	34%	25%	56%
Trips into Key Destinations				
Glasgow	26%	28%	25%	52%
Edinburgh	19%	30%	16%	74%
Aberdeen	6%	10%	9%	25%
Dundee	9%	14%	9%	32%

3.13 To ensure consistency with the other Scottish Executive studies, the CSTCS and Rail Links to Airports studies the analysis reported in the rest of this document is based upon the adoption of the higher, Main Scenario, background growth forecasts. The implications of this decision are discussed in Chapter 10.

Peak Hour Overcrowding – Constrained Demand

3.14 These forecasts are, however, ‘unconstrained’ in that they are not limited by the availability of capacity to carry the additional passengers.

3.15 A ‘Peak Hour Capacity Impacts Model’ has been developed to capture the impacts that peak hour passenger overcrowding has upon background growth in rail demand. This model is then used subsequently to assess the level of benefit which accrues if this overcrowding is relieved.

3.16 The model functions by calculating background growth in passenger loadings for each of the forecast years and the extent to which this increases overcrowding. Using Passenger Demand Forecasting Handbook (PDFH) recommendations the implied generalised journey time equivalence of this crowding increase can be calculated for each line. This is then used to calculate a reduction in demand for each of the forecast years due to the implied generalised time increase for each relevant OD pair in the future demand matrices.

3.17 The impact of peak hour overcrowding is an overall reduction in do minimum demand of 468,000 journeys in 2010 and 1.52 million journeys in 2020 compared with the unconstrained background growth forecasts. This is illustrated by area in Table 3.4 below.

TABLE 3.4 OVERCROWDING IMPACTS UPON DO MINIMUM PASSENGER JOURNEYS (000 's per year)

		2010	2020
SPT	Unconstrained	38,475	47,228
	Constrained	38,244	46,353
	Difference	-231	-875
SESTRAN	Unconstrained	8,965	10,431
	Constrained	8,842	9,975
	Difference	-123	-456
Inter-regional	Unconstrained	6,710	7,979
	Constrained	6,641	7,790
	Difference	-69	-189

Summary

- 3.18 It is clear from the preceding analysis that the pressure on the rail network is expected to grow very considerably over the next twenty years, simply from factors outside of the control of the rail industry. Not having a strategy for the railways is not an option for this reason alone. However, the real opportunity for the railways and the planning authorities is how to capitalise on this expected demand growth and to develop a strategy that builds upon this such that the railways can play a greater role in the achievement of national and local objectives. Our approach to developing such a strategy is described in the next chapter.

4. APPROACH TO STRATEGY DEVELOPMENT

Overview

- 4.1 Our approach is objectives-led. We begin by asking what it is we are trying to achieve and how we would measure achievement, before considering the types of schemes that could help us achieve these objectives
- 4.2 We therefore begin (WP3) by defining high level “overarching objectives”, which can be thought of as a “*vision for rail*”. We then define the *strategic outcomes* which must be achieved to attain the vision. From this, more operational objectives (*planning objectives*) have been developed. These are then refined at the regional level and made Specific, Measurable, Attainable, Relevant and Timed (SMART) by considering targets or *benchmarks* for each planning objective (WP5).
- 4.3 Once we have our objectives and a framework for measuring their achievement we have then considered a range of projects and/or policies that could be tested against them. The projects have been combined into a number of *scenarios* (WPs 6, 7 and 8) in order to test their interactions. To test these scenarios a series of *forecasting and appraisal models* have been developed.
- 4.4 We describe each of these stages briefly here –more detail can be found in the various working papers.

The Vision for Rail

- 4.5 The Scottish railways must contribute towards the achievement of:
- the Scottish Executive’s three over-arching objectives, namely a strong economy, an inclusive society and a clean environment; and
 - the Executive’s aim of developing a sustainable, effective and integrated transport system.
- 4.6 The rail system in Scotland must play a positive role within the overall provision of passenger and freight transport towards the achievement of these objectives. It will do so by meeting the transport needs of businesses and individuals, by reducing the impact of travel on the environment and by enabling better accessibility to travel opportunities. The provision of passenger rail services and associated facilities will also help to shape demand for land use and development, especially within a context of rising demand for housing, pressure on the urban fringe and the overall objective of reducing car traffic.
- 4.7 The vision statement developed with the study steering group is as follows:

The rail system will fully support the economic, social and environmental aspirations of the study area's citizens. Rail passenger services will be of a scale and quality that rail will increasingly become a more viable, practical, affordable and attractive travel choice for passengers in and between the urban areas of Central and North East Scotland, and will become at least as attractive as the private car for an increasing proportion of travel over the next ten years and beyond. As a consequence, the rail network will carry an increasing proportion of peak and off peak travel within the context of sustained growth in travel demand. Rail freight services will similarly be enhanced to play an increasing role in the primary and secondary distribution of goods. The development of rail will represent value for money for users, operators and the taxpayer.

Strategic Outcomes

- 4.8 Achieving the vision will depend upon the achievement of a number of critical outcomes. In order to define these outcomes we need to gain an understanding of the key issues surrounding rail which affect its ability to meet the overarching objective.
- 4.9 The starting point is to examine the strengths and weaknesses of the present system and its interface with the travel market, and to consider the opportunities for future development in the face of competitive threats from alternative travel modes. By looking at both opportunities and threats, the aim is to avoid an overly problem centred approach which is inappropriate when considering the medium to longer term horizon and given the overarching objectives.
- 4.10 This SWOT analysis – strengths, weaknesses, opportunities and threats - is shown as Table 4.1. This is shown here at the national⁷ level and is based on the results of the Executive's Consultation on Strategic Priorities for the Railways, the Railtrack review of capacity, our review of Local Transport Strategies and the background growth forecasts presented in Chapter Three.

⁷ SWOT statements have also been developed at the regional level in order to help identify the balance between strategies at a more local level. These are reported later and are shown in detail in Working Paper 3 Appendix A.

TABLE 4.1 SWOT ANALYSIS (STUDY AREA LEVEL)

<p>STRENGTHS</p> <p>good main line links and through services in parts of the network</p> <p>long distance links between central belt and the north east</p> <p>extensive suburban network in SPT area</p> <p>multiple routes in Glasgow – Edinburgh corridor</p> <p>limited number of train operating companies (and one main passenger TOC)</p> <p>substantial improvements have taken place in facilities management</p>	<p>WEAKNESSES</p> <p>limited core network outside SPT area</p> <p>bottlenecks which limit throughput and service frequency in key parts of urban networks</p> <p>poor reliability affects performance and market acceptability</p> <p>lack of critical information when service problems arise</p> <p>problems of access to information</p> <p>cancellations and short trains at peak affect market acceptability for commuter trips</p> <p>lack of train capacity especially at peak</p> <p>high prices to match demand to capacity where constraints exist</p> <p>disabled access does not fully meet legislation</p>
<p>OPPORTUNITIES</p> <p>rail will play important role in both short and long distance movements within Executive's Transport Delivery plan</p> <p>new funding from road user charging in SESTRAN area</p> <p>links to new developments and role in attracting high value land uses</p> <p>potential for funding associated with new developments</p> <p>growth in potential user base</p> <p>some scope for new services</p> <p>some potential for new stations / routes</p> <p>refranchising / restructuring</p>	<p>THREATS</p> <p>loss of passenger market share at least in short term</p> <p>adverse economic and demographic changes in declining areas</p> <p>issues of public confidence relating to performance and safety</p> <p>lack of integration between land use policy and areas served / potentially served by rail</p> <p>impacts of constraints in cities on rest of network</p> <p>lack of capability will constrain economic role of cities</p> <p>lack of organisational stability</p> <p>lack of capacity will constrain rail growth</p>

4.11 Based on this SWOT, three generic, strategic outcomes can be stated for the overall study area, namely:

- expanding the capability of the existing system;
- making rail use easier for the customer;
- developing new markets for rail.

4.12 The rationale for these three strategic outcomes is as follows.

4.13 *To expand the capability of the existing rail system*; there is a large network which suffers from bottlenecks and other constraints which affect its ability to deliver services. The market is also deterred from using rail because of problems such as overcrowding which is linked to issues of track capacity and capability. In some parts of the existing system travel by rail is therefore suppressed through lack of 'capability' – capacity in some areas, long journey times in other areas and poor service levels in other areas.

- 4.14 *To make rail use easier for the customer – both passengers and freight*; potential demand is suppressed by a number of factors such as poor service reliability, lack of information, unsympathetic customer relations, poor modal interchanges and lack of car parking at stations: improving these interfaces should expand demand and might increase the markets willingness to pay for services.
- 4.15 *To develop new markets for rail*; there are some opportunities to expand the network and to provide new services, and to provide better rail access for some communities. The need is to identify where there is scope to develop viable passenger services and / or to achieve wider objectives, and how suitable schemes can be progressed within realistic timescales. There are also issues of expanding the customer base to enable more people currently excluded to use rail.

Planning Objectives

- 4.16 Given the strategic nature of the foregoing outcomes, it is useful to develop a lower level of planning objectives that can be made SMART. We have therefore ‘operationalised’ the strategic outcomes and the respective planning objectives are shown in Table 4.2. The planning objectives set out in more concrete terms the key outputs that need to be achieved to deliver the strategic outcomes.
- 4.17 The planning objectives shown in Table 4.2 are intended to be comprehensive and to a large extent applicable to all areas; the specific objectives for each area (SESTRAN, NESTRANS etc) and intra regional movements are intended to be sub-sets of these, reflecting the particular issues within / between regions.

TABLE 4.2 PLANNING OBJECTIVES

STRATEGIC OUTCOMES	PLANNING OBJECTIVES
expanding the capability of the existing system	improve journey reliability improve journey quality increase overall carrying capacity increase service frequencies reduce overall journey times
making rail use easier for the customer	deliver enhanced customer care improve intermodal access to / from rail reduce the relative cost of rail – as experienced by the user / potential user
developing new markets for rail	reach communities and businesses currently without access to the network change attitudes towards rail travel

- 4.18 These planning objectives are essentially market or customer driven, rather than supplier driven. This is important as it reflects the fact that rail has to compete for market share against other modes, and within a large number of market segments which include:
- commuting / travel to work;
 - longer distance business travel;
 - leisure / day trip travel, including shopping trips;

- tourism – staying visitors, part of which is a group travel market.

4.19 Adopting a market based perspective also provides us with an approach which is traceable to market research and in particular to consultation undertaken by the Executive.

Generic Strategies

4.20 In order to achieve the planning objectives, it is necessary to devise strategies, which will define how the planning objectives will be achieved. As will be apparent, there are links between these strategies reflecting the fact that rail is a system rather than a single corridor. Therefore in looking at priorities, the aim is to identify key strategic themes or thrusts rather than discrete strategies as described here; these themes will contain elements of other strategies, as described below.

4.21 We begin at the national level where the generic strategies are described below and the interaction between strategies and planning objectives (outcomes) shown in a matrix for each strategic outcome. The strategies are then subsequently developed for lower spatial levels as area/regionally based strategic themes or thrusts. Working Paper 3 describes the rationale and process in more detail

4.22 Table 4.3 summarises the generic strategies which are intended to be all encompassing but not area / region specific.

TABLE 4.3: GENERIC STRATEGIES BY STRATEGIC OUTCOME

				Strategic Outcomes (Ends)		
				<i>Expanding the capability of the existing rail system</i>	<i>Making rail use easier for the customer</i>	<i>Developing new markets for rail</i>
Generic Strategies (Means)	Address network constraints	Staff customer relations	Open new stations on existing routes			
	Increase capacity per train	Information provision	Develop freight facilities			
	Expand amount and availability of rolling stock	Access from other modes – car / bus / HGV	Marketing to business customers / intermediaries			
	Improve rolling stock quality	Ticketing and pricing	Marketing to personal buyers			
	Support infrastructure and programmes		Develop new rail products / packages			

Defining Benchmarks and Aspirational Targets

4.23 The Executive and its partners will need to be able to measure the performance of the strategy in terms of meeting these planning objectives and this obviously requires that they can be measured. Furthermore, we need to reflect that the aspirations for performance in the future are likely to increase. A central feature of modern society is

the continual growth in its aspirations, in all facets of life. Planning services, in the longer term, needs to reflect the likely aspirations of the potential users, for two main reasons:

- unless services are provided at the expected levels, they will not be used effectively;
- service development and investment over the plan period has to be sufficiently resourced to meet future levels of expectation, and a basis of judging this resource level is essential.

4.24 A set of benchmarks has therefore been developed for each of the regions⁸ in the study area (summarised in Chapters 5 to 9 but discussed in detail in WP5). These benchmarks reflect knowledge about passenger aspirations and desires as well as the strengths and weaknesses of the rail network and they are a necessary step in developing packages of schemes that address the planning objectives.

4.25 Quantitative data is needed to make a planning objective SMART. Within the context of this strategic study, data is not available for all the planning objectives, it was however considered important to develop targets for all the objectives to ensure that the focus of the proposed plans (project packages) was not overly biased towards those objectives for which quantitative data are available (e.g. train frequency). For objectives for which no or little data is available (within the context of this study) a broad pragmatic target has been identified.

4.26 Whilst they are necessarily ‘aspirational’ at this stage they nevertheless serve both the purposes indicated above.

Defining Projects and Programmes – Scenario Testing

4.27 An examination of projects that are currently being promoted by any particular body has indicated that there are a very large number of projects at varying levels of scale and stages of planning development. This potentially raises a number of problems:

- appraisal of individual projects risks failing properly to address the potential synergies between projects, which would distort the value of some projects;
- there are small projects which could be very difficult to appraise meaningfully

4.28 Accordingly there is a need to produce groupings or packages of projects.

4.29 An examination of the projects suggests that the major impacts will come from a relatively small number of very large projects (e.g. Edinburgh Waverley, cross rail in Glasgow and addressing bottlenecks at certain junctions). However, these are not “quick wins”. Some or all of these large projects will feature in each future option and therefore within any packages of projects – probably with different timings / scheduling depending on resources. These large projects are also relatively discrete, in

⁸ These aspirational benchmarks have been developed firstly at the national (study area) level but have been adjusted in each of the regions to reflect local differences in current performance, or standards, and the priorities for each region.

that it is not possible to do fractions of the specific projects; therefore the number of large project scenarios is limited, which is useful for the study process.

- 4.30 In contrast, the smaller schemes are, in the main:
- complementary to the large projects – i.e. there will be synergies;
 - variable in scale, in that it is possible to do parts of projects;
 - ‘ground’ side rather than rail side, so they can be implemented by organisations which are not part of the rail industry.
- 4.31 Many small rail side schemes are “soft” and can be implemented quickly, and so there is a need to look at complementarity with quick win ground side schemes such as car parks. Scaling of some smaller projects can be achieved, for example by
- varying the coverage of projects by area, by differentiating the levels of provision by area: this involves applying spatial priorities;
 - varying the quality of provision from “Rolls Royce” provision to “adequate”.
- 4.32 Our approach, set out in Working Paper 5 has therefore involved the identification of:
- major facilitating projects (and the scale of these projects) for each of the four regions and the inter-regional groupings;
 - the ability of the smaller projects to add value to the major schemes – the potential synergies / complementarities;
 - the technical links between projects – such as longer trains needing longer platforms.
- 4.33 The nature of the synergies between the projects, particularly between major facilitating projects and smaller projects, is such that the demand forecasting and economic evaluation has been undertaken using three scenarios. The definition of these scenarios is set out below.
- 4.34 **High Resource Scenario:** includes all major facilitating projects and a package of schemes that potentially could be associated with these major facilitating projects. These scheme packages reflect the planning objectives, stakeholder aspirations, findings from parallel studies (the CSTCS and the rail links to Glasgow and Edinburgh airports study) and to a certain extent operational feasibility. As the study is strategic in nature the packages have not been fully optimised either operationally or from a planning objective or value for money viewpoint. Consequently it should be noted that the exclusion of any particular “small” project from the high resource scenario does not preclude it from further consideration.
- 4.35 **Medium Resource Scenario:** includes a **single** major facilitating project in each area and a package of schemes associated with that major facilitating scheme. The results from the high resource scenario are used to inform the composition of that package. Again it should be noted that these associated packages have not been fully optimised and the exclusion of a smaller project from the package need not preclude further investigations into its feasibility.

- 4.36 **Low Resource Scenario:** does **not** include any major facilitating projects, nor does it include any substantial capacity upgrades to the rail network. The low resource scenario concentrates primarily on what could be done within the constraints of current track capacity.

The Forecasting Models

- 4.37 The modelling methodology used to produce the demand and revenue forecasts for the scenarios presented in the following chapters is described in some detail in WP 2. The main models used are briefly summarised here.
- 4.38 In order to forecast demand between existing stations on existing routes a *TRIPS-based rail network model* has been used. This model covers all of the routes in Scotland and has a representation of the network in England and Wales. It uses a base demand matrix from CAPRI (all stations) and a base rail service matrix from the Train Services Database (again, all services in Scotland and those entering or leaving the country). These are used in order to calibrate base demand and base generalised journey times (GJT) between each origin / destination (O/D) pair. Demand changes due to frequency changes and/or journey time changes are calculated by inputting a new service matrix from which a new GJT matrix is calculated. The ratio of new GJTs to base GJTs for each O/D pair is applied with an elasticity of -0.9^9 to generalised journey time in order to produce a factor by which demand is uplifted/reduced for each O/D pair.
- 4.39 Forecasting demand on *new lines or for new stations* has been undertaken using either existing models or new analysis. Where the proposals for new stations or new lines lie within the study boundary of an existing model, outputs from this model have been used. Therefore for schemes such as the City Union Link / Strathbungo Link / St John's Link or the Airdrie to Bathgate line re-opening the outputs from the relevant CSTM3A model runs have been used to update demand forecasts within the network model. Similarly, outputs from the Rail Links to Edinburgh and Glasgow Airports study have been incorporated into the network model.
- 4.40 Where the proposed new lines/stations fall outside the scope of existing models, a population-based *trip generation / distribution* model has been used.
- 4.41 Background growth effects from the *RIFF model* Main Scenario have been applied to produce results for each of the forecast years.
- 4.42 Peak hour overcrowding effects have been incorporated through the use of a separate peak hour impacts model.

⁹ Default journey time elasticity recommended in PDFH. Note that PDFH provides a range of values for different journey purposes and conditions, but the nature of the data in the SSRS model means that these cannot be adequately disaggregated and the default value has therefore been used.

5. EASTERN CENTRAL BELT - THE SESTRAN AREA

- 5.1 We turn now to an assessment of the various options considered for each of the regions, beginning with the SESTRAN area.

SWOT Analysis

- 5.2 An important characteristic of the SESTRAN network is its role in relation to Edinburgh as a source of employment and as a service centre. The sheer strength of the Edinburgh economy is one of the single most important characteristics of this area. Experience has shown that the costs of not having rail services are extremely high in terms of travel times and potentially lost output and employment. Accordingly the future growth of Edinburgh is dependent upon the development of rail capability in order to avoid serious problems of access to the city centre and, as new peripheral developments take place, to such locations as well. The relationship between future land use and the rail network is therefore a key feature of this area, including the ease with which rail users can access the system.
- 5.3 The rail system within the SESTRAN area has relatively well used key corridors. There are, however, critical capacity bottlenecks in the system, which mean that users of the system experience reliability problems (e.g. delays, train cancellations and short trains). Peak hour overcrowding on services into and out of Edinburgh also lower the overall quality of the journey experience.
- 5.4 The full SWOT analysis for the SESTRAN area is contained in WP3 Appendix A.

