

# **Portlethen Traffic Capacity Study**

**Aberdeenshire Council**

**S-Paramics Model Testing Results**





## PORTLETHEN TRAFFIC CAPACITY STUDY

Description: **Portlethen Traffic Capacity Study**

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## **1 INTRODUCTION**

### **1.1 Introduction**

1.1.1 As part of the North East Term Commission, Aberdeenshire Council (AC) requested that SIAS Limited (SIAS) undertake capacity testing on the Portlethen area.

1.1.2 Two options were to be considered, namely:

- Scenario 1 comprising 1,650 houses at Schoolhill (in addition to the 850 houses under construction over the next few years at Schoolhill) and 30ha of employment land at Schoolhill.
- Scenario 2 comprising 800 additional houses at Schoolhill (in addition to the 850 under construction at Schoolhill) plus 850 houses and 30ha of employment land south of Badentoy and west of A90

1.1.3 This document summarises the S-Paramics option testing results.

1.1.4 In addition, the accessibility of potential future development sites was appraised using Accession accessibility modelling software; the findings are provided in Appendix A.

### **1.2 Study Aims**

1.2.1 The overall aim of the study is to assess the traffic impact on the surrounding road network with either of these potential sites developed at the suggested levels.

### **1.3 Objectives**

1.3.1 The principal objectives of the model build were defined as:

- To develop future year matrices that include the traffic flow impact with the introduction of the Schoolhill and Badentoy developments, which both include 1,650 houses and 30ha of employment
- To test the impacts of the Schoolhill and Badentoy developments

1.3.2 The Portlethen study area is shown in Figure 1.1.





Figure 1.1 : Portlethen Study Area



## 2 S-PARAMICS MODEL APPLICATION

### 2.1 Introduction

2.1.1 Following the completion of the 2008 base model, the future year scenarios were tested in order to gauge the impact of the development scenarios. The following model scenarios were developed:

- 2012 Do-Minimum
- 2016 Reference Case
- 2016 Scenario 1
- 2016 Scenario 2

### 2.2 2012 Do-Minimum

2.2.1 The only network difference was the addition of more internal roads in the Schoolhill housing area.

2.2.2 The matrix changes in the 2012 Do-Minimum reflect the committed developments in the model area, namely:

- Impact of the AWPR
- New developments at Cairnrobin, Marywell and Schoolhill

2.2.3 As part of a previous study undertaken by SIAS, which involved looking at Access to Aberdeen from the South, models had been developed which reflected the changes to the travel demands anticipated with these developments. The actual flow differences on the links surrounding the Findon Interchange were used to create the matrices for the 2012 Do-Minimum.

2.2.4 Table 2.1 shows the changes to the matrix totals in the 2012 Do-Minimum AM Peak (06:30 – 09:30)

*Table 2.1 : 2012 Do-Minimum Matrix Changes AM Peak (06:30 – 09:30)*

	2008 Base	2012 Do-Min	Change
Lights Matrix	13,256	12,375	-881
HGV Matrix	1,065	926	-139
Development Matrix	-	922	922
Total	14,321	14,223	-98

2.2.5 Table 2.1 shows that with the effect in the study area of the 2012 committed developments plus the AWPR, light vehicle trips reduce by 881 and heavy vehicle trips reduce by 139 vehicles. The developments at Cairnrobin, Marywell and Schoolhill account for an additional 922 trips over the AM peak period, equating to an overall reduction of 98 trips (-0.7%) between the 2008 base and the 2012 Do-Minimum in the AM peak period.

2.2.6 Table 2.2 shows the changes to the matrix totals in the 2012 Do-Minimum PM Peak (16:00 – 19:00)



Table 2.2 : 2012 Do-Minimum Matrix Changes PM Peak (16:00 – 19:00)

	2008 Base	2012 Do-Min	Change
Lights Matrix	15,621	15,024	-597
HGV Matrix	675	623	-52
Development Matrix	-	969	969
Total	16,296	16,616	320

2.2.7 Table 2.2 shows that with the effect in the study area of the 2012 committed development plus the AWPR, light vehicle trips reduce by 597 in the northbound and southbound direction and heavy vehicle trips reduce by 52 vehicles in the northbound and southbound direction. The developments at Cairnrobin, Marywell and Schoolhill account for an additional 969 trips over the PM peak period, equating to an overall increase of 320 trips (+2.0%) between the 2008 base and the 2012 Do-Minimum in the PM peak period.

### 2.3 2016 Reference Case

2.3.1 AC requested construction of a Reference Case model in order to provide a benchmark between base and scenario testing.

2.3.2 There were no network changes between the 2012 Do-Minimum and the 2016 Reference Case.

2.3.3 The 2016 Reference Case matrices were developed by applying NRTF (high) traffic growth to the main A90 northbound and southbound traffic flows. The NRTF factors were a 7% increase for light vehicles and a 10% increase for heavy vehicles, resulting in an additional 246 trips in the AM peak (+1.7%), and an increase of 631 trips (+3.9%) in the PM Peak.

### 2.4 Future Year Development

2.4.1 AC has provided the aspirational development proposals for Portlethen for an assumed year of 2016. Figure 2.1 illustrates the approximate locations of the Schoolhill and Badentoy development areas.



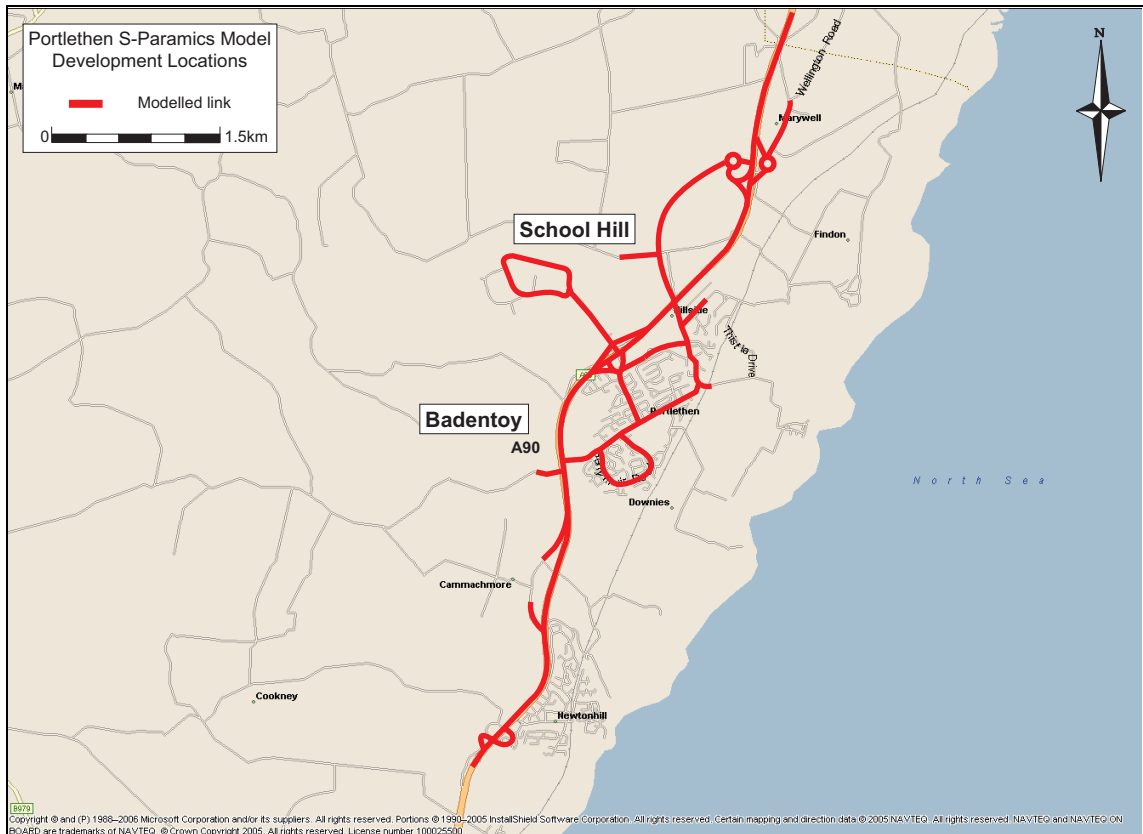


Figure 2.1 : Portlethen Development Areas

2.4.2 As proposed by AC, both developments assume the development of:

- 1,650 houses
- 30Ha of employment
  - Class 4 – 25% at a build density of 3,000m<sup>2</sup> GFA/Ha
  - Class 5 – 25% at a build density of 3,000m<sup>2</sup> GFA/Ha
  - Class 6 – 50% at a build density of 6500m<sup>2</sup> GFA/Ha

2.4.3 The TRICS database was used in order to calculate trip rates for each of the developments. The trip rates extracted from TRICS are summarised in Table 2.3.

Table 2.3 : TRICS Trip Rates

Development Type	AM Peak (06:30-09:30)		PM Peak (16:00 - 19:00)	
	In	Out	In	Out
Housing (per Household)	0.410	0.976	1.087	0.728
Warehouse (Commercial) (GFA 100M2)	0.901	0.444	0.450	0.892
Business (GFA 100M2)	3.247	0.732	0.917	2.897

2.4.4 The trip rates in Table 2.3 were then used to generate the number of trips, to and from each development. The trip totals generated are shown in Table 2.4.



Table 2.4 : Trip Generation

Development Type	AM Peak (06:30 - 09:30)		PM Peak (16:00 - 19:00)	
	In	Out	In	Out
Housing (trips)	677	1,610	1,794	1,201
Warehouse (Commercial) (trips)	642	316	321	636
Business (GFA) (trips)	2,313	522	653	2,064
<b>Total</b>	<b>3,632</b>	<b>2,448</b>	<b>2,768</b>	<b>3,901</b>

- 2.4.5 In reality, not all of the trips above would be new trips; the traffic demand matrix has been adjusted to minimise double counting and allow internal trips to occur between the new housing and existing employment and vice versa. In the AM peak 5,438 trips were added to the network (+38.0%), and in the PM peak 6,277 trips were added to the network (+38.5%).



### **3 SCENARIO TESTING**

#### **3.1 Scenario 1**

- 3.1.1 As stated, Scenario 1 comprises 1,650 houses at Schoolhill (in addition to the 850 houses under construction over the next few years at Schoolhill) and 30ha of employment land at Schoolhill. There is no new infrastructure planned with this test. For the purpose of testing it has been assumed that all new trips will be loaded onto the network at Findon Interchange.
- 3.1.2 Two roundabout access points have been modelled from Cookston Road to serve the new development area.

#### **3.2 Scenario 1 Model Observations**

- 3.2.1 In the AM peak, queues begin to develop at the Findon Interchange (West) roundabout by 07:15, and at the new roundabout to the proposed Schoolhill development. By 07:45 there are queues back into the new developments and down Cookston Road towards the centre of Portlethen, and onto the A90 southbound carriageway at Findon Interchange. By 08:00 there are queues back towards Marywell. These queues remain after 09:00 when they start to dissipate. The Marywell queue remains after 09:00.
- 3.2.2 The main issue appears to be the design of the Findon Interchange, where the traffic from Portlethen heading north towards Aberdeen crosses the path of the traffic heading to Portlethen from the north.
- 3.2.3 Figure 3.1 shows the extent of the queueing in the AM period.
- 3.2.4 In the PM peak, queues develop around Findon Interchange by 16:30, with long queues quickly developing back to Marywell. By 16:45 the queue on the A90 southbound off slip is back to the main A90 carriageway, mainly due to the traffic from the business element of the development heading north to Aberdeen, crossing over the path of the traffic coming off the southbound off slip towards Portlethen. These queues continue to lengthen, with the A90 southbound queue back to the end of the S-Paramics network by 17:15, and by 17:30 there are 246 vehicles queued off the network. By 18:00 this queue has shortened, with all the vehicles on the network, but a queue remains on the main A90. At 18:00 there are 641 vehicles queued off towards Marywell. By the end of the simulation at 18:30 the queue on the A90 has gone, but there are still over 600 vehicles queued off towards Marywell.
- 3.2.5 The PM journey times are summarised in Figure 3.2.
- 3.2.6 While it has been shown that Scenario 1 did not gridlock, the model observations show that there is congestion in the area around the entry to the development and significant problems at Findon Interchange resulting in delays and queueing on the A90(T).



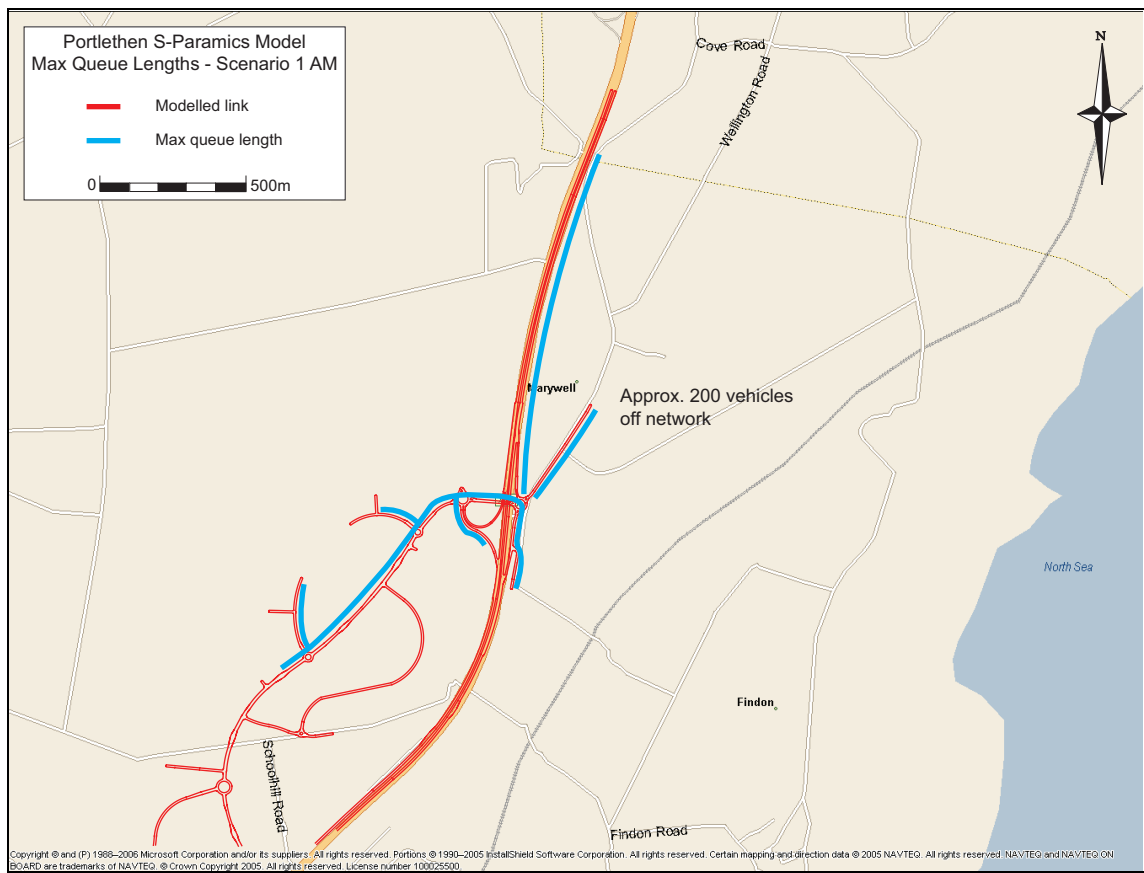


Figure 3.1 :Scenario 1 Maximum Queue Lengths AM Peak Period

3.2.7 Figure 3.1 shows that main area of queuing in Scenario 1 AM peak is centred around Findon Interchange.







Figure 3.2 : Scenario 1 Maximum Queue Lengths PM Peak Period

3.2.8 Figure 3.2 again shows that the main area of queuing in the Scenario 1 PM peak is at Findon Interchange.

**3.3 Scenario 2**

3.3.1 Scenario 2 comprises 800 additional houses at Schoolhill (in addition to the 850 under construction at Schoolhill) plus 850 houses and 30ha of employment land south of Badentoy and west of A90. AC has suggested a new grade separated interchange on the A90 at Bruntland Road be tested with this scenario. Figure 3.3 illustrates the infrastructure that is planned.



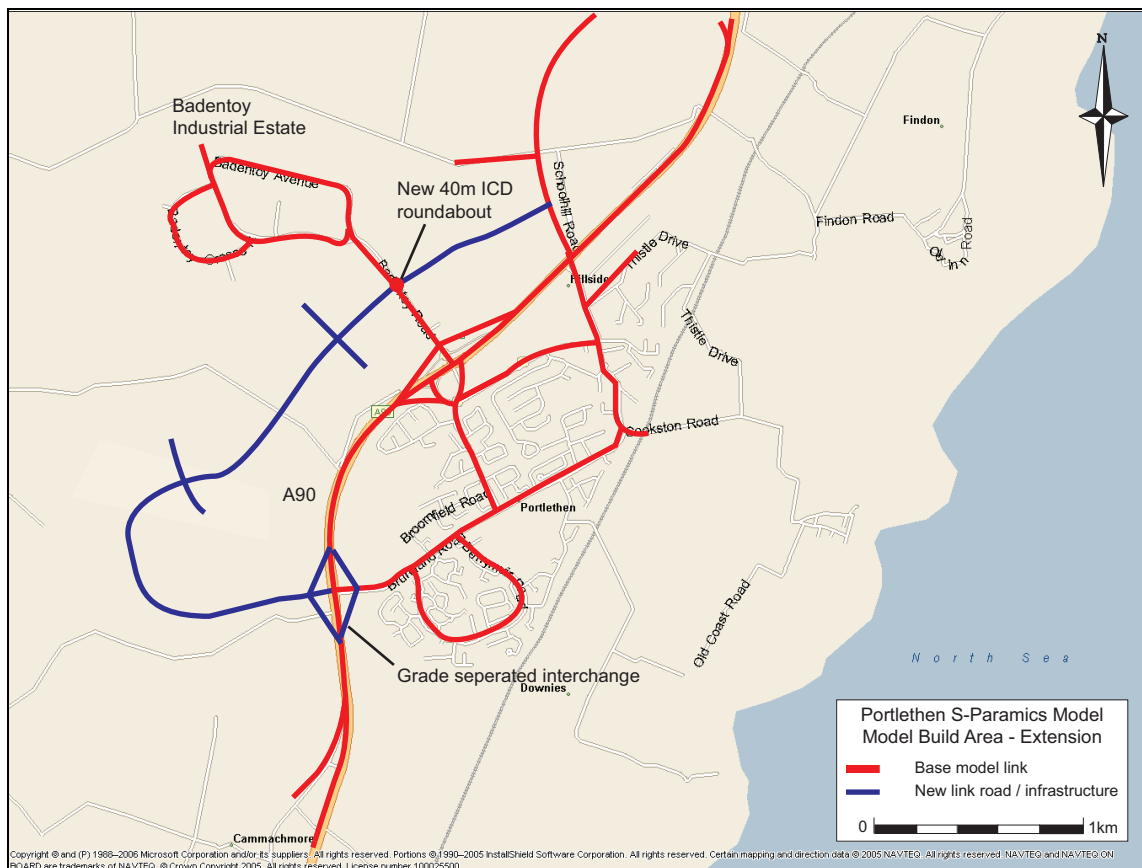


Figure 3.3 : Scenario 2 Infrastructure

3.3.2 Figure 3.3 illustrates that as well as the new interchange, a new link road is planned to Badentoy Road, which then cuts across the golf course to link up with Cookston Road. The new access points to the housing and business can also be seen at Badentoy.

