# Local Development Plans

## Cumulative Transport Appraisal of Aberdeen City & Aberdeenshire Local Development Plans

Final Report for NESTRANS

July 2010

mvaconsultancy

# Document Control

| | |
|---|---|
| Project Title: | Local Development Plan Cumulative Transport Appraisal |
| MVA Project Number: | C36535 19 |
| Document Type: | Final Report |
| Directory & File Name: | H:\Contracts\Live\C3653500_ASAM_Term_Commission\Reports\19_LDP\LDP_Cumulative_Appraisal_Final_Report.Doc |

# Document Approval

| | |
|---|---|
| Primary Author: | Jeff Davidson |
| Other Author(s): | Stephen Reid |
| Reviewer(s): | Scott Leitham |
| Formatted by: | Nicola Milne |

# Distribution

| Issue | Date | Distribution | Comments |
|---|---|---|---|
| 1 | 14/03/2010 | Study Team | 1st Draft for Information |
| 2 | 11/05/2010 | Study Team | 2nd Draft for Information |
| 3 | 02/06/2010 | Study Team | 3rd Draft for Information |
| 4 | 04/06/2010 | Study Team | 4th Draft for Comment |
| 5 | 22/06/2010 | Study Team | Final Draft Report |
| 6 | 14/07/2010 | NESTRANS | Final Report |

This report, and information or advice which it contains, is provided by MVA Consultancy Ltd solely for internal use and reliance by its Client in performance of MVA Consultancy Ltd's duties and liabilities under its contract with the Client. Any advice, opinions, or recommendations within this report should be read and relied upon only in the context of the report as a whole. The advice and opinions in this report are based upon the information made available to MVA Consultancy Ltd at the date of this report and on current UK standards, codes, technology and construction practices as at the date of this report.
Following final delivery of this report to the Client, MVA Consultancy Ltd will have no further obligations or duty to advise the Client on any matters, including development affecting the information or advice provided in this report. This report has been prepared by MVA Consultancy Ltd in their professional capacity as Consultants. The contents of the report do not, in any way, purport to include any manner of legal advice or opinion. This report is prepared in accordance with the terms and conditions of MVA Consultancy Ltd's contract with the Client. Regard should be had to those terms and conditions when considering and/or placing any reliance on this report. Should the Client wish to release this report to a Third Party for that party's reliance, MVA Consultancy Ltd may, at its discretion, agree to such release provided that:
(a) MVA Consultancy Ltd's written agreement is obtained prior to such release, and
(b) by release of the report to the Third Party, that Third Party does not acquire any rights, contractual or otherwise, whatsoever against MVA Consultancy Ltd and MVA Consultancy Ltd, accordingly, assume no duties, liabilities or obligations to that Third Party, and
(c) MVA Consultancy Ltd accepts no responsibility for any loss or damage incurred by the Client or for any conflict of MVA Consultancy Ltd's interests arising out of the Client's release of this report to the Third Party.

# Summary

During November 2009, NESTRANS commissioned MVA Consultancy to undertake an appraisal of Local Development Plans for Aberdeen City and Aberdeenshire. The study considers various changes in land use and identifies the cumulative strategic transport impacts associated with the scale and distribution of development proposals.

The study identifies a range of conceptual transport interventions that could be considered to accommodate the impacts associated with the Development Plans – demonstrating the extent to which the associated impacts could be mitigated if the plan is delivered. The evidence presented also provides some initial indications of how major development proposals could influence and contribute towards the predicted impact at key locations across the network.

The potential transport interventions identified (and tested) to support delivery of the Plans are as a result of a relatively high level assessment and further more detailed appraisal will be required to determine the most appropriate/deliverable interventions prior to any definitive views being taken. This would include establishing the full value-for-money associated with the types of intervention identified.

It is anticipated that parallel work being undertaken on behalf of developers will inform the more detailed appraisal of appropriate access strategies for the proposed land use allocations.

### Development Plan & Transport Assumptions

The study reflected the vision of the finalised Aberdeen City and Shire Structure Plan, which aims to substantially increase the population and economic activity within the North East. The impacts and benefits associated with several proposed transport interventions, including the Aberdeen Western Peripheral Route (AWPR), Haudagain Roundabout improvements and 3rd Don Crossing are also represented.

The total change in development / demographics assumed within Aberdeen and Aberdeenshire between 2007 & the 2023 forecast year was introduced into two separate scenarios. At the regional level, these assumptions and scenarios can be summarised as follows:

- **Change in Households**: Scenario 1 = 24% (48,500), Scenario 2 = 19% (38,000);
- **Change in Employment**: Scenario 1 = 9% (19,500), Scenario 2 = 6% (12,500); and
- **Change in Population**: Scenario 1 = 9%, (41,500), Scenario 2 = 6% (27,000).

The level of regional growth applied for Scenario 1 by 2023 is around 70% of the growth targeted in the full Structure Plan period to 2030. Scenario 2 represents around 70% of the growth anticipated in Scenario 1. Geographically, these changes in development and population tend to reflect a significant growth in development around the periphery of Aberdeen and along the A96 and A90 corridors of Aberdeenshire.

The development assumptions applied reflect a considerable level of in-migration to the region along with a strong growth in the regional economy – particularly relating to Scenario 1. The application of such strong growth scenarios should be borne in mind when interpreting the results presented here.

The modelling analysis was undertaken using the strategic multi-modal transport model, ASAM4 (Aberdeen Sub Area Model 4), which was used to estimate cumulative transport impacts.

## Predicted Impact of Development Plans: Present Day to 2023 Horizon

The following headline transport indicators demonstrate the impact of the introduction of the Development Plan (Scenario 1) compared to present data traffic and travel conditions.

- +20% rise in daily car trips;
- +10% rise in daily public transport trips;
- +30% rise in annual vehicle kilometres;
- +15% rise in annual carbon emissions (tail-pipe); and
- small decrease in the region-wide time lost due to congestion per kilometre travelled.

This increase to car and public transport trip making mainly reflects the strong growth scenario and assumed increase to population levels across the region. The higher rate of growth in car travel reflects factors such as increases in car ownership, which results in a higher proportion of residents having access to a car, and that car travel becomes cheaper in real terms over time. It is also likely to reflect the distribution of new developments, where many of new residential and business related development sites are planned to be located in areas where current levels of accessibility by public transport are relatively low – which may limit suitable alternatives to car travel. In particular, with the AWPR anticipated to improve journey times for a variety of travel movements across the North East.

This increase in car trips generates an associated rise in vehicle kilometres travelled. This trend demonstrates the distribution of the Development Plan, with a high proportion of development located in Aberdeenshire, and a further distance from the existing business and service centres of central Aberdeen.

Consequently, the forecasting indicates an increase in the level of carbon emissions from road traffic across the region – with the rise in car travel (vehicle kilometres) off-setting assumed engine and fuel efficiency improvements anticipated over time.

Traffic forecasting indicates that there would be significant travel time benefits once the current transport infrastructure proposals are introduced. However, as additional traffic utilises these schemes, network-wide congestion returns towards 2010 levels - suggesting that around half of the time-saving benefits associated with committed transport interventions are off-set by the effects associated with development-related traffic growth.

This impact indicates that the North East road network would generally become busier over time. However, set in the context of the Development Plan (which aims to accommodate a significant growth in population by utilising the opportunities provided by an extended road network) congestion is likely to be in general accommodated by the additional road capacity available, as the average delay per vehicle kilometre travelled actually reduces from current day levels. However this network-wide reduction in congestion by this measure will comprise a mixture of areas where congestion is relieved and areas where congestion is getting worse. Areas where congestion is getting worse therefore still require further attention.

Strategic or key areas of the network of most concern (but not limited to) where continued or additional congestion pressure is forecast relate to: the Bridge of Dee and sections of the A96 and A944 corridors.

## Appraisal of a Package of Transport Interventions

To demonstrate the level to which the cumulative impact associated with the Development Plan could be mitigated, a package of conceptual road and public transport interventions were identified and appraised against the 2023 Development Plan Scenario. A package of transport measures of this scope and scale was forecast to generate the following benefits:

- 20%-25% increase in the level of public transport accessibility between key locations;
- +2% rise in daily public transport trips;
- +6% to 7% rise in daily public transport trips to / from new development areas;
- +1% increase in public transport mode share to / from new development areas;
- -8.5% reduction in the total level of congestion; and
- congestion per vehicle km would fall to 21% of time travelled (down from 27% in 2010).

The range of interventions which comprise the package have also been shown to mitigate the main congestion hot spots which have been identified. These congestion benefits will vary by location and depend heavily on the feasibility of interventions to be implemented, and as such the conceptual proposals tested here would **need to be developed further within the context of the Scottish Transport Appraisal Guidance (STAG).**

## Transport Objectives

The predicted reduction in traffic congestion is in line with the Regional Transport Strategy (RTS) target of maintaining or reducing journey times across the North East road network. Similarly, the predicted improvement in public transport accessibility and growth in PT trip making is both encouraging and consistent with the RTS objective of increasing bus passenger volumes using services across the North East.

In other areas, the transport-related impacts associated with the Development Plan appear inconsistent with the objectives of the RTS. For example, public transport mode share is forecast at around 13% with the Development Plan in place, compared to current levels of around 14%. This reduction in PT mode share and resultant rise in car trips does not appear to work towards the RTS aim to reduce the proportion of journeys made by cars. This theme is amplified in relation to major new development areas, where the average mode share is predicted at around 11%, which is lower than the regional average (13%) and perhaps illustrates the challenges associated with attracting travellers to use public transport to / from peripheral areas of the network where many new developments are planned.

The study suggests that the implementation of the Structure Plan allocations would lead to a rise in Carbon emissions of around 15% between 2010 and 2023. This outcome also appears inconsistent with the ambitions of the RTS and the recently agreed Climate Change Delivery Plan targets - which features a 32% reduction in carbon emissions from road traffic by 2020 (from 2006 levels).

Traffic analysis has demonstrated the relationship between development sites and the impact at key points on the network, along with the use of the potential investments required to mitigate the impact of the Development Plan. This therefore provides an initial means of attributing the use of these investments to individual developments and hence a mechanism to establish some broad principles relating to financial contributions. More detailed analysis would be required as further information relating to developments and the transport proposals emerge.

# Contents


1 Introduction 1.1
1.1 Introduction 1.1
1.2 Scope of Study 1.1
1.3 Report Structure 1.2

2 Aberdeen Sub Area Model 4 2.1
2.1 Background to ASAM4 2.1
2.2 Model Forecasting Capability 2.1

3 Development Plan & Forecasting Assumptions 3.1
3.1 Emerging Development Plans 3.1
3.2 Development Ambitions 3.1
3.3 Forecasting Assumptions 3.2
3.4 Transport Network Infrastructure 3.2
3.5 Region-wide Land use and Demographic Assumptions 3.2
3.6 Distribution of Development Assumptions 3.4
3.7 Local Migration / Population Transfer Effect 3.4
3.8 Development Inputs 3.5
3.9 Major City & Shire Development Site Allocations & Access Arrangements 3.5

4 Region-wide Impacts Over Time 4.1
4.1 Introduction 4.1
4.2 Car Travel Volumes 4.1
4.3 Public Transport Travel Volumes 4.2
4.4 Vehicle Kilometres 4.3
4.5 Greenhouse Gas Emissions 4.5
4.6 Time Lost due to Congestion 4.6

5 Strategic Operational Appraisal 5.1
5.1 Introduction 5.1
5.2 Travel Movements 5.1
5.3 Road Network Traffic Flows 5.2
5.4 AWPR Traffic Flows 5.3
5.5 Time Lost Due to Congestion – Key Areas 5.5
5.6 Public Transport Patronage 5.7

6 Transport Options for Consideration 6.1
6.1 Introduction 6.1
6.2 Conceptual Package of Transport Interventions 6.1
6.3 Public Transport Interventions 6.2
6.4 Road-based Interventions 6.4


mvaconsultancy

7 Appraisal of Transport Intervention Package 7.1

7.1 Introduction 7.1
7.2 Time Lost due to Congestion 7.1
7.3 Vehicle Kilometres & Carbon Emissions 7.5
7.4 Public Transport Impacts 7.6
7.5 Development Related Traffic at Key Network Points 7.8
7.6 Summary of Impacts & Benefits 7.10


## Tables


Table 3.1 Scenario 1: Planning Data Changes by Corridor: 2007 to 2023 3.6
Table 3.2 Scenario 2: Planning Data Changes by Corridor: 2007 to 2023 3.7
Table 4.1 Daily Car-Borne Trips: Present Day 2010 to 2023 Scenarios (Motorists) 4.2
Table 4.2 Daily Public Transport Trips: Present Day 2010 to 2023 Scenarios 4.2
Table 4.3 Annual Vehicle Kilometres: Present Day 2010 to 2023 (million) 4.4
Table 4.4 Annual Greenhouse Gas Emissions: 2010 to 2023 (Tonnes $CO_2e$) 4.5
Table 5.1 Daily Traffic Flow across Strategic Screenlines (AADT Vehicles) 5.2
Table 5.2 Daily Traffic Flow at Key Locations (AADT Vehicles) 5.3
Table 5.3 Daily Traffic Flow using AWPR (AADT Vehicles) 5.4
Table 5.4 Rail Patronage (Daily Passengers) 5.8
Table 5.5 Bus Patronage (Daily Passengers) 5.9
Table 6.1 Public Transport Interventions 6.3
Table 6.2 Road-based Interventions 6.5
Table 7.1 Change in Public Transport Mode Share & Trip Making 7.7
Table 7.2 Proportion of Development Traffic using New Infrastructure 7.8


## Figures


Figure 2.1 ASAM4 Coverage Area 2.2
Figure 4.1 Annual Vehicle Kilometres within Aberdeen & Aberdeenshire 4.4
Figure 4.2 Annual Carbon Emissions within Aberdeen & Aberdeenshire (Tonnes) 4.5
Figure 4.3 Total Time Lost Due to Congestion in the Peak Periods 4.6
Figure 4.4 Time Lost Due to Congestion in the Peak Periods 4.8
Figure 5.1 Time Lost Due to Congestion within Key Areas of the Network 5.5
Figure 6.1 Transport Intervention Package – Road Options 6.6
Figure 7.1 Time Lost Due to Congestion in Key Areas 7.1
Figure 7.2 Time Lost Due to Congestion in Corridors 7.2
Figure 7.3 Time Lost Due to Congestion – Network Wide 7.4
Figure 7.4 % Time Lost Due to Congestion – Network Wide 7.5
Figure 7.5 Location of Major Developments & Road Infrastructure Analysis Points 7.9

# Appendices

Appendix A – Demographic Profile & Car Availability

Appendix B – Development Assumptions

Appendix C – Distribution of Development Travel Movements

Appendix D – Traffic Congestion Forecasts

Appendix E – Individual Transport Intervention Appraisal

Appendix F – Development Related Traffic using Key Network Points

# 1 Introduction

## 1.1 Introduction

1.1.1 During November 2009, NESTRANS commissioned MVA Consultancy to undertake an appraisal of Local Development Plans for Aberdeen City and Aberdeenshire. The study would consider various changes in land use and identify the cumulative strategic transport impacts associated with emerging development plans.

1.1.2 The study reflected the vision of the finalised Aberdeen City and Shire Structure Plan, which aims to substantially increase the population and economic activity within the North East.

1.1.3 The impacts and benefits associated with several proposed transport interventions, including the Aberdeen Western Peripheral Route (AWPR) are also represented.

1.1.4 This report describes the methodology and assumptions applied to forecast changes in the level of traffic and public transport movements associated with demographic changes and development. It also provides analysis of the predicted transport-related impacts associated with the different development scenarios, discussing the potential effects to the North East transport system.

1.1.5 The study provides some initial indications of how major development options could influence and contribute towards the predicted impact forecast at key locations across the transport network. The report also identifies a number of potential transport interventions that could be considered to accommodate the impacts associated with the emerging Development Plans – demonstrating the extent to which the associated impacts could be mitigated if the Plan is delivered.

1.1.6 The modelling analysis was undertaken using the strategic multi-modal transport model, ASAM4 (Aberdeen Sub Area Model 4), which was used to help identify cumulative transport impacts.

## 1.2 Scope of Study

1.2.1 The evidence presented here enables a more informed view to be taken with regard to the potential cumulative, cross boundary effects of the Aberdeen City and Aberdeenshire Councils Development Plans and the likely scale of intervention required to mitigate these effects.

1.2.2 The potential transport interventions identified (and tested) to support delivery of the Plans are as a result of a relatively high level assessment and further more detailed appraisal will be required to determine the most appropriate/deliverable interventions prior to any definitive views being taken. This would include establishing the full value-for-money associated with the types of intervention identified.

1.2.3 It is anticipated that parallel work being undertaken on behalf of developers will inform the more detailed appraisal of appropriate access strategies for the proposed land use allocations.

### 1.3 Report Structure

1.3.1 The remainder of this report discusses the study further within the following sections:

- Description of the ASAM4 model;
- Background to the Structure Plan, emerging Local Development Plans and assumptions and methodology used to forecast changes in travel patterns over time;
- Region-wide transport-related impacts forecast over time;
- Strategic operational appraisal of development scenarios; and
- Consideration and appraisal of potential transport intervention options;

# 2 Aberdeen Sub Area Model 4

## 2.1 Background to ASAM4

2.1.1 ASAM4 is a Strategic multi-modal transport model covering the main road and public transport networks within Aberdeen and Aberdeenshire. The geographical coverage of the full ASAM4 model is illustrated in Figure 2.1.

2.1.2 ASAM4 contains road and public transport assignment models and forecast year demand and trip end models which can be used to forecast the change in traffic and travel levels over time.

2.1.3 The ASAM4 'Base Year' is calibrated to reflect the transport system and road traffic and public transport passenger movements in 2007.

## 2.2 Model Forecasting Capability

2.2.1 The ASAM4 model uses anticipated changes in population, households and employment levels to forecast the level and distribution of vehicle and public transport trip making over time.

2.2.2 Changes in the demographic composition of the population (ie in terms of proportion of population at working age or retired) and local car ownership trends are also used to predict changes in trip making characteristics over time.

2.2.3 These changes in planning data were supplied by Aberdeen City and Aberdeenshire Councils with the overall region-wide growth in population and households, reflecting the development targets laid out in the regional Structure Plan.

2.2.4 ASAM4 also takes account of the impacts associated with major committed transport infrastructure schemes anticipated to be delivered across the North East. These schemes are coded into the network modelling and their impact can be assessed on a corridor or road-by-road basis.

2.2.5 The forecasts output from the full ASAM4 processes include road traffic flows and changes in vehicle speeds - which reflect the combined effects of both the introduction of transport schemes and the anticipated changes in the level and distribution of traffic and public transport movements over time. These outputs are interrogated to provide forecast changes in transport indicators, such as, traffic levels, congestion, journey time and Greenhouse Gas emissions.

2.2.6 Further information relating the ASAM4 model can be found in the relevant model development reports.

**Figure 2.1 ASAM4 Coverage Area**

# 3 Development Plan & Forecasting Assumptions

## 3.1 Emerging Development Plans

3.1.1 The Aberdeen City and Shire Structure Plan (Finalised Plan August 2009) presents the vision and direction for future development of the North East. The Structure Plan lays out the aims and spatial strategy associated with housing requirements, employment allowances and demographic targets between 2007 and 2030.

3.1.2 Following the approval of the Structure Plan, Aberdeenshire and Aberdeen City Councils are currently preparing Local Development Plans, which aim to complement the Structure Plan by providing a long-term development strategy for each Local Authority. Different development options are described in the Aberdeen City (October 2009) & Aberdeenshire (May 2009) Main Issues Reports, which identify sites that may provide opportunities for development over time.

3.1.3 The Structure Plan and Aberdeen City & Aberdeenshire Main Issues Reports have been used to form the underlying land use and demographic assumptions applied in this study. Additional more detailed development information was supplied by both Local Authorities and was used to identify potential geographical distributions of development sites.

3.1.4 The reader should bear in mind that at this point, Local Development Plans are not yet finalised and have an emerging position. This study has aimed to make appropriate use of available plans, with assumptions used where data is unavailable. Therefore, the scale and location of developments and/or relevant transport interventions represent potential options going forward – which reflect the ambitions of the Structure Plan, but are yet to be agreed through the emerging Local Development Plans and remain in an emerging position at the more detailed level.

## 3.2 Development Ambitions

3.2.1 The Structure Plan sets out the strategy for a substantial level of housing and employment land to be provided in several corridors across the region. At the regional level, the Structure Plan provides for the following targets from 2007 to 2030:

- An allowance for an additional 72,000 households;
- Regional population level to increase by 40,000; and
- Employment land supply to increase by 255 Hectares.

3.2.2 Aberdeen City & Shire Councils have identified several sites that may accommodate the level of development anticipated. These development proposals have been combined into two scenarios which would reflect alternative levels of growth and/or development across the region.

3.2.3 For some development options, various types of transport plans are proposed, which describe potential road and public transport access options that could serve developments. This information was used to develop an access strategy for each scenario, linking new development areas to the existing road and public transport networks.

## 3.3 Forecasting Assumptions

3.3.1 The ASAM4 modelling processes apply a range of transport infrastructure and planning and development information to calculate and forecast future levels of traffic and travel. Anticipated changes in demographics and car ownership are also input to ASAM4 as part of the process to forecast changes in traffic and public transport trip making. These demographic / population assumptions are described further in Appendix A.

3.3.2 For this cumulative study, these data and assumptions were combined to provide development scenarios that represent two alternative **2023** forecast year horizons.

## 3.4 Transport Network Infrastructure

3.4.1 The modelled 2023 future year '**Do Minimum**' transport network applied in this appraisal was based on the 2007 Base Year network with the addition of the following proposed transport infrastructure schemes:

- Strategic Rail (2008) - Improved Edinburgh-Aberdeen, Aberdeen-Inverurie & Aberdeen-Inverness services;
- Laurencekirk rail station & rail service changes;
- Grade separation on the A90 at Findon;
- A956 dual carriageway upgrade;
- Union Street pedestrianisation and traffic management schemes;
- an A96-to-Aberdeen Airport Link Road;
- A90 Balmedie to Tipperty dualling;
- Aberdeen Western Peripheral Route;
- Park & Ride sites at Chapelbrae, Parkhill & Schoolhill, and associated bus services;
- Haudagain Roundabout Improvements; and
- The 3rd Don Crossing.

3.4.2 The introduction of these transport schemes was applied consistently for both development scenarios.

## 3.5 Region-wide Land use and Demographic Assumptions

3.5.1 Aberdeen City and Aberdeenshire Councils supplied data outlining anticipated areas of housing and employment developments, with the overall region-wide growth in population and households reflecting the development targets laid out in the Structure Plan. Further information is contained in the 'Aberdeen City and Shire Structure Plan, Finalised Plan', August 2009.

3.5.2 The region-wide assumptions used within this appraisal (in terms of future levels of population, households and employment) reflect the information described in Figure 8 and Schedule 1 of the Structure Plan document, which detail the anticipated or targeted increase in housing and population between 2007 and 2030.

3.5.3 The development and population targets between 2007 and 2023 were used in this study to undertake the cumulative transport appraisal.

3.5.4 The study examined two alternative development scenarios, including:

- Scenario 1 – 'High Growth' - Structure Plan '**Allowance**' – which represents the full aspirations of the Structure Plan between 2007 and 2023; and
- Scenario 2 – 'Medium Growth' - Structure Plan '**Requirement**' – which represents the forecast housing requirement in Aberdeen and Aberdeenshire between 2007 and 2023.

3.5.5 Each scenario reflected the spatial strategy or 'build-out' of development outlined in the Structure Plan corridors to the 2023 horizon. The impacts and benefits associated with several proposed transport interventions, including the AWPR are also represented consistently.

3.5.6 Although both Scenarios reflect the ambitions of the Structure Plan, Scenario 1 tends to represent a 'higher' growth scenario which would see the North East population rise to around 500,000 people and much of the employment land allocations taken up. Alternatively, Scenario 2 represents a 'medium' growth situation where population levels would reach around 480,000 by 2030, with less employment allocations being developed.

3.5.7 Using this information along with assumptions agreed with the study team, the following levels of region-wide growth were applied to generate future levels of population, households and employment across Aberdeen and Aberdeenshire.

**Scenario 1 'Allowance'**

- In terms of population levels, an **additional 60,000 people** (+14%) were assumed to live in the region by 2030 (from 2007);
- An **additional 72,000 households** were assumed to be built across the region, including a population transfer or local migration effect used to populate these households to reflect the average (future) population per household levels (ie transferring a proportion of population from existing residential areas to live in new proposed developments); and
- Future employment levels were calculated to reflect the overall future number of people living in the region and the anticipated extra housing developed - where 200 houses were assumed to support 1 Hectare of employment land with an average of 66 jobs per hectare, therefore assuming around an **additional 29,000 jobs** across the region from 2007 and 2030.

**Scenario 2 'Requirement'**

- In terms of population levels, an **additional 40,000 people** (+9%) were assumed to live in the region by 2030 (from 2007);
- An **additional 56,000 households** were assumed to be built across the region; and
- An **additional 20,000 jobs** were assumed across the region from 2007 and 2030.

3.5.8 The release of new development over time was modelled to reflect the phases described for the Structure Plan 'Housing Allowances' (detailed in Schedule 1 of the Structure Plan), resulting in around **70%** of development released between 2007 and **2023**.

### 3.6 Distribution of Development Assumptions

3.6.1 The general distribution of developments also followed the housing (corridor) 'allowances', with Scenario 1 reflecting the build out of the full allowance between 2007 and 2023.

3.6.2 Note that although a total allocation of 72,000 houses is described within the Structure Plan, it is understood that a proportion (50%) of the regeneration area allowance is anticipated to represent replacement housing rather than be in addition to the total housing stock.

3.6.3 The distributions of growth used within Scenario 2 also reflected the corridor allowances detailed within the Structure Plan, but with the total number of additional households **constrained** to match the total region-wide housing '**requirement**' of **56,304** households (detailed in Figure 8 of the Structure Plan) ie assuming that an additional 56,304 houses are required to support an additional 40,000 people living across the region, along with changes in the average population per household.

