Dyce Drive/Argyll Road Study

Aberdeen City Council, Nestrans, BAA Aberdeen

Transport Report

70090
September 2008

DYCE DRIVE/ARGYLL ROAD STUDY

Description:	**Transport Report**
Date:	**01 September 2008**
Project Manager:	**John McDonald**
Project Director:	**Peter Stewart**

SIAS Limited
13 Rose Terrace
Perth PH1 5HA
UK

tel: 01738 621377
fax: 01738 632887
perth@sias.com
www.sias.com

DYCE DRIVE/ARGYLL ROAD STUDY

CONTENTS :

		Page
1	**INTRODUCTION**	**1**
1.1	Purpose of Report	1
1.2	Core Aims	1
1.3	Additional Modelling	2
1.4	Methodology	2
2	**ANALYSIS OF PRESENT AND FUTURE PROBLEMS AND ISSUES**	**3**
2.1	Introduction	3
2.2	Background	3
2.3	Geographical Context	3
2.4	Social Context	4
2.5	Economic Context	4
2.6	Strategic Road Network	5
2.7	Local Road Network	7
2.8	Public Transport	8
2.9	Vehicular Access	10
2.10	Travel Choices	10
2.11	Pedestrian Access	11
2.12	Cycling Access	12
2.13	Bus Service Accessibility	13
2.14	Taxis	13
2.15	Aberdeen Western Peripheral Route (AWPR)	14
2.16	Airport Access Summary	14
3	**DOCUMENT REVIEW**	**15**
3.1	Overview	15
3.2	Other Documents	15
3.3	Dyce Drive Planning Brief	15
3.4	Aberdeen Airport Master Plan (*AAMP*)	16
3.5	A Surface Access Strategy for Aberdeen Airport (2008 – 2012)	18
3.6	Aberdeen City Council Local Plan	21
3.7	Aberdeenshire Council Local Plan	22
3.8	North East of Scotland Transport Partnership (Nestrans)	22
3.9	Aberdeen City Local Transport Strategy	22
3.10	National Policy	23
4	**CONSULTATION**	**25**
4.1	Introduction	25
4.2	Stakeholder Consultation	25
4.3	Section 2 – Prioritising Issues	27
4.4	Section 3 – Other Travel Issues	29
4.5	Section 4 – Any Other Comments Strongly For or Against Any Specific Option	29

4.6 Feedback from Key Stakeholders 30
4.7 Summary of Stakeholder Consultation 31

5 OPTION SIFTING 33

5.1 General 33
5.2 S-Paramics Base Traffic Model 33
5.3 Client Group Workshops 34
5.4 Consideration of Options 36
5.5 Pedestrian and Cyclist Options 36
5.6 Bus and Taxi Priority Lanes 37
5.7 Junction Improvements Options 41
5.8 A96(T)/Dyce Drive Junction Options 45
5.9 Closure of Forties Road to Through Traffic 52
5.10 Summary of Option Sifting Exercise 53

6 OPTION DEVELOPMENT AND TESTING 54

6.1 General 54
6.2 Packages of Options for Testing 54
6.3 Option Testing Methodology 55
6.4 Base Model Development 57
6.5 Option Testing 58
6.6 Test 3 60
6.7 Test 4 62
6.8 Test 5 63
6.9 Test 6 64
6.10 Test 7 65
6.11 Test 8 66
6.12 Test 9 67
6.13 Test 10 68
6.14 Summary of Option Testing 69
6.15 Recommended Tests Derived From Initial Sifting 71

7 ADDITIONAL OPTION TESTING WORKS 72

7.1 General 72
7.2 Purpose of Additional Testing 72
7.3 Options for Consideration 72
7.4 Testing and Outcome 76
7.5 Conclusion 77

8 COST ESTIMATES & PHASING 78

8.1 General 78
8.2 Construction Costs 79
8.3 Phasing of Improvements 80
8.4 Construction Timescales 81

9 PREFERRED PACKAGE APPRAISAL 82

9.1 Introduction 82
9.2 Appraisal 82
9.3 Schemes Considered 83

10 SUMMARY 86

10.1 Introduction 86
10.2 Stakeholder Consultation and Review of Existing Conditions 86
10.3 Traffic Modelling 87
10.4 Immediate/Short Term Option Testing – Specific Criteria 87
10.5 Recommended Options 88
10.6 Overall Recommendation 89

A KILMARTIN OPTION TESTING WORKS 91

A.1 General 92
A.2 Proposed Development at Dyce Drive by Kilmartin Group 93
A.3 Options for Testing 95
A.4 Trip Attraction & Distribution 96
A.5 Kilmartin Future Base Model 97
A.6 Test 11 (Test 4 + Kilmartin Development) 99
A.7 Test 12 (Test 6 + Kilmartin Development) 100
A.8 Test Results 100
A.9 Option Testing 101
A.10 Journey Time Comparison 101
A.10.1 Previous Base 101
A.10.2 Kilmartin Base Model – Future Year Base (FYB) 101
A.10.3 Test 4 102
A.10.4 Test 6 103
A.11 Journey Time Summary 104
A.12 Conclusions 106

B CONSTRUCTION COST ESTIMATES 107

DYCE DRIVE/ARGYLL ROAD STUDY

FIGURES :

	Page
Figure 2.1 : Aberdeen Western Peripheral Route Layout	6
Figure 2.2 : Local Road Network	7
Figure 2.3 : Bus Routes to Aberdeen Airport	9
Figure 2.4 : Main Modes of Travelling to Work or Study	11
Figure 2.5 : Walking Distance Isochrones	12
Figure 2.6 : Accessibility of Bus Services	13
Figure 2.7 : Taxi Movements at Dyce Drive/Argyll Road Junction	13
Figure 3.1 : City of Aberdeen Postal District Groups Passenger and Access Modes Distribution	19
Figure 4.1 : Section 1 – Responses to Specific Concerns	26
Figure 4.2 : Section 2 – Responses to Priorities for Improving Access	28
Figure 5.1 : Principal Options for Consideration	36
Figure 5.2 : Pedestrian and Cyclist Options	37
Figure 5.3 : Bus/Taxi Lane Options	39
Figure 5.4 : Revised Priority at RBS Roundabout on Argyll Road	41
Figure 5.5 : Peak Hour Traffic Flows at RBS Roundabout (vehs/hr)	42
Figure 5.6 : Peak Hour Traffic Flows at Dyce Drive/Argyll Road Junction (vehs/hr)	42
Figure 5.7 : Peak Hour Traffic Flows at Dyce Drive/Wellheads Drive Junction (vehs/hr)	43
Figure 5.8 : Extended Right Turn Lane on Dyce Drive	44
Figure 5.9 : Peak Hour Traffic Flows at Dyce Drive/A96(T) Junction (vehs/hr)	45
Figure 5.10 : Partial Signalisation of A96(T)/Dyce Drive Roundabout	46
Figure 5.11 : Segregated Left Turn Lane	47
Figure 5.12 : AWPR Proposal – Local Area Network	48
Figure 5.13 : Proposed AWPR Junction at Dyce Drive/A96	49
Figure 5.14 : AWPR Junction Layout with Minor Revisions	50
Figure 5.15 : AWPR Junction with SIAS Revisions	51
Figure 5.16 : Segregated Left Turn Plus Partial Signalisation of A96(T)/Dyce Drive Roundabout	52
Figure 6.1 : Journey Time Comparison Routes	57
Figure 6.2 : A96(T) – Aberdeen Airport Average Journey Time Comparison - AM Peak Period	70
Figure 6.3 : Aberdeen Airport – A96(T) Average Journey Time Comparison - PM Peak Period	70

Figure 7.1 : PM Peak Hour Turning Counts at A96(T)/Dyce Drive Roundabout (vehs/hr) 73
Figure 7.2 : Test 13 74
Figure 7.3 : Test 14 75
Figure 7.4 : Journey Time Comparison 77
Figure 8.1 : Cost Comparison Details 79
Figure A.1 : Kilmartin Development Location Plan 92
Figure A.2 : Site Layout Plan 94
Figure A.3 : Proposed Access Junction at Dyce Drive/Wellheads Drive 95
Figure A.4 : Kilmartin Trip Distribution 97
Figure A.5 : AM Peak Hour (07:00 – 08:00) Traffic Through Proposed Roundabout at Dyce Drive/Wellheads Drive 98
Figure A.6 : PM Peak Hour (16:00 – 17:00) Traffic Through Proposed Roundabout at Dyce Drive/Wellheads Drive 98
Figure A.7 : Test 11 - Kilmartin Access Roundabout incorporating Test 4 99
Figure A.8 : Segregated Left Turn Lane at A96(T)/Dyce Drive Roundabout 100
Figure A.9 : AM Peak Period Journey Time Comparison 105
Figure A.10 : PM Peak Period Journey Time Comparison 105

DYCE DRIVE/ARGYLL ROAD STUDY

TABLES :

	Page
Table 2.1 : Percentage of Journeys to Aberdeen Airport by Postcode in 2005	5
Table 2.2 : Peak Period Bus Route Operation to and from Aberdeen Airport (Winter 2007/2008)	8
Table 2.3 : Rail Services to Dyce Station	10
Table 2.4 : Indicative Criteria for Acceptable Walking Distance (STAG Table 10.2)	12
Table 5.1 : Option Compliance with Key Objectives	35
Table 5.2 : Options For Further Consideration	53
Table 6.1 : Option Testing Matrix	55
Table 6.2 : Journey Times for Comparison	56
Table 6.3 : Test 1 Journey Time Comparison – Cars and Taxis	58
Table 6.4 : Test 1 Journey Time Comparison – Buses	59
Table 6.5 : Test 2 Journey Time Comparison – Cars and Taxis	60
Table 6.6 : Test 2 Journey Time Comparison – Buses	60
Table 6.7 : Test 3 Journey Time Comparison – Cars and Taxis	61
Table 6.8 : Test 3 Journey Time Comparison – Buses	61
Table 6.9 : Test 4 Journey Time Comparison – Cars and Taxis	62
Table 6.10 : Test 4 Journey Time Comparison – Buses	63
Table 6.11 : Test 5 Journey Time Comparison – Cars and Taxis	64
Table 6.12 : Test 5 Journey Time Comparison – Buses	64
Table 6.13 : Test 6 Journey Time Comparison – Cars and Taxis	65
Table 6.14 : Test 6 Journey Time Comparison – Buses	65
Table 6.15 : Test 7 Journey Time Comparison – Cars and Taxis	66
Table 6.16 : Test 7 Journey Time Comparison – Buses	66
Table 6.17 : Test 8 Journey Time Comparison – Cars and Taxis	67
Table 6.18 : Test 8 Journey Time Comparison – Buses	67
Table 6.19 : Test 9 Journey Time Comparison – Cars and Taxis	68
Table 6.20 : Test 9 Journey Time Comparison – Buses	68
Table 6.21 : Test 10 Journey Time Comparison – Cars and Taxis	69
Table 6.22 : Test 10 Journey Time Comparison – Buses	69
Table 7.1 : Journey Time Comparisons	76
Table 8.1 : Proposed Phasing of Improvement Options	80
Table 8.2 : Estimated Construction Period	81

Table 10.1 : Option Compatibility with Stated Objectives 88
Table A.2 : Kilmartin Development Proposal Trips 96
Table A.3 : Journey Time Comparison Routes 101
Table A.4 : Journey Time Comparison 102
Table A.5 : Test 11 (Test 4 + Kilmartin Access Junction) – Journey Time Comparison 103
Table A.6 : Test 12 (Test 6 + Kilmartin Access Junction) – Journey Time Comparison 104

1 INTRODUCTION

1.1 Purpose of Report

This report is the culmination of a study undertaken by SIAS Limited (SIAS) on behalf of a client group comprising Aberdeen City Council (ACC), Nestrans and BAA Aberdeen. The study focuses on access to Aberdeen Airport in particular, and the Dyce Drive area from Kirkhill up to and including the A96(T). This study follows on from various pieces of work previously undertaken by BAA Aberdeen in preparing a surface access strategy for Aberdeen Airport.

This study includes an assessment of the existing transport infrastructure in the Dyce Drive area and aims to identify improvement measures which can be reasonably implemented in the immediate to short term. This report summarises the work undertaken by SIAS and draws conclusions based on SIAS's and the Client Group's experience and engineering judgement.

An S-Paramics microsimulation model was developed to assist in the assessment of potential options. This was AM and PM peak period model developed using traffic data collected on 2 Tuesdays in Autumn 2007.

A range of options have been developed by SIAS through close liaison with the Client Group and following a Stakeholder consultation exercise. These options have been prepared for implementation in the immediate/short term, with due cognisance of the medium and longer term Aberdeen Western Peripheral Route (AWPR) proposals. Other documents including *Aberdeen City Council Local Plan* and the *BAA (Aberdeen) Master Plan* have also been reviewed. An incremental approach to the introduction of improvement measures has been considered.

There is an aspiration to improve access for public transport and introduce bus priority at the junction of Argyll Road with Dyce Drive, particularly for vehicles exiting the airport. Proposals to introduce bus priority at this junction should be integrated in any identified junction improvements. Consideration of access to the airport by all modes must be accommodated in the study, with particular reference given to sustainable accessibility and public transport, pedestrian and cycle movements, with safety given a high priority.

The study area extends over the length of Dyce Drive between the A96(T) and Kirkhill Road to include the junctions of Wellheads Drive, A96 (T) and Dyce Avenue, recognising the importance of Dyce Drive and its position within the roads hierarchy serving the North East. SIAS has also considered the impact on the immediate junctions at Wellheads Drive, A96 (T) and Dyce Avenue through the provision of mitigation where problems have been predicted for these junctions.

This final version of the report takes cognisance of comments received from the Client Group on the draft report (SIAS Ref. TPATCAAS/69177).

1.2 Core Aims

The core aims of the study were set out in SIAS's proposal (Ref. 68192) and can be described as follows:

- Maintain and improve the transportation network around Argyll Road and Dyce Drive to ensure Aberdeen Airport continues to contribute to the vibrancy and economic wellbeing of the City through improved transport connections in the immediate/short term

- Maintain and improve, where possible, the accessibility and safety of sustainable modes of transport to and around the immediate areas of Argyll Road and Dyce Drive in particular considering public transport, cyclists and pedestrians
- Ensure options considered are future proof and are complementary to the future aspirations for the area taking cognisance of the AWPR, the Aberdeen Master Plan and the City Council Local Plan

In addition to the core aims, every effort has been made to ensure that any options identified are implementable based on the following criteria:

- Achievable in the immediate to short term
- Technically possible
- Operationally beneficial over the short term
- Financially viable
- Will be acceptable to the public
- Complementary to future schemes

For the purpose of the study, the immediate/short term is based on the initial date of commissioning of the study in 2007 up to the end of 2009. The original brief identified that only immediate/short term options were to be considered, as such, medium term development growth would not require to be accounted for in seeking these short term solutions.

1.3 Additional Modelling

Following on from the main body of work, SIAS was requested to undertake 2 smaller pieces of investigation. These were:

- Testing of a potential roundabout junction at Dyce Drive/Wellheads Drive to accommodate any future development access at that location (See Appendix A)
- Testing of lane re-allocation options on the Dyce Drive approach to the A96(T) roundabout with a view to providing an immediate and positive impact on southbound queues, particularly during the PM peak period.

1.4 Methodology

The methodology adopted during the study is consistent with a *STAG* process in that it was objective led and identified the key problems and issues occurring in the study area prior to identifying solutions. SIAS Ref. TPATCAAS/68372 sets out the tasks originally agreed by the Client Group and forms the framework of this report. Tasks for the subsequent testing as described at 1.3, are detailed in SIAS Proposal Ref. TPATCAAS/69228 and SIAS Ref. TPATCAAS/69562.

2 ANALYSIS OF PRESENT AND FUTURE PROBLEMS AND ISSUES

2.1 Introduction

An inception meeting was held between SIAS and the Client Group on Wednesday 19 September 2007. This was attended by senior transportation engineering staff from Aberdeen City Council, a representative from Nestrans and the Head of Customer Services of BAA Aberdeen. The meeting provided an opportunity for all parties to set out their particular aspirations for the immediate/short term future of transport to and from Aberdeen Airport and Dyce Drive. It also provided an opportunity to inform the SIAS study team of views on existing problems and issues.

2.2 Background

Aberdeen Airport is a major asset for the City of Aberdeen and the North East providing an important transportation hub and link both nationally and world-wide. The airport contributes greatly to the vibrancy and economic wellbeing of Aberdeen City and Aberdeenshire but at present is considered to suffer at peak times from poor access to the principal road network.

The existing principal road network of the A96(T), Dyce Drive and Wellheads Drive is heavily congested in the peak periods and access to the airport from Argyll Road suffers as a direct result. The most significant delays are noted to occur in the evening peak for traffic exiting the airport, with extensive delays occurring on a regular basis.

The Airport Authority has an aspiration to improve the access arrangements to the wider network and provide, where reasonably possible, improved access for public transport, as outlined in the recently published Master Plan by BAA (Aberdeen).

Major development opportunities in the area are identified in Aberdeen City Council's Local Plan, with a number of planning applications already lodged.

The existing signal controlled junction of Dyce Drive with Argyll Road operates at capacity in the peak periods. The signalised junction is linked to the UTC and has enhanced performance controlled through MOVA and integrated bus priority through PRISM. While Argyll Road is the main access to the airport terminal, Dyce Drive is a primary distributor and provides access to the extensive surrounding industrial area and the wider primary network.

The proposed Aberdeen Western Peripheral Route (AWPR) is anticipated to be opened in 2012 and will have implications for traffic flows and distribution in Dyce and surrounding areas.

2.3 Geographical Context

Aberdeen Airport is located 10km northwest of Aberdeen City Centre. It comprises 215 hectares including the airside, terminal building, parking and ancillary facilities. It is bounded to the east by the town of Dyce. The residential areas of Bankhead and Bucksburn form the southern boundary. Kirkhill Industrial estate forms the western boundary while the northern edge of the site is bounded by open farmland. The Aberdeen to Inverness railway line also runs through Dyce providing further restriction to traffic movements and potential development.

The main terminal building is located on Brent Road while the heliport is located on Forties Road. Both terminals have access to the airside areas.

Aberdeen Airport is northeast Scotland's main air gateway providing links to the rest of the United Kingdom and to Europe. The airport provides fixed wing and helicopter services to the off-shore oil and gas fields. The heliport is the busiest of its kind in Europe.

2.4 Social Context

In 2004 the population of Aberdeen City was estimated at 204,000 and the population of Aberdeenshire 233,000. There has been a population movement from Aberdeen City to Aberdeenshire, especially for families.

Projections from the General Register Office for the years 2004-2024 indicate that population changes could be as follows:

- Aberdeen City -23%
- Aberdeenshire +8%

The Structure Plan & Local Plans aim for planned expansion of the North East along development corridors, to maintain vitality of the city and region over the coming years.

In a recent study *Long Distance Commuting in Scotland*, Scottish Executive, July 2006, it was found that Aberdeenshire had the highest level of long distance out-commuters relative to its population in Scotland. Long distance commuters were classed as those making a journey greater than 15km in distance from home to work.

2.5 Economic Context

Aberdeen is the Oil Capital of Europe and has become a centre of excellence in the oil and gas sector. The city and the surrounding area also has a strong reputation for producing fresh food, including fish and finished and processed goods. Raw materials and goods must be transported into the area to facilitate the manufacturing process. The importance of Aberdeen Airport to the economy of the north east of Scotland cannot be overstated.

In 2002 it was calculated that the airport supported 9,000 jobs across Scotland with 2,800 directly employed on-site. This is expected to rise to more than 3,000 in 2015 and 4,000 in 2030.

Business at the airport grew at an average rate of 2.6% per annum between 1995 and 2005. The volume of international passengers has grown by 11.7% per annum between 1995 and 2005 with a number of new routes becoming available in recent years.

Although the amount of air freight arriving and leaving the airport is small compared to the amount of surface freight transported from Aberdeen, the airport and the surrounding areas are the base for a number of warehousing and distribution outlets. More than 6,000 tonnes of freight passed through the airport in 2005 and this is predicted to rise to nearly 9,000 tonnes per year in 2030.

Aberdeen airport provides the main aviation link from the north east of Scotland to the southern United Kingdom with 60% of domestic fixed wing passengers (1 million passengers) destined for London Heathrow, Gatwick or Luton. The split of passengers is approximately 55:45 in favour of business users. As a result, the annual profile of passenger numbers is flatter than airports such as Glasgow which have a greater dependency on holiday charter flights in the summer months.

Table 2.1 illustrates the origins of people travelling to fly from Aberdeen Airport.

Table 2.1 : Percentage of Journeys to Aberdeen Airport by Postcode in 2005

Postcode Area		Percentage of trips to Aberdeen Airport
AB	Aberdeen	87.5%
IV	Inverness	4.1%
DD	Dundee	3.8%
G	Glasgow	1.9%
EH	Edinburgh	1.3%
PH	Perth	0.5%
KY	Fife	0.2%
KW	Kirkwall	0.2%
PA	Paisley	0.1%
FK	Falkirk	0.1%
ML	Motherwell	0.1%
KA	Kilmarnock	0.1%
Postcodes outside Scotland		0.1%
		100.0%

2.6 Strategic Road Network

The A90(T) from Perth to Peterhead and A96(T) from Aberdeen to Inverness are the primary strategic routes associated with access to Aberdeen Airport. These routes currently experience traffic congestion difficulties at their main interchanges with each other (Haudagain) and also with other primary routes in the area. The implementation of the Aberdeen Western peripheral Route (AWPR) will reduce congestion and improve strategic journey times. Figure 2.1 shows the overall route of the AWPR as currently proposed.

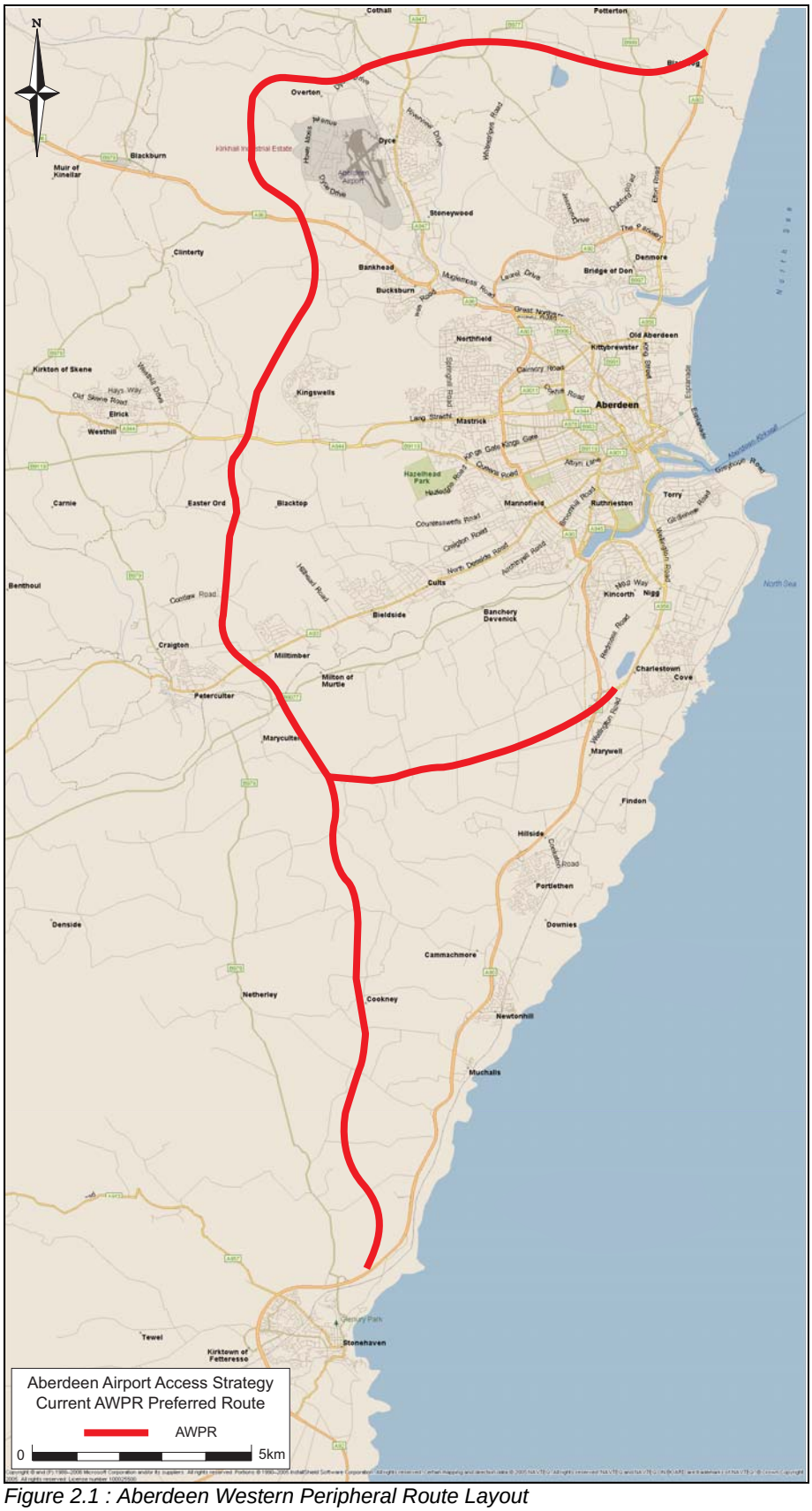

Figure 2.1 : Aberdeen Western Peripheral Route Layout

2.7 Local Road Network

Dyce Drive is the main connection to the Airport between the strategic routes (A96(T) and A90(T)) and is currently under significant pressure due to the volume of traffic using it each day. There is significant congestion on Dyce Drive during the AM and PM peak periods which impacts on the A96(T) and other local roads, such as Wellheads Drive and Argyll Road. Figure 2.2 shows the local road network.

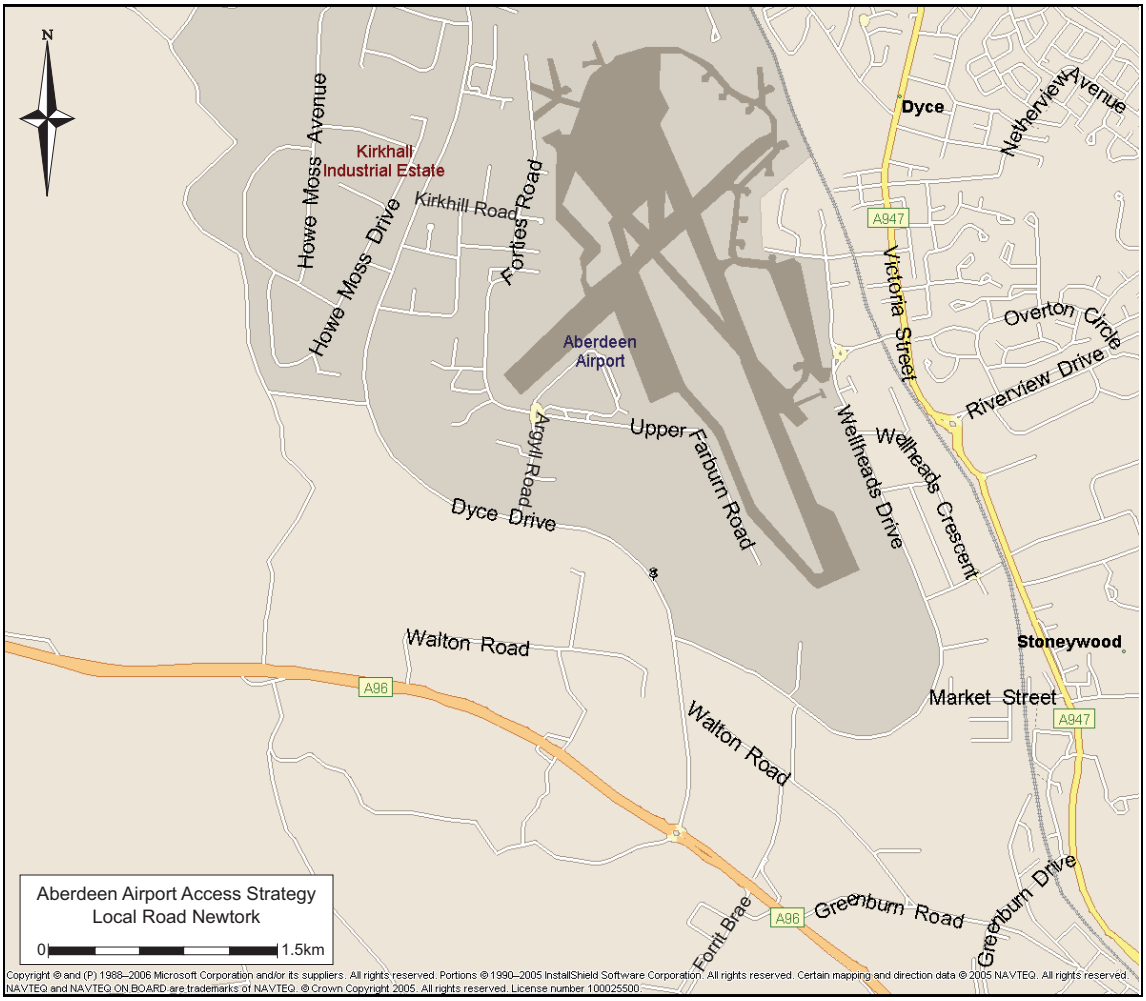

Figure 2.2 : Local Road Network

The congestion currently experienced by southbound drivers on Dyce Drive in the PM peak period can result in rat running through roads owned and maintained by BAA Aberdeen in its role as Roads Authority, namely Forties Road and Argyll Road. The volume of southbound traffic in the PM peak hour can also have significant impact on traffic exiting Wellheads Industrial Estate via Wellheads Drive onto Dyce Drive and the A96(T).

In the AM peak period, there is evidence of rat running through the side roads to the south of the A96(T) by Aberdeen bound traffic in order to avoid the significant delays on the trunk road approach to the roundabout at Dyce Drive. Eastbound congestion is considered to be the result of the heavy right turn from the A96(T) to Dyce Drive from Aberdeen, which effectively cuts off through traffic on the A96(T) from the west. Congestion at the junction between Dyce Drive and Wellheads Drive can also impact on the performance of the A96(T)/Dyce Drive Roundabout in the AM peak period.

Aside from the sheer volume of traffic travelling to the area every day, there are a number of factors which affect the level of congestion on the local road network. These include shift patterns for employees at Aberdeen Airport and Kirkhill Industrial Estate and existing junctions operating at capacity.

2.8 Public Transport

2.8.1 General

It has emerged from the Stakeholder Consultation process that public transport links to Aberdeen Airport are currently poorly perceived. This can be partially attributed to the delays to bus services during peak periods as a result of ongoing congestion issues. The limited number of destinations served by the current bus services and the lack of a direct link to the railway station at Dyce also contribute to poor public perception.

2.8.2 Buses

At the time of undertaking the research for this exercise (September 2007 – March 2008), there were 2 main bus operators with services to and from Aberdeen Airport. Stagecoach Bluebird (SC) services 10, 22 and 307 called at the airport as part of a longer journey either to Inverness, Inverurie or Alford. Service 747 was operated by Bains Coaches between Peterhead and the airport. Service 777 was also operated by Bains Coaches, between Old Meldrum and Dyce Industrial Estate in the AM peak period and in the opposite direction in the PM peak period.

Service 224 was operated between Kintore and Aberdeen Bus Station by Stagecoach Bluebird, but only called at Aberdeen Airport once in the AM peak period and not at all during the PM peak period.

Service 27 operated by First Aberdeen (FA) ran between central Aberdeen and the airport only. Table 2.2 show details of the bus services calling at the airport during winter 2007/2008.

Table 2.2 : Peak Period Bus Route Operation to and from Aberdeen Airport (Winter 2007/2008)

			Services in Peak Period	
			AM	PM
Service	Direction	Operator	(06:00 - 09:00)	(16:00 - 19:00)
10	Aberdeen to Inverness	SC	2	2
	Inverness to Aberdeen	SC	2	3
27	Guild Street to Airport	FA	4	3
	Airport to Guild Street	FA	3	2
220/224	Aberdeen to Alford	SC	3	1
	Alford to Aberdeen	SC	2	2
307/737	Aberdeen to Inverurie	SC	4	4
	Inverurie to Aberdeen	SC	4	3
747	Aberdeen Airport to Peterhead	SC	1	1
777	Old Meldrum to Dyce Ind Est	Bains	3	1
	Dyce Ind Est to Old Meldrum	Bains	0	3

Table 2.2 shows that there were 11 services into Aberdeen from the airport in the AM peak period (06:00 – 09:00) and 10 services in the PM peak period (16:00 – 19:00). There were 13 services from Aberdeen to the airport in the AM peak and 10 services in the PM peak period. Figure 2.3 shows the routes of the bus services calling at Aberdeen Airport during winter 2007/2008.

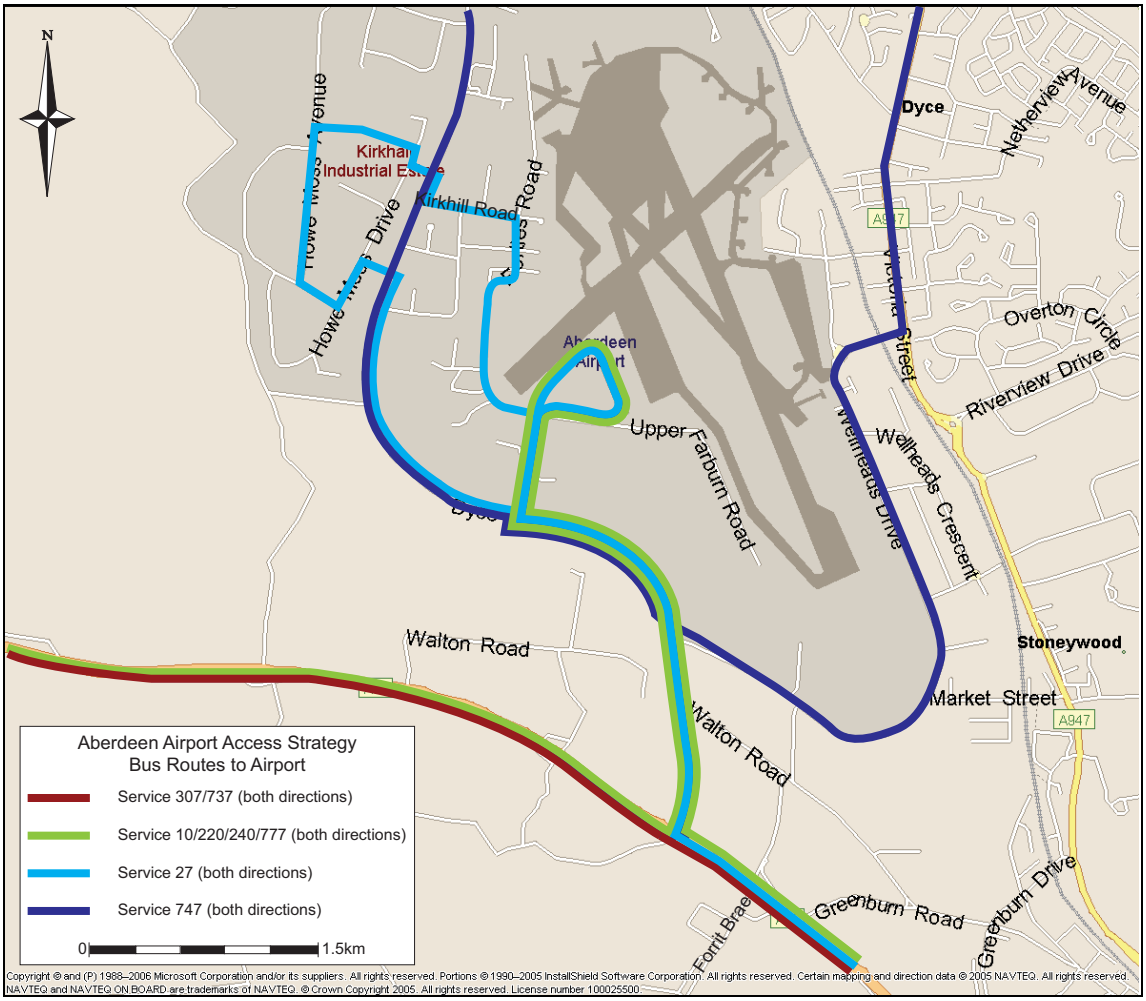

Figure 2.3 : Bus Routes to Aberdeen Airport

There is anecdotal evidence that bus services are badly affected by congestion during peak periods and have, in some instances, chosen not to visit the airport on the course of their journey. The timetables for services 10, 220, 307 & 737 were revised on 26th May 2008. This resulted in fewer buses operating via the airport in peak periods. Stagecoach Bluebird has confirmed that this decision was based on peak period reliability. This would seem to confirm the view that greater confidence in the reliability of bus services is essential to improving their modal share.

2.8.3 Trains

Although most rail services from Glasgow and Edinburgh terminate at Aberdeen, some go on to terminate at Dyce Railway Station which lies on the Aberdeen to Inverness line. The station itself is unmanned, but passengers can purchase tickets once boarded. Table 2.3 summarises the rail services available from Dyce.

