5.4 Glasgow

5.4.1 Setting the Context

Glasgow is the largest and most densely populated city in Scotland. The city has a population of approximately 575,000[228], and the SPT area, which largely correlates with the functioning of the Glasgow labour market, has a population of approximately 2.1 million[229].

The city's economy has changed from being largely manufacturing based to one based on the service sector, with a strong performing financial services sector and a significant number of public sector employees. The economy of the city and the region has been growing in recent years and Glasgow is now recognised as one of the fastest growing cities in the UK. This is reflected in the 18 per cent increase in employment levels between 1996 and 2004, which raised the employment rate from 57 per cent to 65 per cent[230]. These improvements in economic performance have resulted in rising land and property prices and demand for further development in and around the city. Average house prices increased by around 145 per cent over the last ten years compared with an average of 110 per cent in Scotland as a whole[230]. One of the consequences of this is the increase in the number of those working in Glasgow but residing outside the city, increasing the demand to travel into and out of the city at peak times.

Glasgow accounts for 27 per cent of total jobs and a similar proportion of the population in the SPT area[230].

Figure 5.4.1 highlights the areas of particular relevance within the context of STPR. This shows the key areas of economic activity, areas of community regeneration priority, international gateway and the principal components of the transport network that supports the city region.

Table 5.4.1 summarises some relevant socio-economic indicators.

[228] General Register Office for Scotland Mid-2004 population estimates for town/city populations: http://www.gro-scotland.gov.uk/files1/stats/04mid-year-estimates-localities-table3.xls
[229] General Register Office for Scotland Mid-2006 population estimates for administrative areas: http://www.gro-scotland.gov.uk/files1/stats/06mype-cahb-t2-revised.xls
[230] Scottish Enterprise Glasgow Economic Review November 2006

Table 5.4.1: Summary of Socio Economic Characteristics

Indicator	Glasgow	"Region" (SPT)	Scotland	UK
Population (2005)[231]	575,000[232]	2,100,000	5,078,000	60,000,000
Population (2022)[233]	517,500	2,037,000	5,118,000	62,400,000
Population Change (2005-2022)[233]	-10%	-3%	+1%	+4%
Employment (2005)[233]	462,200	994,000	2,330,900	27,900,000
Employment (2022) [233]	453,700	1,031,000	2,427,800	29,300,000
GVA per head (2004)[234]	£23,420	£15,935	£15,500	£16,200
Cars / capita (2005)[235]	0.30	0.36	0.39	0.42
Households with car (2005)[236]	45%	60%	67%	75%

The level of both employment and population within Glasgow are projected to decrease between 2005 and 2022, although employment only decreases by around two per cent compared with a decrease of 10 per cent in population. Conversely, employment levels in the SPT area are projected to increase from 994,000 to 1,031,000 between 2005 and 2022. Inactivity rates are projected to decline in Glasgow from 240,400 in 2005 to 171,200 in 2022[233]. Gross Value Added per head in Glasgow is lower than Edinburgh but higher than Aberdeen and Dundee. Median gross weekly earnings in Glasgow are £396, four per cent below the national average for Scotland of £412[237]. Figure 5.4.2 highlights the areas of change in population and employment in future years.

[231] General Register Office for Scotland Mid-2004 population estimates for town/city populations: http://www.gro-scotland.gov.uk/files1/stats/04mid-year-estimates-localities-table3.xls
[232] General Register Office for Scotland Mid-2006 population estimates for administrative areas: http://www.gro-scotland.gov.uk/files1/stats/06mype-cahb-t2-revised.xls
[233] TELMoS
[234] Scottish Economic Statistics 2007
[235] STS No.25 (2006)
[236] Scotland's Census 2001 www.scrol.gov.uk KS17
[237] Scottish Economic Statistics 2006, table 4.20

Figure 5.4.1: Setting the Context, Glasgow Urban Network

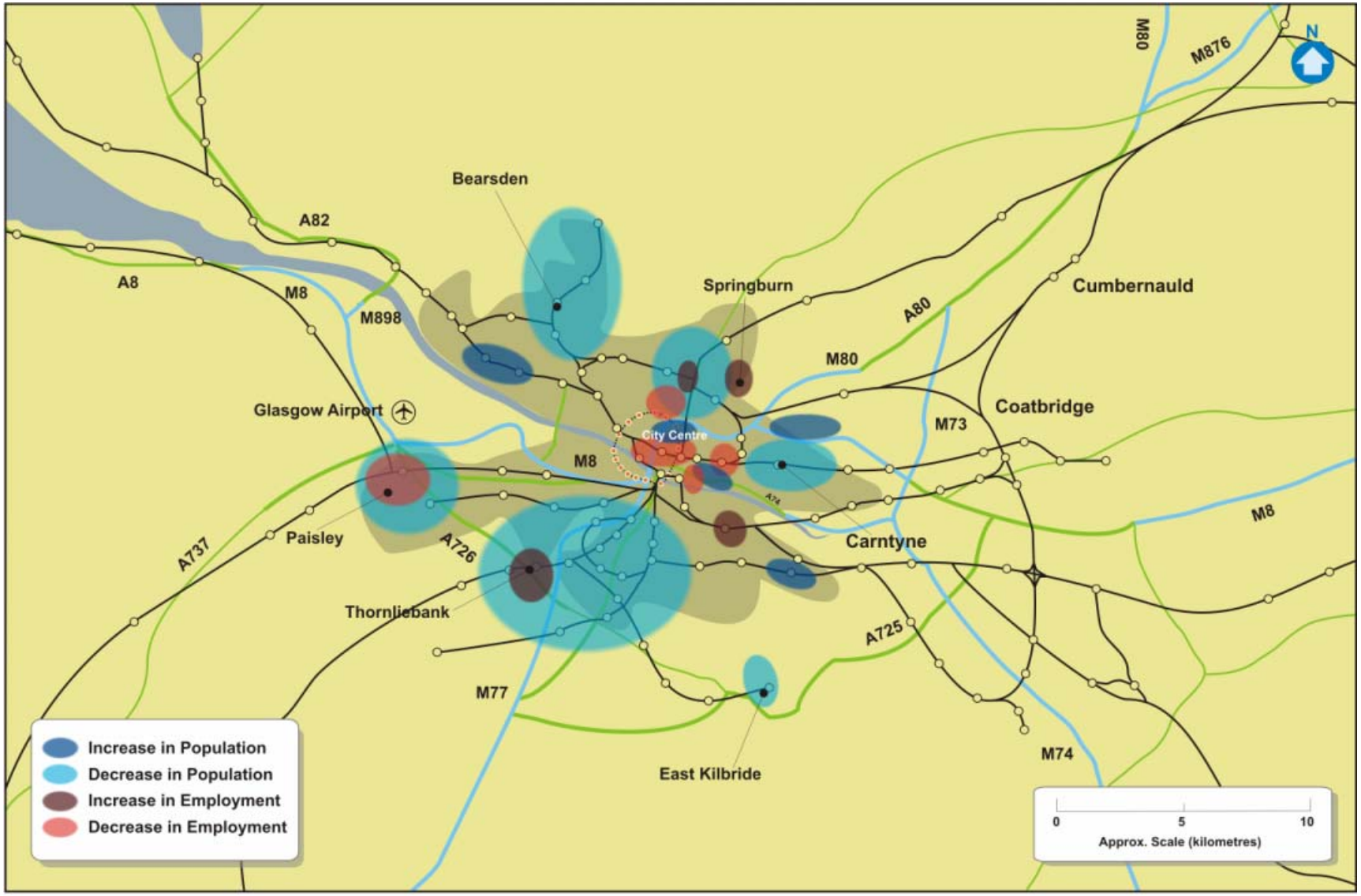

Figure 5.4.2: Change in Employment and Population, 2005 & 2022 - Glasgow

5.4.2 Land Use Patterns

Within Glasgow, five key areas have been identified as being particularly relevant in terms of the STPR:

- Glasgow Airport (international gateway);
- Glasgow Airport Corridor (major industrial/commercial land use concentration);
- Clydebank (community regeneration priority);
- City centre (historic business and retail centre); and
- Clyde Gateway (community regeneration priority).

The changing land use patterns focussed around regeneration of the Clyde Corridor, comprising Clydebank and the Clyde Gateway, will provide a focus of activity and a change in demand and travel patterns that will be a challenge to the city's transport network. While historically, public transport provision has been focussed on linking the suburbs of Glasgow with its city centre through both historical rail alignments and key road corridors, the regeneration focus onto the Clyde brings the need for augmented access, linkage and capacity to realise the regeneration potential. This issue has been recognised in the SPT Regional Transport Strategy and is given greater emphasis with the forthcoming Commonwealth Games in 2014[238].