Planning Objectives and Aspirational Targets

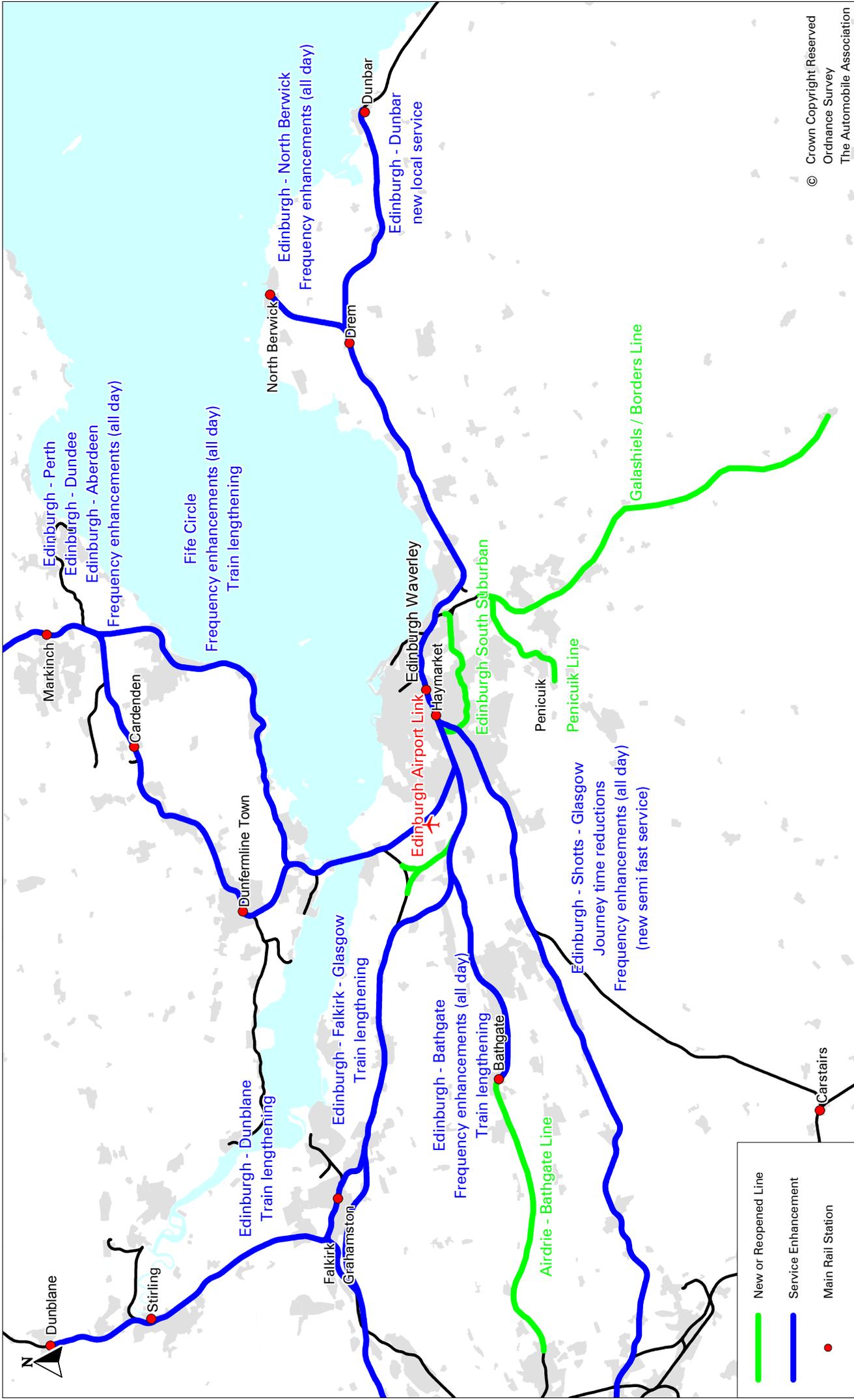
- 5.5 Table 5.1 shows the planning objectives agreed with the study steering group for the SESTRAN area, derived from the study area-wide objectives in Table 4.2. The planning objectives in **bold type** were considered to be the highest priorities. Thus under 'expanding the capability of the existing rail system' improving reliability and peak period carrying capacity were felt to be the priorities. Improving integration with new developments and providing new access to communities and business zones without access to the network were key priorities for 'developing new markets.'

TABLE 5.1 SESTRAN STAG PLANNING OBJECTIVES & ASPIRATIONAL TARGETS

STRATEGIC OUTCOMES	SESTRAN	
	PLANNING OBJECTIVES	ASPIRATIONAL TARGETS ¹
expanding the capability of the existing rail system	improve journey reliability	Charter performance to be: punctuality 95%, reliability (availability) 99.5%
	increase overall carrying capacity especially at peak times	(i) no standing passengers outside defined peak trains (ii) standing permitted for up to 15 minutes on defined peak trains, for up to 20% of seating capacity
	increase service frequencies especially on poorly serviced routes.	15 minute frequency on all urban/suburban services on key travel to work routes, 30 minute frequency on all other suburban / intra-regional services
	improve the quality of the journey experience	increase by 25% the number of passengers satisfied with journey quality (*)
	improve journey times especially on West Edinburgh and Fife services	reduce journey times on Fife, Stirling and Shotts services by 10% and on other SESTRAN services by 5%
making rail use easier for the customer	improve intermodal access to rail particularly for car users outside Edinburgh and to bus networks especially that in Edinburgh.	(i) 90% of intending customers arriving by car able to park within 5 minutes walk of stations outside Edinburgh (*) (ii) bus stops, taxi stand and car drop off facilities within 100 m of station plus walking and cycling facilities at station (iii) increase combined trips by train & bus by 25% (*)
	deliver enhanced customer care	halve number of unsatisfied customers (*)
	reduce the relative (generalised) cost of rail and reduce the incidence of fares being used to restrict demand	(i) reduce generalised cost of rail travel by 10% (ii) achieve a consistent pricing policy through the area
developing new markets for rail	achieve better integration with new developments	For 25% of significant new developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	provide new access for key communities and business zones currently without access to the network	For 25% of significant existing developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	change attitudes towards rail travel	reduce by 33% the number of non-users of rail who consider that rail is a poor method of travel (*)

Note: 1 - The study will inform the achievability of the targets under different resource scenarios as well as the point in time that they can be achieved

(*) - Broad pragmatic target.



Scottish Strategic Rail Study
 Figure 5.1: Schemes Considered: SESTRAN

Projects Considered

- 5.6 The planning objectives for the SESTRAN area suggest that improving journey reliability, carrying capacity, inter modal access to rail and achieving better integration with new developments and providing rail access to key existing developments should be the focus of any rail strategy for the area.
- 5.7 Table 5.2^{10,11} lists the various schemes that have been considered to address these objectives and also shows where they have been tested – the High Resource Scenario (WP6), the Medium Resource Scenario (WP7) or the Low Resource Scenario (WP8). It is important to remember that the scenarios are essentially vehicles for testing projects or groups of projects and their interactions rather than definitive statements of an optimal strategy for a particular level of investment.

High Resource Scenario

- 5.8 The High Resource Scenario is detailed in WP6 and summarised here in Table 5.2. In compiling this scenario, the underlying theme is an urban/sub-urban train service centred on Edinburgh that is frequent and reliable and has sufficient capacity to meet demand. The standards defined in Table 5.1 should be capable of being met. Rail would also form one component of an integrated multi-modal system with the stations acting as well facilitated interchange points and ease of transfer between modes aided by good information, customer service and an integrated ticketing system.

Facilitating Projects

- 5.9 For the HRS we have identified two major facilitating projects in the SESTRAN area that can potentially effect a significant increase in capacity and improve reliability. They are:
- a significant capacity upgrade at Edinburgh Waverley station itself;
 - the construction of the Edinburgh Airport rail link as an underground station served from both the Fife and Edinburgh-Glasgow routes. (Option EA3)

¹⁰ The projects are described in Table 5.2 as ‘contender’ projects. In some cases (mainly in the MRS) there would not be sufficient capacity generated by the facilitating project for all of them to be implemented together. All the projects listed for that scenario were therefore considered ‘contenders’ for that particular scenario and were tested to establish which ones appeared to perform best.

¹¹ Do-minimum schemes such as Stirling - Alloa, and Edinburgh Park are by definition included in the HRS, MRS or LRS scenarios as they are considered committed.

Table 5.2: SESTRAN Contender Projects for the HRS, MRS or LRS

Proposal	All Major Facilitating Projects Scenario (HRS)	One Major Facilitating Project Scenario (MRS)	No Major Facilitating Projects Scenario (LRS)
Waverley Station Redevelopment	✓	✓ ¹	
Edinburgh Airport : Sub surface station plus through routeing of services (option EA3)	✓		
Edinburgh Airport Shuttle service		✓ ¹	
Fife Circle services, new stations and capacity enhancements	✓	✓ ¹	
North Berwick Off Peak Service Enhancement	✓	✓	
Dunbar Service (new)	✓		
Borders Rail (Edinburgh to Galashiels)	✓	✓	
Penicuik Branch (Edinburgh to Penicuik)	✓		
Edinburgh South Suburban	✓		
Airdrie - Bathgate link (implies enhanced frequency to Bathgate)	✓	✓ ¹	
Shotts semi-fast service (Edinburgh to Glasgow Central HL)	✓	✓ ¹	
New Stations	✓	✓	
Fife Circle Platform and Train Lengthening	✓	✓	✓
Bathgate Branch Platform and Train Lengthening	✓	✓	✓
Edinburgh and Glasgow and Stirling/Dunblane to Edinburgh Train Lengthening	✓	✓	✓
Sunday Services	✓	✓	✓
Improved Station facilities	✓ ²	✓ ²	✓ ²
Improved Rolling Stock	✓ ²	✓ ²	✓ ²
Marketing Initiatives	✓ ²	✓ ²	✓ ²
Fares and Ticketing Initiatives	✓ ²	✓ ²	✓ ²

Note 1: The scale of the Waverley Station development will affect the inclusion of these schemes within the Medium Resource Scenario

Note 2: The demand and benefit implications of improved station facilities, rolling stock and other initiatives were considered as sensitivity tests to the MRS.

5.10 The scale of the upgrade at *Waverley* is currently under investigation in a separate study. The project is a major upgrade of the terminal & related infrastructure, and will rebuild Edinburgh Waverley station to provide additional platforms, new approaches to the east and west and a major station upgrade. For the purposes of this analysis two of the ‘western approach’ capacity options under consideration in this study have been used:

- Option 2 - 3 new peak train paths per hour;
- Options 3, 4, 5 and 6 - 11 new peak trains per hour.

5.11 The HRS is based around the 11 new peak tph western approach capacity upgrade.

5.12 *Edinburgh Airport Rail Link* is also the subject of a parallel study and there are a range of options under consideration. The most extensive scheme (Option EA3) is a major infrastructure upgrade and a new Airport station would be provided, as a through station, underneath the Airport terminal with the Fife route diverted in to it along with a diverted Edinburgh-Glasgow (E&G) route. This scale of this option would classify it as a facilitating project because of the extra E&G and West Edinburgh capacity it would create.

Other Projects

5.13 The construction of these major facilitating projects, (and a number of other contingent localised capacity enhancements – see WP6), in the HRS allows the implementation of a package of measures that includes:

- Increased frequencies on existing routes to increase the capability of the system (North Berwick, Dunbar, Bathgate and Fife Circle);
- New routes to develop new markets (Borders/Galashiels rail, Penicuik line, Bathgate to Airdrie and Edinburgh South Suburban);
- New stations (on lines that operate at capacity) to develop new markets (Portobello, East Linton and new stations on Fife Circle).

5.14 Working Paper 6 provides full details on the individual service specifications tested. Figure 5.1 illustrates their location.

Performance of the HRS

5.15 The indicative capital cost of implementing all of the SESTRAN HRS schemes outlined in Table 5.2 is **£702m** of which almost one third is accounted for by the Waverley station upgrade (WP6 for detail). The HRS would have a very significant impact on rail patronage impact in the SESTRAN area as shown in Table 5.3.

TABLE 5.3 SESTRAN JOURNEYS AND PASSENGER MILES FOR HRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	163,183	8,842
High Resource	282,323	16,206
Uplift	119,140	7,384
% Uplift	73%	83%

- 5.16 In terms of the individual components, the aspects of the strategy that performed best were enhancements to existing services to Fife, Bathgate and North Berwick. The revenue generated from the new service to Dunbar and the proposed station at East Linton only recovers a fraction of its operating costs.
- 5.17 Of the new infrastructure, the link to the airport performs well against the planning objectives and provides a revenue return greater than any additional operating costs incurred. The capital cost of this project is, however, high thereby affecting its BCR.
- 5.18 The new Borders rail link to Galashiels, new route to Penicuik and service around the Edinburgh South Suburban provide lower returns on their investment than other aspects of the high resource scenario. Of the three, the Borders rail (Galashiels) route appears to perform best, followed by Penicuik, then the Edinburgh South Suburban. Whilst both Edinburgh South Suburban and Borders Rail meet the SESTRAN planning objectives, it is considered that the rail link to the Borders provides a stronger contribution. Full details of the appraisal of options and packages of options are contained in WP6. A summary appraisal against value for money criteria and the planning objectives is shown in Table 5.7 at the end of this chapter.

Medium Resource Scenario

- 5.19 The definition of the MRS (described in detail in WP7) that we have adopted is one which incorporates the 'best' performing elements of the HRS in value for money terms. Furthermore it should contain only one facilitating project. As the underground Airport through- station would not, in fact, be a facilitating project in the absence of the Waverley upgrade. It is clear that redeveloping Edinburgh Waverley is the facilitating project for the SESTRAN MRS. However, the airport link performs well against planning objectives. Therefore a lower cost alternative to the airport link was considered for inclusion in the medium resource scenario. At the time of preparing this report the Airport Links study, was indicating that an alternative low cost airport option could be a direct shuttle service between the airport and Edinburgh Waverley operating from a spur off the Fife line (4 trains per hour).¹²

¹² As the Airports Links study had not concluded at the time this report was written it is possible that their report may conclude that the shuttle is not a viable option or that a shuttle using the E&G line is the preferable option. However, for the purposes of demonstrating the effect of different uses for any additional Waverley paths the option adopted for the MRS is considered to be adequate.

5.20 The following proposals were therefore considered for inclusion in the medium resource scenario in SESTRAN:

- Redevelopment of Edinburgh Waverley (Major Facilitating Project);
- Enhanced service frequencies from Edinburgh to Fife, Bathgate, (through the Airdrie-Bathgate link), and North Berwick;
- An airport shuttle service to Edinburgh Waverley utilising a new spur off the Fife line;
- Borders/Galashiels Rail Route;
- Improved inter-modal access to rail for car users outside Edinburgh and bus users within Edinburgh;
- Platform and train lengthening;
- A small number (4) of new stations.

5.21 The above service proposals will require a significant upgrade of the capacity of Edinburgh Waverley station and localised capacity upgrades between Inverkeithing and Haymarket W. junction and from Haymarket W. junction to the end of the Bathgate branch.

5.22 When the committed proposals on the ECML and WCML and the inter-regional proposals detailed in Chapter 9 are taken into account the number of potential services that could be included in the medium resource scenario exceeds the train paths that would become available should the capacity of Waverley be expanded to its maximum (see WP7 Appendix B). *Demand forecasts for all of the “contenders” to use Edinburgh Waverley were therefore prepared to enable the identification of those that contribute the most benefit to its re-development.*

5.23 Full details of the precise service specification of the MRS are contained in WP7.

Performance of the MRS

5.24 The indicative capital cost of implementing all of the MRS schemes outlined in Table 5.2 is **£405m** or 58% of the cost of the HRS. The MRS would also result in a significant uplift in rail patronage in the SESTRAN area, Table 5.4. The package of schemes in the MRS generates a 68% uplift in journeys over the capacity constrained do-minimum forecast for 2010, compared to 83% in the HRS and a 60% growth in passenger miles (73% in the HRS). Full results are in WP7.

TABLE 5.4 SESTRAN JOURNEYS AND PASSENGER MILES FOR MRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	163,183	8,842
Medium Resource	260,794	14,886
Uplift	97,611	6,044
% Uplift	60%	68%

- 5.25 However, as we noted earlier it is not possible to implement the entire MRS ‘package’ since the track capacity situation at Edinburgh Waverley dictates the service provision that that can occur within the medium resource scenario. Of the services that are contenders for inclusion within the MRS, those that use the eastern approaches are ‘capacity neutral’ with respect to Edinburgh Waverley (i.e. the Borders/Galashiels rail and the North Berwick service).
- 5.26 The services that use the western approach to Edinburgh Waverley, however, compete with each other for available track capacity whichever design of Edinburgh Waverley is utilised. For schemes using the western approaches, ranked by Net Present Value (NPV) or benefit: cost ratio (BCR), the best performing schemes are Airdrie - Bathgate, Edinburgh Airport shuttle and enhanced Fife Circle services. The Shotts Line service improvements perform less well.
- 5.27 On the eastern approaches the enhanced North Berwick off-peak service performs particularly well but the Borders/Galashiels service rather less so with a large negative NPV.

Waverley Station Packages

- 5.28 Based on the above, it is possible to develop a package of services for each Edinburgh Waverley option. This analysis reflects the number of train paths available and is detailed in Table 5.5. The train path analysis is contained in WP7 Appendix B. Whilst the airport shuttle service provides the second best NPV¹³ of the Waverley service options, it requires 4 train paths per hour, which means that there is insufficient capacity under Edinburgh Waverley Option 2 to include it even if it had the highest NPV.

¹³ Airport option NPV estimates were made for the SSRS based on the Airport Study Phase 2 results. The Phase 3 results indicate higher NPV estimates than utilised within the SSRS.

TABLE 5.5 SERVICES USING WESTERN APPROACH TO EDINBURGH WAVERLEY BY DESIGN OPTION (WITHOUT AIRPORT SUB-SURFACE STATION)

Edinburgh Waverley Option	Airdrie - Bathgate (4 tph) ¹⁴	Edinburgh Airport Shuttle service (4 tph)	Fife Circle package (new stations and enhanced service)
Edinburgh Waverley Option 1 (Do Minimum) (No new peak hour passenger train paths)			
Edinburgh Waverley Option 2 (3 new peak hour passenger train paths)	✓		
Edinburgh Waverley Options 3, 4, 5 and 6 (11 new peak hour passenger train paths)	✓	✓	✓

5.29 Based on the capital costs provided by Railtrack an assessment of these package options (WP7) shows that it is the options with 11 new train paths per hour that have the highest NPV and BCR.

Low Resource Scenario

5.30 The final scenario considered for the SESTRAN area is the low resource scenario (LRS). The LRS, (WP8 for full details), concentrates primarily on what can be done within the constraints of current track capacity such as train and platform lengthening (ie longer trains rather than more frequent trains as in the HRS and MRS) and extra services **only where** there is spare track capacity. The LRS contains no major facilitating projects.

5.31 In practice a complete blanket prohibition on any trackside works as part of the LRS will be extremely restrictive as even platform and train lengthening may require some small trackside capacity enhancements to accommodate the longer trains (e.g. signalling). The LRS could therefore contain some localised capacity enhancements, however, they are small in nature.

5.32 The peak hour impact model detailed in Working Paper 7 (Medium Resource Scenario) was used to inform the selection of lines that would be contenders for train lengthening projects as part of the LRS on the basis of forecast levels of overcrowding. In the SESTRAN area and between SESTRAN & SPT the services considered are as shown in Table 5.6.

¹⁴ NB this is equivalent to 2 *additional* tph into Edinburgh Waverley

TABLE 5.6 PLATFORM AND TRAIN LENGTHENING FOR SESTRAN LRS

Project		Area
SPT to SESTRAN Services		
Edinburgh and Glasgow service	Train lengthening only 4 more train sets ¹⁵	SESTRAN/SPT
Shotts Line	Train lengthening only 1 more train set – West Calder to Edinburgh service	SESTRAN/SPT
SESTRAN Services		
Fife Circle	Platforms to accommodate up to six cars (IoS) ¹⁶ , 10 more train sets – 4 sets to Kirkcaldy, 4 sets to Cowdenbeath and 2 sets to Fife Circle	SESTRAN
Bathgate line	Platforms to accommodate up to six cars (IoS), 2 more train sets – Bathgate service	SESTRAN
Dunblane/Stirling to Edinburgh service	Train lengthening plus platform lengthening at Camelon, Larbert and Bridge of Allan 2 more train sets	SESTRAN

- 5.33 The LRS has also tested the provision of Sunday services where none currently exist. In the SESTRAN area this is on the route from Edinburgh to Newcraighall.

Quality Measures

- 5.34 WP5 identified a large number of quality measures. These measures do not require alterations to the current track capacity and are therefore contenders for inclusion in a low resource scenario. These include the following initiatives:

- Improved quality of rolling stock;
- Improved quality and security of stations;
- Improved information provision;
- Improved interchange with other modes;
- Multimodal/Integrated ticketing;
- Marketing to business customers/intermediaries;
- Marketing to personal users;
- Development of new rail products and packages;
- DDA access.

¹⁵ It is assumed that additional train sets would be provided in multiples of the existing diagramming arrangement. Thus a 2 car train would become a 4 car train, a 3 car train would become a 6 car train and a 6 car train (comprising of two 3 car sets) would become a 9 car train

¹⁶ IOS – Incremental Output Statement – localised capacity enhancement schemes being developed by Railtrack for the SRA

Performance of the LRS

- 5.35 The indicative capital cost of implementing the SESTRAN LRS schemes is £13m and the operating costs are around £7.8m per year. Our modelling indicates relatively small demand uplifts arising from the scenario, of + 6% in terms of journeys and passenger miles compared to the do-minimum. This is as expected given that the primary function of the schemes in the LRS is to relieve overcrowding rather than grow the market.
- 5.36 Nevertheless when looked at on a line by line basis some substantial uplifts in demand can occur as a result of the alleviation of peak hour overcrowding (WP8). Peak hour demand rises of between 19% on the Bathgate Line to 47% on the Edinburgh - Glasgow compared to the capacity constrained do-minimum. In the main the train lengthening projects have also alleviated the majority of the overcapacity situations that occur in 2010.