Table 2.3 : Rail Services to Dyce Station

Line	Route	Time of First Service Arrive/Depart into Dyce	Approximate Frequency (mins)
Express East	Edinburgh - Dyce	09:57	60mins
Express East	Dyce - Edinburgh	07:02	60mins
Express North	Inverness - Dyce	08:42	60mins
Express North	Aberdeen - Dyce	06:37	60mins
Express West	Glasgow - Dyce	05:55	60mins
Express West	Dyce - Glasgow	06:50	60mins

SIAS understands that alterations to timetables on Express East services south of Aberdeen are being considered, which could lead to an increase in the number of services which continue beyond Aberdeen and call at Dyce and Inverurie. It is also understood that Nestrans is considering the introduction of a shuttle bus between the railway station and the Airport. BAA Aberdeen is committed to assisting in the initial funding of such a venture.

2.9 Vehicular Access

Providing vehicular access to the airport and Kirkhill Industrial Estate remains essential to ensuring continuing economic growth in the area. Annual passenger forecasts suggest that movements at Aberdeen will continue to grow by 2.3% (central growth) per year to 2030. This equates to a rise from 2.87 million passengers per year in 2005 to 5.1 million passengers per year in 2030. Ongoing development in Kirkhill Industrial Estate, such as on Dyce Avenue, combined with future development as set out in the Dyce Drive Planning Brief will result in additional journeys on Dyce Drive.

The primary mode of access to Aberdeen Airport and the surrounding area is by private car. Despite moves to achieve a modal shift away from single occupancy car journeys toward more sustainable modes, it is likely that the private car will remain the dominant mode in the short to medium term. Additional development will increase the pressure on existing and future infrastructure.

Access to, and egress from the airport and Kirkhill Industrial Estate is currently subject to significant congestion during peak periods.

2.10 Travel Choices

The A96(T) and Dyce Drive at Aberdeen Airport and Kirkhill Industrial Estate currently serve a variety of transport users:

- Strategic long distance users including freight and commuters
- Commuters from Aberdeen to the airport and Kirkhill Industrial Estate
- Commuters from Inverurie and the west to the airport and Kirkhill Industrial Estate
- Commuters from Inverurie and the west into Aberdeen
- Business travellers to Aberdeen Airport
- Leisure travellers to Aberdeen Airport
- Access to Overton and north Dyce

Due to the dispersed nature of people travelling to work at Aberdeen Airport and Kirkhill Industrial Estate, it is perhaps understandable that the primary mode of travel to work is the car. Aberdeenshire is a rural area with many small towns and villages and does not enjoy the same level of public transport provision as Aberdeen City.

The main modes of travelling to work in Scotland, Aberdeen City and Aberdeenshire are shown in Figure 2.4. There is a marked difference in the number travelling to work and study by bus or by walking between Aberdeen City and Aberdeenshire. Aberdeen City has a greater percentage of people working from home which reduces the need to travel for that sector of the population.

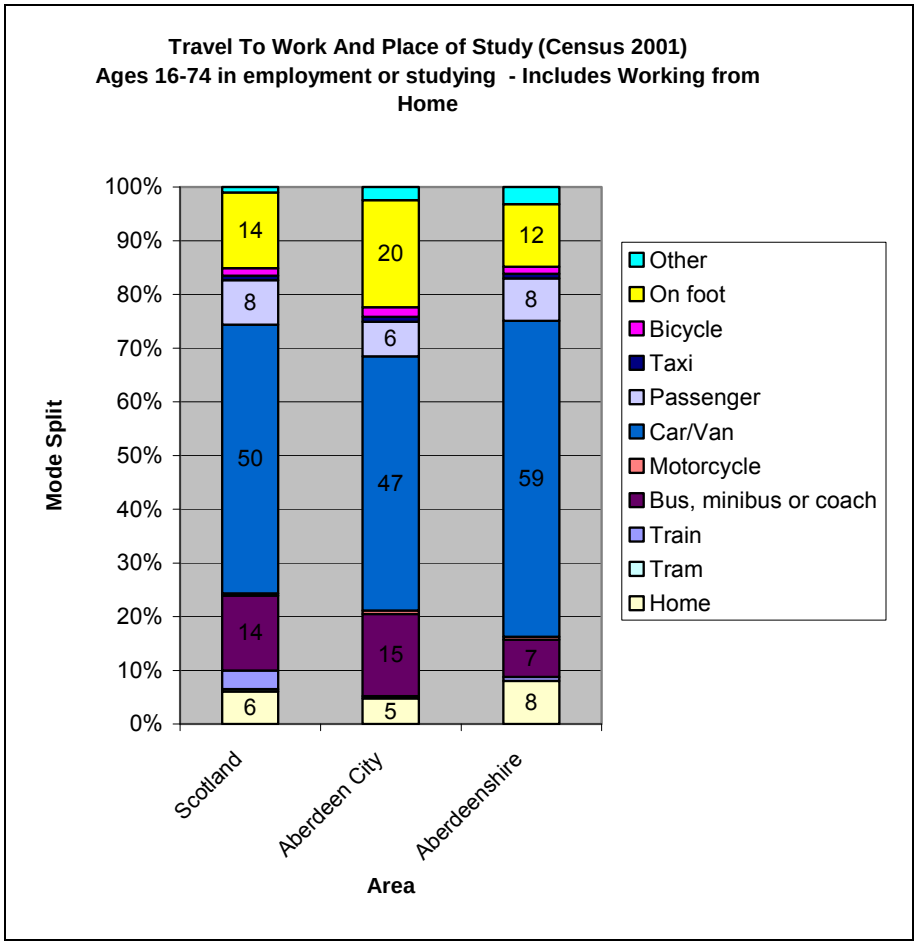

Figure 2.4 : Main Modes of Travelling to Work or Study

2.11 Pedestrian Access

There are existing footpath links between Dyce and the airport (via Wellheads Drive, Dyce Drive and Argyll Road) and beyond to the Kirkhill Forest area to the west, but footpaths in these areas are primarily used for recreational and leisure purposes.

Scottish Transport Appraisal Guidance (*STAG*) suggests that the walking times and distances in Table 2.4are generally acceptable.

Table 2.4 : Indicative Criteria for Acceptable Walking Distance (STAG Table 10.2)

Aspect of Travel	Time and (Distance)	
Walking to facilities	20 mins	(1.4 - 1.6kms)
Walking to bus stop (urban)	5 mins	(300 - 500 metres)
Walking to bus stop (rural)	10 mins	(600 - 1000 metres)
Walking to railway station	10 mins	(600 - 1000 metres)

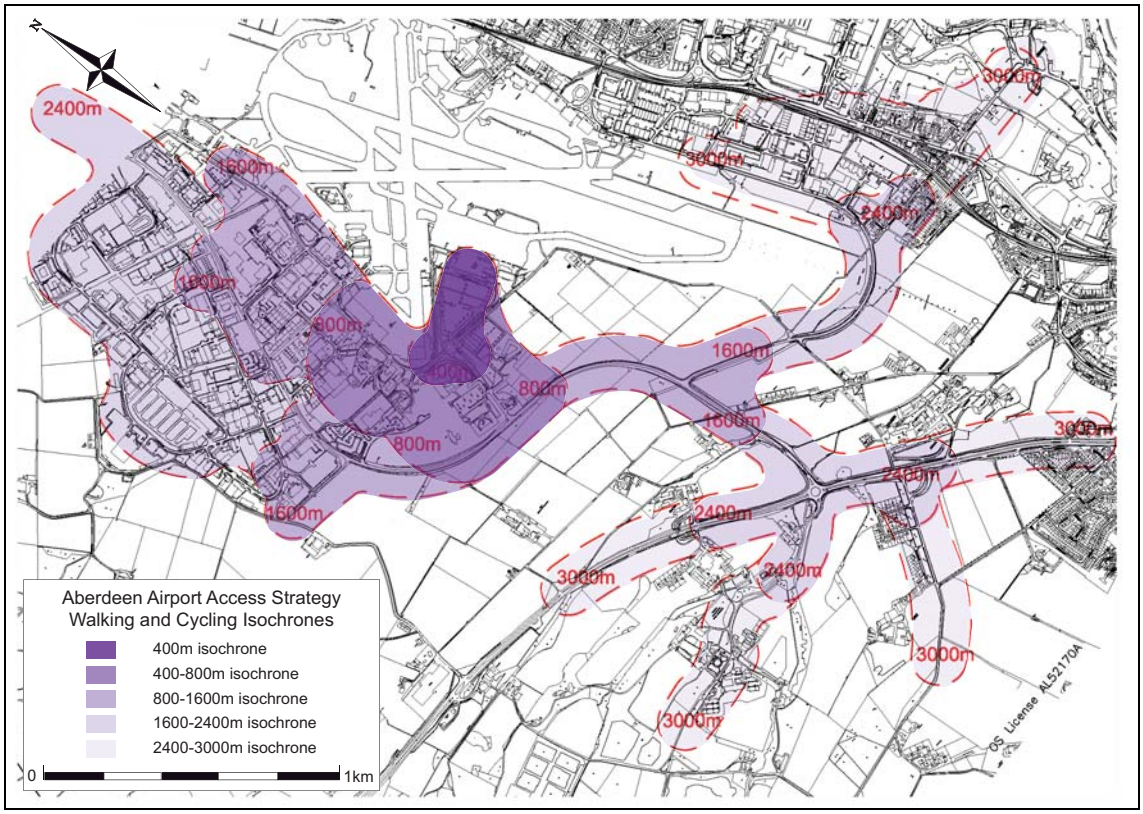

Figure 2.5 : Walking Distance Isochrones

Figure 2.5 demonstrates that the airport is outwith normal walking distances for all areas except the Kirkhill industrial area. It is understood that some employees do walk from the Dyce area, but these are likely to be the exception rather than the rule.

2.12 Cycling Access

STAG states that '*For cycling thresholds and times the distances will be typically two or three times the values for walkers.*' (*STAG* 10.6.5) This puts the airport and Kirkhill area within reasonable cycling distance of Dyce. It is also noted that there is anecdotal evidence of cyclists travelling from the Kingswell area.

Safety is a major consideration in the promotion of cycling, particularly to those who do not already cycle on a regular basis. New cyclists are believed to prefer vehicle free routes and a minimum of conflict with motorised vehicles. The existing footpath/cycleway on Dyce Drive could be considered to meet this criterion, although it does have limitations such as the positioning of lighting columns, etc.

2.13 Bus Service Accessibility

Accessibility to bus services with high frequencies is markedly different between Aberdeenshire and Aberdeen City as shown in household survey results in Figure 2.6.

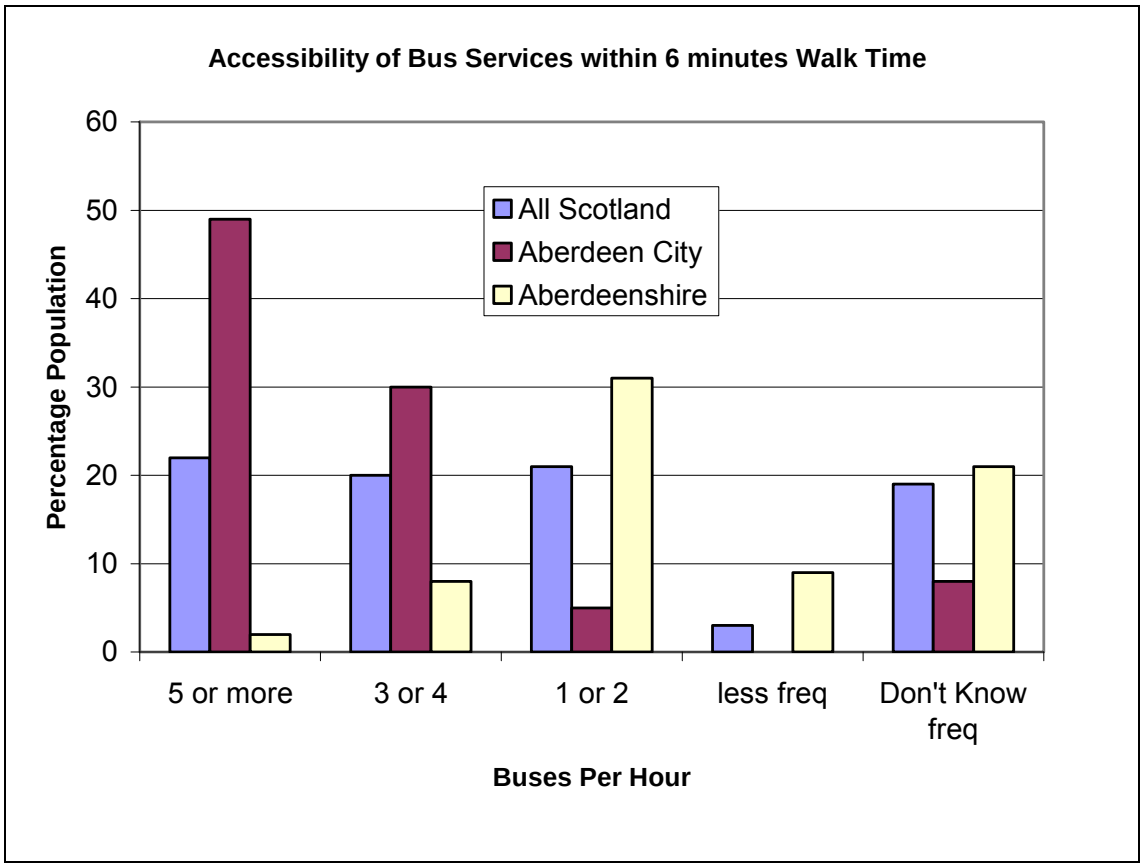

Figure 2.6 : Accessibility of Bus Services

2.14 Taxis

The number of taxis using Dyce Drive during the peak hours has been calculated from traffic survey information collected on Tuesday 2 October 2007 and Tuesday 6 November 2007 and is shown in Figure 2.7.

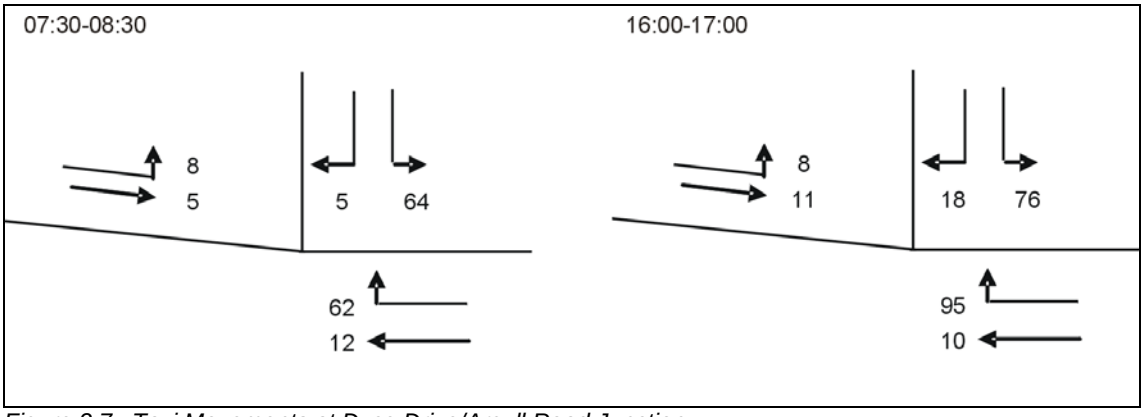

Figure 2.7 : Taxi Movements at Dyce Drive/Argyll Road Junction

Figure 2.7 illustrates that there are a significant number of taxi journeys to and from the airport in both the AM and the PM peak hours with the main flows being the left turn out and right turn into Argyll Road.

2.15 Aberdeen Western Peripheral Route (AWPR)

AWPR is due to be in place by 2012. Although due cognisance has been paid to the medium and long term impact of the AWPR on travel patterns in the north east of Scotland, this report does not directly account for the AWPR proposals as they are unlikely to have any significant implications in the immediate to short term.

2.16 Airport Access Summary

Traffic congestion issues on Dyce Drive, Argyll Road and the A96(T) can primarily be attributed to the fact that, between them, the airport and Kirkhill Industrial Estate have high trip attraction rates drawing in nearly 6000 employees on a daily basis. Traffic flows are very tidal with significant flows entering Dyce Drive in the AM peak period and leaving in the PM peak period.

The area immediately around the airport and Kirkhill Industrial Estate has a limited residential population with the nearest settlement being at Dyce, approximately 3km to the east.

The existing issues will be further exacerbated if current planning applications for additional development in the area are successful.

The Client Group is looking for a package of short term measures which will alleviate some of the existing congestion, provide better public transport reliability and encourage a modal shift towards more sustainable modes of transport.

3 DOCUMENT REVIEW

3.1 Overview

SIAS has sought to gain a clearer understanding of the issues in and around Dyce Drive through examination of relevant documentation available in the public domain. The documents considered are either focussed directly on development at the airport and the surrounding area or have a wider connotation to matters relating to the AWPR and the A96(T).

A project inception meeting was held between Aberdeen City Council, BAA Aberdeen, Nestrans and SIAS staff in September 2007. SIAS was issued with copies of the following documents at that meeting:

- *Dyce Drive Planning Brief (Draft)*, Aberdeen City Council
- *Aberdeen Airport Master Plan*, BAA Aberdeen
- *Aberdeen Airport Surface Access Strategy (Draft)*, BAA Aberdeen

It was further agreed at the inception meeting that SIAS would be supplied with copies of land ownership plans and appendix plans from the *Aberdeen Airport Master Plan*.

The final version of *A Surface Access Strategy for Aberdeen Airport* was received by SIAS in May 2008.

3.2 Other Documents

SIAS has also reviewed *Aberdeen City Council Local Plan*, *Aberdeenshire Council Local Plan* and documents pertaining to the AWPR.

3.3 Dyce Drive Planning Brief

The *Dyce Drive Planning Brief* (*DDPB*), March 2004, was an update of the 1998 *Airport South-West Development Brief*. It was intended to provide guidance to potential developers and occupiers by setting out a clear planning framework for the 106 hectares of land to the southwest of Aberdeen Airport Terminal buildings.

DDPB makes reference to a wide range of current and superseded documents including *Grampian Structure Plan* (1997), *Aberdeen and Aberdeenshire Structure Plan 2001 – 2016* (December 2001), *Aberdeen Local Plan*, *SPP2 Economic Development* and The Government's 2003 White Paper *The Future of Air Transport*.

A shift in emphasis away from the strategies set out in the 1998 Development Brief and the Aberdeen Business Park Design Brief (published in February 2000) has come about as a result of the local and national government's commitment to the AWPR and identification of the potential for development within the Master Plan area, which would have high quality links to nearby transport infrastructure. Other influences on the Dyce Drive area include the implementation of a Park and Ride facility, the new Local Plan for Aberdeen and the need to encourage growth in accordance with Aberdeen City's Vision Statement and the North East Scotland Economic Forum's Economic Growth Strategy.

The DDPB contains a section on considerations specific to the airport and its continuing operational requirements. This highlights the fact that passenger throughput at the airport is set to increase by between 60% and 100% by 2030, following a relatively flat period of growth up

to 2004. An increase in passenger numbers will be at least partly dependant on the level of infrastructure investment necessary to increase the length of runway and other ancillary works for the latest generation of aircraft.

The DDPB identifies that there are ongoing traffic congestion issues relating to the A96(T) and Dyce Drive, while appreciating that the introduction of the AWPR will be beneficial to improving this situation.

It is also noted from the DDPB that airport development will be confined to land previously identified for that purpose and will not be permitted on land designated for other commercial development use.

3.4 Aberdeen Airport Master Plan (*AAMP*)

The Aberdeen Airport Master Plan (*AAMP*) was published in December 2006 by BAA Aberdeen. It was intended to set out "*the development strategy for the sustained and responsible growth of Aberdeen Airport to 2030*" and describes the proposed expansion of the operation as a whole in some detail up to 2015 with indicative proposals for the period to 2030.

The *AAMP* is a detailed planning document setting out in-depth predictions for expected growth in air travel from Aberdeen. It also covers the specific requirements of the airport infrastructure in order to meet the increased demand both from aviation and the broader transportation perspective.

The *AAMP* is a wide ranging document. It includes chapters on the social and economic benefits of aviation, regulations and legislation relating to aviation planning, current and future passenger levels, surface access by all modes of transport, current land use demands and predictions for 2015/2030. It also considers the airport's impact on the environment and the challenges that lie directly ahead for Aberdeen airport.

The social and economic benefits to the local area and to the wider community are described by:

- the number of people directly or indirectly employed at the airport
- the taxes and revenues that are paid to local government
- the inward investment resulting from a good air link to other parts of the UK and abroad
- incoming tourism
- travel opportunities for the people of the north east for business and pleasure purposes

The regulations and legislation controlling development at Aberdeen and all other airports in the United Kingdom are extensive. They range from Local Plans through to compliance with international standards governed in the UK by the Civil Aviation Authority (CAA). Other notable influences are the UK Airports Policy White Paper, National Planning Framework, Regional Planning Policy (North East Structure Plan) and local development control. In addition to all of the above, planning and development at and around airports is subject to stringent conditions relating to the safeguarding of aerodrome operations. This affects flight paths, visual obstructions and adjacent land uses. For example, wetlands or waste disposal sites attract high numbers of birds which are a significant threat to safe operation of airports.

Additionally, airport security, public safety zones, economic regulations and environmental regulations relating to noise pollution and air quality must also be considered as part of any planning process.

The *AAMP* contains extensive information on the existing airport including the history, form and scale of the terminal and ancillary buildings and the actual airfield. The level of facilities available to the public including shops, check-in desks and parking are described, as are the commercial facilities such as aircraft maintenance hangars, fuel storage, in-flight catering and car-hire.

Current passenger levels have been recorded and future year levels have been predicted based on high and low growth factors. It is expected that the helicopter operation will see reduced flight numbers as a result of the diminishing natural resources in the North Sea oil and gas sector. Fixed wing aircraft flights and associated passenger numbers are expected to increase to the year 2030. This will be possible if plans to increase the length of the runway and to build facilities for larger aircraft come to fruition. The *AAMP* recognises that an increase in passenger numbers will necessitate an upgrade in terminal facilities and car parking provision.

Similarly, air freight is expected to continue to grow in the period to 2030. Sustained growth will be possible through the upgrading of the airfield and ancillary buildings.

The *AAMP* highlights the need for an increase in short term parking to 2015 to cope with current demand from business users who park for up to 3 days. In the longer term, it is expected that leisure and holiday flights will increase and there will be an increased demand for longer term parking at, or near to, the site.

The *AAMP* recognises the importance of high quality surface access to the airport for all modes of transport. Reference is made to the *Airport Surface Access Strategy* (*ASAS*) report which is discussed in the following section and the targets it sets out for influencing modal split. Assessment of the existing surface access infrastructure demonstrates the airport's current reliance on the A96(T) and Dyce Drive. The impact of traffic congestion on Dyce Drive during peak hours is felt by all road based traffic; it particularly impacts on public transport and airport taxis – whose fares are based on a combination of journey time and distance.

The *AAMP* recognises the potential future benefits that could be derived from closer integration between all forms of travel. In particular, the *AAMP* makes reference to the proposed cross city rail link and potential improvements to the existing bus infrastructure. The airport's commitment to integrated travel planning is emphasised by reference to ongoing liaison with public transport operators, Dyce TMO, Aberdeen City Council and Nestrans.

Data collected by BAA Aberdeen and presented in the *AAMP* shows that the vast majority of journeys to the airport originate in the Aberdeen City or Shire area – 89.5% of passengers and 99.5% of employees. Modal splits for passengers and employees in the *AAMP* also demonstrate the current reliance on the private car in general and on single occupancy journeys in particular. This is somewhat inevitable given the dispersed nature of staff and employees who travel to the airport. The aim of reducing the most inefficient journeys such as 'kiss-and-fly' can be at least partially realised through improved public transport accessibility and an increase in long term parking capacity.

The importance of the AWPR to the airport area cannot be overstated. Along with the main route of the new road, new junctions and ancillary infrastructure will be constructed. This will result in major changes to the road network in the vicinity of Aberdeen Airport. The *AAMP* welcomes this as it will reduce journey times for staff, passengers and visitors to the area. It is

considered essential that any improvements to road infrastructure are matched with measures to lock in the benefits achieved.

It is intended that future access to the airport will be enhanced by providing more choice in travel planning.

The medium to long term future of the airport is also considered in the *AAMP*. It sets out the aims for continued and sustainable growth through responsible development, safeguarding and minimisation of impacts on the environment.

The last section of the document sets out the relationship between the *AAMP* and other related planning documents including Local Plans, National Planning Framework Reviews and the North East Scotland Structure Plan. It also states that the Master Plan is a living document and is reviewed on a 5 yearly basis to take account of any changes to development or planning conditions.

3.5 A Surface Access Strategy for Aberdeen Airport (2008 – 2012)

The final *Surface Access Strategy for Aberdeen Airport* (*SASAA*) was published in the spring of 2008 on behalf of BAA Aberdeen and sets out its 5 year strategy for surface access provision. It is "*the initial medium term tactical response to the surface access demand identified in the Master Plan*". The following is a summary of the final document and will require to be reviewed following publication of the final document which is due imminently.

The first part of the document includes a review of progress against targets set in the previous Airport Surface Access Strategy published in 2002. These were 3 main objectives and 36 specific targets. The main objectives were:

- To increase public transport usage from 4.5% to 7% by 2007. ASAS 2012 states that with an increase in public transport share to 6.7%, this objective is on target.
- To reduce single occupancy car journeys by staff from 87% to 77% by 2007. At the time of publication, ASAS 2012 states that a further staff survey will be undertaken in 2008 to confirm progression.
- To develop an integrated transport strategy. BAA Aberdeen has taken significant steps to address this and has worked with Dyce TMO, in what is an ongoing process and preparing a staff travel plan, providing increased on-site parking provision and various other small scale infrastructure.

The second part of SASAA (2008 – 2012) considers the current situation at the airport with respect to air passenger profile and characteristics and the travel options available to them. This section also contains detailed information on where passengers are travelling to and from, passenger growth and the split between domestic, international and heliport passengers. Section 2 also demonstrates the importance of local trips to the airport with 89.5% of passengers originating in Aberdeen City or Aberdeenshire – based on 2005 survey data. The travel profiles from the most common postcode areas are shown graphically in the SASAA (2008 – 2012) and are reproduced in Figure 3.1.

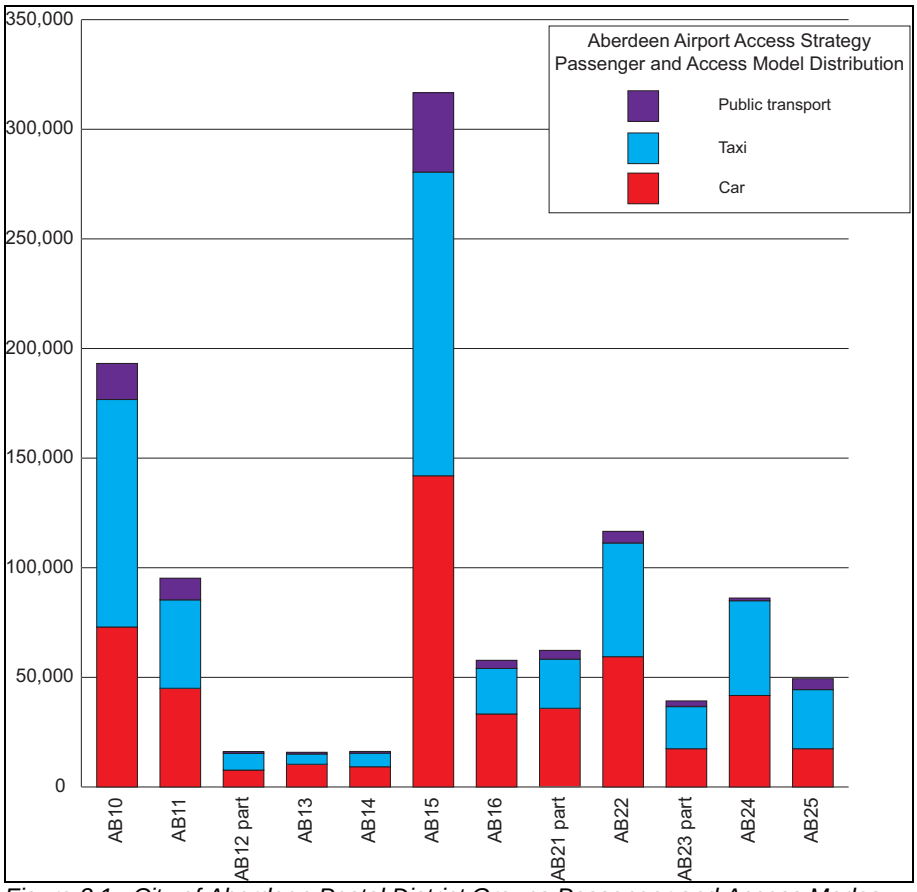

Figure 3.1 : City of Aberdeen Postal District Groups Passenger and Access Modes Distribution

Modal split data shows that overall 82% of passengers arrive at the airport by private car or taxi, with only 8% using public transport or other alternative modes. It is also shown that a significant proportion of trips are made by private cars which are then driven away, so called 'kiss and fly' trips. Together with 1-way taxi trips, these were found to be the most inefficient type of journeys in terms of vehicle miles per passenger (VM/P).

Staff surveys have found that approximately 2,750 people work at the airport either for BAA or any of the other companies such as airlines, handling agents, cleaning and catering staff, retailers and control authorities. Of all staff employed at the airport, 68% work on a shift pattern.

As with air passengers, the predominant mode of travel to the airport is by private car which accounts for 92% of staff (88% drivers + 4% passengers).

Parking for staff and visitors is provided both on and off the airport campus. In total, there are 1,051 short stay and 907 long stay spaces for visitors and 450 spaces for staff.

The external road network is highlighted in the SASAA (2008 – 2012) document as a local weakness with capacity demands from the airport and Kirkhill Industrial Estate leading to congestion in peak periods.

The third section of the SASAA (2008 – 2012) sets out the strategy for surface access for the period 2007 – 2012 including specific objectives and explores how these might be achieved.

Appendix C sets out 8 main targets and 13 actions designed to achieve them. The key objectives identified are:

- Influence surface access journeys and to increase public transport share
- Develop a bus transfer service between the airport and Dyce railway station
- Introduce public transport priority at the airport access and increase car parking for passengers
- Increase public transport modal share from 6.1% in 2007 to 10.5% by 2012
- Consider the implications of closure of Forties Road to non airport traffic

The SASAA (2008 – 2012) sets out how progress toward these over-arching objectives will be monitored including repeating the CAA passenger survey and employee passenger survey.

3.5.1 Structure Plan

North East Scotland Together, the Aberdeen & Aberdeenshire Structure Plan 2001-2006 was published in June 2002. The purpose of the document is to set out a shared strategic statement about the future use of land in the North East. In particular, it provides a long-term vision which takes into account the different functions of, and relationship between, settlements in the area. The new structure plan is currently being developed.

The plan provides the framework for improvements to the main road network such as the A90, A96 and A947. The outcome of such improvements must not run counter to the need to reduce travel, especially by car. Justification for improvements must be based on issues such as road safety, improving access for buses and freight vehicles, and making an overall positive contribution to the aim of a modern transport system.

The structure plan's vision is the development of a sustainable community in the North East that meets the needs of the present, without compromising the ability of future generations to meet their own needs. This will embrace the social and cultural identity of the North East in a way that improves its economic competitiveness and delivers prosperity and a high quality of life for everyone within a secure and well-managed environment.

Achieving this will be based firmly on 3 principles:

- Responsible management of natural, built and community resources
- Fairness in allocation of these resources between competing demands
- The need to benefit both existing and future generations

Structure Plan Transport policy principles are contained in Policy 30, 31, 32 and 33.

> ***POLICY 30: The Main Communications Network in the North East and Beyond***
>
> *Improvements to the main communications network must support the development framework, contribute to the modern transport system, and reflect the need to reduce travel, particularly by car.*
>
> *Aberdeenshire and Aberdeen City Councils will encourage the Strategic Rail Authority, Trunk Road Authority and other relevant agencies to improve rail, road, port, and pipeline and airport infrastructure both inside and outside the structure plan area. The local authorities will bid for funds and press other agencies to invest in transport infrastructure and services.*

POLICY 31: Connecting Communities in the North East

New developments and measures to manage transport infrastructure will help reduce the need to travel, particularly by car. Local plans and local transport strategies will also help realise this aim.

Development proposals:

- *will be well related to existing settlements and avoid dispersed patterns of development*
- *will be close to existing public transport services or deliver major improvements to public transport services*
- *together with the management of transport infrastructure, will maintain or enhance the vitality and viability of the economy, in particular Aberdeenshire town centres and Aberdeen city centre*
- *will give priority to proposals that increase the proportion of journeys by public transport, rail and sea freight, walking and cycling, and help reduce demand for private car travel*

POLICY 32: Transport Infrastructure: Safeguarding Land and Minimising Environmental Impacts

Land identified in local plans will be safeguarded for transport proposals that contribute to the modern transport system. The best practicable environmental option, not entailing excessive cost, will be required to mitigate the impacts of transport proposals. Development proposals that result in a breach of National Air Quality Standards will not be permitted.

POLICY 33: Sharing Responsibility for Transport

Developer contributions, secured by planning or legal agreement, will be required to mitigate any adverse effects of the travel patterns created by the development on the existing transport infrastructure or services, or the wider community. They should address any shortfalls in the choice of transport available to the development. There will be a presumption against development whose travel demands (identified in a transport assessment) will not be satisfied by:

- *proposed car park spaces up to the maximum number for the development*
- *existing or possible new public transport*
- *cycling, walking and other non-car measures*

3.6 Aberdeen City Council Local Plan

Green Spaces – New Places, the Aberdeen City Local Plan was published in August 2004 and is the means by which sustainable new communities will be delivered around Aberdeen over the next 5 years and beyond. At the heart of *Green Spaces – New Places* is a concept which suggests we are custodians of our important green spaces and valued areas, so that they can be enjoyed by future generations. It is vital that we provide the framework to satisfy the needs of the current generation, if Aberdeen is to continue to thrive as a city. The Public Local Inquiry into objections to the Finalised Aberdeen Local Plan took place between February and December 2006 and Reporters have made recommendations in respect of the objections received in late August 2007. Proposed modifications to the Local Plan are to be advertised and any objections received will be considered prior to formal adoption procedures.

The Local Plan vision is:

Successful cities embrace change in a positive and enlightened fashion and use it constructively. Aberdeen sits at the heart of a thriving city region and it is vital we

maintain and continue this. Aberdeen City Council is committed to the diversification of the city's economy and ensuring that Aberdeen is recognised as a 'Global Energy City'. The diversification of Aberdeen's economy requires that the city itself grows and this development is a strategic imperative. This is supported by our own efforts to create conditions in the city which will encourage the sustainable growth of prosperity and jobs.

Policy 74 of the Local Plan recognises the importance of the airport as a transport hub serving the region. Development on airport land is restricted to land uses related to airport activities. Public safety zones are to be maintained which will have presumptions against certain types of development in accordance with current government policy guidance.

3.7 Aberdeenshire Council Local Plan

Aberdeenshire Council's Local Plan makes only brief mention of potential development impact on Aberdeen Airport stating that there are exclusion zones for certain types of development within identified flight paths. This is in accordance with national planning policy guidance (*NPPG17*).

3.8 North East of Scotland Transport Partnership (Nestrans)

Nestrans is the regional transport partnership for north east Scotland and became a statutory regional transport partnership on 1st April 2006. Nestrans has developed a long-term Regional Transport Strategy (RTS) to 2021 which builds on the Modern Transport System.

The RTS has four key objectives:

- To enhance and exploit the north east's competitive economic advantages, and reduce the impacts of peripherality
- To enhance choice, accessibility and safety of transport, particularly for disadvantaged and vulnerable members of society and those living in areas where transport options are limited
- To conserve and enhance the north east's natural and built environment and heritage and reduce the effects of transport on climate and air quality
- To support transport integration and a strong, vibrant and dynamic city centre and town centres across the north-east

The Strategy is expressed through 3 sub strategies relating to improving external communications, internal connections and a strategic policy framework. In the internal communications strategy there are 10 separate elements, 1 of which is specifically related to Airport Surface Connections and aims to:

- encourage enhanced bus services to Aberdeen Airport to be detailed in the Bus Action Plan and Delivery Plan
- support a shuttle bus between Dyce station and the airport terminal
- in the longer term, explore the potential for Bus Rapid Transit or enhanced rail services to the airport, providing faster, more reliable journey times

3.9 Aberdeen City Local Transport Strategy

Aberdeen City Council produced a final draft of their Local Transport Strategy (LTS) 2008 – 2012 for consultation in November 2007. After analysis of the responses, a Final LTS was due

to be produced and presented to the City Council in Spring 2008 for approval and adoption. The approach to the transportation strategy is based on the following statement:

> *The development of a transport strategy in Aberdeen City will recognise the sustainability objective of preserving and enhancing our environmental quality for future generations. Through an emphasis on reducing car dependence and facilitating more environmentally-friendly forms of transport, strategies for sustainable transport in Aberdeen will aim to reconcile the various demands of society, the economy and the environment by:-*
>
> - *meeting the accessibility and safety needs of the community;*
> - *supporting economic activity and growth; and*
> - *minimising the local and global environmental and resource impacts of transport and providing environmental benefits where possible.*

The LTS has 5 key objectives:

- To take full account of the environmental, social and economic implications of transport
- To maximise accessibility for all to services and job opportunities
- To campaign for improved external links to Aberdeen by rail, sea, road and air
- To improve safety in transportation matters
- To ensure the efficient use of resources in accordance with the strategy

The final draft of the LTS recognises that Aberdeen Airport has experienced the fastest passenger growth of all Scottish airports in recent years and continues to play a vital role in the economic development of the region. The LTS is supportive of initiatives to facilitate continued growth and service improvement. Proposed extension of the existing runway is supported by the council who recognise the potential that such an initiative would have for attracting long haul flights to Aberdeen from locations with similar interests such as the Middle East and the USA.