**3.4 Scenario 2 Model Observations**

3.4.1 In the AM peak, the network operates well until around 07:45, at which point queues begin to develop on the northbound off slip at Badentoy Interchange which very quickly block back onto the A90. The main cause of this seems to be the high traffic flows associated with the new development at Badentoy and the priority that the traffic from Aberdeen has over the traffic from the South which is bound for Badentoy. By 08:30 the queues on the A90 are stretching back towards Newtonhill, but after this they start to reduce and by 09:00 the queue is from Badentoy Interchange back to approximately Brunland Road. By 09:15 the queues have disappeared from the main A90 northbound carriageway and there are just small residual queues left on the new link road from the new Brunland Road Interchange to Badntoy Road. By 09:30 all the delays in the network have cleared.

3.4.2 Figure 3.4 shows the extent of the queueing in the AM Peak Period.



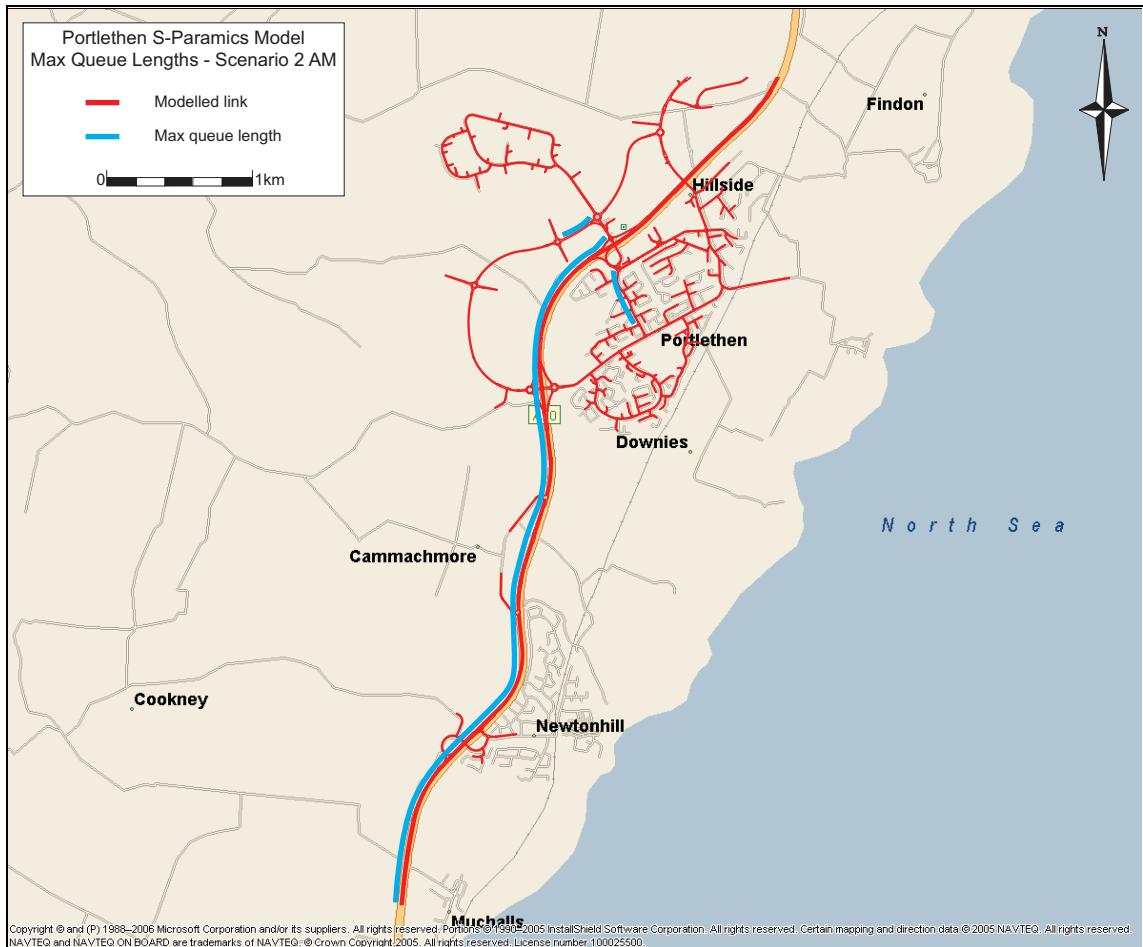


Figure 3.4 : Scenario 2 Maximum Queue Lengths AM Peak Period

- 3.4.3 Figure 3.4 shows that the main location of queueing in Scenario 2 AM Peak is on the main A90(T) heading north towards Aberdeen.
- 3.4.4 In the PM peak, the network operates without problems until around 16:45, when queues begin to develop on Badentoy Road, from the Interchange back towards the existing industrial area. By 17:15 these are stretching back into the existing industrial estate, and there are delays on all arms of Badentoy Interchange. By 17:45 the queues have reduced slightly and continue to reduce until the end of the simulation at 18:30.
- 3.4.5 Figure 3.5 shows the extent of the queueing in the PM Peak.



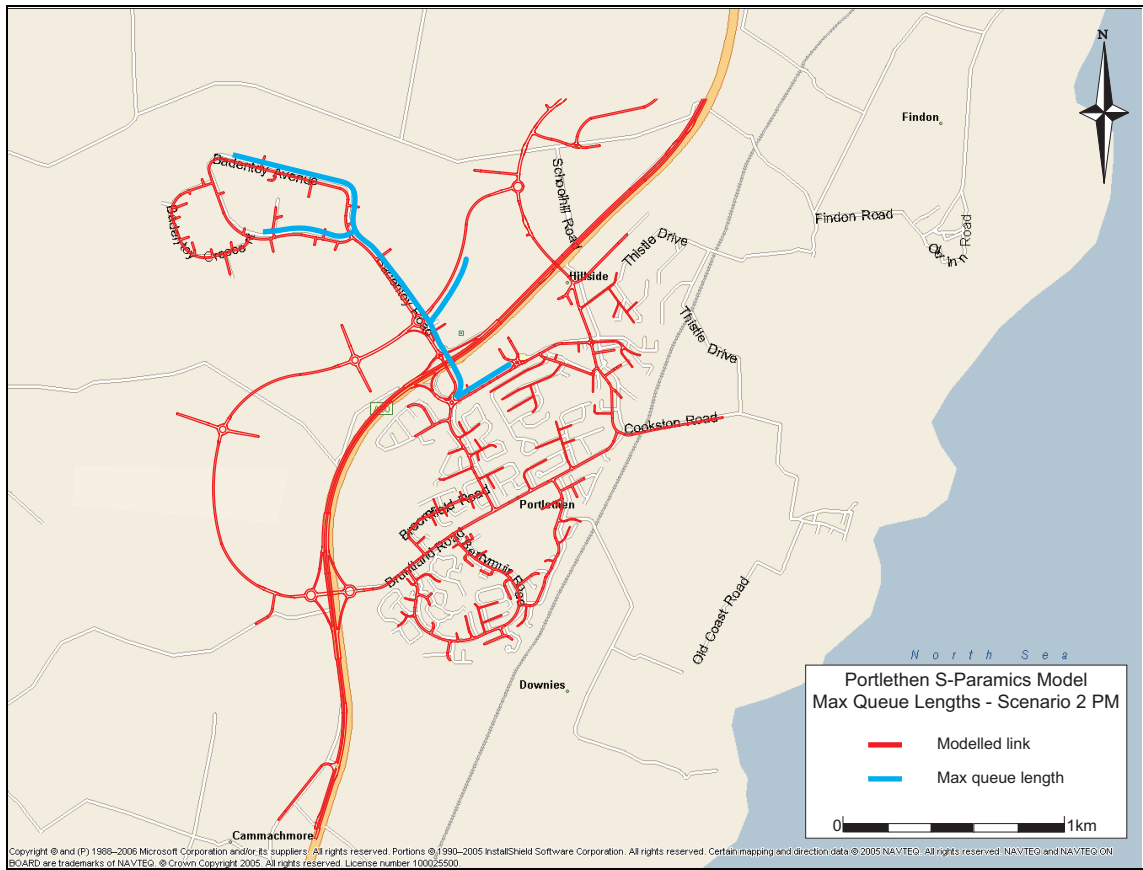


Figure 3.5 : Scenario 2 Maximum Queue Length PM Peak Queue

- 3.4.6 Figure 3.5 shows that in Scenario 2 PM Peak, the traffic exiting Badentoy Industrial Estate experiences delays.
- 3.4.7 No problems were identified at Findon Interchange in Scenario 2, mainly due to the fact that the only development in that area in this scenario is 800 additional houses. The main area of development is at Badentoy where the delays and problems result.
- 3.4.8 Again, while the model did not gridlock, there are long queues particularly on the main A90 northbound carriageway in the AM peak.



**4 RESULTS**

4.1.1 Journey Time and Queue Length data was analysed based on five model runs for each of the following scenarios.

- 2008 Base
- 2012 Do-Minimum
- 2016 Reference Case
- 2016 Scenario 1
- 2016 Scenario 2

**4.2 Journey Time Comparisons**

4.2.1 Journey Times were extracted for the following journey paths:

- From Findon Interchange to Bruntland Road (A90) via Cookston Road
- From Bruntland Road (A90) to Findon Interchange via Cookston Road
- A90 southbound from Findon Interchange to Newtonhill
- A90 northbound from Newtonhill to Findon Interchange

4.2.2 The AM journey times are summarised in Figure 4.1.

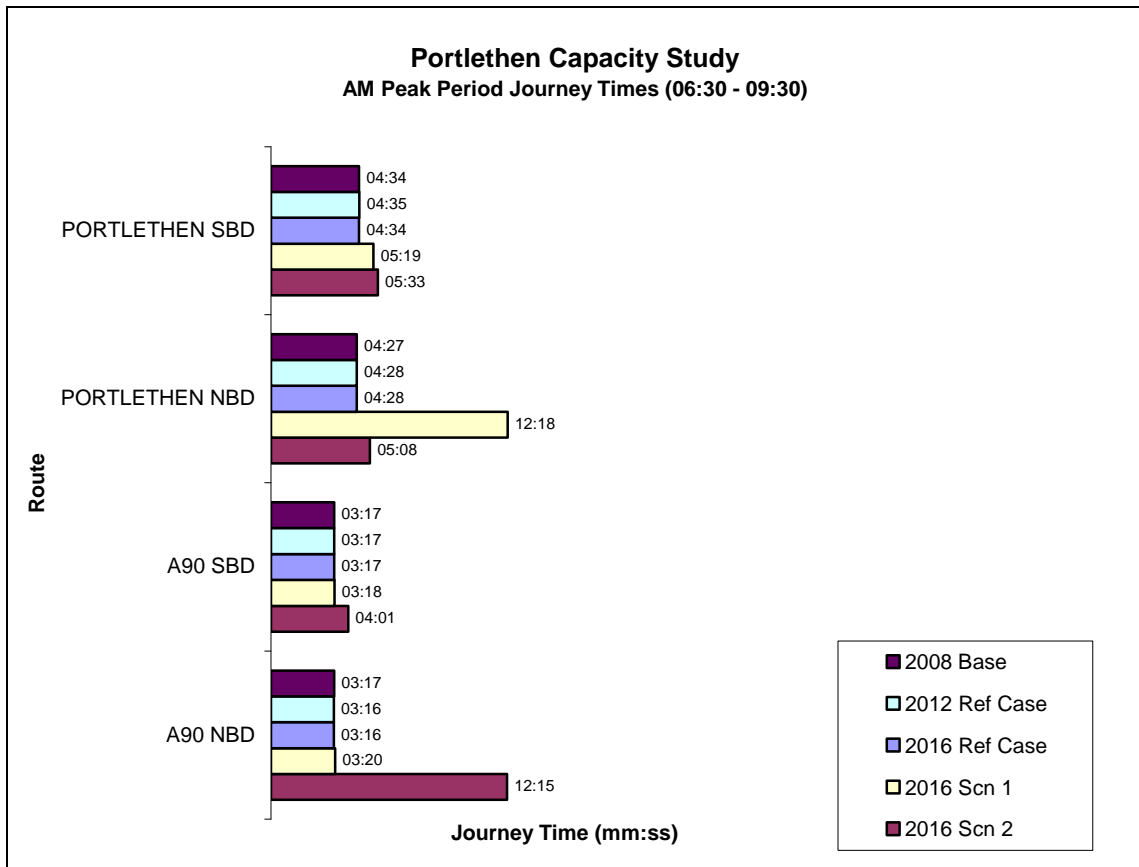


Figure 4.1 : AM Peak Journey Times



- 4.2.3 It can be seen in the AM period, journey times remain relatively consistent between the 2008 Base, 2012 Do-Minimum and 2016 Reference Case, but there are some notable increases when the addition development in Scenarios 1 and 2 are included. Southbound journey times through Portlethen increase by up to almost a minute. Northbound journeys also increase, particularly in Scenario 1, where there is a queue from the development site at Schoolhill back to the centre of Portlethen, increases of approximately 8min can be seen in this option.
- 4.2.4 The A90 journey times remain relatively consistent in the southbound direction, showing a slight increase in Scenario 2 due to the congestion at Badentoy interchange, but northbound increases by approximately 9min in Option 2, again due to the congestion at Badentoy Interchange.
- 4.2.5 The PM journey times are summarised in Figure 4.2.

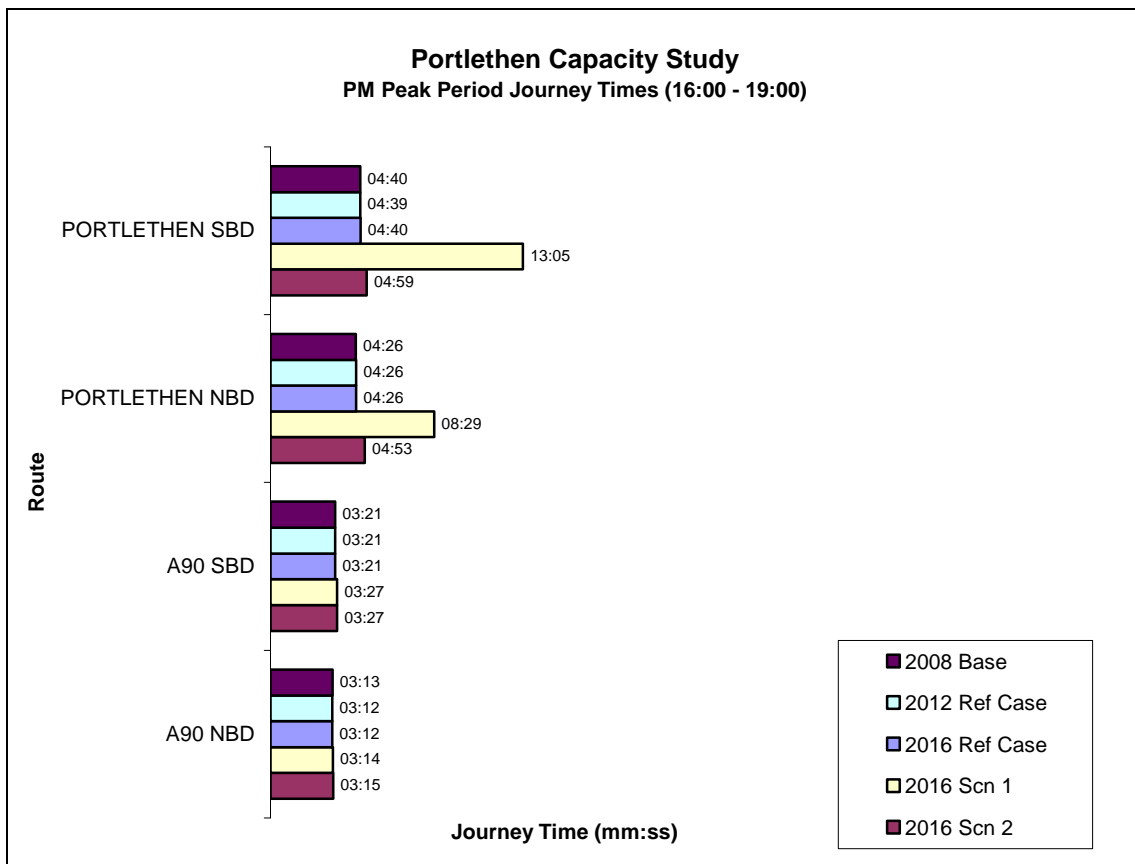


Figure 4.2 : PM Peak Journey Times

- 4.2.6 It can be seen that in the PM period, journey times through Portlethen remain relatively consistent in both the northbound and southbound direction; with the exception of Scenario 1, where there is approximately an 8min increase in the southbound direction and 4min increase in the northbound direction.
- 4.2.7 Journey times on the A90 remain constant in all tests, as the main area of congestion in both scenarios is in Portlethen itself.



**4.3 Queue Length Comparisons**

4.3.1 Maximum queue length data was extracted for the Findon Interchange and Badentoy Interchange. Figure 4.3 illustrates the AM maximum queue lengths occurring on the northbound off slip at Badentoy Interchange.

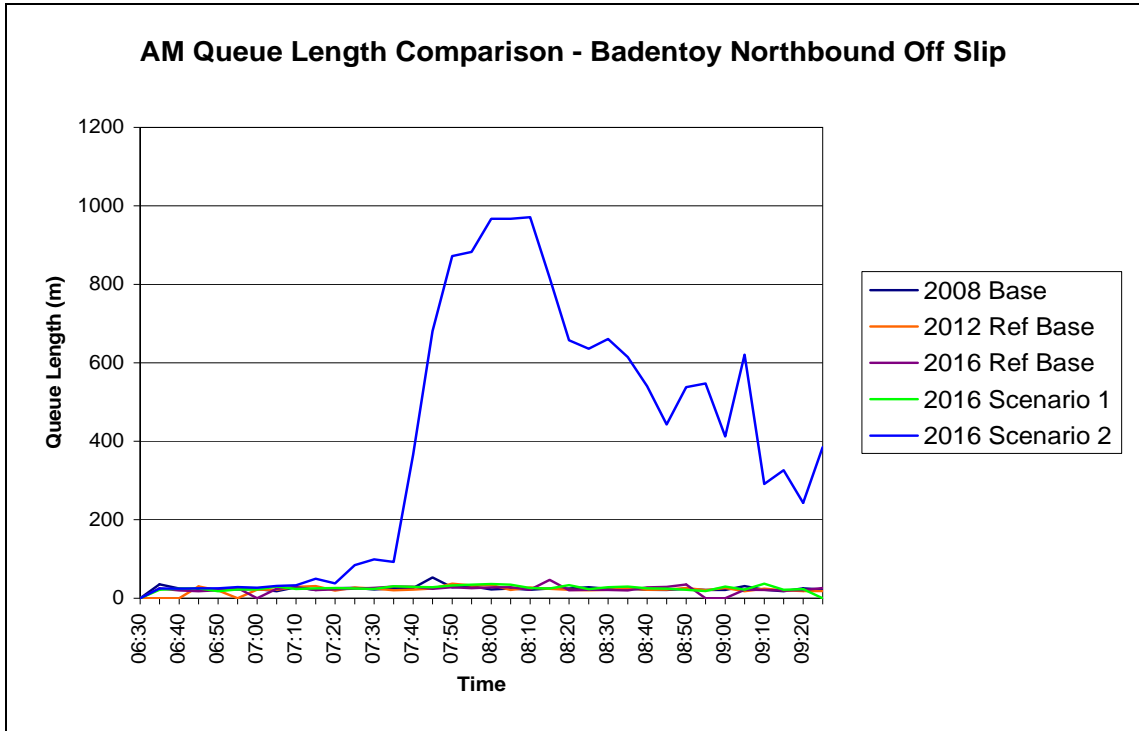


Figure 4.3 : AM Maximum Queue Length Comparison, Badentoy Northbound Off Slip

4.3.2 Figure 4.3 shows that the queue on the A90 northbound off slip remains constant with the exception of Scenario 2, where there is a queue of up to almost 1km, which blocks back on to the A90.