Appraisal against Planning Objectives

- 5.37 The three scenarios have enabled us to test the combined effect of various schemes within three broad bands of investment level. The actual economic performance of each scenario is of little relevance since the scenarios are simply vehicles for allowing us to test the combined effects of various schemes, some of which, as we have seen do not perform particularly well and would not form part of an 'optimised' investment strategy. However, the process has allowed us to consider how the best performing¹⁷ schemes might be packaged together for combinations of the two facilitating projects – Edinburgh Waverley and Edinburgh Airport sub-surface. These packages are presented here in Table 5.7,¹⁸ along with those schemes that are independent of the Waverley upgrade options.
- 5.38 They have been assessed in terms of their contribution towards the planning objectives for the SESTRAN areas (as set out in Table 5.1) and in terms of their economic performance.
- 5.39 The first two packages (A and C) are associated with the various scales of Waverley station upgrade and the services that can be operated with each of them. It is clear from Table 5.7 that Package C (+11tph) performs best against the SESTRAN planning objectives and has as good an economic performance as the smallest package (+3tph) which does less well in terms of meeting planning objectives. Thus package C would appear to offer the best combination of planning and economic performance if Waverley is developed but the airport sub-surface station is not.

¹⁷ In value for money terms

¹⁸ Key to Table 5.7 and subsequent appraisal tables overleaf

- 5.40 Packages D & F are associated with both facilitating projects, Waverley and the Airport sub-surface station and again the same conclusion can be drawn. The best performing package in terms of meeting planning objectives is the larger Waverley upgrade option. The overall economic performance¹⁹ appears poorer than the equivalent 'without airport' option principally because of the high cost of the sub-surface station.
- 5.41 The performance of individual schemes that have not been packaged together with the Waverley upgrade is also shown. Of the 'new' routes (Borders/Galashiels, Penicuik, South Suburban) it is the Galashiels project which performs best in terms of contribution towards planning objectives, but all three projects do not appear to perform well in value for money terms within the analysis presented here.
- 5.42 The train lengthening projects in SESTRAN all perform well, both economically and in terms of their contribution towards planning objectives, whilst the station facilities and train quality enhancements also contribute well towards planning objectives but further analysis would be required to verify the expectation that they would perform well in value for money terms.
- 5.43 The key to Table 5.7 is as follows.

Planning Objectives		Economy	
+++	Strongly Positive Impact	+++	BCR>2.0
++	Positive Impact	++	2.0>BCR>1.5
+	Slightly Positive Impact	+	1.5>BCR>1.0
-	Slightly Negative Impact	-	1.0BCR>0.75
--	Negative Impact	--	0.75BCR>0.5
---	Strongly Negative Impact	---	BCR<0.5

¹⁹ (based on the costings derived from the Phase 2 of the Airport Links study)

6. WESTERN CENTRAL BELT – THE SPT AREA

SWOT Analysis

- 6.1 The rail network in the SPT area is the largest outside of London and carries nearly two thirds of all rail journeys in Scotland. It serves the west central Scotland conurbation commuter region and extends more than 70 kilometres outside of central Glasgow. It plays a crucial economic and social role within the SPT area and is characterised by a high mode share and a significant proportion of purely urban/local movements. Over the years the network has benefited from being within a PTE area and has had higher levels of investment than non-PTE areas. Facilities at stations are generally provided to a higher standard than many places elsewhere in the network and the station CCTV system is regarded as a UK benchmark. Market research by SPT indicates that the system is generally fairly well regarded by rail users. However, despite the levels of satisfaction experienced by users there is a poorer perception of rail amongst non-users; accessibility to the rail network and personal safety and reliability are issues for these non-users.
- 6.2 Demand for rail travel in the SPT area continued to grow during the 1990's despite significant structural changes in the economy. The rail network performs a key regeneration and social inclusion function. However, a weakness in the ability of the railway to perform this role is that some of the key development areas (Pacific Quay, Clyde Corridor, Braehead and the airport) are not well served by rail. Additionally, there is a lack of connectivity between the north and the south parts of the network, due to the fact that there are two terminating stations in Glasgow, Queen Street to the north of the city centre and Central to the south.
- 6.3 Key rail network capacity pinch points occur within the system, particularly in the city centre area and at the peripheries of the network where single track sections of track exist. Such capacity pinch points lead to reliability problems (e.g. delays and train cancellations). The principal infrastructure constraints are:
- Glasgow Central Station;
 - Glasgow Central to Paisley;
 - Glasgow Queen Street to Cowairs and Greenhill;
 - Hyndland to Partick;
 - Balloch Branch;
 - Milngavie Branch;
 - Barrhead to Kilmarnock line;
 - East Kilbride line.
- 6.4 The rail system is subject to peak hour overcrowding into and out of Glasgow lowering the quality of the journey experience for the rail user.

6.5 A SWOT analysis for the SPT area is contained in WP3 Appendix A.

Planning Objective Aspirational Targets

6.6 The planning objectives and targets considered for the SPT area are shown in Table 6.1. Key planning objectives in relation to the existing market include the need to improve reliability, to increase service frequencies, develop regular (clock face) timetables, improve personal safety and security and reduce overcrowding (by measures such as train lengthening)

6.7 In terms of developing new rail markets, one of the priorities is to provide for new movements not served by rail, (notably cross city centre links, the Glasgow Airport rail link and the Larkhall and Maryhill routes) and to serve new developments especially in high car use areas. These planning objectives should be the focus of the rail strategy for the area.

TABLE 6.1 SPT STAG PLANNING OBJECTIVES & ASPIRATIONAL TARGETS

STRATEGIC OUTCOMES	SPT	
	PLANNING OBJECTIVES	ASPIRATIONAL TARGETS
expanding the capability of the existing rail system	improve overall journey reliability	Charter performance to be: punctuality 95%, reliability (availability) 99.5%
	increase service frequencies especially on suburban services	15 minute frequency on all urban/suburban services on key travel to work routes, 30 minute frequency on all others
	reduce journey times on suburban services	reduce suburban journey times by 10%
	increase overall carrying capacity especially at peak times	(i) no standing passengers outside defined peak trains (ii) standing permitted for up to 15 minutes on defined peak trains, for up to 20% of seating capacity
	improve the quality of the journey experience	increase by 40% the number of passengers satisfied with journey quality
making rail use easier for the customer	address perceived deterrence factors including personal safety / security	halve the proportion of people considering rail stations unsafe and unpleasant (*)
	deliver enhanced customer care	halve number of unsatisfied customers (*)
	improve intermodality between rail and other public transport networks in city	increase combined trips by train & bus by 25% (*)
	improve access to rail particularly for car users in commuter settlements	(i) 90% of intending customers arriving by car able to park within 5 minutes walk of stations outside Glasgow city centre (*) (ii) bus stops, taxi stand and car drop off facilities within 100m of station plus walking and cycling facilities at station
	maintainance or improvement to the affordability and social function of the network	(i) price rises at or below rate of inflation (ii) services at standard frequencies 6.00 - 24.00 throughout week
	reduce the (generalised) relative cost of rail	reduce generalised cost of rail travel by 10%
developing new markets for rail	provide for significant movements not served by the current network especially north-south movements through Glasgow	Double the mode share of rail for the north-south movement through Glasgow
	achieve better integration with new developments especially in areas attracting high car ownership residents and business zone areas	For 25% of significant new developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	change attitudes towards rail travel especially for the non-rail user	reduce by 33% the number of non-users of rail who consider that rail is a poor method of travel (*)

Note: 1 - The study will inform the achievability of the targets under different resource scenarios as well as the point in time that they can be achieved

(*) - Broad pragmatic target.

Projects Considered

6.8 Table 6.2 lists the various schemes that have been considered to address these objectives and also shows under which scenario they have been tested.

Table 6.2 : SPT Contender Projects for the HRS, MRS or LRS

Proposal	All Major Facilitating Projects Scenario (HRS)	One Major Facilitating Project Scenario (MRS)	No Major Facilitating Projects Scenario (LRS)
Glasgow City Tunnel	✓		
Strathbungo/City Union/ST John's Link	✓	✓	
Glasgow Airport to Central HL (peak and off peak new service)	✓	✓	
Glasgow Airport to Falkirk GS (or Edinburgh if capacity allows) (peak and off peak new service)	✓	✓	
Neilston - Glasgow (off peak)	✓	✓	
East Kilbride - Glasgow (off peak)	✓	✓	
Kilmarnock - Glasgow (off peak)	✓	✓	
Ayr - Glasgow (off peak)	✓	✓	
Ayr - Glasgow (peak)	✓		
Irvine - Glasgow Central (new semi fast – peak and off peak)	✓		
Shotts semi-fast service (Edinburgh to Glasgow Central HL - peak and off peak)	✓	✓	
Bridge of Weir to Glasgow (new service – peak and off peak)	✓		
Croy to Glasgow (new service – peak and off peak)	✓		
Newton - Cathcart Circle - West Glasgow Central (off peak)	✓		
Largs - Glasgow (off peak)	✓		
Wemyss Bay - Glasgow (off peak)	✓		
Gourock – Glasgow (faster timings as a result of the new Bridge of Weir local service)	✓		
North – South Connectivity (e.g. Ayr to Edinburgh, Glasgow Airport to Maryhill/Anniesland, Bridge of Weir to Croy, Gourock to Croy, Gourock to Falkirk GS, Glasgow Airport to Dunblane/Alloa,	✓		
Airdrie - Bathgate link (implies enhanced frequency between Airdrie and Drumgelloch)	✓	✓	
Whifflet to Dalmuir (re-routing existing service)	✓	✓	
Shotts to Dalmuir (new service peak and off peak)	✓		
Improved service to Lanark (service extension from Motherwell to Lanark)	✓		
Cumbernauld Line : Extension of services to Castlecary/Falkirk .	✓	✓	
Motherwell - Stirling service	✓	✓	
New Stations	✓	✓	
Ayr Service Platform and Train Lengthening	✓	✓	✓
Gourock Service Platform and Train Lengthening	✓	✓	✓
Stirling/Dunblane Service Train Lengthening	✓	✓	✓
East Kilbride Service Platform and Train Lengthening	✓	✓	✓
Shotts Service Platform and Train Lengthening	✓	✓	✓
Paisley Canal Service Platform and Train Lengthening	✓	✓	✓
Sunday Services	✓	✓	✓
Improved Station facilities	✓ ¹	✓ ¹	✓ ¹
Improved Rolling Stock	✓ ¹	✓ ¹	✓ ¹
Marketing Initiatives	✓ ¹	✓ ¹	✓ ¹
Fares and Ticketing Initiatives	✓ ¹	✓ ¹	✓ ¹

Note 1: The demand and benefit implications of improved station facilities, rolling stock and other initiatives were considered as sensitivity tests to the MRS.

Note 2: Larkhall is in the do-minimum

6.9 The degree of project interaction varies with the complexity of the rail network, thus there is a very high degree of interaction in the SPT area (WP6 Figure 2.1 illustrates this).

6.10 By way of example, to increase train frequencies on the south side of Glasgow terminating at Glasgow Central it is necessary to re-route existing trains from Glasgow Central, as the approaches to Glasgow Central are operating at capacity, as well as provide more local targeted capacity enhancements. Thus, increasing train frequencies to Ayrshire requires upgrades to the track in the Ayrshire area plus the construction of other capacity facilitating projects such as the Glasgow Cross City tunnel, the St John's Link, the Strathbungo link and a capacity upgrade between Paisley Gilmour Street and Glasgow Central.

High Resource Scenario

- 6.11 The underlying theme to the high resource scenario (WP6) for SPT is a metro style urban/suburban train service centred on Glasgow that is frequent and reliable and has sufficient capacity to meet demand. The network would maintain its important role with respect to social inclusion and would increase its market penetration with links to the airport and improved connectivity between the north and the south parts of Glasgow. The standards defined in Table 6.1 should be capable of being met. Rail would continue to form one component of an integrated multi-modal system. The stations would act as well facilitated interchange points and ease of transfer between modes would be aided by good information, customer service and the existing integrated ticketing system.

Facilitating Projects

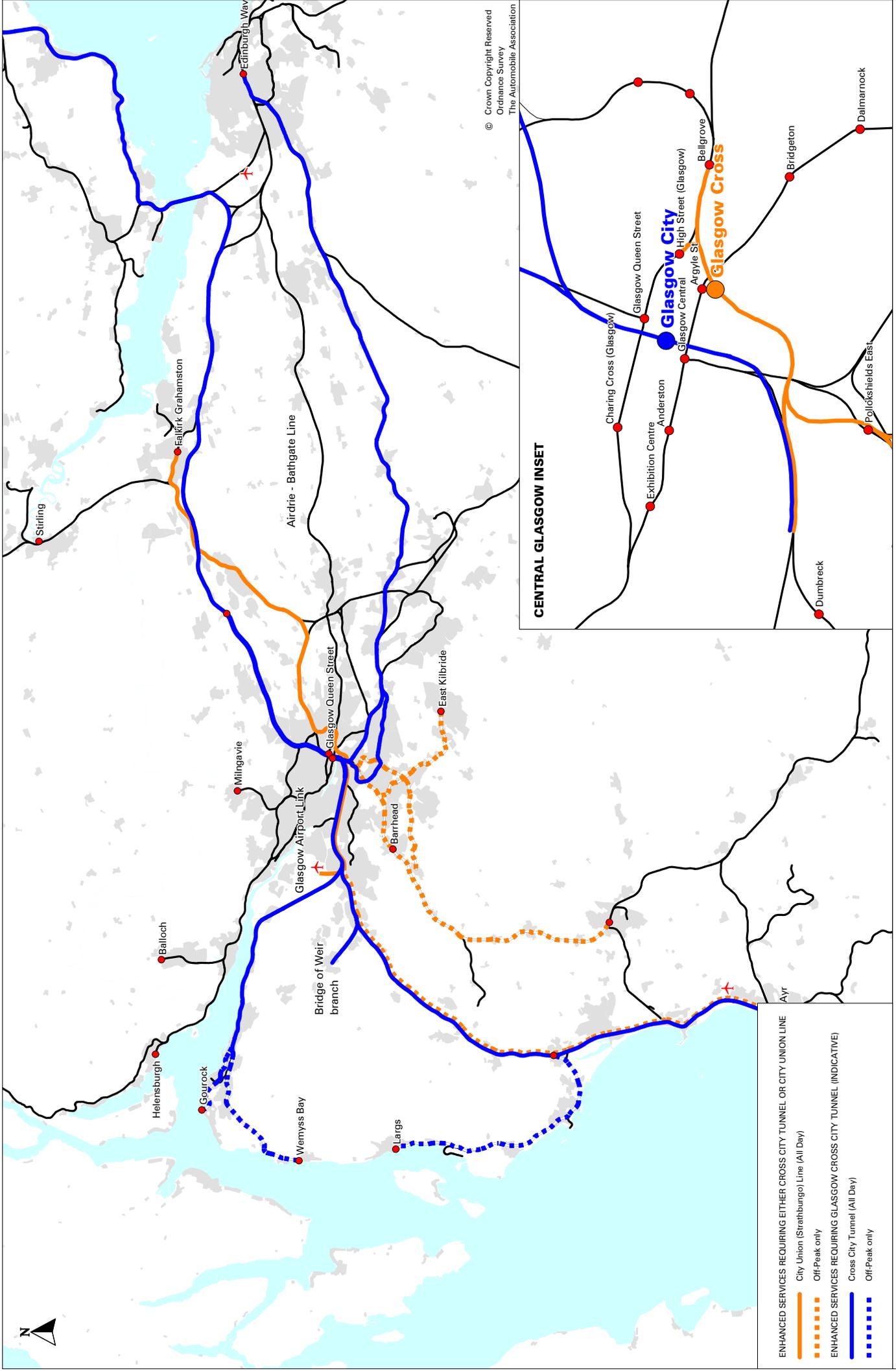
- 6.12 A key requirement in delivering these objectives is the need to resolve the problem that the rail network in the centre of Glasgow is operating at or close to capacity particularly that associated with Central and Queen Street High Level stations. Glasgow Central HL station operates at capacity during the peaks and close to capacity in the off peak, as does Glasgow Queen St station. The high resource scenario therefore included two major facilitating projects;

- a Cross-City Tunnel; and
- an upgrade of the City Union line with the construction of the Strathbungo and St John's links.

- 6.13 The first of these major facilitating projects, the city tunnel, links the Ayrshire, Renfrewshire and Inverclyde services with those on the north side of the river and beyond (e.g. to Edinburgh) and includes a sub-surface station. The tunnel not only provides a north south link but provides the SPT rail system with the necessary extra capacity to allow an expansion of the suburban services on both the south and north sides of the river. The second major facilitating project, the upgrading of the City Union line and the construction of the Strathbungo and St John's links, gives not only better penetration of Glasgow City Centre by rail but also providing an important cross city link (south west to north east). Figure 6.1 illustrates the scale of change in service provision provided by each of the facilitating projects.

Other Projects

- 6.14 The City Tunnel enables the expansion of services from Ayrshire and Inverclyde on the south side and an expansion of the services from Croy and Falkirk Grahamston on the north side (WP6 for full details of the additional services).
- 6.15 Also on the south side it would enable a new *Glasgow Airport* service to be developed. This project incorporates a new Airport station, a new line leaving near Paisley St James (Option GA1 in the parallel Rail Links to Airports study), and upgrading the Paisley – Glasgow central section to four tracks throughout. Frequent services would operate from Glasgow Airport to Glasgow (Cross City station and Central station), both stopping and inter regional, offering links to a wide range of places, including potentially, a service to Edinburgh.



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- ENHANCED SERVICES REQUIRING EITHER CROSS CITY TUNNEL OR CITY UNION LINE**
- City Union (Strathbungo) Line (All Day)
 - Off-Peak only
- ENHANCED SERVICES REQUIRING GLASGOW CROSS CITY TUNNEL (INDICATIVE)**
- Cross City Tunnel (All Day)
 - Off-Peak only

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Figure 6.1: Service enhancements possible as a result of different Capacity Facilitating projects in Central Glasgow

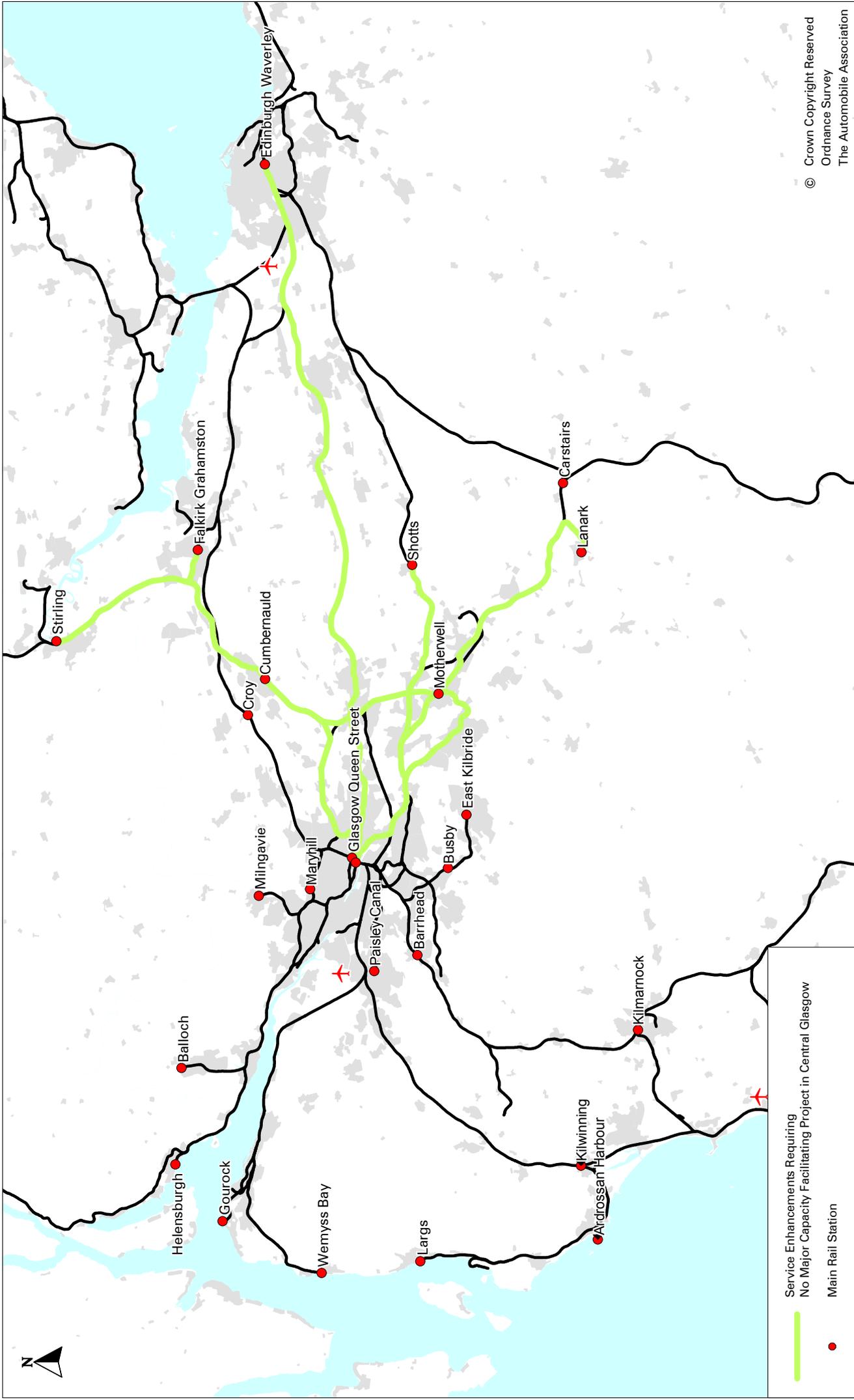
- 6.16 Other major projects associated with the HRS include; re-opening the Bridge of Weir route, electrifying the Shotts (Holytown to Shotts), Rutherglen to Coatbridge/Whifflet and Glasgow – Maryhill routes. There are service enhancements associated with all of these projects as well as a number of new station options on both the new / re-opened routes and existing routes. WP6 provides more details.
- 6.17 There are also a number of schemes that are independent of either the City Tunnel or City Union schemes. These include re-opening the Airdrie-Bathgate route between SPT and SESTRAN with a frequency enhancement between Airdrie and Drumgelloch, improved Lanark services (in the form of service extensions from Motherwell) and the electrification and upgrading of the Cumbernauld route with extended services to a new park and ride station at Castlecary.
- 6.18 Figures 6.1 and 6.2 summarise all of the schemes considered in the SPT area.