The LTS recognises the work that has been done by BAA to deliver surface access provision for the period until 2012. Aberdeen Council will work with BAA, taxi operators and public transport bodies to increase the availability of alternatives to the private car. The LTS also notes that Dyce railway is underutilised as an intermediary point on trips to and from the airport. The Council is considering a dedicated bus service to link these 2 transport nodes.

3.10 National Policy

3.10.1 Scotland's Transport Future

The transport white paper, June 2004, emphasises the importance of all with a stake in transport working together to achieve common goals. It follows on from extensive consultation and sets out the Scottish Government's ambitions for improving the planning and delivery of transport at a local, regional and national level.

The Scottish Government vision is for:

> *An accessible Scotland with safe, integrated and reliable transport that supports economic growth, provides opportunities for all and is easy to use; a transport system that meets everyone's needs, respects our environment and contributes to health; services recognised internationally for quality, technology and innovation, and for effective and well-maintained networks; a culture where fewer short journeys are made*

by car, where we favour public transport, walking and cycling because they are safe and sustainable, where transport providers and planners respond to the changing needs of businesses, communities and users, and where one ticket will get you anywhere.

The overall aim is to promote economic growth, social inclusion, health and protection of our environment through a safe, integrated, effective and efficient transport system. The objectives are to:

- promote economic growth by building, enhancing, managing and maintaining transport services, infrastructure and networks to maximise their efficiency
- promote social inclusion by connecting remote and disadvantaged communities and increasing the accessibility of the transport network
- protect our environment and improve health by building and investing in public transport and other types of efficient and sustainable transport which minimise emissions and consumption of resources and energy
- improve safety of journeys by reducing accidents and enhancing the personal safety of pedestrians, drivers, passengers and staff
- improve integration by making journey planning and ticketing easier and working to ensure smooth connection between different forms of transport

3.10.2 Scottish Planning Policy *SPP17*

Planning for Transport, August 2005, states that land use planning has a key role in supporting the achievement of the Scottish Ministers' economic, environmental and social objectives. The national focus on transport is now on delivery of projects. Integration of land use and transport planning can play a positive role in supporting the Scottish Government's transport delivery agenda. For the transport network to support the economy most effectively, land use planning should assist in reducing the need to travel; in creating the right conditions for greater use of sustainable transport modes; and in avoiding or mitigating adverse environmental impacts.

The overall vision is of a Scotland where the economy can flourish and communities can function without significant environmental and social problems arising from car dependency, traffic congestion and pollution.

4 CONSULTATION

4.1 Introduction

This chapter describes the stakeholder consultation findings and key objectives.

4.2 Stakeholder Consultation

4.2.1 General

Following the inception meeting of 19 September 2007, it was agreed that SIAS would undertake a consultation exercise with organisations (stakeholders) who are closely involved in transportation matters in and around Aberdeen Airport and the adjacent Kirkhill Industrial Estate. This was designed to allow the stakeholders to express their opinions on what they consider the issues to be in relation to transportation in the local area.

4.2.2 Consultation Questionnaire Format

Following discussion of the format and content with the Client Group, Stakeholder Consultation questionnaires were issued to 17 stakeholder representatives on Thursday 27 September 2007. Stakeholders were initially requested to respond by post by Friday 5 October. Due to the subsequent period of industrial action by postal workers, many of the stakeholders were unable to meet that deadline. The latest response was received at SIAS's office at the end of March 2008.

The questionnaire was designed to determine what each of the stakeholder's prime concerns were regarding transport infrastructure in the vicinity of Dyce Drive and Aberdeen Airport. The questionnaire also invited comments from the stakeholders on how best to address their main causes for concern.

The questionnaire was split into 4 sections:

- Section 1 – Request for details of the stakeholders main concerns
- Section 2 – Stakeholders ranked a range of issues from low to high priority
- Section 3 – Stakeholders described any broader travel concerns to the area.
- Section 4 – Stakeholders were invited to submit possible options for consideration and to indicate their preferences for various strategies

Sections 1, 3 and 4 were open ended questions which invite the respondent to provide their own views on the section topic. Section 2 contained specific questions with only identifiable and controlled responses available.

4.2.3 Section 1 – Main Concerns

Please describe your main concerns on the current problems facing Dyce Drive between Dyce Avenue and the A96(T) detailing particular issues for public transport operation, pedestrian facilities and cyclist facilities.

As would be expected each group which responded had its own particular message to convey. This becomes apparent when the responses to Section 1 of the questionnaire are summarised, as shown in Figure 4.1.

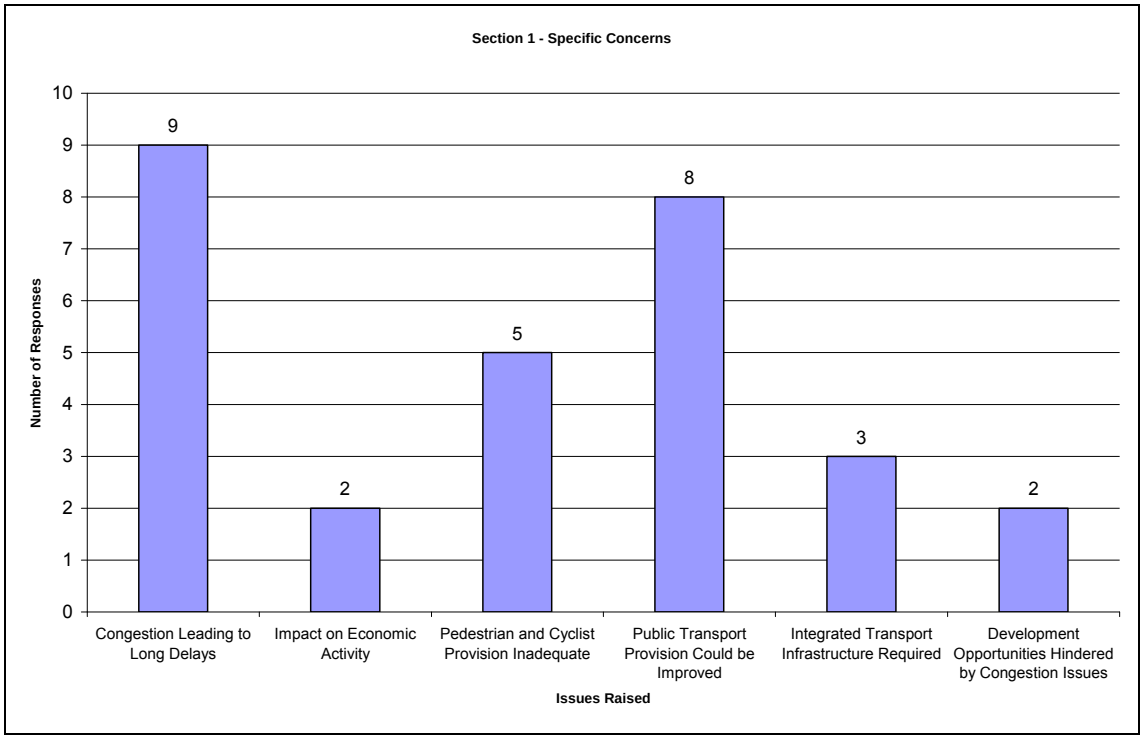

Figure 4.1 : Section 1 – Responses to Specific Concerns

Figure 4.1 shows that the main concerns raised by respondents were related to pubic transport provision and congestion leading to long delays and excessive journey times.

Non-motorised travel modes and the integration of transport modes were also considered important.

The impact of the existing traffic conditions on current economic activity and future development opportunities was also highlighted as a notable concern.

4.3 Section 2 – Prioritising Issues

What priority would you give the following issues when considering options for improving access/exit from the airport?

- Journey time savings (e.g. less delays)
- Increasing safety (e.g. less accidents)
- Encouraging cycling, walking and public transport (e.g. improve foot/cycle ways and bus access to bus lanes)
- Minimise impact on local community (e.g. keep walking routes)
- Complementing other development schemes (e.g. tie in with Dyce Master plan)
- Benefiting the economy (e.g. reduced travel time and costs to business)
- Complement other north east transport improvement proposals (e.g. Park & Rides and the Aberdeen Western Peripheral Route)
- Reduce environmental impact (e.g. ensure replacement tree planting as part of any option)
- Minimising disruption during construction (e.g. reducing diversions and delays)
- Cost of construction (e.g. minimising the cost to government/taxpayers)

The options available were, High Priority, Medium Priority, Low Priority and No Opinion

The responses to this section of the questionnaire were more quantifiable than the open question sections, as stakeholders were invited to rank the identified issues in terms of high, medium or low priority. As a result, the outcomes are perhaps more defined although there is a natural variation between the viewpoints of respondents.

The issues considered to be of *highest priority* by most respondents are:

- Encourage alternative modes of transport (83%)
- Benefit the local economy (83%)
- Ensure that any schemes complement other north east transport improvements (83%)
- Journey time savings (75%)
- Complement other development schemes (50%)

The issues considered to be of *medium priority* by most respondents are:

- The cost of construction (58%)
- Reducing environmental impact (50%)
- Minimising disruption during construction (50%)
- Increasing safety (42%)
- Minimising impact on the local community (42%)

The majority of the issues presented to stakeholders fell into the high or medium priority category.

Figure 4.2 summarises the priorities given to specific issues.

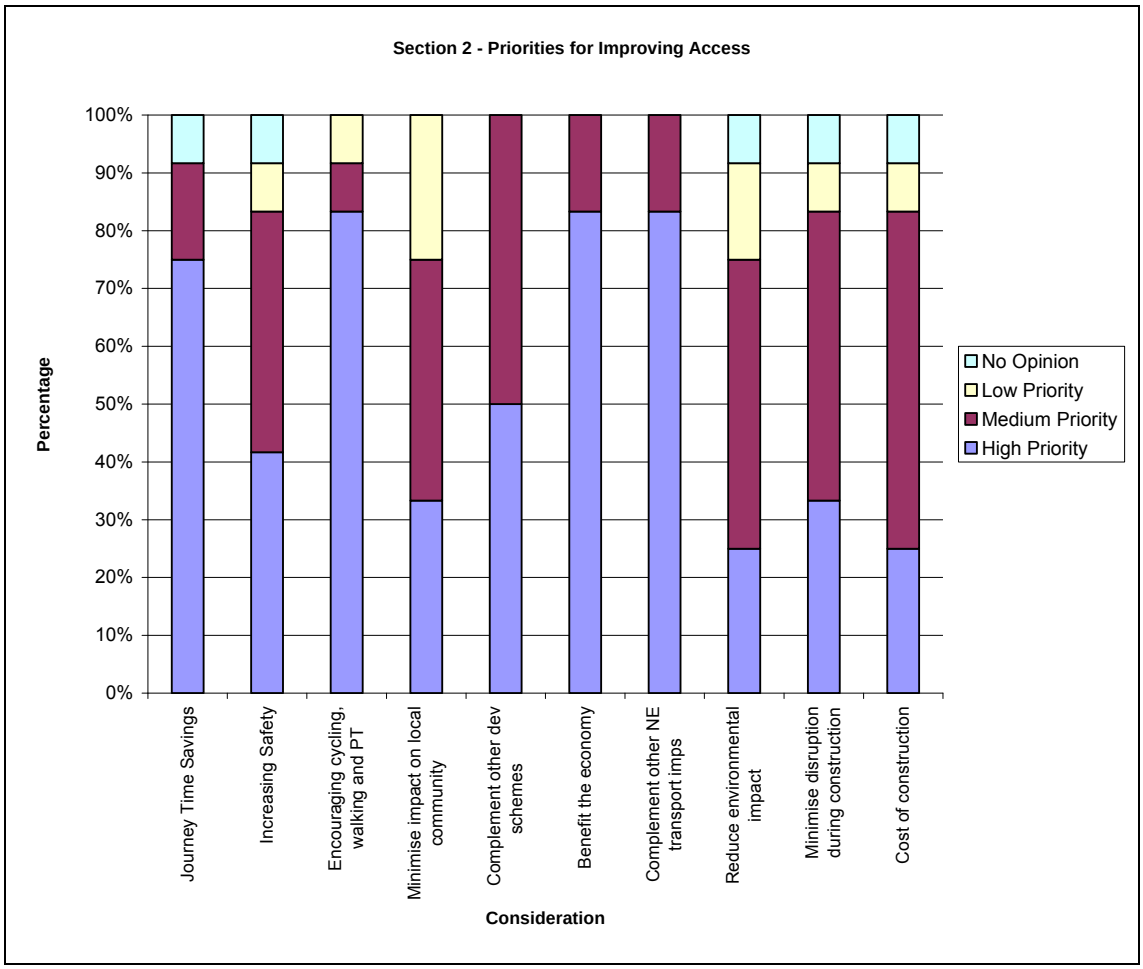

Figure 4.2 : Section 2 – Responses to Priorities for Improving Access

The key issues identified by this section of the questionnaire and agreed with the Client Group were:

- Journey time savings
- Encouraging cycling, walking and public transport
- Benefit the economy
- Complement other NE transport improvements

4.4 Section 3 – Other Travel Issues

Do you have any other travel issues to consider for the Dyce Drive area?

This section of the report invited stakeholders to illustrate any other travel issues they consider relevant for Dyce Drive. Each of the stakeholder responses was quite specific to the needs or preferences of their organisation. As a result, there are few instances of common ground. The following summarises the outcome and number of responses.

- Improve bus parking and lay over facilities (1)
- Realistic solutions required (1)
- Maximise capacity and speed of flow (1)
- Do not maximise capacity (1)
- Integrated transport required (2)
- Tie into future proposals (1)
- Consideration given to alternative modes (1)
- Improve cycle facilities (3)
- Engineering solutions to bring forward development (1)
- Better links to Dyce Station (2)
- Review licensing system for taxis (1)
- Increase time for right turning vehicles at Dyce Drive (1)
- Bus priority measures required (2)

The above shows that there are quite different views with one organisation recommending increasing road capacity while another is directly against such a move. The only common factors are a desire to see improved pedestrian and cycle facilities, and a call for better links between Aberdeen Airport and Dyce Railway Station.

4.5 Section 4 – Any Other Comments Strongly For or Against Any Specific Option

Do you have any comments which you feel may be of relevance in preparing options for consideration e.g. indicate why you are strongly in favour or against a particular option?

The final section of the questionnaire invited any other comments from stakeholders strongly in favour of, or against, specific options. This section produced the most disparate comments and responses. The following is a summary of the comments received.

- Make Dyce Drive bus/taxi/cycle only (1)
- New access for cars west of existing junction (1)
- Better parking for buses and coaches at airport (1)
- Quality solutions required (1)
- Realistic targets in modal shift (1)
- Build extra road capacity (1)
- Fast track solutions (1)

- Options complementary to future works (2)
- Assistance for public transport operators (1)
- Reduce dependency on cars (2)
- Do not build extra road capacity (2)
- Improved public transport links and direct link to Dyce Station (3)
- Improved travel information (1)
- Cycle paths on both sides of Dyce Drive (2)
- Better crossing facilities for pedestrians and cyclists (1)
- Links to National Cycle Route 1 (1)
- Promotion of travel options by employers (1)
- Junction improvements on Dyce Drive between A96 and Airport (1)
- Improved bus services and reliability will increase patronage (1)
- Signalisation of Forrit Brae junction not viable (1)

The above shows that although there is some duplication between stakeholders – relating to the promotion of alternative modes of transport and ensuring the 'future-proofing' of any options – there is a wide range of opinion on what should and should not be done.

It appears that, as with section 3, there is a strong body of opinion in favour of improving the quality of public transport and providing better interchanges between the primary modes of transport.

4.6 Feedback from Key Stakeholders

4.6.1 General Comments

All the key stakeholders have recognised the need for some form of short term measures to address the current traffic congestion occurring on Dyce Drive and Argyll Road.

As stated previously, organisations with competing aspirations have raised issues and concerns contrary to one another. For example, commercial organisations have stated a preference for improving access for all types of commercial and employee vehicles to the airport and surrounding industrial estate. This is based on their need to compete in the business world in order to survive.

Non-profit orientated organisations would prefer to see a broader based approach being adopted with a view to reducing dependency on private cars and high mileage goods. The principles of *SPPG17* suggest that the road user hierarchy should be pedestrian, cyclist, public transport passenger and private vehicle.

4.6.2 Improved Public Transport

It was almost unanimously agreed that public transport provision to Aberdeen Airport is inadequate. The feedback called for better promotion of the existing services to keep existing patrons and attract new patrons. There was also a strong indication that a better link between Aberdeen Airport and Dyce Railway Station would improve overall transport links. SIAS

understands that this matter is currently being examined by Nestrans. Other new services into the city centre including a dedicated shuttle service were also suggested.

There is also scope to consider better integration between bus timetables and shift patterns which may lead to increased passenger numbers at the start and end of shifts. Current shift patterns are so diverse across the Airport and Kirkhill Industrial Estate that coordination with bus services is problematic.

The direct response from First Group highlighted that traffic queuing from the A96(T) roundabout is a major source of disruption to their bus service reliability. First Group is also keen to improve the quality of their service as they have identified this as a potential way of attracting increased patronage.

4.6.3 Better Promotion of Alternative Modes

It was suggested that alternative modes of travel are inadequately promoted and funded by employers in the area. Better promotion of walking, cycling and public transport was suggested in order to achieve modal shift away from the private car. Better facilities for pedestrians and cyclists, including crossings, and more footpaths/cycleways were also recommended.

4.6.4 Junction Improvements

Priority for buses, taxis and cycles at key junctions was raised by a range of organisations. This would also help to improve the reliability and safety of these modes for less capital investment than wider ranging schemes designed to improve road capacity.

4.6.5 Additional Road Capacity

Only one of the respondents to the questionnaire advocated the wholesale construction of additional road capacity in the area. This is most likely due to the wider appreciation that the AWPR is anticipated to go a long way to reducing local traffic congestion on Dyce Drive.

4.7 Summary of Stakeholder Consultation

Of the 17 questionnaires issued, there were 13 responses from groups including bus operators, cycling groups, Aberdeen City Council Departments, Dyce TMO and taxi operators which provided a diverse range of opinions and proposals.

It was generally accepted that the traffic congestion on Dyce Drive and Argyll Road during peak periods is becoming an increasing hindrance to the airport, industry and private citizens alike. Although the Aberdeen Western Peripheral Route is moving towards implementation, the completion date is sufficiently in the future that immediate to short term measures are required.

The main feedback from responding stakeholders highlighted the need for:

- improved public transport infrastructure including additional routes, increased frequency and interchanges
- more frequent services and a wider range of destinations for bus services
- journey time reductions required for bus services from the A96(T) to the airport
- better information on existing public transport services
- better links with Dyce Railway Station

- short term junction improvement measures to maximise the existing road infrastructure

The key objectives which can be derived from the stakeholder consultation are:

- Efforts should be made to maximise journey time savings
- Encouraging cycling, walking and public transport should be a priority
- The overall scheme should benefit the economy
- The scheme should be complementary to other proposed transport improvements such as AWPR

5 OPTION SIFTING

5.1 General

The initial option sifting process involved considering the options and ideas produced through Client Group meetings and the consultation process which were then measured against the basic objectives of the project brief. The main criteria for inclusion as an option have been identified as:

- Achievable in the immediate to short term
- Technically possible
- Operationally beneficial over the short term
- Financially viable
- Acceptable to the public and stakeholders

Options were also considered against the key objectives identified by the stakeholder consultation process, namely:

- Journey time savings
- Encouraging cycling, walking and public transport
- Benefit the economy
- Complement other NE transport improvements

Where the options had the potential to meet the objectives, they could then be considered as either part of a package for traffic model assessment or as a measure worthy of future consideration, but outwith the scope of this study and traffic model testing. It has also become apparent that not all of the options can be considered for testing in the S-Paramics model.

Although this is not a full *STAG* process, the methodology used does follow the broad principles of *STAG*. Table 5.1 shows the compliance level of each option against the objectives above and denotes whether the impact of the option can be measured from a modelling exercise. These have been scored by senior SIAS engineering staff in a manner consistent with *STAG*, where a 7-point scale is used. The scale is from -3 (major negative) to +3 (major positive) with 0 being neutral.

Where appropriate, designs have been produced to conceptual, preliminary stage to indicate alignments and scale of new infrastructure.

The options are described in more detail in subsequent sections.

5.2 S-Paramics Base Traffic Model

An S-Paramics microsimulation base model was developed to test future options. During the development, calibration and validation of this model the potential for various small changes which would impact on the performance of the network were noted; these have been taken forward for consideration. For example, it was noted that extending the length of the right turn lane from Dyce Drive to Wellheads Drive improved the flow of traffic northbound during the AM peak and reduced the knock-on effect at the A96(T) roundabout. While this is clearly of benefit in the modelling exercise, SIAS believes that this alone will not solve the congestion issues in the AM peak on the A96(T).

5.3 Client Group Workshops

A meeting was held between SIAS and the Client Group on 18 December to assess progress on this project and to identify the way ahead for initial model testing. It was noted from that workshop that the Client Group have a strong preference for measures which will primarily benefit sustainable transport: a reduction in journey times for buses and taxis was considered to be at least as important as an overall reduction in congestion and associated journey times for all classes of vehicle.

Table 5.1 : Option Compliance with Key Objectives

Option	Implementable in Short Term	Technical Issues	Operational Issues	Financial Issues	Public Issues	Journey time savings	Encouraging cycling, walking and PT	Benefit the economy	Complement other NE transport imps	Overall Score	Explanatory Comment on Objective and Implementability Scoring	Consider in Modelling
Changinging priorities at RBS Roundabout	3	3	2	2	3	1	1	1	2	2	Relatively quick and low cost to implement, may encourage more PT use through quicker egress from Airport	Y
Bus/taxi Priority lane on Brent Road and Argyll Road	2	2	2	-1	0	2	2	1	2	2	Initial construction costs and interuption, but will encourage PT use	Y
Bus/taxi Priority Lane on Dyce Drive between Argyll Road and Wellheads Drive	1	1	1	-2	0	3	2	1	1	1	Initial construction costs and interuption, but will encourage PT use	Y
Bus/taxi Priority Lane on Dyce Drive between Wellheads Drive and A96(T)	1	1	1	-2	0	3	2	1	1	1	Initial construction costs and interuption, but will encourage PT use	Y
Segregated left turn at existing A96(T) roundabout	1	-1	3	-2	2	3	0	2	2	2	Initial construction costs and interuption which can be used to form AWPR junction, should provide significant PM journey time savings for all users	Y
Partial siagnalisation of existing A96(T) roundabout	1	-1	1	-1	-1	1	0	1	-1	-1	Installation of signals will become obsolete when AWPR junction constructed. Roundabout limited stacking capacity on circulating carriageway is a con	Y
Improvements to merges on Dyce Drive exit from A96(T) roundabout	2	-1	2	-1	0	1	0	1	2	2	If construction can be completed off-line disruption could be kept to a minimum. Aiding the access to Dyce Drive will benefit lane usage on the A96 for AWPR junctions	Y
Early implementation of AWPR signalised junction	-2	-2	1	-2	-1	0	0	0	3	0	Unlikely to facilitate current traffic flows, in particular the right turn from the A96 in the AM peak	Y
Minor amendments to AWPR junction	-2	-2	1	-2	-1	0	0	0	3	0	Unlikely to facilitate current traffic flows, in particular the right turn from the A96 in the AM peak	Y
Major amendments to AWPR junction	-2	-2	3	-2	-1	3	0	3	3	2	Increase in lanes will accommodate existing AM right turn flow. Needs the improvement to merge length on exit to Dyce Drive to make viable	Y
New bus/taxi only link between Brent Road and Dyce Drive	-3	-2	2	-2	1	2	2	1	1	1	Not a viable short term options. Would give a clear benefit public transport travel times	Y
New bus/taxi only link between Bucksburn and Wellheads Drive	-3	-2	2	-2	-1	2	2	1	1	1	Not a viable short term options. Would give a clear benefit public transport travel times over a significant section	Y
Close Forties to through traffic	3	3	2	2	-1	1	1	1	2	1	Relatively quick and low cost to implement, reduces accessibility to the Airport and will effect Dyce Drive	N
New cycle lane on northbound side of Dyce Drive between A96(T) and Dyce Avenue	1	1	1	-2	0	3	2	1	1	1	Will encourage/aid promotion of cycles. Needs construction and could be expensive on its own. Should be considered as a package with bus/taxi lanes	N
Allow cyclists to use bus/taxi lane	1	1	1	-2	0	3	2	1	1	1	Will encourage/aid promotion of cycles. Should be considered as a package with bus/taxi lanes	N
New footpath link on northside of Dyce Drive between Dyce Avenue and Argyll Road	3	1	3	-1	2	0	2	0	1	2	Improved pedestrian linkages. Off-line constructio	N
Increase length of right turn lane from Dyce Drive to Wellheads Drive	3	2	2	-1	2	1	0	0	1	2	Relatively quick and low cost to implement, with the aim of reducing queue back to A96(T) in AM peak	Y
Green Travel Plan (Dyce TMO)	3	3	3	3	3	1	3	2	3	3	Encourage sustainable modes, flexible working etc to provide peak spreading and private car reduction to improve journey times for all	N

5.4 Consideration of Options

Based on the output from Table 5.1, the principal options to reduce congestion and journey times on Dyce Drive are summarised in Figure 5.1.

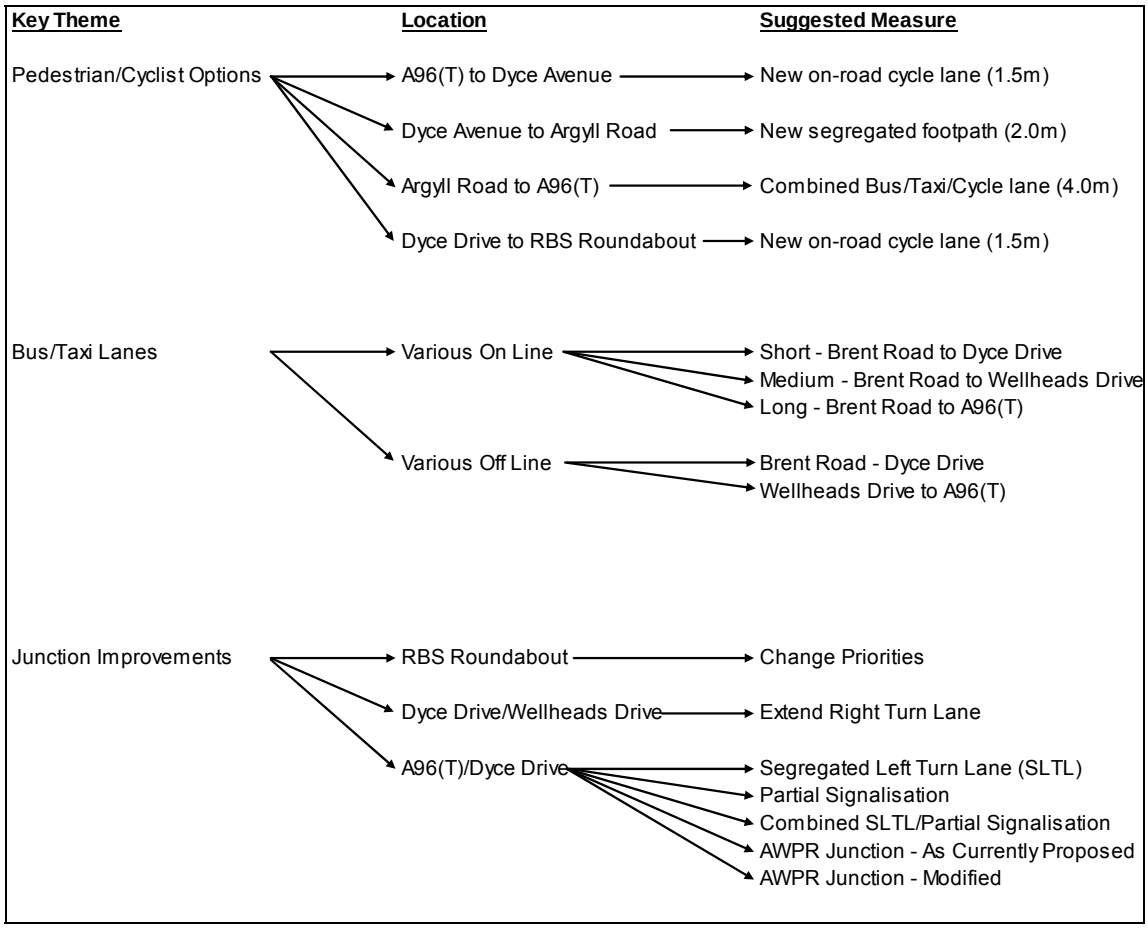

Figure 5.1 : Principal Options for Consideration

On-line bus/taxi priority lanes are those marked on the existing road surface, while off-line refers to routes constructed off the line of the existing road network.

5.5 Pedestrian and Cyclist Options

The location of Aberdeen Airport does not necessarily promote access by walking or cycling, but infrastructure works in the immediate to short term do present the opportunity for enhancement of existing facilities and introduction of new linkages.

The stakeholder consultation has identified the following:

- The existing off-road footpath cycleway adjacent to Dyce Drive is not popular with all cycle groups
- Cyclist groups would welcome the opportunity to use on-road bus and taxi lanes
- Cyclists would welcome a facility of some sort on the northbound lane of Dyce Drive

One recommendation from a stakeholder was to reduce the width of the footpath/cycleway and reinstate the width to the carriageway, which could then be used as part of any bus/taxi lane

incorporating on-road cycle lane. It was agreed by the Client Group that the existing off-road facility should be retained to encourage new cyclists to use the route.

SIAS also suggests that a new footpath could be constructed beside Dyce Drive between Dyce Avenue and Argyll Road. This would provide the missing link for pedestrians from the Dyce Avenue area to the existing facilities on Argyll Road and Dyce Drive.

Figure 5.2 illustrates the location of these options.

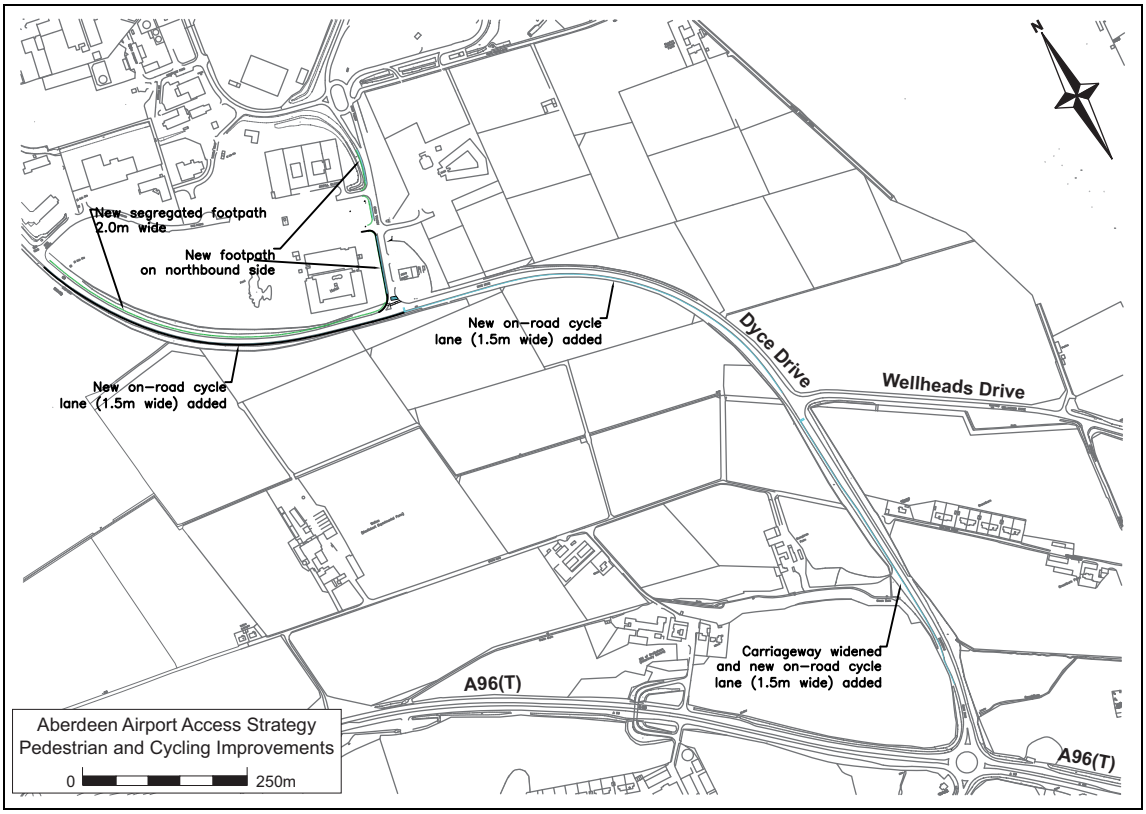

Figure 5.2 : Pedestrian and Cyclist Options

5.6 Bus and Taxi Priority Lanes

5.6.1 General

Feedback from the stakeholders and the Client Group indicated major concerns about the reliability and quality of public transport provision to the Airport area, particularly during peak hours. SIAS has identified from the public transport assessment that Dyce Drive is used by 16 service buses during the AM peak period and 13 during the PM peak period. It was provisionally suggested that SIAS should consider options which would address this issue. Bus and taxi only lanes are the logical addition to the road infrastructure based on the need for immediate to short term improvements on the road network.

The consultation process and SIAS knowledge of the area has identified 3 options for providing bus and taxi priority between the airport and the A96(T):

- On-line: providing bus/taxi priority lanes on the existing line of Brent Road, Argyll Road and Dyce Drive

- Off-line: providing new bus/taxi only links between either Brent Road and Dyce Drive or Wellheads Drive and the A96(T) at Bucksburn

SIAS has adopted an incremental approach to the provision of bus and taxi lanes. Various lengths of bus and taxi only lanes have been evaluated using the S-Paramics traffic model to determine which offers the most benefit. Where possible these have been included with a minimum of construction, relying instead on road markings and painted lanes.

The bus/taxi lane options are shown in Figure 5.3.

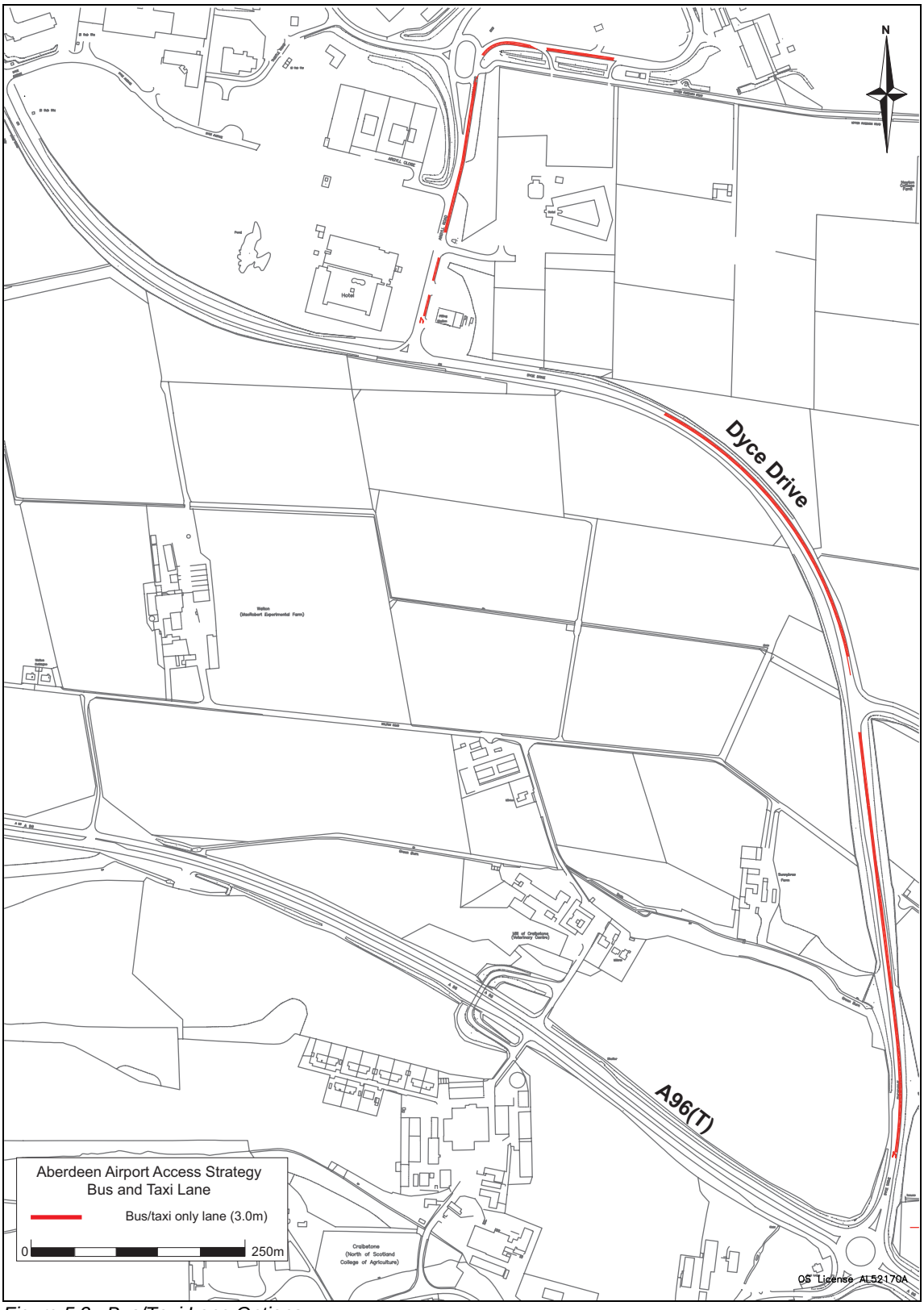

Figure 5.3 : Bus/Taxi Lane Options

5.6.2 On-line Bus/Taxi Lanes

On-line bus/taxi only lanes would require some widening of the existing carriageway over most of the length of the proposed scheme. Typically this would require a width increase of around 2m.