3.6.4 Employment-related developments were distributed to reflect employment land allocations described within both the Aberdeenshire and Aberdeen Main Issues Reports and were **constrained** to reflect the targeted region-wide demographic forecasts.

3.6.5 The major and presently un-developed Local Plan allocation of employment land at Dyce Drive (23 Hectares) was also included within both Scenarios in addition to the allocations within the Structure Plan. Furthermore, as the Union Square development was opened after the Base Year used within the modelling (2007), 1,000 jobs were added to the future year scenarios to represent this specific site.

3.6.6 Similarly, the Findon residential development and employment opportunities at Axcess Aberdeen and Cairnrobin (located close to the new Findon Junction on the A90) also came online recently post the 2007 base year. Therefore, these development locations were included within the distribution of future year growth.

3.6.7 Within the City, more limited information was available describing the location of potential Brownfield-related development. Therefore, Brownfield housing allocations were distributed evenly throughout the urban area, with the exception of the potential re-development of Mugiemoss Mill, which was included as a more detailed proposal.

### 3.7 Local Migration / Population Transfer Effect

3.7.1 The Structure Plan population and housing targets take account of recent and projected changes to the structure of the city region population, targeting a significant number of additional housing across the region. It is anticipated that additional housing would help deliver the objective of growing the regional population, but also accommodate the trend of reducing household size – whereby more housing stock is required just to accommodate the same level of population.

3.7.2 It is clear that where there is significantly more housing growth than population growth there would be a migration of population from existing residential areas to new development areas. Therefore, a local population migration effect was applied to 'transfer' or 'fill' new housing areas with a proportion of existing population, with the number of residents per household calculated to match the average future population per household. Subsequently,

population levels were reduced on a pro-rata basis to accommodate this level of growth whilst constraining the overall population to regional targets. Note that such a trend may have the effect of reducing population levels in areas where no or limited new residential development is planned.

## 3.8 Development Inputs

3.8.1 The change in the total number of households, employment and population assumed for Scenarios 1 & 2 between 2007 and 2023 are described in Tables 3.1 & 3.2 respectively.

3.8.2 The total change in planning data assumed within Aberdeen and Aberdeenshire between 2007 and 2023 can be summarised for each scenario as follows:

- **Households**: Scenario 1 = 24% (48,500), Scenario 2 = 19% (37,927);
- **Employment**: Scenario 1 = 9% (19,414), Scenario 2 = 6% (12,516); and
- **Population**: Scenario 1 = 9%, (41,458), Scenario 2 = 6% (26,944).

3.8.3 Using these assumptions, the level of regional growth applied for Scenario 1 by 2023 is around 70% of the growth targeted of the full Structure Plan period to 2030. Scenario 2 represents around 70% of the growth anticipated in Scenario 1.

3.8.4 Geographically, these changes in development and population tend to reflect a significant growth in development around the periphery of Aberdeen and along the A96 and A90 corridors of Aberdeenshire. Although there is a considerable growth in households assumed in specific urban areas of Aberdeen (where there are opportunities for brownfield housing), to some extent, this additional development and population in central parts of the city is offset by the reduction in population required to populate the more extensive growth areas in peripheral areas. Therefore, a decline in population in some existing residential areas is assumed (ie through lower average household occupancy levels).

3.8.5 The growth scenarios applied were designed to reflect the 'build-out' of all potential housing or employment land allowances or requirements identified - therefore assuming that each development proposal was developed to some extent, rather than some individual developments succeeding or some being abandoned.

3.8.6 Overall, the development assumptions applied in both Scenarios for this study reflect a considerable level of in-migration to the region along with a strong growth in the regional economy – particularly relating to Scenario 1. The application of such strong growth scenarios should be borne in mind when interpreting the results presented here.

## 3.9 Major City & Shire Development Site Allocations & Access Arrangements

3.9.1 Where more detailed information was available, development data was applied to individual development site proposals. For each major development site, an access strategy was developed to reflect a reasonable level of road and public transport opportunities for travel to and from the various developments. These assumptions are described further in Appendix B.

**Table 3.1 Scenario 1: Planning Data Changes by Corridor: 2007 to 2023**

| Area | HH's | Emp. | Popn. | Change | | | Change % | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | HH's | Emp. | Popn. | HH's | Emp. | Popn. |
| Brownfield | 75,278 | 105,937 | 151,649 | 7,000 | 1,000 | -3,670 | 9% | 1% | -2% |
| Regeneration | 18,827 | 8,550 | 38,441 | 1,250 | - | -1,841 | 7% | 0% | -5% |
| Greenfield | 8,089 | 20,035 | 19,170 | 17,000 | 8,514 | 27,529 | 210% | 42% | 144% |
| **Aberdeen** | **102,195** | **134,522** | **209,260** | **25,250** | **9,514** | **22,017** | **25%** | **7%** | **11%** |
| Huntly-Pitcaple | 5,651 | 3,658 | 13,042 | 800 | 660 | 167 | 14% | 18% | 1% |
| Inverurie-Blackburn | 9,928 | 8,728 | 23,172 | 2,500 | 2,112 | 2,356 | 25% | 24% | 10% |
| Portlethen-Stonehaven | 10,378 | 8,214 | 25,509 | 4,600 | 3,432 | 6,123 | 44% | 42% | 24% |
| Drumlithie-Laurencekirk | 1,849 | 1,162 | 4,445 | 900 | 726 | 1,255 | 49% | 62% | 28% |
| Peterhead-Hatton | 11,681 | 11,079 | 27,675 | 1,600 | 1,188 | 167 | 14% | 11% | 1% |
| Ellon-Blackdog | 8,845 | 4,264 | 21,593 | 2,300 | 1,782 | 2,139 | 26% | 42% | 10% |
| Local Growth (AHMA) | 15,557 | 10,379 | 38,972 | 2,350 | - | 420 | 15% | 0% | 1% |
| Local Growth (RHMA) | 36,303 | 23,921 | 84,752 | 8,200 | - | 6,814 | 23% | 0% | 8% |
| **Aberdeenshire** | **100,191** | **71,405** | **239,160** | **23,250** | **9,900** | **19,441** | **23%** | **14%** | **8%** |
| **Aberdeen & Aberdeenshire** | **202,386** | **205,928** | **448,420** | **48,500** | **19,414** | **41,458** | **24%** | **9%** | **9%** |

Notes: 'HH's' represents the number of households, 'Emp' represents the number of jobs or employment and 'popn' represents the population within a particular area.

'Brownfield' covers existing urban areas within Aberdeen, whilst 'Greenfield' reflects semi-rural or relatively undeveloped areas in and around the periphery of Aberdeen.

'Regeneration' areas cover areas within Torry, Seaton, Tillydrone, Woodside Middlefield, Cummings Park and Northfield.

**Table 3.2 Scenario 2: Planning Data Changes by Corridor: 2007 to 2023**

| Area | HH's | Emp. | Popn. | Change | | | Change % | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | HH's | Emp. | Popn. | HH's | Emp. | Popn. |
| Brownfield | 75,278 | 105,937 | 151,649 | 5,474 | 1,000 | -4,861 | 7% | 1% | -3% |
| Regeneration | 18,827 | 8,550 | 38,441 | 978 | - | -1,952 | 5% | 0% | -5% |
| Greenfield | 8,089 | 20,035 | 19,170 | 13,294 | 5,658 | 21,496 | 164% | 28% | 112% |
| **Aberdeen** | **102,195** | **134,522** | **209,260** | **19,746** | **6,658** | **14,683** | **19%** | **5%** | **7%** |
| Huntly-Pitcaple | 5,651 | 3,658 | 13,042 | 626 | 391 | -37 | 11% | 11% | 0% |
| Inverurie-Blackburn | 9,928 | 8,728 | 23,172 | 1,955 | 1,250 | 1,561 | 20% | 14% | 7% |
| Portlethen-Stonehaven | 10,378 | 8,214 | 25,509 | 3,597 | 2,031 | 4,506 | 35% | 25% | 18% |
| Drumlithie-Laurencekirk | 1,849 | 1,162 | 4,445 | 704 | 430 | 934 | 38% | 37% | 21% |
| Peterhead-Hatton | 11,681 | 11,079 | 27,675 | 1,251 | 703 | -226 | 11% | 6% | -1% |
| Ellon-Blackdog | 8,845 | 4,264 | 21,593 | 1,799 | 1,054 | 1,410 | 20% | 25% | 7% |
| Local Growth (AHMA) | 15,557 | 10,379 | 38,972 | 1,838 | - | -172 | 12% | 0% | 0% |
| Local Growth (RHMA) | 36,303 | 23,921 | 84,752 | 6,412 | - | 4,286 | 18% | 0% | 5% |
| **Aberdeenshire** | **100,191** | **71,405** | **239,160** | **18,182** | **5,858** | **12,261** | **18%** | **8%** | **5%** |
| **Aberdeen & Aberdeenshire** | **202,386** | **205,928** | **448,420** | **37,927** | **12,516** | **26,944** | **19%** | **6%** | **6%** |

Notes: 'HH's' represents the number of households, 'Emp' represents the number of jobs or employment and 'popn' represents the population within a particular area.
'Brownfield' covers existing urban areas within Aberdeen, whilst 'Greenfield' reflects semi-rural or relatively undeveloped areas in and around the periphery of Aberdeen.
'Regeneration' areas cover areas within Torry, Seaton, Tillydrone, Woodside Middlefield, Cummings Park and Northfield.

# 4 Region-wide Impacts Over Time

## 4.1 Introduction

4.1.1 The assumptions outlined in Chapter 3 relating to committed infrastructure schemes and land use developments were input to ASAM4 to create two 2023 forecast year scenarios. To isolate the impacts between committed transport infrastructure schemes and development plans a further scenario was developed which included all committed infrastructure schemes, but excluded any development-related travel growth.

4.1.2 For ease of reference, a (2010) 'Present Day' Scenario was also generated by undertaking some minor updates to the 2007 Base Year Scenario. This Present Day scenario assumed no changes to overall traveller demand (from 2007), but included the effects associated with transport schemes which are now on-the-ground – ie the new dual carriageway along the A956 and the new interchange at Findon connecting to the A90.

4.1.3 Therefore and where relevant, comparisons can be drawn for up to four scenarios, including:

- **2010 Present Day Scenario** – representing current traffic and travel conditions;
- **Scenario 0: 2023 Scenario with committed infrastructure only** – representing traffic and travel conditions with several transport schemes in place but with no overall change in region-wide traffic/travel levels from the present day;
- **Scenario 1 – 'High Growth' - 2023 Scenario with committed infrastructure & development 'Allowance'** – representing the full aspirations of the Structure Plan; and
- **Scenario 2 – Medium Growth' - 2023 Scenario with committed infrastructure and development 'Requirement'** – representing the forecast housing requirement.

4.1.4 The following section describes the impact of these scenarios, comparing the 'Region-wide' changes forecast across the transport system between the present day and 2023.

4.1.5 Note that data for 'Scenario 0' is not included for some statistics as the overall volume of traffic and Public Transport Trips are assumed to be consistent with the 2010 Present Day Scenario.

## 4.2 Car Travel Volumes

4.2.1 Table 4.1 describes the predicted change in the number of car-borne trips between the present day and 2023 forecast year for each scenario. These figures reflect the total level of motorists using a car to travel across Aberdeen and Aberdeenshire during an average day.

4.2.2 The forecasts indicate a considerable rise in the number of car trips over time, with around a 21% increase across Aberdeen and Aberdeenshire from 2010 to 2023 for Scenario 1 and around a 17% increase related to Scenario 2. The predicted increase in region-wide vehicle trip making reflects the considerable increase in the level of population and employment across the North East along with the anticipated increase in the level of car ownership. Depending on the distribution of car-borne journeys and how network infrastructure can

accommodate these additional movements, the road network could come under increasing pressure if the aspirations of the Structure Plan are delivered.

**Table 4.1 Daily Car-Borne Trips: Present Day 2010 to 2023 Scenarios (Motorists)**

| Scenario | Daily Car Trips | Present Day 2010-2023 | |
|---|---|---|---|
| | | Change | % Change |
| 2010 Present Day | 369,954 | | |
| 2023 Scenario 1 | 448,364 | 78,410 | 21% |
| 2023 Scenario 2 | 431,292 | 61,338 | 17% |

4.2.3 Note that the anticipated growth in non-working population over time (as a higher proportion of the population move into the retirement age bracket) could result in a change in the choice of time of day to make a journey. As retirees are more likely to travel for non-work purposes during the inter peak, a potential decline in working population could limit the growth of commuters in the peak time periods. Therefore, the overall growth in regional population combined with a substantial growth in non-work travel purposes could result in additional pressures during the inter peak periods and / or during weekends.

## 4.3 Public Transport Travel Volumes

4.3.1 Table 4.2 describes the change in the number of public transport trips between 2010 and 2023 for each development scenario. These figures reflect the total level of travellers using public transport during an average day.

**Table 4.2 Daily Public Transport Trips: Present Day 2010 to 2023 Scenarios**

| Scenario | Daily Person Trips | Present Day 2010-2023 | |
|---|---|---|---|
| | | Change | % Change |
| 2010 Present Day | 58,342 | | |
| 2023 Scenario 1 | 64,735 | 6,393 | 11% |
| 2023 Scenario 2 | 62,320 | 3,978 | 7% |

4.3.2 The forecasts indicate around an 11% rise in the number of people using public transport across Aberdeen and Aberdeenshire between 2010 and 2023 for Scenario 1 and around a 7% increase related to Scenario 2. When compared to the (higher) car trip forecasts, this travel analysis suggests that public transport mode share would decrease from 14% in 2010 to 13% in 2023.

4.3.3 The level of public transport mode share associated with all new major development sites (as listed in Appendix B) is around 11% (2023 Scenario 1), which is slightly lower than the regional average of 13%.

4.3.4 These public transport trends are likely to reflect a number of interrelated factors, including:

- The overall **rise** in regional population would result in a proportion of new inhabitants choosing to use rail or bus services;
- New public transport services and interchange opportunities are likely to **attract** some existing motorists to travel by PT. For example, the recent opening of Laurencekirk rail station, improved rail services and park and ride sites would **encourage mode shift**;
- A **higher** proportion of inhabitants are anticipated to have **access to a car** in the future, and therefore a proportion of these travellers are likely to choose to use the car for some journeys, therefore **limiting** or off-setting the **growth in PT travel** associated with other factors;
- Many of new residential and business related development sites are planned to be located in areas where current levels of **accessibility by public transport are relatively low** (ie parts of Aberdeenshire and Greenfield sites around the periphery of Aberdeen). Therefore, higher car ownership and usage is likely to be associated with many of these new development sites, which over time, may limit growth in public transport trips;
- As many planned developments would be located around the edges of Aberdeen, an increase in **orbital style movements** between peripheral residential and business areas are likely. Currently, existing and anticipated public transport services focus on travel to / from Aberdeen city centre and therefore for some travel movements, there is likely to be a **lack of suitable alternatives** to using the car to travel – again potentially limiting growth in PT travel; and
- Existing and new bus services operating within central Aberdeen are likely to benefit from the decongestion effects associated with proposed transport infrastructure schemes such as the AWPR. However, with the targeted growth in regional population, for some locations delays and the impact of congestion are still likely to occur. The introduction of the AWPR is likely to provide benefits for many travellers, particularly in generating quicker journey times between areas which currently require a journey through the centre of Aberdeen. Travellers could potentially find it quicker to travel a much further distance around Aberdeen using the AWPR than travelling into the city centre. These considerable benefits created by the AWPR, along with the availability of additional housing and employment land would generate greater choices for travellers, who may decide to choose to live and/or work in a different location to take advantage of these benefits – if so, the likely mode of travel would tend towards car use (to use the AWPR) and therefore constrain growth in public transport movements.

## 4.4 Vehicle Kilometres

4.4.1 Table 4.3 and Figure 4.1 describe the forecast change in the number of vehicle kilometres travelled by cars and goods vehicles between 2010 and 2023 for each Scenario.

4.4.2 The modelling indicates that with (only) proposed infrastructure in place (and no change in overall trip making) there would be a small rise in vehicle kilometres. This trend reflects the impact of the AWPR, which provides a quicker but longer distance route for some journeys.

4.4.3 Both development scenarios are anticipated to significantly increase the level of vehicle travel across the North East, which ultimately reflects the level of development and population growth planned for the region – where additional road travel would be unavoidable. However, the magnitude of this trend is also likely to reflect aspects of the spatial strategy, where a considerable proportion of future housing and employment developments would be located at the edges of Aberdeen and within Aberdeenshire – where the average distance travelled to work and other services is higher than the regional average.

**Table 4.3 Annual Vehicle Kilometres: Present Day 2010 to 2023 (million)**

| Scenario | Vehicle Kilometres | Present Day 2010-2023 | |
|---|---|---|---|
| | | Change | % Change |
| 2010 Present Day | 3,813 | | |
| Scenario 0 - 2023 | 3,895 | 82 | 2% |
| Scenario 1 - Allowance | 5,013 | 1,199 | 31% |
| Scenario 2 – Requirement | 4,816 | 1,003 | 26% |

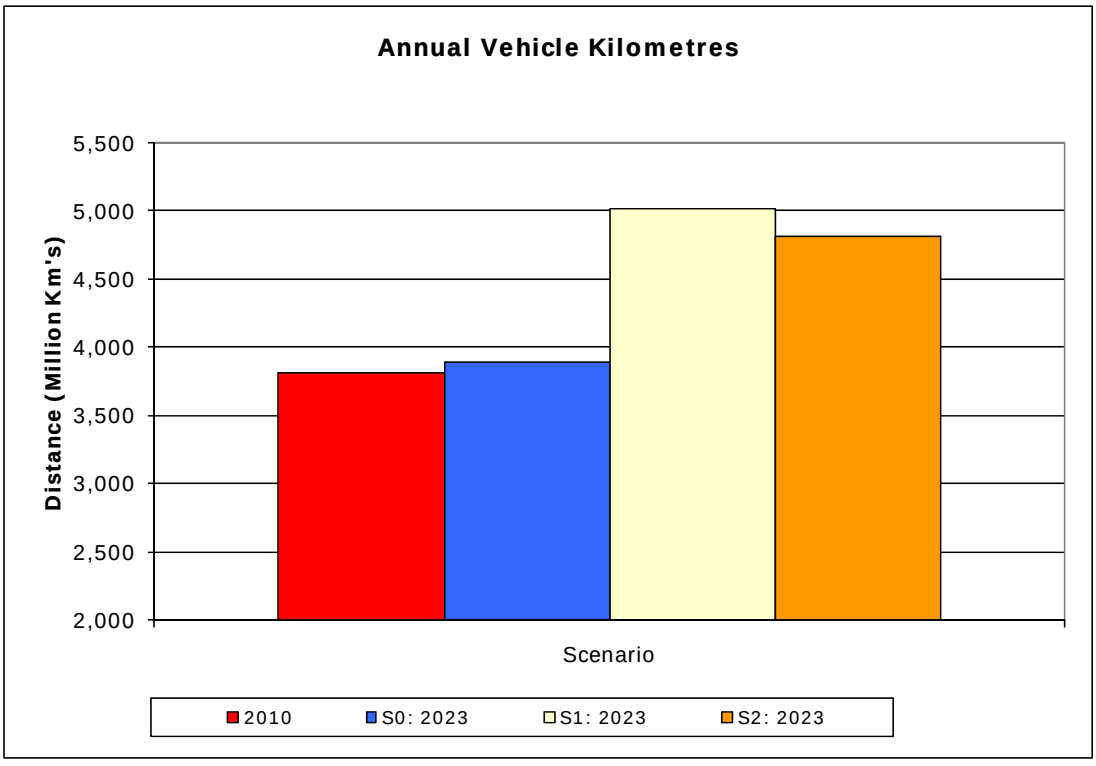


**Figure 4.1 Annual Vehicle Kilometres within Aberdeen & Aberdeenshire**

## 4.5 Greenhouse Gas Emissions

4.5.1 Table 4.4 and Figure 4.2 describe the predicted change in road-related (exhaust pipe) Greenhouse Gas emissions in Aberdeen and Aberdeenshire between 2010 and 2023 for each Scenario (measured in Carbon Dioxide Equivalent).

**Table 4.4 Annual Greenhouse Gas Emissions: 2010 to 2023 (Tonnes $CO_2e$)**

| Scenario | $CO_2e$ (Tonnes) | Present Day 2010-2023 | |
|---|---|---|---|
| | | Change | % Change |
| 2010 Present Day | 804,192 | | |
| Scenario 0 - 2023 | 715,215 | -88,977 | -11% |
| Scenario 1 - Allowance | 941,919 | 137,727 | 17% |
| Scenario 2 – Requirement | 902,320 | 98,129 | 12% |

Note that this analysis assumes no fuel and vehicle efficiency improvements after 2020

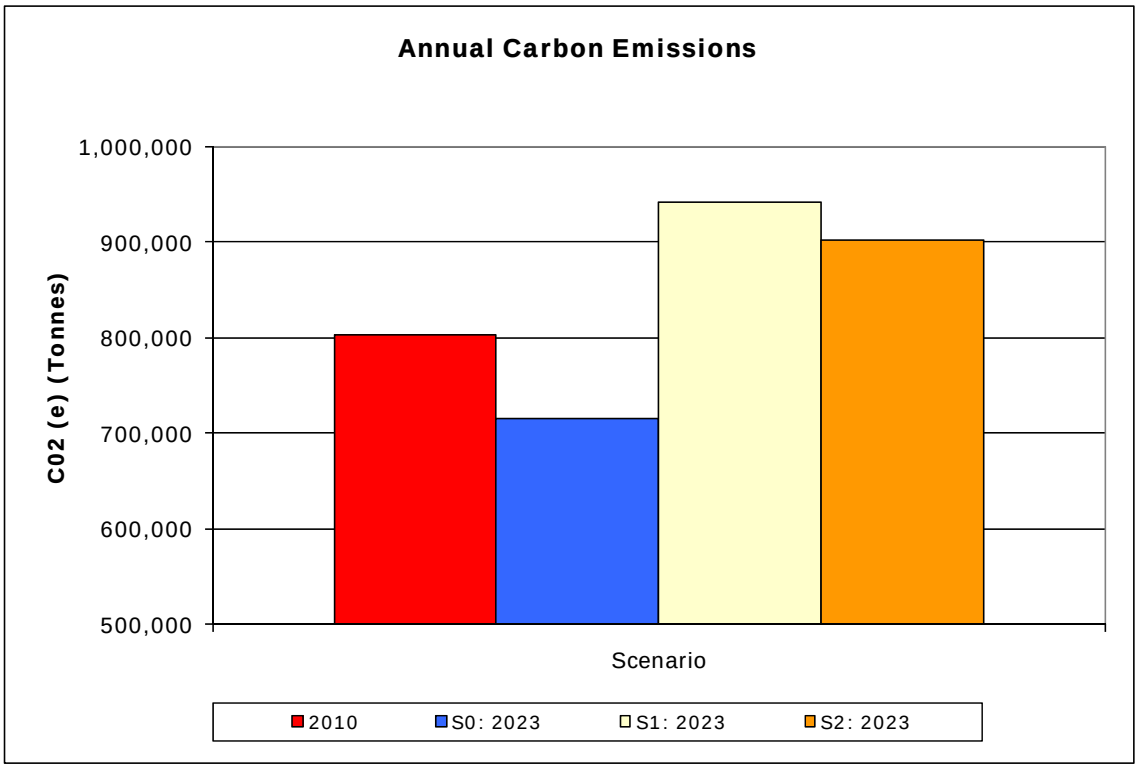


**Figure 4.2 Annual Carbon Emissions within Aberdeen & Aberdeenshire (Tonnes)**

4.5.2 The modelling indicates that with (only) committed infrastructure in place (and no change in overall trip making) there would be a reduction in Carbon emissions over time. This trend reflects the assumptions applied, that assume that vehicle and fuel technology will consistently improve over time. Therefore, these technology improvements off-set the additional Carbon emissions associated with a rise in vehicle kilometres (described in Table 4.3).

4.5.3 When development-related travel growth is included to the forecasts, this indicates a considerable rise in Carbon emissions in both development Scenarios. These additional Greenhouse Gas emissions reflect the increase in traffic predicted over time, whereby the increase in $CO_2$ from the rise in vehicle kilometres (and fuel burned) off-sets the assumed reductions in emissions over time associated with advances in technology and engine/fuel efficiency.

4.5.4 It should be noted that this forecast reflects current DfT assumptions on future vehicle fleet composition. Alternative scenarios are being developed at present to better reflect the Government's envisaged route to meeting their ambitious climate change targets, ie the widespread introduction of low or zero carbon vehicles.

## 4.6 Time Lost due to Congestion

4.6.1 Figure 4.3 describes the forecast change in the total time lost due to congestion for cars and goods vehicles between 2010 and 2023 for each scenario. This analysis measures the time lost between travelling unrestricted across the road network compared to that realised during an average hour in the morning peak period. This type of analysis is also a reasonable estimate of how bus services may be affected by changes in congestion over time (with the exception of some sections of the network that provide bus priority measures).

4.6.2 The congestion analysis is separated into areas, with delays associated with roads in Aberdeen City, Aberdeenshire, and for some scenarios, sections of the AWPR (including access junctions).