5.4.3 Transport Network and Operations

Infrastructure and Services

The M8 Motorway runs through the centre of Glasgow and is the main route connecting the other roads that radiate out of Glasgow. The M8 / A8 Trunk Road runs from Edinburgh in the east to Gourock in the west. To the east of Glasgow it connects with the M80 / A80 Trunk Road and M74 Motorway by way of the M73 Motorway. The M80 also has a direct connection to the M8 close to the city centre. To the west of the city centre, the M8 connects with the M77 Motorway which takes traffic to and from the south west, and to the west of Glasgow it connects to the A82 Trunk Road by way of the M898 and the Erskine Bridge. The A82 also has a direct connection to the M8 close to the city centre.

The A726 Glasgow Southern Orbital (GSO) Trunk Road acts, along with the A725 East Kilbride Expressway, as a southern distributor connecting the M77 with the M74 and reducing the need for travel through central Glasgow, as well as providing an alternative to travel through the city centre for trips between areas such as Renfrewshire and Lanarkshire.

The trunk routes are all dual carriageway as they approach Glasgow. The M77 and M80 on approach to Glasgow are dual two-lane motorways and the M8 varies from two to five lanes in each direction as it passes through Glasgow with a significant number of lane gains and lane drops at junctions. Between the M77 and the southern approaches to the city centre, the M8 has four separate carriageway sections. Junction 16 of the M8 uses ramp metering during the evening peak period.

[238] SPT, Regional Transport Strategy

Glasgow is the confluence of many national road and rail links, is well linked to other national routes and has an extensive railway network providing links to a large part of the SPT area, as shown in Figure 5.4.1. This railway network is the largest in the UK outside London with 186 stations[239].

There are two principal railway stations in Glasgow; Glasgow Central station and Glasgow Queen Street station.

Glasgow Central is the busiest station in Scotland and is the northern terminus for the West Coast Mainline (WCML), which provides a high-speed link to London, the Midlands and North West England. Glasgow Central also acts as the terminus for services from Ayrshire, the Clyde coast and the south of Glasgow. The Argyle Line runs through Glasgow Central Low Level railway station and connects much of North and South Lanarkshire, the south east of Glasgow, Glasgow city centre and the north west of Glasgow.

Service patterns at Glasgow Central are generally:

- four trains per hour between Glasgow and Gourock / Wemyss Bay;
- four trains per hour between Glasgow and Ayr / Ardrossan / Largs;
- one train per hour between Glasgow and Kilmarnock with every second train extending to Carlisle via Dumfries;
- two trains per hour between Glasgow and East Kilbride;
- one train per hour between Glasgow and Edinburgh via Shotts;
- four trains per day between Glasgow and Stranraer;
- one train per hour between Glasgow and London Euston;
- one train every two hours between Glasgow and London Kings Cross;
- one sleeper train per day between Glasgow and London;
- various Intercity cross country services; and
- various inner and outer suburban services using both high level and low level stations.

Glasgow Queen Street is the terminus for services from Stirling, Inverness, Aberdeen, the West Highlands and Edinburgh via Falkirk. The North Electric Line runs through Glasgow Queen Street Low Level railway station and connects Airdrie, Coatbridge, Glasgow east end, Glasgow city centre, the north west of Glasgow and Dumbarton.

Service patterns at Glasgow Queen Street are generally:

- one train per hour between Glasgow and Aberdeen;
- four trains per hour between Glasgow and Edinburgh via Falkirk;
- two trains per hour between Glasgow and Stirling / Dunblane;
- two trains per hour between Glasgow and Cumbernauld / Falkirk;

[239] SPT

- various inner and outer suburban services using both high level and low level stations;
- three trains per day between Glasgow and Inverness; and
- three trains per day between Glasgow and Fort William.

The main railway stations within the Glasgow City Council area currently cater for some 43.6 million passengers per annum (2005). In addition, 33 million passengers per annum (2005) pass through stations within Glasgow city centre[240].

Glasgow is one of only four British cities to be served by an underground light rail system. The subway consists of a circular line that connects the city centre, the West End, Govan and areas to the immediate south and south west of the city centre. The subway is well used, especially during peak times, although demand has fallen from 14.7 million journeys per annum in 1999 - 2000 to 13.2 million journeys per annum in 2005 - 2006[241].

Glasgow has an extensive bus network with many different operators. The main urban operator in the Glasgow area is First Glasgow, part of Aberdeen based First Group, with over 1,000 buses and 118 routes. First Glasgow also operates a network of peak express services to and from some of the towns around Glasgow. There is a core network of 23 routes running at frequencies of 10 minutes or better. To the west, the dominant operator is Arriva, while to the south west, Stagecoach run frequent, high quality services into Ayrshire, notably to Kilmarnock and Ayr. There are also a range of medium sized and smaller companies operating services.

Buchanan Bus Station is the hub for an extensive network of long distance bus services. Citylink and Megabus run services to much of Scotland. Citylink also operate a high frequency service between Glasgow and Edinburgh. Megabus and National Express provide services from Glasgow to the rest of the UK.

Service patterns are generally:

- two buses per hour between Glasgow and Gourock/Largs;
- two buses per hour between Glasgow and Ayr;
- two buses per hour between Glasgow and Kilmarnock;
- four buses per hour between Glasgow and Edinburgh;
- two buses per hour between Glasgow and Perth;
- three buses per day between Glasgow and Campbeltown;
- three buses per day between Glasgow and Oban; and
- one bus every three hours between Glasgow and Fort William.

[240] Rail industry LENNON data (Station Usage 2004/2005) The total rail passenger trips do not include SPT zonecard trips
[241] STS No.25 (2006) Table 8.18

Buchanan Bus Station and the two main railway stations at Central and Queen Street are located some distance from each other, resulting in poor integration.

Integrated tickets in Glasgow are available in the form of the *PLUSBUS* ticket and the SPT Zonecard. *PLUSBUS* covers rail journeys into Glasgow and provides the addition of unlimited bus travel within the urban network. The SPT Zonecard is widely used and gives unlimited travel on bus, rail, subway and certain ferry services within designated zones in the SPT area.

In 2005 Glasgow Airport had a throughput of around 8.8 million passengers and 8,700 tonnes of freight per year[242].

The River Clyde through Glasgow acts as a significant barrier to travel. This is felt most to the west of the city centre, where there are only a handful of fixed crossings. West of the M8 Kingston Bridge there are vehicle crossings at the Clyde Arc in Finnieston, the Clyde Tunnel and the Erskine Bridge. The Glasgow Subway crosses under the River Clyde at Govan. Within the city centre there are four vehicle crossings and two railway crossings.

There is a significant volume of freight transported both by road and rail through Glasgow. The majority of freight heading to Glasgow is transported by road, either for the full journey or via rail heads at Deanside, Elderslie, Mossend Eurocentral, Coatbridge or Grangemouth. However, rail freight in Glasgow is typically travelling between the corridors with the most significant flows being south west to east through Glasgow with imported coal from Hunterston to power stations in Scotland and England.

Asset Management

In 2007, 10 per cent of the trunk road network pavement[243] in Glasgow is judged to require structural strengthening as it has no theoretical residual strength. This compares with a national level of 5 per cent[244]. Under Transport Scotland's planned maintenance schedule, the net figure for the city is expected to remain at 10 per cent by 2012.

Further details on asset management, including bus and rail, are provided in Chapter 4.

Demand Management

Within Glasgow, Glasgow City Council, West Dunbartonshire Council, SPT and First Glasgow have worked together to introduce Quality Bus Corridors under the branding *Streamline*. *Streamline* includes a number of features to improve bus journeys into Glasgow. These include real time bus information at bus stops, bus lanes and bus priority at traffic signals[245].

[242] STS No. 25 (2006) Table 9.6, 9.13
[243] Transport Scotland SERIS Database
[244] STS No. 25 (2006)
[245] STS No. 25 (2006)

Many of the suburban stations on the SPT network have small car parks. Some such as Croy and Whitecraigs have larger facilities. There are also limited parking facilities at some Subway stations. Glasgow has only one large Park-&-Ride site, at Shields Road station on the SPT Subway, close to the M8 and M77 and providing 800 parking spaces[246].

Off street parking in Glasgow costs around £1.60 per hour. On street parking is limited to a maximum of two hours and costs around £1.80 per hour. The high prices and short maximum stay durations suggests that parking is aimed at managing travel demand and encouraging modal shift to public transport[247].

Programmed Schemes

Programmed schemes, which are of relevance to STPR are shown in Figure 5.3.3 and include:

- M80 upgrade;
- M8 upgrade Baillieston to Newhouse;
- M8 Associated Network Improvements;
- Pollok Grade Separated Interchange;
- Platform Extension at Bishopbriggs;
- Additional services on Shotts line;
- Increased capacity on Glasgow and South Western route;
- Burma Road electrification;
- M74 extension; and
- Glasgow Airport Rail Link.