SIAS believes that any future bus linkage between the airport and Dyce Railway Station would benefit from the formation of a westbound bus/taxi lane on Wellheads Drive from Market Street to Dyce Drive. This is also shown on Figure 5.3. The traffic eastbound on Wellheads Drive was not observed to be significantly delayed in either peak hour. The far end of Wellheads Drive at Victoria Street is outwith the limits of this model. Further investigation would be required to determine if a bus/taxi lane would be required. The Wellheads Drive bus/taxi lane has not been included in the option testing at this stage.

5.6.3 Off-line Bus/Taxi Links

SIAS has considered the potential for forming a new public transport only link between Bucksburn and Dyce Drive via Bankfield Avenue, Greenburn Drive, Greenburn Road, Market Street and Wellheads Drive. The potential route is also shown in Figure 5.3. This route would reduce journey times for buses and taxis, particularly during peak periods by removing them from the main traffic congested routes. This has not been tested at this stage as it is considered undeliverable in the short term.

The final bus/taxi only link for consideration is the formation of a new road between Brent Road and Dyce Drive. This could be incorporated into development roads at some point in the future but is not considered a viable option in the immediate to short term and has not been taken forward for further consideration.

5.7 Junction Improvements Options

5.7.1 RBS Roundabout (Argyll Road/Forties Road/Brent Road)

Egress from the airport, particularly for buses and taxis, has been reported as a main cause of concern for passengers and operators alike. It is proposed that the priorities at the RBS roundabout be changed to prevent traffic from Forties Road cutting off the airport traffic. This is intended to reduce the time traffic from the airport has to queue on Brent Road without disrupting accessibility to the airport. Figure 5.4 shows a provisional layout.

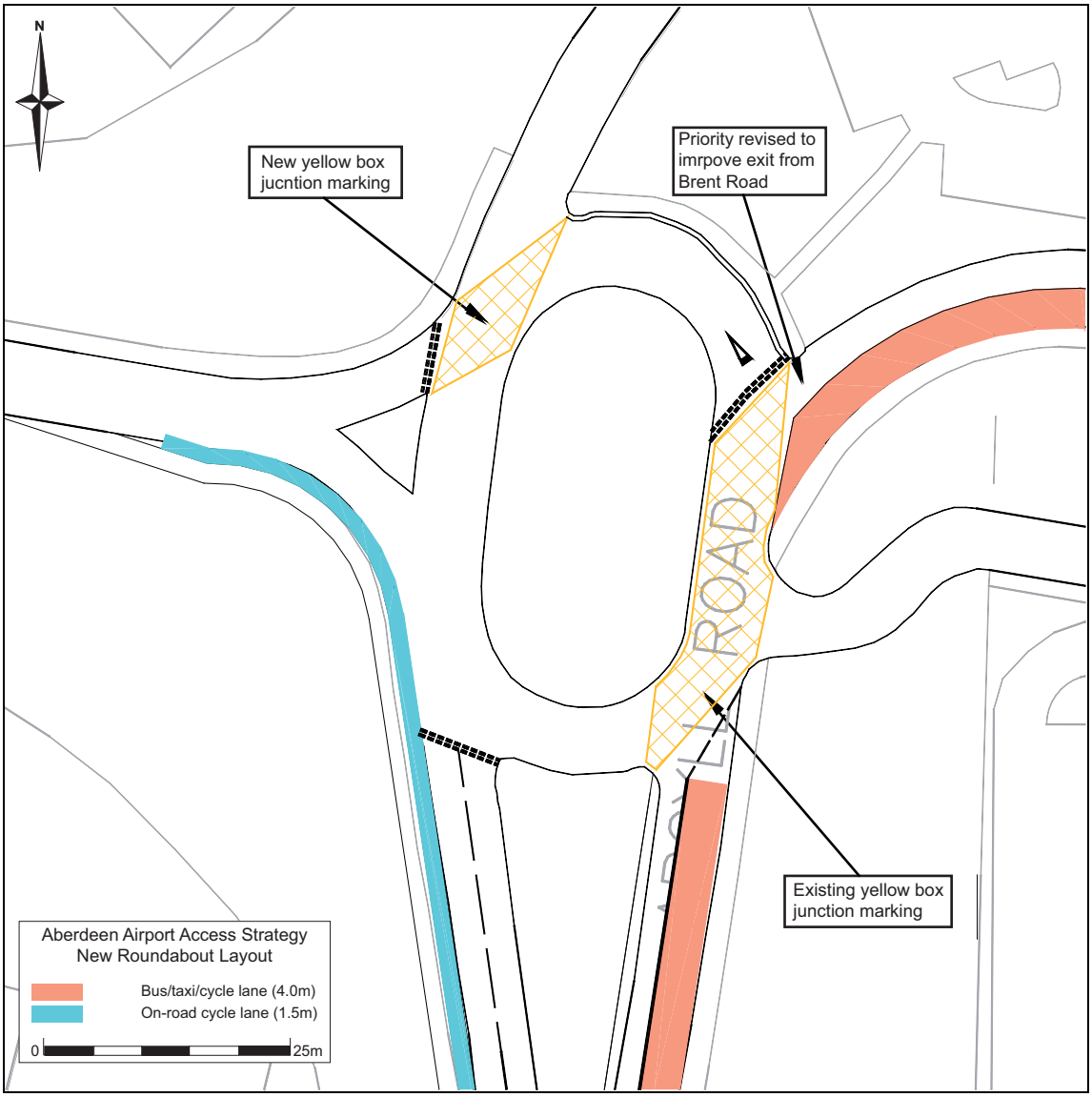

Figure 5.4 : Revised Priority at RBS Roundabout on Argyll Road

AM and PM peak hour traffic flows at the RBS roundabout are illustrated in Figure 5.5.

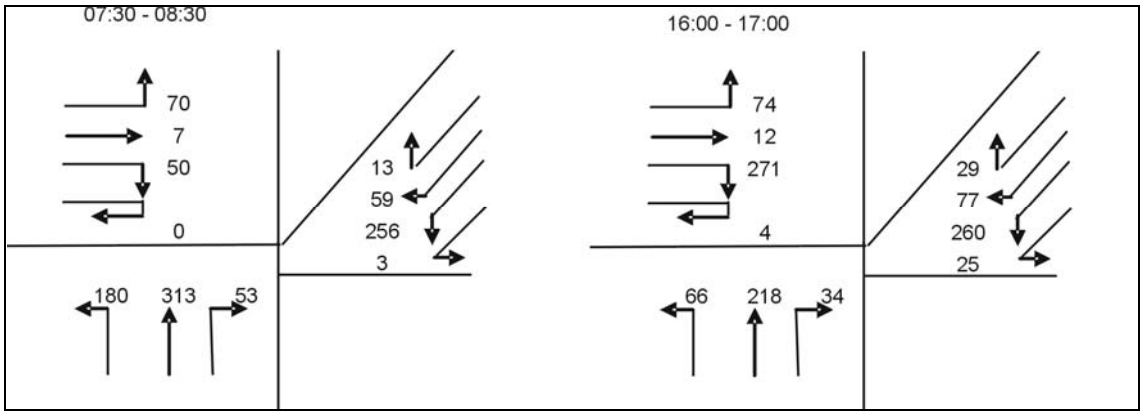

Figure 5.5 : Peak Hour Traffic Flows at RBS Roundabout (vehs/hr)

The traffic flows in Figure 5.5 reflect the tidal nature of traffic movements at Aberdeen Airport and Kirkhill Industrial Estate with 50% more northbound traffic on Argyll Road in the AM peak hour compared to the PM peak hour. In the PM peak hour there is more than 5 times the amount of traffic exiting Forties Road as during the AM peak hour.

A registration Number Plate (RNP) survey was undertaken to ascertain the level of rat running through Kirkhill Road, Forties Road and Argyll Road in the PM peak period. It was found that around 100 vehicles used this route as a short cut to avoid congestion on Dyce Drive during the peak hour (16:00 – 17:00). This was successfully replicated in the S-Paramics base model.

5.7.2 Dyce Drive/Argyll Road Junction

The stakeholder consultation did not yield any specific suggestions for changes to this junction. SIAS has evaluated the layout and traffic throughput to see what, if any, improvements can be made. Simple capacity calculations show that the junction in its current format should have adequate capacity to deal with the existing levels of traffic. Any current problems with junction performance are considered to be as a result of traffic congestion further south on Dyce Drive, especially at the A96(T) roundabout. Figure 5.6 shows the AM and PM peak hour traffic at this junction.

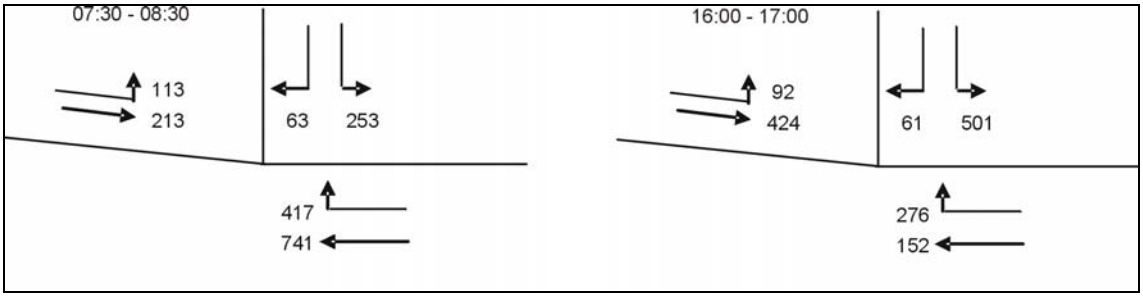

Figure 5.6 : Peak Hour Traffic Flows at Dyce Drive/Argyll Road Junction (vehs/hr)

As part of the improvement package for pedestrians and cyclists, it is proposed that crossing facilities be installed at this junction to connect the existing footpath to a new footpath link to Dyce Drive as described in Section 5.5. Any widening of Argyll Road to accommodate a bus/taxi lane may also require some realignment of kerbs at this junction.

5.7.3 Dyce Drive/Wellheads Road

On-site observation and the viewing of the S-Paramics base model have indicated that there is a lack of stacking capacity for right-turning traffic from Dyce Drive into Wellheads Drive resulting in queuing at the A96(T)/Dyce Drive roundabout during the AM peak. It was noted that right-turning traffic was queuing back beyond the current lane markings and impeding the through flow of north bound traffic. This in turn led to shockwave queuing back as far as the A96(T) roundabout. Observations have shown that traffic exiting the A96(T) onto Dyce Drive joins the back of slow moving platoons.

Capacity calculations based on the traffic flows in Figure 5.7 have shown that the junction in its existing format should have adequate capacity. This further reinforces the view that congestion at this junction may not be a direct result of capacity issues at the junction itself.

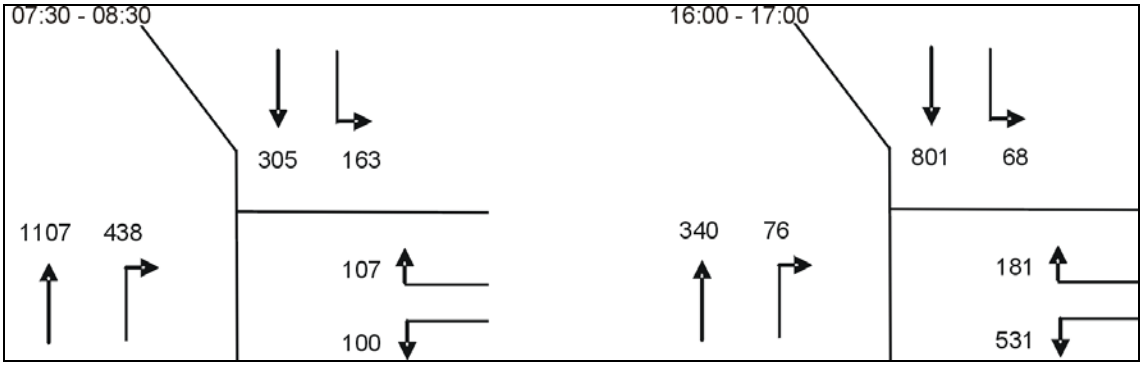

Figure 5.7 : Peak Hour Traffic Flows at Dyce Drive/Wellheads Drive Junction (vehs/hr)

It is proposed that the existing right turn lane be extended by approximately 25m. This is intended to formalise the current practice of vehicles waiting in the hatched area and increase throughput for northbound traffic. This has subsequently been included in all options modelled by SIAS. Figure 5.8 shows the extent of the revised right turn lane.

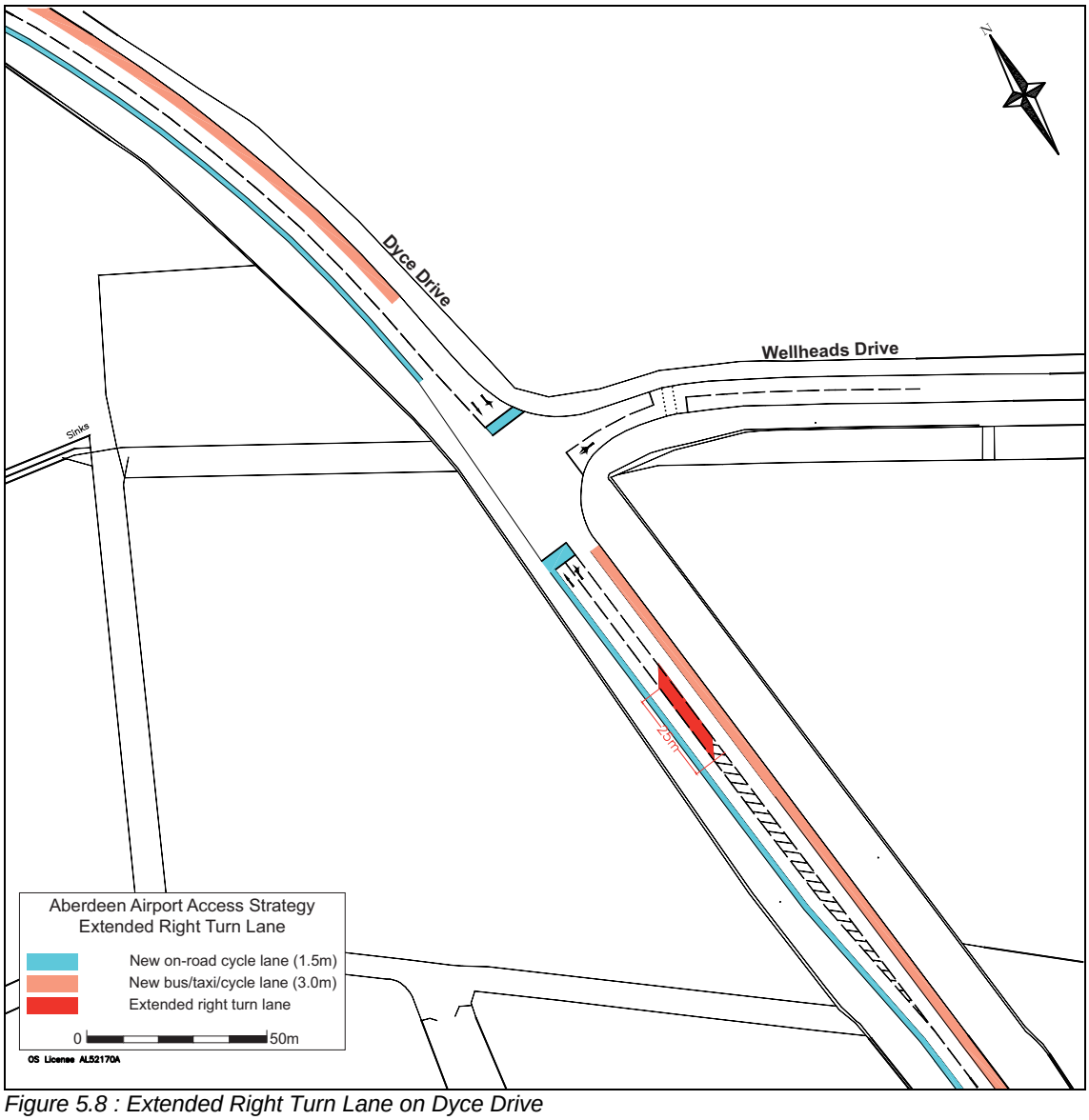

Figure 5.8 : Extended Right Turn Lane on Dyce Drive

There is currently no right turn filter or early cut-off stage at the signalised junction with Wellheads Drive. The inclusion of such a facility has been considered by SIAS and has also been included in the options tested thus far.

Any changes to the layout of this junction, including widening, lengthening of right turn lanes or similar which would affect the positioning of the existing loop detectors in the road will require an input from MOVA junction specialists.

5.8 A96(T)/Dyce Drive Junction Options

5.8.1 Overview

Site surveys and observations have identified the roundabout junction between the A96(T) and Dyce Drive as a major contributor to the peak period congestion currently experienced. It therefore follows that measures to improve the performance of the junction would have a wider benefit to the local area network.

The options for junction improvements are as follows:

- Do-nothing, as per existing junction layout
- Signalisation or partial signalisation of the existing roundabout junction
- A new segregated left turn lane from Dyce Drive to the A96(T)
- Early implementation of the proposed AWPR junction
- A new signalised junction based on the AWPR junction layout

Given the high volumes of traffic which pass through this junction during peak hours (see Figure 5.9) SIAS considers that to implement any bus/taxi priority scheme on Dyce Drive without making changes to this junction would fail to maximise the benefits of the proposed improvements on Argyll Road and Dyce Drive.

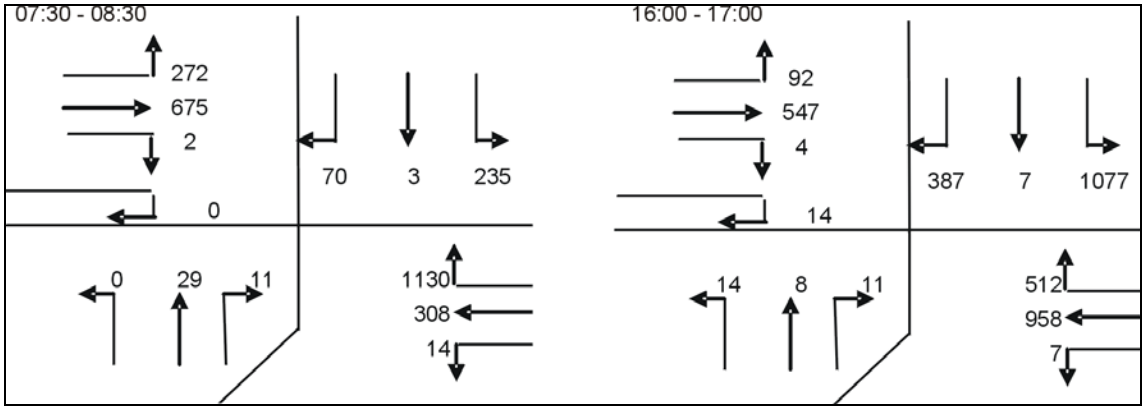

Figure 5.9 : Peak Hour Traffic Flows at Dyce Drive/A96(T) Junction (vehs/hr)

The traffic flow in the AM peak hour is dominated by the right turn from the A96(T) to Dyce Drive which was observed to cause delays on Dyce Drive and for eastbound traffic on the A96(T). This is reversed in the PM peak hour with the most significant volume of traffic being recorded from Dyce Drive left onto the A96(T).

5.8.2 Signalisation of Existing Roundabout

Signalisation or partial signalisation of the existing roundabout would require the addition of a third lane on the westbound approach to the roundabout. SIAS also has some concerns about the available stacking on the circulatory carriageway on the roundabout. The predicted length of these lanes is 10m – 12m and further detailed design will be required before considering this as a viable option. The length of the 2 lanes exiting the roundabout onto Dyce Drive will require to be extended to provide better merging opportunities for traffic

SIAS has undertaken initial testing of this option with the addition of the third lane as described previously. Figure 5.10 shows the draft layout which has been tested.

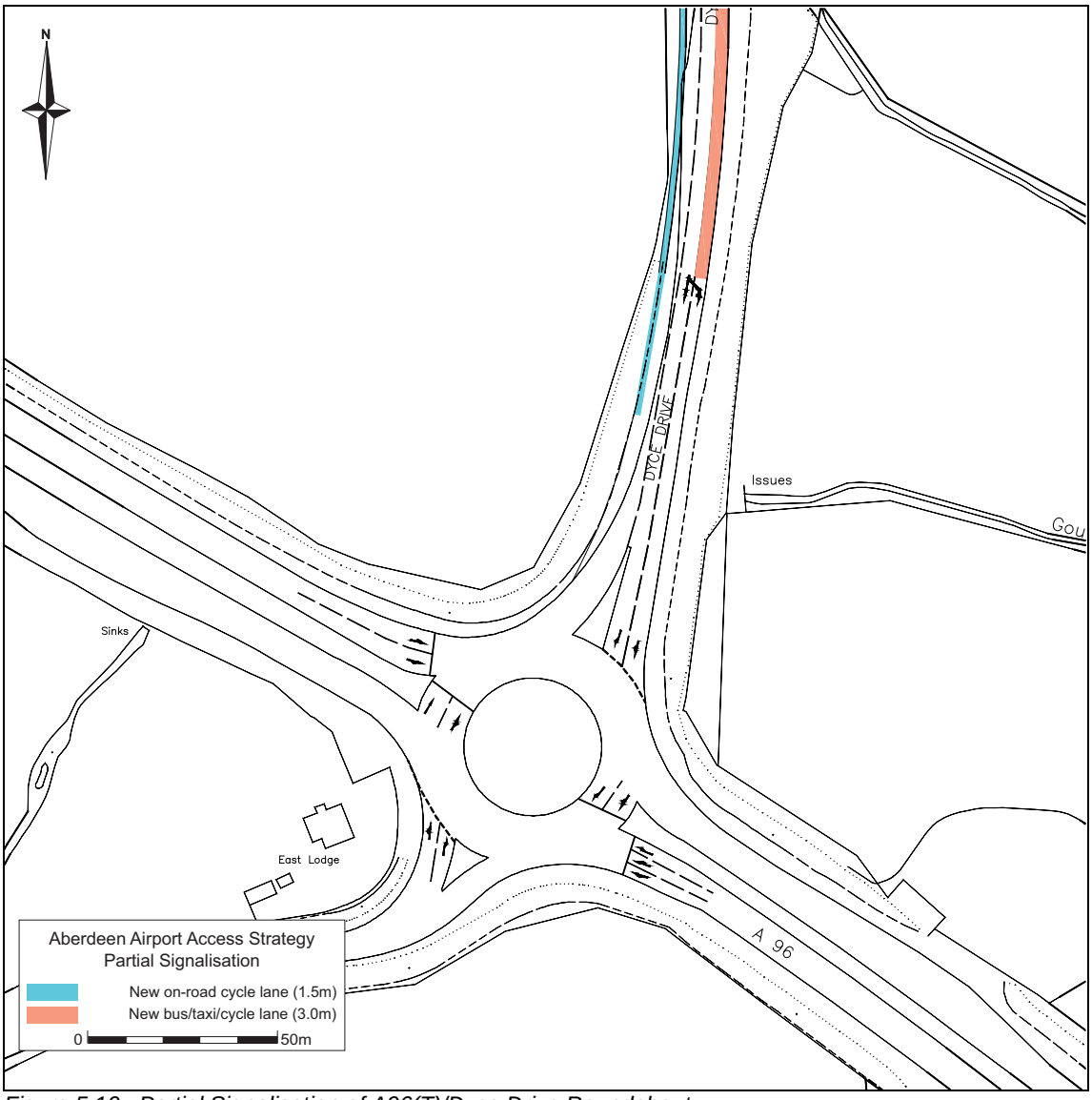

Figure 5.10 : Partial Signalisation of A96(T)/Dyce Drive Roundabout

5.8.3 New Segregated Left Slip from Dyce Drive to A96(T)

A new segregated left turn lane from Dyce Drive to the A96(T) would improve the flow of traffic during the PM peak hour. Figure 5.11 shows a provisional layout for a segregated left turn from Dyce Drive to the A96(T). Although there is predicted to be a beneficial effect on traffic through the roundabout in the PM peak period, such a layout would have a nominal effect in the AM peak period.

This option has the benefit of not requiring major works on the roundabout itself, although there would be some disruption as the new lane is tied into the existing carriageway. Other construction issues would include up-filling of the land to the northeast of the roundabout to facilitate the new lane.

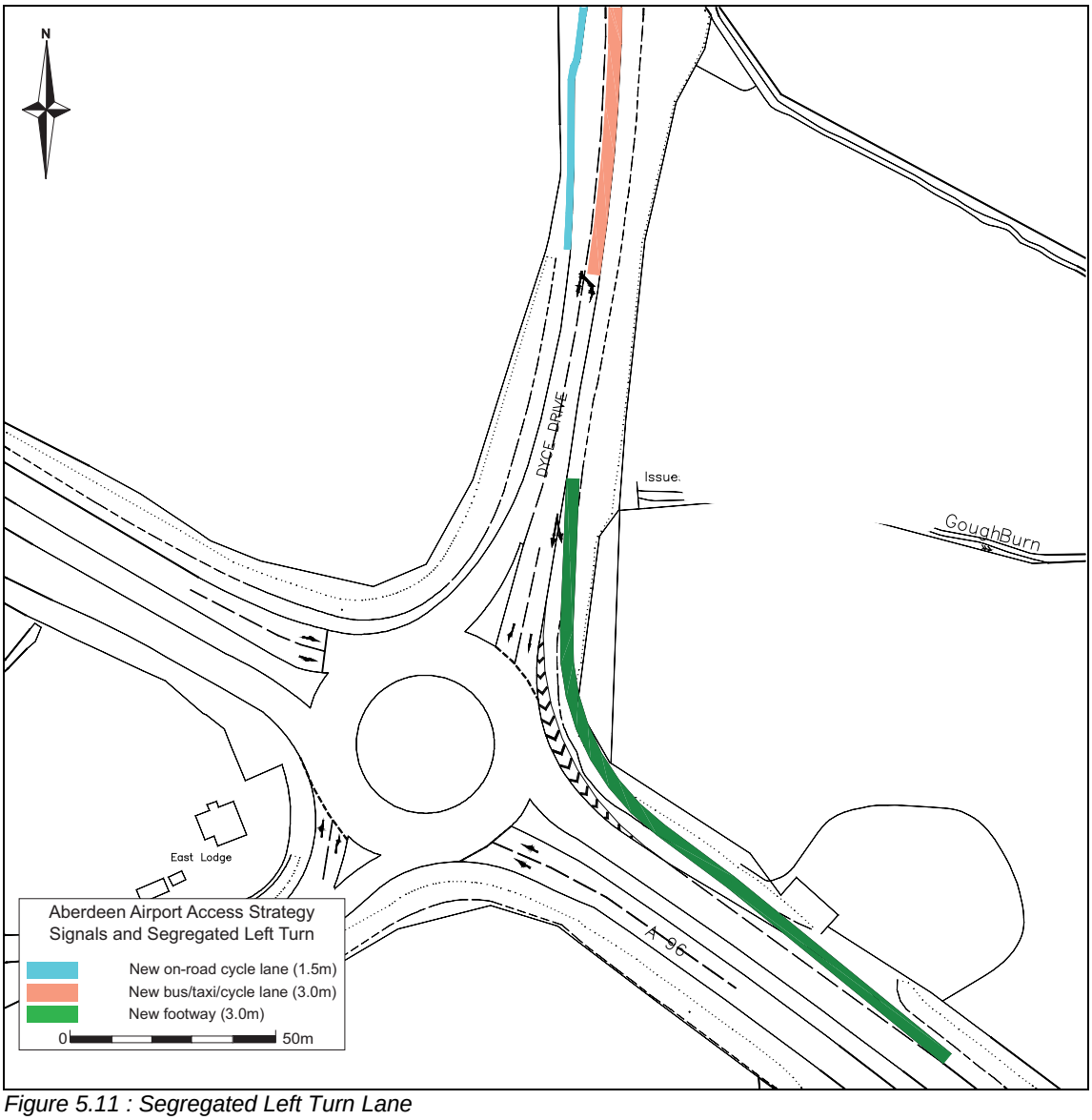

Figure 5.11 : Segregated Left Turn Lane

5.8.4 AWPR Junction

The proposed AWPR includes a package of infrastructure with junctions and ancillary roads connecting it to the existing network. Through the consultation process, it was noted that early implementation of the proposed signalised AWPR junction at the A96(T)/Dyce Drive could be considered. Figure 5.12 shows an extract from the AWPR S-Paramics model, built by Jacobs and copied to SIAS in Autumn 2007.

The diagrams show a new off-line roundabout immediately south of Argyll Road and a new north-south link road between the airport and the A96 (T). The A96 would access the AWPR via a new link road and a signalised junction west of the current roundabout.

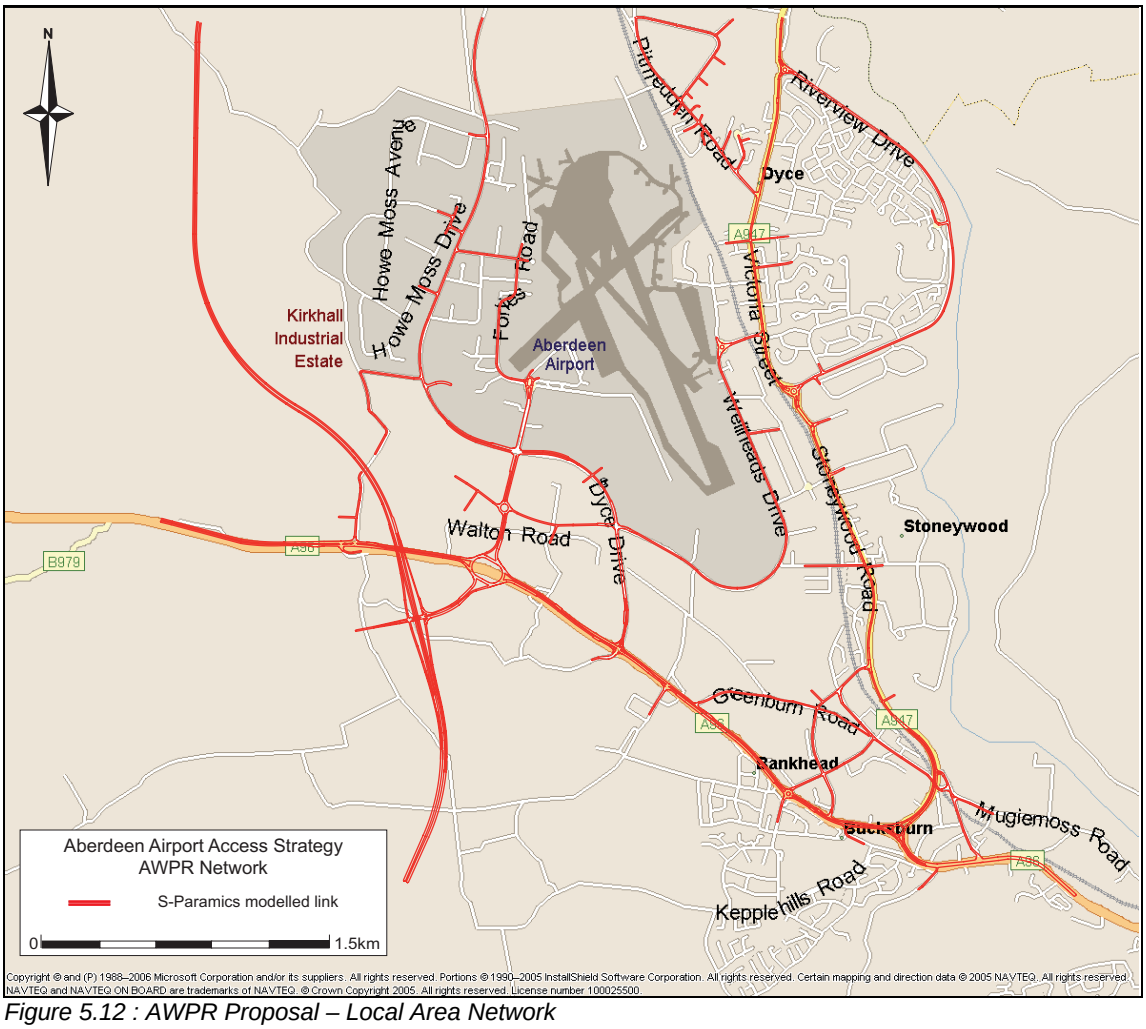

Figure 5.12 : AWPR Proposal – Local Area Network

SIAS appreciates that the junction layout shown in Figure 5.13 has been prepared based on AWPR predicted traffic conditions. These will differ from the current scenario as the influence of the AWPR affects the routes that drivers use for local trips as well as longer trips.

Following the consultation exercise and discussion with the Client Group, it was agreed that SIAS would not test the junction in its proposed layout. This is because the design requirements for the junction layout shown are significantly different from the current requirements to facilitate existing flows, i.e., pre AWPR.

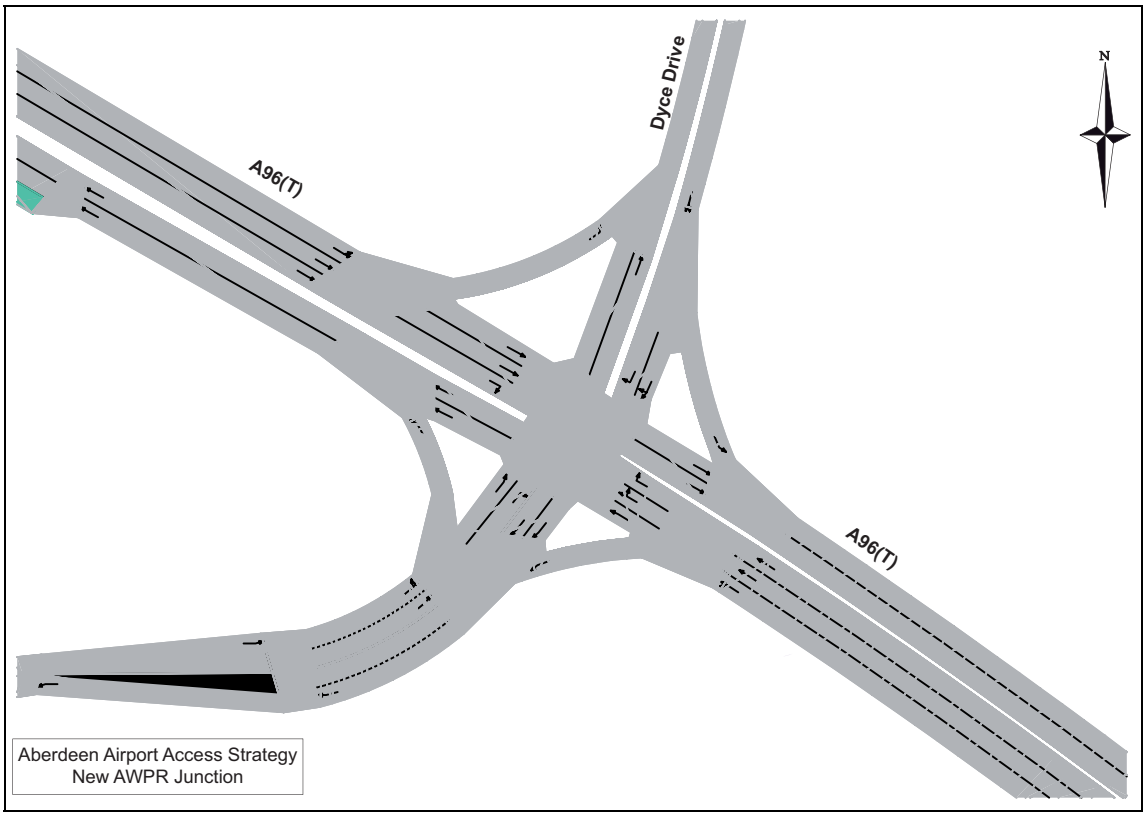

Figure 5.13 : Proposed AWPR Junction at Dyce Drive/A96

5.8.5 Variations on the AWPR Junction Layout

SIAS has developed 2 variations from the AWPR layout to adapt it to suit the current traffic conditions. Primarily these include variations in the number of lanes on the A96 westbound approach to the junction, extension of the 2 lane links on Dyce Drive northbound and adjustments to the signal timings. Figure 5.14 shows a junction layout similar to the AWPR scheme in terms of number of lanes and lane allocations.