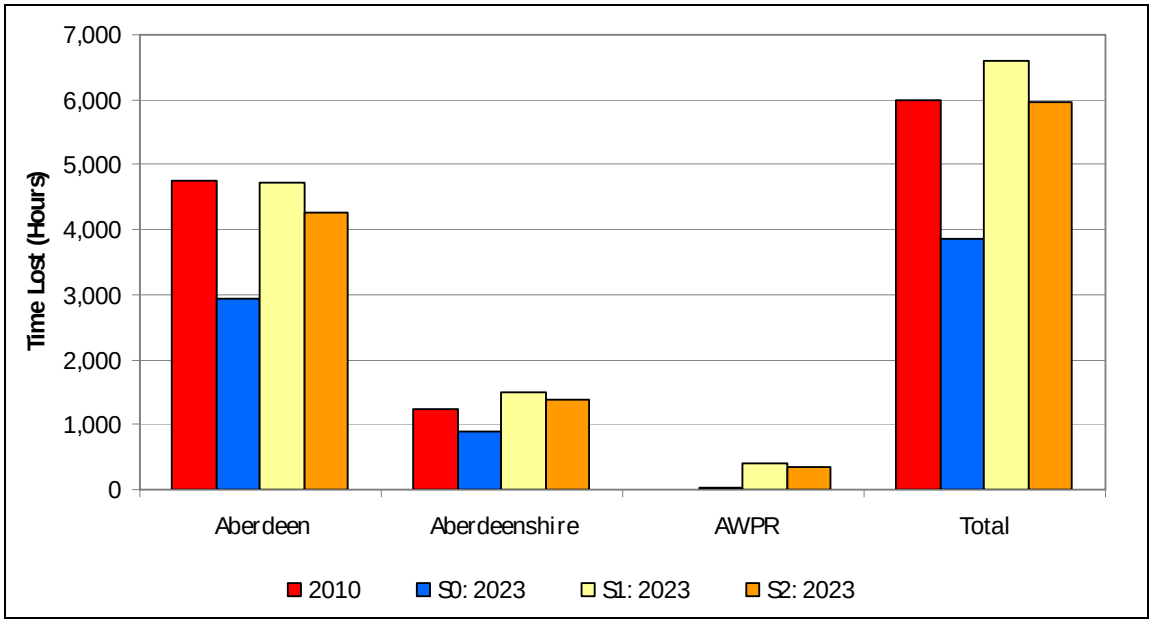


**Figure 4.3 Total Time Lost Due to Congestion in the Peak Periods**

4.6.3 The analysis demonstrates that the time lost by all North East motorists due to the impact of congestion is around 6,000 hours across the peak hours (2010 Scenario). This congestion impact represents around 30% of time travelled in the peak periods being due to delays. At an individual level this figure relates to around ten minutes lost due to congestion for every motorist across the region.

4.6.4 The congestion analysis also indicates the disparity between Local Authorities, where the far majority of time lost is realised in the City of Aberdeen (where up to 90% of congestion occurs). The analysis suggests that around 40% of an average journey time is due to delays within the City boundary during the Peak hours (2010 Scenario).

4.6.5 The time lost due to congestion in both the City and Shire is forecast to decrease considerably when the various committed transport interventions are introduced (and no change in overall trip making). This benefit is particularly significant for the City, where total congestion drops to around 3,000 hours (around a 35% reduction in congestion).

4.6.6 The analysis relating to development scenarios 1 & 2, illustrate that many of the traveller-benefits associated with new transport infrastructure are lost, as additional traffic utilises the network and overall congestion returns towards or in excess of 2010 levels - suggesting that some of the time-saving benefits associated with committed transport interventions are off-set by the effects associated with development-related traffic growth.

4.6.7 With the development scenarios implemented, the analysis indicates that around 400 hours of congestion would be associated with travelling via the AWPR, this impact represents around 20% of (AWPR-related) travel time at peak times. This trend is likely to reflect a slight reduction in free-flow speed along some of the busiest sections and potentially increase the time required to travel via some AWPR junctions, where additional traffic growth may put pressure on the operation of some access arrangements.

### Time lost per Vehicle Kilometre

4.6.8 Although this type of congestion analysis indicates that the North East road network would generally become busier over time, this outcome must be set in the context of the development plan - which assumes a significant growth in population (and subsequently car travel) utilising the opportunities provided by the improved road network (ie including committed road infrastructure projects such as the AWPR). Therefore, although the total amount of congestion would rise (in terms of vehicle hours lost), as there are predicted to be more motorists on the road, this increase is likely to be in general accommodated by the additional road capacity available, as the average delay per vehicle kilometre travelled actually reduces from current day levels. **However this network-wide reduction in congestion by this measure (hours lost per vehicle kilometre travelled) will comprise a mixture of areas where congestion is relieved and areas where congestion is getting worse**. Areas where congestion is getting worse therefore still require further attention.

4.6.9 This is illustrated in Figure 4.4, which shows the total change in hours lost due to congestion within the peak hours and the percentage time lost due to congestion per vehicle kilometre travelled. The analysis indicates that, at present around 27% of road travel time is attributable to congestion within the peak periods (ie compared to travelling in free flow conditions). This level of congestion is expected to decrease considerably over the short term with the additional road capacity across the North East. The analysis also demonstrates that the average time lost due to congestion per vehicle is forecast to reduce with the full development plan allocations (compared to the present day scenario) – although the congestion-related impact of the plan would off-set over half of the time-saving benefits associated with new infrastructure schemes.

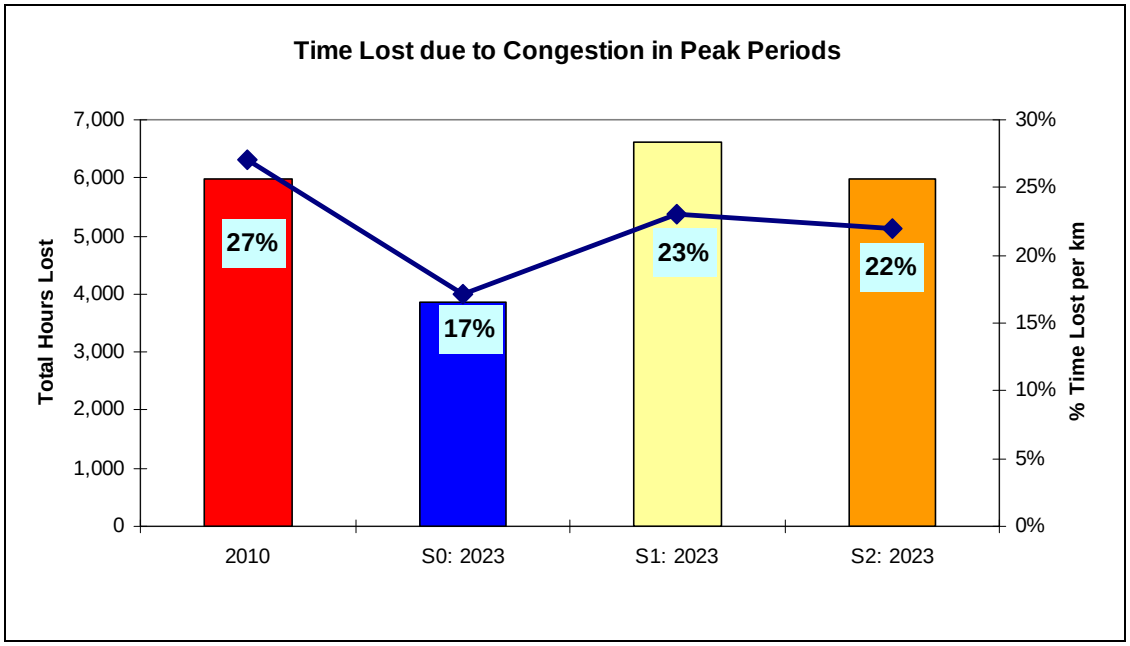


**Figure 4.4 Time Lost Due to Congestion in the Peak Periods**

4.6.10 Note that the extent to which a motorist may realise these potential travel-time benefits, would depend on their current travel circumstances. For example, a motorist currently travelling along some of the usual commuter routes across Aberdeen may well see an improvement compared to current day travel times. However, the previous travel behaviour of new residents (who are anticipated to re-locate to the region) is unknown (ie the counterfactual) so benefits or otherwise to these people can only be speculated upon.

# 5 Strategic Operational Appraisal

## 5.1 Introduction

5.1.1 The following section describes how the development plan is predicted to impact on the operation of key areas of the road network and public transport (PT) system.

## 5.2 Travel Movements

5.2.1 The ASAM4 model provides forecasts of the likely traffic and PT movements associated with each new development site and changes to travel patterns of existing residential and business orientated areas.

5.2.2 To provide an example of the distribution of anticipated development-related travel movements, Appendix C illustrates the level of travel movements between the major proposed developments at Whitestripes, Countesswells and Loirston developments and other areas of Aberdeen and Aberdeenshire.

5.2.3 The modelling indicates that the movements associated with each of these developments form a relatively dispersed travel pattern, with around 25%-30% of development-related travel movements travelling to central Aberdeen, 45%-50% to the periphery of Aberdeen and 20%-25% to Aberdeenshire.

5.2.4 Although the city centre and central Aberdeen area attract a considerable number of trips, the areas within the immediate vicinity of each development are also predicted to attract a sizeable proportion of trips - which is perhaps not unexpected given the relative close proximity of employment sites to residentially-orientated developments.

5.2.5 The analysis also suggests a large proportion of travel movements from these developments to other peripheral areas – which is likely to reflect the significant growth in employment opportunities provided within the development plan around the outskirts of Aberdeen. Similarly, movements to Aberdeenshire are also relatively significant and this is also likely to reflect the planned increase in employment opportunities along the A90 south, A90 North and A96 corridors.

5.2.6 For each development, around 3%-4% of development-related travel movements are anticipated to travel beyond the boundary of Aberdeenshire.

5.2.7 The magnitude of new travel movements associated with areas located out with Aberdeen city centre and other current major employment centres suggests an increase in the demand on parts of the road and public transport system which are not currently associated with this level of activity.

5.2.8 The AWPR is anticipated to provide additional capacity to cater for future traffic growth across the strategic network. However, due to the scale of growth, the ability for travellers to access existing local and regional networks will become significant in maintaining sufficient levels of accessibility in and around new development areas. Subsequently, new infrastructure or services may be required to accommodate / mitigate these increasing demands.

## 5.3 Road Network Traffic Flows

5.3.1 The following section discusses the impact that the Development Plan Scenarios could have on the level of traffic travelling along key sections of the road network.

5.3.2 Table 5.1 describes the predicted change in daily traffic flow at a number of key locations, including all bridges crossing the River Dee and River Don, and the main approaches from North and South Aberdeenshire.

**Table 5.1 Daily Traffic Flow across Strategic Screenlines (AADT Vehicles)**

| Scenario | AADT / %Change | Existing River Don Crossings | Existing River Dee Crossings | All River Don Crossings | All River Dee Crossings | A90 North of Murcar | A90 South of Charleston |
|---|---|---|---|---|---|---|---|
| 2010 | AADT | 78,030 | 117,150 | 78,030 | 117,150 | 20,850 | 45,500 |
| 2023 S0 | AADT | -9,990 | -23,090 | 2,960 | 2,180 | -2,150 | -9,340 |
| | %Change | -13% | -20% | 4% | 2% | -10% | -21% |
| 2023 S1 | AADT | 8,100 | -8,500 | 34,240 | 33,420 | 3,330 | 7,490 |
| | %Change | 10% | -7% | 44% | 29% | 16% | 16% |
| 2023 S2 | AADT | 4,510 | -11,140 | 28,210 | 28,040 | 1,940 | 4,040 |
| | %Change | 6% | -10% | 36% | 24% | 9% | 9% |

5.3.3 Table 5.1 illustrates a consistent reduction in traffic volumes across several strategic locations when various transport interventions are introduced across the North East road network. Traffic volumes approaching Aberdeen from the North and South (using the A90) and crossing all bridges over the River's Dee and Don are expected to reduce considerably (between 10%-20%).

5.3.4 However, the analysis indicates that many of these traffic-reduction benefits would be lost if the Development Plan proposals are implemented, with an overall increase in traffic forecast for the majority of strategic locations highlighted here. For example, the morning peak hour flow at the A90 South of Charleston is predicted to be slightly in excess of current day levels under both development scenarios.

5.3.5 Identifying the level of traffic using all bridges over the Dee (excluding the AWPR) provides a good illustration of the benefits of the AWPR, where motorists are expected to divert to use the new bypass thus reducing the total traffic flow using the existing crossings. Therefore this diversion effect off-sets the growth in traffic over time for these existing locations.

5.3.6 However, the total traffic flow forecast across all bridges over the Dee & the Don (including the new AWPR crossing points) would actually increase, with the modelling predicting around a 30% rise in traffic over the River Dee and a around a 45% increase across the River Don between 2010 and 2023.

5.3.7 Table 5.2 describes further predicted changes to daily traffic volumes travelling via key areas of the road network. Again, the analysis suggests a sustained decrease in traffic volumes at the Bridge of Dee, although the reduction in traffic is relatively marginal in relation to Scenario 1. This outcome suggests that although traffic volumes at the Bridge of Dee might be reduced in the short term, as the Development Plan materialises, this area of the network would come under increasing pressure – similar to that experienced at present.

5.3.8 The analysis also illustrates potential changes to traffic volumes at key locations close to major development areas. Around a 10%-20% increase in traffic levels is predicted at Persley Bridge (which would form a major route to and from the Whitestripes development), a 20%-25% increase at the A944 (which would provide access to the AWPR for traffic associated with the Countesswells development) and at 25%-30% increase at the A96, which would serve the A96 development corridor.

5.3.9 These forecasts illustrate the scale of development planned for the A944 and A96 corridors in particular, and demonstrate the additional volume of traffic that would need to be catered for if the development plan is implemented.

**Table 5.2 Daily Traffic Flow at Key Locations (AADT Vehicles)**

| Scenario | AADT / %Change | Persley Bridge | Bridge of Dee | A96 West of AWPR | A944 East of AWPR |
|---|---|---|---|---|---|
| 2010 | AADT | 19,830 | 36,300 | 25,470 | 24,460 |
| 2023 S0 | AADT | -4,030 | -6,760 | 760 | 780 |
| | %Change | -20% | -19% | 3% | 3% |
| 2023 S1 | AADT | 3,740 | -1,400 | 7,970 | 6,400 |
| | %Change | 19% | -4% | 32% | 26% |
| 2023 S2 | AADT | 2,080 | -2,430 | 6,570 | 4,990 |
| | %Change | 10% | -7% | 27% | 20% |

## 5.4 AWPR Traffic Flows

5.4.1 Table 5.3 describes the level of daily traffic predicted to use specific sections of the AWPR, comparing traffic volumes related to these Development Plan scenarios with traffic forecasts used previously in appraising the impacts of the AWPR (reflecting the 2027 Design Year).

5.4.2 The analysis indicates that the general level of AWPR-related traffic associated with these development scenarios are in excess of those predicted previously. For example, the volume of traffic forecast to use the Fastlink is anticipated to be around 50%-60% greater than previous expectations. Although, despite this increase the overall volume of Fastlink-related traffic is still considerably less than for other sections of the AWPR.

**Table 5.3 Daily Traffic Flow using AWPR (AADT Vehicles)**

| Scenario | AADT / %Change | Stonehaven Fastlink | Charleston-Cleanhill | A93-A944 | Kingswells North- A96 | A947 – A90 North |
|---|---|---|---|---|---|---|
| Previous Forecasts | | 13,500 | 17,400 | 40,100 | 52,800 | 22,000 |
| 2023 S0 | AADT | 13,280 | 12,020 | 28,940 | 37,930 | 12,530 |
| | %Change | -2% | -31% | -28% | -28% | -43% |
| 2023 S1 | AADT | 21,860 | 20,230 | 47,410 | 59,540 | 21,960 |
| | %Change | 62% | 16% | 18% | 13% | 0% |
| 2023 S2 | AADT | 20,740 | 18,590 | 44,470 | 55,780 | 20,150 |
| | %Change | 54% | 7% | 11% | 6% | -8% |

Notes: 'Previous Forecasts' reflect the AWPR 2027 Design Year forecasts which were based on the North East Structure Plan (NESP).
The '2023 S0' scenario excludes any representation of development related (traffic) growth.

5.4.3 Traffic travelling along sections of the AWPR between Charleston and the A96 is around 15%-20% greater for Scenario 1, and around 5%-10% greater for Scenario 2 (when compared to previous forecasts).

5.4.4 This increase in traffic predicted to use the AWPR is associated with the greater development or growth aspirations assumed within these scenarios, which is in excess to that assumed during earlier studies. It may also reflect the location of several developments, where recent plans are focussed more on peripheral areas of Aberdeen and along specific Aberdeenshire corridors.

5.4.5 The similar or reduced level of traffic predicted to use the AWPR between the A947 and the A90 North is likely to reflect the assumed introduction of the 3rd Don Crossing and Haudagain junction improvements, which were not accounted for at the time of the previous AWPR study. These schemes are expected to provide some relief to congestion in the North of the City which may attract traffic to travel via some of these more central orientated routes.

5.4.6 At peak times, the busiest section of the AWPR is between Kingswells North and the A96, where the flow is predicted to be around 3,250 vehicles per hour (slightly higher than the present day traffic flow approaching Charleston intersection from the South). If realised, such a volume of traffic has the potential to put considerable pressure on the operation of nearby AWPR access junctions.

## 5.5 Time Lost Due to Congestion – Key Areas

5.5.1 ASAM4 was applied to calculate the total predicted time lost due to congestion for vehicles travelling across the road network in the 2010 present day scenario and 2023 development plan 'Allowance' scenario 1. This analysis measures the time lost between travelling unrestricted across the road network compared to that realised during an average hour during the peak periods.

5.5.2 This type of analysis is useful in comparing the parts of the road network that currently suffer from congestion with those that are predicted to come under pressure in the future – assuming that all transport infrastructure proposals are introduced and the development plan is delivered.

5.5.3 Ten key areas of the network were identified where the level of congestion may change if the development plan is implemented. Figure 5.1 describes the change in congestion for these 10 key areas of the network during the morning and evening peak hours. For comparison purposes this analysis also includes the intermediate 'Scenario 0' (with committed infrastructure only) and the 2023 Scenario 2 'Requirement'.

5.5.4 The coverage of these 10 key areas of the network and predicted changes in congestion are illustrated in Appendix D.

5.5.5 Figure 5.1 shows the effects of a number of interrelated impacts across the road network – the benefits and/or associated impacts associated with transport infrastructure schemes (ie AWPR, A90 Balmedie to Tipperty, Third Don Crossing and Haudagain Roundabout Improvements) and a general increase in overall traffic levels, which may impact on parts of the network.

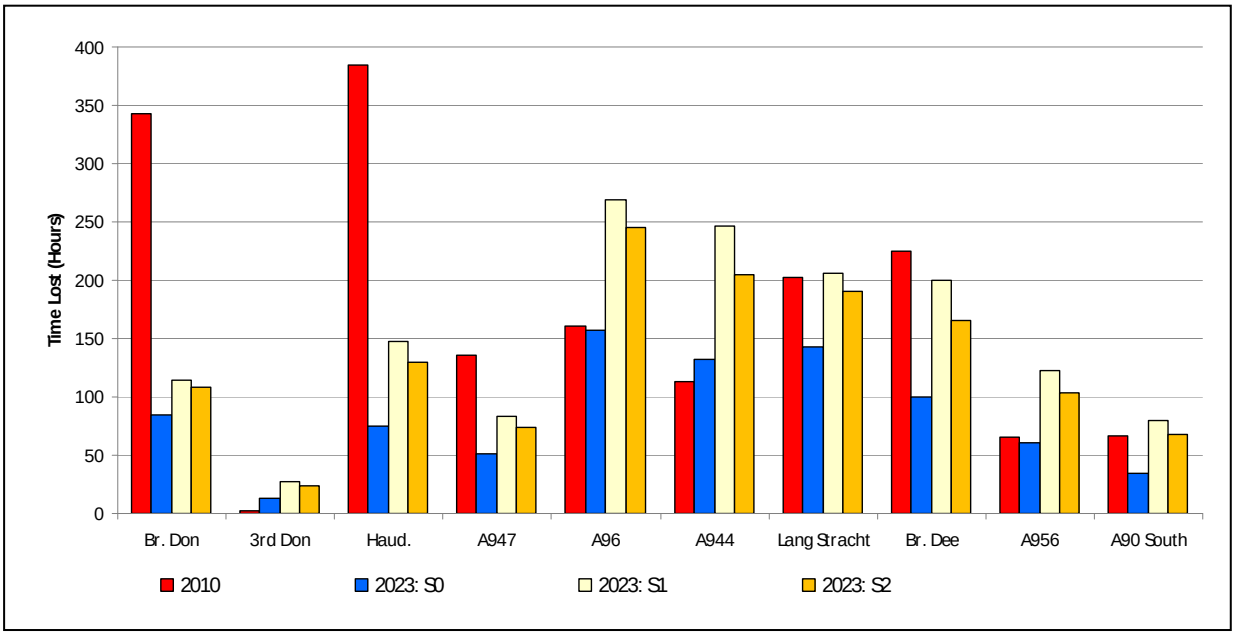


**Figure 5.1 Time Lost Due to Congestion within Key Areas of the Network**

### River Don Crossings

5.5.6 The first set congestion analysis along the Bridge of Don corridor suggests that the proposed transport schemes would significantly improve travel times through this area of the network (which is perhaps not surprising as the AWPR, 3rd Don Crossing and Haudagain Improvements would all be expected to benefit this section of the network. Due to the level of congestion benefit associated with these schemes, the traffic growth associated with the development plan is forecast to only off-set a marginal amount of these time-saving benefits.

5.5.7 The congestion analysis covering the Haudagain area also demonstrates a similar level of time benefit associated with the introduction of these infrastructure schemes. However, the modelling suggests that the implementation of the Structure Plan allocations may off-set some of the benefits anticipated for this area. This may reflect the closeness of several major development sites to this area, particularly at Whitestripes and the substantial level of development planned for the A96 corridor.

5.5.8 A proportion of travel time savings at the A947 are also likely to be lost due to the increase in traffic levels associated with the development plan. However, congestion levels are predicted to be less than those experienced presently.

5.5.9 The level of congestion towards the South end of the 3rd Don Crossing / St Machar Drive is also forecast to increase, both with the introduction of the Crossing (as motorists are attracted by the benefit of using the new bridge) and the additional traffic associated with the development plan. However, at the wider level, it is also clear that the significant benefits related to the Bridge of Don and Haudagain areas significantly outweigh this potential local congestion impact.

### A96 & A944 Corridors

5.5.10 With the introduction of a major access point connecting with the AWPR, coupled with the closeness of large development sites, the A96 corridor will likely experience a considerable rise in traffic levels over time.

5.5.11 The increased road and junction capacity associated with the AWPR is forecast to lead to a reduction in congestion levels in the short term. However, with the level of development located close by and also further west along the A96, the modelling indicates that the road network would come under increased pressure and potentially lead to higher delays than currently experienced.

5.5.12 A similar trend is also demonstrated along the A944 corridor, where the implementation of the Structure Plan allocations is forecast to increase congestion in excess of present day levels. To some extent this trend is likely to be related to the increase in traffic levels associated with development sites at Home Farm and Countesswells, which would need to be accommodated along this heavily trafficked corridor.

5.5.13 Note that as the AWPR provides new access junctions along these corridors, some of this additional delay is likely to stem from the introduction of this new road space. These (total) delays would therefore be attributed between higher volumes of motorists, potentially constraining the level of congestion on a per vehicle basis. This may have the effect of lessening the perception of congestion in this area compared to the present day situation. More detailed analysis would be required to ascertain the operational effectiveness of these access junctions linking to the AWPR.

5.5.14 Further into Aberdeen, the modelling indicates an initial reduction in congestion levels along the Lang Stracht. However, the majority of these benefits are likely to be offset if the development plan is delivered. Which suggests that the traffic related growth associated with developments such as Maidencraig is likely add pressure to the network within this area.

### Approaches from the South

5.5.15 Within and to the South of Aberdeen, the analysis demonstrates a considerable reduction in congestion approaching the Bridge of Dee in the short and medium term - which is likely to reflect the time-saving benefits of the AWPR attracting traffic away from this congested area. This trend is also identified along the A90 South, where the introduction of the Fastlink provides an alternative route for motorists and therefore reduces the level of congestion between Newtonhill and the Charleston interchange in the shorter term.

5.5.16 Congestion levels along the A956 corridor remain relatively constant when (only) transport interventions are brought on line. This trend reflects the significant change in traffic movements caused by the AWPR - where traffic that used to access destinations such as Altens via central Aberdeen, can now avoid the congested city centre by using the AWPR. However, this results in similar or additional levels of traffic using the A956 approaching Altens.

5.5.17 The modelling demonstrates that all three southern approaches to Aberdeen are expected to experience heightened levels of congestion if the development plan is delivered. Which perhaps illustrates the potential challenges faced in this part of the network, providing the main access routes into central Aberdeen, but no current 'solutions' for the bottlenecks at the Bridge of Dee and at the A956. Therefore, if left unchecked, additional levels of traffic using these corridors may create a more sensitive impact to congestion than for other areas of Aberdeen.

## 5.6 Public Transport Patronage

5.6.1 This section discusses the potential change to public transport patronage along the key corridors approaching Aberdeen.

### Rail Passengers

5.6.2 Table 5.4 describes the predicted change to rail passenger flows along the East Coast Mainline and Inverness rail line between the 2010 Present Day Scenario and the 2023 Development Plan Scenarios.

5.6.3 The rail patronage analysis demonstrates that the number of passengers expected to use rail services to and from Aberdeen is forecast to increase considerably if the Development Plan is delivered. This trend reflects the significant level of new households and greater employment opportunities planned for these corridors. It is also likely to reflect the benefits associated with new rail services included within the 2023 Scenario (including the opening of Laurencekirk Station, Edinburgh-Aberdeen services are now extended through to Inverurie and an improved hourly service between Inverness and Aberdeen), which would encourage additional travellers to make use of these rail lines due to improvements in rail journey times. It also reflects the (assumed) continued rise in longer distance rail journeys over time.

5.6.4 Further analysis of hourly passenger levels suggests that this forecast level of rail patronage growth along the East Coast Mainline would result in over 90% of seated capacity being utilised in the peak time periods between Stonehaven and Aberdeen.