4.3.3 Figure 4.4 shows the queue length on the Badentoy southbound off slip.



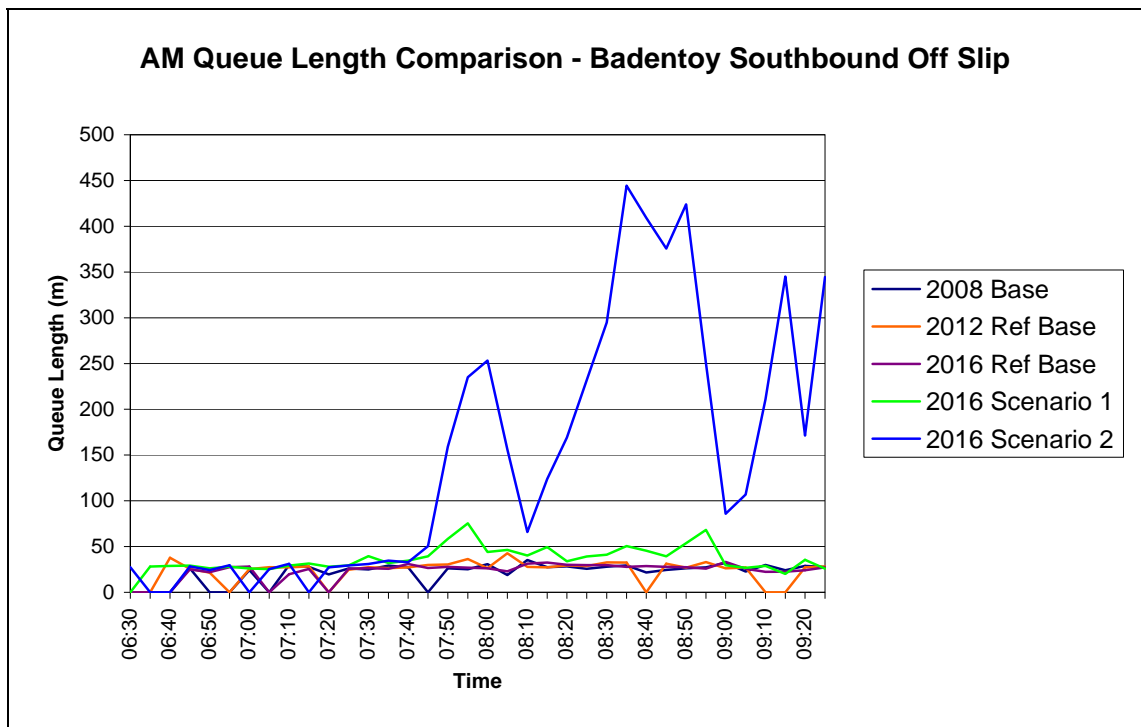


Figure 4.4 : AM Maximum Queue Length Comparison, Badentoy Southbound Off Slip

4.3.4 Figure 4.4. again shows that the queue lengths remain relatively consistent, with the exception of Scenario 2, where the area of development is Badentoy Industrial Estate.

4.3.5 Figure 4.5 shows the queue lengths for Muirend Road (South).

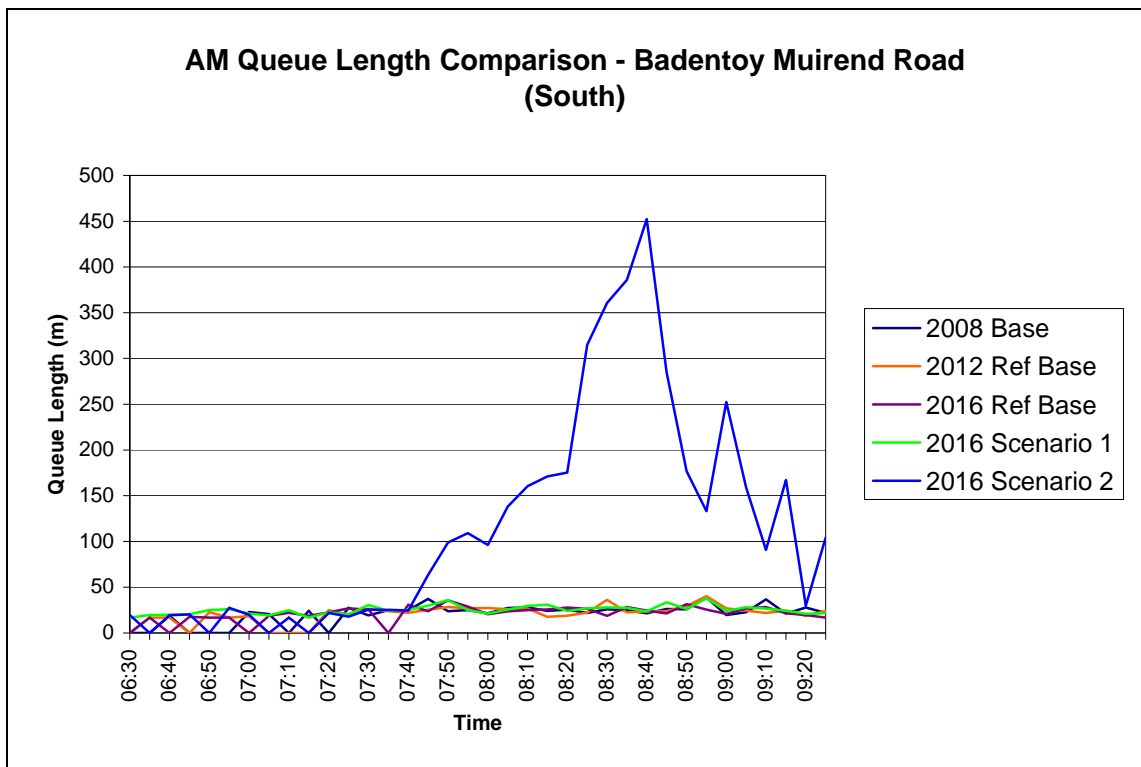


Figure 4.5 : AM Maximum Queue Length Comparison, Badentoy, Muirend Road South





- 4.3.6 Figure 4.5 shows that there are queues on the south arm of Muirend Road (South) in the AM peak in Scenario 2 only, due to the increased development at Badentoy.
- 4.3.7 No queue length graphs have been produced for both Muirend Road (ASDA) and Badentoy Industrial Estate in the AM peak, as there were no significant changes between scenarios and the queue lengths never exceeded 40m.
- 4.3.8 Figure 4.6 shows the queue lengths on the Cookston Road approach to Findon Interchange.

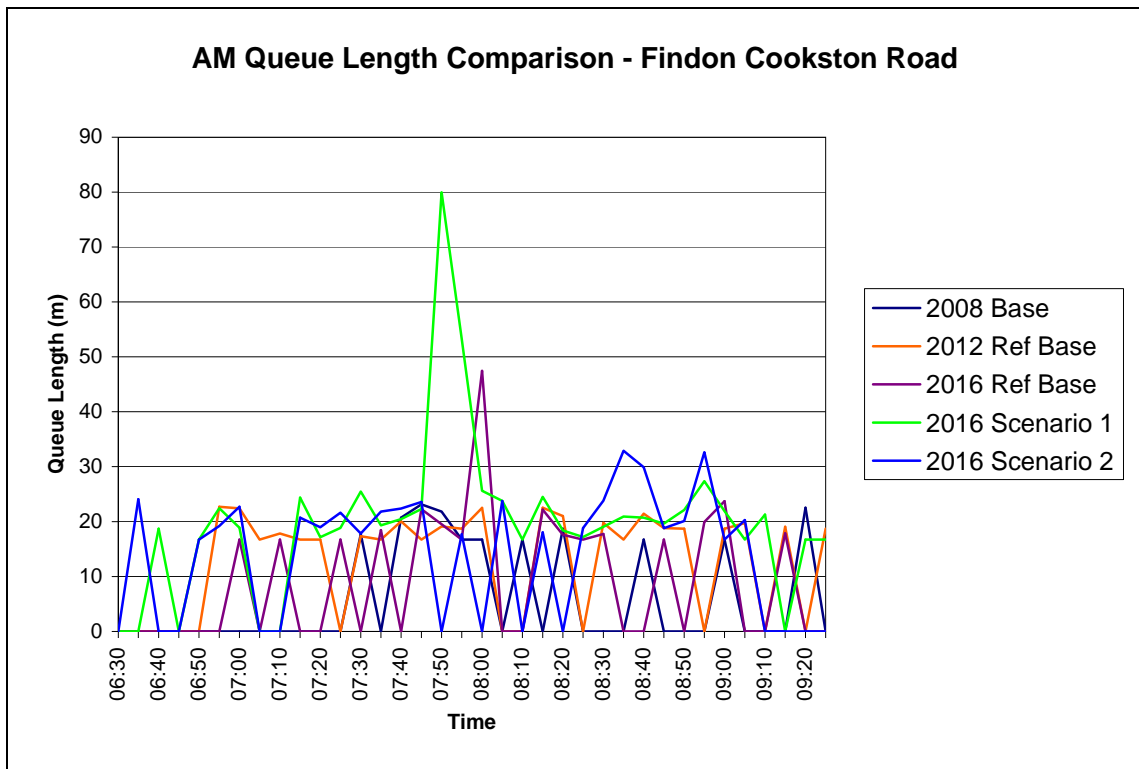


Figure 4.6 : AM Maximum Queue Length Comparison, Findon, Cookston Road

- 4.3.9 Figure 4.6 shows that there is a slight increase in queue lengths on Cookston Road, the majority of queues on Cookston Road are at the new development access junctions, slightly further south.
- 4.3.10 The queue lengths on the A90 northbound off slip are shown in Figure 4.7.



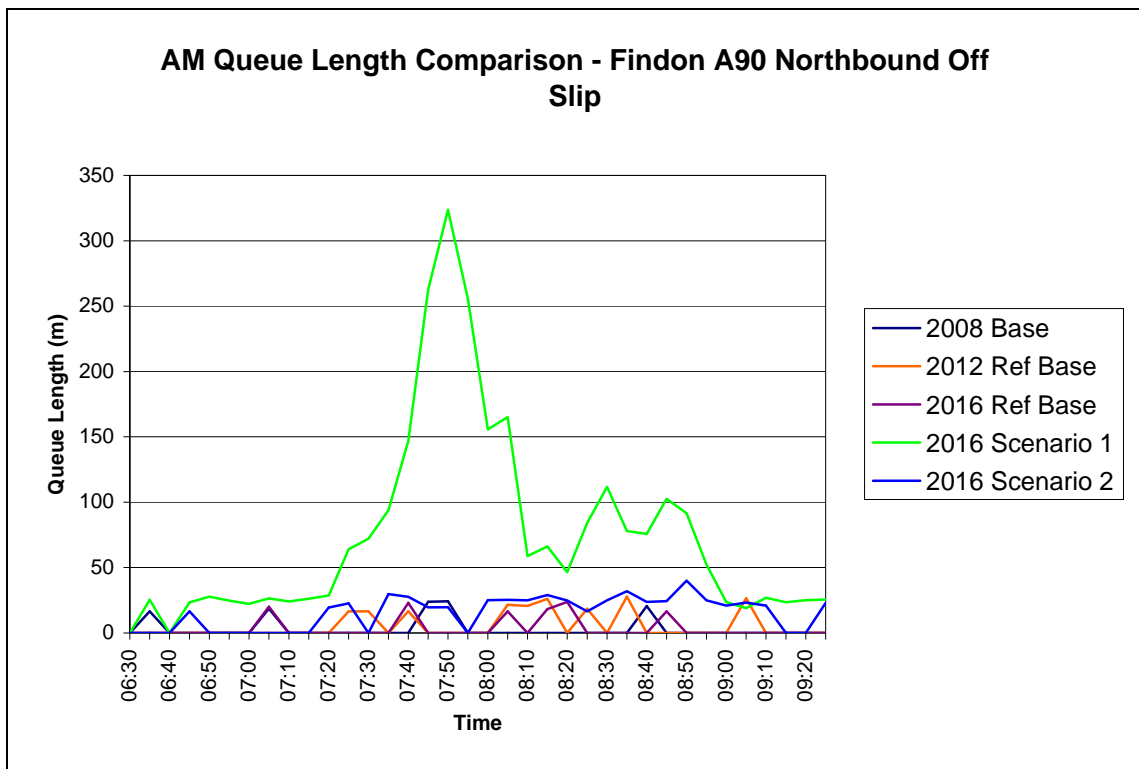


Figure 4.7 : AM Maximum Queue Length Comparison, Findon, A90 Northbound Off Slip

- 4.3.11 Figure 4.7 shows that there is an increase in the queue length on the northbound off slip at Findon Interchange when the additional development is at Schoolhill.
- 4.3.12 Figure 4.8 shows the queue lengths on the southbound off slip at Findon Interchange.



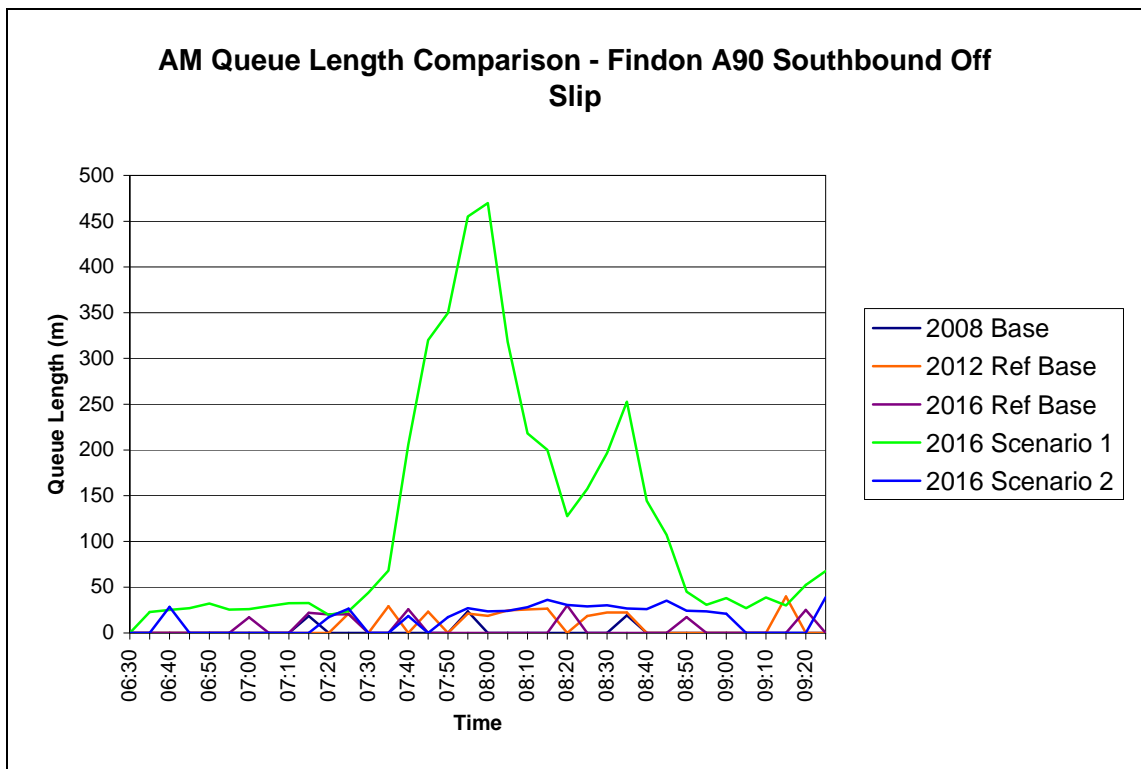


Figure 4.8 : AM Maximum Queue Length Comparison, Findon, A90 Southbound Off Slip

4.3.13 Figure 4.8 shows that in Scenario 1 with the development at Schoolhill there is an increase in queue length on the A90 southbound off slip.

4.3.14 Figure 4.9 shows the graph for the Marywell arm of Findon Interchange.



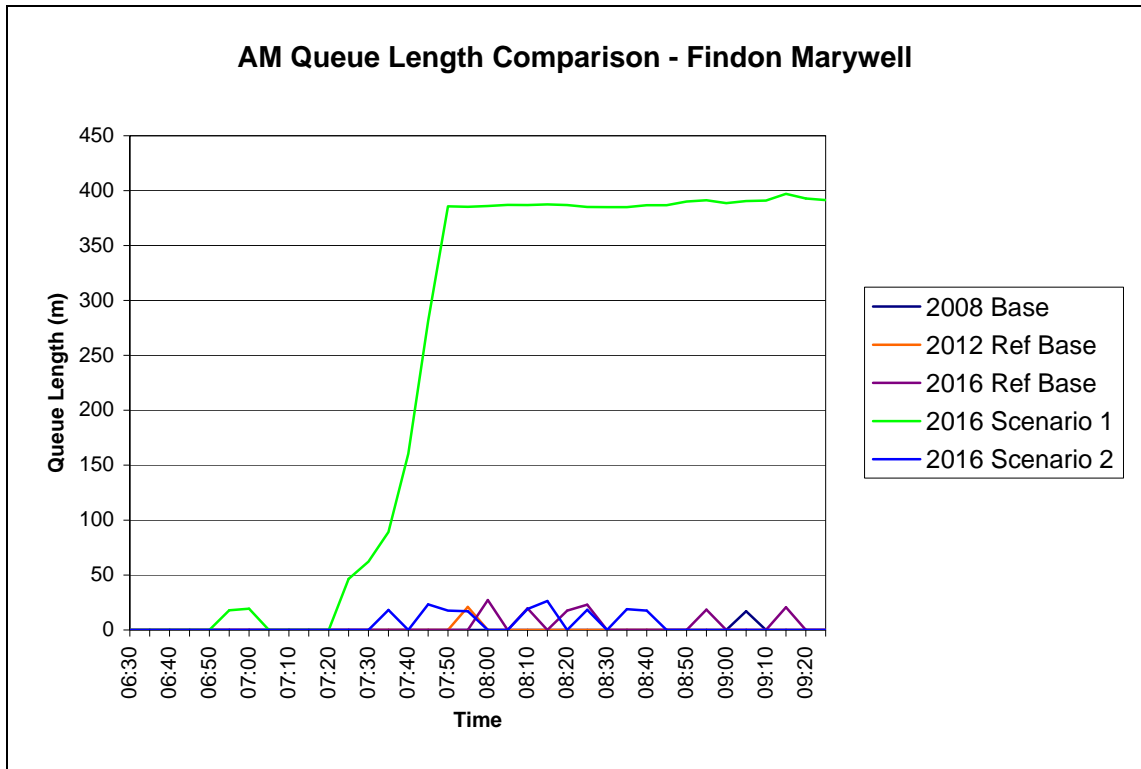


Figure 4.9 : AM Maximum Queue Length Comparison, Findon, Marywell

4.3.15 Figure 4.9 shows that there is a large increase in the queue length on the Marywell approach to the junction. This does not take into account the large number of vehicles queued off the network.