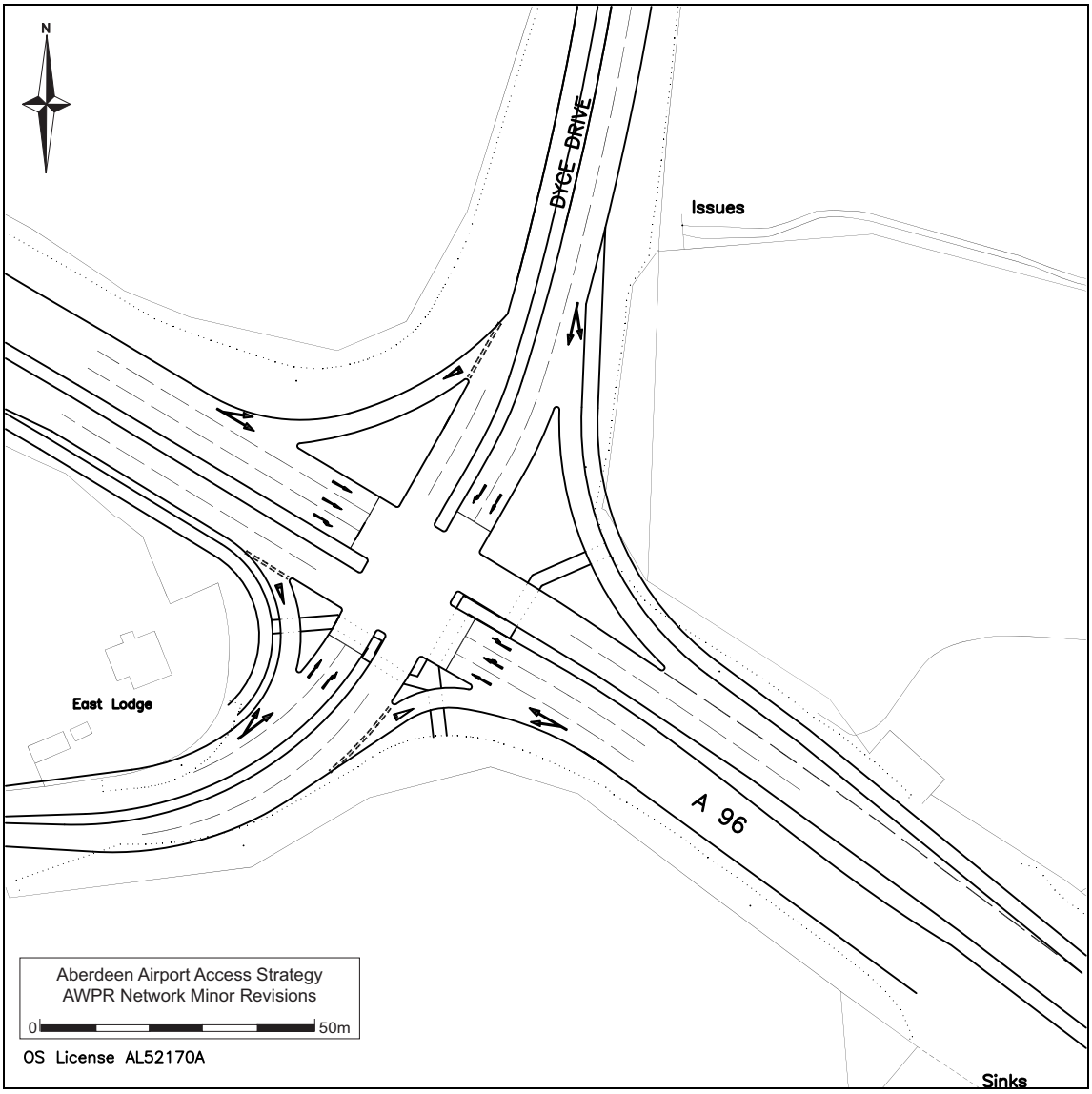

Figure 5.14 : AWPR Junction Layout with Minor Revisions

Figure 5.15 is also based on the AWPR junction layout, but has been adapted to include a fourth lane on the approach from Aberdeen and longer sections of 2 lanes on the Dyce Drive approaches and exits.

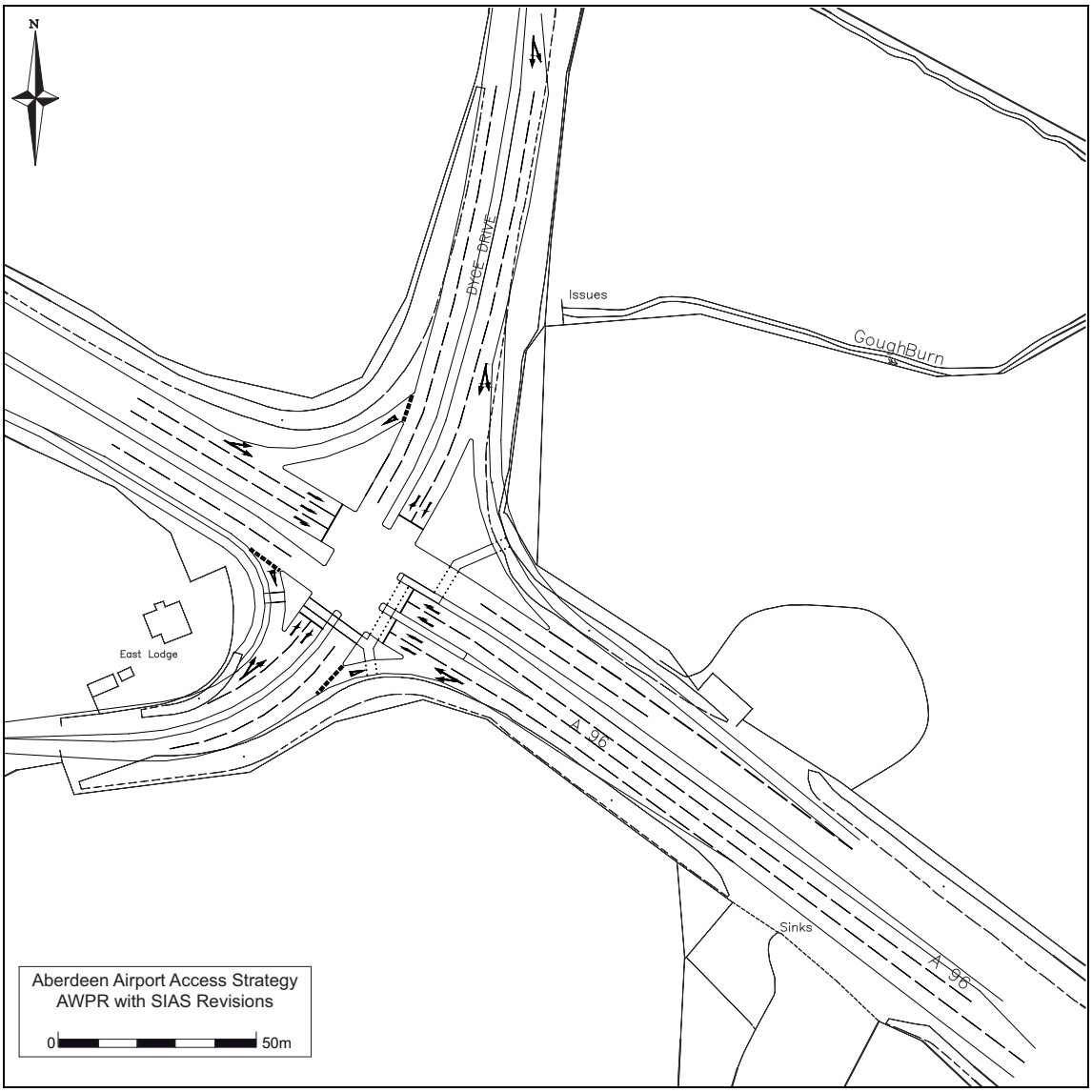

Figure 5.15 : AWPR Junction with SIAS Revisions

5.8.6 Segregated Left Turn Lane and Partial Signalisation

Following the meeting with the Client Group in February 2008, it was agreed that SIAS should test a hybrid junction comprising the segregated left turn lane from Dyce Drive to the A96(T) in conjunction with partial signalisation of the existing roundabout. Figure 5.16 shows the resulting layout.

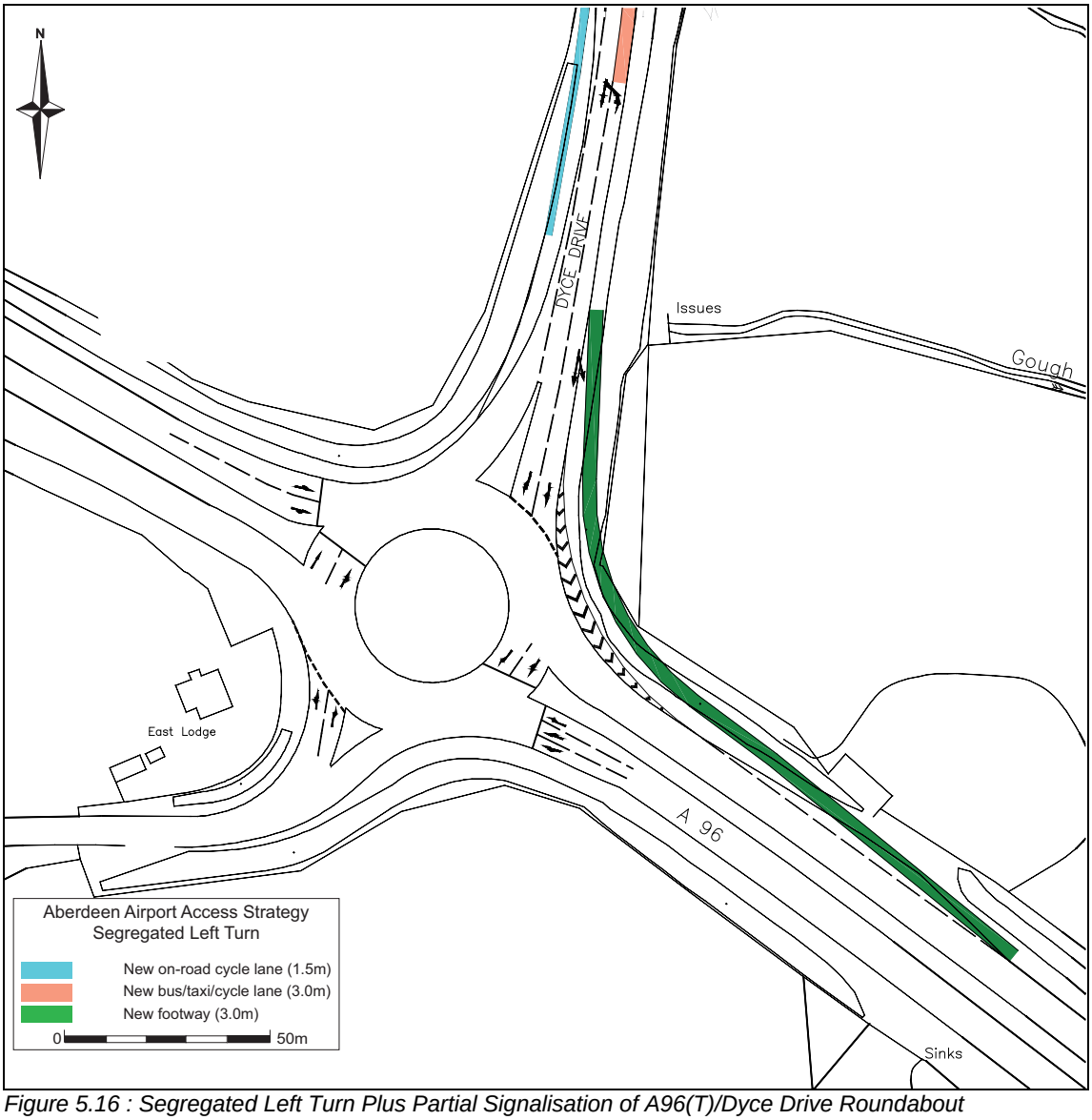

Figure 5.16 : Segregated Left Turn Plus Partial Signalisation of A96(T)/Dyce Drive Roundabout

5.9 Closure of Forties Road to Through Traffic

As Forties Road is an airport owned route, BAA Aberdeen has the authority to close it. This is in line with *ASAS 2012, Section C, paragraph 15.5* which states BAA Aberdeen's intention to consider closure of this route at peak times. There are already gates at the junction of Forties Road and Kirkhill Road. It is proposed that this option be tested in S-Paramics to evaluate the outcome.

5.10 Summary of Option Sifting Exercise

From the original list of options considered in Table 5.1, some have been discounted due to being incompatible with the key objectives identified in this report. The main exclusions are the off-line bus/taxi priority routes. The options shown in Table 5.2 have been selected to go forward for testing and possible inclusion in a final package of recommendations.

Table 5.2 : Options For Further Consideration

Option	Option	Detail
Traffic Modelling	Bus/Taxi Lanes	Short - Brent Road to Dyce Drive Medium - Brent Road to Wellheads Drive Long - Brent Road to A96(T) Brent Road - Dyce Drive Wellheads Drive to A96(T)
	RBS Roundabout	Change Priorities
	Dyce Drive/Wellheads Drive	Extend Right Turn Lane
	A96(T)/Dyce Drive	Segregated Left Turn Lane (SLTL) Partial Signalisation Combined SLTL/Partial Signalisation AWPR Junction - As Currently Proposed AWPR Junction - Modified
Other	A96(T) to Dyce Avenue	New on-road cycle lane (1.5m)
	Green Travel Plans	To be co-ordinated by Dyce TMO, ACC, Nestrans
	Dyce Avenue to Argyll Road	New segregated footpath (2.0m)
	Dyce Drive to RBS Roundabout	New on-road cycle lane (1.5m)
	Closure of Forties Road to through trips during peak hours	Existing gate closed at Kirkhill Road

6 OPTION DEVELOPMENT AND TESTING

6.1 General

It is clear from Section 5 that no single option will provide all the desired solutions to the traffic congestion issues in the short term. It has been necessary to combine individual options and develop them into packages which can be considered as a whole. Packages of the options identified during the key stakeholder workshop and wider stakeholder consultation have been developed for the immediate to short term. These are considered to have the potential to achieve the basic objectives. Package development was undertaken incrementally from a number of very basic improvement options. These have been agreed in principle by the Client Group.

6.2 Packages of Options for Testing

Packages of options have been brought together taking the most likely beneficial measures at each of the key locations in combination, i.e. improvements at Dyce Drive/Wellheads Road and improvements at Argyll Road/Forties Road roundabout.

There are 2 basic sets of improvements which have been considered. These comprise:

- Footpath link between Dyce Avenue and Argyll Road
- Cycle lanes northbound on Dyce Drive
- Pedestrian/cycle facilities at Argyll Rd/Dyce Drive
- Bus lane on Argyll Road

Plus either:

- Changed priorities at the RBS roundabout (Test 1)

or

- Peak period closure of Forties Road to through traffic (Test 2).

These 2 options (Test 1 & Test 2) are considered to be the core packages, from which further options can been developed.

In such an instance, where there are alternative options within a core package, the option with the greatest overall benefit to the network performance was selected and taken forward. It was found that changing the priorities at the RBS roundabout (Test 1) offered a greater overall benefit, so this option was taken forward to the next stage of testing.

An initial series of tests was undertaken by SIAS prior to a key stakeholder meeting in February 2008. The outcomes of these tests were discussed openly between SIAS and the Client Group. As a result, certain refinements were suggested which have been incorporated into the final evaluation.

In addition to the traffic model tests it was important to consider other road users including pedestrians, cyclists and alternative travel, such as public transport including rail and bus.

SIAS has identified 10 possible tests based on various elements of infrastructure improvement. These are summarised in Table 6.1.

Table 6.1 : Option Testing Matrix

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
Footpath link between Dyce Avenue and Argyll Road	√	√	√	√	√	√	√	√	√	√
Cycle lanes northbound on Dyce Drive	√	√	√	√	√	√	√	√	√	√
Pedestrian/ cycle facilities at Argyll Rd/Dyce Dr	√	√	√	√	√	√	√	√	√	√
Bus lane on Argyll Rd	√	√	√	√	√	√	√	√	√	√
Bus lane on Dyce Drive (Argyll Road to Wellheads Drive)			√	√	√	√	√	√	√	√
Bus lane (Wellheads Drive to A96T)				√		√		√	√	√
Changed priority at RBS roundabout	√		√	√	√	√	√	√	√	√
Closure to through traffic on Forties Road		√								
Segregated left at A96 roundabout					√	√				√
AWPR Junction							√			
Revised AWPR Junction								√		
Signalised roundabout on A96									√	√
Extended Right Turn lane on Dyce Drive north to Wellheads	√	√	√	√	√	√	√	√	√	√

6.3 Option Testing Methodology

In order to assess the proposed options, it has been necessary to identify a measurable value that is common to both the base model and the option testing models and can be readily output from the model. In this instance, journey time comparison is considered to give a good indication of the performance of the various options. For the broader purposes of this exercise, a range of journeys have been selected for comparison. These reflect the directionality of the traffic flow and associated congestion in the AM and PM peak periods. For example, in the AM peak period, vehicles travelling to the airport and Kirkhill Industrial Estate are subject to delays. In the PM peak period, the converse is true with delays being experienced by drivers leaving the airport and Kirkhill Industrial Estate heading towards the A96(T).

This is in line with the key objectives identified by stakeholders which include the maximisation of journey time savings.

S-Paramics permits the user to extract journey time data for trips between zones. This can be further refined to include separate data on specific vehicle types. It has been possible to

consider the benefits to cars and taxis individually. Bus journey times have also been extracted for comparison.

For comparison purposes, the journeys shown in Table 6.2 have been selected. Figure 6.1 illustrates the routes graphically.

Table 6.2 : Journey Times for Comparison

	Route	From	To
AM Peak Period	Route 1	A96(T) west of A947	Dyce Drive North (Z6)
	Route 2	A96(T) west of A947	Aberdeen Airport (Z7)
	Route 3	A96(T) west of A947	Wellheads (Z9)
	Route 4	A96(T) east of B979	Dyce Drive North (Z6)
	Route 5	A96(T) east of B979	Aberdeen Airport (Z7)
	Route 6	A96(T) east of B979	Wellheads (Z9)
	Bus Route A	A96(T) west of A947	Aberdeen Airport (Z7)
	Bus Route B	A96(T) west of A947	A96(T) east of B979
	Bus Route C	A96(T) east of B979	A96(T) west of A947
PM Peak Period	Route 7	Dyce Drive North (Z6)	A96(T) west of A947
	Route 8	Dyce Drive North (Z6)	A96(T) east of B979
	Route 9	Aberdeen Airport (Z7)	A96(T) west of A947
	Route 10	Aberdeen Airport (Z7)	A96(T) east of B979
	Route 11	Wellheads (Z9)	A96(T) west of A947
	Route 12	Wellheads (Z9)	A96(T) east of B979
	Bus Route D	Aberdeen Airport (Z7)	A96(T) west of A947
	Bus Route E	A96(T) west of A947	A96(T) east of B979
	Bus Route F	A96(T) east of B979	A96(T) west of A947

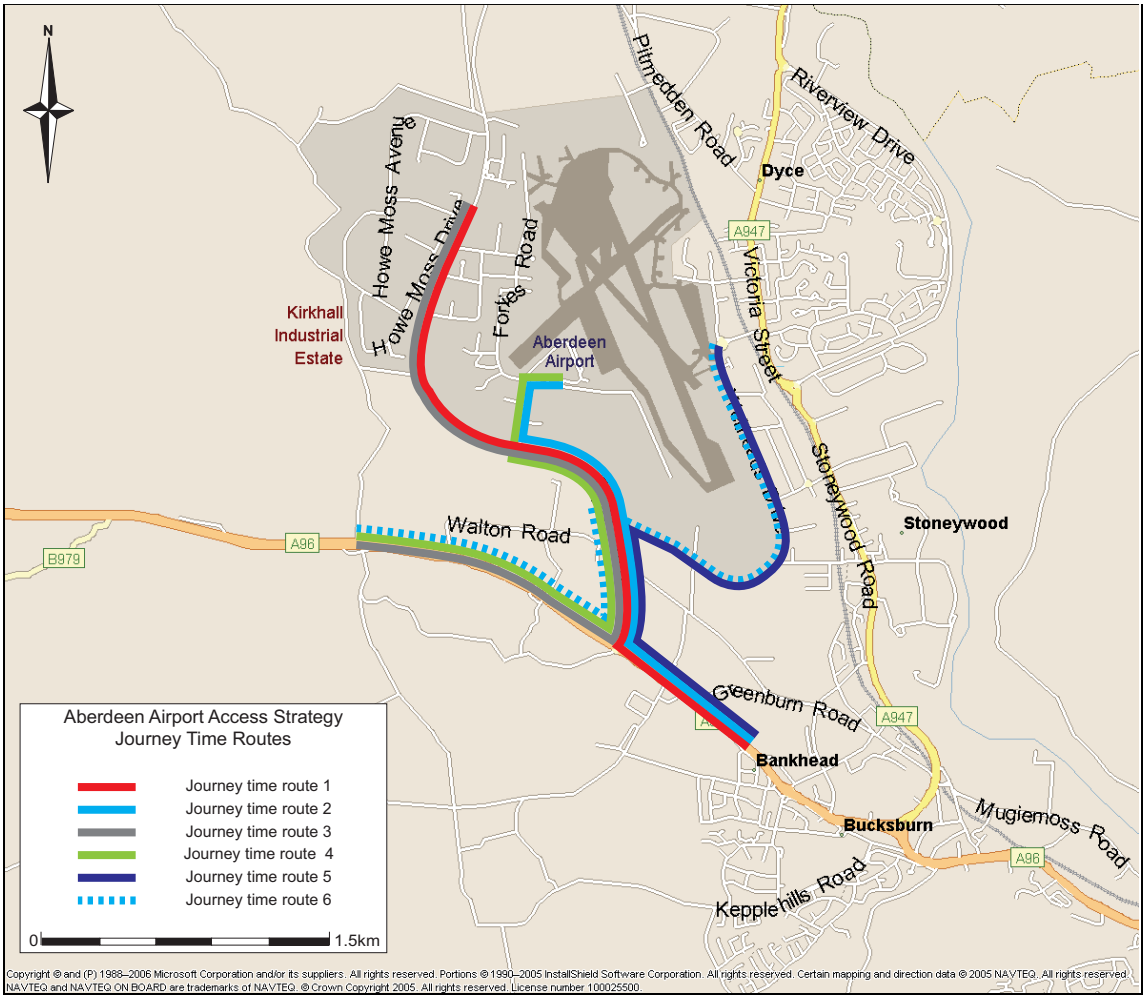

Figure 6.1 : Journey Time Comparison Routes

6.4 Base Model Development

The basis for the short term model testing has been the calibrated and validated base model supplied to Aberdeen City Council in January 2008. That model was built based on traffic survey data collected in October and November 2007. A validation report was submitted to Aberdeen City Council in January 2008 (SIAS Ref. TPATCAAS/68975).

As this programme of testing concerns immediate to short term option testing, no additional traffic growth has been applied and no future year base models have been prepared.

6.5 Option Testing

6.5.1 General

The validated base model has been used as the basis for the following sequence of testing. As with the base model, the options were tested in AM (06:00 – 09:00) and PM (16:00 – 19:00) peak periods. The output shown below is based on 5 model runs in accordance with S-Paramics good practice.

As this is an immediate/short improvement programme, the existing traffic conditions are being considered in the first instance without any future development growth.

6.5.2 Test 1

Test 1 contained 3 key elements that were common to the majority of the tests. These are:

- Bus/taxi lane on Brent Road and Argyll Road to reduce journey times for those vehicles in the PM peak period
- Change of priorities at RBS roundabout to encourage better flow of traffic from the airport to Argyll Road especially in the PM peak period
- Extended right turn lane on the northbound Dyce Drive approach to the junction with Wellheads Drive

The extended right turn lane part of this package of options was found to have a beneficial effect on the traffic flow northbound on Dyce Drive in the AM peak period. Test 1 was also found to partially alleviate the queuing on the A96(T) on the westbound approach to the roundabout in the AM peak. The eastbound queue on the A96(T) to the roundabout was also observed to be reduced. Although this is a positive outcome, SIAS would not expect this improvement alone to result in a total reduction in congestion.

Table 6.3 : Test 1 Journey Time Comparison – Cars and Taxis

	Test 1	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	281	-34.7%	273	-35.9%
	Route 2	380	387	266	-30.1%	266	-31.2%
	Route 3	481	488	319	-33.5%	324	-33.6%
	Route 4	1,626	992	390	-76.0%	567	-42.9%
	Route 5	1,625	1,640	376	-76.8%	474	-71.1%
	Route 6	1,673	0	426	-74.5%	0	
PM Peak Period	Route 7	735	740	763	3.8%	674	-8.9%
	Route 8	768	0	798	3.9%	0	
	Route 9	531	538	511	-3.7%	465	-13.4%
	Route 10	570	575	548	-3.9%	506	-11.9%
	Route 11	789	784	758	-3.9%	755	-3.7%
	Route 12	823	817	792	-3.8%	806	-1.4%

Table 6.3 shows the journey time comparison with the base model for cars and taxis. The table illustrates that journey time savings will be made in both the AM and PM peak periods. Typical journeys from the A96(T) west of the A947 to the airport or Kirkhill Industrial Estate will be

30% - 35% quicker in the AM peak. Journeys from the A96(T) east of the B979 to the airport and Kirkhill Industrial Estate will be 74% - 77% quicker in the AM peak. This is due to improved throughput resulting from the extended right turn lane described above.

Typical journey times in the PM peak period between Kirkhill Industrial Estate and the A96(T) were around 4% slower than the base. Journey time savings for cars from the airport to the A96(T) were less (4%) than for taxi journeys (12% - 13%).

Table 6.4 : Test 1 Journey Time Comparison – Buses

	Test 1	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	336	-25%
	Bus Route B	178	179	0%
	Bus Route C	1,082	219	-80%
PM	Bus Route D	563	542	-4%
	Bus Route E	180	180	0%
	Bus Route F	165	165	0%

Table 6.4 shows the typical journey time savings for buses in the AM and PM peak periods. The benefits in the AM peak period are more notable than the PM peak period.

Based on the results of Test 1, it is concluded that the package of measures as described would have a beneficial effect on journey times in the immediate term and all aspects can be carried forward for further consideration.

6.5.3 Test 2

Test 2 contained the alternative option to changing priorities at RBS roundabout. As discussed at initial meetings with the Client Group, BAA Aberdeen reserves the right to close the gates on Forties Road, thus preventing through traffic from Dyce Drive (north) rat running through the airport roads and emerging onto Dyce Drive from Argyll Road. The key components are therefore:

- Bus/taxi lane on Brent Road and Argyll Road to reduce journey times for those vehicles in the PM peak period
- Closure of Forties Road to through traffic by closing the gate at the junction of Kirkhill Road and Forties Road
- Extended right turn lane on the northbound Dyce Drive approach to the junction with Wellheads Drive

Table 6.5 shows the journey time comparison with the base model. A similar pattern of benefits to Test 1 on Routes 1-6, 9 & 10 are apparent from Table 6.5. It is notable that the journey time savings are generally less in Test 2 than Test 1.

There are increases in journey times in the PM peak period from Dyce Drive North to the A96(T) east and westbound. This is due to the closure of Forties Road to through traffic forcing more vehicles to use Dyce Drive and also removing the possibility of rat running. Additional traffic on Dyce Drive leads to more queuing, especially on the approach to Argyll Road, resulting in increased journey times.

Journey time comparisons for buses in Test 2 were more varied than in Test 1. This can be explained by more traffic from Dyce Drive North to Aberdeen Airport using Argyll Road which increases delays for other traffic heading toward the airport.

Table 6.5 : Test 2 Journey Time Comparison – Cars and Taxis

	Test 2	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	314	-26.8%	315	-26.1%
	Route 2	380	387	307	-19.4%	309	-20.2%
	Route 3	481	488	328	-31.8%	331	-32.2%
	Route 4	1,626	992	452	-72.2%	474	-52.2%
	Route 5	1,625	1,640	443	-72.7%	518	-68.4%
	Route 6	1,673	0	468	-72.0%	0	
PM Peak Period	Route 7	735	740	1,003	36.4%	1,012	36.7%
	Route 8	768	0	1,001	30.3%	0	
	Route 9	531	538	469	-11.7%	429	-20.2%
	Route 10	570	575	488	-14.4%	448	-22.1%
	Route 11	789	784	705	-10.6%	697	-11.1%
	Route 12	823	817	741	-9.9%	729	-10.8%

Table 6.6 shows the journey time comparison for buses in Test 2. The table demonstrates that there are additional benefits in the AM peak period for buses. The overall benefits in the PM peak period are similar to Test 1.

Table 6.6 : Test 2 Journey Time Comparison – Buses

	Test 2	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	382	-14%
	Bus Route B	178	179	0%
	Bus Route C	1,082	250	-77%
PM	Bus Route D	563	544	-3%
	Bus Route E	180	180	0%
	Bus Route F	165	322	96%

6.5.4 Summary

Test 1 has been found to offer a wider range of journey time savings in comparison to Test 2 and was therefore adopted for the next stages of testing. In particular, journeys from Dyce Drive North in the PM peak were found to be adversely affected in both tests, though most notably in Test 2. Other journeys not included in this comparison exercise such as between Dyce Drive North and the airport would also be affected with increased journey length and times throughout the peak periods.

6.6 Test 3

Test 3 comprised the following:

- Test 1
- Bus/Taxi Lane on Dyce Drive between Argyll Road and Wellheads Drive

Table 6.7 shows the journey time comparison output for Test 3.

Table 6.7 : Test 3 Journey Time Comparison – Cars and Taxis

	Test 3	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	265	-38.3%	263	-38.4%
	Route 2	380	387	243	-36.2%	242	-37.6%
	Route 3	481	488	306	-36.4%	301	-38.4%
	Route 4	1,626	992	385	-76.3%	527	-46.8%
	Route 5	1,625	1,640	367	-77.4%	270	-83.5%
	Route 6	1,673	0	422	-74.8%	0	
PM Peak Period	Route 7	735	740	604	-17.9%	471	-36.4%
	Route 8	768	0	644	-16.1%	0	
	Route 9	531	538	425	-20.0%	323	-40.0%
	Route 10	570	575	464	-18.7%	365	-36.5%
	Route 11	789	784	941	19.2%	941	19.9%
	Route 12	823	817	978	18.9%	986	20.7%

The journey times for the highlighted journeys in the AM peak period are similar to Test 1 with trips from the A96(T) west of the A947 to the airport and Dyce Drive North being between 36% - 38% quicker than the base. Journeys from the A96(T) east of the B979 to the airport and Dyce Drive North were around 76% quicker.

Journey times in the PM peak period were also quicker than in Test 1, with 16% - 20% less time taken between the A96(T) west of the A947 and Dyce Drive North and the Airport. Journeys between the A96(T) east of the B979 and Dyce Drive North and the Airport were also down by more than 60%. As with Tests 1 & 2, journey times from Wellheads to the A96(T) were found to be marginally slower. This is due to improvements at the RBS roundabout increasing the flow of traffic southbound on Dyce Drive thus reducing the space on Dyce Drive for Wellheads Drive traffic to turn into.

Table 6.8 : Test 3 Journey Time Comparison – Buses

	Test 3	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	305	-32%
	Bus Route B	178	178	0%
	Bus Route C	1,082	224	-79%
PM	Bus Route D	563	368	-35%
	Bus Route E	180	179	-1%
	Bus Route F	165	164	0%

Table 6.8 shows a further decrease in bus journey times in the AM peak period over and above the results of Test 1. The bus journey time savings in the PM peak period are more notable with between 20% - 35% journey time reduction.

Test 3 has shown that increasing the length of the bus/taxi priority lanes will reduce journey times further than Test 1. As with Test 1, extending the right turn lane on Dyce Drive will reduce AM journey times although this should be treated with caution as it is unlikely that a single measure will have such a significant impact.

6.7 Test 4

This is the natural progression from Test 3 and sees only 2 further inclusions:

- Test 3
- Bus/Taxi lane on Dyce Drive from Wellheads Drive to the A96(T)
- Improvement to the merge on exit from the A96(T) roundabout onto Dyce Drive

Table 6.9 : Test 4 Journey Time Comparison – Cars and Taxis

	Test 4	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	270	-37.1%	267	-37.3%
	Route 2	380	387	250	-34.4%	249	-35.6%
	Route 3	481	488	312	-35.1%	315	-35.4%
	Route 4	1,626	992	386	-76.3%	344	-65.3%
	Route 5	1,625	1,640	369	-77.3%	289	-82.4%
	Route 6	1,673	0	430	-74.3%	0	
PM Peak Period	Route 7	735	740	411	-44.2%	324	-56.2%
	Route 8	768	0	444	-42.2%	0	
	Route 9	531	538	278	-47.6%	217	-59.7%
	Route 10	570	575	306	-46.4%	250	-56.6%
	Route 11	789	784	534	-32.3%	514	-34.5%
	Route 12	823	817	566	-31.3%	552	-32.5%

Table 6.9 demonstrates the additional journey time savings which can be achieved by making the changes required for Test 4. There are journey time savings in on all compared routes in both the AM and PM peak periods. It is notable that there is no longer an increase in journey times for trips from Wellheads Drive in the PM peak. This is a result of improved flows on Dyce Drive allowing more traffic to emerge from Wellheads Drive.

The inclusion of bus/taxi facilities as far as the A96(T) has a significant effect on the journey times from Dyce Drive North and Aberdeen Airport in the PM peak period. Average journey times are between 42% and 47% less than the base model. This benefit arises due to the inclusion of extra stacking length on the approach to the A96(T) roundabout. The extra stacking length permits vehicles bound for Inverurie to avoid the queue of left turning traffic.

Table 6.10 : Test 4 Journey Time Comparison – Buses

	Test 5	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	318	-29%
	Bus Route B	178	179	0%
	Bus Route C	1,082	231	-79%
PM	Bus Route D	563	270	-52%
	Bus Route E	180	179	-1%
	Bus Route F	165	162	-1%

Table 6.10 shows further journey time savings for buses in the AM and PM peak periods. The PM peak shows the greatest improvement with journey time savings of between 25% and 51% compared to the base model.

6.8 Test 5

Test 5 is the first test to include junction improvements at the Dyce Drive/A96(T) roundabout and is based on Test 3 with the following amendments:

- Test 3
- Segregated left turn lane from Dyce Drive to the A96(T)
- Improvement to the merge on exit from the A96(T) roundabout onto Dyce Drive

Table 6.11 shows the journey time comparison for Test 5. The reduction in journey times in the AM peak period is similar to previous tests. This is to be expected as the segregated left turn lane will have little impact on traffic turning north from the A96(T).

The PM peak period journey times are significantly reduced in comparison to the base model (29% - 51% quicker) and represent a further improvement on Tests 1 – 4. As with the previous tests, taxis continue to gain greater savings compared to private cars. Test 5 does not result in a significant reduction in PM journey times compared to Test 4. This can be attributed to the lack of bus/taxi priority lane south of Wellheads Drive and the associated stacking distance for vehicles about to turn right.

All vehicles in the PM peak appear to benefit significantly from the inclusion of a segregated left turn lane at the A96(T) roundabout.

Table 6.11 : Test 5 Journey Time Comparison – Cars and Taxis

	Test 5	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	271	-36.9%	272	-36.3%
	Route 2	380	387	252	-33.8%	252	-35.0%
	Route 3	481	488	310	-35.4%	310	-36.5%
	Route 4	1,626	992	381	-76.6%	357	-64.0%
	Route 5	1,625	1,640	371	-77.2%	324	-80.2%
	Route 6	1,673	0	425	-74.6%	0	
PM Peak Period	Route 7	735	740	395	-46.2%	312	-57.9%
	Route 8	768	0	433	-43.6%	0	
	Route 9	531	538	262	-50.6%	214	-60.2%
	Route 10	570	575	297	-47.9%	252	-56.1%
	Route 11	789	784	550	-30.2%	548	-30.1%
	Route 12	823	817	585	-28.9%	554	-32.2%

Table 6.12 shows that buses also benefit further from the introduction of the segregated left turn lane.

Table 6.12 : Test 5 Journey Time Comparison – Buses

	Test 5	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	318	-29%
	Bus Route B	178	179	0%
	Bus Route C	1,082	231	-79%
PM	Bus Route D	563	270	-52%
	Bus Route E	180	179	-1%
	Bus Route F	165	162	-1%

It can be observed from the output of Test 5 that the introduction of a segregated left turn lane at the roundabout significantly reduces the journey times for southbound vehicles in the PM peak period in comparison to Test 3.

6.9 Test 6

Test 6 is a formed from Test 4 but adopts the segregated left turn lane from Test 5. In summary:

- Test 4
- Segregated left turn lane from Dyce Drive to the A96(T)
- Improvement to the merge on exit from the A96(T) roundabout onto Dyce Drive

Table 6.13 shows the journey time comparison for Test 6.

Table 6.13 : Test 6 Journey Time Comparison – Cars and Taxis

	Test 6	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	267	-37.9%	267	-37.3%
	Route 2	380	387	248	-34.7%	248	-36.0%
	Route 3	481	488	311	-35.3%	313	-35.8%
	Route 4	1,626	992	388	-76.1%	419	-57.8%
	Route 5	1,625	1,640	372	-77.1%	685	-58.3%
	Route 6	1,673	0	430	-74.3%	0	
PM Peak Period	Route 7	735	740	342	-53.5%	294	-60.3%
	Route 8	768	0	379	-50.7%	0	
	Route 9	531	538	233	-56.2%	191	-64.4%
	Route 10	570	575	269	-52.8%	224	-61.0%
	Route 11	789	784	418	-47.0%	415	-47.0%
	Route 12	823	817	456	-44.6%	474	-42.0%

In the AM peak period, the journey time savings are comparable with Tests 3, 4 & 5.

The benefits of the additional bus lane between Wellheads Road and the A96(T) over and above the segregated left turn are notable with further reduction in journey times compared to Test 5 in both the AM and PM peak periods. Average journey times in the PM peak period are 44% - 57% less than the base model.