5.6.5 With the road network continuing to come under pressure when travelling to Aberdeen City centre, the rail network allows a viable and un-congested alternative for these types of journeys. However, the lack of seating capacity during peak travel times may act to discourage further travel by rail in the A90 South corridor.

**Table 5.4 Rail Patronage (Daily Passengers)**

| Location | Scenario | Daily Passengers | Present Day 2010-2023 | |
|---|---|---|---|---|
| | | | Change | % Change |
| North of Portlethen (East Coast Mainline & A90 South) | 2010 | 4,703 | | |
| | 2023 S1 | 6,052 | 1,348 | 29% |
| | 2023 S2 | 5,952 | 1,248 | 27% |
| North West of Dyce (Inverness Line) | 2010 | 1,813 | | |
| | 2023 S1 | 2,611 | 799 | 44% |
| | 2023 S2 | 2,560 | 747 | 41% |

Notes: Rail forecasts reflect Development Plan related public transport travel growth and National rail patronage targets.

### Bus Passengers

5.6.6 Table 5.5 describes the predicted change in bus passengers using the A90 North and South and the A96.

5.6.7 Table 5.5 indicates that the level of bus passengers travelling along the A90 South and A90 North corridors is anticipated to increase over time, again reflecting the considerable growth planned for these corridors within the Development Plans. The greater growth in bus passenger numbers in the A90 South corridor is likely to stem from the opening of a Park & Ride site at Findon. It also suggests that a proportion of travellers associated with the proposed development at Elsick choose to use the bus to access Aberdeen.

5.6.8 The analysis suggests that the A96 corridor between Aberdeen and Aberdeenshire may see a slight decrease in bus passenger numbers in the future. This trend is likely to reflect travellers switching to use new rail services within this corridor.

5.6.9 It may also reflect travellers choosing to travel by car to the new Park & Ride site at Chapelbrae (from locations such as Inverurie and Kintore), then using the dedicated bus service to access central Aberdeen (whereas previously, some travellers would have chosen to travel the full journey by bus). This would have the effect of reducing the number of passengers travelling by bus to the West of the planned A96 Park and Ride site but could increase patronage levels further East into Aberdeen.

**Table 5.5 Bus Patronage (Daily Passengers)**

| Location | Scenario | Daily Passengers | Present Day 2010-2023 | |
|---|---|---|---|---|
| | | | Change | % Change |
| A90 North of Portlethen | 2010 | 2,799 | | |
| | 2023 S1 | 3,712 | 913 | 33% |
| | 2023 S2 | 3,479 | 680 | 24% |
| A96 North West of Chapel of Stoneywood | 2010 | 1,588 | | |
| | 2023 S1 | 1,463 | -125 | -8% |
| | 2023 S2 | 1,410 | -178 | -11% |
| A90 North of Aberdeen (Murcar) | 2010 | 3,552 | | |
| | 2023 S1 | 3,782 | 231 | 6% |
| | 2023 S2 | 3,572 | 21 | 1% |

# 6 Transport Options for Consideration

## 6.1 Introduction

6.1.1 To combat or mitigate potential impacts associated with the Development Plan, a series of transport interventions were identified. This process involved a review of existing studies and transport plans which have previously put forward various options for improving the transport system in and around Aberdeen. It also involved feedback from the study group relating to other potential constraints associated with the interventions considered.

6.1.2 A total of 12 road-based interventions and three public transport orientated packages were identified for appraisal purposes. The initial assumptions associated with these options and modelling undertaken to appraise these interventions are described within Appendix E.

## 6.2 Conceptual Package of Transport Interventions

6.2.1 The initial appraisal results described within Appendix E were discussed with the Study Team along with relevant feedback relating to other potential constraints associated with the interventions. This information was used to identify a package of transport interventions that could potentially assist in the accommodation of the emerging Aberdeen and Aberdeenshire Local Development Plans (LDPs).

6.2.2 This package represents relatively high level 'options for consideration', which reflect the scope and scale of intervention that may be required to accommodate Development Plans, given the quantity of development envisaged.

6.2.3 These options aim to provide a transport system which complements the proposed developments and also mitigates their transport-related impacts. In particular, this package is anticipated to mitigate the potential congestion impacts and improve the level of public transport accessibility associated with the new development areas.

6.2.4 At present these options are by no means an exhaustive list of transport schemes that could be implemented to coincide with the Development Plans. It should be noted that, in line with Scottish Government guidance, further study, including undertaking the relevant components of the Scottish Transport Appraisal Guidance (STAG) would be required to ascertain the full range of impacts, benefits and constraints associated with each potential intervention with greater certainty than has been possible here. Therefore further consideration requires to be given to determine the most appropriate interventions.

6.2.5 It is anticipated that parallel work being undertaken on behalf of developers will inform the more detailed appraisal of appropriate access strategies for the proposed land use allocations.

6.2.6 The combined package of road and public transport based measures described were tested using ASAM4 to identify the transport-related benefits associated with the overall package. Note that the ASAM4 version applied included some minor updates to that used for previous analysis and therefore some of the model outputs are anticipated to change slightly from those described previously.

## 6.3 Public Transport Interventions

6.3.1 The recent appraisal of the development plan identified a relatively low level of public transport accessibility between the new development sites and some peripheral employment areas and key public service locations. Other North East studies have also noted the lack of direct services between peripheral areas.

6.3.2 The appraisal of new orbital bus services serving new development areas and other peripheral areas illustrated a substantial reduction in bus travel time to key areas of the North East and showed some growth in public transport journeys to and from new development sites. The realisation of these outcomes would assist in providing a more sustainable orientation of travel movements associated with these new sites. Therefore, all bus frequency improvements and orbital bus services were included within the final package.

6.3.3 Furthermore, some orbital services were extended to provide additional linkages to/from peripheral areas of the City and parts of Aberdeenshire – promoting further accessibility improvements. Orbital services were extended to serve Stonehaven and Ellon, allowing direct connections to new areas of growth along with popular destinations such as the ARI and Airport.

6.3.4 Note that it is recognised that there is potential for some aspects of these orbital routes to be implemented by altering and/or extending existing services. Furthermore, service frequency may have to be revised to complement or reduce any overlap with existing services. Within this study these new services are being appraised to establish the principal of the benefits of providing public transport connections between existing areas of the North East and new development sites. Further work would be required to establish the most appropriate way in delivering these types of intervention.

### Bus Priority Measures

6.3.5 As the Development Plan is anticipated to pressurise parts of the road network, it is recommended that bus priority measures are considered to ensure the efficient operation of new or existing bus services. These more detailed measures are not included within the model testing phase, but the potential benefits associated with such infrastructure would support the requirement of providing of sufficient levels of accessibility to key areas and encouraging higher level of public transport mode share associated with new developments.

### Kintore Rail Station

6.3.6 Within this initial phase of appraisal, the introduction of a rail station and associated services at Kintore also led to an encouraging growth in rail patronage along this part of the rail network. Kintore station would provide an additional public transport choice along the A96 corridor and offer an alternative to driving via more pressurised or congested sections of the A96 corridor (and within the Aberdeen urban area).

6.3.7 This station is being considered as part of Transport Scotland's work on rail service enhancements between Aberdeen and Inverness and further work is anticipated to ascertain the full value for money associated with this type of intervention. Notwithstanding this, at this stage a new rail station at Kintore was included within the overall package.

6.3.8 The public transport package identified for appraisal is described in Table 6.1.

**Table 6.1 Public Transport Interventions**

| Option/Test | Potential Intervention |
|---|---|
| **A: Bus Frequency Improvements** | |
| A. Improved frequency of basic services accessing new developments | One step improvement to services assumed to access new developments (ie 20 minute to 15 minute frequency etc). 10 minute frequency associated with major developments (ie Whitestripes, Craibstone area, Home Farm, Countesswells, Elsick & Loirston). |
| **B: Additional Bus Services** | |
| B1. Orbital Bus Service (North West-South East) | New orbital bus service operating from Kirkhill to Stonehaven via Anderson Drive & Altens.<br>Proposed route includes, Kirkhill, Aberdeen Airport, A96 Park & Ride, Craibstone area, Auchmill Road, ARI, Woodhill House, Garthdee, Kincorth, Altens, Loirston, A90 South Park & Ride, Portlethen, Elsick, Newtonhill & Stonehaven.<br>Assumed frequency every 20 minutes. |
| B2. Orbital Bus Service (North East-South East) | New orbital bus service operating from Ellon to Stonehaven via Anderson Drive & Altens.<br>Proposed route includes, Ellon, Balmedie, Blackdog, Murcar, Dubford, Whitestripes, ARI, Woodhill House, Garthdee, Kincorth, Altens, Loirston, A90 South Park & Ride, Portlethen, Elsick, Newtonhill & Stonehaven.<br>Assumed frequency every 20 minutes. |
| B3. Orbital Bus Service (North East-South West) | New orbital bus service operating from Ellon, to Peterculter via Murcar & Aberdeen Airport.<br>Proposed route includes, Ellon Balmedie, Blackdog, Murcar, Dubford, Whitestripes, Stoneywood, Dyce, Aberdeen Airport, Kirkhill, A96 Park & Ride, Craibstone area, Kingwells, Home Farm, Kingswells Park & Ride, Countesswells, Bieldside, Oldfold & Peterculter.<br>Assumed frequency every 20 minutes. |
| B4. Orbital Bus Service (West-North West) | New orbital bus service operating from Westhill to Aberdeen Airport via Kingswells.<br>Proposed route: Westhill, Kingswells Park & Ride, Home Farm, Kingswells, Craibstone area, A96 Park & Ride, Airport & Kirkhill.<br>Assumed frequency every 20 minutes. |
| **C: Kintore Rail Station** | |
| C. Station at Kintore | New rail station at Kintore – associated rail services, feeder bus services and car parking capacity to be confirmed. |
| **Bus Priority Measures – Not included within appraisal** | |
| Bus priority measures | Develop a series of bus priority measures to ensure services accessing new development areas are not significantly affected by congestion |

## 6.4 Road-based Interventions

6.4.1 The initial appraisal phase has identified that the overall level of road traffic (in terms of vehicle kilometres travelled) is forecast to increase significantly if the Local Development Plans are implemented in full. This outcome is predicted to lead to an overall rise in the level of time lost due to congestion (and hence economic inefficiency) and carbon emissions.

6.4.2 At some locations, congestion levels are anticipated to be in excess of present day conditions. These areas include: sections of the A90 South corridor, A96 corridor and A944 corridors. Therefore a number of interventions are proposed to mitigate the traffic impacts associated with the LDPs at strategic locations across Aberdeen and Aberdeenshire. These road schemes are also anticipated to provide more efficient connectivity between new development areas and limit the pressure to congested areas of the network from development related traffic.

6.4.3 The road-based intervention package identified for appraisal is described in Table 6.2 and illustrated in Figure 6.1.

6.4.4 Note that options have not been fully considered in terms of detailed engineering design and the access arrangements from developments to the local road network. Environmental assessments detailing the potential constraints associated with each intervention have also not been considered. Further work would be required to better understand the feasibility of design and impact to the environment of options identified here.

**Table 6.2 Road-based Interventions**

| Option/Corridor | Potential Road Intervention |
|---|---|
| **North Aberdeen** | |
| 1. Parkway, Persley Bridge & Parkhill Improvements | Junction improvements along the Parkway and additional capacity at Persley Bridge to Haudagain Roundabout. Upgrade sections of B997 Scotstown Road and capacity improvements through Parkhill into North end of Dyce Drive using appropriate design standards to accommodate forecast traffic volumes. |
| **A96 Corridor** | |
| 2. Capacity improvements & Upgrade Kingswells North Junction | Capacity improvements at A96/Dyce Drive/Craibstone access junction.<br>Upgrade route between Bucksburn and AWPR Kingswells North junction using appropriate design standards to accommodate forecast traffic volumes.<br>Upgrade Kingswells North junction with South facing slips. |
| **A944 Corridor** | |
| 3. Upgrade A944 junctions & additional links from developments | Upgrade junctions at A944/B9119 on approach to Westhill & A944 Kingswells Roundabout.<br>Second access point from Home Farm to Kingswells bypass and from Countesswells to B9119. |
| Improve access to A93 Corridor | Safety / limited capacity improvements along Countesswells Road, Baillieswells Road & access to Cults from Countesswells. |
| **A956/A90 Corridor** | |
| 4. Junction capacity Improvements | Additional capacity and signal control at Souterhead roundabout. |
| Link from Loirston to A90 | Local distributor connecting Loirston development with A90. |
| New Fastlink junction accessing Elsick | Additional Fastlink interchange connecting Elsick with AWPR. Upgrade interchange at Newtonhill using appropriate design standards to accommodate forecasted traffic volumes. |
| River Dee Link | New bridge connecting A90 South to South Anderson Drive area. |

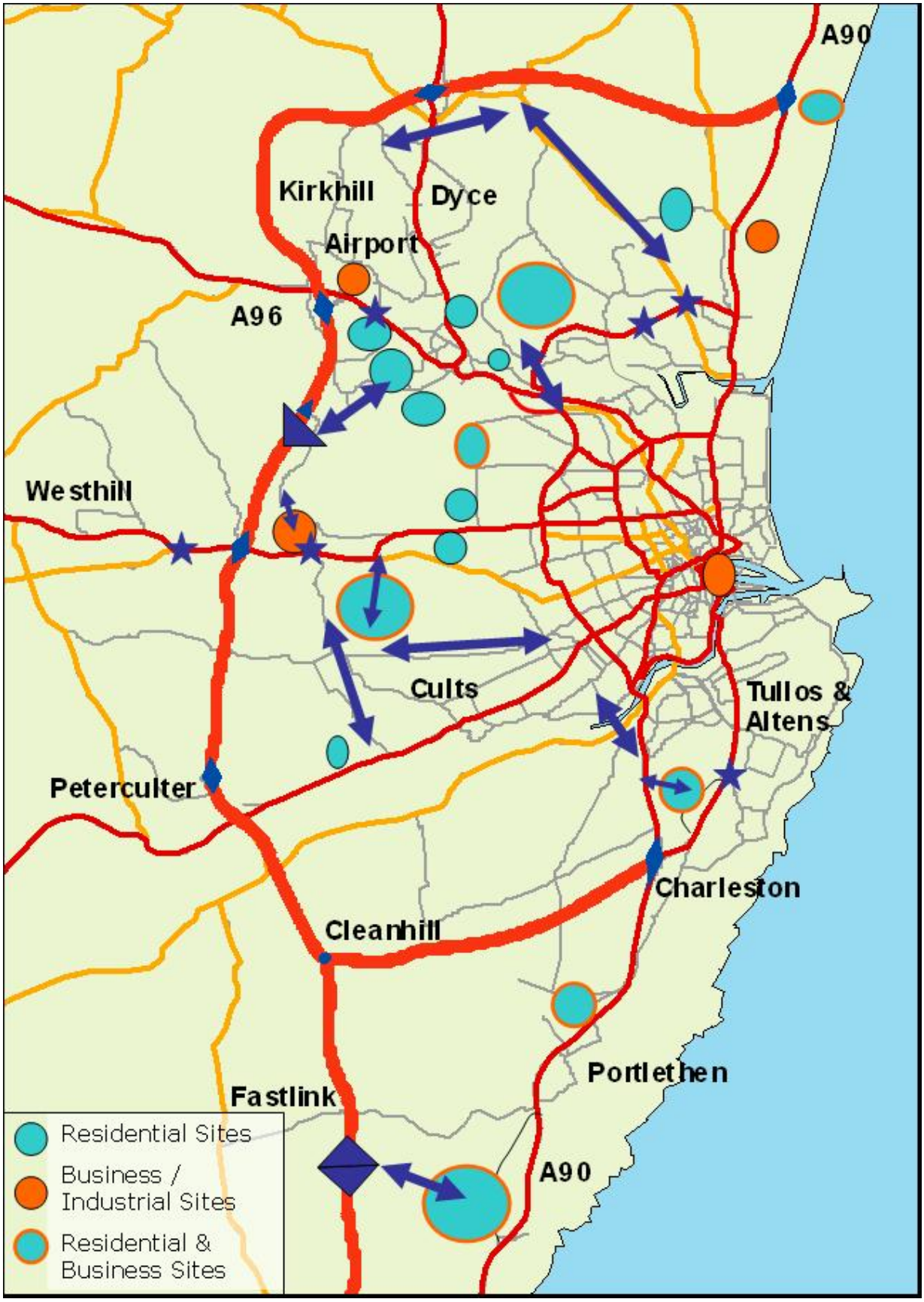


**Figure 6.1 Transport Intervention Package – Road Options**

# 7 Appraisal of Transport Intervention Package

## 7.1 Introduction

7.1.1 The following section describes the effectiveness of a package of transport interventions (Described in Chapter 6) in accommodating and mitigating the impact of the Development Plan.

## 7.2 Time Lost due to Congestion

7.2.1 Figure 7.1 describes the predicted change in the total time lost due to congestion for cars and goods vehicles (at the set of key locations across the North East) with the combined package of road and public transport interventions in place ('2023 S1 Package'), as well as the earlier scenarios. To recap, this analysis measures the time 'lost' between travelling in free flow conditions across the network compared to conditions in an average hour in the peak periods.

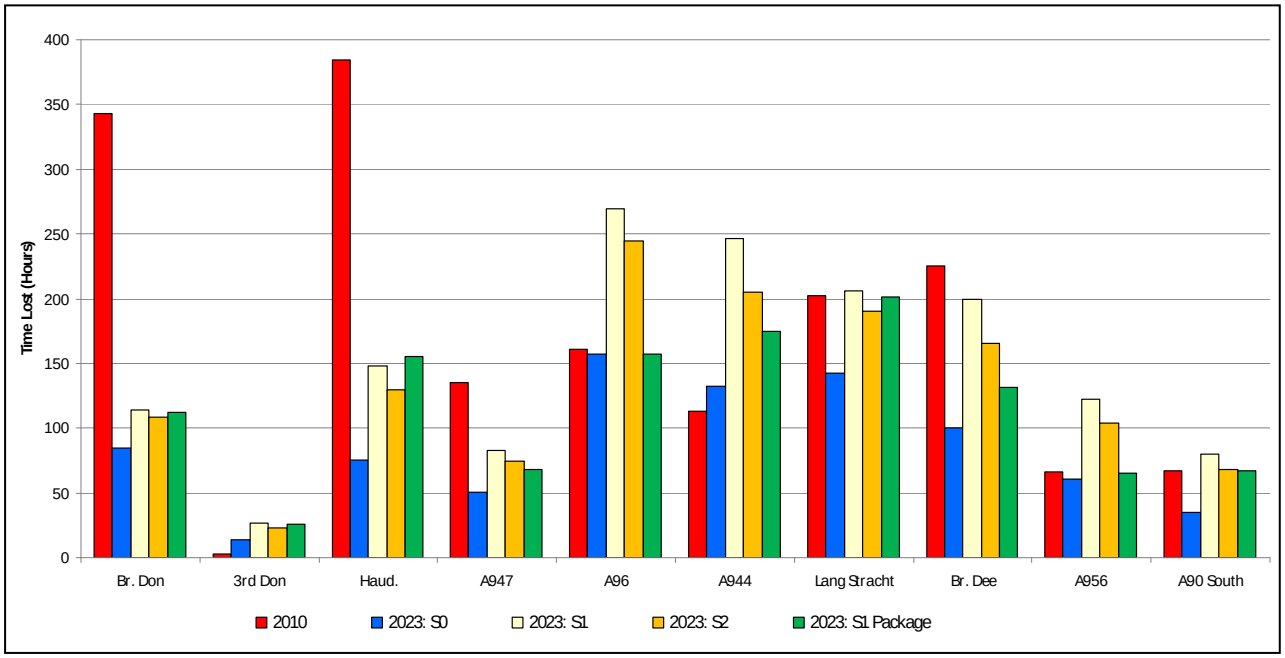


**Figure 7.1 Time Lost Due to Congestion in Key Areas**

7.2.2 Figure 7.2 shows a similar analysis, this time combining the changes in time lost due to congestion for all locations in either: North, West or South of Aberdeen.

### Northern Corridors

7.2.3 Figure 7.2 indicates that the interventions package has a slight benefit in reducing the overall time lost due to congestion within the Northern Corridors (Bridge of Don, 3rd Don Crossing, Haudagain & A947), ie compared with '2023 S1'. In terms of the detail (Figure 7.1), time savings are greatest in the A947 corridor, which is likely to reflect a shift in traffic away from this route towards the additional road capacity provided along the Parkway and Persley Bridge. This re-routing effect leads to a slight increase in traffic and total congestion levels in the Haudagain area.

7.2.4 With the transport options currently proposed for the Northern corridors already predicted to provide considerable benefits, it is perhaps unsurprising that lower levels of time savings benefits are forecast for this area from the package. In comparison to present day traffic conditions, the appraisal suggests that the scale of interventions introduced here in tandem with the current committed schemes are likely to provide improved traffic conditions for these Northern corridors than exist today - therefore, potential accommodating the impact of the Development Plan to a reasonable level in strategic terms. However, the extent to which these benefits are maintained will depend on the detailed operation of key points of the network (such as Haudagain) and the constraints associated with providing further capacity in these areas as required.

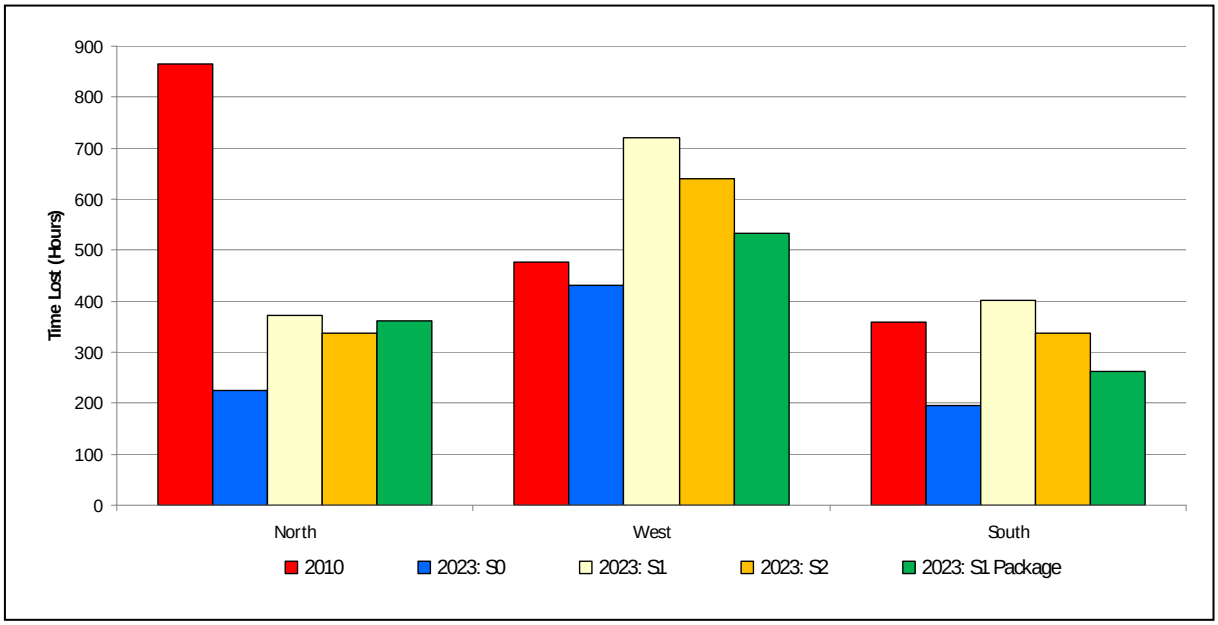


**Figure 7.2 Time Lost Due to Congestion in Corridors**

### Western Corridors

7.2.5 In the Western corridors (A96, A944 & Lang Stracht) the analysis indicates that the proposed interventions would result in a considerable reduction in overall congestion levels in the key sections of the A96 & A944. These predicted benefits stems from two key effects: firstly as traffic chooses to re-route via the new southbound slips at North Kingswells, this provides relief to both the A96 and A944 corridors; and secondly, the introduction of larger capacity junctions and improved access arrangements cater for higher volumes of traffic.

7.2.6 Compared to the basic development plan scenario (2023: S1) the level of improvement to traffic conditions with the package is considerable, particularly for the A96 corridor, where overall congestion returns to present day levels. However, the analysis does tend to suggest continued pressure in the A944 corridor, which is likely to reflect the extensive growth in both business and residential sites planned for this area. One issue is the Countesswells development area, which due to constraints to the South and East, is anticipated to 'face' the A944 corridor. Therefore, the majority of development-related traffic would be expected to travel via this key section of the network. The constraints and limited strategic access options associated with this development should therefore be seen as a risk through the development plan process.

7.2.7 Note that as the A96 and A944 provide for higher volumes of traffic, total congestion levels would be spread over a greater number of motorists and may lead to a perceived benefit per vehicle within this area of the network compared to current day levels – ie potentially generating slightly more time-saving benefits than described here. Again these types of benefits will depend on the detailed operation of proposed road improvements and their ability to accommodate the throughput of predicted traffic levels.

7.2.8 Although the analysis illustrates some considerable benefits for parts of the A96 and A944, it also demonstrates little change in delays for other roads sections located out with the key areas of improvement, such as the Lang Stracht. This section of the network perhaps indicates the difficulties in accommodating the overall level of traffic associated with the Development Plan – where potential solutions may exist around the periphery of Aberdeen, whilst other more urban areas are constrained, but are likely to come under pressure as motorists travel via these points to gain access to new growth areas.

7.2.9 Overall, the analysis demonstrates that the introduction of further interventions of the scale described here could mitigate a significant amount of traffic-related impacts associated with the Development Plan. However, the appraisal also suggests that the Western corridors (particularly sections of the A944) would remain under pressure due to the level of traffic associated with the Development Plan.

### Southern Corridors

7.2.10 With considerable infrastructure options considered within the Southern approaches to Aberdeen, it is perhaps unsurprising that a considerable level of benefit is associated with these interventions.