[246] SPT: www.spt.co.uk
[247] Glasgow City Council: www.glasgow.gov.uk

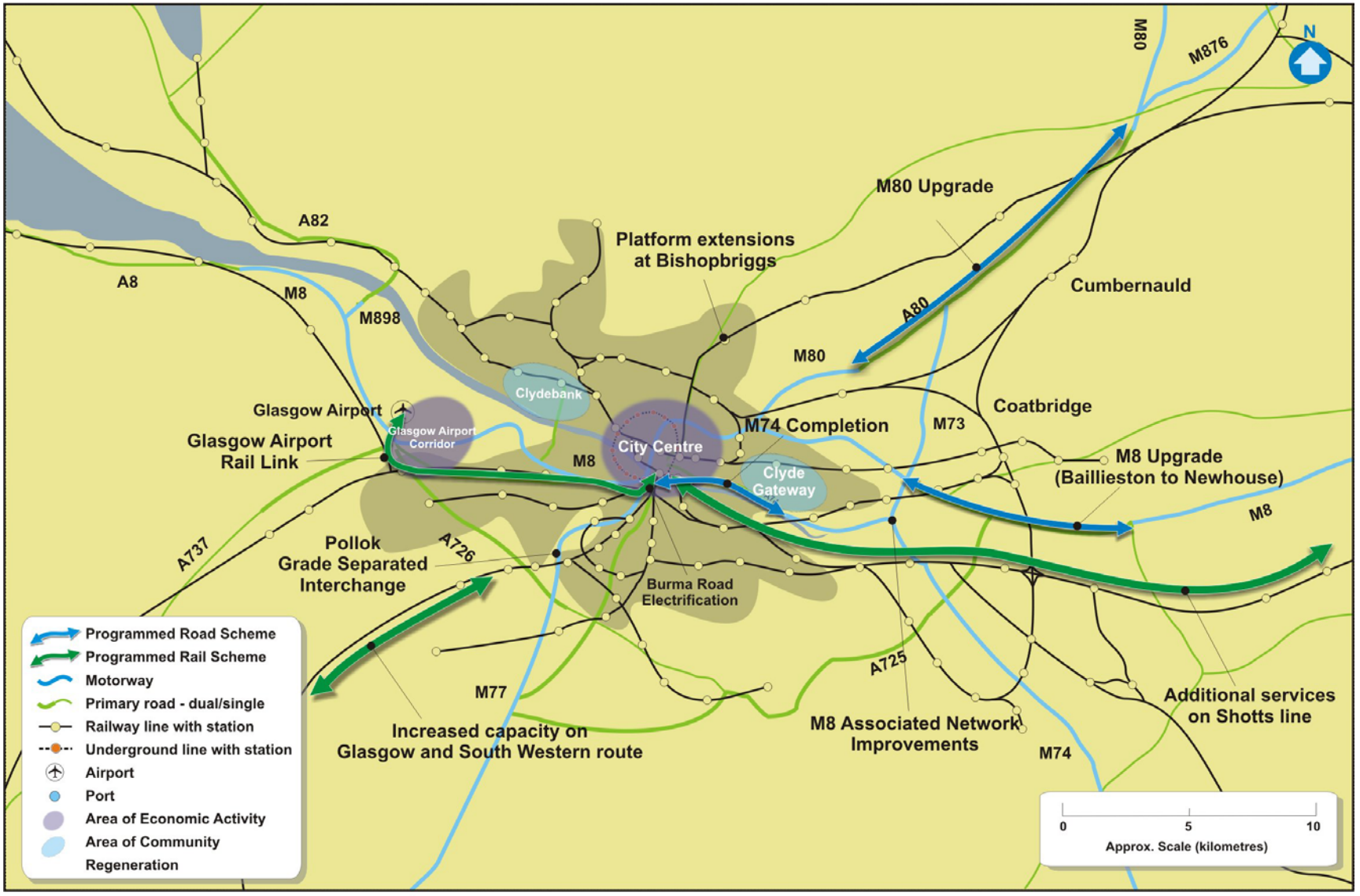

Figure 5.4.3: Programmed Future Transport Schemes, Glasgow Urban Network

5.4.4 Travel Patterns

Figure 5.4.4 and Table 5.4.2 highlight the demand for travel into Glasgow, across Glasgow and within Glasgow for 2005 and 2022. It also highlights the percentage of trips by public transport (PT) for these movements.

Table 5.4.2: Summary of Demand (12 hour) and Public Transport Share[248]

Corridor Approach	2005		2022		Change	
	Total Trips	PT Share	Total Trips	PT Share	Total Trips	PT Share
Fort William and Oban To / from Corridor 7	39,000	21%	46,000	19%	+16%	+5%
Perth To / from Corridor 9	143,000	17%	176,000	13%	+23%	-8%
Edinburgh To / from Corridor 13	108,000	18%	146,000	17%	+36%	+29%
Ayr and SW Scotland To / from Corridor 15	118,000	19%	127,000	16%	+7%	-11%
Inverclyde To / from Corridor 17	82,000	11%	93,000	9%	+14%	-10%
Lanarkshire and Northwest England To / from Corridor 18	147,000	12%	170,000	10%	+16%	-9%
Sub-total	637,000	16%	757,000	13%	+19%	-1%
Within Glasgow	1,660,981	24%	1,715,484	18%	+3%	-19%
Cross Glasgow	125,483	3%	159,004	3%	+27%	+18%
Total	2,423,126	21%	2,631,967	16%	+9%	-14%

[248] TMfS05

There is a reasonable balance of demand to Glasgow from all directions, although the greatest levels of demand are from Corridor 18 (to and from Lanarkshire and North West England) and Corridor 9 (to and from Perth). These account for about half of trips in and out of Glasgow.

Trips between Glasgow and the corridors account for 26 per cent of the total trips, with the largest proportion, 69 per cent, made up of trips within the city itself. The remaining five per cent consists of trips between corridors across Glasgow.

By 2022, there is an overall growth of nine per cent in trips. This overall figure, however, masks a significant variation. Within Glasgow, trips are projected to grow by only three per cent and although trips within Glasgow remain by far the largest proportion of overall trips, this does reduce by four per cent to 65 per cent. There is a consequent rise in the proportion of the overall trips that take place between Glasgow and the corridors to 30 per cent. The growth in demand on individual corridors varies from seven per cent (Corridor 15 – Ayrshire) to 36 per cent (Corridor 13 – Edinburgh). The proportion of overall trips that route across Glasgow remains at five per cent with a growth in these movements compared with 2005 of 27 per cent. The percentage of HGV traffic on the M8 in Glasgow is approximately six per cent by TMfS.

Analysis of inter-Glasgow movements shows that in general, movements are localised within 'sectors' of the city and between neighbouring sectors. There are three movements that are substantive, which do not fit with this general situation and involve longer journeys across the city. These are between:

- The inner west area (Partick/Hyndland) and Paisley / Renfrew / Braehead;
- The inner west area (Partick/Hyndland) and the inner south area (Cathcart/Shawlands); and
- Clydebank / Whiteinch and Paisley / Renfrew / Braehead.

An important feature of each of these is that they involve crossing the River Clyde, and while trips between the inner west and inner south areas have access to high frequency rail connections via Glasgow Central railway station, the other two movements have no viable rail connection options and few competitive bus opportunities.

Journeys across Glasgow account for only five per cent of total trips although these are likely to have a disproportionate impact on the operation of the M8 due to its function in linking the corridors. Cross Glasgow trips have the lowest public transport modal share of all the movements, at only three per cent.

From the totals in Figure 5.4.4, trips to and from Glasgow account for between 57 per cent and 82 per cent of trips for the surrounding corridors.

About 69 per cent of all trips are fully within Glasgow and of these trips approximately 24 per cent are by public transport. This is higher than the proportion of trips into and out of Glasgow made by public transport at 16 per cent. This is likely to be because of the better availability of public transport within the city due to the denser network and higher frequency of services. For travel to / from Glasgow city centre, public transport trips make up a far higher percentage, but the lower use of public transport further out of the city centre decreases the city wide average.