Table 6.14 : Test 6 Journey Time Comparison – Buses

	Test 6	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	314	-30%
	Bus Route B	178	178	0%
	Bus Route C	1,082	228	-79%
PM	Bus Route D	563	270	-52%
	Bus Route E	180	180	0%
	Bus Route F	165	163	-1%

Table 6.14 demonstrates that further journey time reductions for buses are available over and above the previous tests.

The combination of bus/taxi only over the full length of Dyce Drive and segregated left turn lane at the A96(T) roundabout offer the greatest journey time savings and should be taken forward for further consideration.

6.10 Test 7

The junction between the A96(T) and Dyce Drive forms part of a wide range of improvements forming the overall AWPR scheme which is a long term package. The original design of the junction has been based on predicted flows resulting from the revised road network. Junction performance in the immediate to short term is therefore unlikely to be optimised.

A summary test was carried out on a modified version of the proposed AWPR junction, shown in Figure 5.14. Table 6.15 shows the journey time comparison output.

Table 6.15 : Test 7 Journey Time Comparison – Cars and Taxis

	Test 7	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	292	-32.1%	293	-31.3%
	Route 2	380	387	273	-28.2%	272	-29.8%
	Route 3	481	488	327	-32.0%	334	-31.6%
	Route 4	1,626	992	314	-80.7%	269	-72.9%
	Route 5	1,625	1,640	293	-82.0%	317	-80.7%
	Route 6	1,673	0	348	-79.2%	0	
PM Peak Period	Route 7	735	740	434	-41.0%	355	-52.0%
	Route 8	768	0	482	-37.2%	0	
	Route 9	531	538	284	-46.6%	235	-56.3%
	Route 10	570	575	326	-42.7%	271	-52.9%
	Route 11	789	784	572	-27.5%	578	-26.3%
	Route 12	823	817	620	-24.7%	612	-25.1%

Table 6.16 : Test 7 Journey Time Comparison – Buses

	Test 7	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	349	-22%
	Bus Route B	178	201	13%
	Bus Route C	1,082	198	-82%
PM	Bus Route D	563	301	-47%
	Bus Route E	180	218	21%
	Bus Route F	165	198	20%

Table 6.15 and Table 6.16 demonstrate that some journey time savings are achievable using a modified AWPR junction, for example routes 4 – 6 show reduction in journey times in the AM peak period. The reductions in journey time are generally less than in Tests 1 – 4 (which do not include junction improvements) in the PM peak period.

6.11 Test 8

SIAS has made additional amendments to the proposed AWPR model including longer merges on Dyce Drive, more appropriate allocation on the A96(T) and adjustment of the signal timings. The resulting option for testing has the following key elements:

- Test 3
- Revised AWPR junction including revised lane allocation and signal timings

Table 6.17 : Test 8 Journey Time Comparison – Cars and Taxis

	Test 8	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	291	-32.2%	290	-31.9%
	Route 2	380	387	279	-26.6%	280	-27.7%
	Route 3	481	488	320	-33.4%	327	-33.1%
	Route 4	1,626	992	332	-79.6%	309	-68.8%
	Route 5	1,625	1,640	325	-80.0%	327	-80.1%
	Route 6	1,673	0	362	-78.4%	0	
PM Peak Period	Route 7	735	740	394	-46.4%	327	-55.8%
	Route 8	768	0	480	-37.5%	0	
	Route 9	531	538	257	-51.6%	210	-61.0%
	Route 10	570	575	331	-41.9%	283	-50.7%
	Route 11	789	784	498	-36.9%	495	-36.9%
	Route 12	823	817	581	-29.4%	594	-27.4%

Table 6.18 : Test 8 Journey Time Comparison – Buses

	Test 8	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	355	-20%
	Bus Route B	178	201	13%
	Bus Route C	1,082	512	-53%
PM	Bus Route D	563	264	-53%
	Bus Route E	180	213	18%
	Bus Route F	165	550	234%

Table 6.17 and Table 6.18 demonstrate that further journey time savings are achievable using a more significantly modified AWPR junction. These are less than in Tests 1 – 4 (which do not include junction improvements) in the PM peak period. It is also noted that journey times from Wellheads Drive in the PM peak period are similarly affected by the increase in traffic on the Dyce Drive approach to the junction.

6.12 Test 9

This option is based on Test 4 with the addition of partial signalisation of the roundabout at the A96(T)/Dyce Drive junction. The key elements are therefore:

- Test 4
- Signals on the A96(T) approaches to Dyce Drive Roundabout, peak period only
- Improvement to the merge on exit from the A96(T) roundabout onto Dyce Drive

Table 6.19 shows the journey time comparison output for Test 9.

Table 6.19 : Test 9 Journey Time Comparison – Cars and Taxis

	Test 9	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	278	-35.3%	279	-34.6%
	Route 2	380	387	261	-31.4%	260	-32.8%
	Route 3	481	488	307	-36.0%	313	-35.8%
	Route 4	1,626	992	366	-77.5%	342	-65.5%
	Route 5	1,625	1,640	352	-78.4%	342	-79.1%
	Route 6	1,673	0	390	-76.7%	0	
PM Peak Period	Route 7	735	740	589	-19.8%	450	-39.2%
	Route 8	768	0	635	-17.4%	0	
	Route 9	531	538	385	-27.5%	271	-49.5%
	Route 10	570	575	425	-25.5%	318	-44.7%
	Route 11	789	784	756	-4.1%	724	-7.7%
	Route 12	823	817	807	-2.0%	728	-10.9%

The output from testing of this option indicates that there are similar journey time reductions to tests 4, 5 & 6 for trips from both east and west on the A96(T) to Aberdeen Airport and Dyce Drive North in the AM peak period. Journeys from Inverurie are considerably quicker in comparison to the base model (65% to 70%). This is a result of improved traffic flow from the Inverurie direction through the roundabout.

Journey time savings in the PM peak from the Airport and Dyce Drive are also similar to Tests 4, 5 & 6. Average journey times are around 20% less from Dyce Drive North and around 28% less from Aberdeen Airport. Journey times from Wellheads Drive are also considerably less (8% to 10%) compared to the base model.

Table 6.20 : Test 9 Journey Time Comparison – Buses

	Test 9	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	337	-24%
	Bus Route B	178	181	1%
	Bus Route C	1,082	194	-82%
PM	Bus Route D	563	337	-40%
	Bus Route E	180	195	8%
	Bus Route F	165	173	5%

Table 6.20 illustrates the bus journey time comparison output for Test 9 and demonstrates an overall increase in journey times compared to Test 8.

6.13 Test 10

This option is a hybrid of 2 previously tested options – Test 4 and Test 9 – which is considered to offer a comprehensive package of junction improvement measures at the A96(T). Table 6.21 shows the journey time comparison for this test.

Table 6.21 : Test 10 Journey Time Comparison – Cars and Taxis

	Test 10	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	276	-35.6%	274	-35.7%
	Route 2	380	387	256	-32.8%	255	-34.0%
	Route 3	481	488	313	-34.9%	309	-36.6%
	Route 4	1,626	992	453	-72.1%	349	-64.8%
	Route 5	1,625	1,640	437	-73.1%	493	-69.9%
	Route 6	1,673	0	490	-70.7%	0	
PM Peak Period	Route 7	735	740	425	-42.2%	367	-50.5%
	Route 8	768	0	476	-38.1%	0	
	Route 9	531	538	258	-51.4%	212	-60.6%
	Route 10	570	575	307	-46.1%	261	-54.5%
	Route 11	789	784	535	-32.2%	536	-31.7%
	Route 12	823	817	585	-28.9%	559	-31.6%

As would be expected, this option provides the greatest overall range of journey time savings. AM peak period journey times to Aberdeen Airport and Dyce Drive North are up to 70% less than the base model. PM peak period journey times from Aberdeen Airport and Dyce Drive North are up to 51% less than the base model. As with all of the options tested, taxis are a primary beneficiary of this scheme.

Table 6.22 demonstrates that bus journey times are also significantly reduced by this option, which again highlights the benefits in the PM peak period of combining bus/taxi priority lanes with a segregated left turn lane

Table 6.22 : Test 10 Journey Time Comparison – Buses

	Test 10	Base Journey Time (s)	Journey Time (s)	
			Time	% Diff
AM	Bus Route A	446	327	-27%
	Bus Route B	178	181	1%
	Bus Route C	1,082	272	-75%
PM	Bus Route D	563	280	-50%
	Bus Route E	180	190	6%
	Bus Route F	165	175	7%

6.14 Summary of Option Testing

All of the options tested included an extension to the right turn lane on Dyce Drive in to Wellheads Drive. This produced a journey time saving in the AM peak period for cars, taxis and buses of at least 20%. Although satisfied with the validity of the base model, SIAS would state that site observation and analysis of turning movements on different days have shown sensitive variation in behaviour. A combination of improvements would be required to maximise any journey time savings from the A96(T) to Aberdeen airport and Dyce Drive North.

All of the various lengths of bus/taxi lane on Brent Road, Argyll Road and Dyce Drive produced incremental journey time savings in the PM peak period. Buses and taxis benefited the most from these measures.

Figure 6.2 & Figure 6.3 illustrate the average journey time between the eastern extent of the traffic model and Aberdeen Airport (Route 2) in the AM peak period and vice versa (Route 9) in the PM peak period for cars and taxis for the various test options. These graphs are intended to show an overall comparison only as further detail has been provided in the preceding sections.

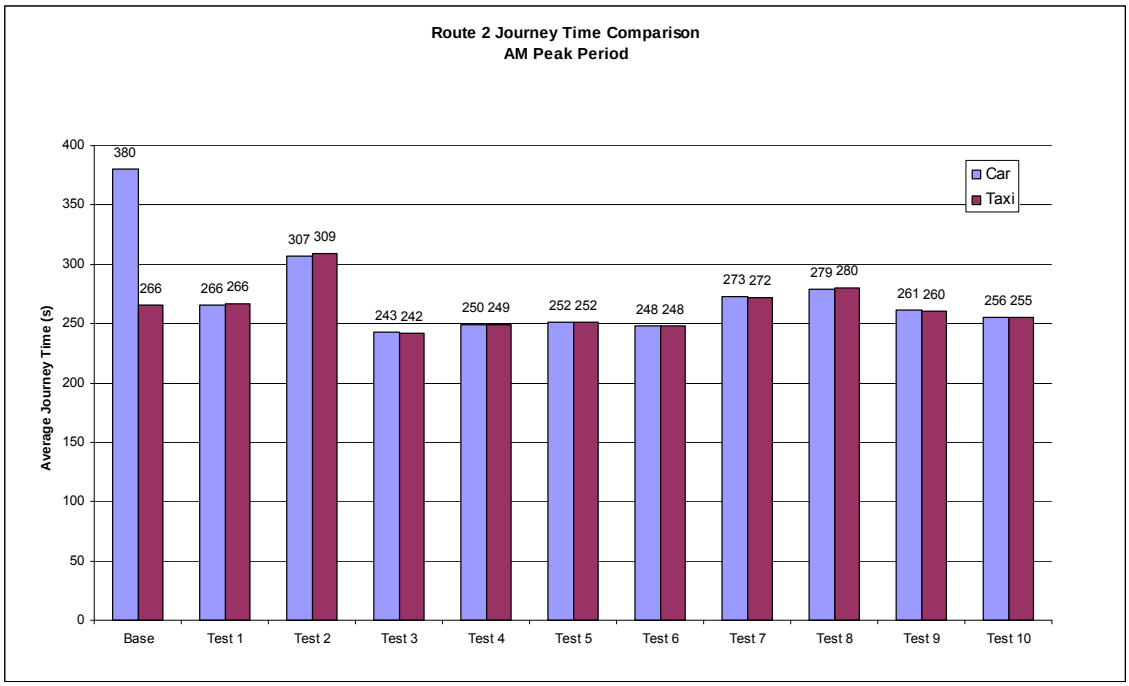

Figure 6.2 : A96(T) – Aberdeen Airport Average Journey Time Comparison - AM Peak Period

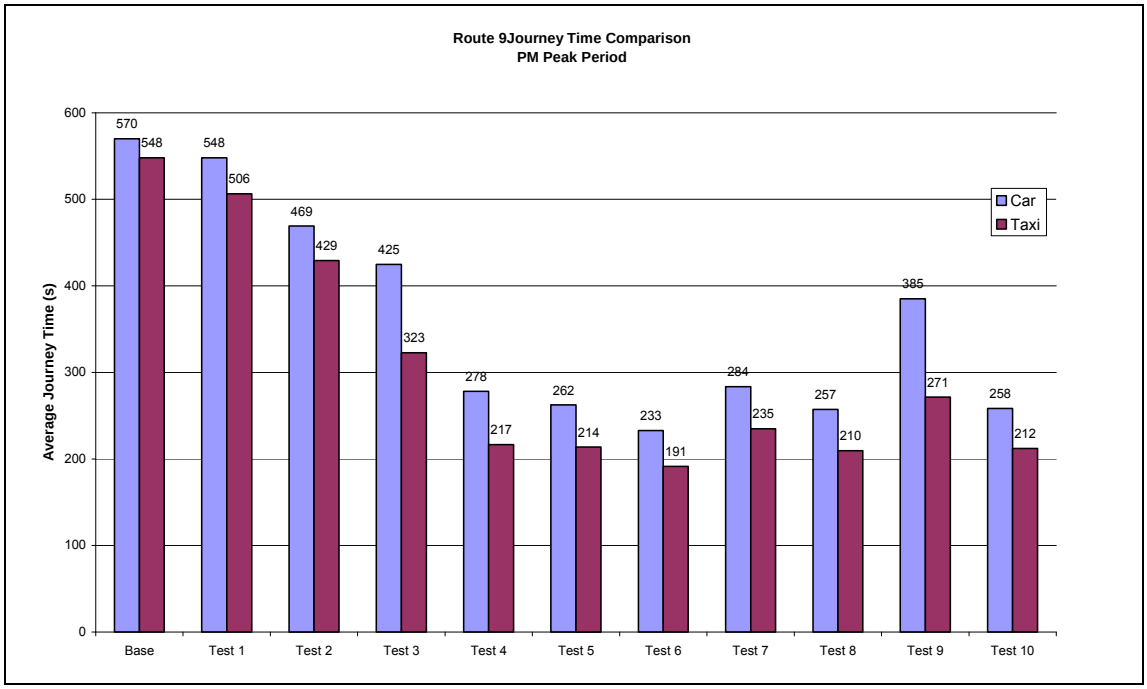

Figure 6.3 : Aberdeen Airport – A96(T) Average Journey Time Comparison - PM Peak Period

It can be observed from Figure 6.2 that the most beneficial scheme in the AM peak period is Test 3. Figure 6.3 demonstrates that Test 6 is the most beneficial for airport traffic in the PM peak period.

6.15 Recommended Tests Derived From Initial Sifting

Based on the programme of testing undertaken to this point, SIAS recommends the following options for further consideration:

6.15.1 Test 4

This option contains the following elements:

- Bus/taxi lane on Brent Road and Argyll Road to reduce journey times for those vehicles in the PM peak period
- Change of priorities at RBS roundabout to encourage better flow of traffic from the airport to Argyll Road especially in the PM peak period
- Extended right turn lane on the northbound Dyce Drive approach to the junction with Wellheads Drive.
- Bus/Taxi Lane on Dyce Drive between Argyll Road and Wellheads Drive
- Bus/Taxi lane on Dyce Drive from Wellheads Drive to the A96(T)
- Improvement to the merge on exit from the A96(T) roundabout onto Dyce Drive

6.15.2 Test 6

This option contains the elements of Test 4 plus the following:

- Segregated left turn lane from Dyce Drive to the A96(T)

7 ADDITIONAL OPTION TESTING WORKS

7.1 General

Following on from the main option testing process, Nestrans has subsequently requested that SIAS tests the impact of undertaking lane re-allocation measures on Dyce Drive on the approach to the A96(T) roundabout, which could be carried out in the immediate to short term.

SIAS was also requested to consider the potential impact of a development adjacent to Dyce Drive north of Wellheads Drive. Two tests are (Test 11 & Test 12) were undertaken and are described in Appendix A.

7.2 Purpose of Additional Testing

Based on the findings of Chapter 6 of this report, SIAS has tested a range of measures which could be carried out at comparatively low cost and could offer immediate journey time savings. These include:

- changing the priorities at the RBS roundabout at the junction of Argyll Road, Brent Road and Forties Road
- implementing bus/taxi only lanes over various lengths of Brent Road, Argyll Road and Dyce Drive
- extending the right turn lane on Dyce Drive at the junction with Wellheads Drive

These were designed to be implementable in the immediate to short term and have been tested through the use of the S-Paramics base model and found to offer some journey time savings in the AM and PM peak periods.

Further options including improvements to the A96(T)/Dyce Drive junction were also considered, although these would require a greater degree of infrastructure changes, with increases in the associated costs and timescales.

With a view to the future construction of the AWPR in the medium term, the Client Group is keen to see the immediate implementation of measures which will offer journey time savings in the Dyce Drive area. Ideally these would not involve significant changes to existing infrastructure, which will become obsolete in the medium term.

7.3 Options for Consideration

SIAS has been requested to test 2 further options which involve re-allocation of the lanes on the southbound Dyce Drive approach to the A96(T) roundabout.

The main requirements for the options in this testing exercise are that the construction can be undertaken quickly and within the existing kerblines. This is intended to minimise construction costs and disruption. Such an approach has the additional benefit of not requiring additional land take or being contrary to the medium term AWPR proposals.

Although there are no significant infrastructure changes involved in the 2 options, appropriate measures would have to be taken to ensure driver education regarding new road markings. This could take the form of advance signing warning of new road layout ahead, press releases and other public awareness exercises and could include Aberdeen City Council, BAA Aberdeen and Dyce TMO.

It was agreed between SIAS and Aberdeen City Council that the options would be tested for PM peak period performance only, as the works would not materially affect the traffic conditions in the AM peak period.

The PM peak hour turning movements are shown in Figure 7.1 which demonstrates the high level of left turns from Dyce Drive onto the A96(T) toward Aberdeen (73% of traffic southbound on Dyce Drive turned left). The other major flow is on the A96(T) from east to west (65% of all vehicles from the A96(T) east of the A947 go straight ahead at the roundabout).

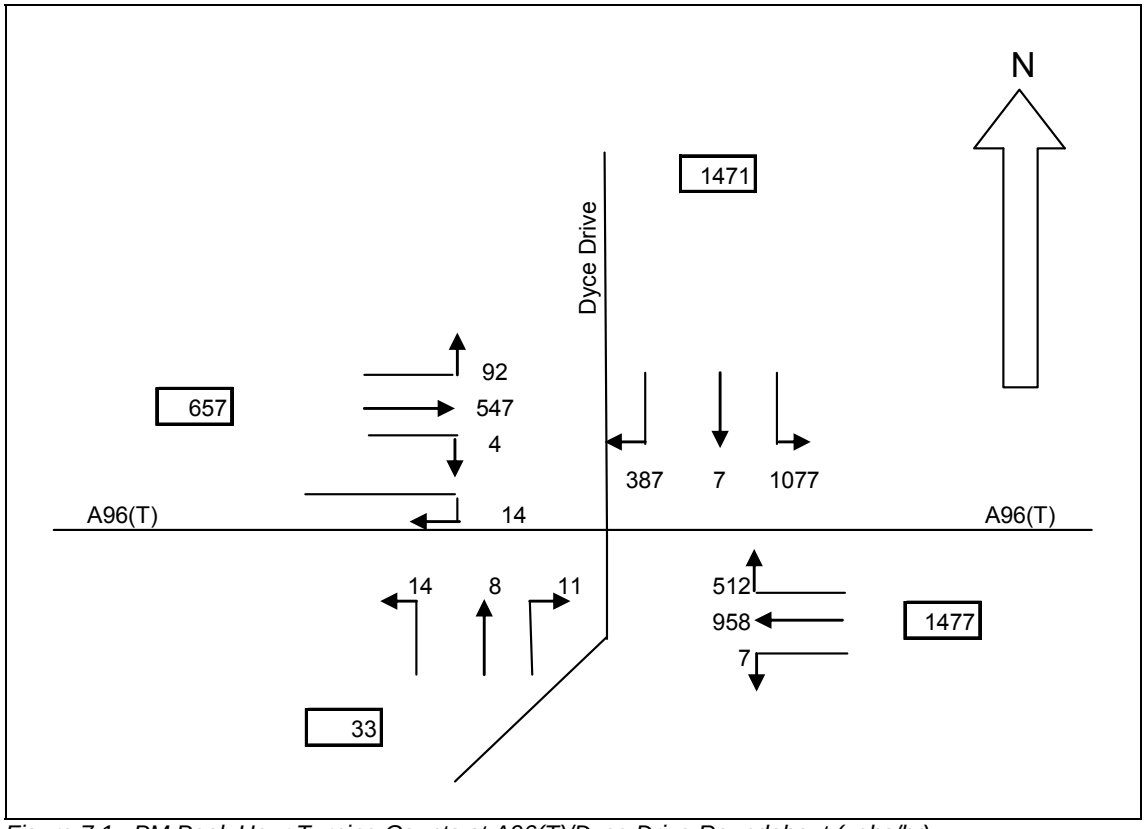

Figure 7.1 : PM Peak Hour Turning Counts at A96(T)/Dyce Drive Roundabout (vehs/hr)

7.3.1 Test 13

This option involves remarking of lane allocation arrows on the Dyce Drive southbound approach to the roundabout as shown in Figure 7.2.

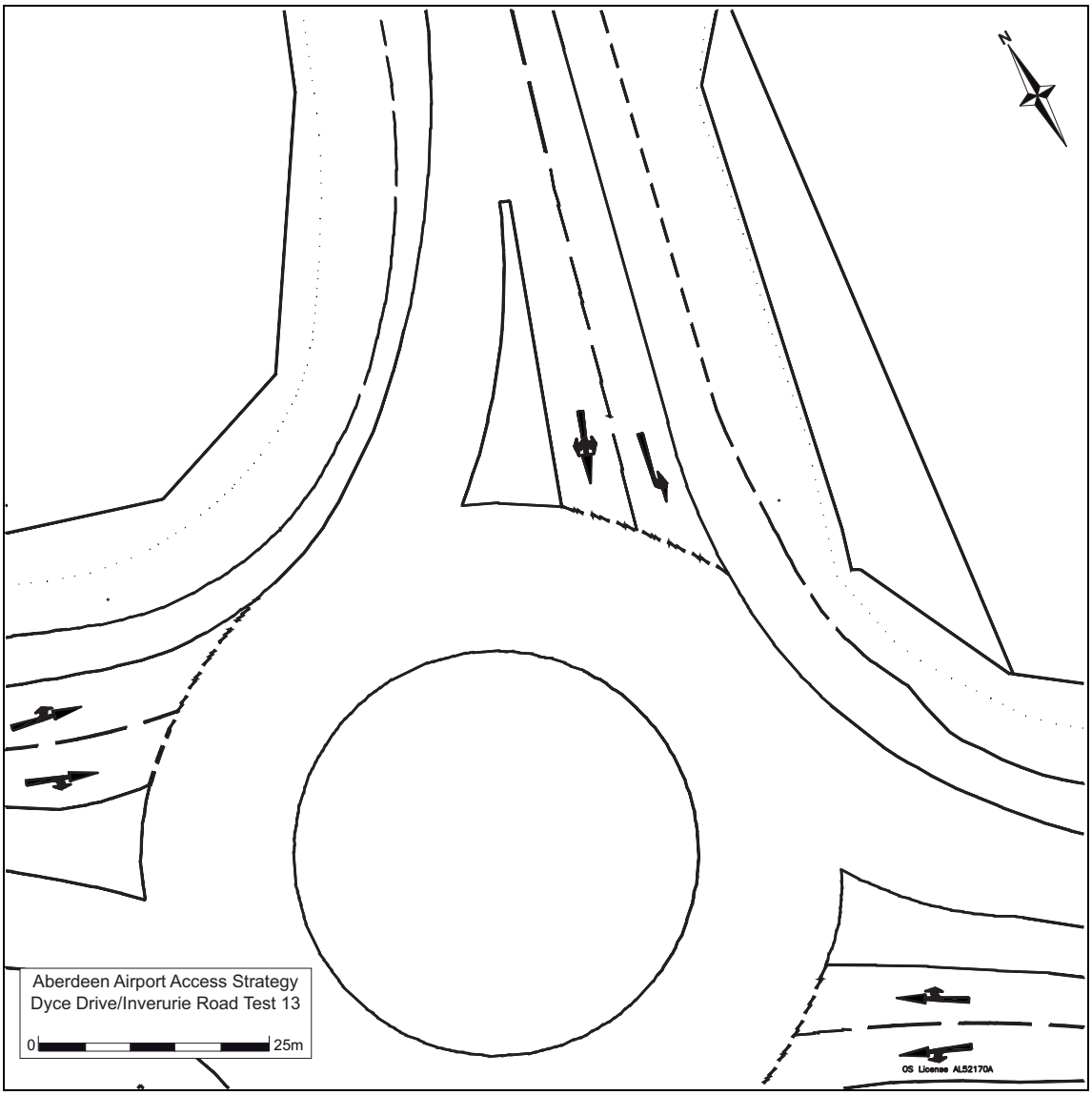

Figure 7.2 : Test 13

The nearside lane would be for left turning traffic only as this has been identified as the most common manoeuvre for traffic on this link. The offside lane would also be available for left turns, straight ahead movements and right turns.

These changes would require to be signposted on the southbound side Dyce Drive to ensure appropriate driver behaviour.

7.3.2 Test 14

This option involves splitting the 2 existing approach lanes on Dyce Drive to form 3 approach lanes southbound on Dyce Drive as shown in Figure 7.3.

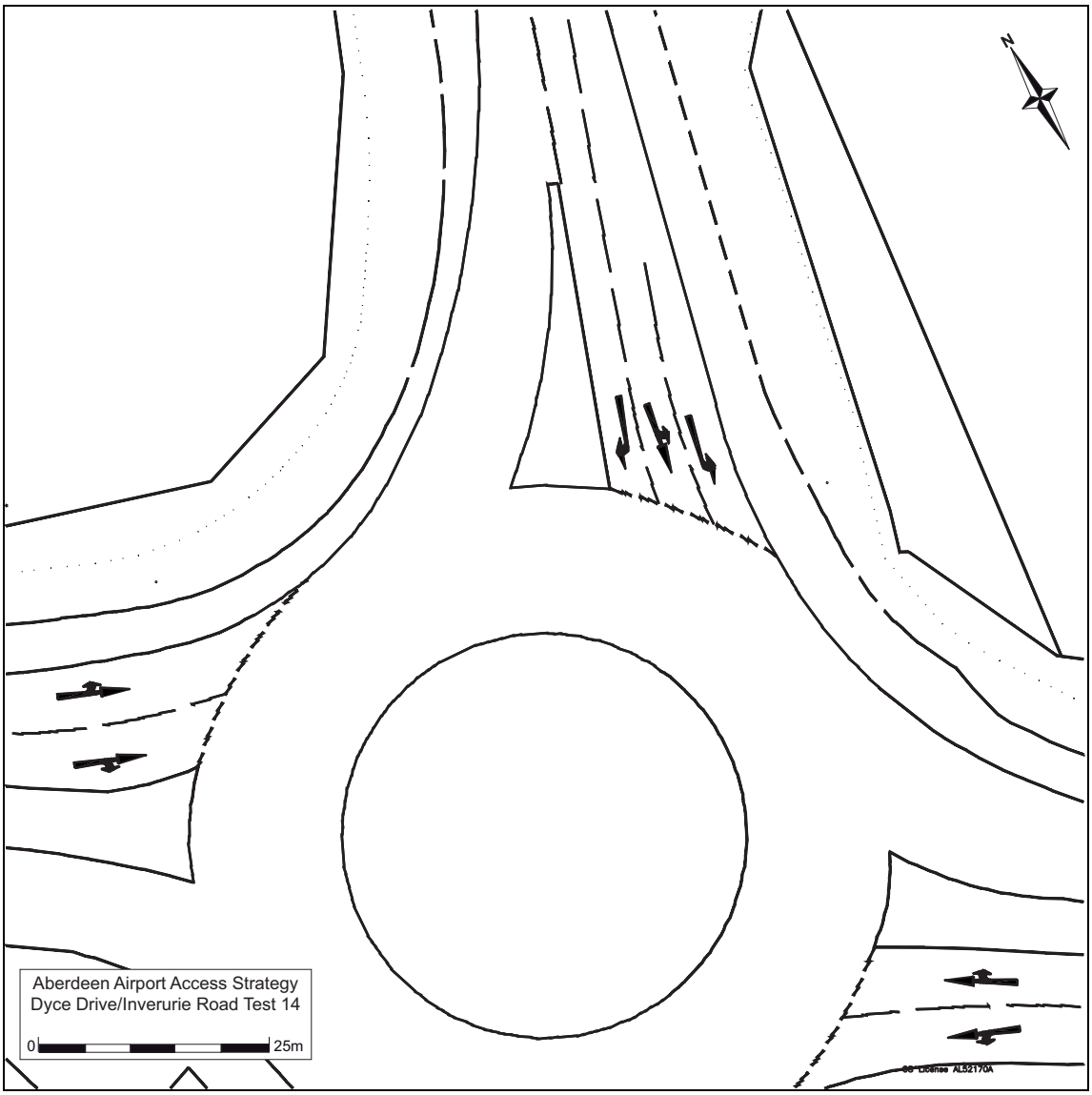

Figure 7.3 : Test 14

As with Test 13, the nearside lane would be left turn only. The middle lane would be for left turns and straight ahead movements, while the offside lane would be for right turns only.

A similar arrangement is currently in operation at Haudagain roundabout between the A90(T) and the A96(T).

7.4 Testing and Outcome

7.4.1 Base Model

The base model used for the 2 tests was developed during the main Dyce Drive/Argyll Road Study and is listed as Test 1 in Chapter 6 and includes:

- Bus/taxi lane on Brent Road and Argyll Road to reduce journey times for those vehicles in the PM peak period
- Change of priorities at RBS roundabout to encourage better flow of traffic from the airport to Argyll Road especially in the PM peak period
- Extended right turn lane on the northbound Dyce Drive approach to the junction with Wellheads Drive)

This was developed from the original base model used for calibration and validation.

7.4.2 Model Period

It was agreed that Tests 13 and 14 would only be undertaken during the PM peak period. This is modelled in S-Paramics as 16:00 – 19:00 with a 30 minute run-out period.

7.4.3 Journey Time Comparison

The PM journeys used in the testing exercise are the same as those in the main report. As previously, the journey times listed in the following tables are based on the average journey times for cars during the PM peak period and are based on 5 runs of the S-Paramics model with a random seed to ensure variation between each run. Only journey times on Routes 7 – 12 have been measured.

The original base model and Test 1 have been used as benchmarks to compare the impact of the proposed lane allocation changes. The results of the testing are summarised in Table 7.1, the % difference refers to the change in journey time compared to the calibrated base model.

Table 7.1 : Journey Time Comparisons

Car Journey Times	Base	Test 1		Test 13		Test 14	
	Time (s)	Time (s)	% diff	Time (s)	% diff	Time (s)	% diff
Route 7	735	763	4%	428	-42%	428	-42%
Route 8	768	798	4%	459	-40%	460	-40%
Route 9	531	511	-4%	283	-47%	280	-47%
Route 10	570	548	-4%	319	-44%	315	-45%
Route 11	789	758	-4%	428	-46%	426	-46%
Route 12	823	792	-4%	464	-44%	462	-44%

Table 8.1 shows that Tests 13 and 14 have the potential to reduce journey times from Aberdeen Airport, Kirkhill Industrial Estate and Wellheads to the A96(T) during the PM peak period. The results are illustrated in Figure 7.4.

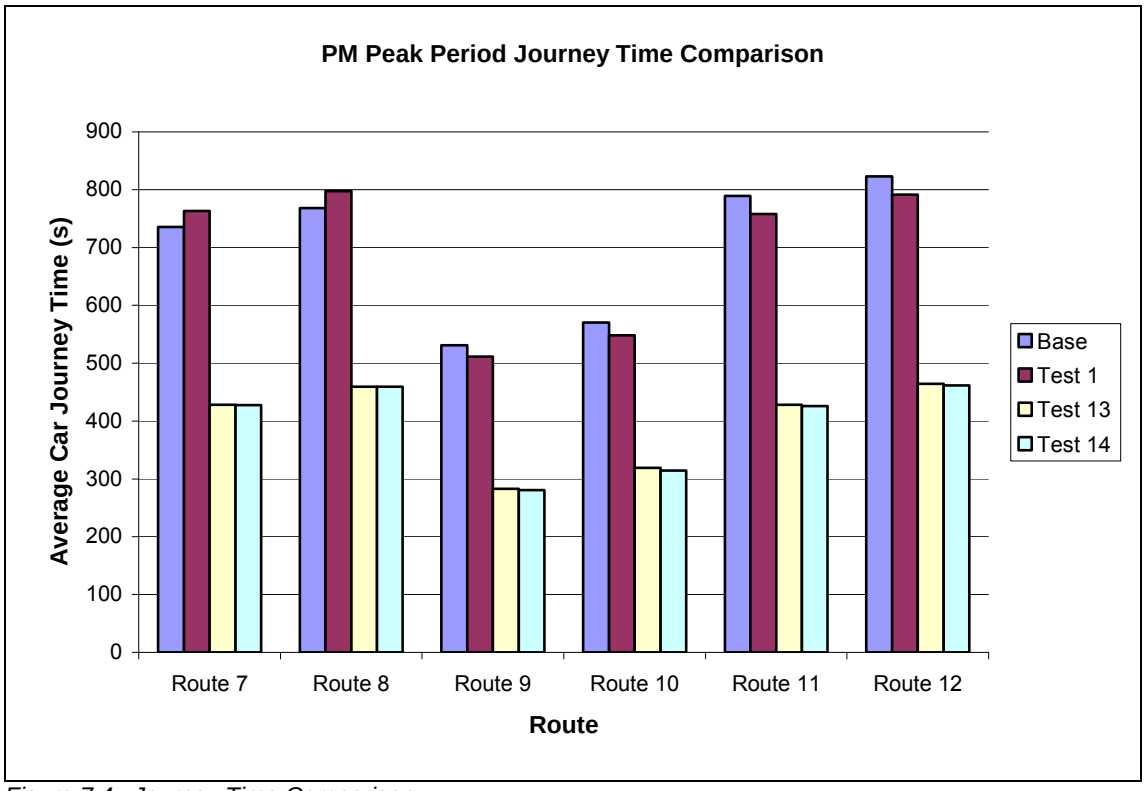

Figure 7.4 : Journey Time Comparison

SIAS would point out that the actual level of journey time savings and reduction in queue lengths may vary from the model. This is due to the fact that the calibrated and validated model was based on the traffic prevalent on 2 survey days. It was noted that there were significantly different levels of congestion on the 2 days. As with any traffic model, this represents a snapshot of the conditions prevalent on the day of survey.

SIAS would also recommend caution when considering the potential improvements resulting from changes to lane markings. It is unlikely that these alone would maximise the journey time savings and they would have to be augmented by new signage and a campaign to alert motorists to the new road layout.

7.5 Conclusion

Both of the options considered have been found to offer journey time savings for trips from Aberdeen Airport, Kirkhill Industrial Estate and Wellheads to Aberdeen and Inverurie during the PM peak period in comparison to the base model and Test 1, which also included minor improvement measures.

Test 13 and Test 14 produced very similar results with only a few seconds between the average journey times. Test 14 was found to produce journey times which were up to 4 seconds shorter.

Typical savings of around 40% may be possible for cars on the routes identified in comparison to the base model.

8 COST ESTIMATES & PHASING

8.1 General

Initial construction cost estimates have been prepared by Mouchel for all of the elements of the Option Tests described in Chapters 5 & 6. These cost estimates have been prepared on the assumption that there are no extraordinary costs associated with any of the proposal, i.e. the following assumptions have been made:

- No account has been made of costs relating to utility diversions
- All land required for widening and/or junction improvement works will be available
- No other special permits or permissions will be required to undertake the works
- Costs have been prepared for carrying out the works at night and during normal working hours. Night working has an additional premium to reflect labour costs
- Preliminaries - 15%
- Contingency - 20%
- Design fees - 10%
- Day site supervision fees - 10%
- Night site supervision fees - 10%

In addition, no allowances have been made for:

- site clearance of existing signage
- site clearance of vegetation that may affect the proposals
- site clearance of existing lighting columns and associated electrical items
- erection of existing signs that require to be moved to facilitate the works
- erection of lighting columns in new locations at rear of new road/footway alignments
- relaying existing parking restriction lining

These items have been omitted from the estimates as extensive survey and design work would be required to accurately estimate the costs involved.

An allowance has been made for working at night and a 25% premium has been added to the labour portion of the full rates used in this estimate.

8.2 Construction Costs

Figure 8.1 shows a summary of the initial costs received by SIAS for undertaking the options described in Chapter 5 of this report. Full construction cost details are included in Appendix B. Tests 7 & 8 have not been costed at this stage as it is assumed that these would be constructed as early implementation of supporting infrastructure for the AWPR scheme.