4.3.16 The queue lengths on the two-way slip road (A90 southbound on slip) are shown in Figure 4.10.



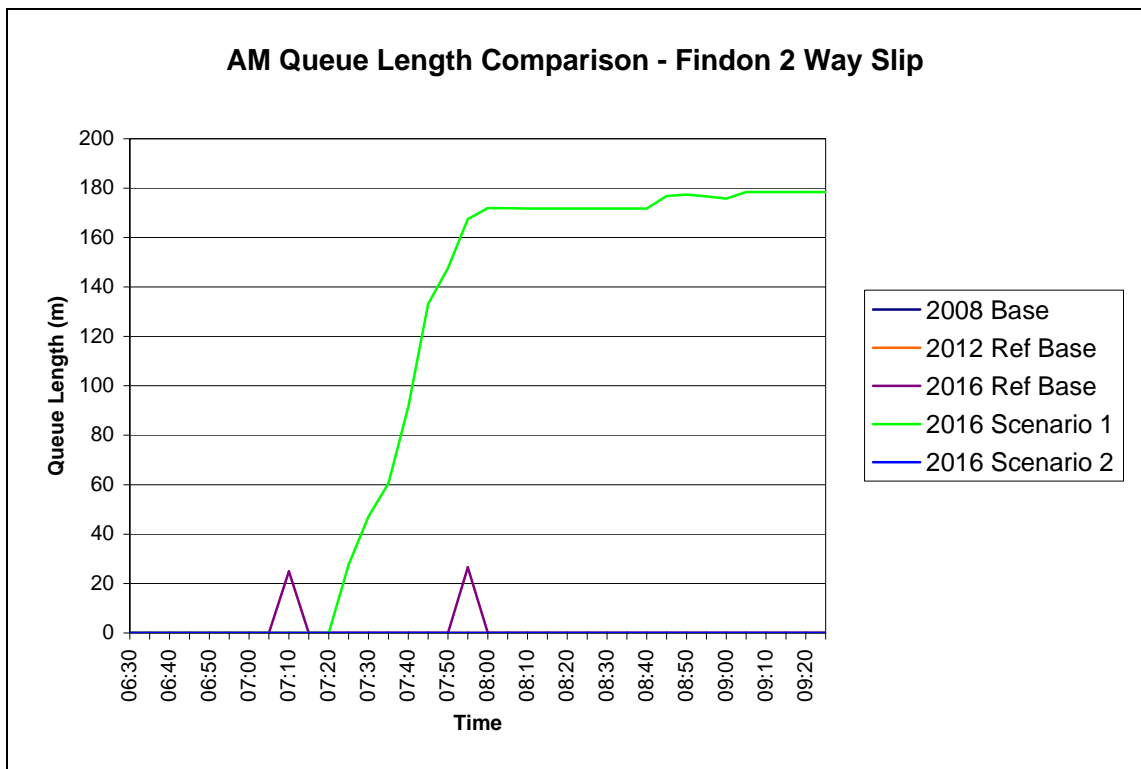


Figure 4.10 : AM Maximum Queue Length Comparison, Findon, 2 way slip

- 4.3.17 Figure 4.10 shows an increase in queue lengths in Scenario 1 on the two-way slip road at Findon Interchange.
- 4.3.18 Figure 4.11 shows the graph for the southbound off slip in the PM peak.



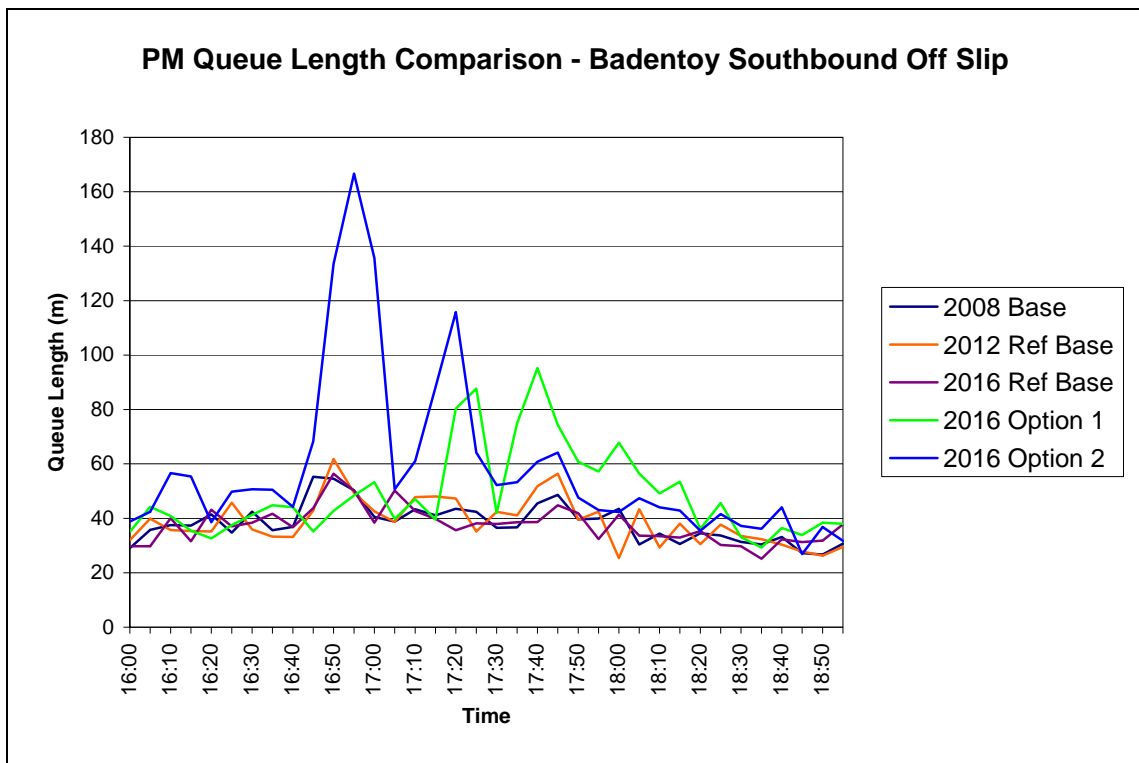


Figure 4.11 : PM Maximum Queue Length Comparison, Badentoy, A90 Southbound Off Slip

4.3.19 Figure 4.11 shows that there is a slight increase in Scenario 2 on the southbound off slip queue length in the PM peak.

4.3.20 The graph for Muirend Road (South) is shown in Figure 4.12.



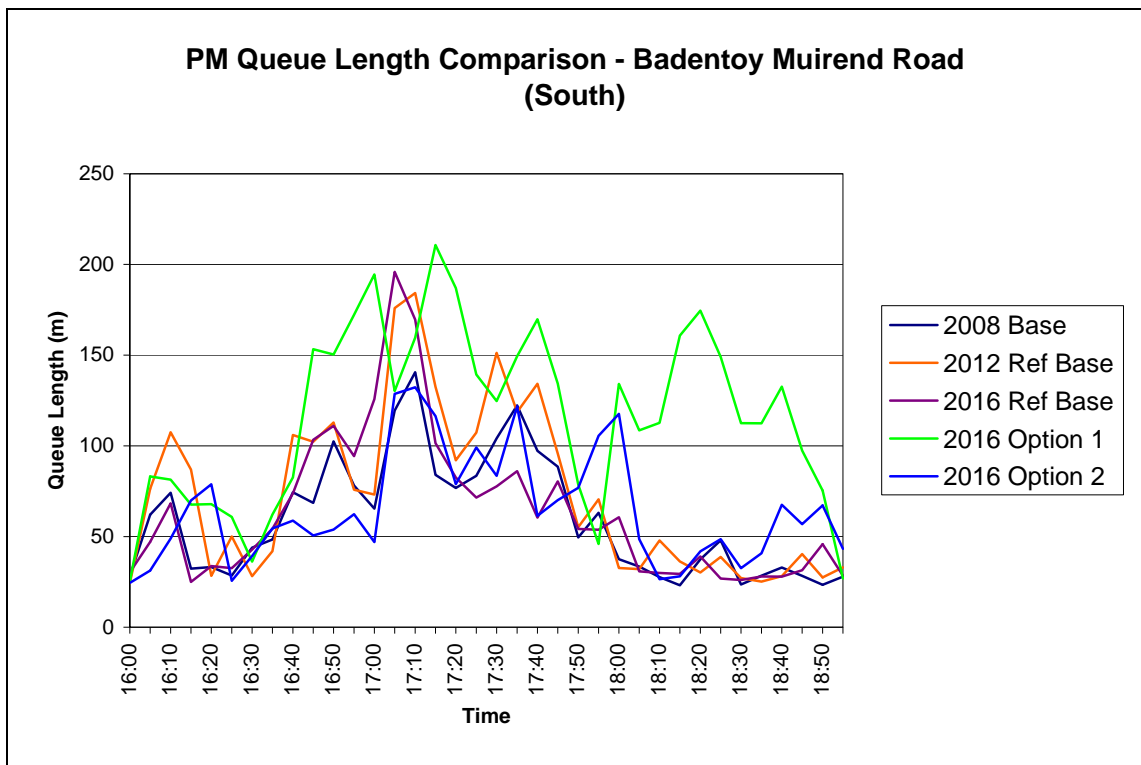


Figure 4.12 : PM Maximum Queue Length Comparison, Badentoy, Muirend Road (South)

4.3.21 Figure 4.12 shows that there is, again, a slight increase in queue lengths in scenario 1.

4.3.22 The queue length from Badentoy Industrial Estate is shown in Figure 4.13.

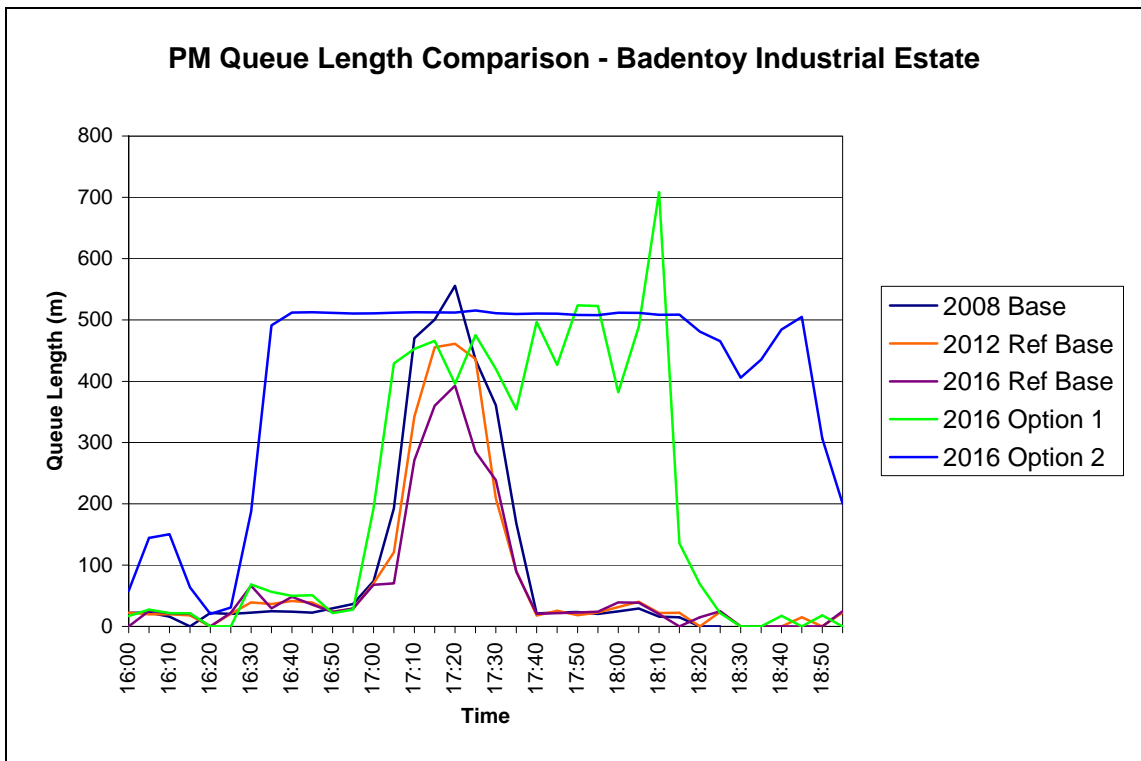


Figure 4.13 : PM Maximum Queue Length Comparison, Badentoy, Badentoy Industrial Estate



4.3.23 Figure 4.13 shows that there is an increased queue in both Scenarios 1 and 2 with the additional development. The queue length in Scenario 2 is actually longer than is shown in the graph, as it forks in different directions in the industrial estate.

4.3.24 The queue length on Muirend Road (ASDA) is shown in Figure 4.14.

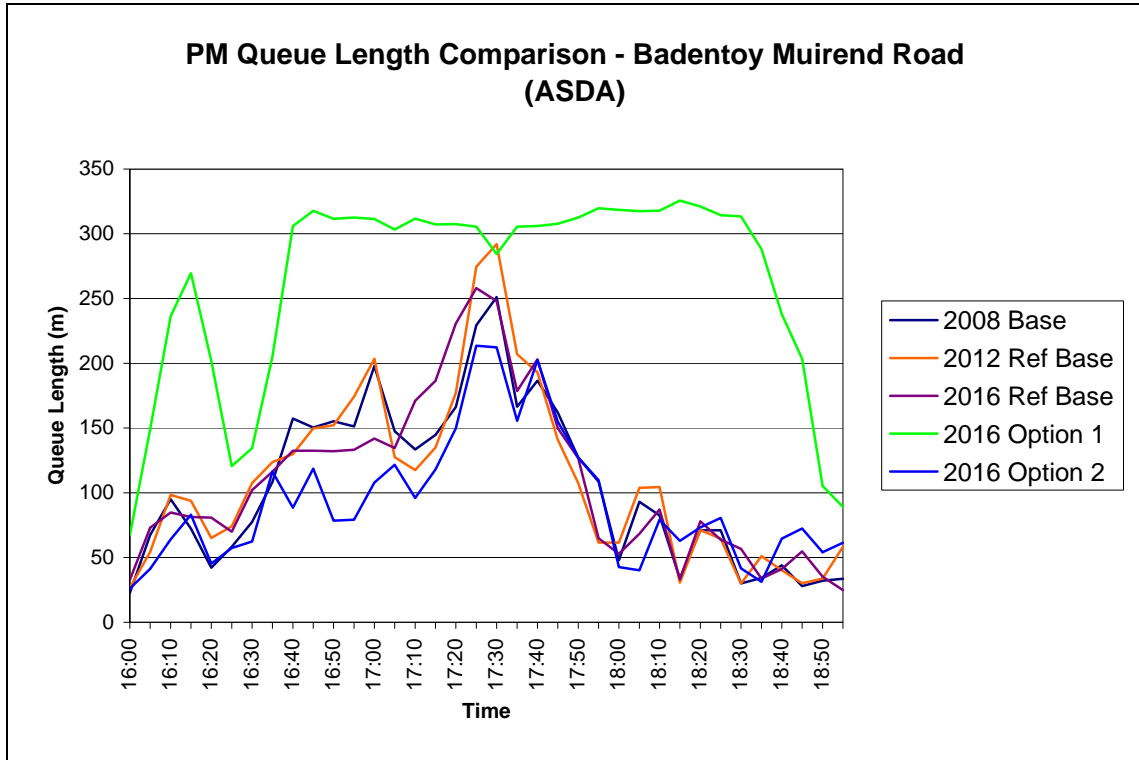


Figure 4.14 : PM Maximum Queue Length Comparison, Badentoy, Muirend Road (ASDA)

4.3.25 Figure 4.14 shows that there are increased queues on Muirend Road (ASDA), caused by vehicles rerouting due to the delays at Findon Interchange in Scenario 1.

4.3.26 No queue data graphs are presented for the northbound off slip at Badentoy Interchange, as there was little difference between the scenarios with a maximum queue length of 30m.

4.3.27 The queue length on Cookston Road at Findon Interchange is shown in Figure 4.15.





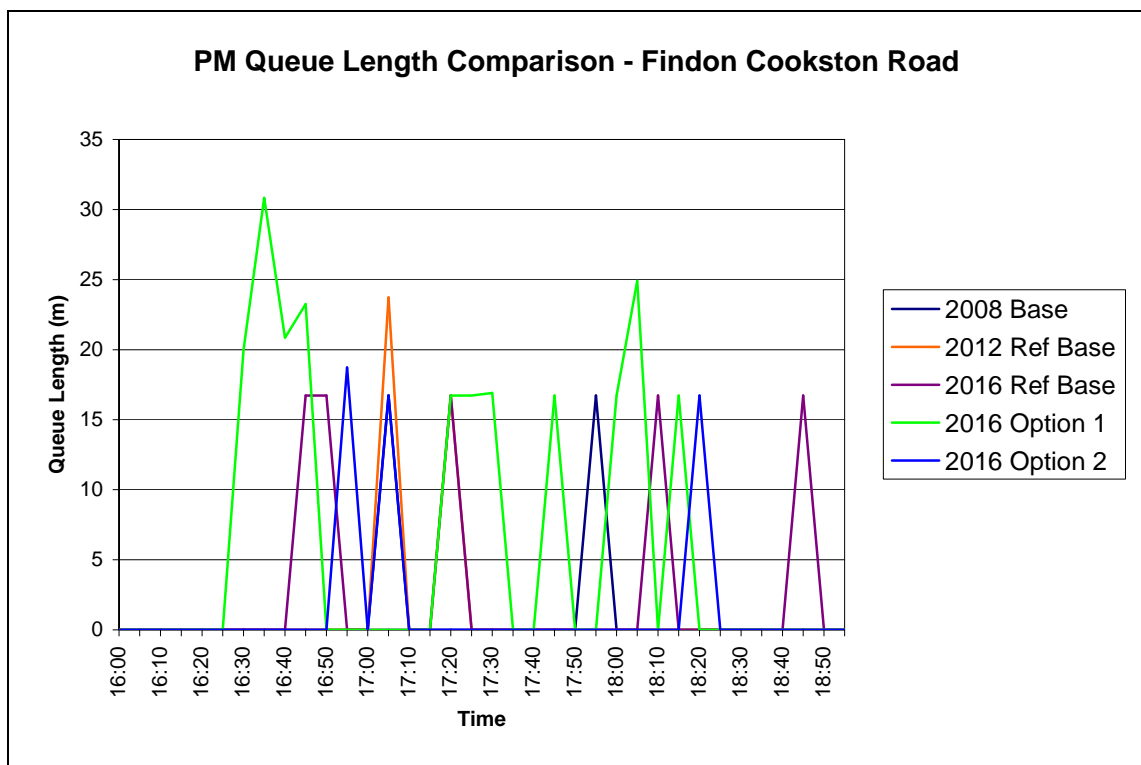


Figure 4.15 : PM Maximum Queue Length Comparison, Findon, Cookston Road

4.3.28 Figure 4.15 shows that there is a slight increase in queuing on Cookston Road in the PM Peak. Again, the majority of queuing is south of the new access junctions and into the development.

4.3.29 Figure 4.16 shows the graph for the A90 southbound off slip.



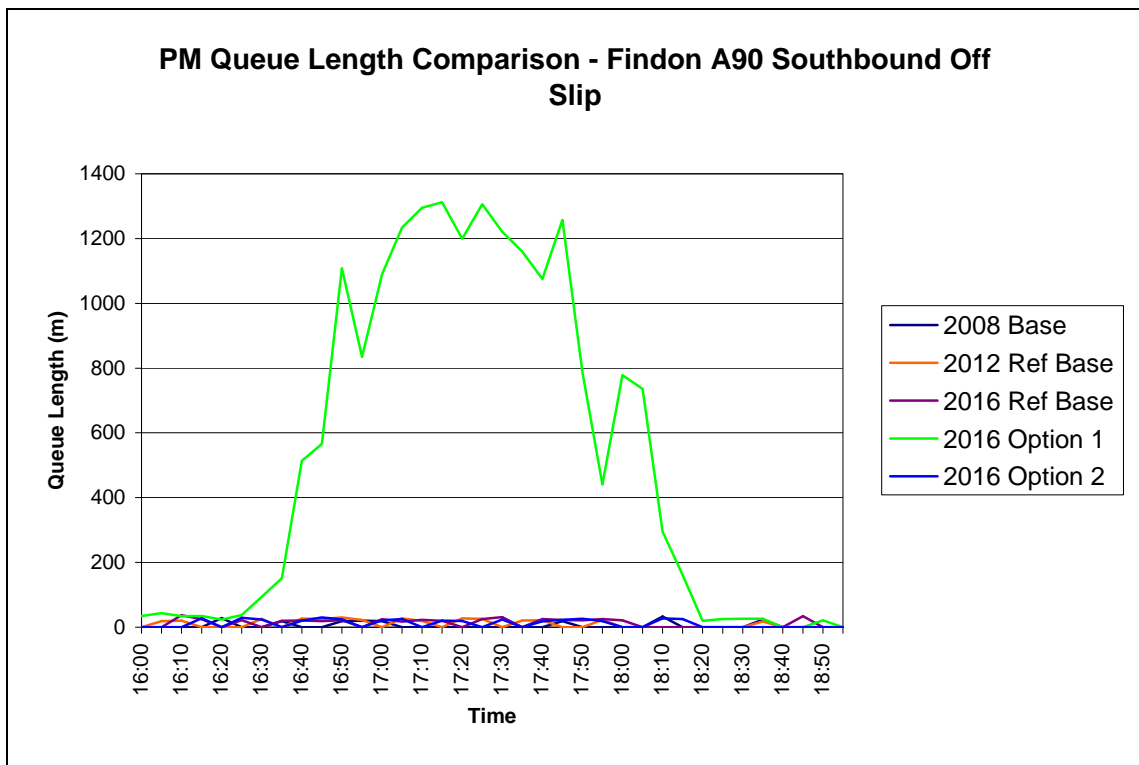


Figure 4.16 : PM Maximum Queue Length Comparison, Findon, A90 Southbound Off Slip

4.3.30 Figure 4.16 shows that there is an increase on the queue length in Scenario 1, caused partly by the design of Findon Interchange, where the employment traffic heading back to Aberdeen takes priority over the residential traffic heading for the new housing at Schoolhill.