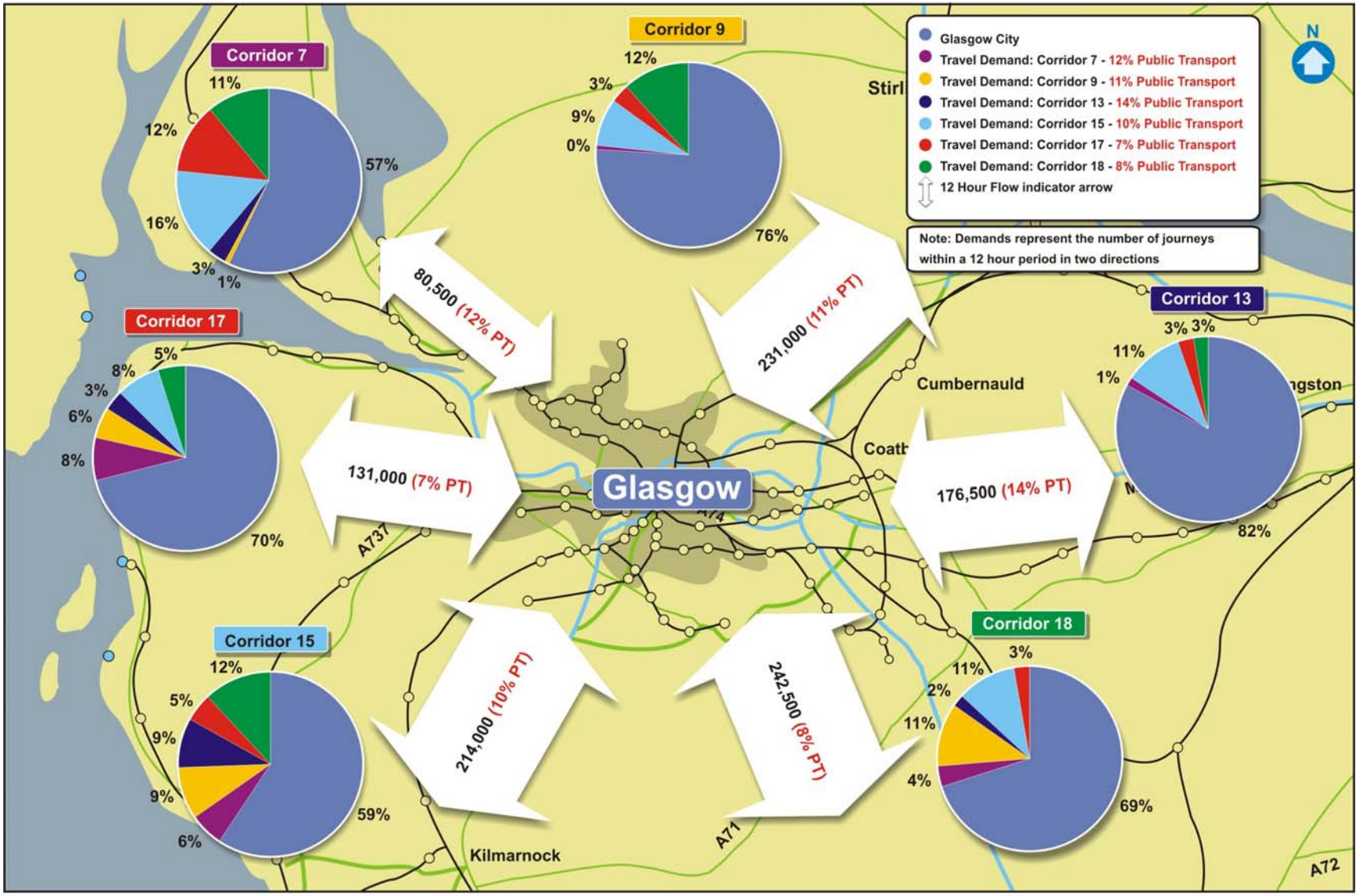

Figure 5.4.4: Travel Patterns to, through and around Glasgow (2022)

Despite an increase in the number of public transport trips to and from many of the corridors, public transport mode share is expected to decrease in future years as car ownership rises. However, this decline has to be seen in the context of the model being unable to accurately reflect the way in which bus services will alter in the future to serve a changing demand, as there are many variables not least of which are commercial considerations.

Only three per cent of trips through Glasgow are between corridors and these trips are concentrated on the strategic road network through the city. Of these, only three per cent are by public transport. This is not surprising given the well developed road linkages among the corridors, mainly via the M8. These linkages are not generally mirrored within the rail network, with nearly all services from the south terminating at Glasgow Central station and nearly all services from the north terminating at Glasgow Queen Street station. The Argyle Line and North Electric Line do allow for cross Glasgow travel, but the competitiveness of this against car for corridor to corridor movements is impacted by the low average speed through the urban area where station stops are frequent.

Considering travel to work, approximately 32 per cent of journeys by Glasgow residents are made by public transport. This is considerably above the Scottish average of 15 per cent[249].

Travel Patterns – To Areas of Economic Activity, Community Regeneration Priorities and International Gateways

Within Glasgow two areas of economic activity, two areas of community regeneration priority and one international gateway have been identified as being particularly relevant in terms of the STPR. The areas of economic activity are:

- City centre (historic business and retail centre); and
- Glasgow Airport Corridor (industrial, distribution and out of town retail).

The areas of community regeneration priority are:

- Clyde Gateway (east of the city centre); and
- Clydebank (west of the city centre).

The international gateway is:

- Glasgow Airport.

Figure 5.4.5 summarises the travel patterns to these areas of economic activity and community regeneration priority.

[249] Scottish Census 2001; http://www.scrol.gov.uk Table KS15

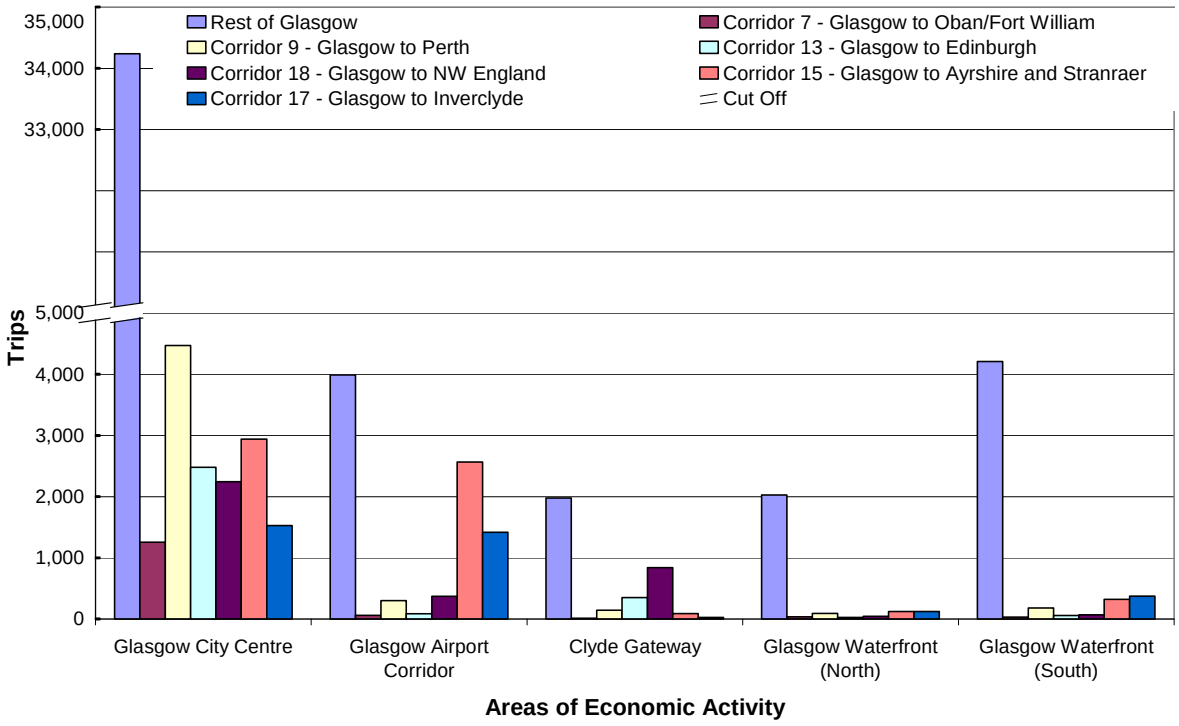

Figure 5.4.5: Travel Patterns to Centres of Economic Activity

The majority of trips to all of the areas, especially the city centre, are shown to be from other areas of the city. However in the case of Glasgow Airport Corridor a large proportion of the trips in the morning peak originate from Corridor 15 (Ayr), which has good links to the area via the A737 and M77/M8, and Corridor 17 (Inverclyde) that is located to the west along the M8 / A8 corridor that passes Glasgow Airport Corridor.

Approximately 41 per cent of the trips to the city centre area in 2005 are made by public transport. However, when reviewing the patterns of trips to the non-centre areas, the public transport share is projected to be lower with only seven per cent of trips to Glasgow Airport Corridor and eight per cent to the Clyde Gateway area made by public transport in the morning peak period. Clydebank performs slightly better with around 14 per cent of trips made by public transport in the morning peak period, but this is still significantly below the current level for the city centre.

Currently 11 per cent of passengers use public transport to access the airport, a level that is comparable with many other regional airports in the UK. A dedicated bus service currently operates from Glasgow city centre with a journey time of around 25 minutes, however, this journey is affected by congestion on the M8 approaching the city centre in peak periods[250]. The proposed Glasgow Airport Rail Link is expected to provide a service with a frequency of 15 minutes from Glasgow Airport to Paisley Gilmour Street and Glasgow Central, with an end to end journey time of 16 minutes[251].