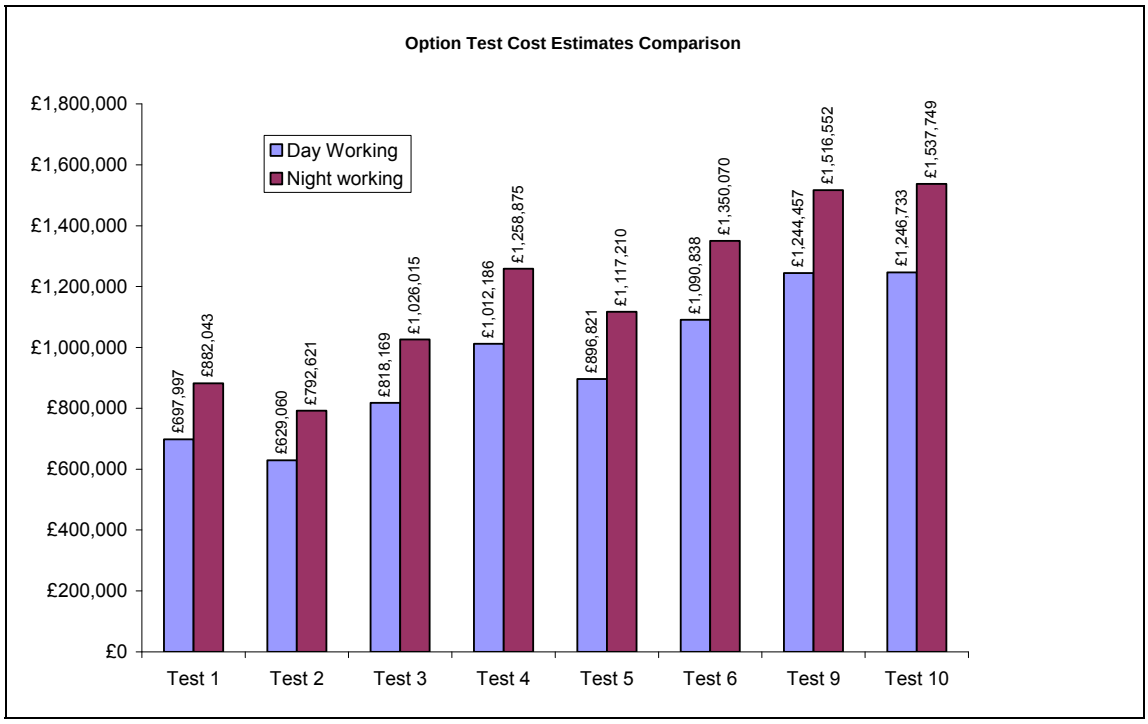

Figure 8.1 : Cost Comparison Details

8.3 Phasing of Improvements

SIAS proposes that any improvements to the transport infrastructure be implemented in a phased manner. This means that the simplest of the improvement options – change of priorities at RBS roundabout and extending the right turn lane on Dyce Drive – could be installed immediately.

Table 8.1 : Proposed Phasing of Improvement Options

Phase 1	Phase 2	Phase 3
1A Change of Priorities at RBS Bus/Taxi Priority Lane on Brent Road and Argyll Road Extended Right Turn Lane on Dyce Drive	2A Phase 1A/1B Bus/Taxi Priority Lane on Dyce Drive from Argyll Road to Wellheads Drive	3A Phase 2B Segregated Left Turn Lane
1B Closure of Forties Road to Through Traffic Bus/Taxi Priority Lane on Brent Road and Argyll Road Extended Right Turn Lane on Dyce Drive	2B Phase 1A/1B Dyce Drive from Argyll Road to A96(T)	3B Phase 2B Partial Signalisation
		3C Phase 2B Segregated Left Turn Lane + Partial Signalisation
		3D Phase 2B AWPR Junction
		3E Phase 2B Revised AWPR Junction Layout

If there was a requirement to minimise costs and times for construction it would be possible to consider breaking the overall phases down as shown in Table 8.1.

It should be noted that Phase 1B could also be implemented if Phase 1A is not considered to be achieving the desired change in traffic patterns which are beneficial to airport related traffic in the PM peak period. In Tests 4 & 6 the construction of extra stacking length on the approach to the A96(T) roundabout will result in additional journey time savings in the PM peak period. The impact of this relatively minor measure should therefore be observed and evaluated prior to committing to a programme of major junction improvements at this location.

As stated elsewhere in this report, SIAS would recommend caution with regard to the implementation of the additional right turn lane on Dyce Drive. While SIAS fully endorses the additional length as part of a package of measures to reduce congestion and journey time delay during peak periods, it is recommended that an observational period follows the relining and reconfiguration of the MOVA control equipment.

SIAS would recommend a staged approach to improvement measures, with appropriate intervals to permit observation and analysis of the cumulative effect of the progressing level of intervention.

8.4 Construction Timescales

Initial construction schedules have been prepared on the basis of the preliminary packages of options. Three key assumptions have been made in preparing these estimated timescales for the works. These are:

- Working weeks will be 6 days
- All works will be carried out consecutively and not concurrently to avoid disruption to large areas of the network
- No allowance is made in these timescale estimates for bad weather or anything that would be required to divert/protect any Utilities

It is to be emphasised that these are estimates only and should any works be ordered a more detailed examination of the requirements would be carried out and more accurate timescales provided. Table 8.2 illustrates the likely time scales for completion of the options considered.

Table 8.2 : Estimated Construction Period

Test Option	Likely Duration of Works	
	Day	Night
1	19	26
2	18	25
3	24	34
4	28	40
5	27	38
6	31	45
9	37	54
10	40	60

9 PREFERRED PACKAGE APPRAISAL

9.1 Introduction

Based on the findings of the option testing process described in Chapter 6, the preferred package of options, which meet the key objectives and try to find a balance with the findings of the stakeholder consultation, would include some or all the following elements:

- **Revised Priorities** at RBS roundabout (Argyll Road/Brent Road)
- **Extended Right Turn Lane** on Dyce Drive northbound approach to Wellheads Drive
- **Bus/Taxi Priority Lanes** southbound on Brent Road, Argyll Road and Dyce Drive
- **Segregated Left Turn Lane** from Dyce Drive (southbound) to the A96(T) eastbound
- **Partial Signalisation** of A96(T)/Dyce Drive roundabout – This option would be subject to detailed design criteria being met before further consideration was given
- **Lane Reallocation** on the Dyce Drive approach to the A96(T) roundabout. Two options have been considered

It has been shown in Chapter 8 that more immediate and short term measures could also have a beneficial impact on traffic flow in the PM peak hour, namely lane re-allocation on the Dyce Drive approach to the A96(T) roundabout.

In addition to the improvements listed above, the preferred package would also include items which cannot be modelled and measured at this stage such as:

- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road
- A campaign to raise awareness of staff and passengers of the public transport options available for them to travel to Aberdeen Airport and Kirkhill Industrial Estate
- Green Travel Plans by Dyce TMO

9.2 Appraisal

Although based on and consistent with current *STAG* methodology, the appraisal of the options tested in this instance is not a full *STAG* process.

The elements listed above all meet the key objective of being achievable in the immediate to short term. Indeed, revising the priorities at the RBS roundabout and extending the right turn lane on Dyce Drive in conjunction with revision to the MOVA operation could be carried out almost immediately. These alone have been demonstrated to have the potential to reduce journey times during peak periods.

The construction of additional road width to accommodate bus/taxi priority lanes would also be relatively straightforward subject to land ownership and finance. Junction improvements at the A96(T)/Dyce Drive roundabout would be the major costs in providing a comprehensive package of measures and any on-line revisions would have serious consequences during construction for existing congestion problems. SIAS has commissioned initial costing of the

preliminary schemes discussed. The schemes provide significant journey time reductions, albeit for different cost scales as shown in Chapter 8.

9.3 Schemes Considered

9.3.1 Overview

Based on the costing details in Figure 8.1, it is possible to make a simple comparison of the schemes considered so far. Figure 6.2 and Figure 6.3 show that the most viable tests identified thus far are Test 4, Test 6 and Test 10. These offer the most significant journey time savings in their format but vary in terms of cost implications. The following is a discussion of these two options against the baseline of doing nothing.

9.3.2 Test 0 – Do nothing

The existing traffic congestion and subsequent delays in peak periods is of significant concern to the Client Group. As additional developments in and around Dyce Drive and Dyce Avenue become occupied it is likely that this situation will continue with a slight increase in congestion and journey times over and above the existing problems. The construction of the AWPR will be generally beneficial to the area, but will not be completed until at least 2012. Doing nothing in the immediate/short term is not considered a viable option.

9.3.3 Test 4 – Bus/taxi lanes southbound on Dyce Drive, extended northbound right turn lane on Dyce Drive plus ancillary measures

This is a comprehensive option but does not include junction improvements at the A96(T) roundabout. Widening of Dyce Drive to facilitate the introduction of a southbound bus/taxi only lane would reduce journey times for all vehicles, especially buses and airport taxis. The works required to deliver the Test 4 package would include:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road, Argyll Road and Dyce Drive
- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

Although land appears to be available, this option would be subject to detailed design and the feasibility of moving, or working around, existing utilities. As most of the works would be carried out off-line, there would be minimal disruption to traffic during the construction period.

The extra stacking length on the Dyce Drive approach to the A96(T) roundabout is an added benefit from widening works to accommodate the bus/taxi priority lane.

Test 4 could be constructed in the sequential manner described in Chapter 9 providing the opportunity to evaluate the implication of each individual measure.

9.3.4 Test 6 – Test 4 plus segregated left turn from Dyce Drive to A96(T)

This option incorporates almost all of the elements listed at 9.1and is the most likely to give journey time savings in the PM peak period. The overall scheme would include:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road, Argyll Road and Dyce Drive
- Segregated Left Turn Lane from Dyce Drive (southbound) to the A96(T) eastbound
- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

If a new segregated left turn lane was to be installed, it could be incorporated into a revised AWPR junction. This would prevent any immediate/short term works from becoming obsolete when the AWPR construction takes place.

9.3.5 Test 10 – Test 6 plus partial signalisation of existing roundabout

This option incorporates all of the elements listed at 10.1 and is the most likely to give journey time savings in the AM peak period. The overall scheme would include:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road, Argyll Road and Dyce Drive
- Segregated Left Turn Lane from Dyce Drive (southbound) to the A96(T) eastbound
- Partial Signalisation of A96(T)/Dyce Drive roundabout
- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

Construction of this option would obviously have greater cost implications than Tests 4 & 6. There would be the added complications of working on part of the trunk road network and calibrating new traffic signals on the roundabout. This may result in further disruption to traffic flows during the construction period.

The cost implications of including partial signalisation over and above a segregated left turn lane are significant. While this option provides the greatest benefit to the AM peak period, the actual journey time savings in the PM peak may not justify the additional costs. Signalisation of the roundabout is not compatible with the proposed AWPR junction improvement which would result in it becoming obsolete in the medium term.

9.3.6 Test 13 – Test 1 plus lane re-allocation option 1 on Dyce Drive

This option is based on a very immediate approach to reducing congestion and journey times. Apart from reallocating the lane markings on the Dyce Drive approach to The A96(T) roundabout, it incorporates:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road and Argyll Road

- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

With the exception of the footpath link between Dyce Avenue and Argyll Road, all of the above could be carried out with a minimum of infrastructure works. Repainting of lane allocation markings and priorities could be undertaken relatively quickly and cheaply.

9.3.7 Test 14 – Test 1 plus lane re-allocation option 2 on Dyce Drive

This option is based on an immediate approach to reducing congestion and journey times. Apart from reallocating the lane markings on the Dyce Drive approach to the A96(T) roundabout, it incorporates:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road and Argyll Road
- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

As with Test 13, and with the exception of the footpath link between Dyce Avenue and Argyll Road, all of the above could be carried out with a minimum of infrastructure works. Repainting of lane allocation markings and priorities could be undertaken relatively quickly and cheaply.

10 SUMMARY

10.1 Introduction

SIAS was commissioned in September 2007 to undertake a review of existing surface access to Aberdeen Airport. This review was specifically intended to consider the existing peak period congestion on Argyll Road and the A96(T). Based on the findings of the review, SIAS was requested to provide immediate to short term improvements to relieve the current conditions.

From carrying out the initial appraisal of the existing traffic conditions, SIAS has considered a range of improvement options from simple white-lining exercises to bus/taxi priority lanes and full scale junction improvements on the A96(T).

While not a full *STAG* process, the underlying principles of *STAG* have been observed. This means that the process has been objective led, open minded, pragmatic, auditable and inclusive. The main criterion have been to develop potential options for the immediate/short term which will benefit access to and from Aberdeen airport and meet local planning and government objectives.

The problems and opportunities, objectives and options were discussed during a workshop with key stakeholders at the beginning of the study and 2 subsequent workshops through the course of the project. SIAS has striven to keep the Client Group informed of evolving options and findings for the immediate and short term.

10.2 Stakeholder Consultation and Review of Existing Conditions

SIAS carried out a stakeholder consultation exercise in order to gauge opinion of 17 groups and organisations with vested interests in traffic and congestion in the Dyce Drive area. Relevant planning and development documentation has also been referenced to ensure that any proposed solutions are compliant with the future requirements of the area.

The key stakeholder issues were:

- Journey time savings
- Encouraging cycling, walking and public transport
- Benefit the economy
- Complement other NE transport improvements

A programme of junction and queue length surveys was carried out to determine the cause and the severity of the existing congestion and traffic delay problems.

This has identified that congestion in the AM peak period is rooted at the A96(T)/Dyce Drive junction and the Dyce Drive/Wellheads Drive junction. A heavy right turn from the A96(T) from Aberdeen to Dyce Drive and approaching the Wellheads junction is hampered by traffic waiting to turn right from Dyce Drive to Wellheads Drive. This in turn causes extensive queuing on the eastbound approach of the A96(T) to the roundabout.

Congestion in the PM peak has been found to occur as a result of the high volume of traffic existing Dyce Drive from the airport and Kirkhill Industrial Estate to the A96(T). This leads to shockwaves of stationary traffic on the Dyce Drive approach to the roundabout which stretch back to the Wellheads junction and beyond to the Argyll Road junction. Traffic turning from

the A96(T) to Dyce Drive accounts for 73% of all traffic from the east in the AM peak hour. In the PM peak hour, 77% of traffic from Dyce Drive turns left to the A96(T).

10.3 Traffic Modelling

An S-Paramics microsimulation traffic model was developed and has been used to prepare a periodic base traffic model for the AM and PM peaks. The base model has been calibrated and validated in accordance with *DMRB12*.

It has emerged from Client Group workshops – and also from the stakeholder consultation – that a key priority is to improve the frequency and reliability of public transport and taxis during the peak periods. It follows that whatever benefits are accrued by these road users will also be felt by other vehicle types.

A range of options was derived from the consultation process, from key stakeholder workshops and also from on-site observations. Where these options have been suitable for traffic modelling, they have been taken forward. Design elements which could not be modelled have been noted and have been put forward for consideration as part of the wider package of works.

10.4 Immediate/Short Term Option Testing – Specific Criteria

The construction of the AWPR means that any options presented must be considered primarily in the immediate to short term. It is imperative that any options put forward for consideration must meet certain specific criteria. They must be:

- Achievable in the immediate to short term
- Technically possible
- Operationally beneficial over the short term
- Financially viable
- Acceptable to the public and stakeholders
- Journey time savings
- Encouraging cycling, walking and public transport
- Benefit the economy
- Complement other NE transport improvements

SIAS has developed a range of options, which have been sifted to ensure compliance with the criteria above. The approach to developing options has been incremental based on the most basic white-lining exercises, increasing in scale through bus/taxi priority lanes to large scale junction improvements. Table 10.1 shows how the overall options comply with the criteria above.

Table 10.1 : Option Compatibility with Stated Objectives

	Achievable in the immediate to short term	Technically possible	Operationally beneficial over the short term	Financially viable	Acceptable to the public and stakeholders	Journey time savings	Encouraging cycling, walking and public transport	Benefit the economy	Complement other NE transport improvements
Test 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test 3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test 4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test 5	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Test 6	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Test 7	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Test 8	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Test 9	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Test 10	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Test 13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test 14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The options have been provisionally priced based on the assumption that land is available and that there will not be costly utility diversions to consider. The benefits of the options have been weighed against these initial costs and 2 options have been selected for further evaluation.

10.5 Recommended Options

10.5.1 General

The following options are assumed to meet the criteria above. This would require to be verified with particular reference to land availability and utility company requirements. Test 10 could also be considered subject to meeting design criteria for stacking length on the circulatory carriageway.

The following section summarises the options which are considered to be most compliant with the stated objectives. The options are listed in order from most compliant and suitable for immediate implementation down through those which would require greater levels of infrastructure improvements.

10.5.2 Test 13 or Test 14

These 2 options are based on Test 1:

- Revised Priorities at RBS roundabout (Argyll Road/Brent Road)
- Extended Right Turn Lane on Dyce Drive northbound approach to Wellheads Drive
- Bus/Taxi Priority Lanes southbound on Brent Road and Argyll Road
- A cycle lane northbound on Dyce Drive from the A96(T) to Dyce Avenue
- A footpath adjacent to the eastbound side of Dyce Drive between Dyce Avenue and Argyll Road

As they involve no significant infrastructure changes, they could therefore be undertaken quickly and at minimal cost. Changes to the priorities at the RBS roundabout, a bus lane on Brent Road and Argyll Road would benefit all vehicles exiting the airport in the PM peak period. Lengthening of the right turn lane northbound on Dyce Drive may have a beneficial effect in the AM peak period for traffic travelling from the A96(T) to the airport.

10.5.3 Test 4

This option consists of relatively cosmetic changes to the local road network at Dyce Drive and Argyll Road and is also primarily based on Test 1. Repainting of the priorities at the RBS roundabout (Argyll Road/Brent Road/Forties Road junction) will improve PM peak hour egress from the airport. Increasing the length of the right turn lane from Dyce Drive to Wellheads Drive will improve the traffic flow northbound in the AM peak period. Bus/taxi priority lanes on Brent Road, Argyll Road and Dyce Drive between Argyll Road and the A96(T) will reduce PM peak period journey times for passengers leaving the airport.

In addition to these elements which can be modelled, it is also proposed that a new cycle lane be marked on the northbound carriageway of Dyce Drive between the A96(T) and Argyll Road. This will reduce the need for cyclists to cross onto the combined footpath cycleway adjacent to the southbound carriage way and afford them a degree of protection from traffic. Finally, a new footpath link adjacent to Dyce Drive from Dyce Avenue to Argyll Road should also be included.

10.5.4 Test 6

This option is the next logical progression from Test 4 and is based on the components described above. In addition, this option would include junction improvements at the A96(T)/Dyce Drive roundabout. It has been found that adding a segregated left turn gives the best overall performance in terms of reducing journey times for all vehicles.

As with Test 4, the additional measures which cannot be modelled would also be included as part of an overall package.

Test 6, while meeting all of the technical requirements, is constrained by the need for land acquisition and major construction work at the A96(T)/Dyce Drive roundabout and can therefore be discounted at this stage.

10.6 Overall Recommendation

SIAS recommends a staged approach to implementation of improvements.

- Stage 1 – It is proposed that in the first instance **Test 13 or Test 14** (lane re-allocation on Dyce Drive at A96(T) roundabout and change of priorities at the RBS roundabout) be applied. After a period of 'bedding in', the network can be re-assessed to determine what, of any, effect there has been on delays and queuing.
- Stage 2 – If, after that bedding-in period, it is considered that further works are required, it is proposed that the works listed in **Test 4** should be undertaken.

APPENDICES

A KILMARTIN OPTION TESTING WORKS

A.1 General

Aberdeen City Council (ACC) has requested that SIAS tests the impact of the proposed Kilmartin Development off Dyce Drive. The location of the proposed development is shown in Figure A.1

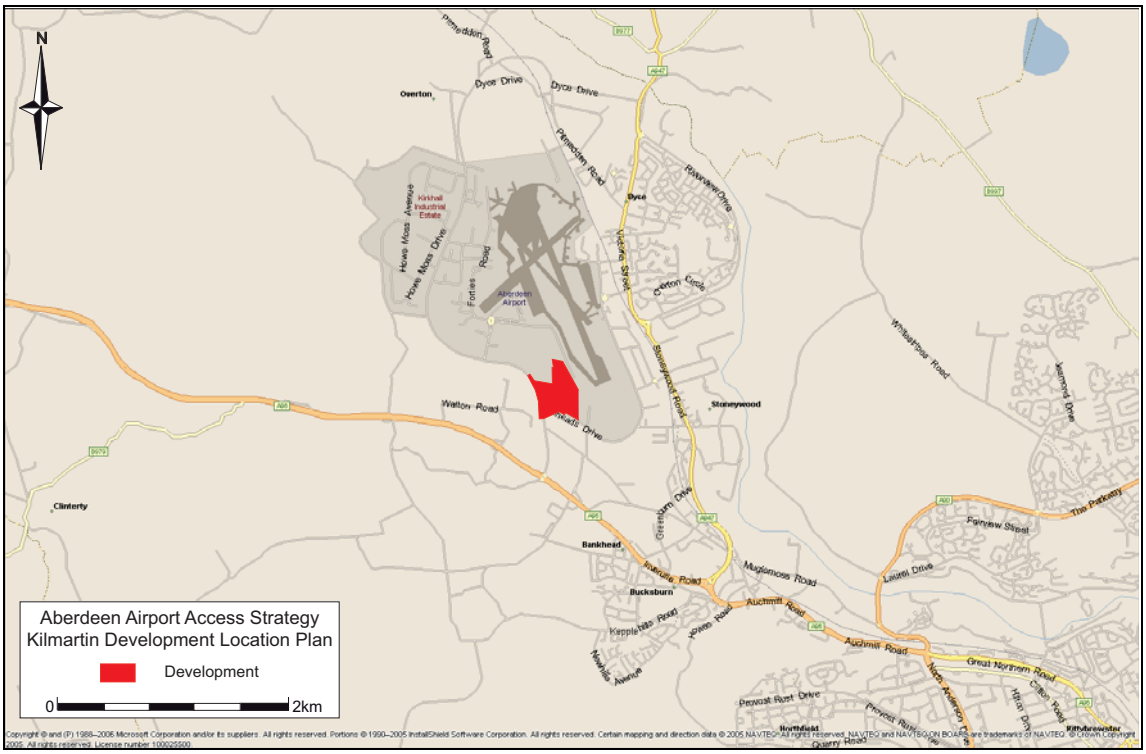

Figure A.1 : Kilmartin Development Location Plan

The following chapter describes the findings of the additional testing undertaken by SIAS on the proposed access roundabout for the Kilmartin development at Dyce Drive. The junction layout has been extracted from the drawings submitted by Steer Davies Gleave in support of the planning application and includes testing the proposed roundabout at the junction of Dyce Drive and Wellheads Drive.

The tests used in this exercise represent the preferred options described in Chapter 6 of this report:

- Do-Nothing
- Test 4 (Bus/taxi lanes, but no junction improvements at A96(T))
- Test 6 (Bus/taxi lanes plus segregated left turn lane)

Future year development scenarios will not be considered because of the impending construction of the Aberdeen Western Peripheral Route (AWPR).

A.2 Proposed Development at Dyce Drive by Kilmartin Group

It is proposed that a new office development will be constructed on 2,378ha of land between Dyce Drive and Wellheads Drive, as shown in Figure A.2. The development will comprise:

- 4 star hotel – 172 bedrooms, 108 parking spaces
- Premier Travel Inn – 102 bedrooms, 102 parking spaces
- Long stay car park – 1,152 spaces
- 6,976.4m^2 Class 4 office space, 232 parking spaces

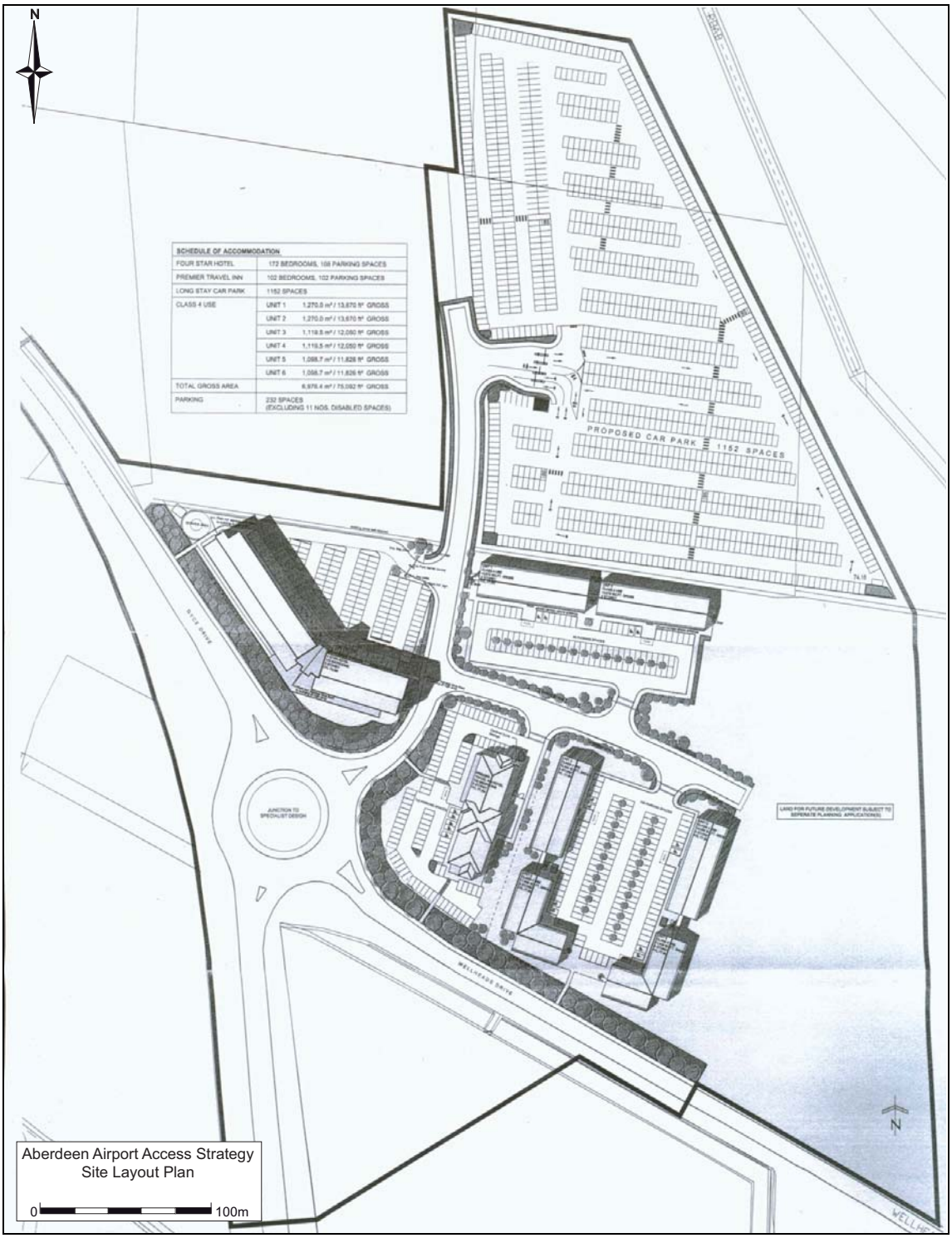

Figure A.2 : Site Layout Plan

Access to the site is proposed to be taken from a new 4-arm roundabout at the junction of Dyce Drive and Wellheads Drive. This junction currently has 3-arms and is controlled by traffic signals operating on a MOVA system. It is proposed that a new roundabout junction be formed to include an additional arm for access to the development site. A further access designed to facilitate future development to the west of Dyce Drive is also proposed. The junction layout is shown in Figure A.3

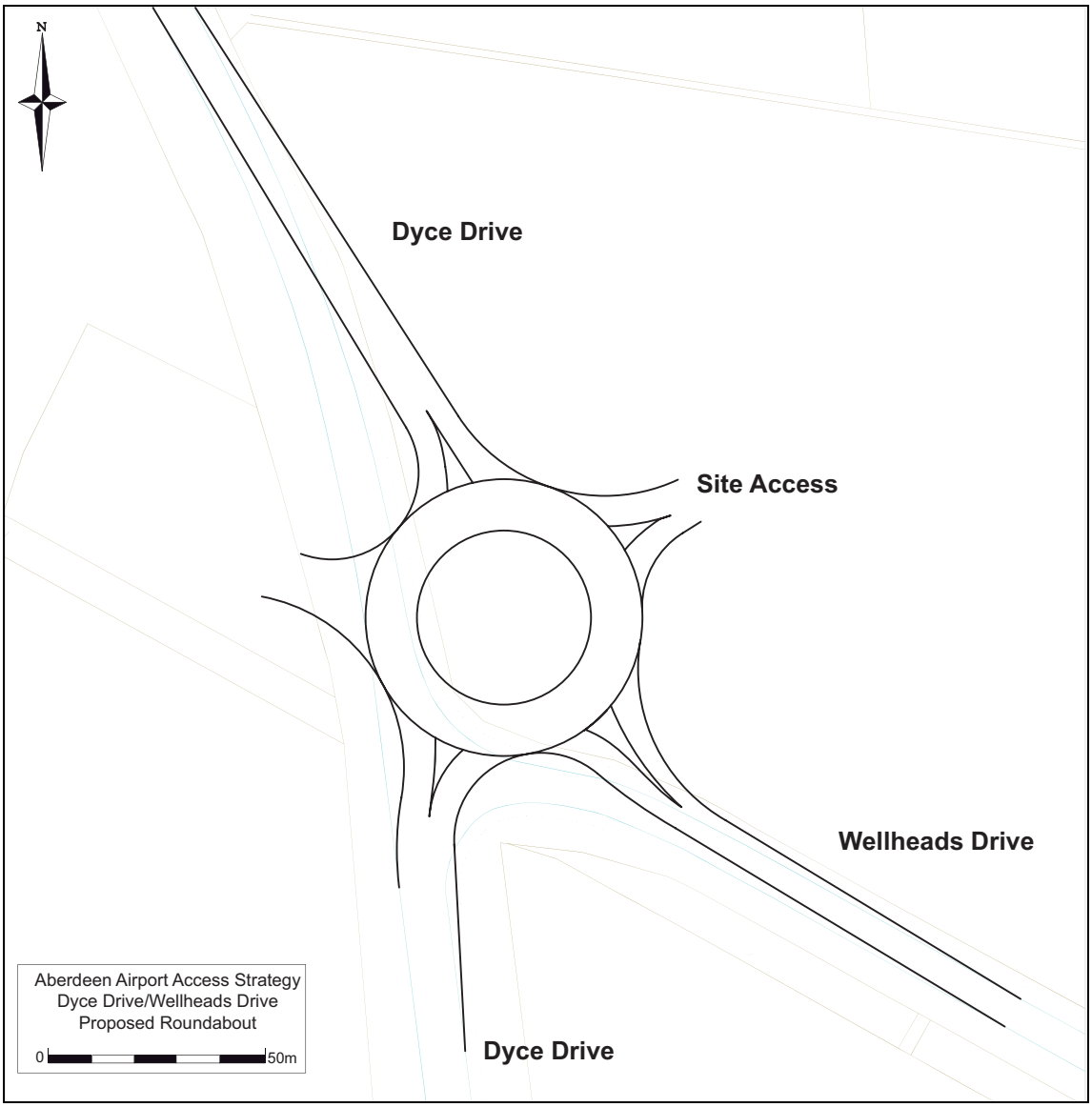

Figure A.3 : Proposed Access Junction at Dyce Drive/Wellheads Drive

A.3 Options for Testing

From the various test scenarios considered in Chapter 6 of this report, the options which provided the greatest overall journey time savings in comparison to the Do-Nothing scenario were Test 4 and Test 6.

Test 4 included the changed priorities at RBS roundabout, bus/taxi lanes on Argyll Road and Dyce Drive from Brent Road to the A96(T). The formation of the bus/taxi lane as far as the A96(T) results in additional stacking capacity southbound on Dyce Drive on the approach to the roundabout. This option included additional stacking capacity for right turning vehicles at the junction of Dyce Drive and Wellheads Drive, the northbound cycle lane and extended footpath facilities on Dyce Drive.

Test 6 contains the same primary elements as Test 4, with the addition of a segregated left turn lane from Dyce Drive to the A96(T) eastbound.

It is proposed that models for testing purposes in this exercise be based on 3 options:

- Do-Nothing Scenario + Kilmartin roundabout access + Development
- Test 11 (Test 4 + Kilmartin roundabout access + Development)
- Test 12 (Test 6 + Kilmartin roundabout access + Development)

As this programme of testing concerns immediate to short term option testing, no additional traffic growth over and above the Kilmartin development has been applied.

A.4 Trip Attraction & Distribution

At the outset of this exercise, SIAS was supplied with trip attraction rates for the proposed development via Aberdeen City Council.

SIAS has prepared and submitted a separate report on the overall testing process involved with the Kilmartin development proposal (SIAS Ref. TPATCAAS/69498), which deals with the predicted trip attraction and distribution for the site. It is not proposed to repeat that process verbatim in this report. In summary, the predicted trips associated with the site and their distribution onto the local road network are shown in Table A.2 and Figure A.4.

Table A.2 : Kilmartin Development Proposal Trips

Total	AM Peak Period (Vehicle Trips)				PM Peak Period (Vehicle Trips)			
	Time Period	Arr	Dep	Total	Time Period	Arr	Dep	Total
	06:00 - 07:00	119	42	161	16:00 - 17:00	102	284	386
	07:00 - 08:00	257	85	342	17:00 - 18:00	98	151	249
	08:00 - 09:00	248	98	346	18:00 - 19:00	79	95	175
	06:00 - 09:00	624	225	849	16:00 - 19:00	279	530	809

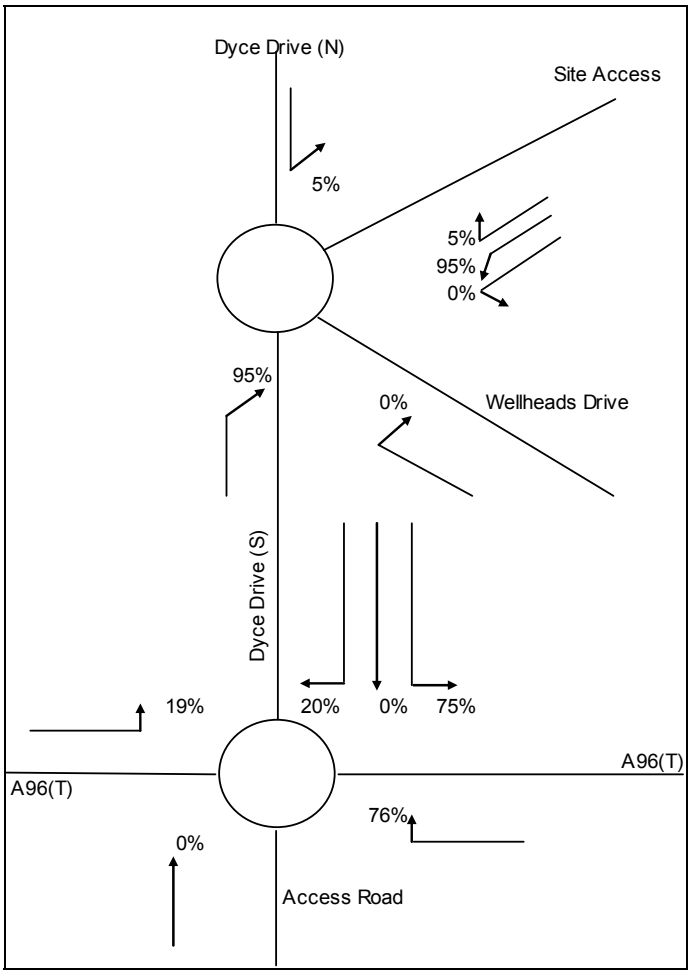

Figure A.4 : Kilmartin Trip Distribution

A.5 Kilmartin Future Base Model

The previous base S-Paramics model has been updated to include the proposed development. This has involved adding a new zone for the proposed development and distributing the traffic as per Figure A.4. The resulting traffic through the proposed junction in the AM and PM peak periods is shown in Figure A.5 and Figure A.6.