Performance of the HRS

- 6.19 The indicative capital cost of implementing all of the SPT HRS schemes outlined in Table 6.2 and including a number of localised capacity enhancement projects required to deliver the service enhancements is **£1.1bn** of which around 43% is accounted for by the City Tunnel project (WP6 for detail). However, the HRS would have a large impact on rail patronage impact in the SPT area as shown in Table 6.3.

TABLE 6.3 SPT JOURNEYS AND PASSENGER MILES FOR HRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	417,324	38,244
High Resource	580,213	49,995
Uplift	162,889	11,751
% Uplift	39%	31%



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Figure 6.2: Service Enhancements Independent of Central Glasgow Capacity Facilitating Projects

- 6.20 The HRS would result in almost a one third increase in the number of passengers on the SPT network. Although not as dramatic in percentage terms as the growth in the SESTRAN area, in absolute terms it represents almost 12m new rail passengers²⁰.
- 6.21 The synergies between the proposals that are included within the high resource scenario make it difficult to separate out the individual contributors to the benefit. However it is possible to draw some conclusions and these are set out below.
- 6.22 The City Tunnel, associated capacity enhancements and associated services give rise to significant benefits which are both inter-regional and local. The capital cost of the combined proposals is high as are the operating costs of the new services that use the tunnel. Because of the complexity of the package of projects that have been associated with the City Tunnel in the HRS, isolating and identifying the economic performance of the tunnel itself is not straightforward. Our analysis suggests that net social benefits may exceed net social costs, though fare revenues are expected to cover only a proportion of the operating costs (between quarter and a half). However, it should be noted that previous analysis of the tunnel option on behalf of SPT has indicated a poorer economic performance than this.
- 6.23 The City Union line upgrade and Strathbungo and St John's links provide a more local function than does the City Tunnel. They give a better distribution of rail trips through Glasgow city centre as well as facilitating some cross city movements. Additionally, they facilitate a capacity expansion at Glasgow Central HL through the removal of trains from the station. The capital cost of the upgrades and associated capacity enhancements (e.g. to Glasgow Queen Street Low Level) are considerably lower than those of the City Tunnel and the ratio of benefits to costs is also better than that for the tunnel.
- 6.24 Service enhancements that contribute the most to the benefit of the SPT area are those from Croy, Ayr, Neilston and the airport.

Medium Resource Scenario

- 6.25 With respect to the definition of the medium resource scenario (WP7) only one of the two major facilitating projects in the high resource scenario can be included. Of the two the City Tunnel is the single most significant contributor to the capital cost of the SPT high resource scenario (forming almost half of it) and correspondingly provides the most significant step change in the capacity of the rail system.

²⁰ Noting that the base CAPRI trip figures used in our analysis for SPT are an underestimate we would expect the absolute growth to be somewhat higher than that presented in Table 6.3 –see Chapter 4.

- 6.26 The City Union line upgrade however, also increases the capacity of the rail system and has a much lower cost and better ratio of benefit to cost.
- 6.27 However, without a City Tunnel project the medium resource scenario is severely capacity constrained by the operation of Glasgow Central and Queen Street High Level stations. The planning objectives point towards reliability improvements, service frequency enhancements and the integration of new or expanding developments with the rail network. Such objectives cannot be met without increasing the number of services which in turn require a solution to the capacity within the central area. Without a city tunnel or re-building Glasgow Central or Queen Street stations such capacity enhancements can only be achieved by re-routeing trains out of Central High Level and in to Queen Street Low Level and Central Low Level with associated localised capacity enhancements (including the City Union line upgrade). There are no significant options for re-routeing trains out of Queen St High Level, therefore the only options that exist here are to extend existing services into areas of the network that are not at capacity.
- 6.28 The extra services that can be developed as a result of the extra capacity released on the south side would be those found to be the biggest contributors to the benefit in the high resource scenario (i.e. Ayr, Neilston, the airport and Kilmarnock). Work undertaken by the parallel Airport Links study has identified that the airport option that comes closest to covering its operating costs is the shuttle between Glasgow Central and the airport (4 trains an hour). The Airport Links study has also identified that stakeholders have a desire to see a long distance cross city service operate from the airport with the most likely route being via Cumbernauld – such a service would also contribute strongly to the SSRS planning objectives for the SPT area. Work also undertaken as part of the Airport links study indicates that in order to achieve a regular timetable for such an airport service it is necessary to remove more than 4 trains an hour from Glasgow Central.
- 6.29 This fact means that **it is not possible to enhance the frequency of the peak hour services into and from Glasgow in the medium resource scenario** (with the exception of the new service to and from the airport). The medium resource scenario therefore requires platform and train lengthening as the mechanism to meet peak hour demand.
- 6.30 At Glasgow Queen St capacity restrictions mean that the best performing service (that from Croy) cannot be included within the medium resource scenario. Capacity, however, does exist for further trains to utilise the Cumbernauld line as recommended by the CSTCS.
- 6.31 A consideration of the performance of the thirty one stations in the high resource scenario has led to only 12 new stations being included in the medium resource scenario including the new airport terminus and the proposed new stations on the City Union line.
- 6.32 In summary, therefore the medium resource scenario includes the following:
- Re-routeing of trains from Central High Level - the East Kilbride and Barrhead trains via the City Union and associated capacity enhancements to Queen St Low Level (also requires electrification of Barrhead and East Kilbride lines) (Major Facilitating Project);

- Re-routing the Whifflet train via Central Low Level to Dalmuir (requires electrification of Rutherglen to Whifflet line);
- An airport link between Glasgow Central and the airport (4 trains per hour);
- An enhancement to the off peak frequency of the Ayr, Neilston, E. Kilbride and Kilmarnock services;
- Airdrie-Bathgate re-opening;
- The extension of existing Glasgow Queen Street Low Level services (Dalmuir to Bellgrove and Milngavie to Springburn) to Cumbernauld, Castlecary and Falkirk via the Garngad curve (Barnhill link);
- A long distance airport service to Falkirk via the City Union line and Cumbernauld;
- Train and platform lengthening to address peak capacity shortages;
- Measures to address perceived deterrence factors (station amenities and facilities).

6.33 A consideration of WCML committed proposals and the inter-regional proposals detailed in Chapter 9 in addition to the above services suggest that the number of potential off peak services that could be included in the medium resource scenario exceeds the train paths that would become available should the identified services be re-routed from Glasgow Central High Level (see WP7 Appendix B). *Demand forecasts for all of the “contenders” to use Glasgow Central High Level were therefore prepared to enable the identification of those that generate the most benefit under the medium resource scenario.*

Performance of the MRS

6.34 The indicative capital cost of implementing all of the MRS schemes outlined in Table 6.2 is **£384m** or around one third of the cost of the HRS. The MRS would also result in a significant uplift in rail patronage in the SPT area, Table 6.4. The package of schemes in the MRS generates a 19% uplift in journeys over the capacity constrained do-minimum forecast for 2010, compared to 31% in the HRS and a similar 19% growth in passenger miles (39% in the HRS). Full results are in WP7.

TABLE 6.4 SPT JOURNEYS AND PASSENGER MILES FOR MRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	417,324	38,244
Medium resource	497,159	45,423
Uplift	79,835	7,179
% Uplift	19%	19%

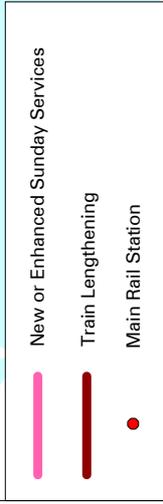
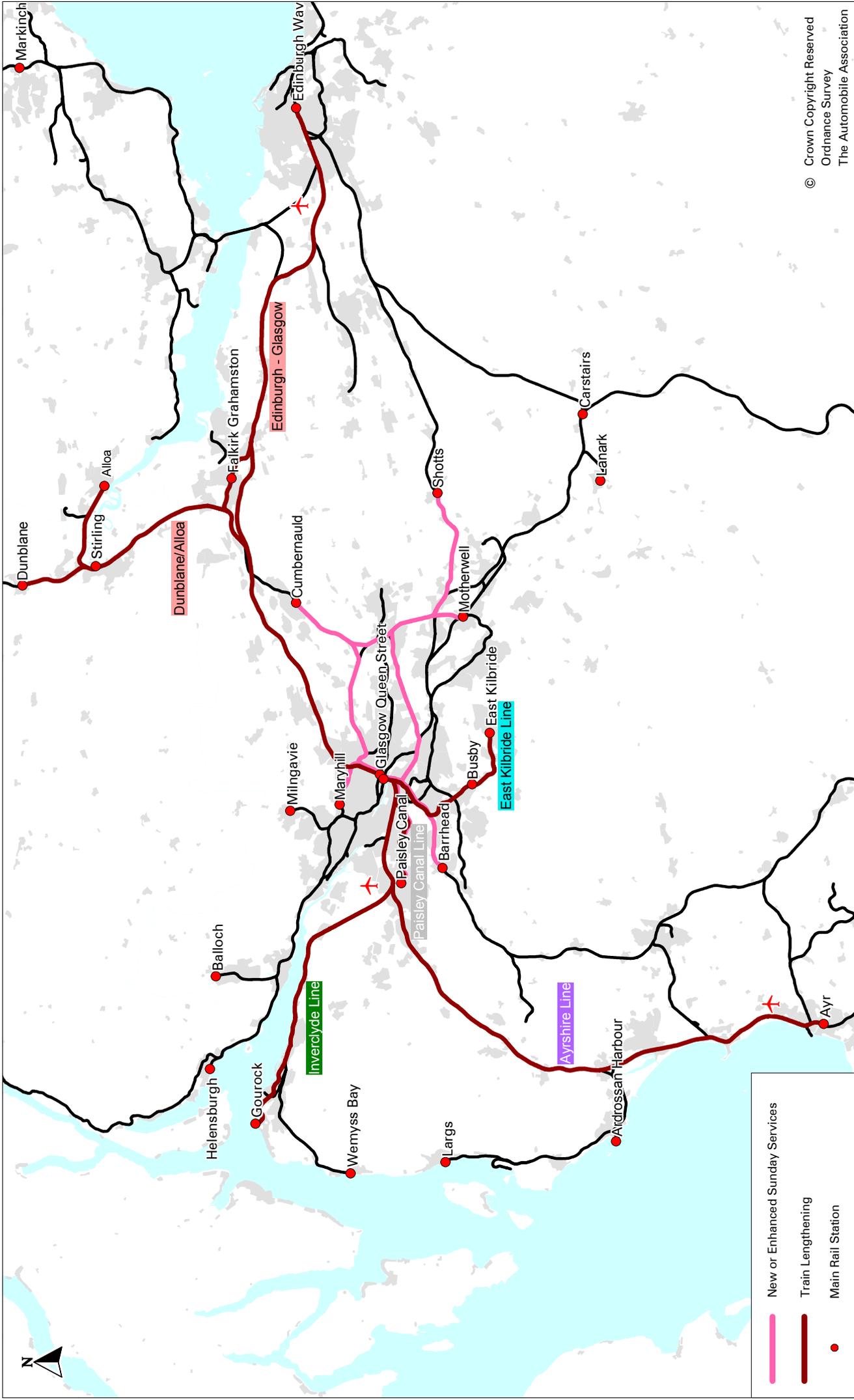
6.35 This is almost entirely off-peak growth because, unlike the HRS, the MRS does not introduce any additional peak hour services beyond those provided for the new Glasgow Airport service.

- 6.36 Glasgow Central remains the key constraint however, in the MRS. The current view regarding capacity at Glasgow Central High Level is that the approach track capacity is 56 trains per hour. However, this does not reflect the operational and platform capacity implications of Central High Level station itself and it is generally recognised that Central High Level station is currently operating at capacity. The modelled MRS (once committed WCML improvements are accounted for) would push Glasgow Central High Level overcapacity.
- 6.37 An analysis of the various components of the MRS using Central High Level is shown in WP7. The Neilston and Kilmarnock services come out best when ranked by NPV²¹ followed by the Ayr services and then the Airport shuttle. On the basis of this analysis it would appear that the Shotts semi-fast service and the long distance airport service from Falkirk contribute least to overall benefits and in a capacity constrained situation at Glasgow Central High Level should not be considered as part of the Central High Level package.
- 6.38 The best performing elements have thus been combined to form a Glasgow Central package scheme, described in WP7. This package would seem to have a reasonable prospect of having a small but positive benefit: cost ratio.

Low Resource Scenario

- 6.39 The final scenario considered for the SPT area is the low resource scenario, illustrated in Figure 6.3 and described in detail in WP8. This concentrates primarily on what can be done within the constraints of current track capacity such as train and platform lengthening and extra services **only where** there is spare track capacity. The LRS contains no major facilitating projects.
- 6.40 The peak hour impact model was used to inform the selection of lines that would be contenders for train lengthening projects as part of the LRS on the basis of forecast levels of overcrowding. This analysis indicated that in 2010 the lines shown in Table 6.5 would exceed 110% utilisation in one or both of the AM or PM peaks (1 hour peaks).

²¹ It should be noted that the Glasgow Airport services represent an aggregate of the shuttle service to Glasgow Central High Level and the service to Falkirk GS. Of these two services, the Phase 2 stage of the Rail Links to Airports study has indicated that the shuttle service to Glasgow Central HL offers the best value for money. The aggregate value presented in WP7 is therefore considered to be an underestimate of the NPV and BCR for the airport shuttle service



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Figure 6.3: Schemes Considered: SPT (Longer Trains and Sunday Services)

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TABLE 6.5 SPT - PLATFORM AND TRAIN LENGTHENING FOR LRS

Project		Area
SPT Services		
Ayrshire Line	Platforms to accommodate up to nine cars (IoS), 3 more train sets - Ayr to Central HL service	SPT
Inverclyde line	Train lengthening only 1 more train set – Gourock to Central HL service	SPT
Paisley Canal Line	Train lengthening only 1 more train set – Paisley Canal to Central HL service	SPT
Dunblane/Alloa to Glasgow	Train lengthening and platform lengthening at Bridge of Allan & Bishoprigg 3 more train sets – Dunblane/Alloa to Queen St HL services	SPT/SESTRAN
East Kilbride line	Platforms to accommodate up to six cars (IoS) 4 more train sets – East Kilbride/Busby to Central HL services	SPT

Sunday Services

6.41 The LRS has also tested the provision of Sunday services where none currently exist. In SPT these routes are:

- Glasgow Central to Shotts via Whifflet (IoS);
- Glasgow Queen Street to Cumbernauld (IoS);
- Glasgow Central HL to Paisley Canal;
- Glasgow Central HL to Barrhead;
- Motherwell to Cumbernauld;
- Glasgow Queen Street HL to Maryhill.

6.42 The service quality measures outlined in the SESTRAN chapter would also feature as elements in the SPT LRS.

Performance of the LRS

6.43 The indicative capital cost of implementing the SPT LRS schemes is **£18m**, arising from the platform lengthening work. Although SPT has purchased rolling stock with PTF funds in the past for the purposes of our analysis it has been assumed that the new stock will be leased and therefore appears in the annual costs. The lease cost of the lengthened trains, and their operation, and the operation of the Sunday services would cost in the region of £4.5m pa. Our modelling approach indicates a relatively small increase in journeys of 0.3m per year in 2010, or a 1% increase and 3.7m additional passenger miles (also 1%). This is perhaps not unexpected given that the bulk of the investment is aimed at relieving overcrowding rather than growing the market. Furthermore our modelling approach is likely to underestimate the benefits of some of the elements of the strategy such as Sunday service enhancements.

- 6.44 Nevertheless some significant uplifts in demand can occur as a result of the alleviation of peak hour overcrowding (WP8). AM Peak hour demand rises between 11% on the Croy Line to 19% on the Ayr Line compared to the capacity constrained do-minimum. In the main, the train lengthening projects have also alleviated the majority of the overcapacity situations that occur in 2010.

Appraisal against Planning Objectives

- 6.45 The three scenarios have enabled us to test the combined effect of various schemes within three broad bands of investment level. The process has allowed us to consider how the best performing schemes might be packaged together for combinations of the two facilitating projects of City Tunnel and City Union.
- 6.46 These packages are presented in Table 6.6 along with those schemes that are independent of either of the facilitating projects, and assessed in terms of their contribution towards the planning objectives for the SPT area and in terms of their economic performance.
- 6.47 Package A is based around the City Union /Strathbungo scheme. This package appears to perform reasonably well in terms of its economics and makes a worthwhile contribution towards the planning objectives of the SPT area.
- 6.48 Package B is based around the City Tunnel project and includes all of the components of Package A plus those services and new routes that can only be delivered with the City Tunnel. This much more extensive scheme unlocks the peak period constraints in the central area and with its associated service enhancements and new services makes a significant contribution towards the planning objectives for the SPT area. Furthermore there may well be potential for development gain from the proposals given the high rateable land values in the Buchanan Street area, but for the purposes of the economic cost-benefit analysis these are not included here. In conventional value-for-money terms therefore it appears to perform less well than the City Union scheme despite the high level of economic benefit that it generates.
- 6.49 The appraisal of the non-packaged elements shows a mixed picture. The new routes /enhanced services (Lanark, Airdrie-Bathgate, Shotts, Motherwell, Cumbernauld) all make useful contributions to different elements of the area planning objectives, but appear some way short of providing a strong value for money case. The train lengthening projects score particularly highly in terms of their contribution to key planning objectives, but unlike the SESTRAN area their economic case is more mixed, with the East Kilbride and Stirling/Dunblane services having the best performance. The key to Table 6.6 is shown below.