Over three-quarters of those using the airport travel to or from the Strathclyde area[252].

The predictions for future growth at the airport are significant, with UK Government estimates of around 70 per cent[253] and BAA estimates of 172 per cent[254] to the year 2030. In the short term, the target for the airport is to increase public transport mode share to 27 per cent by 2011[250].

5.4.5 Performance Review

Network performance is considered within the context of the three KSOs:

- Improving journey times and connections;
- Reducing emissions; and
- Improving quality, accessibility and affordability.

Journey Time and Connections

The following paragraphs address the issues of:

- Does the network offer competitive journey times?
- Is the network operating efficiently and reliably? and
- What are the delays and when do they occur?

[250] BAA - Glasgow Airport Masterplan, October 2006
[251] SPT: http://www.spt.co.uk/garl/
[252] SPT: www.spt.co.uk
[253] Department for Transport figures; http://www.garl.info
[254] BAA figures; http://www.garl.info

Figures 5.4.6a and 5.4.6b[255] summarise the typical journey times by road and rail for trips to the city centre and Glasgow Airport Corridor. Considering these journey times in the context of the city's labour market, it is estimated that approximately 1.6 million of Scotland's population live within a one hour commute of the city centre, with slightly less within one hour of Glasgow Airport Corridor. It is predicted that due to the increased levels of congestion projected in the future, the population within a one hour commute of the city centre will fall slightly, as shown in Figure 5.4.6c. The reduction is not considered to be of a significant level, but that there is a reduction at all is an indication of the impact of transport network constraints. The economic area adjacent to Glasgow Airport benefits from the Glasgow Airport Rail Link, which in terms of Figure 5.4.6c acts to offset the reduction due to effects on congestion. One issue that Figures 5.4.6a and 5.4.6b highlight is the poor level of public transport competitiveness for journeys between Glasgow Airport and points east of Glasgow, compared with the city centre.

[255] Journey times for bus/rail include a 20 minute walk/wait time

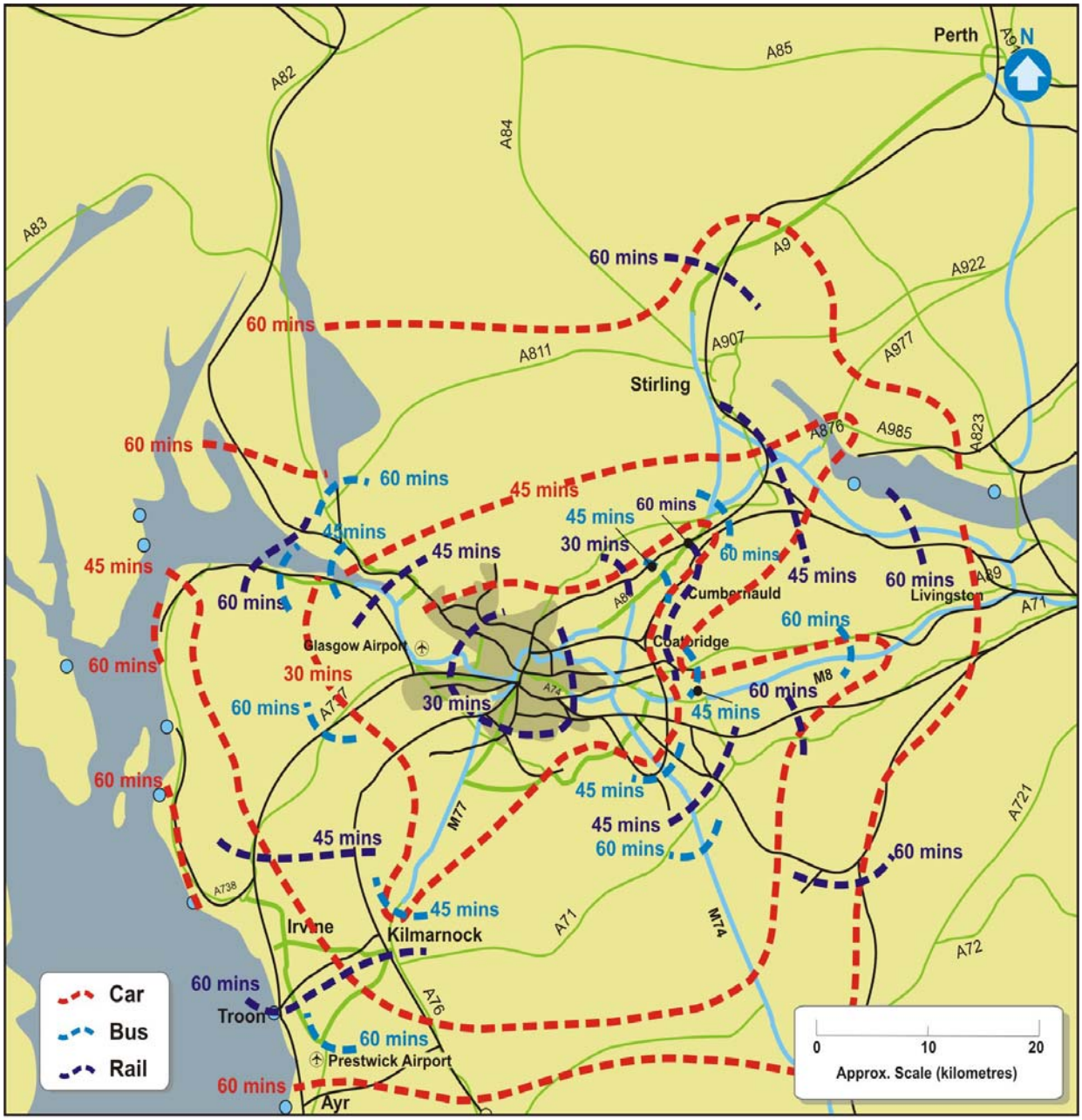

Figure 5.4.6a: Travel to Glasgow City Centre (2005 AM Peak)

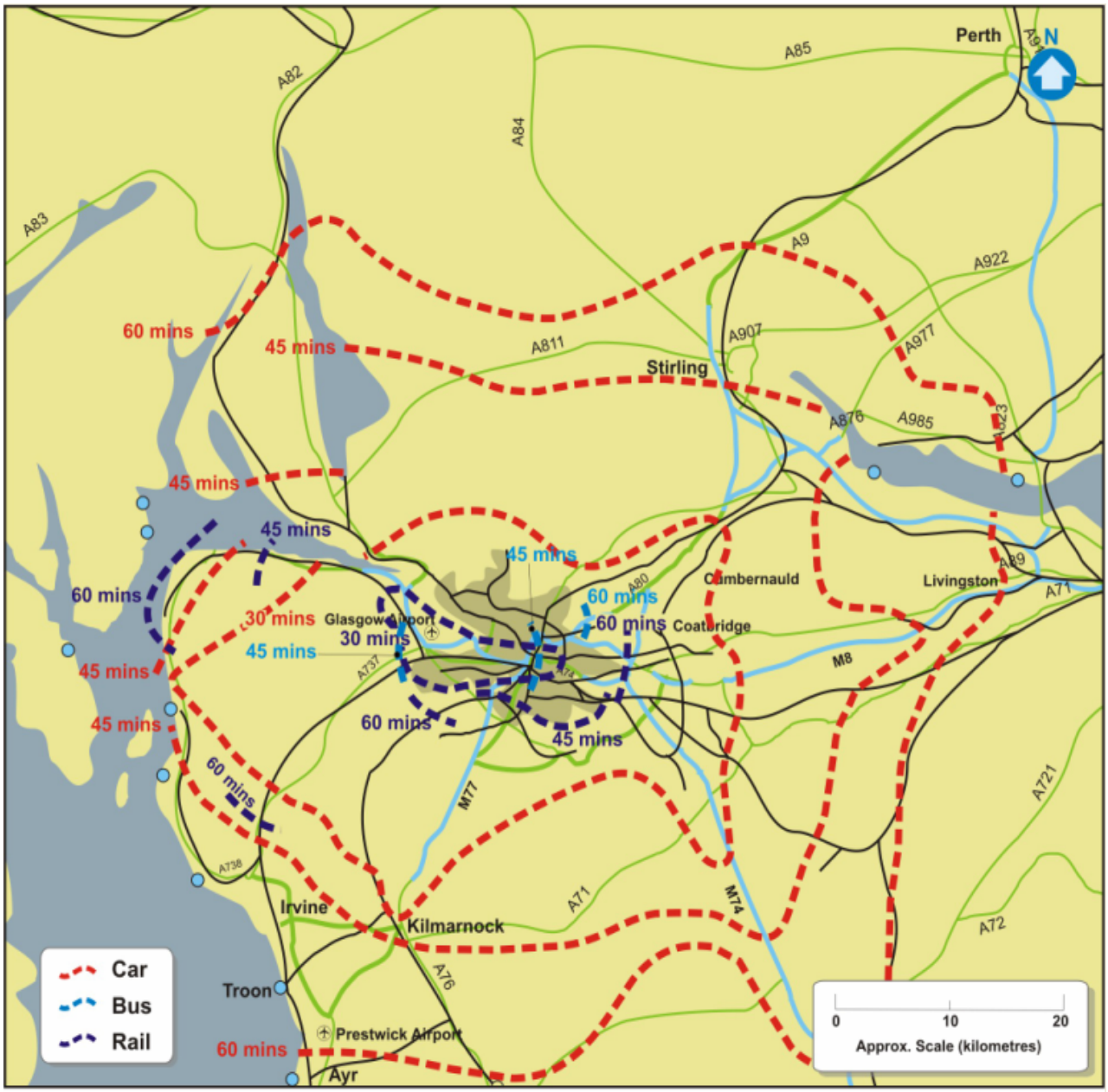

Figure 5.4.6b: Travel to Glasgow Airport Corridor (2005 AM Peak)