7.2.11 An additional crossing over the River Dee is anticipated to mitigate a significant proportion of the congestion impacts associated with the Development Plan in this area of the network. This type of scheme would offer additional capacity through the Bridge of Dee, offering an alternative route for southbound motorists and providing relief to the A956 corridor.

7.2.12 The A956 corridor (and Souterhead) would also benefit from improved capacity and the provision of a direct link to the A90 – thus potentially, limiting the volume of development-related traffic from nearby developments (such as Loirston) travelling via Souterhead and Charleston interchanges.

7.2.13 The A90 South is also anticipated to benefit from this scale of interventions, with the new connection to the AWPR Fastlink (from Elsick) attracting motorists away from the A90. The introduction of this connection is also anticipated to provide a faster route for several travel movements, thus potentially minimising the volume of traffic associated with A90 South development sites travelling via the constrained Bridge of Dee area.

7.2.14 With the A90 Southern approach to Aberdeen the first choice of route to travel to/from the majority of areas within Aberdeen City, it is likely to represent the most important strategic road link in the North East, and therefore the operation of this part of the network should be a key factor in implementing the Development Plan.

7.2.15 Further more detailed work will be required to identify the most suitable interventions that ensure the satisfactory operation of the network if the Development Plan is delivered.

### Regional Time Lost due to Congestion

7.2.16 Figure 7.3 demonstrates the combined benefits of the intervention package in terms of total road travel time lost due to congestion across the entire North East road network in the peak periods.

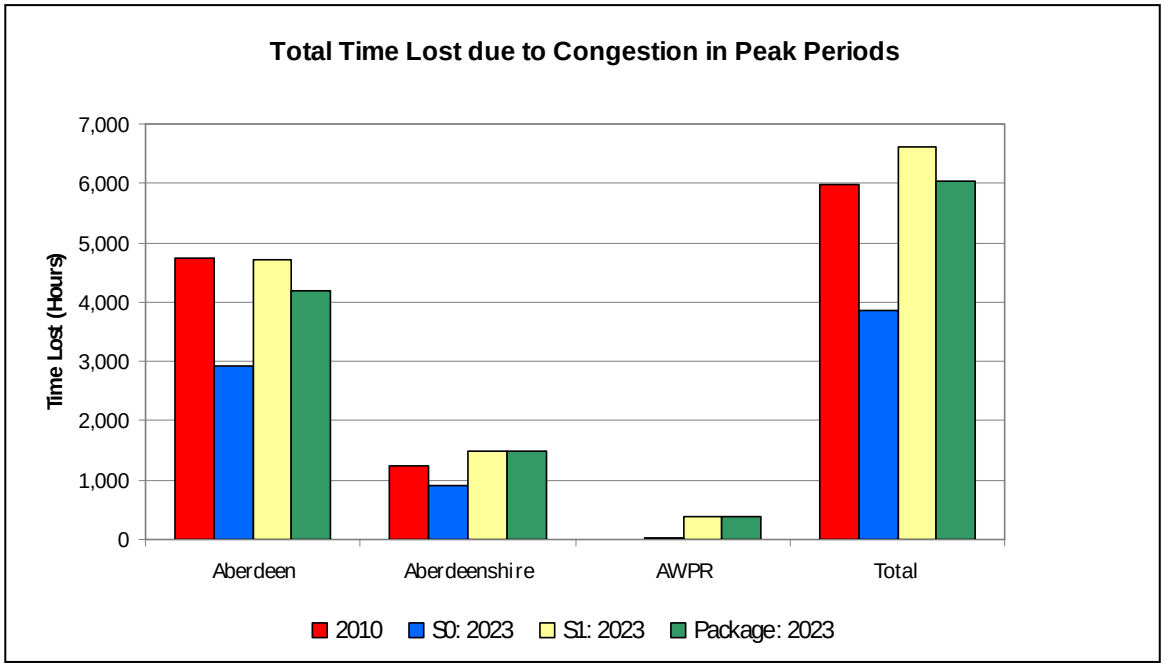


**Figure 7.3 Time Lost Due to Congestion – Network Wide**

7.2.17 This region-wide analysis demonstrates that the combined package of transport interventions is forecast to reduce the total time lost due to congestion compared to the basic Development Plan Scenario (2023: S1) – therefore mitigating some of the traffic-related impacts associated with the Structure Plan.

7.2.18 These benefits are mostly associated with areas inside the City boundary, which reflect the type of schemes considered within the package to date.

7.2.19 This congestion analysis tends to suggest that the North East road network would generally continue to suffer from congestion at peak times. However, this outcome must be set in the context of the development plan - which targets a significant growth in population (and subsequently car travel) but would utilise the opportunities provided by a much more significant road network. Therefore, although the total amount of congestion would remain similar to the present day, these delays would be associated with a higher volume of traffic, and thus the average delay per motorist actually reduces compared to current day levels.

7.2.20 This issue is illustrated by Figure 7.4, which describes the total time lost due to congestion across the entire road network for all motorists (using bars) and the % of time lost for each motorist travelling across the network (using a line) during the peak hours (ie % time lost per vehicle per kilometre travelled during the peak periods).

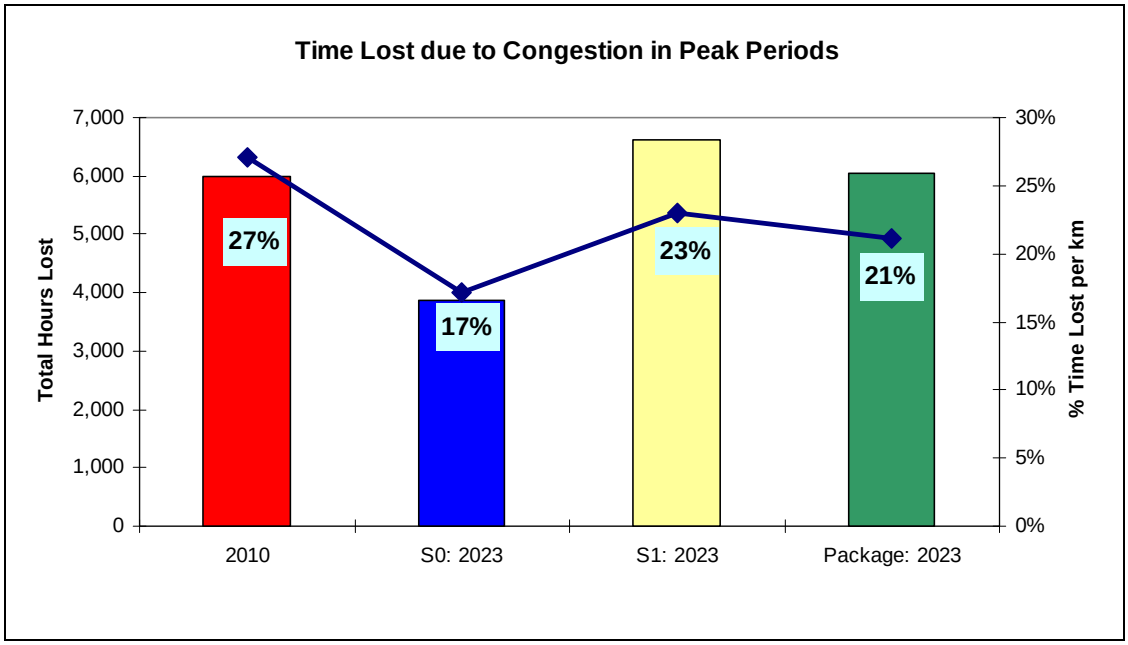


**Figure 7.4 % Time Lost Due to Congestion – Network Wide**

7.2.21 The analysis indicates that:

- at present within the peak periods, around 27% of road travel time per vehicle kilometre is due to congestion;
- in 'S0 2023', this congestion figure drops dramatically to around 17% with all the committed schemes in place (NB this reflects a hypothetical situation which assumes no change from present day traffic volumes, ie it represents a best case) – total vehicle hours lost to congestion in the area also reduces;
- with the Development Plan in place ('S1 2023') the figure rises to 23% ie the adoption of the plan would lead to a 'loss' of over half of the time-saving benefits associated with new infrastructure schemes – and total hours lost to congestion in the area exceeds 2010 levels; and
- with the transport package in place ('Package 2023'), the analysis suggests that peak period congestion per vehicle km would decrease to around 21% of time travelled – and the total hours lost is similar to 2010 levels. This outcome appears in line with the Regional Transport Strategy target of maintaining or reducing journey times across the North East road network.

## 7.3 Vehicle Kilometres & Carbon Emissions

7.3.1 Compared to the 2023 Scenario 1 the final intervention package is forecast to have only a marginal effect (less than 1% difference) on the volume of vehicle kilometres travelled across the region. Similarly, only marginal changes in the level of carbon emissions (tail-pipe) were also demonstrated with the package in place (compared to 2023:S1).

7.3.2 Therefore, if delivered the Development Plan and potential transport options would produce around a 30% rise in Vehicle Kilometres and subsequently around a 15% increase in total regional carbon emissions (road traffic-related) compared to the present day situation.

7.3.3 It has been noted previously that these types of forecasts must be set in the context of the Structure Plan - which targets a significant growth in population across the region. However, it is also clear that these outcomes appear to be inconsistent with the ambitions of both the Regional and National Transport Strategies and recently agreed Climate Change Delivery Plan targets - which reflect a 32% reduction in carbon emissions from road traffic by 2020 (from 2006 levels).

## 7.4 Public Transport Impacts

7.4.1 The following section discusses the predicted public transport related benefits associated with the full package of transport interventions (including the introduction of new orbital bus services and a rail station at Kintore).

### Public Transport Accessibility

7.4.2 To demonstrate the level of PT accessibility improvements associated with the transport package, the relative level of public transport accessibility to / from new development areas to the Aberdeen Royal Infirmary and Aberdeen Airport were compared. This analysis reflects the PT journey time during the AM Peak and compares the full package with the 2023: Scenario 1.

7.4.3 The accessibility analysis indicates a substantial improvement to public transport journey time to access these two locations – particularly from new development areas situated around the periphery of Aberdeen where the overall travel time by public transport to the ARI and Aberdeen Airport is forecast to improve by around 23% and 26% respectively, if this frequency and pattern of public transport services are introduced.

7.4.4 More specifically, PT travel times from areas in the Bridge of Don (such as Dubford & Murcar) and areas such as Loirston in the South East of the city would see a PT travel time benefit of around 20%-25% when travelling to the ARI.

7.4.5 Access to the Hospital from areas along the A96 corridor (such as Craibstone & Greenferns Landward) would improve by around 30%. A similar level of journey time benefit is also associated with the Elsick development area. There are also journey time improvements to the Hospital of around 15% from the A93 corridor and the Countesswells area.

7.4.6 Public transport journey time improvements to Aberdeen Airport are also identified for several peripheral areas, such as a 20% improvement from parts of the A90 South corridor and a 40% benefit from areas within the Bridge of Don and from the A944 and A93 corridors.

### Public Transport Mode Share

7.4.7 Table 7.1 describes the predicted change in public transport mode share and trip making associated with the introduction of the proposed package. The change in PT trip making characteristics is described at a region-wide level and also for the combined impact associated with major new development sites (compared with the 2023 Scenario 1).

7.4.8 The analysis indicates that the transport intervention package is anticipated to increase the level of public transport trip making by over 2% – which reflects the improved level of accessibility provided by new PT services.

**Table 7.1 Change in Public Transport Mode Share & Trip Making**

| Scenario | Regional PT | | Major Development Sites PT | |
|---|---|---|---|---|
| | PT Trips (Daily) | PT Mode Share | PT Trips (Peak Hour) | PT Mode Share |
| 2023 S1 – Development Plan Allowance | 64,541 | 12.6% | 1,438 | 10.8% |
| 2023 S1 – Transport Intervention Package | +2.4% | 12.9% | +6.6% | 11.5% |

7.4.9 The improved range of bus services and rail options are forecast to increase public transport patronage to and from major new development areas by around 6%-7%, which would increase the PT mode share associated with these sites by almost 1%.

7.4.10 The region-wide analysis suggests that public transport mode share across the North East is forecast to be around 13% in the 2023 Scenario, whereas mode share associated with major new development sites would be lower at around 10%-11%. This statistic perhaps illustrates the challenges associated with attracting travellers to use public transport to and from peripheral areas of the network where many new development sites are planned.

7.4.11 With the full package in place and compared to the present day situation, the modelling also suggests a slight region-wide reduction to the proportion of public transport mode share, from 14% in 2010 to around 13% in 2023 – thus increasing the proportion of journeys made by car. Although this statistic excludes walking and cycling journeys, this outcome appears inconsistent with the Regional Transport Strategy (RTS) target to reduce the proportion of journeys made by cars.

### Public Transport Passenger Boardings

7.4.12 The predicted level of daily rail and bus passenger boardings for all public transport services across the North East were also analysed and compared against the 2023 Scenario 1.

7.4.13 The volume of public transport boardings is forecast to increase by around 1,500 passengers per day (around 2%) with the full package in place. This reflects a rise in bus passengers and a small decrease in some rail boardings, as a proportion of travellers choose to use newly available bus services. This outcome, along with the forecast increase in bus boardings over time (2010 present day to 2023 Scenario 1) is in line with the RTS target of increasing the number of bus passengers across the North East.

7.4.14 This initial modelling suggests that around 900 passengers per week would choose to use rail services to and from a new station at Kintore. Additional information regarding these new rail proposals and further analysis would be required to confirm these initial estimates.

7.4.15 The modelling also suggests average bus occupancies of around ten passengers per vehicle along the routes associated with proposed orbital bus services. Again, additional information providing the detail of development proposals would be required to confirm these initial estimates.

## 7.5 Development Related Traffic at Key Network Points

7.5.1 Table 7.2 describes the relationship between traffic patterns to/from development sites and the use of key points on the road network, including traffic distributions associated with potential new road infrastructure. The analysis describes the total level of traffic predicted to travel via these locations and identifies the proportion of motorists associated with each development site forecast to use this infrastructure (ie 25% of Persley Bridge traffic is anticipated to originate from or be destined for the Whitestripes development area).

7.5.2 The location of specific Development Plan sites & locations used within this analysis to identify traffic distributions using new infrastructure are shown in Figure 7.5. Further analysis describing the relationship between traffic patterns to/from development sites and existing points on the network is included within Appendix F.

**Table 7.2 Proportion of Development Traffic using New Infrastructure**

| Development & Proportion of Traffic Flow to/from each site | Road Network Infrastructure & Daily Traffic Flow | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Persley Bridge | A947 | A96 East of AWPR | KW North | A944 | New Br. of Dee | Loirston Link | Fastlink Elsick |
| | **24,300** | **15,500** | **24,300** | **16,000** | **25,600** | **11,500** | **5,500** | **6,000** |
| Ellon | 0% | 2% | 0% | 0% | 0% | 0% | 0% | 0% |
| Inverurie | 0% | 0% | 5% | 1% | 1% | 0% | 0% | 1% |
| Blackdog | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 0% |
| Murcar /Dubford | 2% | 2% | 0% | 1% | 0% | 0% | 0% | 1% |
| Whitestripes | 25% | 5% | 2% | 4% | 0% | 1% | 1% | 1% |
| Stoneywood | 1% | 2% | 1% | 3% | 0% | 0% | 0% | 1% |
| Craibstone | 3% | 1% | 9% | 11% | 0% | 0% | 1% | 2% |
| Greenferns SHLR | 3% | 1% | 1% | 0% | 2% | 0% | 0% | 0% |
| Maidencraig | 0% | 0% | 1% | 0% | 4% | 0% | 1% | 0% |
| Home Farm | 2% | 0% | 0% | 12% | 8% | 0% | 1% | 2% |
| Countesswells | 2% | 0% | 1% | 1% | 12% | 1% | 1% | 2% |
| Oldfold | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 1% |
| Loirston | 1% | 0% | 0% | 0% | 0% | 7% | 99% | 0% |
| Elsick | 1% | 0% | 1% | 2% | 1% | 7% | 2% | 79% |

Note that Craibstone also includes Rowett & Greenferns Landward traffic movements

Traffic movement proportions reflect daily two-way journeys associated with each development

Rounding applied to minor proportions

There can be some double counting of traffic proportions where traffic originates from and is destined for new development sites

7.5.3 Table 7.2 shows the relationship between the significant road infrastructure proposals tested here and the major development locations. This provides an initial means of attributing the use of these investments to individual developments and hence a mechanism to establish some broad principles relating to financial contributions. More detailed analysis would be required as further details relating to developments and the transport proposals emerge.

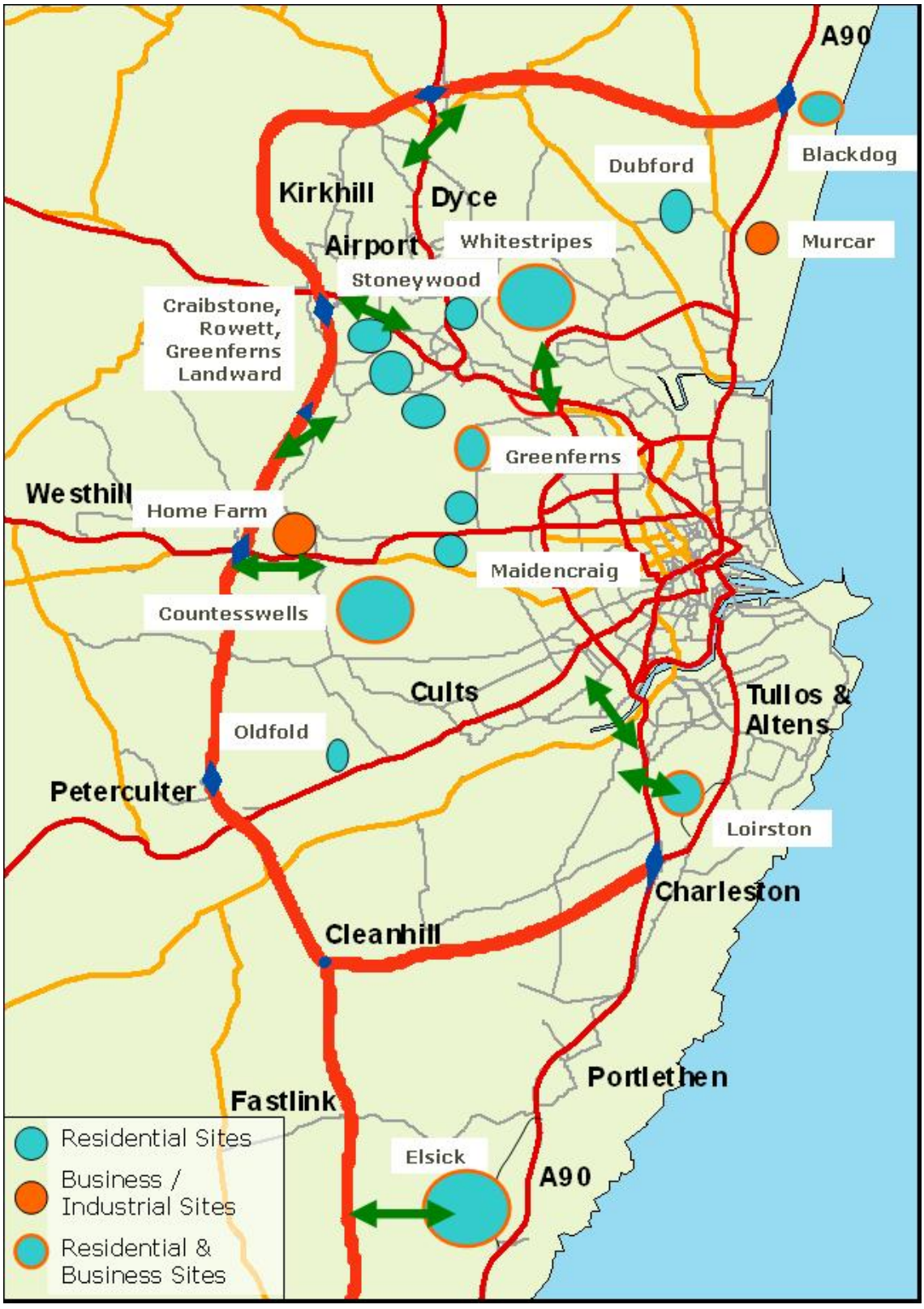


**Figure 7.5 Location of Major Developments & Road Infrastructure Analysis Points**

mvaconsultancy

## 7.6 Summary of Impacts & Benefits

7.6.1 A package of transport measures of this scope and scale has a significant impact on the Development Plan scenario, reducing peak period congestion by 8.5% across the whole area, with greater impacts locally. The range of interventions which comprise the package have also been shown to mitigate the main congestion hot spots which have been identified. Of course these congestion benefits will vary by location and depend heavily on the feasibility of interventions to be implemented, and as such the conceptual proposals tested here would need to be developed further within the context of the Scottish Transport Appraisal Guidance (STAG).

7.6.2 Potential public transport options have been shown to deliver improved public transport accessibility between many parts of Aberdeen and Aberdeenshire. These improvements are forecast to lead to an encouraging growth in the level of public transport use associated with new developments. Similarly, further more detailed work would be required to confirm the level of benefits associated with these types of public transport interventions.

# Appendix A – Population Profile & Car Availability

## Population Profile & Car Availability

To calculate the change in the demographic profile of the population and the level of car availability, information was extracted from the Land use and Transport Integration in Scotland (LATIS) service. This service, which includes an integrated land use model, provided forecasts that estimate the change in the proportion of working and non-working population on a geographical basis. It also provides details of predicted changes in car availability (calculated by comparing the % of households that do not have access to a car).

These forecasts were used in this study to create changes to the population profile and level of car availability in Aberdeen and Aberdeenshire between 2007 and 2023 (described in Table A.1).

**Table A.1 Assumed Change in Demographic Profile & Car Availability**

| Area | % Non-Working Population | | % Non-Car Owning Households | |
|---|---|---|---|---|
| | 2007 | 2023 | 2007 | 2023 |
| Aberdeen | 37.8% | 39.2% | 33% | 25% |
| Aberdeenshire | 32.9% | 37.8% | 20% | 16% |

The population profile forecasts shown in Table A.1 suggest that the proportion of the population that does not work is forecast to increase over time across both Aberdeen and Aberdeenshire. This trend generally reflects an 'ageing population', with a larger proportion of retired people living in the North East (with a particularly large increase in the proportion of non-working population indicated in Aberdeenshire).

The forecasts also suggest a reduction in the proportion of households that would not have access to a car between 2007 and 2023, particularly within Aberdeen. This trend reflects growth in the economy and increasing income levels resulting in cars becoming more affordable. It is also likely to reflect the location of new housing developments, where many developments are proposed for areas that tend to have higher car ownership levels.

These demographic changes may also have knock-on consequences for the transport system, whereby a smaller level of working population may tend to reduce the number of people travelling during the traditional commuting time periods. However, for the road network these effects could be offset if a greater number of people choose to travel by car - an opportunity regularly associated with higher levels of car availability.

# Appendix B - Development Assumptions

## Development Assumptions

Table B.1 describes the level of additional development associated with each major development site (which includes the allowance of a migration / transfer effect used to constrain the scale of development proposals to demographic targets). Figure B.1 illustrates the locations of major developments.

**Table B.1 Major Development Site Allocations: 2007 to 2023 (Scenario 1)**

| Development Site | Scenario 1 - Allowance | | |
|---|---|---|---|
| | Households | Employment | Population |
| **Aberdeenshire** | | | |
| Elsick | 3,210 | 1,366 | 6,131 |
| Findon/Axcess Aberdeen | 850 | 964 | 1,614 |
| Cairnrobin | | 950 | |
| Blackdog | 550 | 255 | 1,050 |
| **Aberdeen City** | | | |
| Dubford | 550 | | 955 |
| Murcar | | 1,320 | |
| Whitestripes | 4,551 | 330 | 7,891 |
| Stoneywood | 500 | | 862 |
| Dyce Drive / Airport | | 1,733 | |
| Craibstone | 983 | | 1,708 |
| Rowett | 1,652 | | 2,870 |
| Greenferns Landward | 983 | | 1,708 |
| Greenferns SHLR | 1,075 | 660 | 1,867 |
| Home Farm | | 2,871 | |
| Countesswells | 2,922 | 660 | 5,076 |
| Maidencraig | 750 | | 1,268 |
| Oldfold | 547 | 330 | 950 |
| Loirston | 1,483 | 726 | 2,576 |
| Union Square | | 1,000 | |

Employment figures reflect the number of jobs assumed at each site

**Figure B.1 Major Development Site Locations**

## Development Access Strategies

For each major development site, an access strategy was developed to reflect a reasonable level of road and public transport opportunities for travel to and from the various developments. Where new developments were broadly located nearby existing residential and employment areas, the use and access to the existing network and services was assumed. For more isolated developments occupying relatively unconnected locations changes to the network or the introduction of new services were assumed. Table B.2 and Figures B.2 & B.3 describe the relevant road network and bus service changes.

The assumptions described above created future transport networks that represented reasonable access to the strategic road network and public transport system.

Note that these assumed changes or improvements to the road network and bus services are used as part of this modelling exercise and do not intend to imply that these interventions and/or service patterns would necessarily be introduced if these developments are progressed. They do however represent potential options for access to and from new residential and employment areas.