4.3.31 Figure 4.17 shows the queue length graph on the Marywell approach to Findon Interchange.



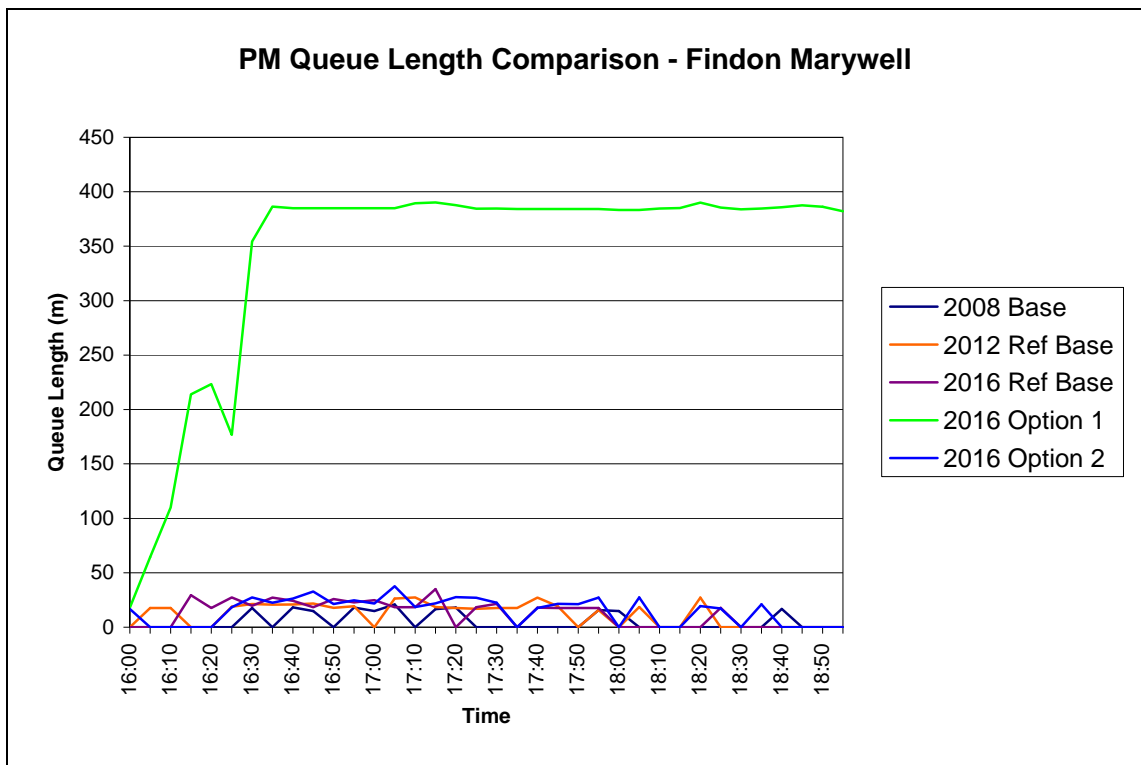


Figure 4.17 : PM Maximum Queue Length Comparison, Findon, Marywell

4.3.32 Figure 4.17 again shows a long queue in scenario 1, caused by the same problems as that for the A90 Southbound off slip. This graph does not take into account the vehicles queued off the network.

4.3.33 The data for the two-way slip road (A90 southbound on slip) is shown in Figure 4.18.



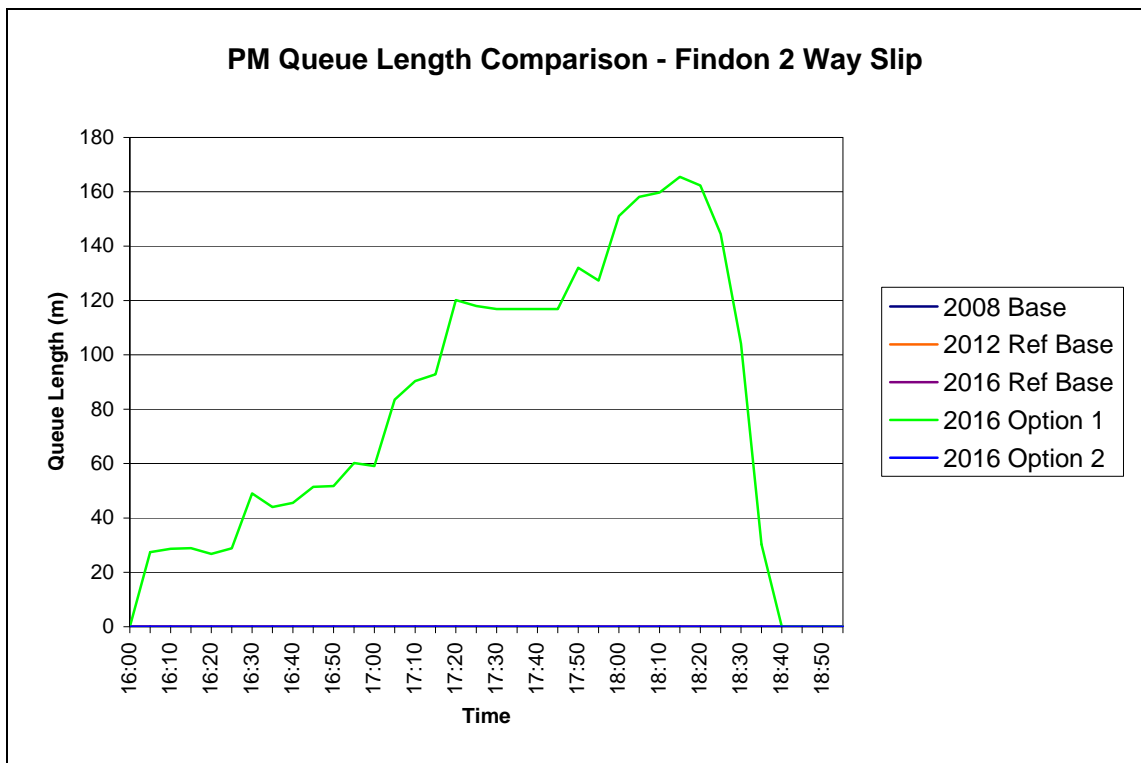


Figure 4.18 : PM Maximum Queue Length Comparison, Findon, 2 way Slip Road

- 4.3.34 Figure 4.18 shows that, again, there is a long queue in Scenario 1, as per the other arms on this roundabout.
- 4.3.35 No queue graph is presented for the A90 northbound off slip in the PM peak, as there is little difference between the scenarios, with a maximum queue length of 30m.



## 5 PROVISIONAL SCHEME COSTS

### 5.1 Introduction

5.1.1 Provisional cost estimates were calculated by Mouchel for the following infrastructure improvements in Scenario 2:

- Preliminaries
- Site Clearance
- Link Road Section 1
- 40m ICD Roundabout at Badentoy Road
- Link Road Section 2
- Grade Separated Junction at Bruntland Road
- Fencing and Gates
- Drainage
- Settlement Ponds
- Street Lighting

5.1.2 Mouchel have developed all costings using SPONS 2009, considering:

- Optimism Bias 44% (*DMRB Stage 2*)
- Contingencies Allowance 20%
- Utilities Allowance 10%

5.1.3 The summary costs provided in Table 4.1 are given as indicative costs.

*Table 5.1 : Portlethen Provisional Scheme Costs*

<b>Infrastructure</b>	<b>Indicative Cost Estimate</b>
Preliminaries	£181,900.00
Site Clearance	£12,700.00
Link Rd Section 1	£2,579,900.00
40m ICD Roundabout	£557,300.00
Link Rd Section 2	£897,400.00
Grade Separated Junction	£5,745,600.00
Fencing and Gates	£348,000.00
Drainage	£407,000.00
Settlement Ponds	£114,900.00
Street Lighting	£153,200.00
<b>Total</b>	<b>£ 10,997,900.00</b>

5.1.4 A full detailed breakdown of all costs is provided in Appendix B.





## 6 SUMMARY

- 6.1.1 Model testing has been carried out as an initial appraisal of the Portlethen road network operation, under agreement with Aberdeenshire Council.
- 6.1.2 With the existing road network in place both the 2012 Do-Minimum and the 2016 Reference Case operate satisfactorily.
- 6.1.3 The 2016 test Scenario 1 comprised 1,650 houses at Schoolhill (in addition to the 850 houses under construction over the next few years at Schoolhill) and 30ha of employment land at Schoolhill. There was no new infrastructure with this test. All new trips were loaded onto the network around Findon Interchange.
- 6.1.4 Scenario 1 put a significant additional load on to the road network and in the AM peak there was queueing on Cookston Road northbound at the entrance junctions to the new development and at Findon Interchange. In the PM peak there was queueing at the Findon Interchange, particularly on the main A90 southbound and from Marywell.
- 6.1.5 The 2016 test Scenario 2 comprised 800 additional houses at Schoolhill (in addition to the 850 under construction at Schoolhill) plus 850 houses and 30ha of employment land south of Badentoy and west of A90. Aberdeenshire Council suggested a new grade separated interchange on the A90 at Bruntland Road be tested with this scenario.
- 6.1.6 Again, this scenario puts a significant additional load on to the road network and the existing Badentoy Interchange is under strain in both the AM and PM Peaks. In the AM Peak there is queueing on the A90 northbound from Badentoy Interchange which stretches back towards Newtonhill and in the PM Peak there is queueing back towards the existing Industrial area as the traffic attempts to access the trunk road network.
- 6.1.7 While neither of the test scenarios gridlocks the modelled network there are significant delays and long queues associated with both tests which impact severely on the local and strategic road network.







**A PORTLETHEN ACCESSIBILITY APPRAISAL**





## Aberdeenshire Council Aberdeenshire Towns – Portlethen Accessibility Appraisal

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<i>Date :</i>	<b>23 July 2009</b>	<i>Distribution :</i>	
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### 1 INTRODUCTION

SIAS Limited (SIAS) has been commissioned by Aberdeenshire Council under the Term Commission to provide transport consultancy advice with regard to the development of the following Aberdeenshire towns:

- Inverurie
- Kintore
- Westhill
- Portlethen
- Stonehaven

As part of these studies, S-Paramics is being used to assess the impact of future expansion on the existing and committed road network in the vicinity of the towns. In addition, the accessibility of potential future development sites is to be appraised using Accession accessibility modelling software.

The accessibility appraisal has been based on existing bus service details and has not investigated the accessibility of the sites in terms of rail travel due to the local nature of the studies. It is, however, suggested that this should be undertaken as part of the detailed appraisal of the potential development sites. At the request of Aberdeenshire Council the A90(T) Park & Ride at Schoolhill has been assumed as committed for the purpose of this accessibility appraisal.

This Technical Note summarises the results of the accessibility appraisal for Portlethen.



## **2 POTENTIAL DEVELOPMENT SITES**

### **2.1 Introduction**

Portlethen has a population of around 6,600 and is located 13km to the south of Aberdeen. Direct bus and rail services provide connection between the town and Aberdeen City Centre, with the A90(T) providing access to the city.

The trunk road forms the western boundary of Portlethen and the Dundee – Aberdeen rail line forms the town's eastern boundary.

Aberdeenshire Council has confirmed that Portlethen has two potential development sites at Schoolhill and Badentoy, to the north and west of the town.

### **2.2 Potential Development Sites**

The Schoolhill site is located to the north of Portlethen and to the west of the A90(T). The A90(T) is of dual carriageway standard in the vicinity of Portlethen and forms a barrier to movement between the site and existing town. The recently constructed Findon Interchange provides access into the site from the trunk road network, and the recently realigned Schoolhill Road provides connection between the site and Portlethen utilising an underpass to cross the A90(T).

Bus services currently route through the site on Cookston Road and past the site on the A90(T). The bus services which currently route along the A90(T) will serve a bus based Park & Ride, which is to be constructed at the A90(T) Findon Interchange and will improve the accessibility of the Schoolhill site. The Park & Ride facility has been assumed to be operational for the purpose of this study. While Service No. 109 currently routes through the Schoolhill site, the public transport data which has been used to inform this study does not include any bus stops in the Schoolhill development site as these have yet to be activated. The nearest bus stop to the Schoolhill site, which is currently served by bus services, is provided on Cookston Road approximately 500m to the north of the A90(T).

The Badentoy site is located to the west of Portlethen and the A90(T), which again presents a barrier to movement between the site and the town. The Badentoy Interchange provides the only segregated crossing of the trunk road in the vicinity of the potential development site, with the majority of crossing uncontrolled and at-grade in the vicinity of the site.

Express and local bus services route past the site on the A90(T) and serve the Badentoy Business Centre and Park. The nearest bus stops to the site are located in the Business Park and on the A90(T) immediately to the east of the site.

The location of the sites is shown in Figure 2.1.



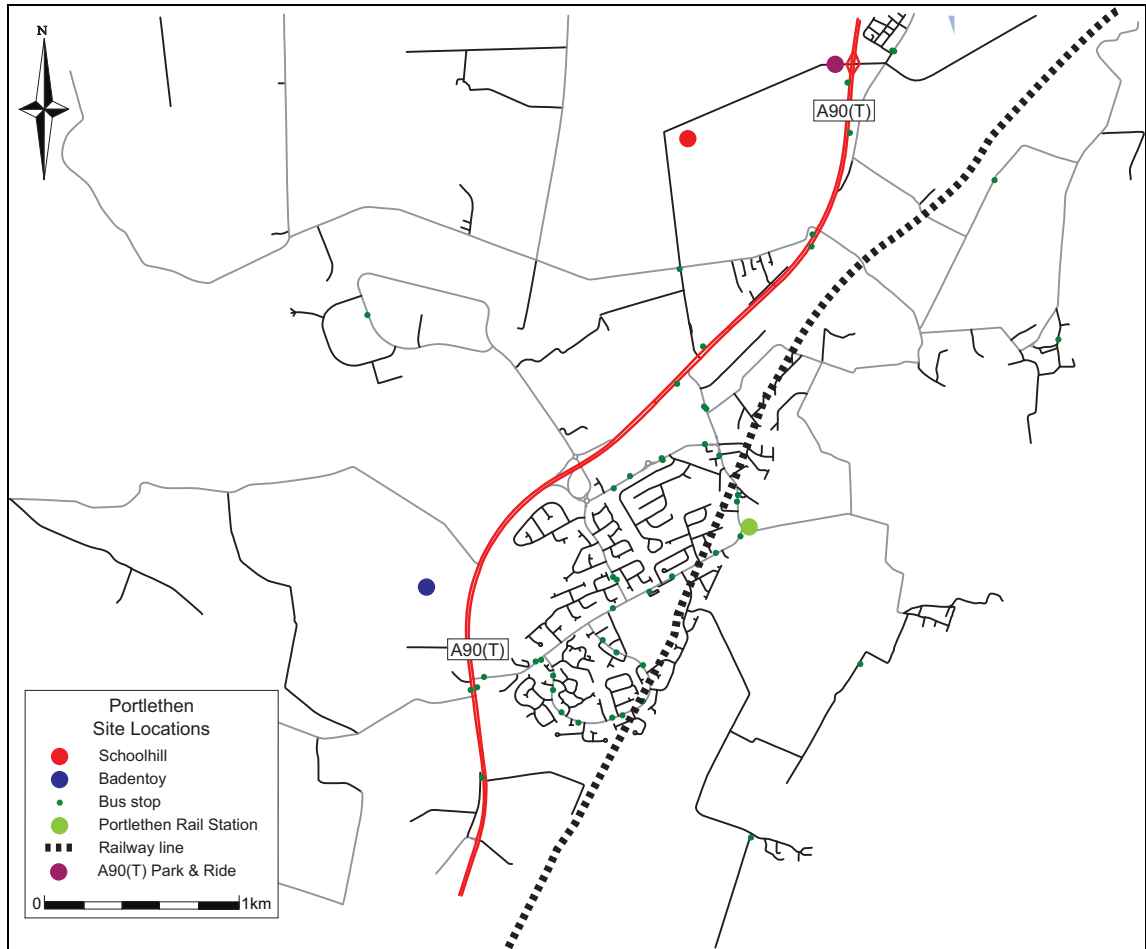


Figure 2.1 : Site Locations



### 3 ACCESSIBILITY APPRAISAL

#### 3.1 Accession Modelling

Accession is a software package which was developed on behalf of the Department for Transport as a joint venture between MVA and Citilabs. The software enables the accessibility of an area to be appraised and has been approved by the Government for use in accessibility planning.

The software operates as a Geographical Information System (GIS) which brings together a number of data sources (including road network and public transport service information) to enable the accessibility of a potential development site or area to be appraised. ATCO Cif public transport service data (exported 11 February 2009) has been supplied by Aberdeenshire Council for use in the Aberdeenshire Town Studies.

Accessibility analysis calculations are generally based on travel time and results can be displayed graphically as contours or presented in a tabular format.

Accession can be used to undertake 'Local Accessibility' calculations which enable the accessibility of public transport services to be appraised for a particular area. 'Network Accessibility' calculations enable the accessibility of a destination to be determined from a user defined area. This study has made use of both Local and Network Accessibility calculations.

The accessibility of the potential development sites have been appraised in terms of their proximity to local bus services in the morning peak (08:00 – 09:00) and off-peak (12:00 – 13:00) weekday periods. While it is acknowledged that the future developments will be supported by improvements to the public transport network to ensure they comply with national and local planning policy, in the first instance, the use of existing service information will enable an appraisal of the sites accessibility to be undertaken. The A90(T) Park & Ride has been assumed to be operational for the purpose of this study.

The parameters which have been used to inform the local accessibility analysis are as follows:

- Average walk speed: 4.8km/h
- Straight line walk distance factor: 1.2
- Maximum walk distance: 10min

The analysis has been undertaken to appraise the accessibility of the sites to 1, 2 and 4 buses per hour in the weekday peak and off-peak periods. A 60min service frequency would represent a minimum standard and a 15min frequency is considered to represent a high level of service frequency.

Network accessibility calculations have also been undertaken to determine the accessibility of the potential development sites on foot, cycle and by bus. The parameters which have been used to inform the network accessibility analysis are as follows:

- Average walk speed: 4.8km/h
- Average cycle speed: 16km/h
- Straight line walk distance factor: 1.2
- Maximum connection distance: 1.0km
- Minimum time calculation undertaken
- All wait time included



For the purpose of this study it has been assumed that pedestrians and cyclists would be prepared to travel a maximum of 20min to access the development site or to access local amenities from the site.