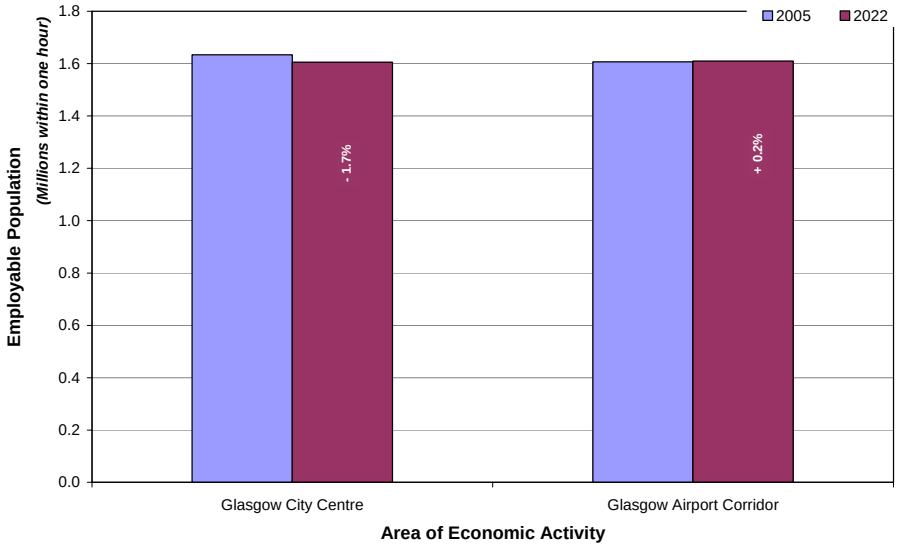

Figure 5.4.6c: Change in Labour Catchment for Areas of Economic Activity

Despite the high level of journeys to work by public transport, much of the city's road network experiences congestion during peak periods. It is estimated that in 2005 approximately five to six per cent of the road network in Glasgow was operating at or above capacity during the peak periods. Due to the projected increase in travel over the next 15 years, congestion in these periods is projected to increase, with eight to eleven per cent of the network predicted to be operating over capacity in 2022. The off peak period is predicted to remain uncongested during this time.

Figure 5.4.7 presents details of the average speed on the road network for all peak periods throughout the day. This graph considers key routes within the city, such as the A80, M73, A725 and A726 and therefore the average speeds detailed are a result of varying levels of congestion on these given routes. Within the city centre, the network is more congested and speeds will be lower than the averages indicated here. Further analysis does highlight that despite the completion of the M74, which will provide a significant increase in road capacity, there will only be a marginal increase in average speeds in 2012 and by 2022 they will be similar or lower than today.

The variability of travel throughout the day can be taken to be a proxy for journey time reliability on the road network. As Figure 5.4.7 shows, there is some variability in speeds and therefore journey times at present.

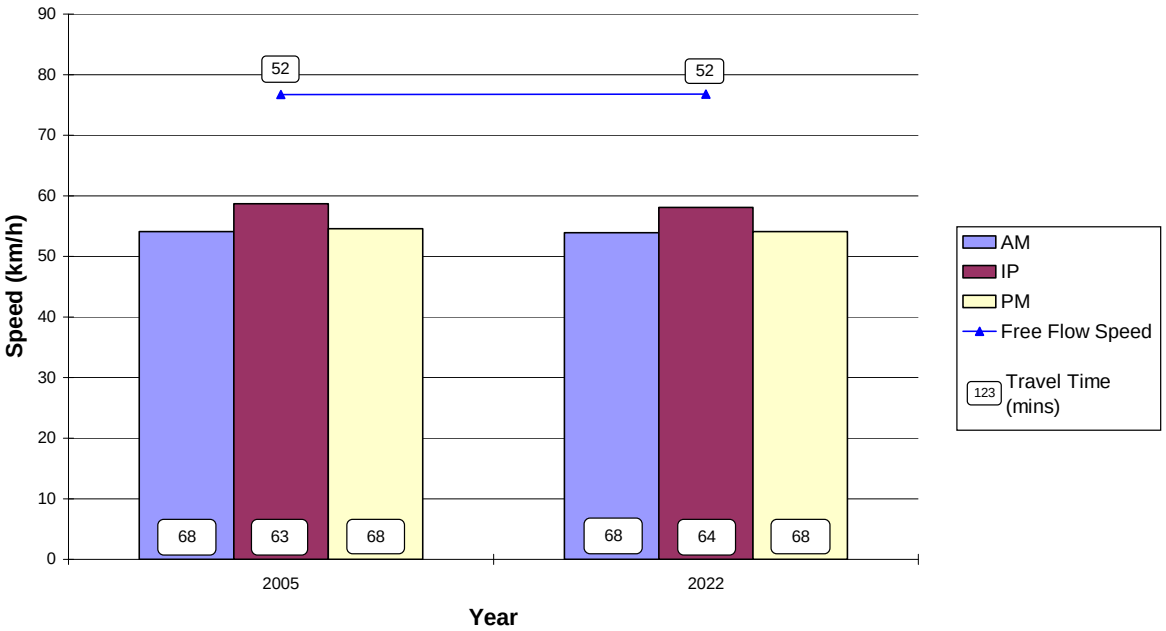

Figure 5.4.7: Average Urban Road Network Speed

Summary of Infrastructure and Operational Constraints

Figures 5.4.8a and 5.4.8b highlight the areas of constraint on both the road and rail network.

Points of congestion on the road network are on the M8 through the city, on the M80 and M77 approaches to the city, the A725 and A726 to the south of the city and on the A898 Erskine Bridge to the north west of the city.

In terms of the rail network, the constraints are focussed on overcrowding issues for commuters on services between the city and towns on the services towards Stirling, Edinburgh, and south west Scotland. There are also track congestion issues on a number of lines into the city, in addition to capacity issues at Glasgow Queen Street and Central stations.