**Table B.2 Assumed 'Basic' Development Access Arrangements**

| Area | Road & Public Transport Access Strategy Assumptions |
|---|---|
| Elsick | A new access road from the existing A90 interchange at Newtonhill through Elsick to a new grade separated interchange connecting with the A90 at Bruntland Road.<br><br>Stonehaven Coastrider services diverted through Elsick with an increased frequency to mitigate the increase to journey time. |
| Dubford / Mundurno / Murcar | Direct road access from Dubford and Mundurno onto local road connecting to B999 with potential new intersection.<br><br>Bus only route from Dubford & Mundurno through Denmore with extensions to services 5 & 13.<br><br>New Spur from Murcar to A90 Murcar Roundabout. Services 5 & 13 extended to serve new development with public transport access also available through existing Bluebird services). |
| Whitestripes | New road access from Whitestripes to Parkway with Roundabout. Upgrade using appropriate design standards to accommodate forecasted traffic volumes to Whitestripes Road to enable sufficient access to AWPR. Note that this intervention excludes any further capacity improvements connecting the B977/B997 through Parkhill towards Dyce Drive.<br><br>Existing bus services 1 & 19 extended /diverted to link to new development. |
| Stoneywood / Walton Farm / Craibstone / Rowett South / Greenferns Landward | New Road connection from Stoneywood development to A947 with signals. Access to existing bus services along A947.<br><br>Access from Walton Farm onto new spine road between AWPR & Dyce Drive.<br><br>Road connection from Craibstone and Rowett South to A96 at existing Roundabout at Dyce Drive (which will be signalised as part of AWPR). Road connection through to Kepplehills Road and Greenferns Landward.<br><br>Extension to bus service 17 to link to Craibstone, Rowett South & Greenferns Landward. |
| Greenferns / Kingswells / West Hatton & Home Farm / Maidencraig | Road access from Greenferns to Provost Rust Drive and Provost Fraser Drive. Existing bus service extended to access new development.<br><br>New signalised junction from West Hatton & Home Farm to access A944. Public transport access using / extending existing P&R services.<br><br>Kingswells developments assumed to use existing road infrastructure and bus services.<br><br>New signalised junction to access Maidencraig development from A944. Bus service 23 extended to serve development. |
| Countesswells | Upgrade using appropriate design standards to accommodate forecasted traffic volumes at rural road connecting Countesswells to Kingswells & A944 Roundabout. Extend and improve frequency of bus service 16 to access development. |
| Oldfold | New signalised junction connecting Oldfold to A93. Access to existing bus services operating along A93. |
| Loirston | Connections from Loirston to A956 through Industrial area to Souterhead Roundabout and using junction adjacent to Old Wellington Rd (which will be becoming a signalised junction). Access to bus services serving A956. |

**Figure B.2 Assumed Road Access Arrangements**

**Figure B.3 Assumed Public Transport Access Arrangements**

# Appendix C – Distribution of Travel Movements

## Introduction

The ASAM4 model provides forecasts of the likely traffic and PT movements associated with each new development site and changes to travel patterns of existing residential and business orientated areas. Figures C1 to C3 illustrate the level of travel movements between the major proposed developments at Whitestripes, Countesswells and Loirston developments and other areas of Aberdeen and Aberdeenshire. These figures represent the combined level of car and public transport journeys (within the 2023 forecast year 'Allowance' scenario) and are shown within a shaded sector system.

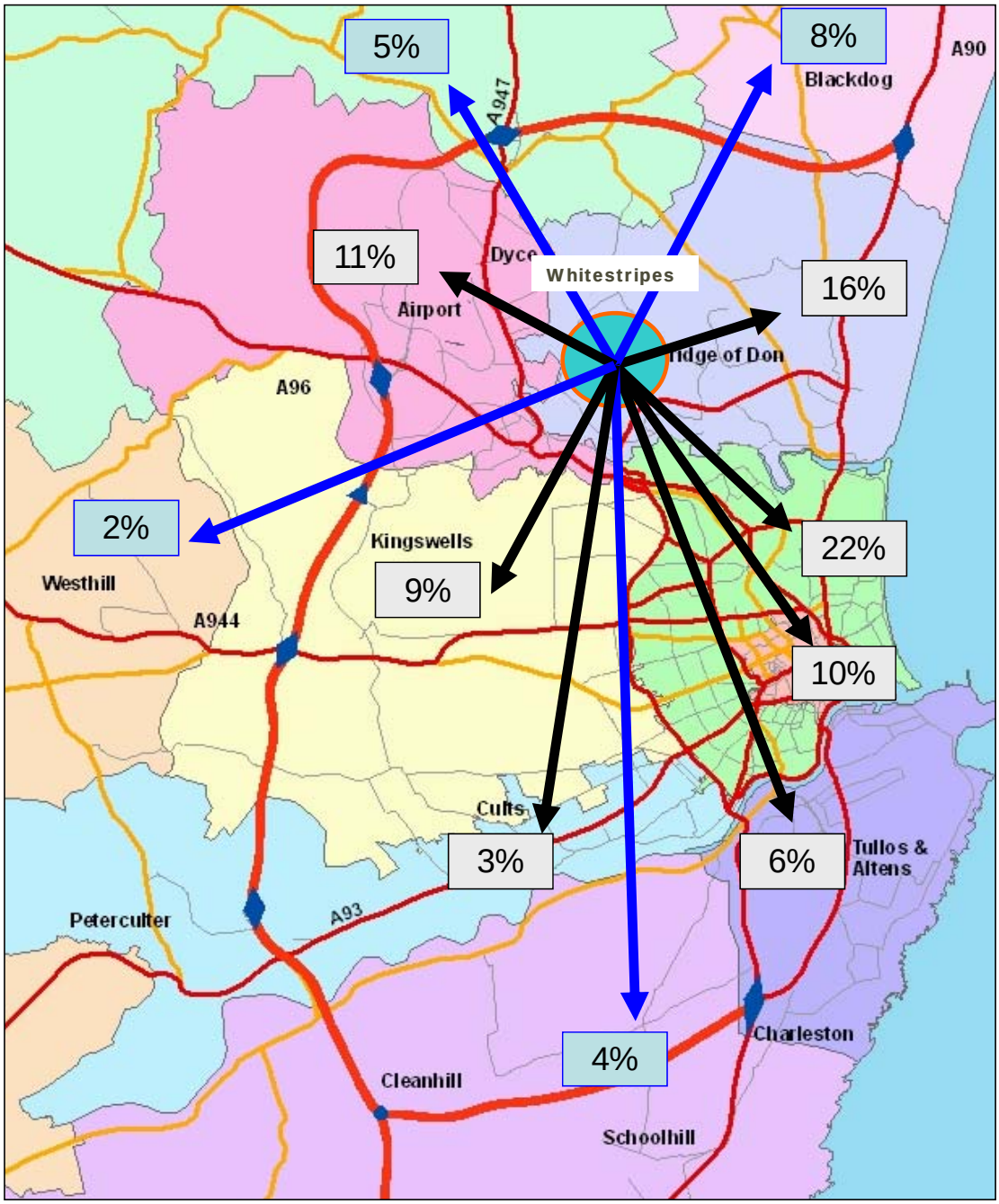


**Figure C.1 Distribution of Travel Movements from Whitestripes**

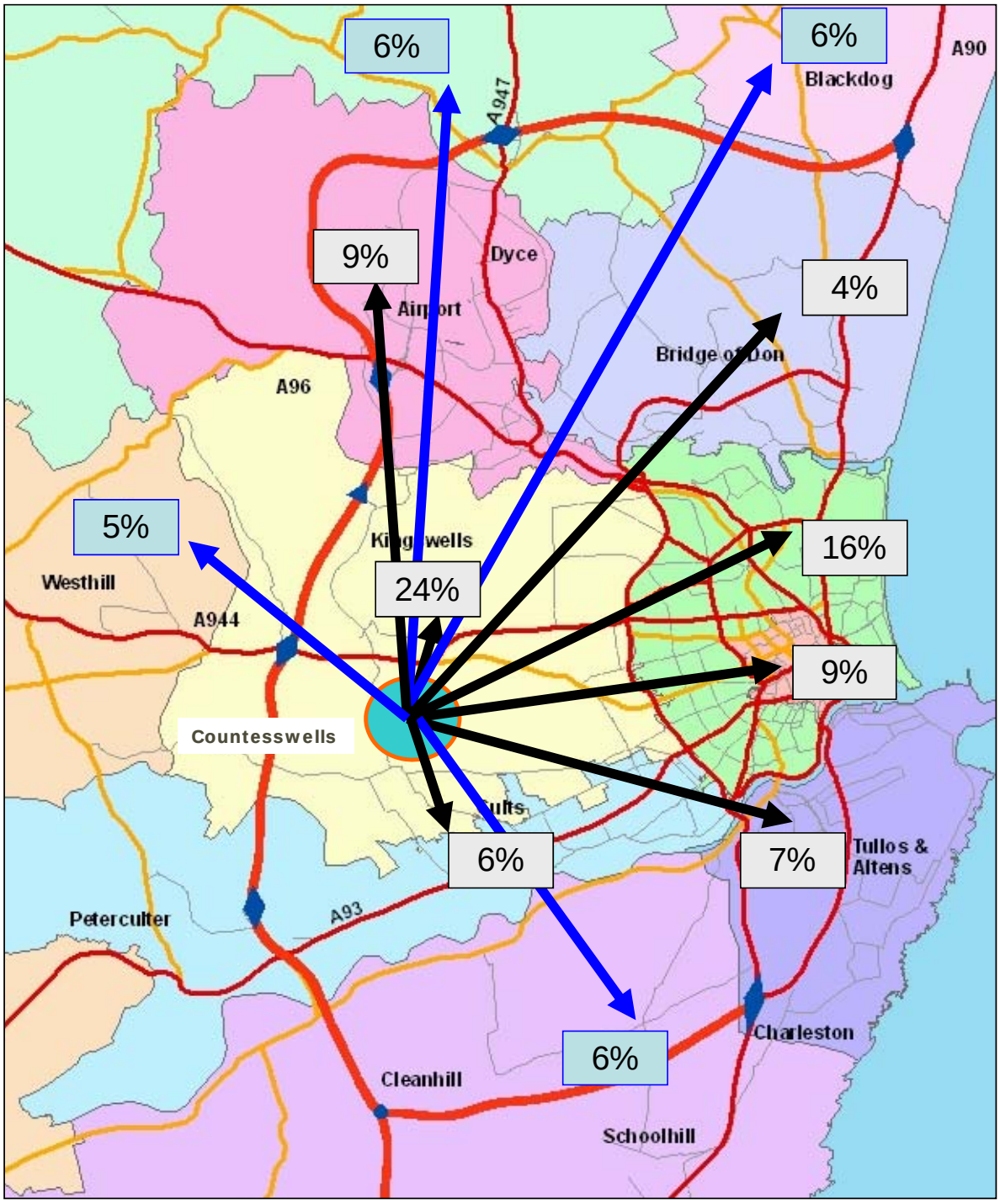


**Figure C.2 Distribution of Travel Movements from Countesswells**

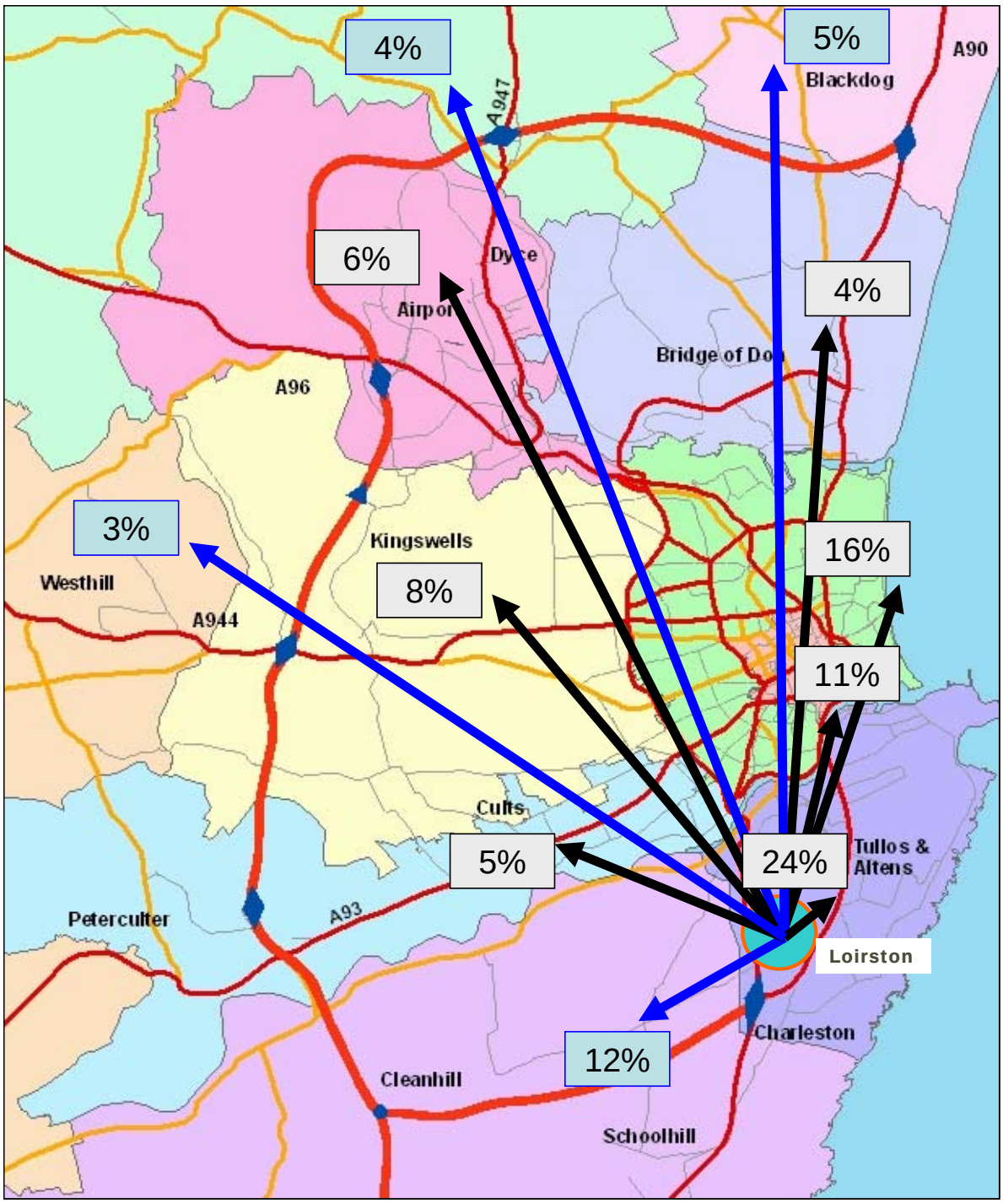


**Figure C.3 Distribution of Travel Movements from Loirston**

# Appendix D – Traffic Congestion Forecasts

## Introduction

ASAM4 was applied to calculate the predicted time lost due to congestion for vehicles travelling across the road network in the 2010 present day scenario and 2023 development plan 'Allowance' scenario 1. This analysis measures the time lost between travelling unrestricted across the road network compared to that realised during an average hour in the morning peak period.

This type of analysis is useful in comparing the parts of the road network that currently suffer from congestion with those that are predicted to come under pressure in the future – assuming that all transport infrastructure proposals are introduced and the development plan is achieved.

Figures D1 and D2 provide an illustration or map of congestion within the 2010 Present Day Scenario and the 2023 scenario if the Development Plan targets are achieved. Figure D2 also highlights the main areas where further congestion analysis has been undertaken.

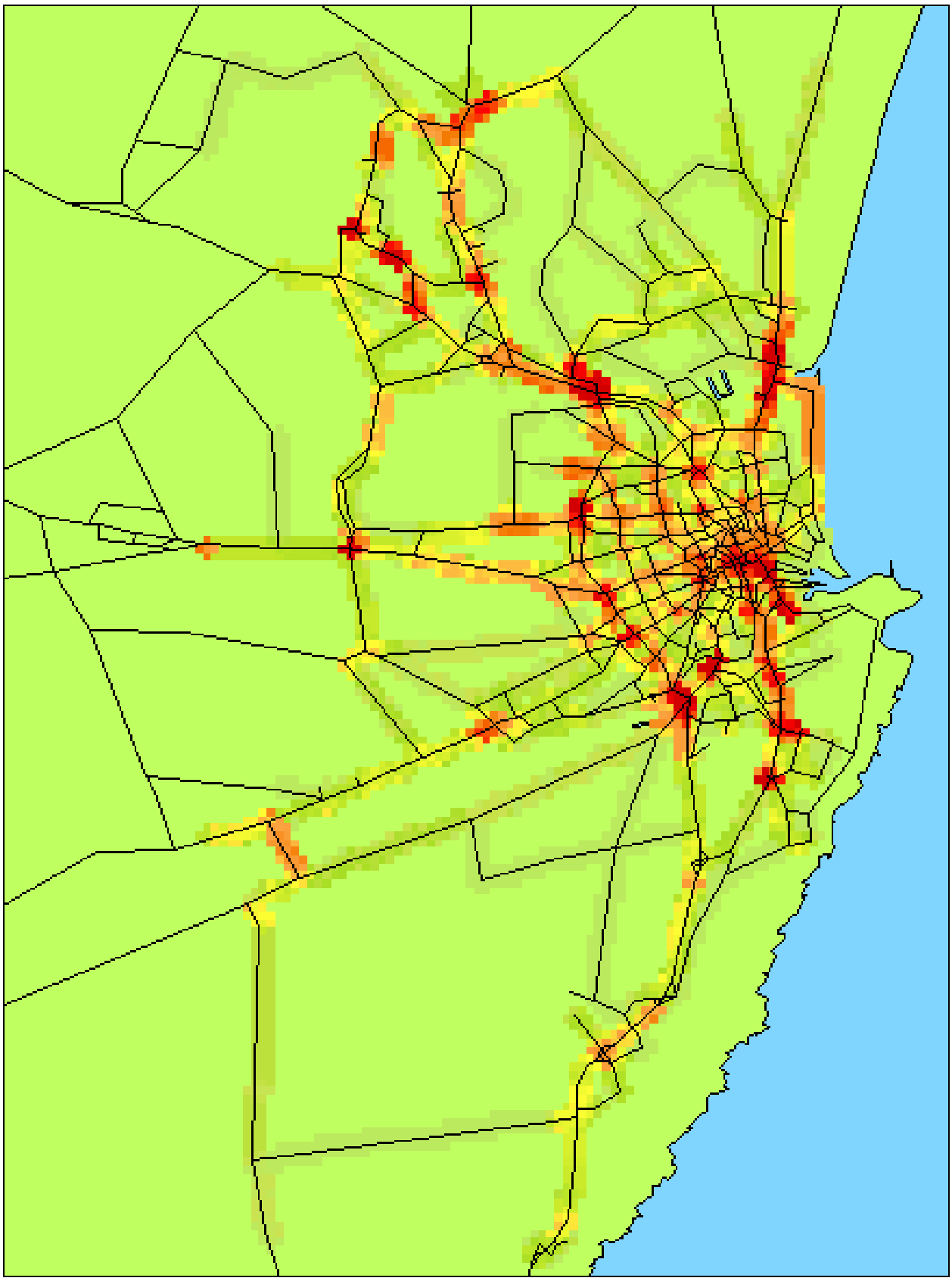

**Figure D.1 Congestion - 2010 Present Day Scenario – Morning Peak**

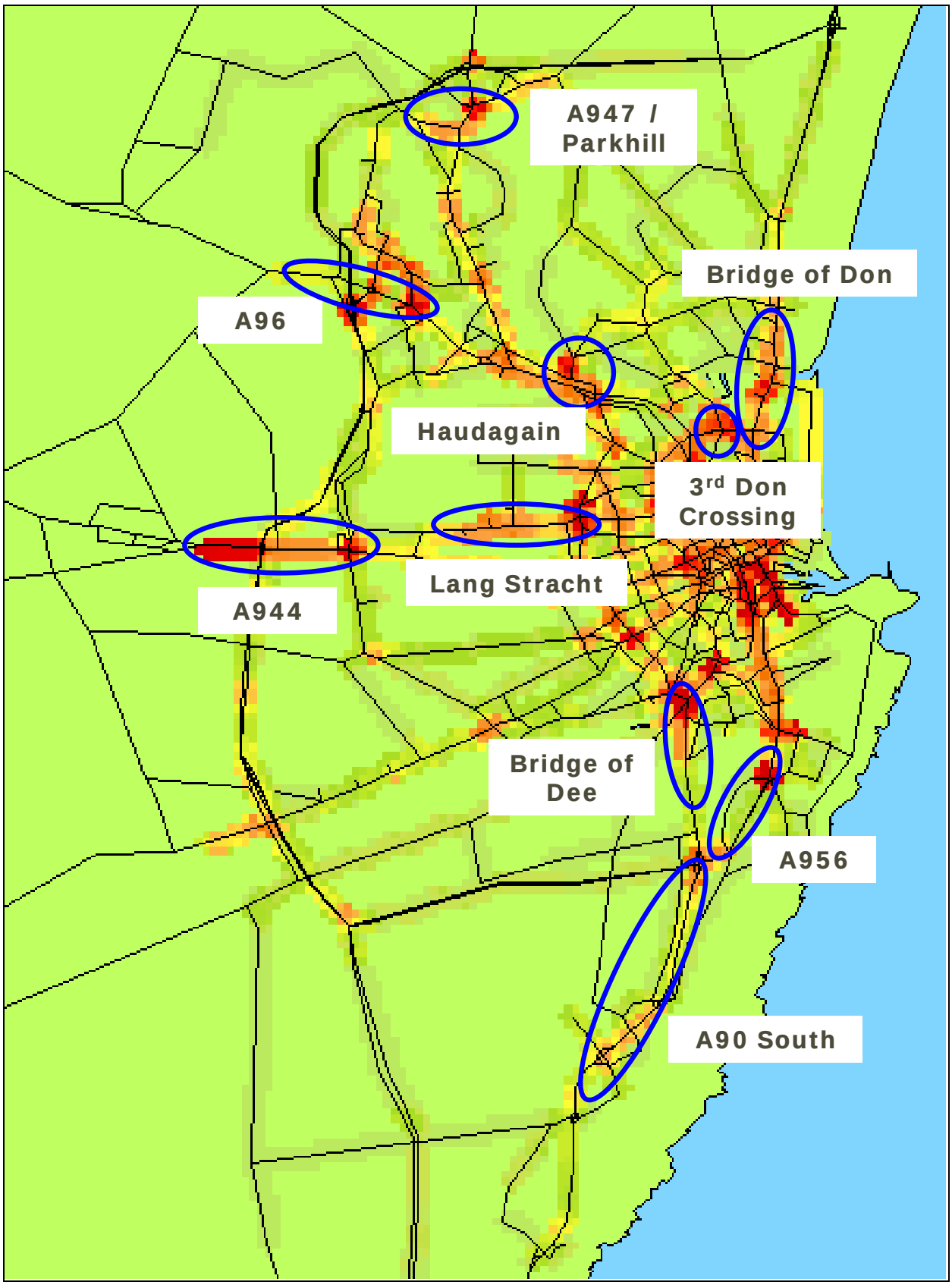


**Figure D.2 Congestion - 2023 Scenario 1 –Allowance – AM Peak**

# Appendix E – Transport Intervention Appraisal

## Introduction

To combat or mitigate potential impacts associated with the Development Plan, a series of transport interventions were identified. This process involved a review of existing studies and transport plans which have previously put forward various options for improving the transport system in and around Aberdeen. It also involved feedback from the study group relating to other potential constraints associated with the interventions considered.

A total of 12 road-based interventions and 3 public transport orientated packages have been identified for appraisal purposes. The initial assumptions associated with these interventions are described in Tables E.1 and E.2.

During the testing phase all options were based on and are compared against the 2023 Do Minimum Scenario 1 – 'Allowance'. Each road-based option was tested individually using an ASAM4 'fixed' matrix road assignment methodology – which enabled the appraisal of route choice and congestion effects, but excluded some transport choice measures – such as mode choice. The level of traffic demand associated with Scenario 1 (Allowance) was used to measure the impacts of all road-based interventions.

The first public transport test (A) was appraised individually, whilst tests B & C were built upon the previous test (ie A & B combined, A, B & C combined). If a road intervention was required to cater for new PT services/routes, the assumption reflected a bus only link. Public transport tests were undertaken using the full ASAM Demand Model, allowing for the traveller choices of mode and destination to be included within the appraisal.