Planning Objectives		Economy	
+++	Strongly Positive Impact	+++	BCR>2.0
++	Positive Impact	++	2.0>BCR>1.5
+	Slightly Positive Impact	+	1.5>BCR>1.0
-	Slightly Negative Impact	-	1.0 BCR>0.75
--	Negative Impact	--	0.75 BCR>0.5
---	Strongly Negative Impact	---	BCR<0.5

Table 6.6 SPT Package Appraisal

STRATEGIC OUTCOMES AND PLANNING OBJECTIVES											ECONOMY											
expanding the capability of the existing rail			making rail use easier for the customer			developing new markets for rail			Economic Indicator													
improve journey reliability	increase frequencies especially on suburban services	reduce journey times	improve the quality of the journey experience	address safety and security	improve customer care	improve connectivity between public transport networks in city	improve accessibility for car users in commuter settlements	improve affordability and social inclusion for the network		reduce the relative cost of rail	provide for significant services served by the current network especially north-south movements through Glasgow	achieve better immediate developments especially in areas attracting high car ownership residents and business zone areas	changes towards rail travel especially for the non-rail user									
PACKAGE A - CITY UNION LINE, STRATHFINNACH, ST JOHNS LINK AND CENTRAL HL TO WHIFFLET RE-ROUTING PACKAGE																						
<ul style="list-style-type: none"> - Strathbungo/City Union/ST John's Link - Central HL to Whifflet re-routing to Central LL - Glasgow Airport to Central HL (peak and off peak new services) - Glasgow Airport to Falkirk GS (peak and off peak new services) - East Kibride - Glasgow (off peak) - East Kibride - Glasgow (off peak) - Ayr - Glasgow (off peak) - Ayr - Glasgow (off peak) - New stations 																						
PACKAGE B - GLASGOW CITY TUNNEL PACKAGE																						
Package A plus <ul style="list-style-type: none"> - Glasgow City Tunnel - Ayr - Glasgow (peak) - Irvine - Glasgow Central (new semi fast - peak and off peak) - Shotts semi-fast services (Edinburgh to Glasgow Central HL peak and off peak) - Bridge of Weir to Glasgow (new service - peak and off peak) - Coy to Glasgow (new service - peak and off peak) - Newton - Gallanach Crude - West Glasgow Central (off peak) - Largs - Glasgow (off peak) - Armys Bay - Glasgow (off peak) - Cowdree - Glasgow (semi fast as a result of the new Bridge of Weir local service) - North - South Connectivity (e.g. Ayr to Edinburgh, Glasgow) - Airport to Marshall/Leasland, Bridge of Weir to Coy. 																						
INDIVIDUAL SCHEME INDEPENDENT OF EITHER CITY TUNNEL OR CITY UNION LINE PACKAGE																						
Airdrie - Bathgate link (implies enhanced frequency between Airdrie and Dunnington)																						
Shotts to Dalmeir (new service peak and off peak)																						
Improved service to Lanark (service extension from Motherwell/Lanark)																						
Cumbernauld Line - Extension of services to Castletown/Falkirk (Falkirk / Cumbernauld - Glasgow Centre)																						
Motherwell - Shing service																						
New Stations																						
Ayr Service Platform and Train Lengthening																						
Gourock Service Platform and Train Lengthening																						
Stirling/Dunblane Service Train Lengthening																						
East Kibride Service Platform and Train Lengthening																						
Shotts Service Platform and Train Lengthening																						
Paisley Canal Service Platform and Train Lengthening																						
Sunday Services																						
Improved Station facilities																						
Improved Rolling Stock																						
Marketing Initiatives																						
Fares and Ticketing Initiatives																						

7. THE TAY AREA

SWOT Analysis

- 7.1 The Tay and NESTRANS (Chapter 8) areas exhibit similar physical and operational characteristics in that there is a sparse railway network in which long distance services also serve a local service function. Local service frequencies are therefore low. Potential passengers also experience some deterrence to using the railway system due to the low key facilities at some stations and the lack of integration of the rail network with the local bus networks.
- 7.2 A key issue is the interaction between rail and land use, the growth areas of population and employment (within the Perth-Dundee corridor) are not well served by rail.
- 7.3 A SWOT analysis for the Tay Area is contained in WP3 Appendix A.

Planning Objectives & Aspirational Targets

- 7.4 The planning objectives for local services in the Tay Area are shown in Table 7.1. (Objectives for inter regional services from the area are shown in Chapter 9).

TABLE 7.1 TAY AREA STAG PLANNING OBJECTIVES & ASPIRATIONAL TARGETS

STRATEGIC OUTCOMES	Tay Area	
	PLANNING OBJECTIVES	ASPIRATIONAL TARGETS ¹
expanding the capability of the existing rail system	increase service frequencies especially between local stations	30 minute frequency on all local services
	improve rail journey integration especially around Dundee	50% of through local rail journeys should involve no more than a 5 minute wait in Dundee
	reduce journey times especially from Perth towards Ladybank	reduce journey times from Perth towards Ladybank by 10%
making rail use easier for the customer	address deterrence factors including personal safety / security, information and facilities	halve the proportion of people considering rail stations unsafe and unpleasant (*)
	improve intermodal access to rail particularly for car users outside Perth and Dundee and to the Perth and Dundee bus networks	(i) 90% of intending customers arriving by car able to park within 5 minutes walk of stations outside Dundee City Centre(*) (ii) bus stops, taxi stand and car drop off facilities within 100 m of station plus walking and cycling facilities at station (iii) increase combined trips by train & bus by 25% (*)
	deliver enhanced customer care	halve number of unsatisfied customers (*)
developing new markets for rail	provide new access for developing communities and business zones especially within the Perth-Dundee corridor	For 25% of significant developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	change attitudes towards rail travel	reduce by 33% the number of non-users of rail who consider that rail is a poor method of travel (*)

Note: 1 - The study will inform the achievability of the targets under different resource scenarios as well as the point in time that they can be achieved

(*) - Broad pragmatic target.

- 7.5 Key planning objectives for the existing network are to increase service frequencies between local services, improve rail journey integration around Dundee and to improve inter-modal access to the rail network (to the Perth and Dundee bus networks and for car users outside of these two cities. For new markets a key issue is improving the interaction between rail and land use and the objective is to better serve the developing communities and businesses west of Dundee in the Perth corridor.

Projects Considered

- 7.6 Table 7.2 lists the various schemes that have been considered to address these objectives and also shows under which scenario they have been tested.

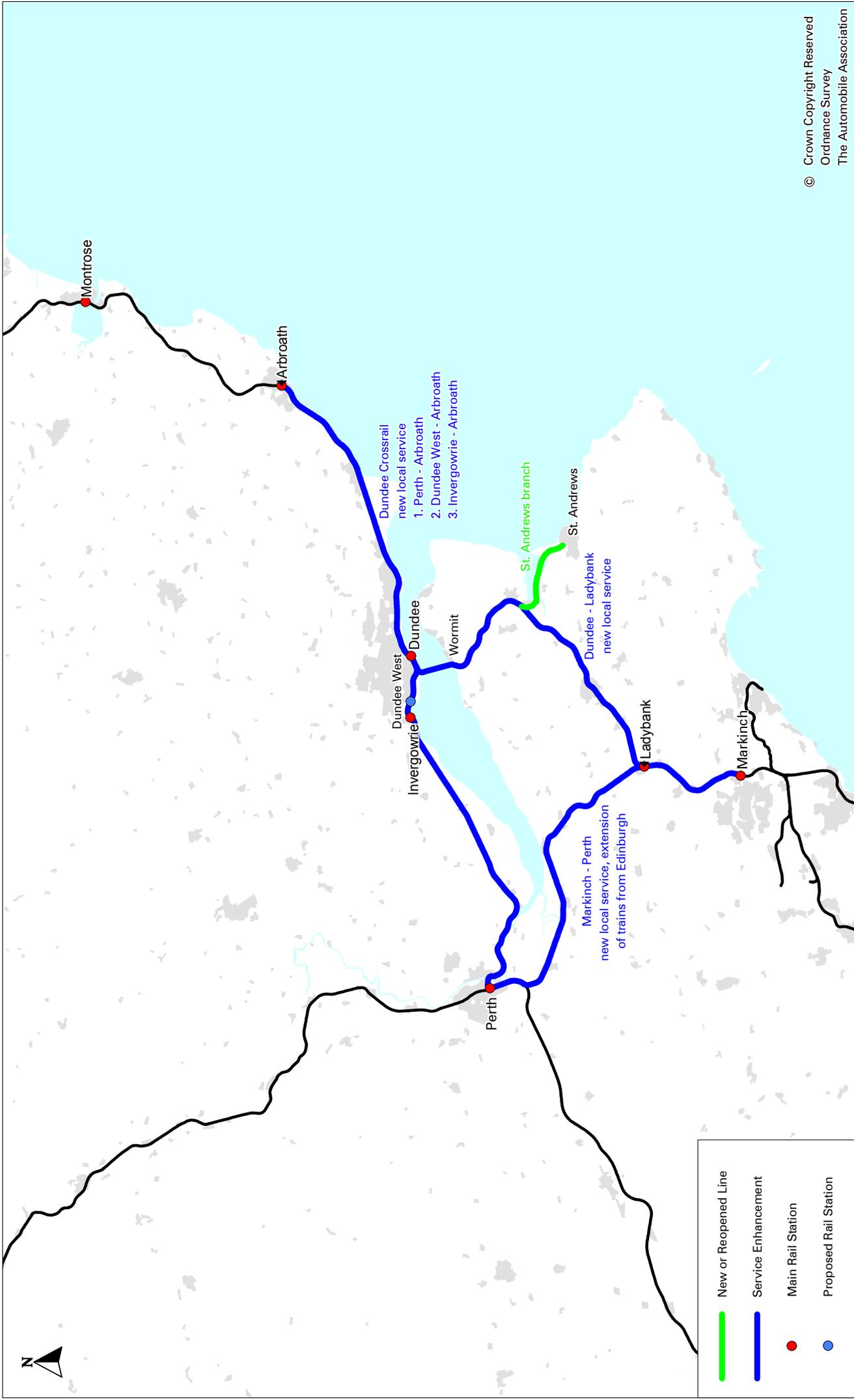
Table 7.2: Tay Area Contender Projects the HRS, MRS or LRS

Proposal	All Major Facilitating Projects Scenario (HRS)	One Major Facilitating Project Scenario (MRS)	No Major Facilitating Projects Scenario (LRS)
Dundee Crossrail (Arbroath to Perth)	✓		
Dundee Crossrail (Arbroath to Dundee West)		✓	
Dundee Crossrail (Arbroath to Invergowrie)			✓
St Andrews branch line and service to Dundee	✓		
Hourly local service (Perth to Markinch and south) and new stations	✓	✓	
Ladybank to Dundee		✓	
Improved Station facilities	✓ ¹	✓ ¹	✓ ¹
Improved Rolling Stock	✓ ¹	✓ ¹	✓ ¹
Fares and Ticketing Initiatives	✓ ¹	✓ ¹	✓ ¹

Note 1: The demand and benefit implications of improved station facilities, rolling stock and other initiatives considered as sensitivity tests to the MRS.

High Resource Scenario

- 7.7 The High Resource Scenario for the Tay Area is detailed in WP6 and summarised here in Table 7.2. In compiling this scenario, the underlying theme is one in which high quality, frequent local train services would be provided (additional to and independent from the existing inter-regional express services). There would be three components to the service, the primary one between Perth and Arbroath via Dundee whilst the other two are local services between Perth, Markinch and beyond and between St Andrews and Dundee. Significant interchange facilities would be provided at Perth, Dundee and Arbroath and new stations would be opened to increase market penetration. All local transport services would be integrated (timetabling and ticketing) and a high standard of customer service provided.



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Figure 7.1: Schemes Considered: Tay

7.8 The scenario will require the provision of extra capacity at a number of locations. However, certain projects could be implemented before the capacity enhancements are in place. These are as follows:

- New station at Dundee West:
- Ground side projects aimed at improving inter-modal access (e.g. car parks, bus bays, taxi facilities), information provision, security (e.g. CCTV) and general customer service. All of which contribute to making the rail system easier to use.

Facilitating Project

7.9 A single facilitating project in the Tay Area – the Dundee Crossrail service (Perth-Dundee-Arbroath) has been tested as part of the HRS. This involves a substantial upgrade of the line between Perth and Arbroath to provide half-hourly local rail services, as a core part of integrated transport along corridor. This would be additional to existing InterCity and ScotRail Express services. The project would also include new stations at Glencarse/St Madoes and Errol (subject to development), enhancements to track and signalling where necessary and up to 6 new high performance local DMU trains.

Other Projects

7.10 A number of other schemes complement the Crossrail project. A Perth to Markinch (and on to Edinburgh) local service will provide hourly service between Edinburgh and Perth, stopping at all stations between Markinch and Perth. This is additional to the existing 2 hourly Perth - Edinburgh (- Inverness) service and has been tested as an extension of the existing Edinburgh - Markinch local service. New stations at Bridge of Earn/Oudenard and Newburgh have also been tested.

7.11 Enhancements to track and signalling, where necessary, will include doubling of the track between Hilton Junction and Bridge of Earn and dynamic loops at Abernethy and Newburgh.

7.12 Further new stations at Dundee West (to serve Ninewells Hospital, Technology Park, Dundee Western Development Area and Dundee airport) on the Crossrail service and at Wormit/Tay Bridge (a reopened station) are included within the HRS. Improvements to existing stations, including modal interchange enhancements, improved information and security provision and major upgrade to Dundee and Perth stations also feature.

7.13 The final component of the HRS is the reopening of the St Andrews branch to provide a half hourly service to Dundee - integrated with the Perth – Dundee – Arbroath Crossrail service. This would require the provision of a new single-track branch, a new junction at Leuchars and necessary signalling works.

Performance of the HRS

- 7.14 The indicative capital cost of implementing all of the Tay Area HRS schemes outlined in Table 7.2 is **£70m** of which around 41% is accounted for by the St Andrews branch line reopening (WP6²² for detail). The HRS would have a large impact on rail patronage impact in the Tay area (Table 7.3), increasing the number of journeys in the Tay Area by 158,000 in 2010 (+37%) compared to the do-minimum. Passenger miles would be increased by 31%.

TABLE 7.3 TAY JOURNEYS AND PASSENGER MILES FOR HRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	8,792	422
High Resource	11,505	580
Uplift	2,713	158
% Uplift	31%	37%

- 7.15 The main contributors to benefits in the high resource scenario are the Crossrail Perth to Arbroath service (the key facilitating project) and the new stations at Newburgh and Bridge of Earn/Oudenard (with the Edinburgh to Markinch service extended to Perth). The proposed new branch line and service to St Andrew's provides a poor return with revenues covering only a small fraction of the operating costs. The Crossrail service performs well against the planning objectives, as do new stations, although it should be noted that revenue does not cover operating costs for any of the schemes in the high resource scenario.
- 7.16 Further consideration of the Perth to Arbroath Crossrail service indicates that:
- The core of the benefit of the scheme is derived from stations between Arbroath and Dundee;
 - The proposed Dundee West station provides an important link to and integration with existing employment centres and proposed housing development areas;
 - The new stations in the Carse of Gowrie (St Madoes and Errol) do not contribute a net benefit to the Crossrail scheme due to the lack of populace in the area. It is considered that the opening of stations at these locations is dependent upon development proposals for these areas;
 - Perth to Dundee is well served by the hourly express service from/to Glasgow and the hourly Glasgow-Aberdeen service giving an overall thirty-minute service; hence the demand for an additional local service between Perth and Dundee is low.

²² Note to Draft Final –the estimate of £111m in WP6 has been reduced to £84m to reflect a lower cost estimate for the St Andrews branch. This will be amended in the final version of WP6.

Medium Resource Scenario

- 7.17 From the above it is clear that an ‘optimisation’ of the Crossrail service which seeks to improve its economic performance whilst retaining the features that contribute well to the planning objectives for the area is appropriate for the MRS. Furthermore an additional service across the Tay Estuary was considered. A local service from Dundee to Ladybank would use existing track and would provide an additional service to Leuchars, Cupar, Springfield and Ladybank as well as allowing Wormit station to re-open. This option would build on existing demand and should be considered for the medium resource scenario, particularly in the absence of the proposed St Andrews service that would have served Leuchars.
- 7.18 The medium resource scenario for the Tay area (WP7) therefore includes;
- A revised Crossrail service of Arbroath to Dundee West with a half hourly local service;
 - A Dundee to Ladybank hourly service;
 - New stations at Newburgh and Bridge of Earn served by an extension of the Edinburgh to Markinch service to Perth (hourly);
 - Station improvements (infrastructure, interchange facilities and amenities).

Performance of the MRS

- 7.19 The indicative capital cost of implementing all of the Tay Area MRS schemes is **£12m** compared to £70m for the **HRS** (WP7 for detail). The MRS would have an almost identical impact on rail demand as the HRS, increasing the number of journeys in the Tay Area by 157,000 in 2010 (+37%) compared to the do-minimum (Table 7.4). Journey lengths for new trips would be shorter in the MRS –hence the increase in passenger miles is smaller (at 20%) than in the HRS (30%).

TABLE 7.4 TAY JOURNEYS AND PASSENGER MILES FOR MRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	8,792	422
Medium Resource	10,541	579
Uplift	1,748	157
% Uplift	20%	37%

- 7.20 The MRS for the Tay Area therefore achieves most of the benefits of the HRS proposals at much lower cost. WP7 shows that the Crossrail service does not have positive NPV. However, the implementation of this local service (and the Crossrail project in Aberdeen – discussed in Chapter 8) would mean that express services between Aberdeen and Edinburgh and Glasgow do not have to stop as often.
- 7.21 Analysis of this proposition (discussed in more detail in WP7 and in Chapter 9 of this report) suggests that, in combination, the Crossrail services could enable the Inter Regional services to generate a significant amount of benefit. The benefit of the local

services should therefore not be considered in isolation but should be considered as a package that includes:

- Dundee local services;
- Aberdeen Crossrail;
- Inverness to Aberdeen service;
- Edinburgh and Glasgow to Aberdeen services;
- Edinburgh and Glasgow to Dundee express services.

7.22 Of the other components of the MRS the additional Dundee to Ladybank service would have a negative NPV and performs slightly less well than the Crossrail service whilst the Perth-Markinch service would have a better BCR but a poorer NPV due to its higher capital cost. Both perform well against local planning objectives however.

Low Resource Scenario

7.23 The low resource scenario (LRS) concentrates primarily on what can be done within the constraints of current track capacity. There are no opportunities for train lengthening or the introduction of new Sunday services²³ within the Tay Area as services are currently provided by Inter Regional trains and already operate on Sunday's. However, a Crossrail scheme similar to that in the MRS but with an upgraded Invergowrie station rather than the new Dundee West station would require minimal capacity enhancement and is therefore appropriate for reconsideration under the LRS.

7.24 The Dundee Crossrail scheme, on the basis of the analysis undertaken, performs better than services from Dundee to the south side of the Tay Estuary. The development of new stations between Ladybank and Perth requires significant capacity enhancements along the route and therefore has been excluded from the LRS by definition.

7.25 The principal components of the LRS in the Tay Area are therefore;

- Two trains per hour Arbroath to Invergowrie;
- Station improvements at Invergowrie;
- Improved quality and security of stations;
- Improved information provision;
- Improved interchange with other modes.

7.26 The indicative capital cost of implementing the LRS for the Tay Area is **£5m**. The LRS would achieve a 24% increase in journeys over the 2010 do-minimum (compared to 37% with the MRS. Passenger miles would increase by 17%.

²³ NB the Crossrail service would provide the Sunday service from local stations rather than the inter-regional trains.

TABLE 7.5 TAY JOURNEYS AND PASSENGER MILES FOR LRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	8,792	422
Low resource	10,314	524
Uplift	1,522	102
% Uplift	17%	24%

Appraisal against Planning Objectives

- 7.27 The three scenarios have enabled us to test the combined effect of various schemes within three broad bands of investment level. The process has allowed us to consider how the best performing schemes might be packaged together.
- 7.28 These packages are presented in Table 7.6²⁴ along with those schemes that are independent of the Crossrail facilitating project, and assessed in terms of their contribution towards the planning objectives for the Tay Area and in terms of their economic performance. Table 7.6 also shows how these schemes could be packaged with NESTRANS, Inter Regional and SESTRAN projects.
- 7.29 The first cross-area package combines the Arbroath to Dundee West and Dundee Ladybank projects with an Aberdeen Crossrail service and with inter-regional services between Aberdeen and Edinburgh and Glasgow services that can be speeded up by removing their local stops now provided for by the Crossrail services. Table 7.6 shows that it contributes well to a number of the key planning objectives of the Tay Area and appears to offer a reasonable economic case, the benefits to the Inter Regional services improving the case compared to viewing the Crossrail scheme in isolation.
- 7.30 The second cross-area package is centred on the Perth to Markinch –Edinburgh local service and combines it with the full scale Waverley package (11 extra peak trains paths per hour) which includes an enhanced Edinburgh-Perth express service, Fife Circle service enhancements as well as other elements of the Waverley package between Edinburgh & Glasgow. This combined package makes a useful contribution towards planning objectives, although it contributes rather less to key objectives such as improving access to growth areas in the Dundee-Perth corridor. It is also more marginal in terms of value for money.
- 7.31 The results of the three Dundee Crossrail options (Arbroath to Perth, Arbroath to Dundee West and Arbroath to Invergowrie) show that Arbroath to Perth option provides the largest contribution towards the planning objectives. All three schemes perform poorly in economic terms although the Dundee West to Arbroath is the best performing (not apparent in Table 7.6 because of the banding used to rank the BCR's).