In addition, the accessibility of the town to the centre of Aberdeen, has been appraised in the peak and off-peak periods. A maximum journey time of 47min has been assumed for the purpose of this study to provide an additional parameter against which to assess the accessibility of the potential development sites. A journey time of 47min has been chosen as the whole of Portlethen lies within a 47min journey of the centre of Aberdeen.

Census population data (General Register Office for Scotland, circa 2003) has been applied to the network accessibility appraisal to determine the magnitude of existing (based on 2001 data) residents living within a 20min walk or cycle of the sites to provide an additional indicator of the site's accessibility.



### 3.2 Accessibility Appraisal – Local Accessibility

#### 3.2.1 Public Transport Accessibility – Weekday Peak

Figures 3.1 and 3.2 confirm the availability of bus services in the morning weekday peak period, which has been assumed to be 08:00 – 09:00 for the purpose of this appraisal. National planning policy guidance, *Scottish Planning Policy: SPP17 Planning for Transport (SPP17)* (Scottish Executive, August 2005), suggests that 400m (equivalent to a 5min walk) represents a convenient distance which residents would be prepared to walk to access a bus service, however, given the scale and nature of a number of the development sites, this appraisal has set a maximum journey time of 10min or 800m.

Figure 3.1 shows the proportion of Portlethen which is accessible to a bus service which operates with a minimum of a 60min frequency in the morning peak. A proportion of both the Schoolhill and Badentoy sites are within a 10min walk of a 60min frequency service with the Schoolhill site shown to be the more accessible due to the location of existing bus services in relation to the site.

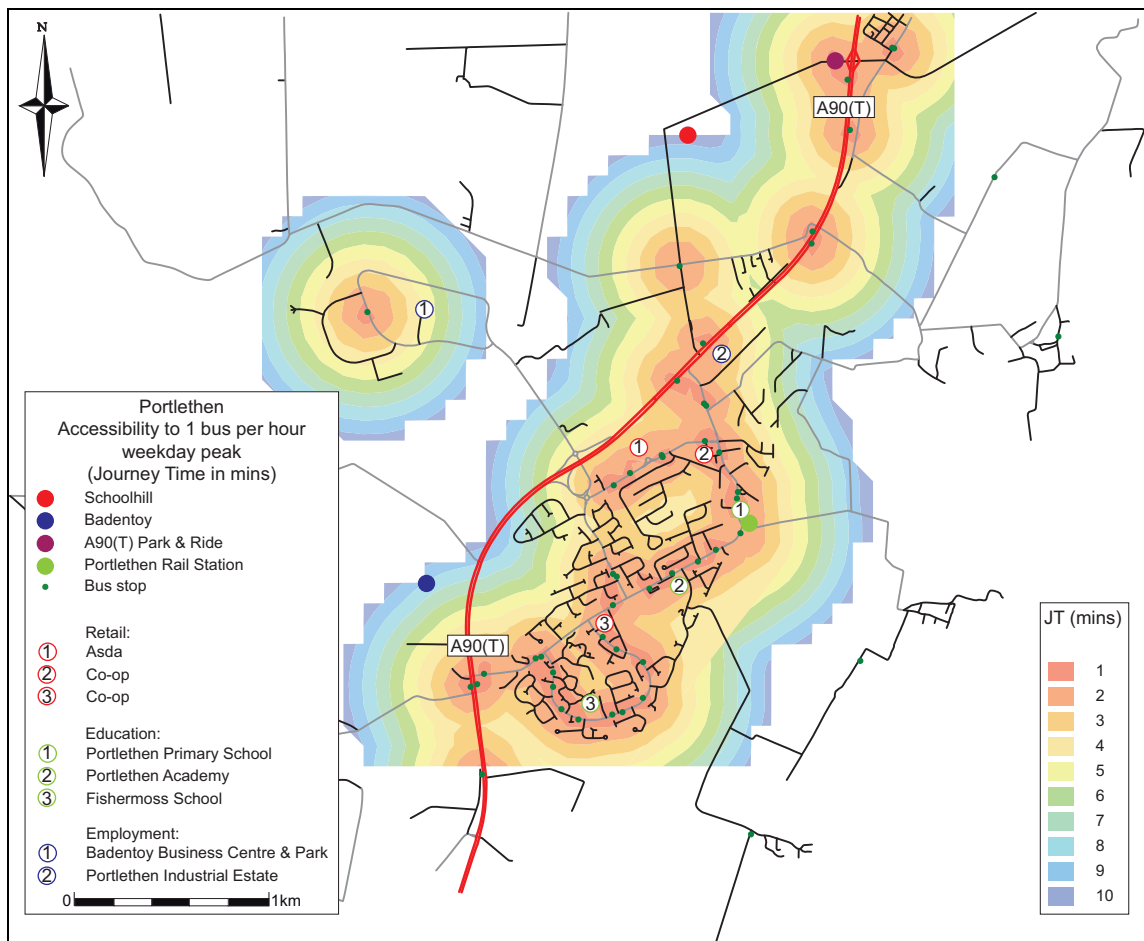


Figure 3.1 : Weekday Peak Accessibility to a 60min bus service





Figure 3.2 shows the proportion of Portlethen which is accessible to a bus service which operates with a minimum of a 30min frequency in the morning peak. The contour plot is virtually unchanged from the output which detailed the accessibility of Portlethen to a 60min service frequency. The Schoolhill site remains the more accessible of the two potential sites, however, the proportion of the site which is located within a 10min walk of a 30min frequency bus service is reduced when compared to its accessibility to a 60min service.

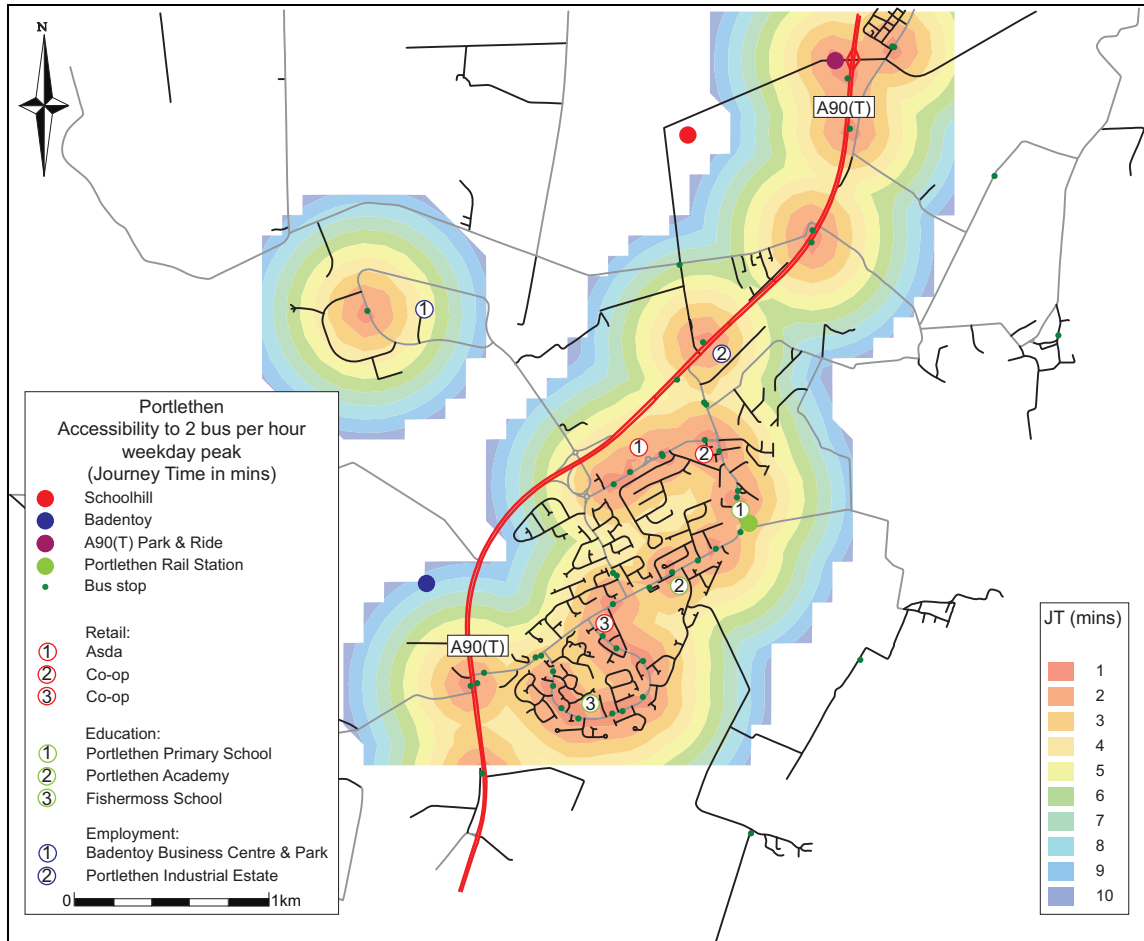


Figure 3.2 : Weekday Peak Accessibility to a 30min bus service



Figure 3.3 shows the proportion of Portlethen which is accessible to a 15min frequency in the morning peak. It can be seen that only a small proportion of Portlethen bus stops are served by a combined 15min service frequency in the morning peak period. These stops are located in the vicinity of the Asda foodstore on Muirend Road. The A90(T) Park & Ride is also shown to be served by a 15min frequency. This is as a result of the assumption that all bus services which currently route along the A90(T) will serve the Park & Ride facility, which has been assumed to be operational for the purpose of this study. The results of the accessibility appraisal suggest that, while a proportion of the Schoolhill site lies within a 10min walk of a combined 15min service frequency, the Badentoy site is not expected to be within a 10min walk of an equivalent service frequency.

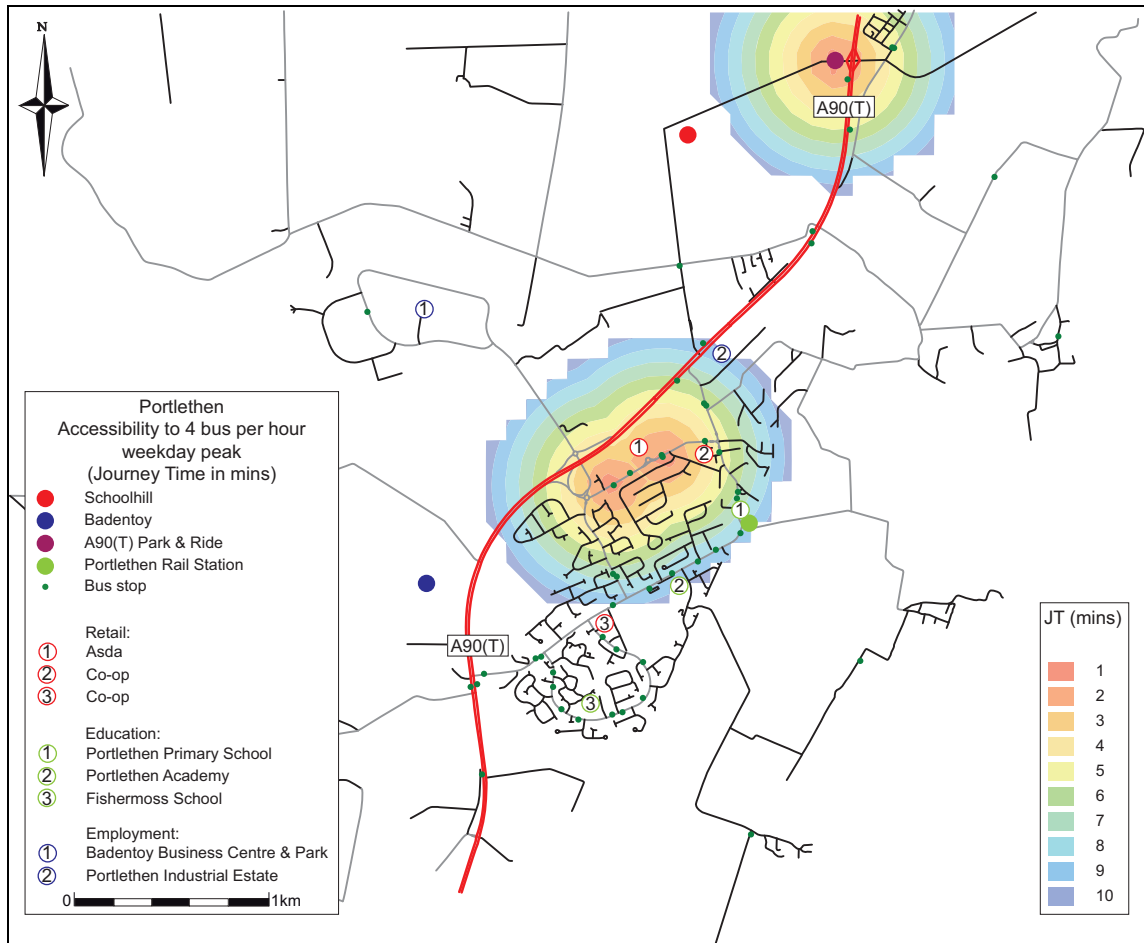


Figure 3.3 : Weekday Peak Accessibility to a 15min bus service



3.2.2 Public Transport Accessibility – Weekday Off-Peak

Figures 3.4 – 3.6 show the availability of bus services outwith the peak (12:00 – 13:00). The figures confirm that a similar level of service is provided in the off-peak period when compared to the peak.

Figure 3.4 shows the proportion of Portlethen which is accessible to a bus service which operates with a minimum of a 60min frequency in the off-peak period. The Schoohill site is shown to be more accessible than the Badentoy site, with a greater proportion of the site is located within a 10min walk of a 60min frequency service.

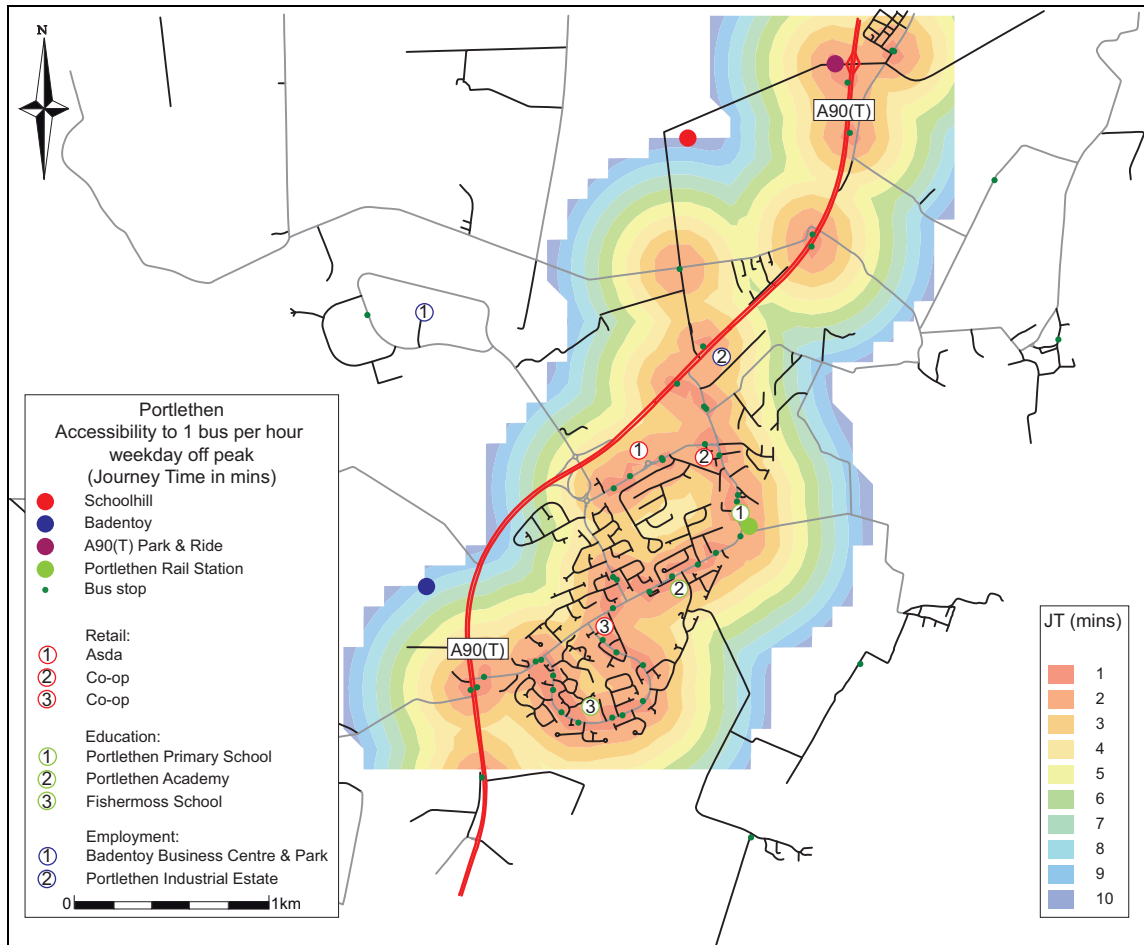


Figure 3.4 : Weekday Off-Peak Accessibility to a 60min bus service



Figure 3.5 shows the proportion of Portlethen which is accessible to a bus service which operates with a minimum of a 30 minute frequency in the off-peak period. The contour plot is unchanged from the output which detailed the accessibility of Portlethen to a 60 minute service frequency. The Schoolhill site remains the more accessible of the two potential development sites due to its proximity to the bus stops located on Cookston Road and the A90(T) Park & Ride. The nearest bus stops to the Badentoy site are provided on the A90(T) at Mill of Kingcausie.

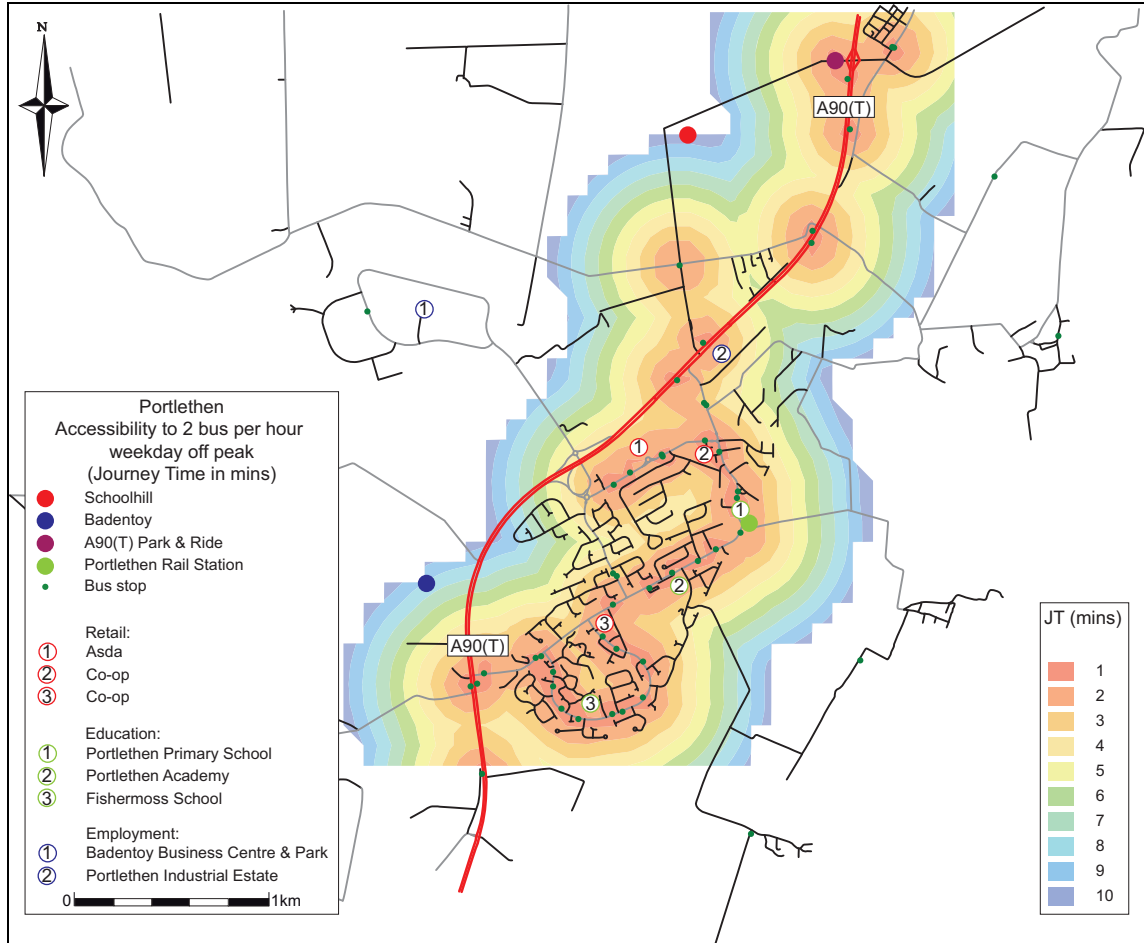


Figure 3.5 : Weekday Off-Peak Accessibility to a 30min bus service



Figure 3.6 shows the proportion of Portlethen which is accessible to a bus service which operates with a minimum of a 15min frequency in the off-peak period. As can be seen from the output, the A90(T) Park & Ride is shown to be the only stop which is served by a combined service frequency of 15mins outwith the peak. The Schoolhill site remains the more accessible of the two sites due to its location adjacent to the Park & Ride. The Badentoy site is not located in the vicinity of bus stops which provide access to services which operate with a combined frequency of 15mins outwith the peak.