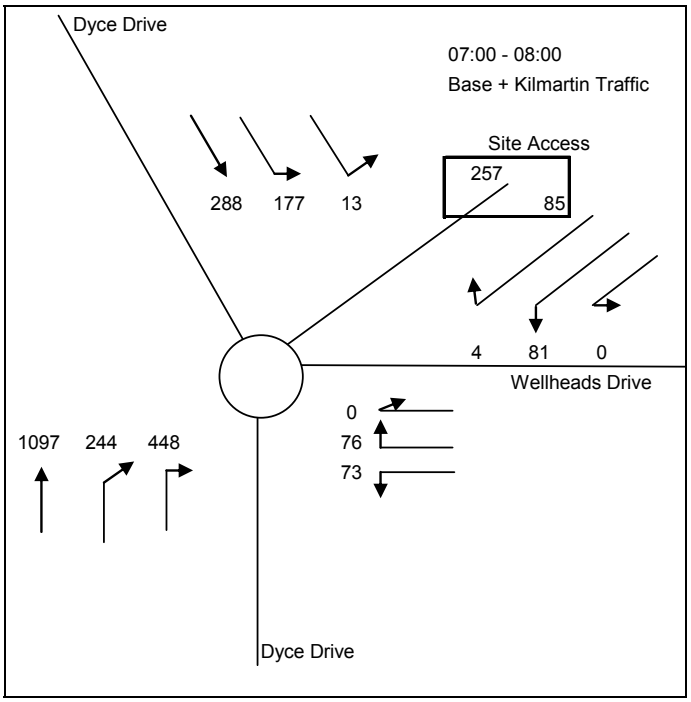

Figure A.5 : AM Peak Hour (07:00 – 08:00) Traffic Through Proposed Roundabout at Dyce Drive/Wellheads Drive

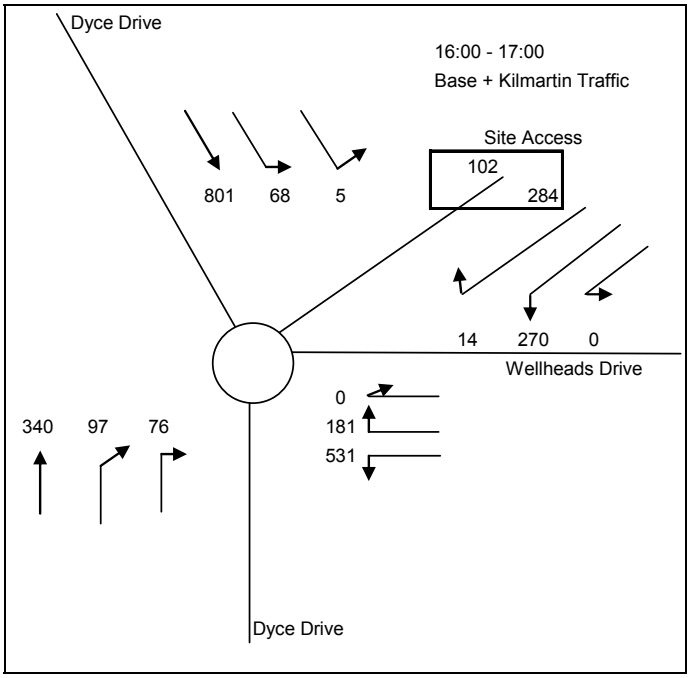

Figure A.6 : PM Peak Hour (16:00 – 17:00) Traffic Through Proposed Roundabout at Dyce Drive/Wellheads Drive

A.6 Test 11 (Test 4 + Kilmartin Development)

As described in 6.1, Test 4 includes bus/taxi only lanes southbound on Argyll Road and Dyce Drive between the RBS roundabout and the A96(T), and an on-road cycle lane northbound on Dyce Drive as far as Dyce Avenue. The layout of the Kilmartin access roundabout has been adapted to include these and is shown in Figure A.7.

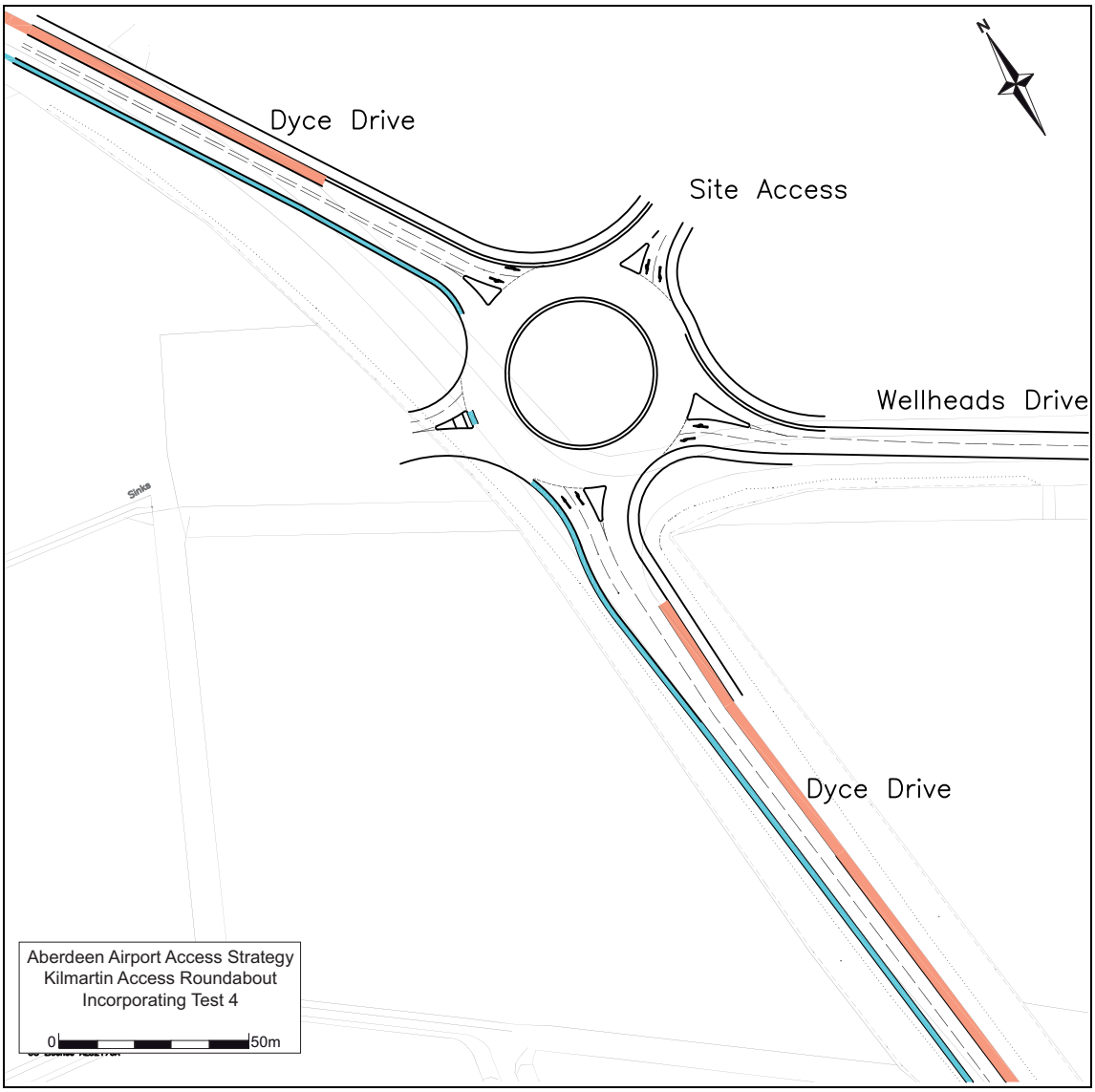

Figure A.7 : Test 11 - Kilmartin Access Roundabout incorporating Test 4

A.7 Test 12 (Test 6 + Kilmartin Development)

Test 6 is based on Test 4 with the addition of a segregated left turn lane at the A96(T)/Dyce Drive roundabout. The proposed layout is shown in Figure A.8.

Figure A.8 : Segregated Left Turn Lane at A96(T)/Dyce Drive Roundabout

A.8 Test Results

As with the testing described in chapters 6, option testing has been based on journey time comparisons for clearly identifiable routes. For comparison purposes, the journeys shown in Table A.3 have been selected.

Table A.3 : Journey Time Comparison Routes

	Route	From	To
AM Peak Period	Route 1	Aberdeen (Z1)	Dyce Drive North (Z6)
	Route 2	Aberdeen (Z1)	Aberdeen Airport (Z7)
	Route 3	Aberdeen (Z1)	Wellheads (Z9)
	Route 4	Inverurie (Z3)	Dyce Drive North (Z6)
	Route 5	Inverurie (Z3)	Aberdeen Airport (Z7)
	Route 6	Inverurie (Z3)	Wellheads (Z9)
PM Peak Period	Route 7	Dyce Drive North (Z6)	Aberdeen (Z1)
	Route 8	Dyce Drive North (Z6)	Inverurie (Z3)
	Route 9	Aberdeen Airport (Z7)	Aberdeen (Z1)
	Route 10	Aberdeen Airport (Z7)	Inverurie (Z3)
	Route 11	Wellheads (Z9)	Aberdeen (Z1)
	Route 12	Wellheads (Z9)	Inverurie (Z3)

A.9 Option Testing

The validated base model has been used as the baseline for testing the options against. As with the base model, the options were tested in AM (06:00 – 09:00) and PM (16:00 – 19:00) peak periods. The output shown below is based on 5 model runs.

A.10 Journey Time Comparison

A.10.1 Previous Base

The validated S-Paramics model of Dyce Drive, including the A96(T), Argyll Road and Wellheads Drive has been used as the baseline for comparison with the options which have been tested.

A.10.2 Kilmartin Base Model – Future Year Base (FYB)

It has previously been observed that there is a significant tidal flow of traffic on Dyce Drive in the AM and PM peak periods. In the AM peak period, the larger proportion of traffic is moving north from the A96(T) to Aberdeen Airport and Kirkhill Industrial Estate. In the PM peak period, this reverses with the larger proportion of traffic exiting Aberdeen Airport and Kirkhill Industrial Estate toward the A96(T).

Roundabouts are most suited to junctions with evenly balanced flows on the approach arms. The tidal flow on Dyce Drive leads to one direction of flow becoming dominant during peak periods to the detriment of others.

It was found that, during the PM peak period, southbound traffic from Aberdeen Airport and Kirkhill Industrial Estate was unhindered by the proposed roundabout. With few cutting movements to interrupt the north-south traffic flow, the impact on traffic from Wellheads Drive was significant. This resulted in increased queue lengths and journey times from the Wellheads area. It was also observed that the increased throughput of traffic at the Wellheads junction led to increased queuing on the approach to the A96(T). The findings of this option are summarised in Table A.4.

Table A.4 : Journey Time Comparison

Kilmartin Test FYB		Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	448	4.4%	443	4.0%
	Route 2	380	387	400	5.3%	402	4.0%
	Route 3	481	488	487	1.2%	486	-0.3%
	Route 4	1,626	992	433	-73.4%	538	-45.7%
	Route 5	1,625	1,640	403	-75.2%	711	-56.7%
	Route 6	1,673	0	566	-66.2%	0	
PM Peak Period	Route 7	735	740	1,130	53.7%	1,118	51.1%
	Route 8	768	0	1,165	51.7%	0	
	Route 9	531	538	1,102	107.5%	1,089	102.6%
	Route 10	570	575	1,132	98.5%	1,143	98.7%
	Route 11	789	784	989	25.3%	991	26.3%
	Route 12	823	817	1,022	24.3%	952	16.5%

Journey time savings are predicted for trips between the A96(T) east of the B979 and Aberdeen Airport, Kirkhill Industrial Estate and Wellheads (Routes 4, 5 and 6) during the AM peak period. The observed savings of up to 75% are unlikely to be achieved on the ground due to the variability of traffic flows on any given day.

The most significant impact is on journey times between Aberdeen Airport and the A96(T) (Routes 9 and 10 from Wellheads Drive) during the PM peak period which are predicted to increase by between 98% and 108%. Routes 7, 8, 11 and 12 also show increases in journey times during the PM peak period. There are also slight increases in journey times from the Aberdeen end of the model to the Aberdeen Airport, Kirkhill Industrial Estate and Wellheads (Routes 1, 2 and 3) during the AM peak period.

A.10.3 Test 4

The benefits of the original Test 4 in the main document (SIAS Ref: TPATCAAS/69177) were found to be:

- Improved northbound flow through the Dyce Drive/Wellheads Drive junction in the AM peak period, leading to improved flow through the A96(T)/Dyce Drive Roundabout and reduced journey times in the AM peak period. (Although this is a positive outcome, SIAS would not expect this improvement alone to result in a total reduction in congestion due to the sensitive nature of the S-Paramics model, as has been previously discussed with Aberdeen City Council.)
- Reduced journey times for southbound trips in the PM peak period, particularly for buses and taxis.

The effect of addition of the Kilmartin access roundabout on journey times is summarised in Table A.5.

Table A.5 : Test 11 (Test 4 + Kilmartin Access Junction) – Journey Time Comparison

Kilmartin Test 4		Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	467	8.7%	443	4.0%
	Route 2	380	387	428	12.6%	402	4.0%
	Route 3	481	488	514	6.9%	486	-0.3%
	Route 4	1,626	992	505	-68.9%	538	-45.7%
	Route 5	1,625	1,640	473	-70.9%	711	-56.7%
	Route 6	1,673	0	543	-67.5%	0	
PM Peak Period	Route 7	735	740	266	-63.9%	259	-65.0%
	Route 8	768	0	301	-60.8%	0	
	Route 9	531	538	197	-63.0%	189	-64.8%
	Route 10	570	575	231	-59.4%	229	-60.1%
	Route 11	789	784	2,880	265.1%	2,883	267.5%
	Route 12	823	817	2,916	254.4%	3,079	276.7%

Table A.5 illustrates that journey time savings will be made in the AM peak period from Inverurie to Aberdeen Airport, Kirkhill Industrial Estate and Wellheads (Routes 4, 5 and 6). Journey time savings are also predicted for trips between Aberdeen Airport and Kirkhill Industrial Estate and the A96(T) (Routes 7, 8, 9 and 10)

In the PM peak period, trips from Wellheads to the A96(T) (Routes 11 and 12) took up to 265% longer than in the original base and were also greater than in the Do-Nothing (FYB) model. This is believed to be a result of an uncontrolled increase in southbound throughput restricting the opportunity for traffic to emerge from Wellheads Drive.

A.10.4 Test 6

The initial benefits of the original Test 6 were found to be similar to Test 4 (as described in SIAS Ref: TPATCAAS/69177):

- Improved northbound flow through the Dyce Drive/Wellheads Drive junction in the AM peak period leading to improved flow through the A96(T)/Dyce Drive Roundabout and reduced journey times in the AM peak period. (Although this is a positive outcome, SIAS would not expect this improvement alone to result in a total reduction in congestion.)
- Reduced journey times for southbound trips in the PM peak period, particularly for buses and taxis

The further benefit to traffic from Aberdeen Airport and Kirkhill Industrial Estate provided by the segregated left turn lane was also apparent in this test.

The effect of addition of the Kilmartin access roundabout on journey times is summarised in Table A.6.

Table A.6 : Test 12 (Test 6 + Kilmartin Access Junction) – Journey Time Comparison

	Kilmartin Test 6	Base Journey Time (s)		Journey Time (s)			
		Car	Taxi	Car	% diff	Taxi	% diff
AM Peak Period	Route 1	429	426	448	4.3%	334	-21.7%
	Route 2	380	387	410	7.8%	302	-22.0%
	Route 3	481	488	493	2.6%	380	-22.2%
	Route 4	1,626	992	511	-68.5%	465	-53.1%
	Route 5	1,625	1,640	461	-71.6%	408	-75.1%
	Route 6	1,673	0	566	-66.2%	0	
PM Peak Period	Route 7	735	740	257	-65.1%	243	-67.2%
	Route 8	768	0	294	-61.7%	0	
	Route 9	531	538	188	-64.6%	180	-66.6%
	Route 10	570	575	222	-61.0%	220	-61.7%
	Route 11	789	784	2,797	254.4%	2,801	257.1%
	Route 12	823	817	2,828	243.7%	2,773	239.3%

Table A.6 illustrates that journey time savings will be made in the AM peak period from Inverurie to Aberdeen Airport, Kirkhill Industrial Estate and Wellheads (Routes 4, 5 and 6). Journey time savings are also predicted for trips between Aberdeen Airport and Kirkhill Industrial Estate and the A96(T) (Routes 7, 8, 9 and 10). Savings were slightly greater in Test 6 compared to Test 4.

Trips from Wellheads to the A96(T) (Routes 11 and 12) in the PM peak took up to 254% longer than in the original base and were also greater than in the Do-Nothing (FYB) model. This is believed to be a result of increased and uncontrolled southbound throughput restricting the opportunity for traffic to emerge from Wellheads Drive.

A.11 Journey Time Summary

Figure A.9 and Figure A.10 show the overall journey time comparison between the existing base model, the model including proposed development and the model including the proposed development and 2 of the potential schemes previously proposed by SIAS.

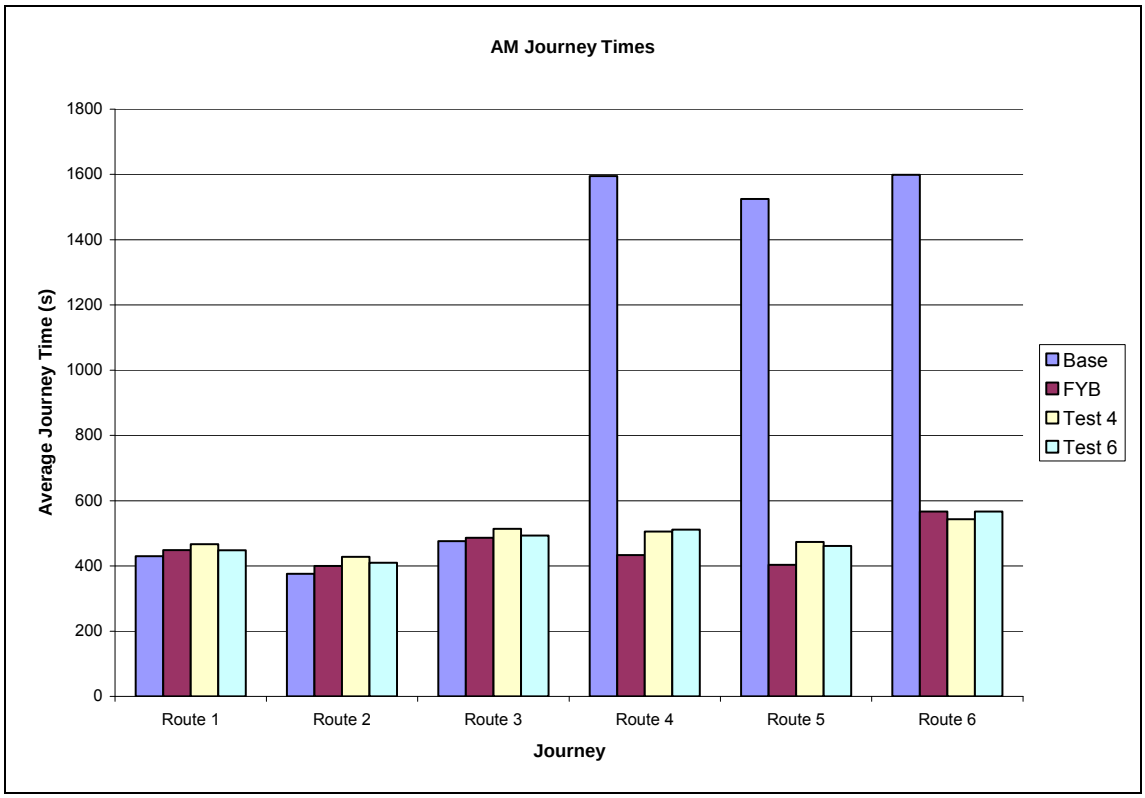

Figure A.9 : AM Peak Period Journey Time Comparison

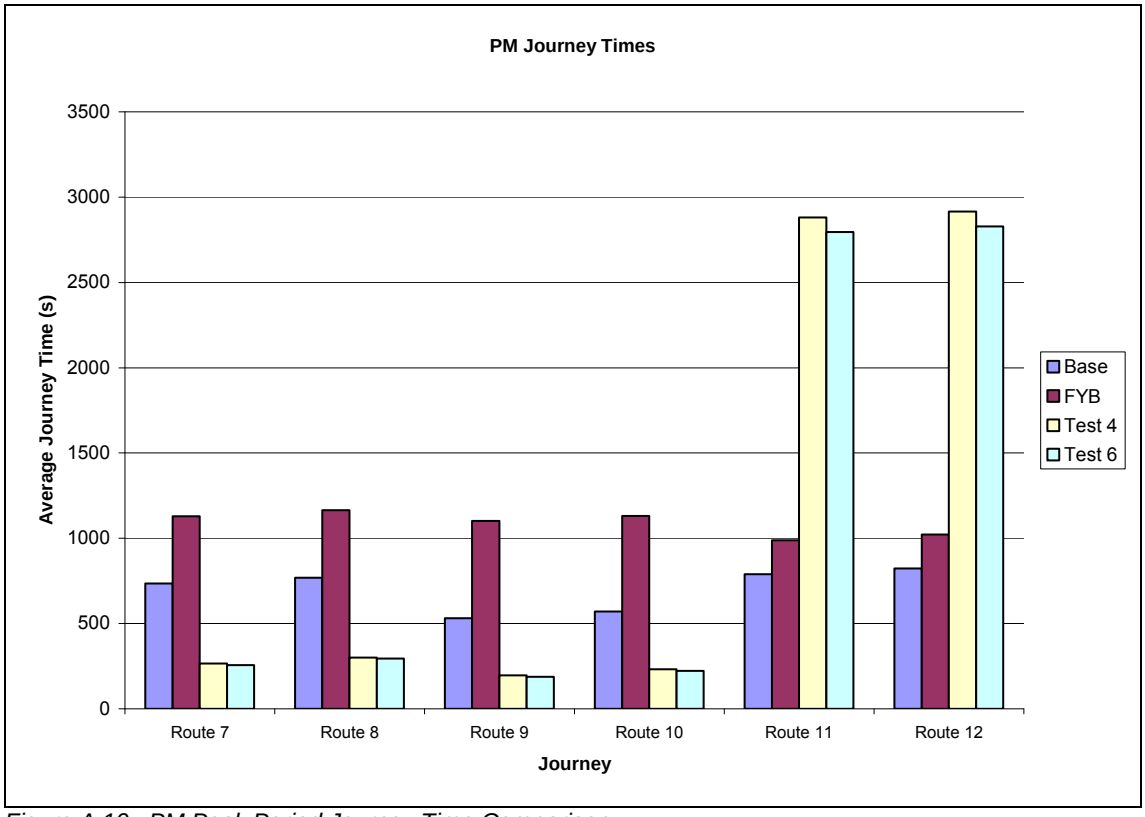

Figure A.10 : PM Peak Period Journey Time Comparison

The figures demonstrate that all 3 options considered would reduce journey times from the A96(T) east of the B979 to Aberdeen Airport, Kirkhill Industrial Estate and Wellheads Drive in the AM peak period. Journeys from the A96(T) west of the A947 to these destinations would take slightly longer as a result of the additional traffic generated by the proposed development.

In the PM peak journey times from Aberdeen Airport and Kirkhill Industrial Estate would benefit from the inclusion of the proposed roundabout and the bus/taxi lane measures on Dyce Drive.

Journey times from Wellheads Drive would be most affected by the proposed development and junction arrangements at Dyce Drive/Wellheads Drive.

A.12 Conclusions

It has been found that if the development were to be constructed without any other improvement works on the local road network the following conditions would occur:

- The proposed roundabout junction could reduce average journey times for trips between A96(T) east of the B979 and Aberdeen Airport, Kirkhill Industrial Estate and Wellheads Drive in the AM peak period
- Trips from the A96(T) west of the A947 to Aberdeen Airport, Kirkhill Industrial Estate and Wellheads Drive in the AM could take slightly longer
- The proposed roundabout junction could decrease average journey times for trips between Aberdeen Airport and Kirkhill Industrial Estate and the A96(T) and in the PM peak period
- The proposed roundabout junction could significantly increase journey times for trips between the Wellheads area and the A96(T) and in the PM peak period

If the road network was adapted to include the previously tested options (Tests 4 and 6 from SIAS Ref: TPATCAAS/69177) the proposed development at Wellheads Drive will potentially increase some journey times while reducing others during the AM and PM peak periods. For example, journey time savings in the PM peak between the airport and the A96(T) for the segregated left turn option would be significant. Conversely, the increase in journey times from the Wellheads area would be even greater.

In summary, initial traffic modelling results of the proposed roundabout, together with the improvements from Test 4 and Test 6, suggest greater reductions in journey times between Aberdeen Airport and Kirkhill Industrial Estate and Inverurie and Aberdeen. The modelling also suggests these improvements will be to the significant detriment of Wellheads Drive, particularly during the PM peak period.

The impact during the AM peak period will be less notable, though an increase in journey time between Aberdeen and Aberdeen Airport and Kirkhill Industrial Estate is predicted. This can be attributed to the presence of additional traffic from Aberdeen to the development site. This will impact on performance of the A96(T) roundabout, which has previously been noted to be sensitive to changes in traffic volumes.

SIAS considers that a roundabout junction is not the most appropriate solution for providing access to the proposed development. This is due to the heavy tidal flow on the A96(T) and Dyce Drive to and from the airport and industrial area in the peak periods.

B CONSTRUCTION COST ESTIMATES

DYCE DRIVE, ABERDEEN

	TEST 1	Day Working		Night Working	
Location	Work Required	Amount for Day Working	Total for Day working	Amount for Night working	Total for Night working
A-B	New Bus/Taxi Lane Brent Road - 140m		£9,110.00		
	Revise Priorities at RBS Junction		£1,830.00		
	Yellow Box Marking		£2,485.00	£0.00	
	add preliminaries - 15%	£2,013.75		£2,455.50	
	add contingency - 20%	£2,685.00	£18,123.75	£3,274.00	£22,099.50
	add design fees - 10%	£1,812.38		£1,812.38	
	add day site supervision fees - 10%	£1,812.38			
	add night site supervision fees - 10%			£2,209.95	
			£3,624.75		£4,022.33
			£21,748.50		£26,121.83
B-C	Paint Bus/Taxi Lane - Argyll Road - 230m				
	add preliminaries - 15%	£2,206.50		£2,672.34	
	add contingency - 20%	£2,942.00	£19,858.50	£3,563.13	£24,051.09
	add design fees - 10%	£1,985.85		£1,985.85	
	add day site supervision fees - 10%	£1,985.85			
	add night site supervision fees - 10%			£2,405.11	
			£3,971.70		£4,390.96
			£23,830.20		£28,442.05
C-B	Widen Northbound c/way and provide cyclelane - 250m				
	add preliminaries - 15%	£11,562.33		£14,645.90	
	add contingency - 20%	£15,416.44	£104,060.97	£19,527.87	£131,813.12
	add design fees - 10%	£10,406.10		£10,406.10	
	add day site supervision fees - 10%	£10,406.10			
	add night site supervision fees - 10%			£13,181.31	
			£20,812.19		£23,587.41
			£124,873.16		£155,400.53
E-D	Widen existing northbound c/way, paint as cyclelane and alter right turn lane - Dyce Drive - 300m				
	add preliminaries - 15%	£7,749.00		£10,346.53	
	add contingency - 20%	£10,332.00	£69,741.00	£13,795.38	£93,118.78
	add design fees - 10%	£6,974.10		£6,974.10	
	add day site supervision fees - 10%	£6,974.10			
	add night site supervision fees - 10%			£9,311.88	
			£13,948.20		£16,285.98
			£83,689.20		£109,404.76
D-C	Widen c/way by 1.5m and line as cyclelane - 670m				
	add preliminaries - 15%	£17,936.21		£23,254.99	
	add contingency - 20%	£23,914.94	£147,477.65	£31,006.66	£193,008.96
	add design fees - 10%	£14,747.76		£14,747.76	
	add day site supervision fees - 10%	£14,747.76			
	add night site supervision fees - 10%			£19,300.90	
			£29,495.53		£34,048.66
			£176,973.17		£227,057.63
C-G	Widen c/way by 1.5m - 600m				
	add preliminaries - 15%	£18,500.33		£23,738.42	
	add contingency - 20%	£24,667.11	£137,007.44	£31,651.23	£179,597.16
	add design fees - 10%	£13,700.74		£13,700.74	
	add day site supervision fees - 10%	£13,700.74			
	add night site supervision fees - 10%			£17,959.72	
			£27,401.49		£31,660.46
			£164,408.92		£211,257.62
G-C	New 2.0 m footway remote from c/way - 600m		£59,751.00		
	add preliminaries - 15%	£6,639.00		£25,233.95	
	add contingency - 20%	£8,852.00	£59,751.00	£33,645.27	£108,671.73
	add design fees - 10%	£5,975.10		£5,975.10	
	add day site supervision fees - 10%	£5,975.10			
	add night site supervision fees - 10%			£10,867.17	
			£11,950.20		£16,842.27
			£71,701.20		£125,514.00
		Day working	**£667,224.36**	**Night working**	**£883,198.41**

DYCE DRIVE, ABERDEEN

	TEST 2	Day Working		Night Working	
Location	Work Required	Amount for Day Working	Total for Day working	Amount for Night Working	Total for Night Working
B-C	Paint Bus/Taxi Lane - Argyll Road - 230m				
	add preliminaries - 15%	£2,206.50		£2,672.34	
	add contingency - 20%	£2,942.00	£19,858.50	£3,563.13	£24,051.09
	add design fees - 10%	£1,985.85		£1,985.85	
	add day site supervision fees - 10%	£1,985.85			
	add night site supervision fees - 10%			£2,405.11	
			£3,971.70		£4,390.96
			£23,830.20		£28,442.05
C-B	Widen Northbound c/way and provide cyclelane - 250m				
	add preliminaries - 15%	£11,562.33		£14,645.90	
	add contingency - 20%	£15,416.44	£104,060.97	£19,527.87	£131,813.12
	add design fees - 10%	£10,406.10		£10,406.10	
	add day site supervision fees - 10%	£10,406.10			
	add night site supervision fees - 10%			£13,181.31	
			£20,812.19		£23,587.41
			£124,873.16		£155,400.53
E-D	Widen existing northbound c/way, paint as cyclelane and alter right turn lane - Dyce Drive - 300m				
	add preliminaries - 15%	£7,749.00		£10,346.53	
	add contingency - 20%	£10,332.00	£69,741.00	£13,795.38	£93,118.78
	add design fees - 10%	£6,974.10		£6,974.10	
	add day site supervision fees - 10%	£6,974.10			
	add night site supervision fees - 10%			£9,311.88	
			£13,948.20		£16,285.98
			£83,689.20		£109,404.76
C-G	Widen c/way by 1.5m - 600m				
	add preliminaries - 15%	£14,076.00		£18,631.13	
	add contingency - 20%	£18,768.00	£126,684.00	£24,841.50	£167,680.13
	add design fees - 10%	£12,668.40		£12,668.40	
	add day site supervision fees - 10%	£12,668.40			
	add night site supervision fees - 10%			£16,768.01	
			£25,336.80		£29,436.41
			£152,020.80		£197,116.54
D-C	Widen c/way by 1.5m and line as cyclelane - 670m				
	add preliminaries - 15%	£15,803.48		£20,766.53	
	add contingency - 20%	£21,071.30	£142,231.28	£27,688.71	£186,898.81
	add design fees - 10%	£14,223.13		£14,223.13	
	add day site supervision fees - 10%	£14,223.13			
	add night site supervision fees - 10%			£18,689.88	
			£28,446.26		£32,913.01
			£170,677.53		£219,811.82
G-C	New 2.0 m footway remote from c/way - 600m				
	add preliminaries - 15%	£6,639.00		£7,468.88	
	add contingency - 20%	£8,852.00	£59,751.00	£9,958.50	£67,219.88
	add design fees - 10%	£5,975.10		£5,975.10	
	add day site supervision fees - 10%	£5,975.10			
	add night site supervision fees - 10%			£6,721.99	
			£11,950.20		£12,697.09
			£71,701.20		£79,916.96
	Close gates	£200.00		£225.000	
	No through Road signs	£1,200.00		£1,350.000	
	add preliminaries - 15%	£210.00		£236.25	
	add contingency - 20%	£280.00	£1,890.00	£315.00	£2,126.25
	add design fees - 10%	£189.00		£189.00	
	add day site supervision fees - 10%	£189.00			
	add night site supervision fees - 10%			£212.63	
			£378.00		£401.63
			£2,268.00		£2,527.88
		Day Working	**£629,060.09**	**Night Working**	**£792,620.54**

DYCE DRIVE, ABERDEEN

Location	TEST 3 (as Test 1 plus additions below)	Day Working: Amount for Day Working	Day Working: Total for Day Working	Night Working: Amount for Night Working	Night Working: Total for Night Working
H-D	Paint bus lane and for advance stop - 350m				
	add preliminaries - 15%	£3,273.00		£3,656.16	
	add contingency - 20%	£4,364.00	£29,457.00	£4,874.88	£32,905.41
	add design fees - 10%	£2,945.70		£2,945.70	
	add day site supervision fees - 10%	£2,945.70			
	add night site supervision fees - 10%			£3,290.54	
			£5,891.40		£6,236.24
			£35,348.40		£39,141.65
D-E	Paint bus lane to extend 30m past junction - 30m				
	add preliminaries - 15%	£467.25		£525.66	
	add contingency - 20%	£623.00	£4,205.25	£700.88	£4,730.91
	add design fees - 10%	£420.53		£420.53	
	add day site supervision fees - 10%	£420.53			
	add night site supervision fees - 10%			£473.09	
			£841.05		£893.62
			£5,046.30		£5,624.52
E-D	Widen lane by 4.0m - 170m long, extend right turn and allow bus lane - 70m				
	add preliminaries - 15%	£7,386.75		£9,349.31	
	add contingency - 20%	£9,849.00	£66,480.75	£12,465.75	£84,143.81
	add design fees - 10%	£6,648.08		£6,648.08	
	add day site supervision fees - 10%	£6,648.08			
	add night site supervision fees - 10%			£8,414.38	
			£13,296.15		£15,062.46
			£79,776.90		£99,206.27

Total from Test 1	£667,224.36	Total from Test 1	£883,198.41
Total from above	£120,171.60	Total from above	£143,972.44
Day working	**£787,395.96**	**Night working**	**£1,027,170.85**

DYCE DRIVE, ABERDEEN

	TEST 4 (as Test 3 plus additions below)	Day Working		Night Working	
Location	Work Required	Amount for Day Working	Total for Day Working	Amount for Night Working	Total for Night Working
D-E	Paint bus lane south - 470m				
	add preliminaries - 15%	£3,554.25		£4,352.44	
	add contingency - 20%	£4,739.00	£31,988.25	£5,803.25	£39,171.94
	add design fees - 10%	£3,198.83		£3,198.83	
	add day site supervision fees - 10%	£3,198.83			
	add night site supervision fees - 10%			£3,917.19	
			£6,397.65		£7,116.02
			£38,385.90		£46,287.96
E-D	Widen lane by 4.0m, extend right turn and allow bus lane 450m				
	add preliminaries - 15%	£14,410.35		£17,535.68	
	add contingency - 20%	£19,213.80	£129,693.15	£23,380.90	£157,821.08
	add design fees - 10%	£12,969.32		£12,969.32	
	add day site supervision fees - 10%	£12,969.32			
	add night site supervision fees - 10%			£15,782.11	
			£25,938.63		£28,751.42
			£155,631.78		£186,572.50

Total from Test 3	£787,395.96	Total from Test 3	£1,027,170.85
Total from above	£194,017.68	Total from above	£232,860.45
Day Working	**£981,413.64**	**Night Working**	**£1,260,031.30**

DYCE DRIVE, ABERDEEN

TEST 5 (as Test 3 plus additions below)
TEST 6 (as Test 4 plus additions below)

		Day Working		Night Working	
Location	**Work Required**	**Amount for Day Working**	**Total for Day working**	**Amount for Night Working**	**Totals for Night working**
	segregated left turn and footway moved - 125m				
	add preliminaries - 15%	£7,282.59		£8,549.54	
	add contingency - 20%	£9,710.12	£65,543.31	£11,399.39	£76,945.85
	add design fees - 10%	£6,554.33		£6,554.33	
	add day site supervision fees - 10%	£6,554.33			
	add night site supervision fees - 10%			£7,694.58	
			£13,108.66		£14,248.92
			£78,651.97		£91,194.76

Total from Test 3	£787,395.96	Total from Test 3	£1,027,170.85
Total from above	£78,651.97	Total from above	£91,194.76
Day Working	**£866,047.93**	**Night Working**	**£1,118,365.61**

Total for test 4	£981,413.64	Total for test 4	£1,260,031.30
Total from above	£78,651.97	Total from above	£91,194.76
Day Working	**£1,060,065.61**	**Night Working**	**£1,351,226.07**

DYCE DRIVE, ABERDEEN

Location	TEST 9 (as Test 4 plus additional below) Work Required	Day Working Amount for Day Working	Day Working Total for Day working	Night Working Amount for Night Working	Night Working Total for Night working
	Widen Dyce Drive Northbound from r/bout - 100m				
	add preliminaries - 15%	£7,071.90		£6,427.58	
	add contingency - 20%	£9,429.20	£63,647.10	£8,570.10	£57,848.18
	add design fees - 10%	£6,364.71		£6,364.71	
	add day site supervision fees - 10%	£6,364.71			
	add night site supervision fees - 10%			£5,784.82	
			£12,729.42		£12,149.53
			£76,376.52		£69,997.70
	Signals				
	add preliminaries - 15%	£14,434.65		£17,645.23	
	add contingency - 20%	£19,246.20	£129,911.85	£23,526.98	£158,807.08
	add design fees - 10%	£12,991.19		£12,991.19	
	add day site supervision fees - 10%	£12,991.19			
	add night site supervision fees - 10%			£15,880.71	
			£25,982.37		£28,871.89
			£155,894.22		£187,678.97

Total from Test 4	£981,413.64	Total from Test 4	£1,260,031.30
Total from above	£232,270.74	Total from above	£257,676.68
Day Working	**£1,213,684.38**	**Night Working**	**£1,517,707.98**

DYCE DRIVE, ABERDEEN

	TEST 10 (as Test 6 plus additional below)	Day Working		Night Working	
Location	Work Required	Amount for Day Working	Totals for Day working	Amount for Night Working	Totals for Night working
	Signals				
	add preliminaries - 15%	£14,434.65		£17,645.23	
	add contingency - 20%	£19,246.20	£129,911.85	£23,526.98	£158,807.08
	add design fees - 10%	£12,991.19		£12,991.19	
	add day site supervision fees - 10%	£12,991.19			
	add night site supervision fees - 10%			£15,880.71	
			£25,982.37		£28,871.89
			£155,894.22		£187,678.97
		Total from Test 6	£1,060,065.61	Total from Test 6	£1,351,226.07
		Total from above	£155,894.22	Total from above	£187,678.97
		Day Working	**£1,215,959.83**	**Night Working**	**£1,538,905.04**