²⁴ Key to Table 7.6 and subsequent appraisal tables

7.32 Finally, the appraisal of the non-packaged elements of the individual schemes, including the St Andrews branch, indicates that improvements to existing stations are highly consistent with the planning objectives and that the St Andrews branch performs particularly poorly in economic terms.

7.33 The key to Table 7.6 is shown below.

Planning Objectives		Economy	
+++	Strongly Positive Impact	+++	BCR>2.0
++	Positive Impact	++	2.0>BCR>1.5
+	Slightly Positive Impact	+	1.5>BCR>1.0
-	Slightly Negative Impact	-	1.0BCR>0.75
--	Negative Impact	--	0.75BCR>0.5
---	Strongly Negative Impact	---	BCR<0.5

Table 7.6 Tay Estuary Appraisal

STRATEGIC OUTCOMES AND PLANNING OBJECTIVES										ECONOMY													
expanding the capability of the existing rail system			making rail use easier for the customer				developing new markets for rail		Economic Indicator														
Increase service frequencies especially between local stations	improve rail journey integration especially around Dundee	reduce journey times especially from Perth towards Ladybank	address deterrence factors including personal safety / security, information and facilities	improve intermodal access to rail particularly for car users outside Perth and Dundee and to the Perth and Dundee bus networks	deliver enhanced customer care	provide new access for developing communities and business zones especially within the Perth-Dundee corridor																	
PACKAGE OF TAY AND NESTRANS LOCAL SERVICES AND INTER-REGIONAL SERVICES																							
<ul style="list-style-type: none"> - Aberdeen Crossrail 2 : Airport to Stonehaven plus associated new stations including airport - Dundee Crossrail 2 : (Abroath to Dundee West) - Ladybank to Dundee Local Service - Hourly Aberdeen to Inverness Inter-Regional service - Faster timings for Edinburgh to Aberdeen Inter-Regional service (removal of local halts) - Faster timings for Glasgow to Aberdeen Inter-Regional service (removal of local halts) 										+++	++					+++			+				
PACKAGE : WAVERLEY STATION RE-DEVELOPMENT AND EDINBURGH AIRPORT SUB-SURFACE STATION PLUS THROUGH ROUTING OF SERVICES																							
<ul style="list-style-type: none"> Package F: +11 peak tph western approach to Edinburgh Waverley - Airdrie - Bathgate Proposals - File Circle package - Improved Express service to Perth - Local service to Perth serving new stations in Tay area 										++		+++				+++			-				
DUNDEE CROSSRAIL SCHEME OPTIONS																							
Dundee Crossrail 1 (Abroath to Perth) and new stations										+++	+++						+++				---		
Dundee Crossrail 2 (Abroath to Dundee West (new station))										+++	++										---		
Dundee Crossrail 3 (Abroath to Invergowrie)										+++	++										---		
INDIVIDUAL SCHEMES CONSIDERED BUT NOT INCLUDED IN ABOVE PACKAGES																							
St Andrews branch line and service to Dundee plus new stations										+												---	
Improved Station facilities													+++									Potentially positive	
Improved Rolling Stock																							Potentially positive
Fares and Ticketing initiatives																		+				Dependent upon strategy	

8. NORTH EAST SCOTLAND – THE NESTRANS AREA

SWOT Analysis

- 8.1 The NESTRANS area is characterised by strong economic growth centred around Aberdeen. Key growth areas (both population and business/employment) are located along the rail axis to the north and south of Aberdeen. The ability of rail to link to these developments is important for the area.
- 8.2 The rail network through the area consists of a single route and 7 stations. Only 12% of the population currently live within 1km of a station. There are poor service levels (low frequencies) between the local stations and Aberdeen. These are key travel to work corridors. Local services are provided by long distance services stopping at local stations. Connectivity by rail between areas to the north and south of Aberdeen is difficult. There is little spare capacity in the system (either north or south of Aberdeen) except for a continuation of the current service patterns.
- 8.3 Consultation has shown businesses and residents view rail positively. Accessibility to the rail system from and to other modes plus issues surrounding local station facilities, particularly where the station is unmanned or manned part-time, are however considered deterrents to using the system.
- 8.4 A SWOT analysis for the NESTRANS area is contained in WP3 Appendix A

Planning Objectives & Aspirational Targets

- 8.5 The planning objectives for the local services in NESTRANS arising from this analysis are shown in Table 8.1.
- 8.6 In broad terms the priority planning objectives are similar to those in the Tay Area. For the existing network they are to increase service frequencies, particularly on journey to work routes, to improve rail integration around Aberdeen, and to improve intermodal access, particularly for car users, outside of Aberdeen. In terms of developing new markets the primary aim is to provide new access for developing communities and business zones.

TABLE 8.1 NESTRANS STAG PLANNING OBJECTIVE ASPIRATIONAL TARGETS

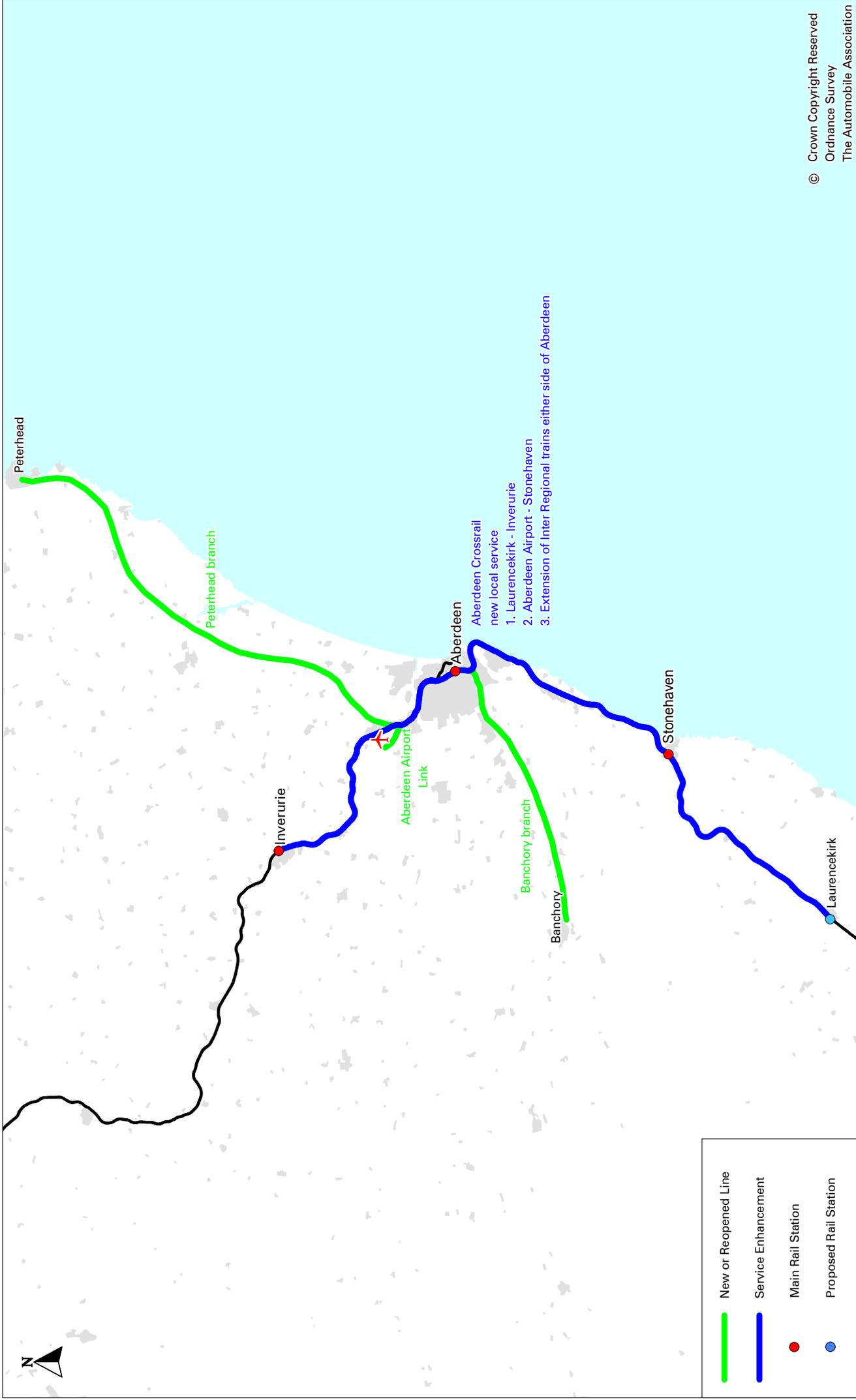
STRATEGIC OUTCOMES	NESTRANS AREA	
	PLANNING OBJECTIVES	ASPIRATIONAL TARGETS ¹
expanding the capability of the existing rail system	increase service frequencies especially on key travel to work routes and between local stations	Minimum 30 minutes between services with peak enhancements
	improve rail journey integration around Aberdeen	50% of north-south journeys should involve no more than a 5 minute wait in Aberdeen
	reduce journey times for travel especially between stations north – south of Aberdeen	Reduce journey times by a minimum of 10%
making rail use easier for the customer	improve intermodal access to rail particularly for car users outside Aberdeen	(i) 90% of intending customers arriving by car able to park within 5 minutes walk of stations outside Aberdeen (*) (ii) bus stops, taxi stand and car drop off facilities within 100 m of station plus walking and cycling facilities at station (iii) increase combined trips by train & bus by 25% (*)
	deliver enhanced customer care	Halve number of unsatisfied customers (*)
	reduce the relative (generalised) cost of rail especially relative to the car	Reduce generalised cost of travel by a minimum of 10%
developing new markets for rail	provide new access for developing communities and business zones especially those with poor or no access to the network	For 25% of significant existing developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	achieve better integration with new developments	For 25% of significant new developments, within potential catchment area of the railway, ensure there is less than 10 minutes travel time to access railway. (*)
	change attitudes towards rail travel	Reduce the number of Non-Users of the rail system who consider that rail is a poor method of travel by 33%. (*)

Note: 1 - The study will inform the achievability of the targets under different resource scenarios as well as the point in time that they can be achieved

(*) - Broad pragmatic target.

Projects Considered

8.7 Table 8.2 lists the various schemes that have been considered to address these objectives and also shows under which scenario they have been tested.



Scottish Strategic Rail Study
Figure 8.1: Schemes Considered: NESTRANS

Table 8.2: NESTRANS Contender Projects in the HRS, MRS or LRS

Proposal	All Major Facilitating Projects Scenario (HRS)	One Major Facilitating Project Scenario (MRS)	No Major Facilitating Projects Scenario (LRS)
Aberdeen Crossrail: Inverurie to Laurencekirk plus associated new stations including airport	✓		
Aberdeen Crossrail: Airport to Stonehaven plus associated new stations including airport		✓	
Hourly Inverurie to Aberdeen service (part of Inverness to Aberdeen service)		✓	✓
Aberdeen Crossrail: Extension of inter-regional services to Stonehaven (from Inverness) and to Inverurie (from Aberdeen).			✓
Peterhead Branch	✓		
Banchory Branch	✓		
Improved Station facilities	✓ ¹	✓ ¹	✓ ¹
Improved Rolling Stock	✓ ¹	✓ ¹	✓ ¹
Marketing Initiatives	✓ ¹	✓ ¹	✓ ¹
Fares and Ticketing Initiatives	✓ ¹	✓ ¹	✓ ¹

Note 1: The demand and benefit implications of improved station facilities, rolling stock and other initiatives were considered as sensitivity tests to the MRS.

High Resource Scenario

- 8.8 The underlying theme to the HRS scenario for NESTRANS is of a high quality, frequent local train service that is additional to and independent from the existing inter-regional express services. Rail would also increase its market penetration through an increased number of local stations. There would be a higher level of integration with other modes and a higher standard of customer service. Such a local service would be aimed at contributing towards the economic growth of the area and reducing traffic growth and road congestion in Aberdeen.

Facilitating Project

- 8.9 The Aberdeen Crossrail scheme of a new local service between Inverurie-Aberdeen Airport-Aberdeen-Stonehaven (and possibly on to Laurencekirk) is the facilitating project for this area. The scheme would provide a cross rail service with a 30 minute frequency that would run independently of and in addition to existing (and proposed) ScotRail Express and InterCity services in the area. New stations would be opened at Kintore, at Aberdeen airport, Aberdeen North (in the Bucksburn area), and Newtonhill. A station at Laurencekirk could form the southern end of the Crossrail scheme or could be an independent project.

- 8.10 Infrastructure improvements would be required for the 4 extra train paths - certainly between Aberdeen and Inverurie and possibly between Stonehaven and Aberdeen. New rolling stock would be provided consistent with the operation of a frequent and fast local service.

Other Projects

- 8.11 Two further projects – re-opening branch lines to Banchory, west of Aberdeen, and Peterhead to the north are included in the HRS with the aim of extending access to the rail network in the NESTRANS area. Both these projects are dependent upon the capacity enhancements associated with the Crossrail scheme.
- 8.12 Some projects can, however, be undertaken without the capacity increase in the short term these are:
- New station at Kintore;
 - New station at Laurencekirk (if separated from the Crossrail project).
- 8.13 Ground side projects aimed at improving inter-modal access (e.g. car parks, bus bays, taxi facilities), information provision, security (e.g. CCTV) and general customer service are also potentially independent of the facilitating project.
- 8.14 Figure 8.1 illustrates the location of the HRS schemes.

Performance of the HRS

- 8.15 The indicative capital cost of implementing all of the NESTRANS HRS schemes outlined in Table 8.2 is **£373m** of which 53% is accounted for by the diversion of the Aberdeen-Inverness line to an underground station at Aberdeen airport (WP6 for detail). The HRS would have a major impact on rail use within the NESTRANS area, increasing the number of journeys by 809,000 in 2010 (+130%) compared to the do-minimum (Table 8.3). Passenger miles would be increased by 62%.

TABLE 8.3 NESTRANS JOURNEYS AND PASSENGER MILES FOR HRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	15,677	623
High Resource	25,343	1,432
Uplift	9,665	809
% Uplift	62%	130%

8.16 The main contributors of benefit to the NESTRANS high resource scenario are the Crossrail link (the key facilitating project), associated new stations and the linkage of Aberdeen Airport and employment centre to the Crossrail service. The new branch lines to Banchory and Peterhead, whilst meeting the planning objectives, give a poor return on investment and annual revenues only cover a small fraction of annual operating costs.

Medium Resource Scenario

8.17 Further analysis of the Aberdeen Crossrail scheme indicates that the performance of the project is significantly reduced through the extension from Stonehaven to Laurencekirk. This section of Crossrail incurs 25% of the operating costs but only generates 5% of the fare revenue. Therefore for the medium resource scenario Stonehaven forms the southern terminus of the Crossrail scheme.

8.18 The linkage of the rail network to Aberdeen airport has the potential to generate a significant amount of additional trips. However, the high resource proposal to divert the Inverurie to Aberdeen line under the terminal, thereby allowing the airport to form a component of the Crossrail service is very expensive. For the purposes of the medium resource scenario a lower cost alternative, in the form of a spur of the main Inverness to Aberdeen line, has been considered. To provide an effective airport service requires at least two trains an hour between the airport and Aberdeen as well as to the residential and business areas to the south of Aberdeen.

8.19 In summary the medium resource scenario for the NESTRANS area consists of:

- Crossrail service between the new station and spur at Aberdeen Airport and Stonehaven (2 trains per hour), with new stations at Bucksburn, Cove and Newtonhill (Major Facilitating Project);
- An increase in frequency of the Inverness to Aberdeen service to hourly with a new station at Kintore, thereby providing an hourly service between Inverurie, Kintore, Dyce and Aberdeen;
- Station improvements providing better amenities and accessibility by other modes.

Performance of the MRS

8.20 The indicative capital cost of implementing the NESTRANS MRS is **£32m** compared to £373m for the HRS. The large difference is explained by the absence of the underground airport station and the two long branch lines to Banchory and Peterhead. The MRS would achieve an increase in rail journeys in the area of just under 0.5m in 2010 (Table 8.4), or around 61% of the HRS uplift in demand. Passenger miles would be increased by 5.1m in 2010, just over half of what would be achieved with the HRS.

TABLE 8.4 NESTRANS JOURNEYS AND PASSENGER MILES FOR MRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	15,677	623
Medium resource	20,803	1,118
Uplift	5,126	495
% Uplift	33%	79%

8.21 Analysing the performance of the two main components of the MRS package it appears that the Inverness – Aberdeen service (with Kintore station) contributes a larger share of the benefits than the Crossrail and Aberdeen Airport component.

8.22 While it performs well against planning objectives, the Crossrail project on its own would not generate a positive NPV or BCR. However, as we noted in the Tay Area chapter, combining the Aberdeen and Dundee Crossrail services with a package of inter regional service enhancements facilitated by these two projects would improve their overall performance and provide a reasonable prospect of a positive BCR for the package (WP7).

Low Resource Scenario

8.23 The low resource scenario (LRS) concentrates primarily on what can be done within the constraints of current track capacity. There are no opportunities for train lengthening or the introduction of new Sunday services within the NESTRANS area as services are currently provided by inter-regional trains and already operate on Sunday. Furthermore, the Crossrail scheme as defined in the MRS, would require capacity enhancements and has therefore been excluded from the LRS.

8.24 The alternative that has been tested in the low resource scenario is a lower cost version of the Crossrail scheme which involves extending one current express service per hour to Inverurie (from the south) and to Stonehaven (from Inverness). This would give a half hourly frequency between Stonehaven and Inverurie. This service would still require capacity enhancements north of Aberdeen, however, as these form part of the Aberdeen to Inverness IoS it is reasonable to assume that this is a deliverable capacity enhancement within the context of the LRS. The station at Kintore, would not, however, feature in the LRS. As currently occurs, local stations would be served by inter-regional services in the LRS.

8.25 The LRS would also include ‘quality’ enhancements such as:

- Improved quality and security of stations;
- Improved information provision;
- Improved interchange with other modes.

8.26 The indicative capital cost of implementing this LRS for the NESTRANS area is **£14m**²⁵. The LRS would achieve an 11% increase in journeys over the 2010 do-minimum (compared to 79% with the MRS and 130% with the HRS). Passenger miles would increase by 5%.

TABLE 8.5 NESTRANS JOURNEYS AND PASSENGER MILES FOR LRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	15,677	623
Low resource	16,530	694
Uplift	853	71
% Uplift	5%	11%

8.27 Looking at the performance of the components of the LRS (WP8) it would appear that the additional services to Inverness required to provide an hourly service are the poorer performing elements. However, neither component performs well. The poor performance of the LRS, relative to the MRS, indicates that serving the airport is an important element of the Crossrail service.

Appraisal against Planning Objectives

8.28 The three scenarios have enabled us to test the combined effect of various Crossrail schemes with other measures within three broad investment level bands, and to consider how the best performing schemes might be packaged together.²⁶

8.29 These packages are presented in Table 8.6 which also shows how these schemes could be packaged with Tay Area and Inter Regional projects.