**Table E.1 Road-based Transport Interventions**

| Option/Corridor | Potential Road Intervention |
|---|---|
| **North Aberdeen** | |
| T1. Parkway, Persley Bridge & Parkhill Improvements | Junction improvements along the Parkway and additional capacity at Persley Bridge to Haudagain Roundabout. Upgrade sections of B997 Scotstown Road and capacity improvements through Parkhill into North end of Dyce Drive using appropriate design standards to accommodate forecast traffic volumes. |
| T2. New Link to Dyce/ Stoneywood | New Bridge connecting Whitetripes to Stoneywood / Dyce. |
| **A96** | |
| T3. New road link to Greenferns SHLR | Local distributor connecting Craibstone, Rowett South and Greenferns Landward through to Greenferns SHLR. Greater junction capacity at Dyce Drive/Craibstone. |
| T4. Capacity improvements & new AWPR junction | Improvements at A96/AWPR/Dyce Drive with additional capacity at A96/DyceDrive & grade separation of AWPR/A96 intersection.<br>New junction from AWPR to South Kirkhill (South facing slips). |
| T5. Upgrade Kingswells North Junction | Capacity & quality improvements between Bucksburn and AWPR Kingswells North junction using appropriate design standards. |

| | |
|---|---|
| **A944** | |
| T6. Upgrade A944 junctions & additional links from developments | Upgrade junctions at A944/B9119 on approach to Westhill & A944 Kingswells Roundabout. Second access point from Home Farm to Kingswells bypass and from Countesswells to B9119. Upgrade Countesswells Road towards Aberdeen. |
| T7. Improve access to A93 Corridor | Upgrade Baillieswells Road & access to Cults from Countesswells. |
| T8. New link to Greenferns SHLR | Local distributor connecting Maidencraig developments through to Greenferns Strategic Housing Land Reserve (tested in tandem with (3) new distributor from A96 to Greenferns SHLR). |
| **A956/A90** | |
| T9. B9077 to A90 Link Road | A new access road from the B9077 South Deeside Road linking with an at grade roundabout on the A90 (Bus Gate on Leggart Terrace and no access assumed to Nigg Way). |
| T10. Link to A90 & junction improvements | Local distributor connecting Loirston development with A90 at new junction assumed south of B9077 link. Greater capacity and additional signal control at Souterhead. |
| T11. New AWPR Junction on Fastlink | Additional Fastlink junction to connect Elsick with AWPR Fastlink. Improved quality of interchange at Newtonhill. |
| T12. River Dee Link | New bridge connecting A90 South to Anderson Drive corridor (potentially upstream of existing crossing). |

**Table E.2 Public Transport Interventions**

| Option/Test | Potential Intervention |
|---|---|
| **A: Bus Frequency Improvements – PT Test 1** | |
| A. Improved frequency of basic services accessing new developments | One step improvement to (basic or existing) services assumed to access new developments (ie 20 minute to 15 minute frequency etc). 10 minute frequency associated with major developments (ie Whitestripes, Craibstone area, Home Farm, Countesswells, Elsick & Loirston). |
| **B: Additional Bus Services – PT Test 2** | |
| B1. Orbital Bus Service<br>(North West-South East) | New orbital bus service operating from Kirkhill to Elsick via Anderson Drive & Altens.<br>Proposed route includes, Kirkhill, Aberdeen Airport, A96 Park & Ride, Craibstone area, Greenferns SHLR, ARI, Woodhill House, Garthdee, Kincorth, Altens, Loirston, A90 Park & Ride & Elsick.<br>Assumed frequency every 20 minutes. Assumed bus only link connecting Greenferns Landward & Greenferns SHLR. |
| B2. Orbital Bus Service<br>(North East-South East) | New orbital bus service operating from Murcar to Elsick via Anderson Drive & Altens.<br>Proposed route includes, Murcar, Dubford, Whitestripes, ARI, Woodhill House, Garthdee, Kincorth, Altens, Loirston & Elsick.<br>Assumed frequency every 20 minutes. |

| | |
|---|---|
| B3. Orbital Bus Service<br><br>(North East-South West) | New orbital bus service operating from Murcar to Peterculter via Aberdeen Airport.<br><br>Proposed route includes, Murcar, Dubford, Whitestripes, Stoneywood, Dyce, Aberdeen Airport, Kirkhill, A96 Park & Ride, Craibstone area, Kingwells, Home Farm, Kingswells Park & Ride, Countesswells, Bieldside, Oldfold & Peterculter.<br><br>Assumed frequency every 20 minutes. |
| B4. Orbital Bus Service<br><br>(West-North West) | New orbital bus service operating from Westhill to Aberdeen Airport via Kingswells.<br><br>Proposed route: Westhill, Kingswells Park & Ride, Home Farm, Kingswells, Craibstone area, A96 Park & Ride, Airport & Kirkhill.<br><br>Assumed frequency every 20 minutes. |
| B5. Connections to Aberdeenshire | Where relevant, Aberdeenshire to central Aberdeen based services would be altered slightly to connect and have a stopping point at new developments situated around the periphery of Aberdeen. |
| **C: Kintore Rail Station – PT Test 3** | |
| C. Station at Kintore | New rail station at Kintore with similar level of service to Laurencekirk and 70 space car park. Feeder bus service to/from Kemnay. |

### Impacts to the Regional Road Network

The following sections describe the predicted impacts and benefits associated with each road intervention. Note that analysis associated with road intervention 8 was not undertaken, and was subsequently sifted out due to concerns related to achieving appropriate linkages to the local network.

Figure E.1 describes the predicted change in the total time lost due to congestion across the North East road network (during the AM Peak) once each intervention is in place. Changes in congestion are measured against the 2023 Do Minimum Scenario 1.

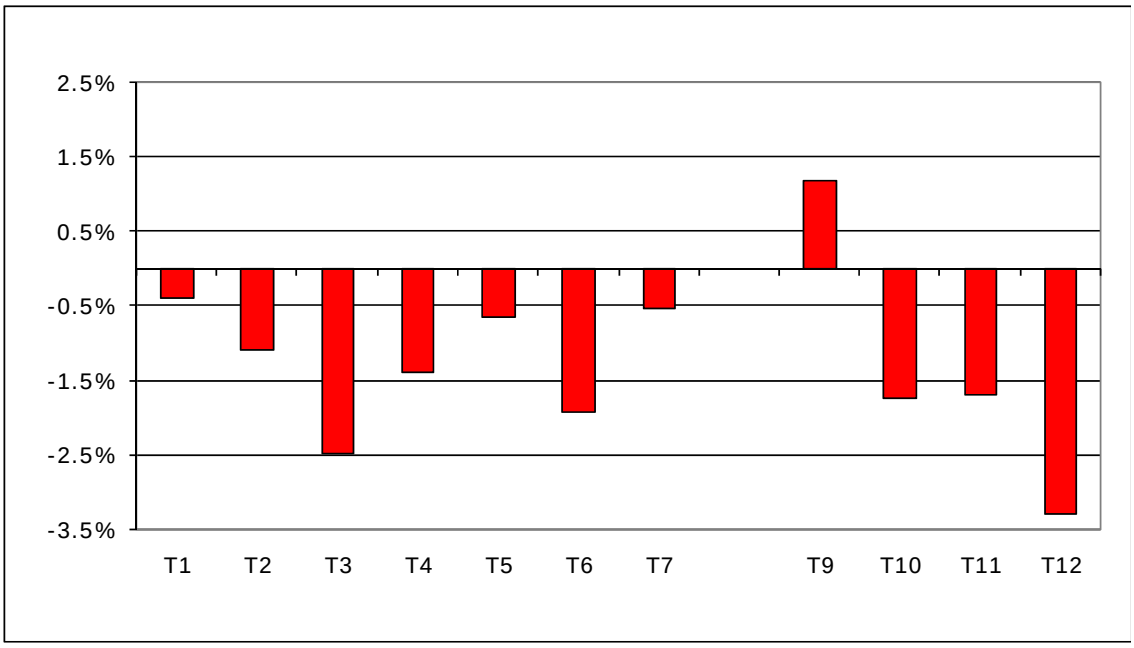


**Figure E.1 Change in Time Lost Due to Congestion (Region-Wide)**

Figure E.1 indicates that the majority of proposed interventions have a positive impact on reducing the overall time lost due to congestion across the North East.

The most significant time-saving benefits are associated with intervention Tests T3 (a new road link connecting the A96 area with Greenferns), and T12 (a new bridge across the River Dee) which are predicted to reduce time lost due to congestion by at least 2.5%.

The analysis also suggests that Tests T6 (improved road capacity along the A944), T10 (improved road capacity along the A956 corridor and T11 (a new connection to the AWPR Fastlink) would also reduce congestion considerably – by around 1.5%.

This initial analysis suggests that Road Test 9, which includes changes to the road layout approaching the Bridge of Dee, would not create time saving benefits. This outcome is likely to reflect the disbenefits associated with introducing a new at grade roundabout on a presently high speed carriageway – which would lead to lower traffic speeds along this section. However, given the complexities associated with traffic arrangements within this area of the network, further testing may identify an arrangement which would better complement traffic patterns in this area (ie traffic signals or introducing a controlled and extended traffic management arrangement).

### Impact to Key Road Network Locations

Figures E.2 to E.5 describe the predicted change in the time lost due to congestion (during the Morning Peak) at key sections of the road network once each road intervention is in place.

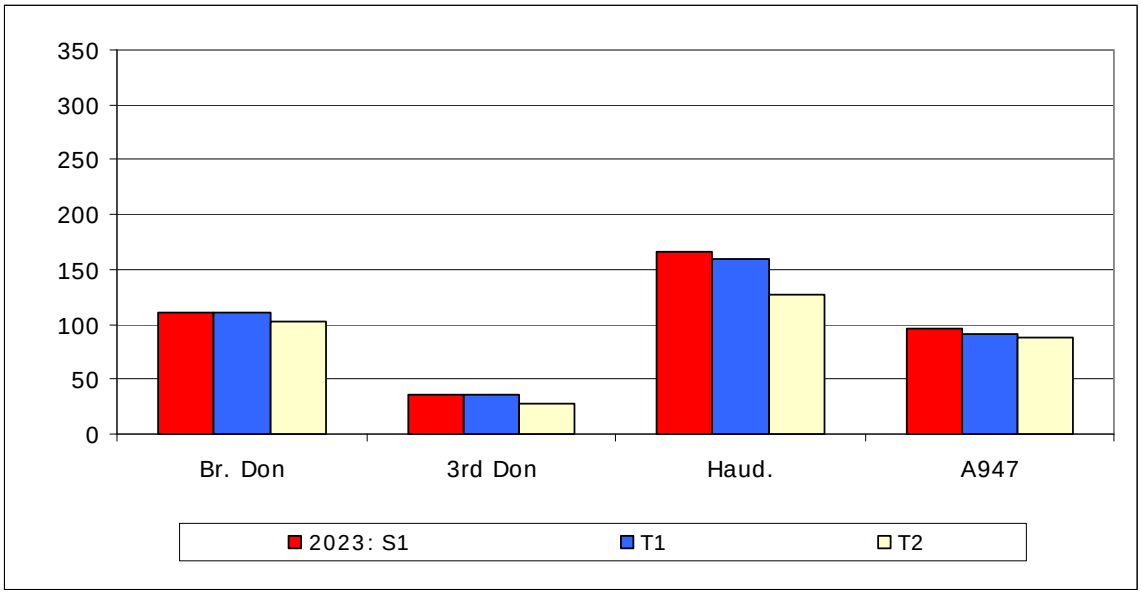


**Figure E.2 Time Lost Due to Congestion (North Aberdeen)**

Figure E.2 describes the predicted impact of Road Tests 1 & 2 to areas of the road network in North Aberdeen. The analysis suggests that Test 1 (road capacity improvements to the Parkway, Persley Bridge & Parkhill) would have a minor impact to the Bridge of Don and 3rd Don Crossing. Further benefits are identified along the Persley Bridge / Parkway corridor and at the A947 through Parkhill.

The analysis indicates that if a new bridge is introduced connecting the Whitestripes and Stoneywood Road areas (Test 2), congestion levels would be reduced at all River Don crossings. By providing an additional and more direct route between the North East and North West of Aberdeen this intervention attracts a proportion of motorists to divert to use the new bridge (around 9,500 Vehicles AADT). This

diversionary effect is likely to benefit other river crossing routes. However, given the existing capacity restrictions and congestion issues within the A947 corridor, introducing a major connection in practice may prove challenging, without impacting on the local urban area.

Overall, the appraisal suggests that these scheme proposals are likely to provide more reliable access arrangements for existing and new development-related traffic travelling between the Bridge of Don and the A96 / Dyce areas.

Figure E.3 describes the predicted impact of Road Tests 3, 4 & 5 to areas of the road network in the North & West of Aberdeen. The congestion appraisal indicates that a new road connection between Craibstone and Greenferns would generate time saving benefits in the Haudagain area and along the A944 corridor. This initial testing suggests that the new link would attract around 11,000 vehicles (AADT) per day and would therefore provide an alternative route for a considerable volume of motorists.

The analysis also suggests that this new link would attract additional motorists into the A96 and Lang Stracht areas, which subsequently is predicted to increase congestion levels at either end of the new route – again highlighting the difficulty of linking new infrastructure into the existing network without detriment to network operation.

The appraisal suggests that Test 4 (introducing a new junction at South Kirkhill and grade separation of the A96/AWPR intersection) would generate congestion benefits within the A96 corridor and at the A947. Similarly Test 5 (which includes improved access arrangements at the AWPR Kingwells North intersection) would also create time-saving benefits at the A96, A947 and A944.

The South Kirkhill access junction would provide an alternative route for motorists to access the Airport area. Similarly, improved access arrangements at Kingswells North would allow development-related traffic in and around the A96 to access the AWPR and travel to areas further West and South – diverting traffic from the heavily trafficked A96 / AWPR intersection and the busiest section of the AWPR between Kingswells North and the A96. However, the additional congestion highlighted in and around the Haudagain area, indicates that traffic may also be attracted to use the new AWPR interchange from out with the local A96 & A944 areas.

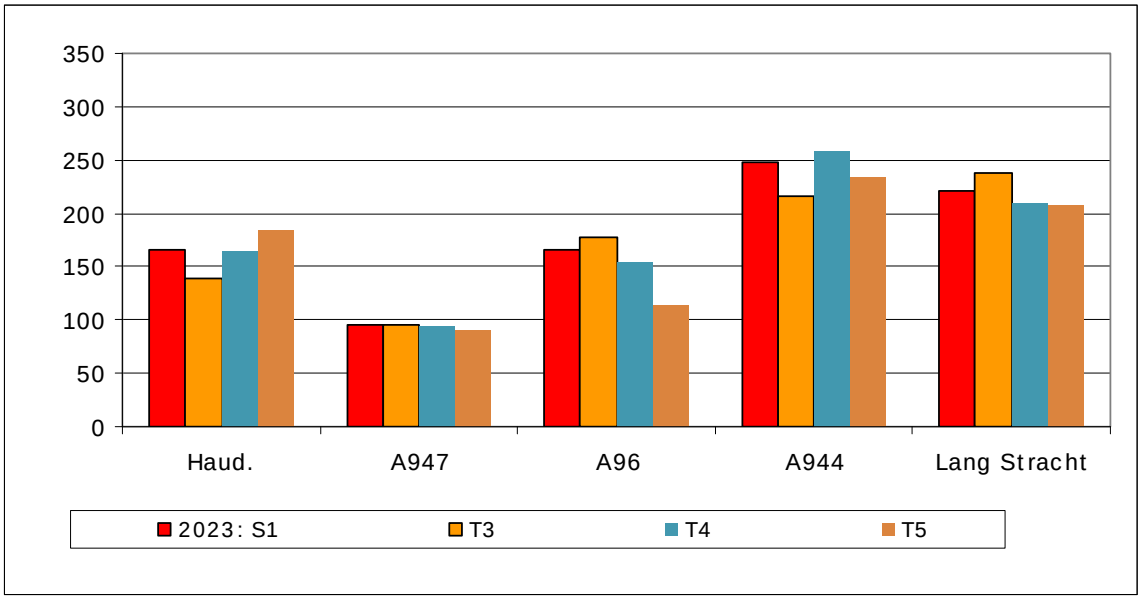


**Figure E.3 Time Lost Due to Congestion (West Aberdeen)**

Figure E.4 describes the predicted impact of Road Tests 6 & 7 to areas of the road network in North and West of Aberdeen. The main benefits associated with these scheme proposals are located within the A944 corridor, with the analysis demonstrating that the improved connections and additional road capacity included in Test 6 would reduce the level of congestion in and around Kingswells. As a result of improved travel times along the A944, additional traffic is likely to be attracted to this corridor and this trend is highlighted along the Lang Stracht where a slight increase in congestion is predicted.

The analysis suggests some minor benefits associated with Test 7, which aims to improve access between the A93 Corridor and the Countesswells area.

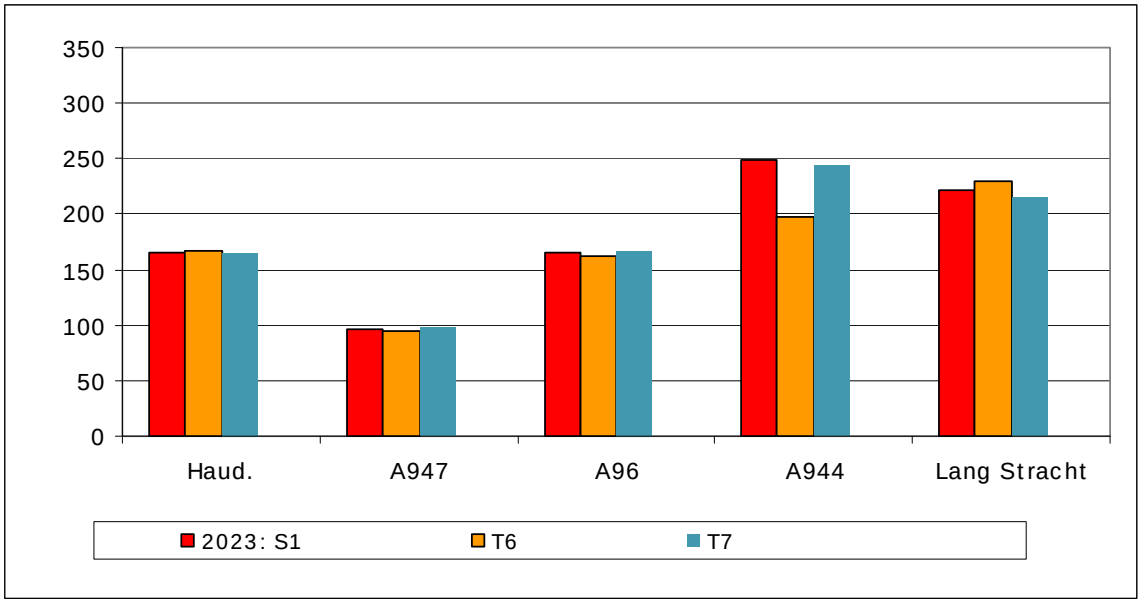


**Figure E.4 Time Lost Due to Congestion (West Aberdeen)**

Figure E.5 describes the predicted impact of Road Tests 9, 10, 11 & 12 to areas of the road network in and to the South of Aberdeen.

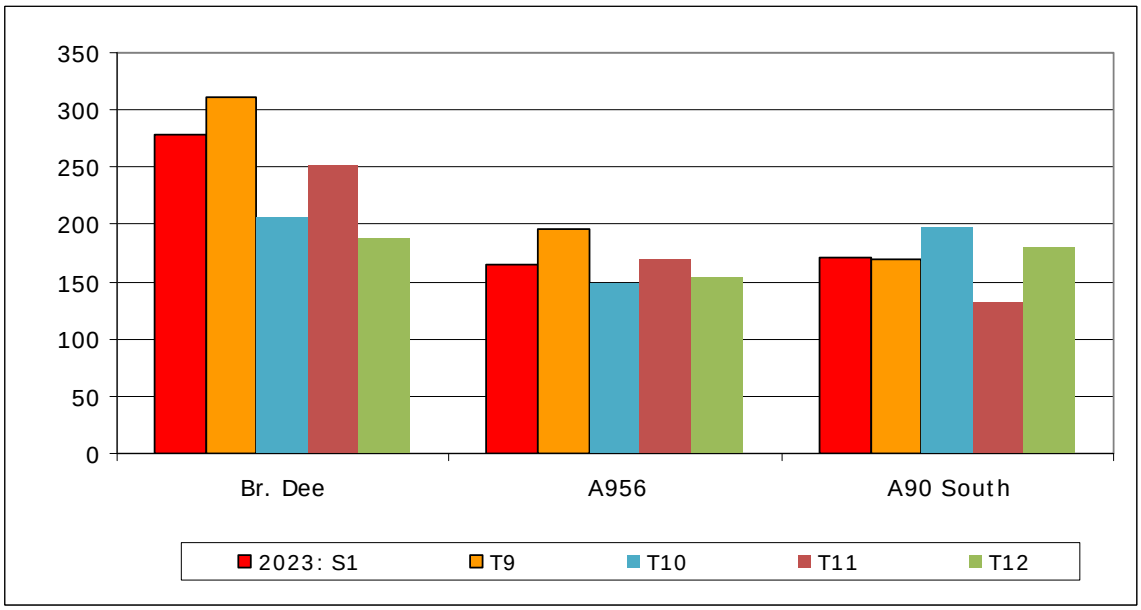


**Figure E.5 Time Lost Due to Congestion (South Aberdeen)**

The analysis suggests that varying the road layout approaching the Bridge of Dee (Test 9), is unlikely to create time saving benefits. This outcome is likely to reflect the disbenefits associated with introducing a new at grade roundabout on a presently high speed carriageway – which would lead to lower traffic speeds along this section.

Given the complexities associated with traffic movements within this area of the network, further testing may identify an arrangement which would better complement traffic patterns (ie by introducing traffic signals and/or introducing a controlled and extended traffic management arrangement).

Road Test 10 (which would provide junction improvements at Souterhead and a new link connecting the Loirston area direct to the A90), is predicted to generate travel time savings along both the A956 and Bridge of Dee corridors. These benefits stem from improved network performance at Souterhead and providing an additional route for development-related traffic to access the A90 (without travelling through Charleston Interchange).

With improved traffic movement through these areas, additional traffic is attracted into the A90 South corridor, and as a result, a slight increase in congestion is predicted here.

Note that the performance of a major signalised interchange such as Souterhead would also depend on the detailed operation of the traffic management system, including how signal settings are linked together and the availability of stacking capacity within the junction area. These types of detailed effects are not included within ASAM4 and therefore further work would be required to confirm the detailed operation of these potential improvements.

Road Test 11 would provide a new AWPR interchange connecting the Elsick development site with the Fastlink. The modelling suggests that this new connection would be used by around 6,000 vehicles per day and increase the level of traffic using the northern section of the Fastlink by around 20% to 26,000 vehicles (AADT).

With direct access to the Fastlink, a greater number of motorists are predicted to choose to use the AWPR and therefore divert away from the A90 South and Bridge of Dee approaches to Aberdeen. With the Fastlink connection in place, the level of daily traffic using the A90 (South of Charleston) is forecast to decrease by around 7%, compared to the 2023 Scenario 1. Subsequently, the level of congestion is forecast to reduce within these corridors.

Road Test 12 represents a new link connecting the A90 with the South Deeside road and a new bridge across the River Dee. This type of scheme would obviously be associated with a variety of challenges, in terms of engineering requirements, environmental constraints and financial cost. However, if this type of scheme were to be introduced, this initial modelling work suggests that it would generate a considerable level of travel time-savings within the Bridge of Dee corridor.

The analysis suggests that the new Bridge would attract around 10,000 vehicles per day (AADT) and this would lead to a reduction in the level of traffic using the existing Bridge of Dee. However, the analysis also suggests a slight increase in congestion further south as motorists are attracted into the A90 South corridor to access the new Bridge. Therefore, a considerable degree of pressure is likely to remain within this area of the network.

Furthermore, with the existing capacity restrictions and local congestion issues just to the North of the Dee, it may prove difficult to link the new bridge into the local network without significantly impacting on the network operation in and around Garthdee.

Figure E.6 illustrates the predicted % change in congestion when the impact forecast at all relevant areas associated with each specific Road Test is combined (for example combining the total change in congestion within the A90 South corridor by combining the change predicted in the A90 South, A956 and Bridge of Dee areas). The 2023 Scenario 1 is used to compare these forecasts.

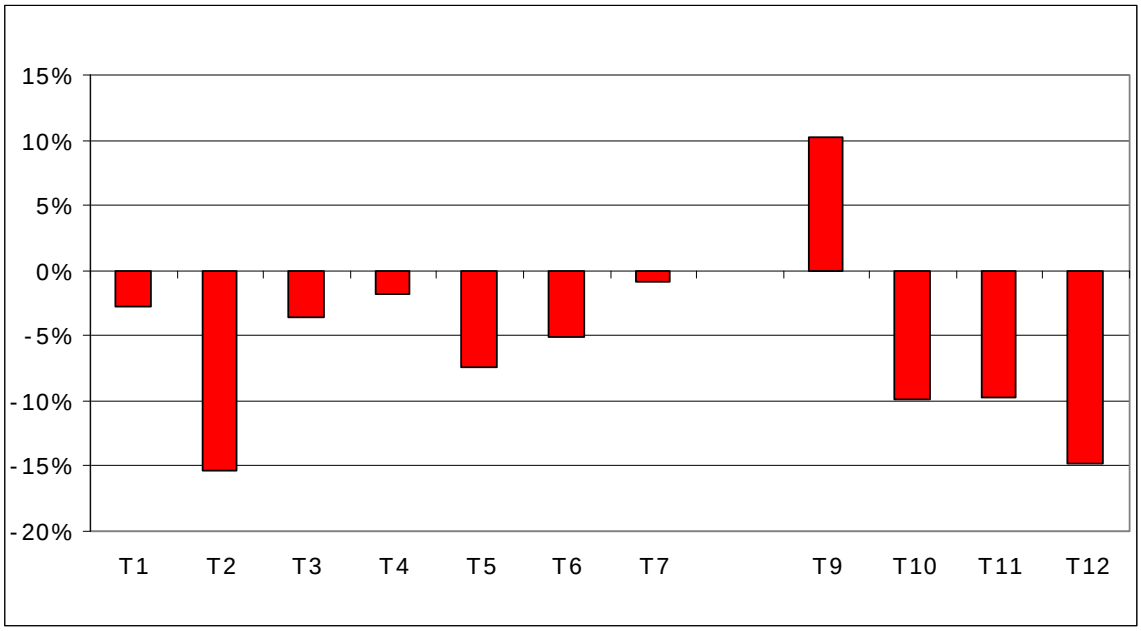


**Figure E.6 Change in Time Lost Due to Congestion (All Relevant Areas)**

Figure E.6 indicates that the majority of proposed interventions have a positive impact on reducing congestion levels in and around the relevant parts of the network.

The most significant time-saving benefits are associated with intervention Tests T2 (a new bridge across the River Don), and T12 (a new bridge across the River Dee) which are predicted to reduce time lost due to congestion by around 15% within nearby congested areas. Tests T10 and T11 are also anticipated to reduce congestion within nearby corridors.

Note that these results only represent changes in congestion for the 10 areas of the network that have been incorporated into this analysis. Therefore, there may be congestion benefits or impacts associated with other areas of the network which would affect the overall level of congestion (which is described in Figure E.1).

Although this evidence does suggest some considerable benefits related to these types of interventions, previous analysis (Figure 4.3) demonstrated that the introduction of current infrastructure proposals would reduce overall congestion by around 30% across Aberdeen – demonstrating the scale of this additional infrastructure. Therefore, with the magnitude of time-saving benefits described here, more than one additional piece of infrastructure is likely to be required to off-set the full impacts of congestion if the development plans are achieved.

## Impact on Public Transport

The following section discusses the predicted impacts and benefits associated with the 3 public transport test options.