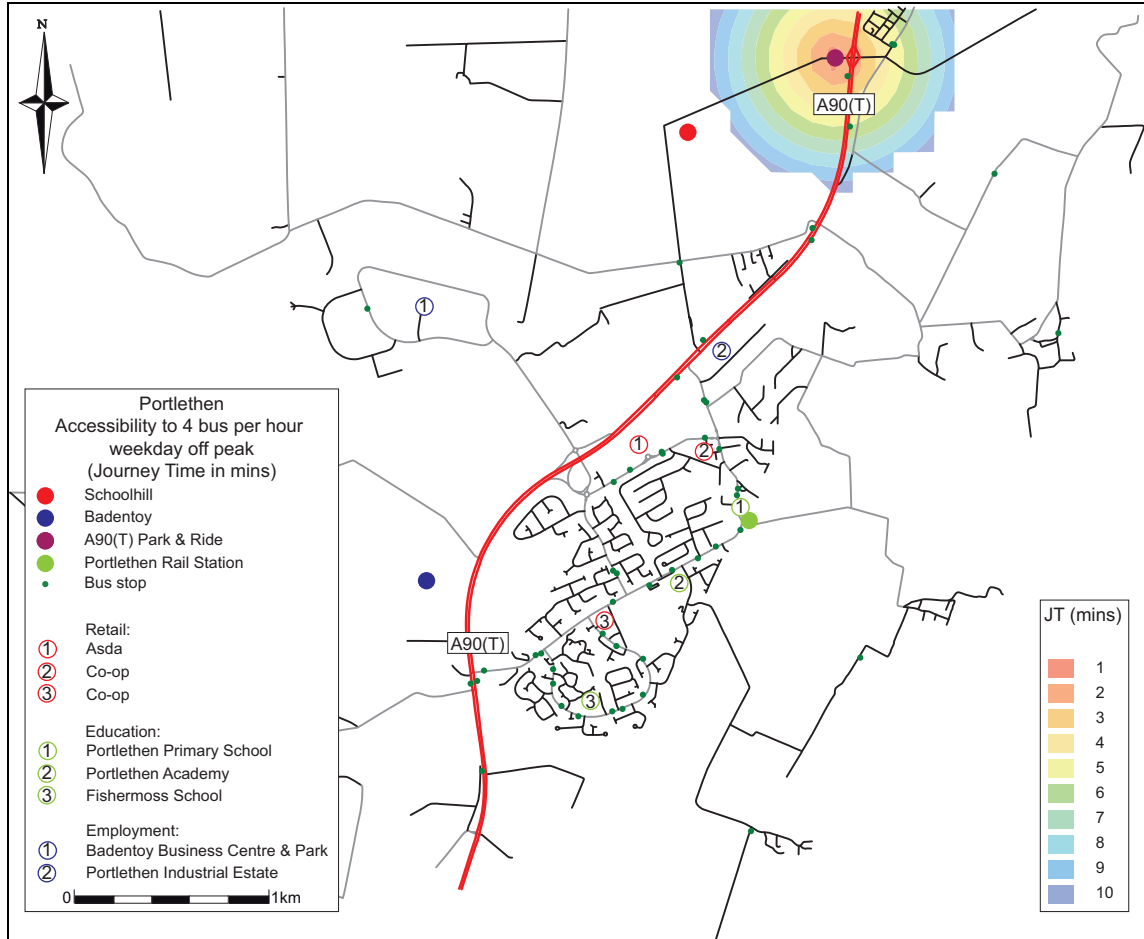


Figure 3.6 : Weekday Off-Peak Accessibility to a 15min bus service



### 3.3 Accessibility Appraisal – Network Accessibility

#### 3.3.1 Pedestrian and Cycle Accessibility

Figures 3.7 – 3.10 show the accessibility to local amenities on foot and by cycle, for the two development site options. For the purpose of this study, the approximate location of the sites was assumed. Given the expected size of the development sites, the location of the centre of the site could vary from that which has been assumed. It is, however, expected that the assumed site centroid locations will enable a robust comparison to be made between accessibility of the two sites.

Figures 3.7 and 3.8 show the predicted accessibility of the two potential development sites on foot. It is considered that Accession has underestimated the severance issue generated by the A90(T) and has potentially overestimated the accessibility of both development sites. The accessibility of the Badentoy site is shown to be greater than the Schoolhill site due to its location in relation to Portlethen. The northern edge of Portlethen including the Portlethen Industrial Estate, are shown to be within a 20min walk of the Schoolhill site, whereas a large proportion of Portlethen including the Badentoy Business Park, Asda and Co-op foodstores and Portlethen Academy and Fishermoss School, are shown to be located within a 20min walk of the Badentoy site.

The accessibility appraisal is expected to provide a realistic assessment of the accessibility of the Schoolhill site as the severance issue which is generated by the A90(T), is minimised by the provision of the Schoolhill Road underpass which links the site with Portlethen. No grade separated crossings of the A90(T) are provided in the vicinity of the Badentoy site and it is considered that the accessibility appraisal output provides an optimistic prediction of the accessibility of the site on foot. Nevertheless, even in the absence of a segregated crossing, it is considered that the Badentoy site is more accessible on foot due to its proximity to Portlethen, albeit with reservations on the safety and perception barriers to pedestrian and cycle access which required to be addressed.



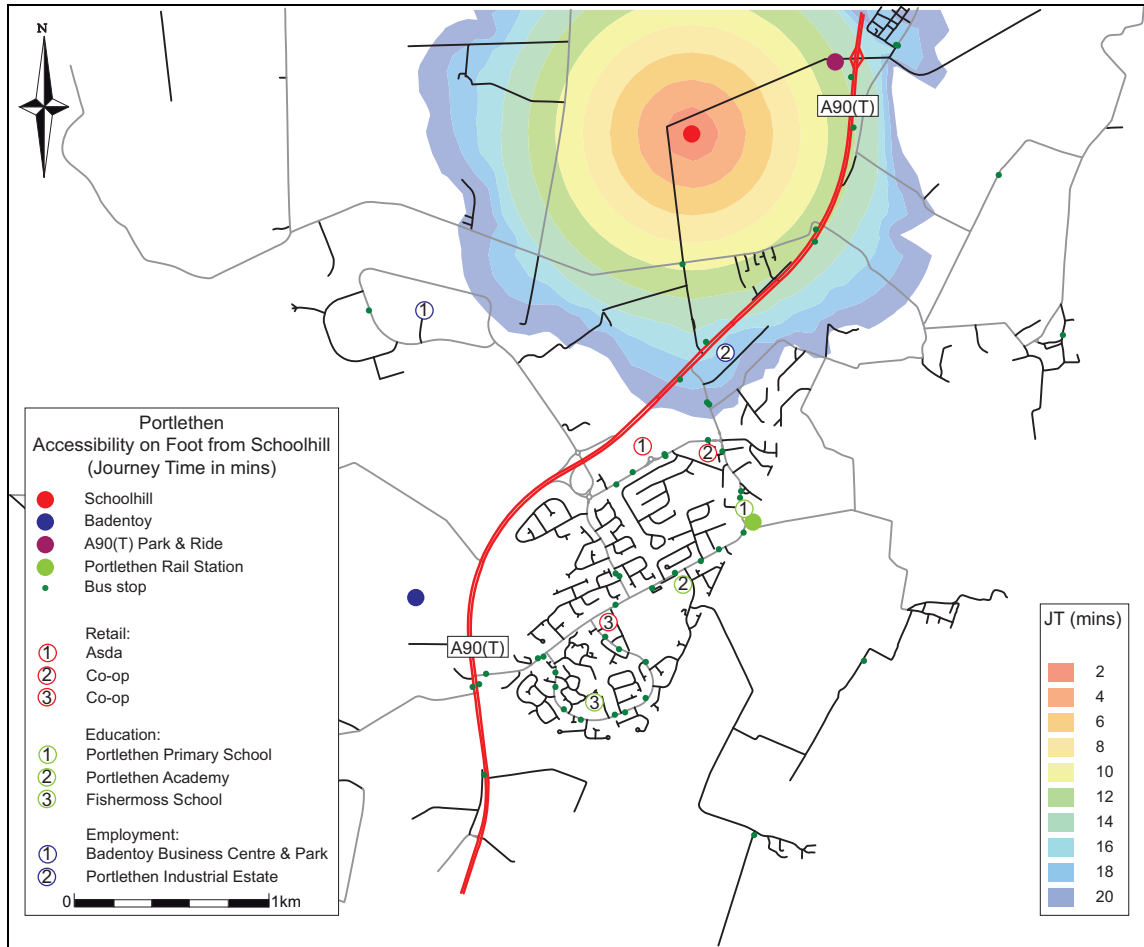


Figure 3.7 : Pedestrian Accessibility to Schoolhill Site



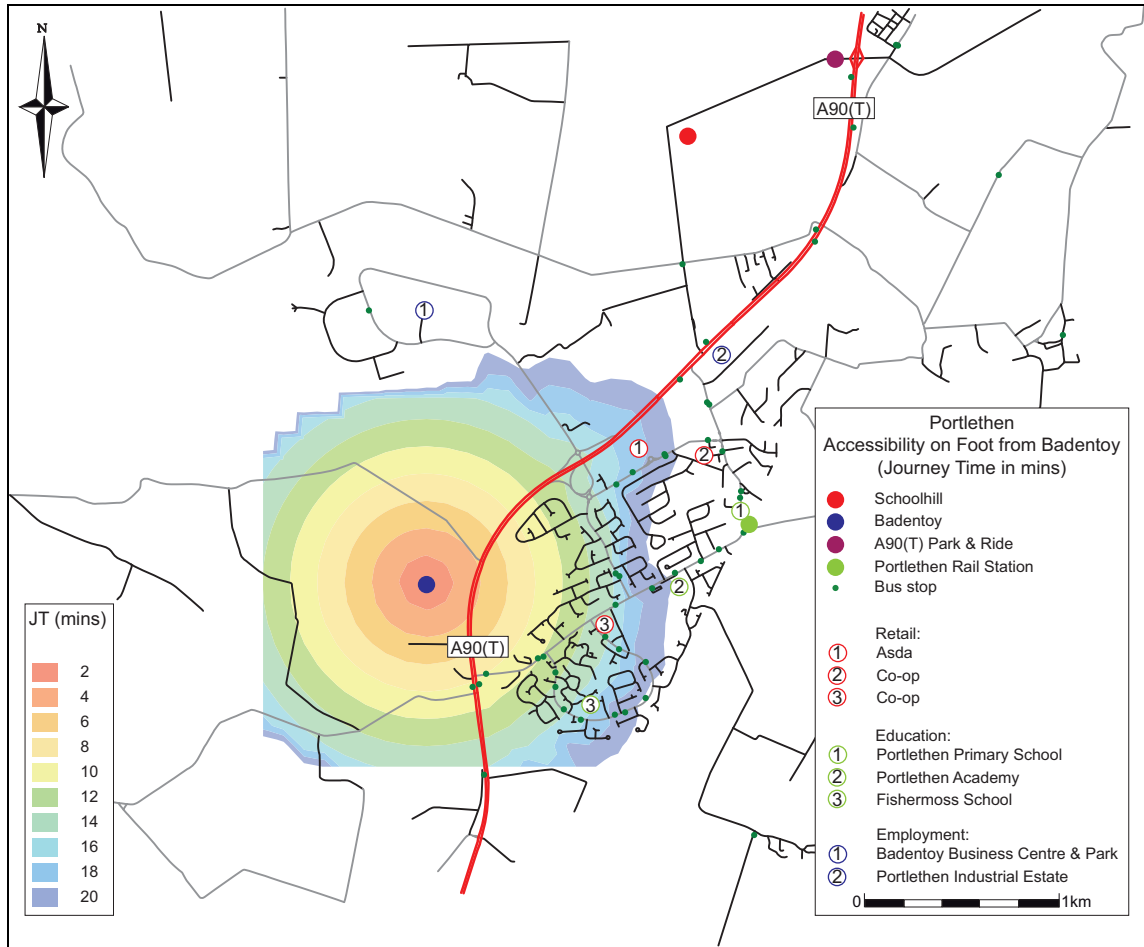


Figure 3.8 : Pedestrian Accessibility to Badentoy Site





Figures 3.9 and 3.10 show the predicted accessibility of the two potential development sites by cycle. The compact nature of Portlethen results in both sites being located within a 16min cycle of the whole town. As with the appraisal of the pedestrian accessibility of the two site options, the Badentoy site is shown to have a greater level of accessibility by cycle when compared to the Schoolhill site. This is primarily due to the proximity of the site to Portlethen. As previously highlighted, Accession does not take cognisance of the barrier to movement which is created by the A90(T), with the result that the appraisal is likely to present an optimistic assessment of the accessibility of the site. The appraisal shows that the Badentoy Business Park, Portlethen Industrial Estate, Asda foodstore and Portlethen rail station are located within an 8min cycle of the Schoolhill site. All amenities are shown to be located within a 10min cycle of the Badentoy site.

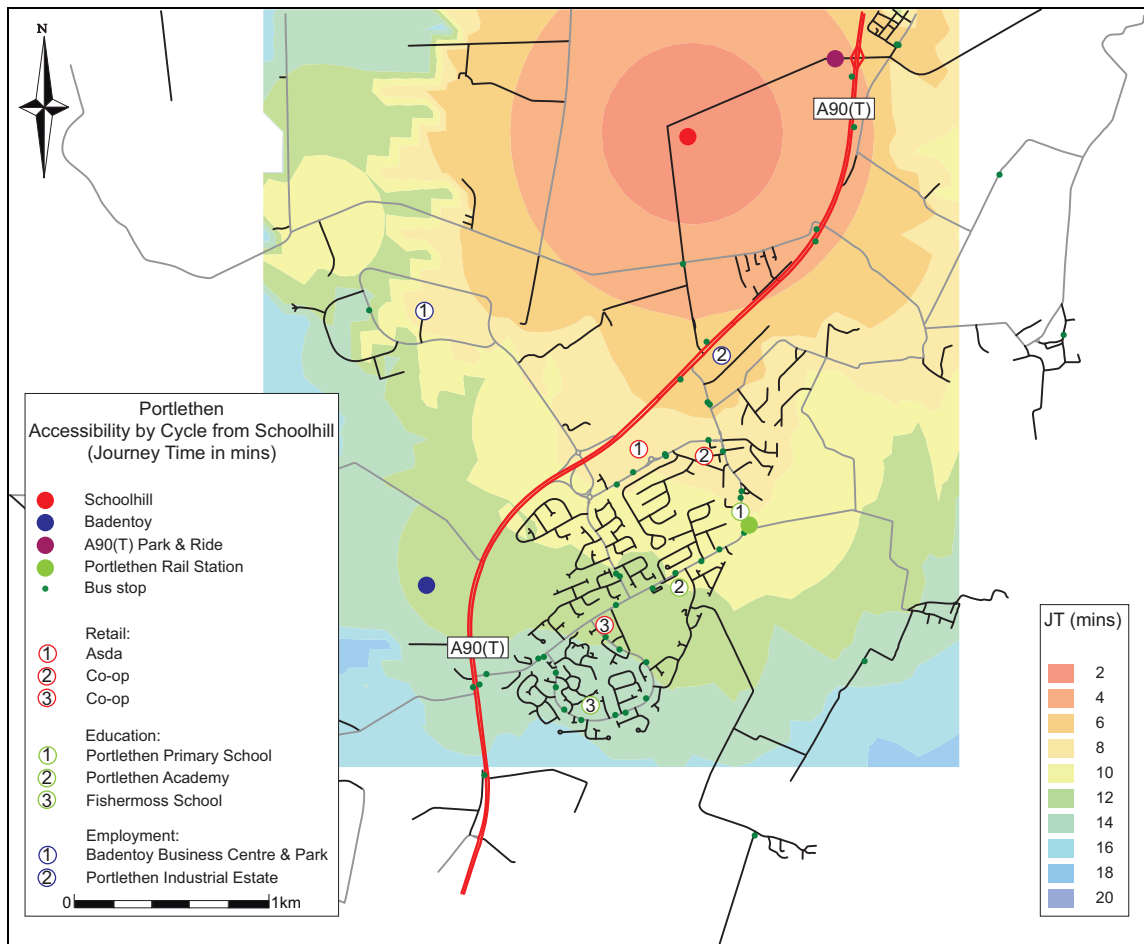


Figure 3.9 : Cycle Accessibility to Schoolhill Site



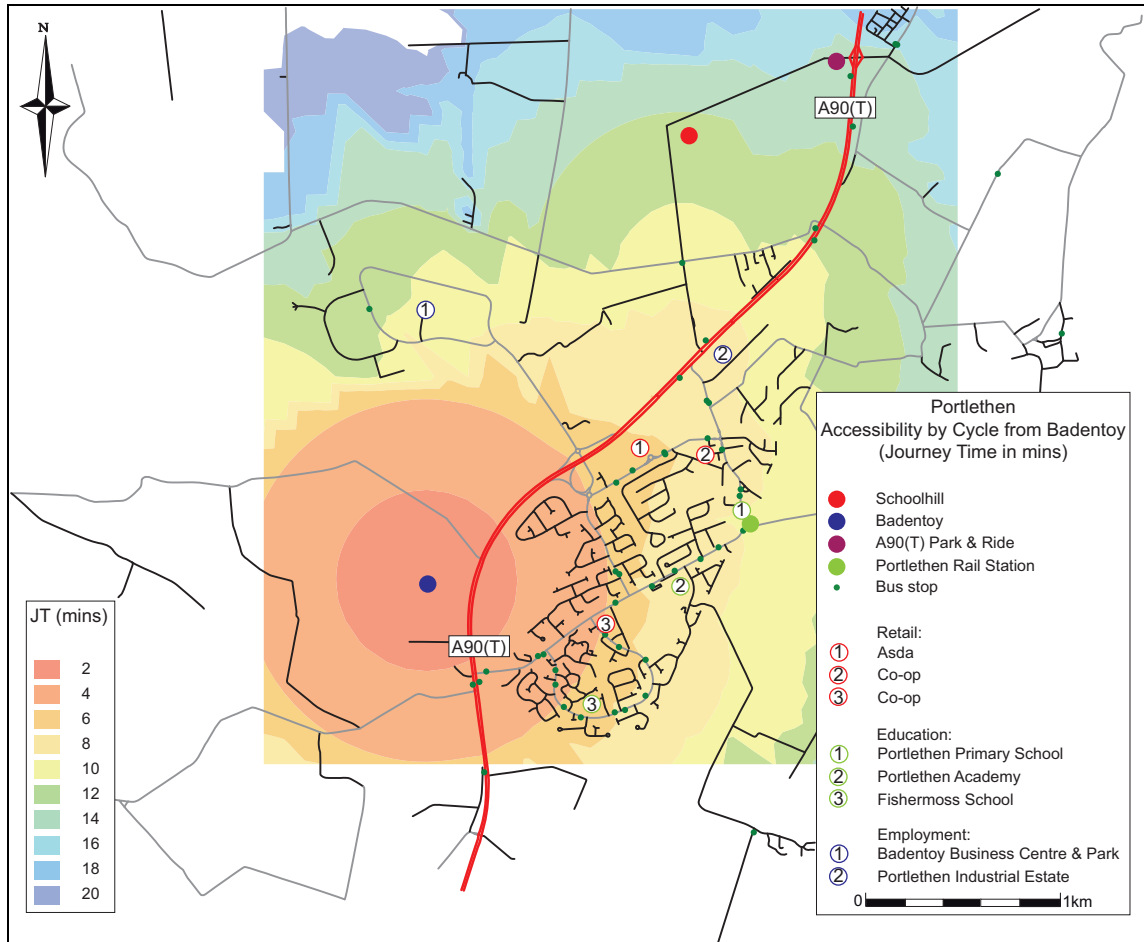


Figure 3.10 : Cycle Accessibility to Badentoy Site



### 3.3.2 Census Population Data Analysis

Tables 3.1 and 3.2 summarise the results of the accessibility appraisal with regard to the proximity of the sites to existing Portlethen residents.