²⁵ NB this excludes an allowance of £10m to facilitate the hourly Inverness-Aberdeen service which has been allocated to the Inter Regional LRS

²⁶ Key to Table 8.6

Planning Objectives		Economy	
+++	Strongly Positive Impact	+++	BCR>2.0
++	Positive Impact	++	2.0>BCR>1.5
+	Slightly Positive Impact	+	1.5>BCR>1.0
-	Slightly Negative Impact	-	1.0 BCR>0.75
--	Negative Impact	--	0.75 BCR>0.5
---	Strongly Negative Impact	---	BCR<0.5

Table 8.6 NESTRANS Appraisal

STRATEGIC OUTCOMES AND PLANNING OBJECTIVES										
	expanding the capability of the existing rail system			making rail use easier for the customer			developing new markets for rail			ECONOMY
	increase service frequencies especially on key routes and between local stations	improve rail journey integration around Aberdeen	reduce journey times for travel especially between stations north-south of Aberdeen	improve intermodal access to rail particularly for car users outside Aberdeen	deliver enhanced customer care	reduce the relative (generalised) cost of rail especially relative to the car	provide new access for developing communities and business zones especially those with poor or no access to the network	achieve better integration with new developments	change attitudes towards rail travel	
PACKAGE OF TAY AND NESTRANS LOCAL SERVICES AND INTER-REGIONAL SERVICES										
- Aberdeen Crossrail 2 : Airport to Stonehaven plus associated new stations including airport - Dundee Crossrail 2 : (Arbroath to Dundee West) - Ladybank to Dundee Local Service - Hourly Aberdeen to Inverness Inter-Regional service - Faster timings for Edinburgh to Aberdeen Inter-Regional service (removal of local halts) - Faster timings for Glasgow to Aberdeen Inter-Regional service (removal of local halts)	+++	+++	+	++		+	+++	+++		+
ABERDEEN CROSSRAIL SCHEME OPTIONS										
Aberdeen Crossrail 1 : Inverurie to Laurencekirk plus associated new stations including airport	+++	+++	+	++		+	+++	+++		---
Aberdeen Crossrail 2 : Airport to Stonehaven plus associated new stations including airport	+++	+++	+	++		+	+++	+++		--
Aberdeen Crossrail 3 : Extension of inter-regional services to Stonehaven (from Inverness) and to Inverurie (from Aberdeen).	+		-	+						---
INDIVIDUAL SCHEMES CONSIDERED BUT NOT INCLUDED IN ABOVE PACKAGES										
Peterhead Branch							+++			---
Banchory Branch							+++			---
Improved Station facilities				+++	+++	+			++	Potentially positive
Improved Rolling Stock				++	++	+			++	Potentially positive
Marketing Initiatives									+++	Dependent upon strategy
Fares and Ticketing Initiatives						+++			+	Dependent upon strategy
Scheme in isolation										
As part of package of local Aberdeen and Dundee services and fast Glasgow and Edinburgh to Aberdeen services										

- 8.30 The first package in Table 8.6 is the cross-area Tay, NESTRANS, Inter Regional Package described in the Tay Area chapter but assessed here against NESTRANS planning objectives. This package as we noted in the previous chapter performs reasonably well in terms of its economics and scores particularly highly against the planning objectives for the NESTRANS area, making significant contributions to all of the key objectives.
- 8.31 The second group of packages are centred around the Crossrail options from the three scenarios. This shows that the Stonehaven-Aberdeen airport option performs better in economic terms than the Inverurie-Laurencekirk whilst meeting the same planning objectives. Providing the Airport-Stonehaven service as part of a wider package such as the one outlined would seem the best prospect.
- 8.32 Of the remaining projects assessed in Table 8.6, the Banchory and Peterhead branches both make a significant contribution to only one of the planning objectives for the region and both have very poor value for money cases.
- 8.33 As was the case in the Tay Area, measures to improve existing stations to integrate them with other modes and ‘softer’ quality and safety/security enhancements as part of a package of measures performs well against the objectives.

9. INTER-REGIONAL LINKS

- 9.1 The final element of our analysis has been to look at the links between the geographical ‘regions’ of the study area and beyond.

SWOT Analysis

- 9.2 Inter-regional movements are characterised in the main by journey times that are not competitive with the car or coach (with the exception of the Glasgow to Edinburgh service). This is a particular concern in the North East of the country. For external movements that are not on the East Coast Mainline (e.g. Manchester, Birmingham, Liverpool, Bristol) current journey times are considered to be uncompetitive. There is a lack of north-south journey integration through Glasgow, which can be a deterrent. Service reliability and frequency are also issues within the west of Scotland on cross-border routes.
- 9.3 Accessibility to the long distance rail network by car or bus can be an issue in the congested urban areas. Additionally, increased competition from low cost airlines (cross border) and the coach and car (within Scotland) are eroding rail’s market share of the long distance market.
- 9.4 A SWOT analysis for the Inter-Regional and External Movements is contained in WP3 Appendix A.

Planning Objective & Aspirational Targets

- 9.5 The planning objectives for Inter –Regional services are shown in Table 9.1. The priorities lie largely with improving the service for existing markets; to reduce journey times where rail is not competitive with car and coach (principally to/from the North East), to reduce the relative generalised cost of rail with respect to its competitors, to improve north-south journey integration and to improve inter-modal access.

Projects Considered

- 9.6 Table 9.2 lists the various schemes that have been considered to address these objectives and also shows under which scenario they have been tested. By definition there is a very high degree of inter-relationship between the Inter Regional projects and those under consideration in the regions, particularly those in the Central Belt.
- 9.7 The facilitating projects for the various Inter Regional projects have already been described in the individual area chapters.

TABLE 9.1 INTER-REGIONAL STAG PLANNING OBJECTIVES & ASPIRATIONAL TARGETS

STRATEGIC OUTCOMES	Inter-Regional	
	PLANNING OBJECTIVES	ASPIRATIONAL TARGETS ¹
expanding the capability of the existing rail system	reduce journey times especially routes currently not competitive with car or coach.	reduce journey times on express routes by 15%
	improve north-south journey integration especially through Glasgow	no more than 5 minute interchange time for 50% passengers travelling inter-regionally north - south through Glasgow
	improve reliability especially cross-border services from W. of Scotland	Charter performance to be: punctuality 95%, reliability (availability) 99.5%
	increase service frequencies especially for long distance services from W. of Scotland improve journey quality especially for services from north east of Scotland	minimum 30 minute frequency on all express services and 1 hour minimum on trunk routes increase by 25% the number of passengers satisfied with journey quality (*)
making rail use easier for the customer	improve intermodal access to / from long distance rail	(i) 90% of intending customers able to park within 5 minutes' walk of station (*) (ii) bus stops, taxi stand and car drop off facilities within 100 m of station
	reduce the relative (generalised) cost of rail with respect to the car, low cost airlines and the coach deliver enhanced customer care	reduce generalised cost of rail travel by 15% halve number of unsatisfied customers (*)
developing new markets for rail	change attitudes towards rail travel	reduce by 33% the number of non-users of rail who consider that rail is a poor method of travel (*)

Note: 1 - The study will inform the achievability of the targets under different resource scenarios as well as the point in time that they can be achieved

(*) - Broad pragmatic target.

High Resource Scenario

9.8 The theme for the Inter-Regional High Resource package is to provide a far more attractive service than at present, with higher frequencies throughout, more routes and connections, higher service quality and journey times that are competitive with other modes. These characteristics are aimed at enabling the express railway system to attract many more customers, meet a higher proportion of the longer distance travel demand, and reflect the needs for cohesive development of Scotland's major regional centres based around more effective use of public transport.

9.9 The components of this scenario are described in the following paragraphs.

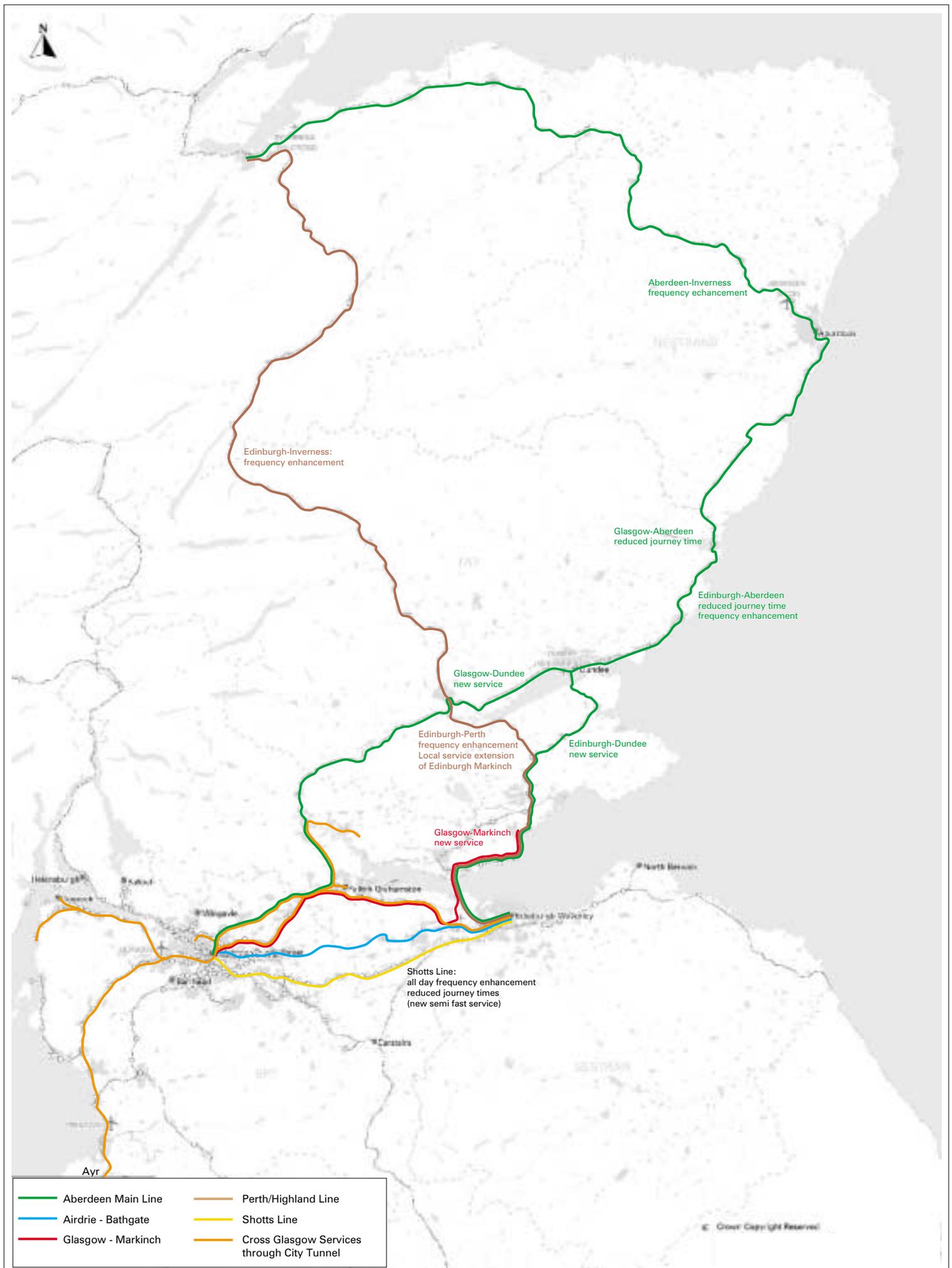
Table 9.2: Inter-Regional Contender Projects for HRS, MRS or LRS

Proposal	All Major Facilitating Projects Scenario (HRS)	One Major Facilitating Project Scenario (MRS)	No Major Facilitating Projects Scenario (LRS)
Waverley Station Re-Development (see SESTRAN area)	✓	✓ ¹	
Edinburgh Airport : Sub surface station plus through routing of services (option EA2) (see SESTRAN area)	✓		
Glasgow City Tunnel (see SPT area)	✓		
City Union Line Upgrade (see SPT area)	✓	✓	
Airdrie-Bathgate	✓	✓ ¹	
Shotts Semi -Fast	✓	✓ ¹	
Edinburgh to Aberdeen (fast service, arising through the removal of stops in the Tay and NESTRANS areas)	✓	✓	✓
Glasgow to Aberdeen (fast service, arising through the removal of stops in the Tay and NESTRANS areas)	✓	✓	✓
Edinburgh to Dundee (new express service)	✓	✓ ¹	
Glasgow to Dundee (new express service)	✓	✓	
Edinburgh to Inverness (enhanced express service)	✓	✓ ¹	
Inverness to Aberdeen (enhanced express service)		✓	✓
Glasgow Airport to SESTRAN area (Falkirk GS or Edinburgh)	✓	✓	
Glasgow to Fife (Markinch) service	✓		
Ayr to Edinburgh (direct express service)	✓		
Improved Station facilities	✓ ²	✓ ²	✓ ²
Improved Rolling Stock	✓ ²	✓ ²	✓ ²
Marketing Initiatives	✓ ²	✓ ²	✓ ²
Fares and Ticketing Initiatives	✓ ²	✓ ²	✓ ²

Note 1: The scale of the Waverley Station development will affect the inclusion of these schemes within the Medium Resource Scenario

Note 2: The demand and benefit implications of improved station facilities, rolling stock and other initiatives were considered as sensitivity tests to the MRS.

- 9.10 A new Inter Regional express network has been devised and tested and includes the following:
- Glasgow and Edinburgh: Four express trains an hour between Glasgow and Edinburgh forming a quarter hourly service via Falkirk, serving Edinburgh Airport en route (with journey time improvements compared to the existing express service). Two will continue on to / from the Ayr Coast from Glasgow via Paisley whilst the other two would continue to /from Glasgow Airport;
 - An hourly semi fast service between Edinburgh and Glasgow via Shotts;
 - A local quarterly hourly service between Edinburgh and Glasgow via Airdrie - Bathgate with 2 continuing on to /from Helensburgh and two continuing on to / from Paisley Gilmour Street (see SESTRAN and SPT projects);
 - A half hourly service from Glasgow and from Edinburgh to Dundee, with two trains per hour continuing on to / from Aberdeen. From both Edinburgh and Glasgow one of the two trains per hour will be fast and the other will be semi-fast;
 - A half hourly semi fast service from Glasgow via Cumbernauld, Falkirk and Edinburgh Airport to Kirkcaldy;
 - An hourly service from Edinburgh to Perth via Kirkcaldy, continuing to / from Inverness.
- 9.11 To achieve these increased service frequencies the following facilitating infrastructure projects will be required:
- Edinburgh Waverley rebuilding (Chapter 5);
 - Edinburgh Airport link (Chapter 5);
 - Glasgow Cross City links (Chapter 6);
 - Ladybank – Perth capacity enhancement (Chapter 7);
 - Lenzie - Falkirk capacity upgrading;
 - Aberdeen and Dundee Crossrail (Chapters 7 & 8).
- 9.12 The construction of these facilitating projects allows the implementation of a package of measures that include improved journey speeds on the Edinburgh – Dundee – Aberdeen line, and the re-opening of the Bathgate to Airdrie line.
- 9.13 The infrastructure projects defined would be complemented by an increase in the number of trains in the express fleet, and greater quality for the whole fleet. These investments would also increase seating capacity over all routes.
- 9.14 The improved level of provision would be supported by integral packages of better customer care, ticketing, information, and marketing, designed to maximize the opportunities for the express network. The express network would be integrated with stopping and suburban rail services and with bus services and access to express service stations by car will form a key element.



Scottish Strategic Rail Study
Figure 9.1: Schemes Considered: Inter Regional

Performance of the HRS

- 9.15 The indicative capital cost of implementing all of the Inter Regional HRS schemes outlined in Table 9.2 is **£129m**. It should be noted that all of the facilitating projects, and most of the other projects within the HRS, with the exception of Airdrie – Bathgate and the Lenzie Falkirk upgrading, have been costed in the regional strategies, hence the relatively low cost for the Inter Regional HRS. However, the operating costs of the new and enhanced express services are substantial and are estimated at an additional £46m pa (WP6).
- 9.16 The high resource scenario improves direct inter-regional journey times through the reduction in the number of stops that such services make. This was achieved by the introduction of local services in the Tay and NESTRANS areas. The generalised cost of travel was reduced through the introduction of increased frequency between Edinburgh and Glasgow and Stirling, Perth and Dundee. Additionally, a new service between Glasgow Queen St and Markinch was introduced. The Glasgow City Tunnel provided a direct link between the Ayrshire and Inverclyde local authorities and the SESTRAN local authorities. As might be expected given the extent of these service enhancements, the HRS results in a large increase in the use of Inter Regional rail services, an extra 72% more passengers and 60% more passenger miles (Table 9.3).

TABLE 9.3 INTER REGIONAL JOURNEYS AND PASSENGER MILES FOR HRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	362,631	6,641
High Resource	579,229	11,432
Uplift	216,598	4,791
% Uplift	60%	72%

Medium Resource Scenario

- 9.17 The improvement in services between the SPT and Tay/NESTRANS and between SESTRAN and Tay/NESTRANS suggests that whilst some of the services produce a positive contribution to overall benefits in the HRS, not all the services do. However, the synergies between all the different services and the major facilitating projects in the high resource scenario (particularly the City Tunnel) make it difficult to disaggregate the benefits of the individual long distance services from those of other projects. All the long distance services between the Central Belt and Tay and NESTRANS were therefore considered as “contenders” for the medium resource scenario and demand forecasts have been prepared.
- 9.18 Elsewhere, the choice of facilitating projects in the Central Belt in the MRS has implications for the Inter Regional services that can be operated. The Glasgow City Tunnel and the Edinburgh Airport sub-surface station projects are not in the MRS. The choice of a smaller scale Edinburgh Airport rail link option and capacity problems at Glasgow Queen St (because there is no Glasgow City Tunnel) means that the Glasgow to Markinch service, that had been included in the high resource scenario, cannot be included in the medium resource scenario.

- 9.19 The high resource scenario also included two new inter-regional services that perform a local function. These services are Airdrie/Bathgate and the Caledonian Express (Shotts semi-fast). Both the Airdrie/Bathgate and the Caledonian Express service have been considered in the MRS to ensure that the interactions between them and the major facilitating projects in the SPT and SESTRAN areas are fully explored.
- 9.20 In summary, the following services were included for testing in the medium resource scenario:
- Hourly services between Glasgow/Edinburgh and Dundee;
 - Hourly services between Glasgow/Edinburgh and Aberdeen (with fewer stops than existing services);
 - Hourly service between Edinburgh and Perth (extension of existing Edinburgh to Markinch service);
 - Two hourly service from Edinburgh to Inverness (serving Perth within the SSRS study area), and;
 - Between SESTRAN & SPT; the Shotts Semi-Fast service and the Airdrie-Bathgate route.
- 9.21 As discussed in the SESTRAN and SPT chapters previously, capacity limitations at Edinburgh Waverley and Glasgow Central High Level mean that not all of these services can in practice be accommodated and hence the MRS testing was used to establish which of the services contribute most to the performance of the strategy.

Performance of the MRS

- 9.22 The capital cost for the MRS is unchanged from the HRS at £143m (the savings in cost between the two scenarios are accounted for elsewhere in the SPT & SESTRAN areas). The operating costs are lower, at £21m pa compared to £43m. The increase in demand is smaller, but is still highly significant at the equivalent of 56% higher than in the do-minimum (Table 9.4).

TABLE 9.4 INTER REGIONAL JOURNEYS AND PASSENGER MILES FOR MRS VS (CAPACITY CONSTRAINED) DO MINIMUM 2010 (000S)

	Passenger Miles pa	Journeys pa
Do Minimum	362,631	6,641
Medium resource	532,675	10,338
Uplift	170,044	3,697
% Uplift	47%	56%

- 9.23 When we look at the performance of the individual components of the MRS, it is very clear that the Inter Regional services are affected by the interactions between the regional projects and vice versa.
- 9.24 Between the *Central Belt and the Tay and NESTRANS* areas, hourly services to Dundee and fast services to Aberdeen were considered. The fast services to Aberdeen could occur as result of the Dundee and Aberdeen Crossrail services. The Edinburgh to Aberdeen service had also been strengthened. There are therefore synergies (shared benefits and costs) between all these enhanced services/schemes, as well as between

these schemes and the hourly Inverness to Aberdeen service – which shares costs with the Aberdeen Crossrail proposal. An analysis was undertaken (WP7) of the new Edinburgh to Dundee service and the enhanced (12 to 16 trains per day) and faster Edinburgh to Aberdeen service to unpick these synergies and it appears that it is the fast and enhanced Edinburgh to Aberdeen service that accrues the majority of the benefit on this route.

- 9.25 A similar conclusion was reached when the services to/from the SPT area were analysed. The two services under consideration here are the new Glasgow to Dundee service and the faster Glasgow to Aberdeen service. The results of the analysis are presented in WP7 and while the Dundee service meets a number of planning objectives it is the fast and enhanced Glasgow to Aberdeen service that accrues the majority of the benefit on this route.
- 9.26 The results of the analysis of the relative benefits of the local and express services from *Edinburgh to Perth* were discussed in Chapter 7 on the Tay Area. To recap, the best NPV, albeit negative, is achieved through the frequency enhancement of express services between (Inverness) -Perth-Edinburgh. However, the BCRs between the two service options are indistinguishable and it was considered that the local service to Perth would contribute more to the planning objectives of the Tay area than the express service to Perth & Inverness does for the planning objectives of the Inter-Regional grouping.
- 9.27 Between *SPT & SESTRAN* the performance of the Shotts semi-fast service and the Airdrie-Bathgate service were reviewed as part of the Waverley upgrade and Glasgow Central capacity debate. In summary, capacity constraints at Glasgow Central HL and Edinburgh Waverley (even with Edinburgh Waverley Option 4) combined with the fact that strong schemes exist that compete for the same train paths as the Shotts semi-fast service, suggest that a Shotts semi-fast service would not be a priority and that a new service between Edinburgh and Glasgow via the Airdrie to Bathgate link would perform better.