## Public Transport Accessibility

To illustrate the accessibility benefits associated with all public transport proposals, the relative level of public transport accessibility is illustrated within Figures E.7 to E.10. These images show the PT journey time (during the AM Peak) between all areas of the North East to the Aberdeen Royal Infirmary and Aberdeen Airport – for the 2023 Scenario 1 and Public Transport Test 3, which includes all PT intervention proposals. The dark green shading is used to represent a shorter public transport journey time and the red shading is used to represent areas where a longer journey by public transport is required to reach these key locations.

The accessibility mapping indicates a substantial improvement in public transport journey time to access these two locations – particularly from new development areas situated around the periphery of Aberdeen.

For example, PT travel times from areas in the the Bridge of Don (such as Dubford & Murcar) and areas such as Loirston in the South East of the city would see a PT travel time benefit of around 20%-25% when travelling to the ARI.

Access to the Hospital from areas along the A96 corridor (such as Craibstone & Greenferns Landward) would improve by around 30%. A similar level of journey time benefit is also associated with the Elsick development area.

There are also journey time improvements to the Hospital of around 5% from the A93 corridor and the Countesswells area.

Public transport journey time improvements to Aberdeen Airport are also identified for several peripheral areas, such as a 30% improvement from parts of the A90 South corridor and a 45% improvement from areas within the Bridge of Don and from the A944 and A93 corridors.

Overall the access by PT to the ARI and Aberdeen Airport is forecast to improve by around 20% and 25% respectively, if this frequency and pattern of public transport services are introduced.

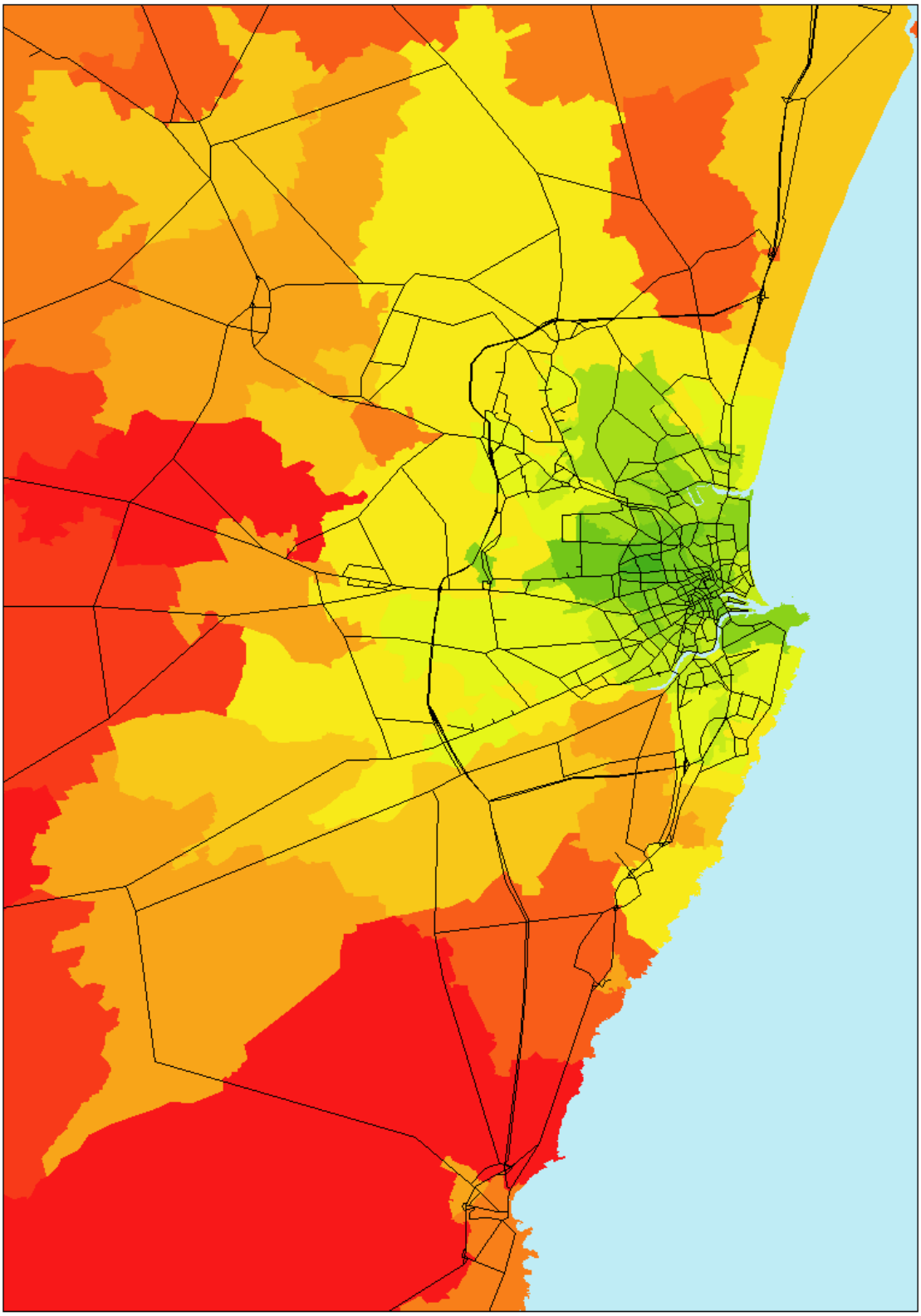

**Figure E.7 PT Accessibility to Aberdeen Royal Infirmary – 2023 Scenario 1**

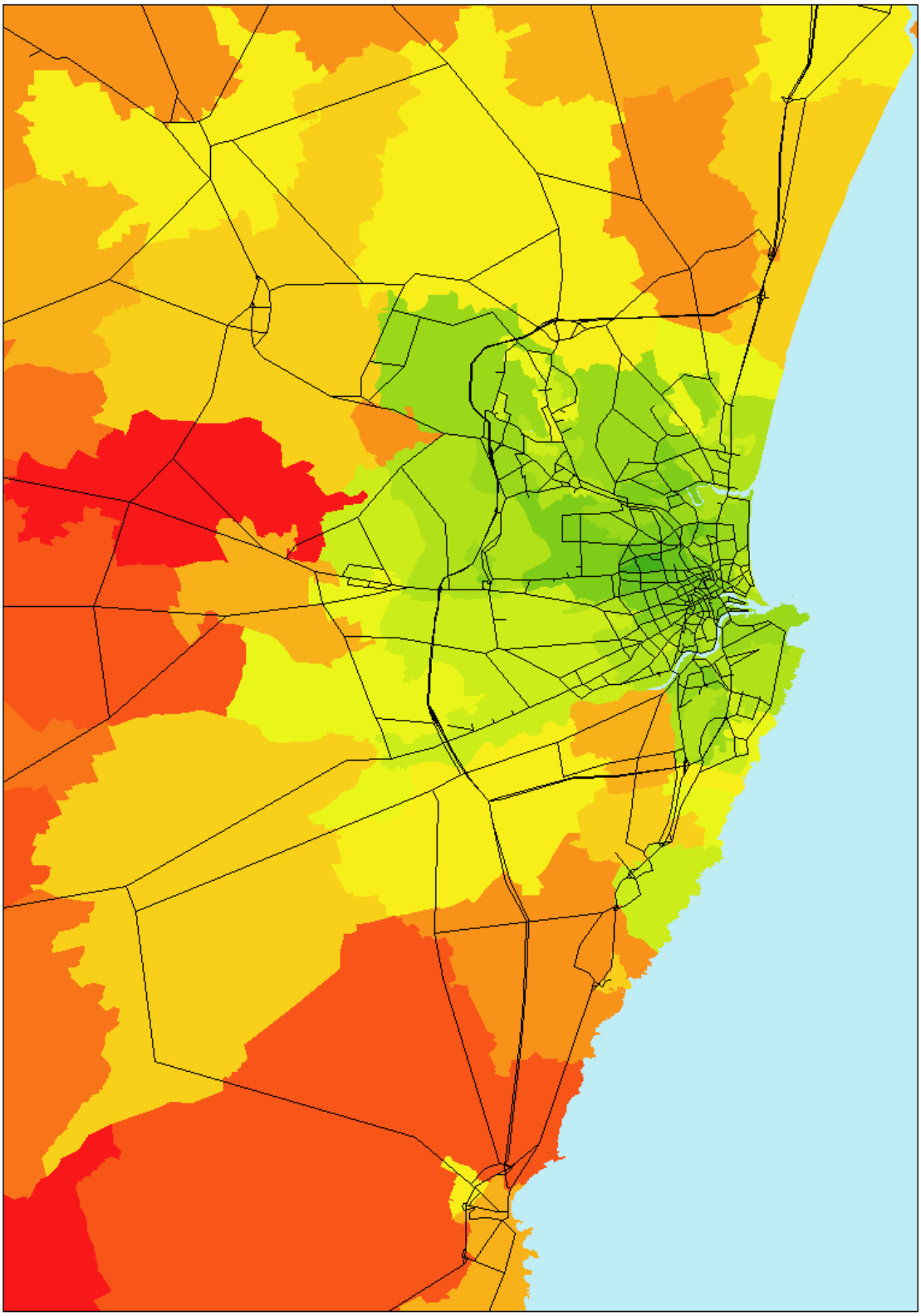

**Figure E.8 PT Accessibility to Aberdeen Royal Infirmary – PT Test 3**

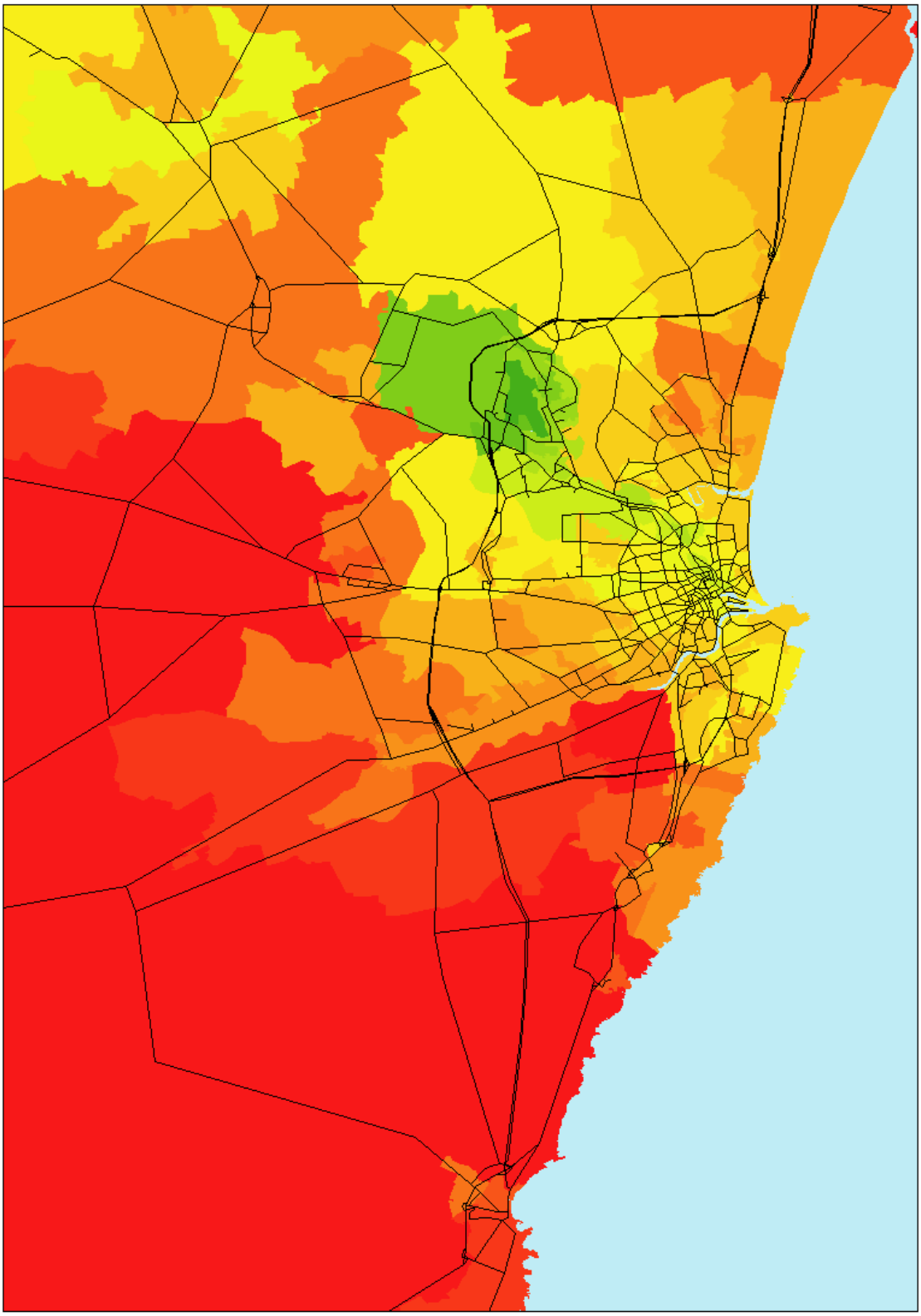

**Figure E.9 PT Accessibility to Aberdeen Airport – 2023 Scenario 1**

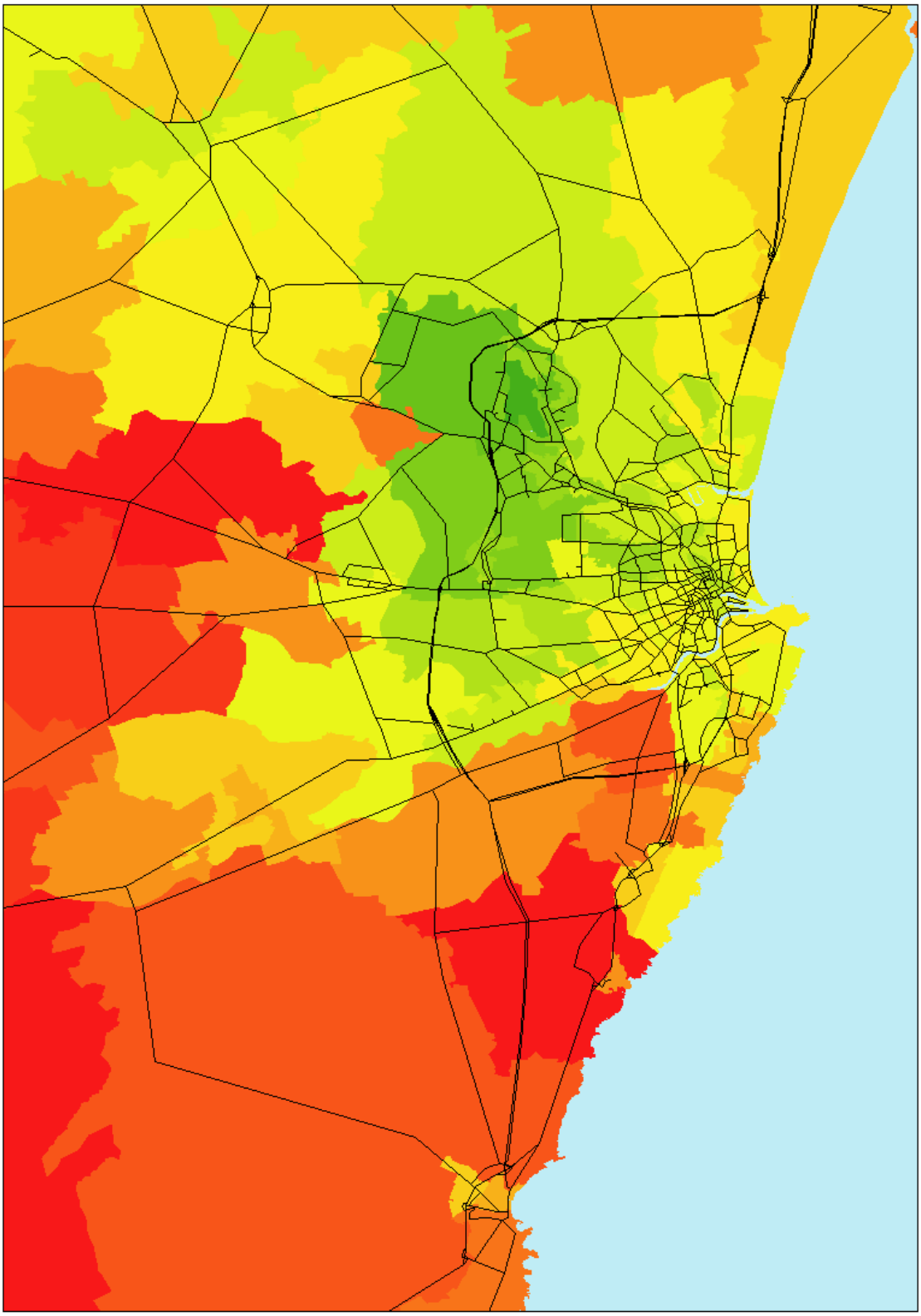

**Figure E.10 PT Accessibility to Aberdeen Airport – PT Test 3**

### Public Transport Mode Share

Table E.3 describes the predicted change in public transport mode share and trip making associated with the introduction of proposed PT intervention Tests 1-3. The change in PT trip making characteristics is described at a region-wide level and also for the combined impact associated with major new development sites (compared with the 2023 Scenario 1).

**Table E.3 Change in Public Transport Mode Share & Trip Making**

| Scenario | Regional PT | | Major Development Sites PT | |
|---|---|---|---|---|
| | PT Trips (Daily) | PT Mode Share | PT Trips (Peak Hour) | PT Mode Share |
| 2023 S1 – Allowance | 64,735 | 12.6% | 1,453 | 10.9% |
| PT Test 1 – Frequency | +0.7% | 12.7% | +2.3% | 11.2% |
| PT Test 2 – Orbital | +2.2% | 12.9% | +7.1% | 11.6% |
| PT Test 3 – Kintore Rail | +2.2% | 12.9% | +7.1% | 11.7% |

Table E.3 indicates that all public transport proposals are anticipated to increase the level of public transport trip making – which reflects the improved level of accessibility provided by new PT services.

The PT analysis indicates that there would be a small increase in PT trips associated with improving the frequency of existing PT services serving new development areas (PT Test 1).

The analysis suggests a much larger impact to PT trip making when a number of orbital bus services are incorporated into the network (PT Test 2). These types of service packages are forecast to increase public transport patronage to and from major new development areas by around 7%, which would increase the PT mode share associated with these sites from 11% to around 12%.

The region-wide analysis suggests that public transport mode share across the North East is forecast to be around 13% in the 2023 Scenario, whereas mode share associated with major new development sites would be lower at around 12%. This statistic perhaps illustrates the challenges associated with attracting travellers to use public transport to and from peripheral areas of the network.

### Public Transport Patronage

ASAM was used to determine the predicted change in the level of daily rail and bus patronage (along the major corridors between Aberdeen and Aberdeenshire) with public transport packages 2 and 3 in place (compared against the 2023 Scenario 1).

The modelling indicates that the volume of rail passengers travelling along the East Coast mainline to the North of Portlethen) would stay relatively constant with these interventions in place.

With the introduction of a new station at Kintore and associated rail services, rail patronage along the Inverness line is forecast to increase by around 13%. These new rail passengers are likely to be attracted from a mixture of previous modes, including existing bus passengers and car drivers.

The volume of bus passengers travelling within the A90 South corridor is also anticipated to increase (by around 8%) if these types of bus services are introduced to complement the Development Plan. This increase in patronage is mainly associated with the proposed bus services that provide an improved service between peripheral areas.

The analysis also suggests a small increase in bus patronage along the A96 if PT Package 2 is introduced.

With new rail services provided at Kintore, it is likely that some existing bus users would choose to use the train for their journey. This trend is also illustrated within the modelling with a slight reduction in bus users between Kintore and the North West of Aberdeen.

### Initial Option Sifting

The following intervention options considered within the earlier appraisal phase were sifted out of the full package at this stage for the following reasons:

#### Bridge over River Don connecting Whitestripes with A947 Stoneywood Road

The appraisal phase has indicated some considerable improvements to journey times for road movements across the River Don – due to the construction of the AWPR, 3rd Don Crossing and Haudagain Roundabout Improvements. Although a proportion of these time-saving benefits would be lost if the Development Plan allocations are implemented, the progression of a further crossing would pose a series of environmental and public acceptability issues. Providing an appropriate access point within the constrained A947 corridor would also be extremely difficult.

Capacity improvements and traffic management measures along Persley Bridge and A947 Parkhill corridors appear more feasible options at this stage. Further, more detailed modelling would be required to confirm this - once more detailed development proposals are available.

#### Road Link Connecting Craibstone / Rowett through to Greenferns SHLR / Maidencraig

Not progressed due to safety issues relating to the unsuitability of existing local roads to accommodate strategic through traffic.

#### A96 Grade Separation / AWPR South Kirkhill Junction

Although engineering designs exist for these options, cost implications and design standards issues are also associated with achieving these potential interventions – particularly in relation to the grade separation of the A96. If under more detailed appraisal the operation of the A96 area is predicted to become under increasing pressure, then additional interventions such as these would remain potential options for mitigating impacts at this strategic location. These options have not been recommended as part of this study. However, given the potential cumulative impact of development on this corridor, further consideration requires to be given to determine the most appropriate interventions.

# Appendix F – Development Related Traffic

### Relationship of Development Related Traffic Movements & Key Network Points

Table F.1 describes the relationship between traffic patterns to/from development sites and the use of existing key points on the road network which may come under pressure if the Development Plan is achieved. This analysis is consistent to that presented within Table 7.2 of the main report but focuses on existing key infrastructure locations. This traffic analysis was also undertaken using the Scenario which incorporated the impacts and benefits associated with the package of proposed transport interventions.

These relationships provides an initial means of attributing the use of these areas of the network to individual developments and hence a mechanism to establish some broad principles relating to financial contributions of potential mitigation measures. More detailed analysis would be required as further details relating to developments and the transport proposals emerge.

**Table F.1 Proportion of Development Traffic using Existing Road Infrastructure**

| Development & Proportion of Traffic Flow to/from each site | Road Network Infrastructure & Daily Traffic Flow (2023 AADT) | | | | | |
|---|---|---|---|---|---|---|
| | Bridge of Don | 3rd Don | A96 West | Lang Stracht | A93 | Bridge of Dee |
| | **34,200** | **11,800** | **31,300** | **14,800** | **9,000** | **28,500** |
| Ellon | 1% | 0% | 0% | 0% | 0% | 0% |
| Inverurie | 0% | 0% | 8% | 0% | 0% | 0% |
| Blackdog | 2% | 0% | 0% | 0% | 0% | 0% |
| Murcar/Dubford | 7% | 1% | 0% | 0% | 0% | 0% |
| Whitestripes | 0% | 29% | 1% | 1% | 0% | 2% |
| Stoneywood | 0% | 0% | 1% | 0% | 0% | 0% |
| Craibstone | 0% | 0% | 2% | 0% | 0% | 0% |
| Greenferns SHLR | 0% | 0% | 1% | 7% | 0% | 1% |
| Maidencraig | 0% | 0% | 1% | 16% | 0% | 2% |
| Home Farm | 0% | 0% | 2% | 5% | 0% | 1% |
| Countesswells | 0% | 0% | 2% | 12% | 0% | 2% |
| Oldfold | 0% | 0% | 0% | 0% | 14% | 1% |
| Loirston | 1% | 0% | 1% | 1% | 1% | 6% |
| Elsick | 0% | 0% | 2% | 1% | 0% | 8% |

Note that Craibstone also includes Rowett & Greenferns Landward traffic movements

Traffic movement proportions reflect daily two-way journeys associated with each development.

Rounding applied to proportions

There can be some double counting of traffic proportions where traffic originates from and is destined for new development sites

**MVA Consultancy provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.**
**A diverse group of results-oriented people, we are part of a strong team of professionals worldwide. Through client business planning, customer research and strategy development we create solutions that work for real people in the real world.**

**For more information visit www.mvaconsultancy.com**


**Abu Dhabi**
AS Business Centre, Suite 201, Al Ain Road, Umm al Nar, P.O. Box 129865, Abu Dhabi, UAE
T: +971 2 510 2402 F: +971 2 510 2403

**Birmingham**
Second Floor, 37a Waterloo Street
Birmingham B2 5TJ United Kingdom
T: +44 (0)121 233 7680 F: +44 (0)121 233 7681

**Dublin**
First Floor, 12/13 Exchange Place
Custom House Docks, IFSC, Dublin 1, Ireland
T: +353 (0)1 542 6000 F: +353 (0)1 542 6001

**Edinburgh**
Second Floor, Prospect House, 5 Thistle Street,
Edinburgh EH2 1DF United Kingdom
T: +44 (0)131 220 6966 F: +44 (0)131 220 6087

**Glasgow**
Seventh Floor, 78 St Vincent Street
Glasgow G2 5UB United Kingdom
T: +44 (0)141 225 4400 F: +44 (0)141 225 4401

**London**
Second Floor, 17 Hanover Square
London W1S 1HU United Kingdom
T: +44 (0)20 7529 6500 F: +44 (0)20 7529 6556

**Lyon**
11, rue de la République, 69001 Lyon, France
T: +33 (0)4 72 10 29 29 F: +33 (0)4 72 10 29 28

**Manchester**
25th Floor, City Tower, Piccadilly Plaza
Manchester M1 4BT United Kingdom
T: +44 (0)161 236 0282 F: +44 (0)161 236 0095

**Marseille**
76, rue de la République, 13002 Marseille, France
T: +33 (0)4 91 37 35 15 F: +33 (0)4 91 91 90 14

**Paris**
12-14, rue Jules César, 75012 Paris, France
T: +33 (0)1 53 17 36 00 F: +33 (0)1 53 17 36 01

**Woking**
Dukes Court, Duke Street, Woking
Surrey GU21 5BH United Kingdom
T: +44 (0)1483 728051 F: +44 (0)1483 755207

**Email: info@mvaconsultancy.com**

**Offices also in**
Bangkok, Beijing, Hong Kong, Shenzhen and Singapore


mvaconsultancy