*Table 3.1 : Accessibility to Schoolhill Site*

Pedestrian Accessibility		Cycle Accessibility	
Journey Time (mins)	Population	Journey Time (mins)	Population
12	82	4	82
18	115	6	336
20	424	8	1,591
<b>Total</b>	<b>621</b>	10	2,198
		12	1,439
		14	1,772
		<b>Total</b>	<b>7,418</b>

*Table 3.2 : Accessibility to Badentoy Site*

Pedestrian Accessibility		Cycle Accessibility	
Journey Time (mins)	Population	Journey Time (mins)	Population
6	117	2	117
10	93	4	1,748
12	686	6	1,622
14	1067	8	2,134
16	554	10	1,147
18	555	12	148
20	517	14	184
		<b>Total</b>	<b>7,215</b>

The results in Tables 3.1 and 3.2 suggest that a significantly greater number of Portlethen residents live within a 20min walk of the Badentoy site when compared to the Schoolhill site reflecting the development site's location in relation to the town.

The analysis predicts that only 621 residents live within a 20min walk of the Schoolhill site, whereas 3,589 residents are predicted to live within a 20min walk of the Badentoy site, however, as previously highlighted, the accessibility appraisal is expected to provide an overly optimistic prediction of the Badentoy site's accessibility as it does not take account of the severance issues created by the adjacent A90(T). Nevertheless, it is considered that the Badentoy site will have a greater level of accessibility potential to existing Portlethen amenities when compared to the Schoolhill site.

The Schoolhill site is shown to be overall marginally more accessible than the Badentoy site by cycle, although a greater number of Portlethen residents are predicted to live within a 10min cycle of the Badentoy site (6,768) when compared to the Schoolhill site (4,207).

### 3.4 Bus Accessibility to Aberdeen

The accessibility of the sites to the Aberdeen was appraised based on local bus services. Rail service information could also be included in the appraisal to enable a fuller appraisal of the town's accessibility to the centre of Aberdeen to be undertaken.

Figures 3.11 and 3.12 show the accessibility of Portlethen to the centre of Aberdeen by bus with a maximum journey time of 47min displayed for the morning peak and off-peak scenarios. The results of the appraisal suggests that the Schoolhill site is within a 30min journey of the centre of Aberdeen in both peak and off-peak scenarios with the Badentoy site a further 10min from the city centre in both scenarios. The majority of Portlethen is shown to be within a 30min journey of Aberdeen City Centre by bus in the appraised peak and off-peak scenarios.

It is a point to note that the Badentoy Business Centre and Park is not accessible by public transport outwith the peak periods. It is considered that this could be a restricting factor to sustainable access, particularly for part time or shift workers as Portlethen grows.

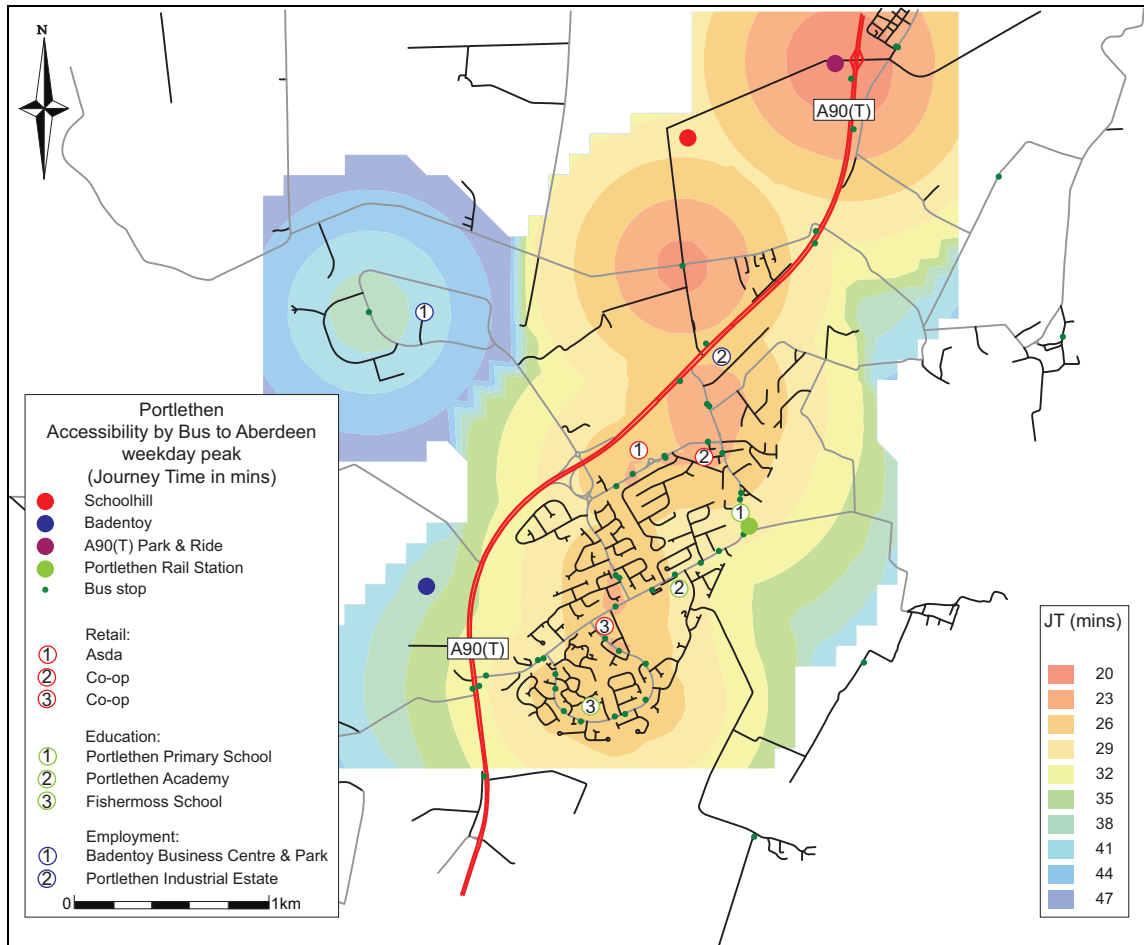


Figure 3.11 : Weekday Peak Accessibility to Aberdeen



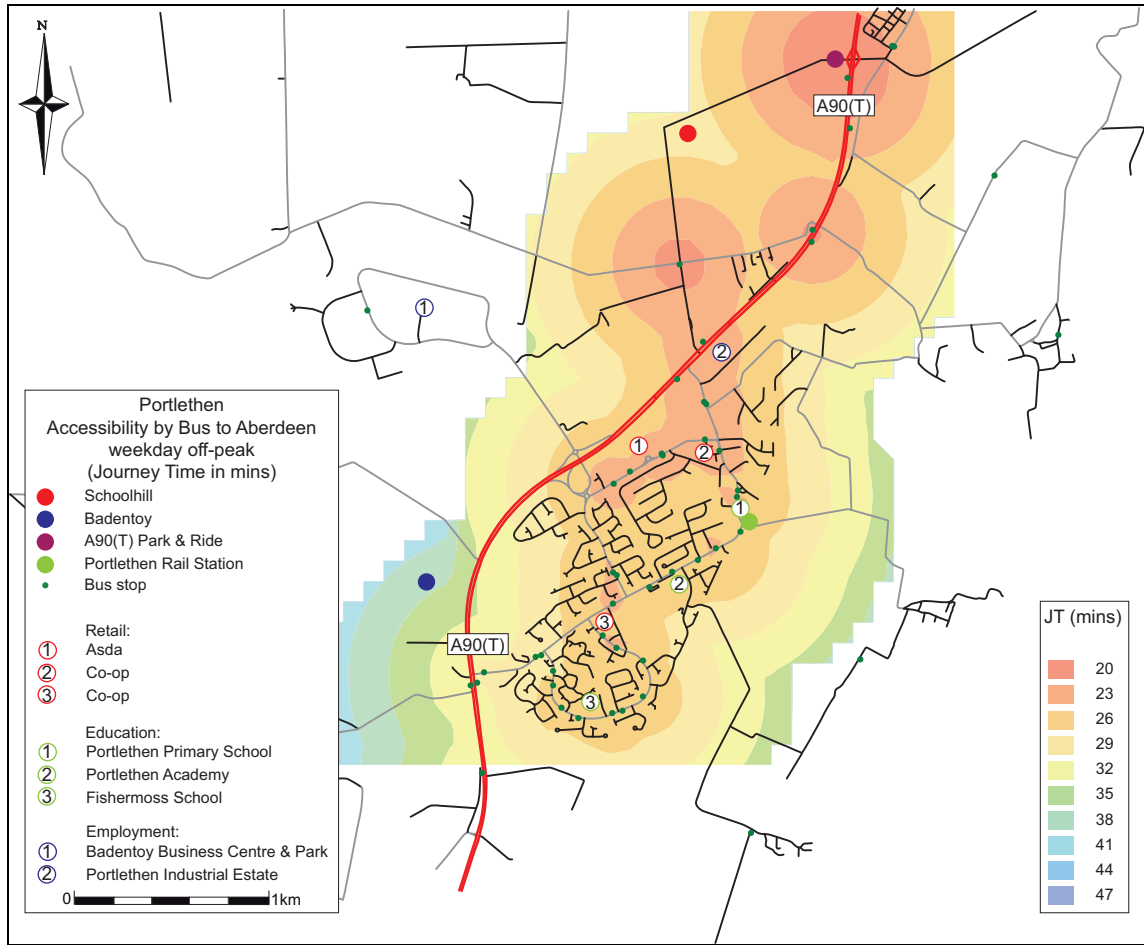


Figure 3.12 : Weekday Off-Peak Accessibility to Aberdeen



## **4 SUMMARY AND CONCLUSIONS**

### **4.1 Summary**

SIAS has been commissioned by Aberdeenshire Council under the term commission to provide consultancy advice with regard to the development of Portlethen.

The accessibility of the following potential development sites has been appraised:

- Schoolhill
- Badentoy

Accession software has been used to appraise the accessibility of the above sites by bus, cycle and on foot. ATCO Cif public transport data, which was supplied by Aberdeenshire Council who exported the data on 11 February 2009, and 2001 Census population data (General Register Office for Scotland, circa 2003) has been used to inform this appraisal.

### **4.2 Conclusions**

The potential development sites are located on the northern and western edges of Portlethen. As a result, a proportion of Portlethen is situated outwith a 20min walk of the sites.

Both potential development sites are located to the west of the A90(T), which provides a barrier to movement between the sites and Portlethen, although the Cookston Road underpass provides a segregated grade separated crossing of the trunk road enabling pedestrian/cycle access to the Schoolhill site from Portlethen. No segregated crossing facilities are provided on the A90(T) in the vicinity of the Badentoy site. It is suggested that development of this site will need to be supported by the provision of new pedestrian/cycle crossing facilities to minimise the impact of the A90(T) on movement to and from the site and realise its full accessibility potential.

The Badentoy site is shown to be more accessible by cycle and on foot than the Schoolhill site, with the majority of Portlethen shown to be approximately an 8min cycle from the Badentoy site and just over a 20min walk from the site. This compares to the Schoolhill site, which is located around a 14min cycle and over a 30min walk from the majority of Portlethen amenities.

The Schoolhill site is shown to have a greater level of existing accessibility by bus when compared to the Badentoy site. A large proportion of the site is located within a 10min walk of a 30min frequency bus service in both the peak and off-peak period. A reduced proportion of the site is shown to be located within a 10min walk of a combined service frequency of 15mins. A proportion of the Badentoy site is located within a 10min walk of bus services which operate with a combined frequency of 30min in the peak and off-peak periods. The site is not within a 10min walk of a 15min service provision.

It is considered that the Schoolhill site is more accessible by bus than the Badentoy site, with the location of the Badentoy site resulting in it being more accessible on foot and by cycle than the alternative site, however, this does not take account of the barrier to movement which is created by the A90(T) which separates both sites from Portlethen.

### **4.3 Further Work**

Although the A90(T) Park & Ride has been assumed to be operational for the purpose of this study, it is suggested that the impact of future infrastructure and service improvements should be tested to provide a detailed appraisal of the accessibility of the development sites.



In addition to considering local travel by bus, it is suggested that rail services should be included in any detailed accessibility analysis to enable the accessibility of the potential development sites to be appraised on a wider network for all modes of travel.







**B PROVISIONAL SCHEME COSTS**





**Portlethen new link**  
**Estimated as Local Distributor Road 7.3m wide**



**Preliminary Estimate**

<u>Item No.</u>	<u>Description of Work</u>	<u>Quantity</u>	<u>Unit</u>	<u>Rate</u>	<u>Amount</u>	
<b>Preliminaries</b>						
	Site Offices	1	item	£20,000.00	£20,000.00	
	Traffic Management	1	item	£75,000.00	£75,000.00	<u>£95,000.00</u>
<b>Site Clearance (3.1km x 17.3m + slip roads)</b>						
	Site Clearance	6	ha	£1,105.00	£6,630.00	<u>£6,630.00</u>
<b>Section 1 (2.3km length) 7.3m c/way, 2m verge, 3m footway/cycletrack total width 17.3m</b>						
<b>C/way</b>						
	Subbase 210mm thick	3526	m3	£34.00	£119,880.60	
	Basecourse 140mm thick	16790	m2	£18.65	£313,133.50	
	Binder course 55mm thick	16790	m2	£8.50	£142,715.00	
	Tack coat	16790	m2	£0.69	£11,585.10	
	Surface course 45mm thick	16790	m2	£9.50	£159,505.00	
	HB Kerbing	4600	m	£10.00	£46,000.00	
	Heel kerb	4600	m	£6.50	£29,900.00	
<b>Footway/cycletrack</b>						
	Subbase 100mm thick	13800	m2			
	Subbase 100mm thick	1380	m3	£2.00	£2,760.00	
	Paving 70mm thick	13800	m2	£18.50	£255,300.00	
	Excavate Topsoil (500mm deep)	19895	m3	£3.00	£59,685.00	
	Excavate Suitable	0	m3	£3.00	£0.00	
	Disposal Topsoil	19895	m3	£10.00	£198,950.00	
	Disposal Suitable	0	m3	£5.00	£0.00	
	Compaction Fill	0	m3	£1.00	£0.00	
	Formation	30590	m2	£0.25	£7,647.50	<u>£1,347,061.70</u>
<b>40m ICD roundabout</b>						
	roundabout	4600	m2	£60.00	£276,000.00	
	tie in areas	300	m2	£50.00	£15,000.00	<u>£291,000.00</u>
<b>Section 2 (0.8km length) 7.3m c/way, 2m verge, 3m footway/cycletrack total width 17.3m (inc r/b)</b>						
<b>C/way</b>						
	Subbase 210mm thick	1226	m3	£34.00	£41,697.60	
	Basecourse 140mm thick	5840	m2	£18.65	£108,916.00	
	Binder course 55mm thick	5840	m2	£8.50	£49,640.00	
	Tack coat	5840	m2	£0.69	£4,029.60	
	Surface course 45mm thick	5840	m2	£9.50	£55,480.00	
	HB Kerbing	1600	m	£10.00	£16,000.00	
	Heel kerb	1600	m	£6.50	£10,400.00	
<b>Footway/cycletrack</b>						
	Subbase 100mm thick	480	m3	£2.00	£960.00	
	Paving 70mm thick	4800	m2	£18.50	£88,800.00	
	Excavate Topsoil (500mm deep)	6920	m3	£3.00	£20,760.00	
	Excavate Suitable	0	m3	£3.00	£0.00	
	Disposal Topsoil	6920	m3	£10.00	£69,200.00	
	Disposal Suitable	0	m3	£5.00	£0.00	
	Compaction Fill	0	m3	£1.00	£0.00	
	Formation	10640	m2	£0.25	£2,660.00	<u>£468,543.20</u>
<b>Grade separated junction (inc structure &amp; slip roads &amp; roundabouts)</b>						
	sum				£3,000,000.00	<u>£3,000,000.00</u>
<b>Fencing &amp; Gates</b>						
	P&W Fencing w/netting	6200	No.	£29.00	£179,800.00	
	Gates	11	No.	£175.00	£1,925.00	<u>£181,725.00</u>
<b>Drainage</b>						
	Gullies	110	No.	£250.00	£27,500.00	
	Manholes	35	No.	£1,200.00	£42,000.00	
	Infiltration Trench	3100	m	£55.00	£170,500.00	<u>£212,500.00</u>

Portlethen new link  
Estimated as Local Distributor Road 7.3m wide



Preliminary Estimate

<u>Item No.</u>	<u>Description of Work</u>	<u>Quantity</u>	<u>Unit</u>	<u>Rate</u>	<u>Amount</u>	
<b>Settlement Ponds</b>						
	Settlement Ponds	20000	m3	£3.00	£60,000.00	<u>£60,000.00</u>
<b>Grassing &amp; Soiling</b>						
	<b>Soiling</b>					
	at less than 10°	19000	m2	£5.20	£98,800.00	
	<b>Grassing</b>					
	at less than 10°	19000	m2	£1.00	£19,000.00	
<b>Street Lighting</b>						
					£80,000.00	<u>£80,000.00</u>
					<b>Sub-total</b>	<b>£5,742,459.90</b>
<b>Signing &amp; lining (3% of total cost above)</b>						
			sum	3%		<u>£172,273.80</u>
					<b>Sub-total</b>	<b>£5,914,733.70</b>
<b>Public Utilities (10% of total cost)</b>						
			sum	10%		<u>£591,473.37</u>
					<b>Sub-total</b>	<b>£6,506,207.07</b>
<b>Contingencies</b>						
				20%		<u>£1,301,241.41</u>
					<b>Sub-total</b>	<b>£7,807,448.48</b>
<b>Optimism Bias</b>						
				44%		<u>£3,435,277.33</u>
					<b>TOTAL</b>	<b><u>£11,242,725.81</u></b>