Low Resource Scenario

- 9.28 The LRS only contains one Inter Regional service enhancements – the increase from 12 to 16 trains per day between Aberdeen to Inverness which supports NESTRANS – Aberdeen Crossrail scheme. All the other Inter Regional projects rely on a major facilitating project. The capital costs of implementing the Inverness service are estimated at **£10m** and the service (and the additional Inter Regional trips generated by some of the other LRS schemes) would increase Inter Regional journeys in total by 220,000 in 2010, or 3%. Passenger miles would increase by 12.2m, also 3%.
- 9.29 When the LRS Inter Regional services are packaged with the Tay and NESTRANS services (WP8) the benefits under the LRS are less than those achieved under the MRS for NESTRANS but similar for the Tay Area. With respect to the NESTRANS results, the lack of integration (through new stations) with development areas, particularly the airport area, has significantly reduced the potential market for the Crossrail service, whilst capital and operating costs have not been reduced by a proportionate amount. The proposals in the Tay area are similar under both the MRS and the LRS and there is no significant change in performance.

Appraisal against Planning Objectives

- 9.30 The three scenarios have enabled us to test the combined effect of various Inter Regional schemes with other measures in each region within the three broad investment level bands, and to consider how the best performing schemes might be packaged together.
- 9.31 Three broad packages as well as the individual projects that have not been assessed within a package are appraised in Table 9.5.
- 9.32 The Tay/NESTRANS/Inter-Regional package has been assessed in both the NESTRANS and Tay chapters and shown to perform well against their objectives. Against the Inter-Regional planning objectives it makes a more modest, although still positive, contribution, perhaps reflecting the geographical diversity of the planning objectives for the inter-regional services. As noted earlier, it performs reasonably well in value for money terms.
- 9.33 The Waverley package has been described in the SESTRAN and Tay Area chapters. When assessed in the Inter Regional context it makes a small positive contribution to a large number of the planning objectives.
- 9.34 The Glasgow City Tunnel package majors on the improved north-south connectivity that the tunnel would bring for Inter Regional travel. This package performs well against one or two of the key objectives and contributes in a smaller way to a number of other ones.
- 9.35 The individual new /enhanced services appraised in Table 9.5²⁷ (Edinburgh-Dundee, Glasgow-Dundee, Glasgow Airport to Falkirk/Edinburgh and Glasgow to Markinch), all make a useful contribution to at least three of the planning objectives but do not perform particularly strongly in economic terms. As elsewhere, station integration and quality measures make a significant contribution towards the planning objectives.

²⁷ Key to Table 9.5

Planning Objectives		Economy	
+++	Strongly Positive Impact	+++	BCR>2.0
++	Positive Impact	++	2.0>BCR>1.5
+	Slightly Positive Impact	+	1.5>BCR>1.0
-	Slightly Negative Impact	-	1.0BCR>0.75
--	Negative Impact	--	0.75BCR>0.5
---	Strongly Negative Impact	---	BCR<0.5

Table 9.5 Inter-Regional Appraisal

STRATEGIC OUTCOMES AND PLANNING OBJECTIVES										ECONOMY
	expanding the capability of the existing rail system					making rail use easier for the customer			developing new markets for rail	Economic Indicator
	reduce journey times especially routes currently not competitive with car or coach.	improve north-south journey integration especially through Glasgow	improve reliability especially cross border services from W. of Scotland	increase service frequencies especially for long distance services from W. of Scotland	improve journey quality especially for services from north east of Scotland	improve intermodal access to / from long distance rail	reduce the relative (generalised) cost of rail with respect to the car, low cost airlines & coach	deliver enhanced customer care	change attitudes towards rail travel	
PACKAGE OF TAY AND NESTRANS LOCAL SERVICES AND INTER-REGIONAL SERVICES - Aberdeen Crossrail 2 : Airport to Stonehaven plus associated new stations including airport - Dundee Crossrail 2 : (Aberroath to Dundee West) - Ladybank to Dundee Local Service - Hourly Aberdeen to Inverness Inter-Regional service - Faster timings for Edinburgh to Aberdeen Inter-Regional service (removal of local halts) - Faster timings for Glasgow to Aberdeen Inter-Regional service (removal of local halts)	++			+			++			+
PACKAGE : WAWERLEY STATION RE-DEVELOPMENT AND EDINBURGH AIRPORT SUB-SURFACE STATION PLUS THROUGH ROUTING OF SERVICES Package F : +11 tph western approach to Edinburgh Waverley - Airdrie - Bathgate Proposals - Fife Circle package - Improved Express service to Perth - Local service to Perth serving new stations in Tay area - Shotts semi-fast service (Edinburgh to Glasgow)	++		+				+			-
PACKAGE : GLASGOW CITY TUNNEL - North - South Connectivity (e.g. Avr to Edinburgh, Glasgow Airport to Maryhill/Anniesland, Bridge of Weir to Croy, Gourcock to Croy, Gourcock to Falkirk GS, Glasgow Airport to Dunblane/Aloa,	++	+++	+	+			+			-
INDIVIDUAL SCHEMES CONSIDERED BUT NOT INCLUDED IN ABOVE PACKAGES										
Edinburgh to Dundee (new express service)	++			+						+
Glasgow to Dundee (new express service)	++			+						+
Glasgow Airport to SESTRAN area (Falkirk GS or Edinburgh)		++			+++					+
Glasgow to Fife (Markinch) service	++	+								+
Improved Station facilities								++		+++
Improved Rolling Stock								+++		++
Marketing Initiatives										+++
Fares and Ticketing Initiatives										+

10. SUMMARY

Future Demand for Rail Travel

- 10.1 Under our central economic and planning scenario the analysis has shown that demand for rail travel within the study area is expected to increase by 17m over the next twenty years, from around 48m²⁸ in 2000 to over 65m by 2020, simply as a result of background economic, demographic and social change.
- 10.2 Whilst it might be tempting to conclude from this that the rail industry does not have to do very much to see an increase in patronage approaching 40% over the next 20 years, simply addressing the current infrastructure constraints and providing the system capacity to cope with this growth will require a significant commitment of resources.
- 10.3 However, it is clear from the preceding analysis that this alone will not be a sufficient course of action if the objectives of the Scottish Executive and the stakeholders in the rail industry are to be met and that further investment will be needed if the vision for rail is to be achieved.
- 10.4 We have used three scenarios (high, medium and low) to test what might be achieved with different scales of investment. While we have noted throughout this document that the scenarios were developed to enable us to understand the *relative* performance of various packages of schemes and that these scenarios do not, in the round, represent an 'optimal' investment package, the study area demand forecasts shown in Table 10.1 are, nevertheless, indicative of the scale of impact that might be achieved.
- 10.5 The schemes considered within the low resource scenario would add only another 2m trips in 2020 but would improve the travelling conditions for existing peak period travellers significantly. If the schemes in the medium resource scenario were implemented they would add another 20m trips per year by 2020 to those in the low resource scenario, while if the schemes tested in the high resource scenario were implemented as tested, demand would grow by a further 9 million per year. The total number of journeys by rail could therefore reach as high as 96m by 2020, or just over double the current number of rail trips within the study area.
- 10.6 It is important to note that the implications of this growth are not solely confined to the lines in the study area as it will also impact upon other routes in Scotland, such as the Highland line.

²⁸ Noting again that the base year figure does not include an estimated additional 10m passengers pa within the SPT area travelling on ticket types that are not recorded in the national rail CAPRI ticket database.

TABLE 10.1 SUMMARY OF ANNUAL PASSENGER JOURNEYS WITHIN THE STUDY AREA DO-MINIMUM, HRS, MRS AND LRS (000S)

	2000	2010	2020
Do Minimum	47,780	54,773	65,232
Low Resource Scenario		55,995	66,937
Medium Resource Scenario		72,345	87,596
High Resource Scenario		79,645	96,260

Factors that Could Affect the Demand Forecasts

- 10.7 To assess the robustness of these forecasts a number of sensitivity tests were undertaken (WP's 4 & 7).

Implications of Economic and Planning Forecasts

- 10.8 Of these tests, the most significant was found to be the planning data that drives the background growth forecasts. For consistency this study uses the CSTM3A planning data that has been used for the parallel Scottish Executive studies.
- 10.9 However, using the national (TEMPRO) forecasts for local population, employment and economic conditions rather than the Glasgow and Clyde Valley Structure Plan forecasts contained within CSTM3A reduces the overall Do-minimum forecast to around 57m in 2020, or one half of the growth shown in Table 10.1. Travel to/from the SPT area is most greatly affected by this but as the largest attractor and generator of rail trips in Scotland the knock-on effect of lower than expected activity in the SPT area spreads to travel to/from all of the regions (Chapter 3).
- 10.10 The general implications of this are largely associated with phasing/timing and re-distribution rather than fundamentally altering the direction of the strategy. The introduction of some of the overcrowding relief measures would be delayed, as would the introduction of many of the other investment measures, while the re-distributional impact would arise from the fact that the investment schemes most directly affected would be those in, or affecting travel to/from, the SPT area.
- 10.11 The under-reporting within the CAPRI rail ticket database of rail travel in the SPT area is likely to be a counter-vailing influence to this that could improve the economic performance of some of the projects assessed, (WP2 and footnote 4, Chapter 3), making it difficult to draw firm conclusions on the implications for the SPT area. However, the general implication is that the timing of investments might be delayed if the economy and the proposals for land use development do not follow the pattern set out in the GCVSP.

Sensitivity to Journey Times, Service Quality and Fares

- 10.12 As well as the specific investment proposals described and appraised in the three scenarios, we have also tested²⁹ the demand implications of a number of more ‘generic’ options for improving rail services – adjusting fares, journey times and improving quality.
- 10.13 Enhancing *service quality* (better integration, information provision, rolling stock and station quality etc) has been identified in this study as an important planning objective, reflecting the need to enhance the overall ‘travel experience,’ for rail customers. The analysis (WP7) suggests that a package of quality enhancements across the network could increase MRS demand by 3m passengers pa in 2010 (+4%). This would increase the present value of the benefits of the MRS by £191m (+13%), indicating that these quality improvements, which are important planning objectives for the SSRS, would be worth pursuing in value for money terms if they can be delivered for less than £190m PV (approximately 13% of the combined capital and operating cost of the MRS).
- 10.14 Further tests on fares and journey times were undertaken to assess the robustness of the central forecasts. The *fares* test included a 15% average fares *reduction* on long distance services across the study area and a five percent *increase* in all fares across the study area³⁰.
- 10.15 A 15% fares reduction for inter regional services would increase overall rail patronage by 0.4m pa in 2010 and increase the PV of the benefits of the MRS by £38 million (3%). The potential effect of an across-the-board 5% average fares increase would increase annual fares revenue by £1.3 million per year in 2010. However, this would also lead to large reductions in the number of journeys and passenger miles by rail (-2.5 million and -49 million respectively), and as consequence the overall incremental PV of benefits would be negative at -£48 million.
- 10.16 We have also looked at how sensitive demand might be to improvements in *journey time*, in particular for long distance journeys where the planning objectives indicated that a priority was to increase competitiveness with car journey times. A simple test, which included a 15% reduction in journey times on all long-distance movements, added almost 0.2m (+18%) long distance trips to the network in 2010 and increased the PV of benefits by an estimated £82 million.

²⁹ These options were assessed as sensitivity tests to the MRS and are described in WP7.

³⁰ The results are heavily dependent upon the choice of fares elasticity used (in this case 1.0) and should therefore be treated with some caution. Nevertheless, they indicate the broad scale of impact

Value For Money

- 10.17 As is the case with the *overall* scenario demand forecasts, it is important not to read too much into the economic appraisal results of the three scenarios presented in Table 10.2. Each scenario contains some high performing schemes and, particularly in the HRS, some poor performing schemes. The analyses presented in Working Papers 6 to 8 have shown how repackaging some projects and replacing others could improve their performance.
- 10.18 It is also important to recognise that the strategic forecasting and appraisal approach used in this study is aimed at gaining an understanding of the relative performance of projects rather than predicting their absolute performance.
- 10.19 Nevertheless, it is reasonable to ask what is likely to be the value for money of the investment required to lever in the additional rail patronage over and above the background growth and to that end Table 10.2 summarises the economic indicators for each of the (non-optimised) scenarios.

TABLE 10.2 ECONOMIC APPRAISAL OF (NON-OPTIMISED) SCENARIOS

Item	High Resource	Medium Resource	Low Resource
	PV £M ³¹	PV £M	PV £M
Capital Cost	(1,534)	(651)	(43)
Operating Cost	(1,084)	(776)	(183)
Revenues	412	402	33
User Benefits	256	666	156
Non User Benefits	594	452	47
Net Present Value	(1,357)	92	10
B/C Ratio	0.5	1.1	1.1

- 10.20 Unsurprisingly as it includes several capital-intensive projects and a number of schemes that subsequently were shown to be particularly poor value for money, the HRS has the poorest economic performance.
- 10.21 The MRS which is a little closer to an ‘optimised’ HRS, in the sense that the poor performing HRS schemes were excluded from it performs better, as does the LRS. Indeed the LRS might have been expected to do better still - the analysis in WP8 suggests that the train lengthening projects within the LRS perform better than the average for the scenario – but that other elements of the scenario pull the overall performance down.
- 10.22 Nevertheless, in the context of a twenty year strategy, these scenarios, even if they were optimised would not necessarily be considered as alternatives. The LRS is largely concerned with things that can be achieved within the next three to five years

³¹ 6% discount rate

and this sets it apart from the other two scenarios. Which path is then pursued will depend on the scale of funding that is available. There are some elements of substitution between the MRS and HRS and some of the key issues that need to be considered here are set out below.

Key Issues – SESTRAN Area

- 10.23 The key issue in the SESTRAN area is what scale of upgrade to provide at Waverley as this project determines most of what can be achieved elsewhere in the area and also influences many of the decisions on Inter Regional traffic. Our analysis suggests that the +11 peak tph option would generate the highest level of achievement against planning objectives and the best economic case of the packages considered.
- 10.24 Linked to this is the decision on the Edinburgh Airport rail link. The full scheme with a sub-surface station in conjunction with the full Waverley upgrade would add significant capability to the system, would do particularly well against planning objectives and generate a high level of demand and revenue but has a very high capital cost. Conversely, the 4tph Airport shuttle service tested in the MRS takes up a significant proportion of the additional capacity provided by an enhanced Waverley and limits the scope for other Inter Regional and SESTRAN to SPT services. The decisions on the airport rail link are therefore highly germane to the future rail strategy.

Key Issues – SPT Area

- 10.25 The key issue in SPT is the central area capacity problem and decisions on the two facilitating projects – City Tunnel and City Union – that have been considered here. The lower cost City Union/Strathbungo Link appears to offer a stronger value for money case than the City Tunnel project, but the latter makes a much greater contribution to planning objectives, not just in the west of the Central Belt, but for the Inter Regional, Tay and NESTRANS areas as well.
- 10.26 These are not competing schemes. Their relative costs, and the scale of their impacts are of different orders of magnitude. Fundamentally, there is relatively little scope to increase peak service frequencies in the SPT area without addressing the Glasgow Central High Level capacity constraint. The City Tunnel project would do that, the City Union project, whilst a worthwhile project in its own right, would not, particularly if the Glasgow Airport shuttle service is introduced. In the context of a twenty year strategy for the largest rail network outside London this particular issue has to be addressed.

Key Issues Tay, NESTRANS and Inter Regional Services

- 10.27 In NESTRANS an important consideration is that the Crossrail service as envisaged is dependent upon the delivery of capacity upgrade *outside* of the study area, on the Inverness-Aberdeen line. However, the key issue in both the Tay and the NESTRANS areas is finding a way to link the proposals for Crossrail projects in Dundee and Aberdeen into a joint package with the express and InterCity services.

10.28 Both Crossrail services perform well against the planning objectives for their respective areas, but poorly in value for money terms when assessed as stand alone projects. The best prospect for delivering these two projects is to consider them as ‘enabling’ projects which, through a service recast into distinct express and local services, allow improvements in Inter Regional express journey times to be achieved. This may prove to be the most cost-effective way of obtaining faster Inter Regional services whilst at the same time meeting the planning objectives for the Tay and NESTRANS areas.

Achieving the Vision – The Priorities

10.29 Finally, we consider how the findings of the area-by-area analysis can be drawn together into a strategy for the whole of the study area. We noted in Chapter Four that there were three strategic outcomes that needed to be achieved if the vision for rail, repeated below, was to be achieved.

The rail system will fully support the economic, social and environmental aspirations of the study area’s citizens. Rail passenger services will be of a scale and quality that rail will increasingly become a more viable, practical, affordable and attractive travel choice for passengers in and between the urban areas of Central and North East Scotland, and will become at least as attractive as the private car for an increasing proportion of travel over the next ten years and beyond. As a consequence, the rail network will carry an increasing proportion of peak and off peak travel within the context of sustained growth in travel demand. Rail freight services will similarly be enhanced to play an increasing role in the primary and secondary distribution of goods. The development of rail will represent value for money for users, operators and the taxpayer.

10.30 These were:

- To expand the capability of the existing rail system;
- To make rail use easier for the customer;
- To develop new markets for rail.

10.31 ‘Generic’ strategies for achieving these outcomes were set out in Chapter 4. The analysis presented area by area in the subsequent chapters has enabled us to firm up the generic strategies with examples of the types of specific project that could form part of these strategies.

10.32 The projects noted here, for each of the three strategic outcomes, are merely examples taken from the large number of projects appraised during this study. This is not meant to be a definitive or exhaustive list, and the omission of a particular project from it should not be considered significant. However, the three tables below illustrate how the projects contribute towards the strategic outcomes and on what sort of timescale they may be most appropriately considered.

TABLE 10.3 STRATEGIC OUTCOMES

Strategic Outcome 1			
EXPANDING THE CAPACITY AND CAPABILITY OF THE SYSTEM			
Projects			
Strategies	Short Term	Medium Term	Long Term
Address network constraints	Some small infrastructure capacity projects where they contribute to medium term objectives (e.g. Haymarket W. to Inverkeithing , Kilmarnock IoS, Kilwinning to Paisley, Bathgate branch, etc.)	Capacity enhancement at Edinburgh Waverley Station Re-route trains from Glasgow Central High Level to Central Low Level (e.g. the Whifflet service) and to Queen St Low Level (e.g. E. Kilbride and Barrhead services) Other smaller infrastructure capacity projects associated with medium term objectives (e.g. Paisley GS to Central, Aberdeen to Inverness IoS which facilitates Aberdeen Crossrail etc.)	Address peak hour and off peak capacity constraints at Glasgow terminal stations (e.g. Cross City Tunnel or alternative solution)
Increase capacity per train/route	Lengthen Trains at peak times (e.g Fife Circle, Edinburgh to Glasgow, Stirling to Glasgow, Stirling to Edinburgh, East Kilbride service and Ayr service)	Lengthen trains at peak times (e.g. Gourock service and Bathgate service) Increased service frequencies (e.g. Fife Circle, North Berwick, Ayrshire, Kilmarnock, Cumbernauld, etc.)	Increased service frequencies/new services (including peak hour) (e.g. from Glasgow to Croy, Ayrshire and Inverclyde lines)
Expand amount and availability of rolling stock	New rolling stock for longer trains at peak times Ensure sufficient rolling stock is available to minimise risk of outages	New rolling stock for longer trains at peak times Ensure sufficient rolling stock is available to minimise risk of outages	Ensure sufficient rolling stock is available to minimise risk of outages
Improve rolling stock quality	Ongoing improvements to meet customer expectations DDA Compliance	Ongoing improvements to meet customer expectations DDA Compliance	Ongoing improvements to meet customer expectations
Support infrastructure	Longer platforms (for above train lengthening projects) Station IOS programme DDA compliance	Longer platforms (for above train lengthening projects) Stations meet customers expectations DDA Compliance	

Strategic Outcome 2			
MAKING RAIL USE EASIER FOR THE CUSTOMER			
Projects			
Strategies	Short Term	Medium Term	Long Term
Staff customer relations	Increased staff presence at stations		
	Part of franchisee business operations		
Information provision	Increased staff presence at stations		
	Part of franchisee business operations		
Access from other modes – car / bus / HGV	Improved car parking facilities at stations, where warranted		
	Interchange with other public transport facilities in the cities		
Ticketing and pricing	Multi-journey tickets for urban and suburban services	Easily available and widely used integrated ticketing within city conurbations	

Strategic Outcome 3			
DEVELOPING NEW MARKETS FOR RAIL			
Projects			
Strategies	Short Term	Medium Term	Long Term
Open new stations on existing routes		New stations on lines with capacity enhancements and/or service frequency enhancements (e.g. Castlecary, etc.)	
Develop new routes		New routes (e.g. Glasgow Airport, Edinburgh Airport, Airdrie-Bathgate)	New routes (e.g. Aberdeen airport, Bridge of Weir, etc.)
		New service routes (e.g. Tay Crossrail, Aberdeen Crossrail, etc.)	
Marketing to business customers / intermediaries		Part of franchisee business operations	
Marketing to personal buyers		Part of franchisee business operations	
Develop new rail products / packages		Part of franchisee business operations	

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