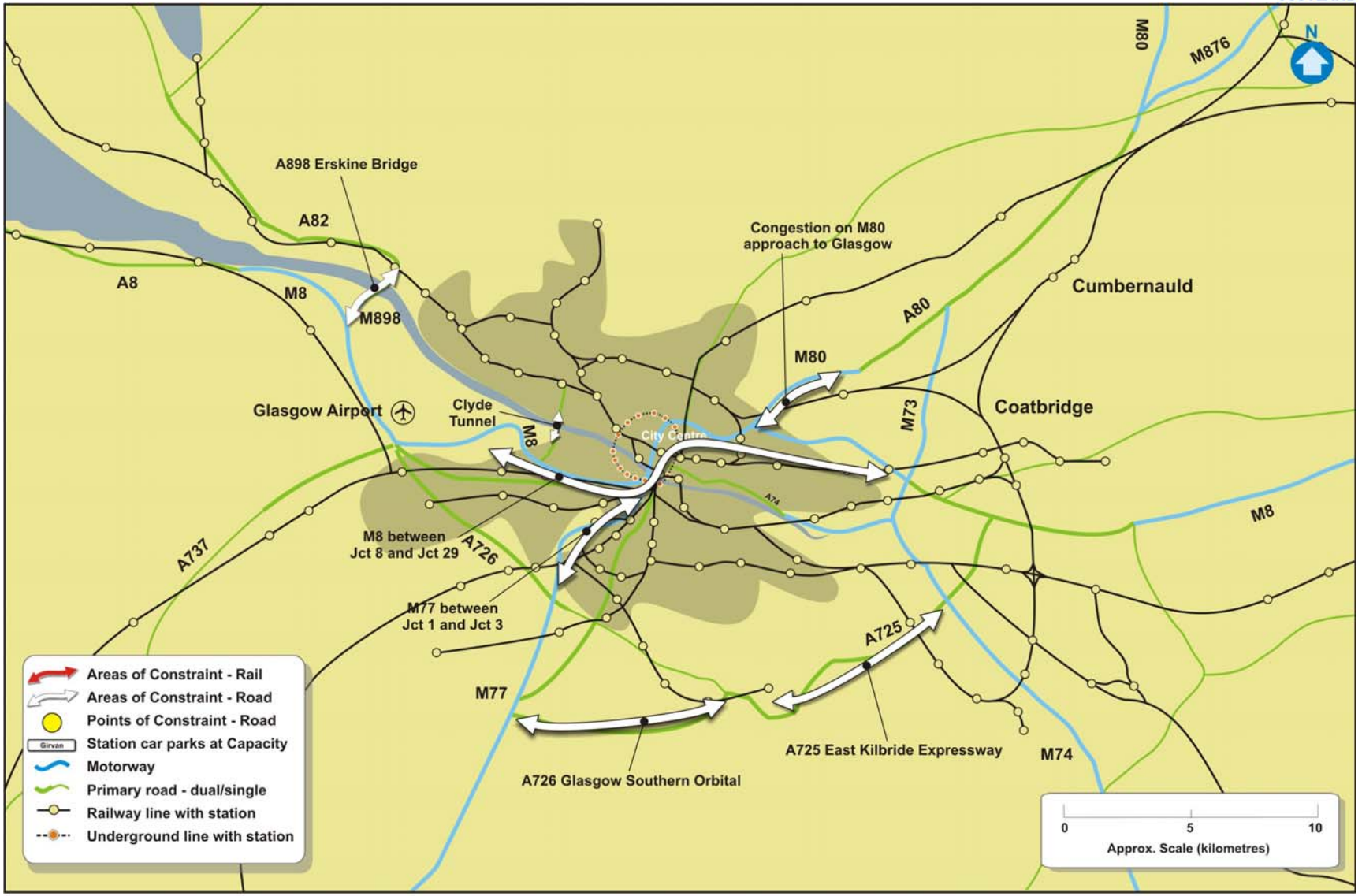

Figure 5.4.8a: Areas of Constraint on the Road Network, Glasgow Urban Network

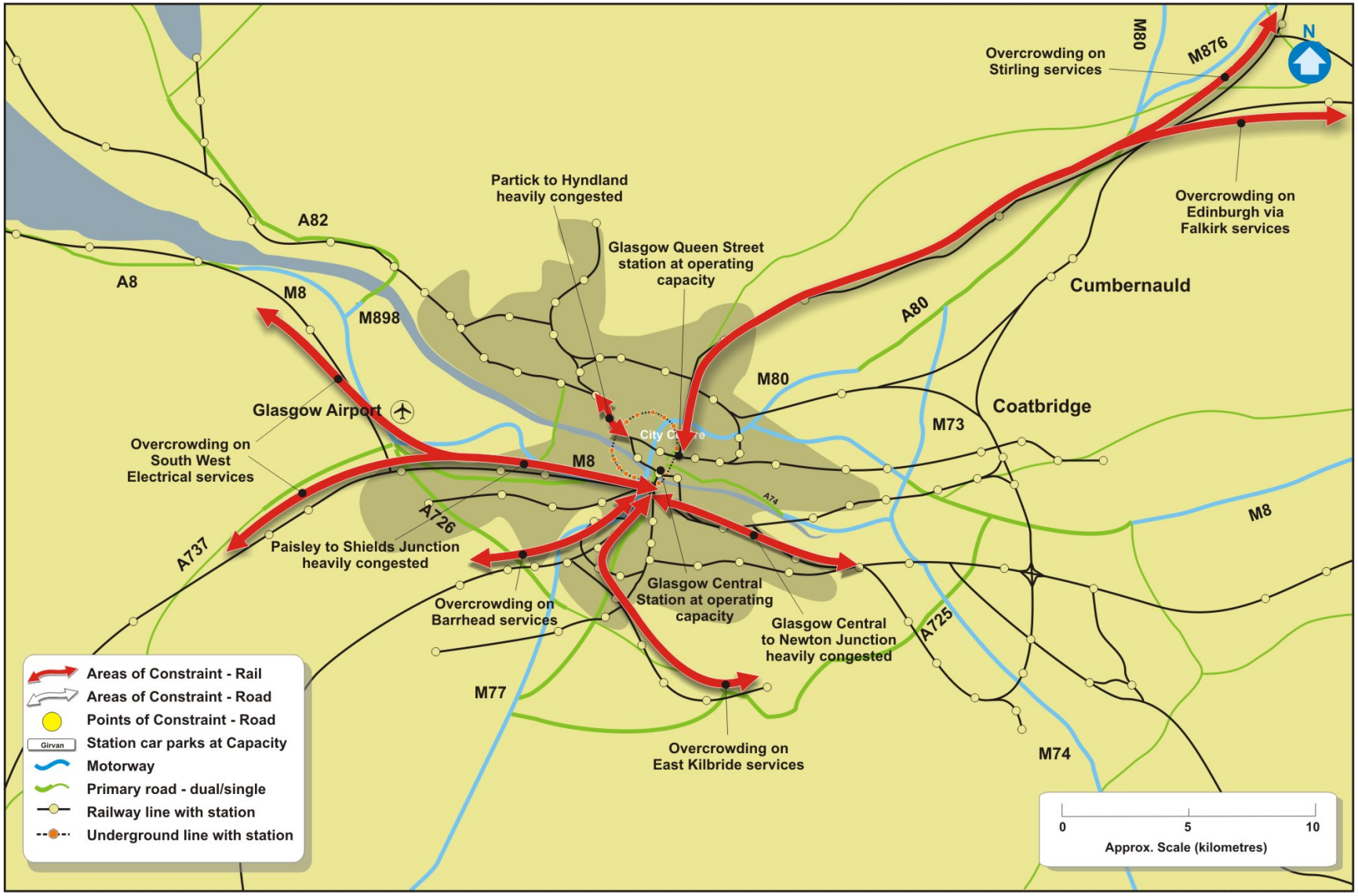

Figure 5.4.8b: Areas of Constraint on the Rail Network, Glasgow Urban Network

Particular areas of congestion on the trunk road network are predicted to be:

- The M8 between Junction 8 (Shawhead) and Junction 29 (Hillington), including the Kingston Bridge;
- The M77 between Junction 1 (Dumbreck Interchange) and Junction 3 (Darnley);
- A80/M80 between Mollinsburn and M80 Junction 5 (M876);
- The A725 / A726 East Kilbride Expressway/Glasgow Southern Orbital; and
- The A898 Erskine Bridge.

The Clyde Tunnel and Clydeside Expressway both suffer from congestion during peak periods. Although not part of the trunk road network, they are both of strategic importance for journeys into and across Glasgow.

Congestion on the motorway network has an adverse impact on local trips across Glasgow, although shorter distance local trips using the strategic road network significantly contribute to this congestion. Local trips on the motorway network reduce the capacity of the motorway due to the impact of traffic entering the motorway and increases in weaving. At a number of junctions on the motorway network as it passes through the urban area, regular congestion on the motorway causes queues to develop on the entry slip roads. During peak demand periods, these queues can spill back onto the local road network, impacting on both local trips and strategic trips originating in Glasgow. Further, some drivers avoid the motorways during peak periods and use the local road network for longer distance trips, adding to the level of congestion on these roads. The M74 completion is likely to have some impact on reducing these problems by providing additional strategic capacity.

On the rail network, the two main terminal stations at Glasgow Central and Glasgow Queen Street are both operating at or close to capacity in peak periods with limited capacity to run additional or longer trains. The Glasgow Airport Rail Link includes proposals to extend the existing Platform 11A at Glasgow Central station to provide additional capacity. There are no current proposals for additional capacity at Queen Street station, which is restricted by the two track tunnel approach and the station throat.

While most of the Glasgow rail network is separate from the longer distance and inter-urban network, there are a number of locations where they interact. At these points, the high volume of local services causes congestion which can affect the operation of longer distance services. Locations where this can be a problem include Glasgow Central to Rutherglen/Newton and the approaches to Glasgow Queen Street.

The suburban rail network also has a number of key constraint points:

- The section of dual track between Paisley and Shields Junction on the south-west approach to Glasgow Central station has high usage, and the Glasgow Airport Rail Link includes the provision of a third track to allow some separation of fast and stopping services; and
- Between the confluence of the two low level lines to the east of Partick and splitting of lines at Hyndland, the dual track line has high usage and is a constraint on the

provision of further services across Glasgow on the Argyle Line (linking Corridors 7 and 18) and North Electric Line (linking Corridors 7 and 13).

Many services operating into Glasgow also suffer from overcrowding. Network Rail consider that some services within the peak are likely to be overcrowded when the three hour peak loading factor (the ratio of number of passengers to the number of seats) is greater than 0.70.

Generally speaking overcrowding will only be found on part of the journey, usually on the sections closest to Glasgow. For example, services to and from Stirling will usually only reach the over crowding threshold at Croy or Lenzie as the train heads into Glasgow.

Reliability on the rail network is currently measured under the ScotRail franchise in terms of the percentage of services actually operated; the latest statistics for the 12 months to 15th September 2007[256] for services that operate into Glasgow show that the results are good only with marginal differences between the actual and target levels.

Of particular concern are services to and from Stirling, the south west electrics serving Inverclyde and Ayrshire, and services to and from East Kilbride. On these routes, some passengers will have to stand for either all or some of the journey.

[256] First ScotRail: www.firstgroup.com/scotrail

Emissions (CO_2 only)

This section of the report addresses the issue:

- What are the levels of transport based emissions within the urban network?

Emissions of CO_2 per person kilometre are forecast to rise from 133 tonnes / million person kilometres to 135 tonnes / million person kilometres between 2005 and 2022[257].

The road based transport network produced 983,500 tonnes of CO_2 in Glasgow in 2005[257]. This equates to approximately 15 per cent of the total road based transport related CO_2 emissions in Scotland.

By 2022, it is forecast that CO_2 emissions in Glasgow will increase to around 1,061,000 tonnes, approximately 13 per cent of Scotland's road based transport related CO_2 emissions in 2022.

The rail network produced 1,000 tonnes of CO_2 in Glasgow in 2007. This equates to approximately one per cent of the total rail based CO_2 emissions in Scotland[258].

Therefore, it is estimated that the road and rail based transport network produced 984,500 tonnes of CO_2 in Glasgow in 2005. This equates to approximately fifteen per cent of the total road and rail based transport related CO_2 emissions in Scotland.

Quality / Accessibility / Affordability

The following paragraphs address the issues of:

- Does public transport provision match origin/destination analysis?
- How competitive is public transport compared with the car?
- How integrated is the transport network?
- Do capacity issues impact on public transport service? and
- How safe is the network?

Although there are many former Social Inclusion Partnership areas in Glasgow where social exclusion is evident, most of them enjoy higher than average levels of public transport accessibility. This suggests that the lack of public transport is not a significant contributory factor to social exclusion in Glasgow, though services may not be providing access to employment opportunities. Less than one per cent of the city's population live in the former Social Inclusion Partnership areas with low public transport accessibility, all of which lie on the city boundary.

[257] TMfS:05
[258] AEA (2001) Rail Emission Model Final Report; www.nationalrail.co.uk; and www.networkrail.co.uk

Glasgow's high density bus and rail network means that it has a generally high level of access to key services by public transport. Improved rail links combined with increasing road traffic congestion will make public transport an increasingly competitive option for central areas in the future. In areas where new road schemes are planned, the opposite will be the case, although in some of these cases public transport accessibility will also improve.

Considering the areas of economic activity, community regeneration priority and international gateways:

- For Glasgow city centre, public transport compares favourably against car. Future conditions will see improved access by rail (e.g. Airdrie-Bathgate and Glasgow Airport Rail Link) and a deterioration in road access;
- Glasgow Airport Corridor is reasonably well served by public transport, but it is predominantly bus based with the railway line to the south of the area. While Glasgow Airport Corridor acts as an economic hub and is well placed on the road network with the M8, Clyde Tunnel and M77 converging in the area, public transport is focused towards providing connections to only Glasgow city centre and Paisley. Access to the Glasgow Airport Corridor will be improved with the completion of the Glasgow Airport Rail Link. Glasgow Airport Corridor also has rail freight facilities through John G. Russell at Deanside, however most freight travels by road. Future conditions will see little change in either car or public transport access to the area;
- Clyde Gateway is currently well served by public transport, with both rail and bus networks through the regeneration area. New M8 and M74 road schemes will improve both public transport and car accessibility. The biggest improvement will be for car travel;
- Clydebank is currently well served by public transport, with journey costs and opportunities comparing favourably against car. Future conditions are likely to see improvements to the rail network with more journey options after the opening of the Airdrie – Bathgate line. Clyde 'Fastlink' will also help improve journey times for public transport users by providing a dedicated bus route to and from the city centre. However road conditions are expected to deteriorate; and
- Glasgow Airport is well served by bus and car, although car journey times are better than bus. Opening of the Glasgow Airport Rail Link in 2012 will offer improvements to public transport journey times. The M74 will provide reduced journey times for car travel.

Measuring the quality of service of public transport is often very subjective. However a recent survey of bus users showed that approximately 14 per cent of bus users in Strathclyde are not satisfied with the overall level of service provided[259]. This is comparable to both the Scotland wide average and for Edinburgh and Lothian.

[259] Bus Passenger Satisfaction Survey, 2005

Interchange between rail services and between bus and rail services in Glasgow is poor due to the distances between Buchanan Bus Station, Glasgow Central railway station and Glasgow Queen Street railway station. A free shuttle bus is provided that links the three; however congestion in the city centre can make this interchange slow and uncertain. Links between the subway and the heavy rail network are good at some locations such as Partick and Queen Street/Buchanan Street, but passengers arriving at Glasgow Central railway station are likely to find the interchange to St Enoch subway station more difficult and uncertain.

Through ticketing is available for commuters who can purchase an SPT Zonecard, however this is only available within the SPT area. Rail and local bus tickets are also available, however this availability is limited and this lack of broad adoption means that advertising and knowledge of them is limited.

Surveys repeatedly show that safety and security fears discourage individuals from cycling and using public transport, particularly in the evening. Within Glasgow around 18 per cent of male bus users and around 26 per cent of female bus users expressed a view that they felt either 'not safe' or 'not particularly safe' on buses. This compares with a national average of 11 and 17 per cent respectively. The corresponding figures for rail in Glasgow are around nine and 24 per cent, compared to national rates of nine and 19 per cent[260].

As expected, within cities the proportion of severe accidents is lower than the national average, due to slower moving vehicles, resulting in less severe accidents. Initial analysis of severe accident clusters indicated safety issues at a number of locations on the M8 which runs through Glasgow. Annual average road accident casualties reported from 1994-1998 and 2001-2005 in Glasgow have fallen by 22 per cent[261]. This is higher than the national average of 16 per cent.

[260] Scottish Household Survey 2003/2004: Perceptions of safety from crime during evening bus/rail travel
[261] Road Accidents Scotland 2005, Table 37

5.4.6 Summary and Conclusions

Overall, how well does the transport network perform?

Glasgow is a major driver of demand as a concentrated centre of population and employment, resulting in significant demand to travel. The transport network in and around Glasgow also provides for linkages between the corridors.

The M8 through Glasgow is subject to recurrent congestion at present, giving a variance in journey time across Glasgow when comparing peak and off-peak travel times.

The suburban rail network around Glasgow caters for a large number of journeys, and in particular a high proportion of peak journeys to and from the city centre. A number of the key rail service corridors are identified as having passenger loadings that are currently close to or at capacity and key operational and physical constraints currently limit the ability to run additional services and meet growing demands.

Will the transport network meet future demand, particularly in areas of economic activity?

A number of major schemes will be in place during the study period, comprising the M74 extension within Glasgow, the M80 Stepps to Haggs scheme outside the city, the Glasgow Airport Rail Link and the Airdrie to Bathgate rail line.

The M74 extension will provide an alternative route to the M8 for many through trips and will support regeneration along the Clyde Corridor, but because of its positive impact on road access, it will also decrease the competitiveness of some public transport trips against car for parts of south east Glasgow.

The rail schemes will increase the competitiveness of public transport with the car for many journeys and will provide new opportunities for sustainable travel.

What are the key drivers that will impact on performance in the future?

The community regeneration priority afforded to the Clyde Gateway and Clydebank areas, together with the existing area of economic activity at Glasgow Airport Corridor will result in new employment opportunities being created. These areas generally have poorer public transport links to the rest of Glasgow and its surrounding corridors than the area of historical growth in the city centre.

Realising the regeneration potential of the Clyde corridor as a whole has been recognised as being of national importance. This will be a key driver of economic growth within the city and much of the future employment increase will be directly related with these areas. The accessibility of these locations by a variety of transport modes will be a key driver.

Future growth predictions for Glasgow Airport are significant if realised and accessibility by all transport modes to facilitate its international gateway status will be a key driver.

What are the key problems associated with delivering the KSOs?

The linear growth of development along the Clyde Corridor together with continued activity in traditional locations such as the city centre and the airport will require an effective strategy that addresses:

- The accessibility of areas of economic activity to one another and to the labour catchment;
- The need for many public transport trips to interchange in the city centre;
- The key constraints on the rail network; and
- The forecast increase in congestion impacting on journey times and reliability on the M8 through the city.

The management of the competing requirements of local and strategic trips on both the public transport network and the urban motorway network will have a significant role in shaping future performance.

The potential conflict associated with addressing the KSOs will be the need to deliver economic growth without damaging the environment through increased emissions.

Over the period to 2022, areas of congestion are forecast to expand over a large area on the approaches to Glasgow.