

Aberdeenshire Council Portlethen Option Testing S-Paramics Testing Results

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1 INTRODUCTION

1.1 Introduction

1.1.1 As part of the Aberdeenshire Framework agreement, Aberdeenshire Council (AC) requested SIAS Limited (SIAS) to undertake scenario testing using the Portlethen S-Paramics traffic model.

1.1.2 This option testing builds on the previous testing that was undertaken in July 2009; see *SIAS Report Ref. TPATCPO1/71591*.

1.1.3 The following items are reported in this Briefing Note:

- Review of 2012 Do-Minimum Content
- Test Familiarity of trips associated with Badentoy Industrial Estate
- ARCADY Assessment of Cookston Road/Muirend Road
- Test Signalisation of Badentoy Link Road/Schoolhill Spine Road
- Test Signalisation of Findon Interchange
- Test Signalisation at Link Road and Findon Interchange
- Cairnrobin Pipeyard Testing

1.2 Study Aims

1.2.1 The overall aim of the study is, under advice from AC, to assess the ability of network changes to aid the performance of the road network under forecast development scenarios.

1.2.2 The future year scenario under consideration is **2012** for the AM and PM peak periods.

1.3 Objectives

1.3.1 The principal objectives of the study were defined as:

- Evaluate the operational impact of the potential infrastructure interventions
- Produce a comprehensive briefing note detailing the process and outcomes

1.3.2 The Portlethen study area is shown in Figure 1.1.



Figure 1.1 : Portlethen S-Paramics Model Study Area

2 S-PARAMICS MODEL APPLICATION

2.1 Study Tasks

2.1.1 The precise requirements of the study are set out in the following work packages. The main elements of consideration are:

- Review 2012 Do-Minimum Content
- Test Familiarity of trips associated with Badentoy Industrial Estate
- ARCADY Assessment of Cookston Road/Muirend Road
- Test Signalisation of Badentoy Link Road/Schoolhill Spine Road
- Test Signalisation of Findon Interchange
- Test Signalisation at Link Road and Findon Interchange
- Cairnrobin Pipeyard Testing

2.2 Review 2012 Do-Minimum Content

2.2.1 The first stage of work was to review the 2012 scenario and agree the development content with AC.

2.2.2 This review is being carried out as the previous 2012 Do-Minimum was developed using aggregate data from a previous study and it was felt by both SIAS and AC that the testing would produce more robust results if the development content was updated.



2.2.3 The following developments are to be included as per the original TA information supplied by AC:

- Schoolhill (780 Houses/50,250m² Industry)
- Cairnrobin (39,280m² Office, 33,090m² Warehouse, 6HA Yard Space)
- Mosside (47,900m² Business)
- Schoolhill Park & Ride
- AWPR (including additional flows from road closures)

2.2.4 Table 2.1 shows the total number of development trips in the 2012 Do-Minimum AM Peak (06:30 – 09:30) and PM Peak (16:00 – 19:00).

Table 2.1 : 2012 Total Development Trips

Development	AM In	AM Out	PM In	PM Out
Cairnrobin	292	75	65	254
Mosside	1,364	237	351	1,341
Schoolhill Housing	83	290	338	169
Schoolhill Business	424	79	112	401
Development Total	2,163	681	866	2,165
Park and Ride	298	0	0	298
High Occupancy Vehicle	53	27	27	53
Grand Total	2,514	708	893	2,516

Indicates redistributed trips, not new trips

2.2.5 Table 2.1 shows that the total of the revised 2012 committed developments is 3,222 trips in the AM Peak and 3,409 trips in the PM Peak period.

2.2.6 While the total number of trips associated with the developments is 3,222 in the AM peak, and 3,409 trips in the PM peak, Table 2.2 shows the number of trips that affect the Portlethen S-Paramics model area, as some of the trips associated with Cairnrobin and Mosside head north towards the A956 and Cove Road.

Table 2.2 : Portlethen S-Paramics Model Area Do-Minimum Development Trips

Development	AM In	AM Out	PM In	PM Out
Cairnrobin	186	48	42	163
Mosside	872	152	225	859
Schoolhill Housing	83	290	338	169
Schoolhill Business	424	79	112	401
Development Total	1,565	569	717	1,592
Park and Ride	298	0	0	298
High Occupancy Vehicle	53	27	27	53
Grand Total	1,916	596	744	1,943

Indicates redistributed trips, not new trips

2.2.7 Table 2.2 shows that the number of development trips that affect the Portlethen S-Paramics model area are 2,134 trips in the AM peak and 2,309 trips in the PM peak. With the Park & Ride and High Occupancy Vehicles included, the total number of trips is 2,512 in the AM peak and 2,687 in the PM peak.



2.2.8 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 1,964 new trips have been added to the network, and in the PM peak, 2,091 new trips have been added.

2.2.9 Table 2.3 shows the changes to the matrix totals as a result of the AWPR derived from ASAM.

Table 2.3 : 2012 Do-Minimum Matrix Changes due to AWPR (3hr Period)

Change	AM	AM	PM	PM
	Northbound	Southbound	Northbound	Southbound
AWPR Reduction on A90	1,256	640	789	1,022
AWPR Reroute via Schoolhill P&R	134	210	371	59

2.2.10 Table 2.2 shows that with the effect in the study area of the AWPR, AM trips change by 2,240 and PM trips by 2,241. The reduction on the A90 Northbound in the AM is 1,256 vehicles and in the Southbound direction is 640. The number of vehicles that have to re-route via the Schoolhill Park & Ride link road as a result of road closures associated with the AWPR is 134 in the northbound direction and 210 in the southbound direction.

2.2.11 The reduction on the A90 Northbound in the PM is 789 vehicles and in the southbound direction is 1,022. The number of vehicles that have to re-route via the Schoolhill Park & Ride link road as a result of road closures associated with the AWPR is 371 in the northbound direction and 59 in the southbound direction.

2.2.12 On running the model with no new infrastructure in the AM Peak no significant issues were identified.

2.2.13 In the PM peak, the existing queue on Badentoy Road, approaching Badentoy Interchange was shown to have almost reached the Industrial Estate by 17:15 and remained until approximately 17:40.

2.2.14 Significant queuing was also observed at Findon Interchange in the PM peak, due to the development at Cairnrobin and Mosside. The queue developed around 16:40 on the approach from Cairnrobin and Mosside and remained until approximately 17:55.

2.3 Test Familiarity of trips associated with Badentoy Industrial Estate

2.3.1 Previous testing undertaken by SIAS questioned whether the original percentage of familiar trips applied to the Badentoy industrial Estate was high enough. It was felt by AC officers that the figures of 30% for light vehicles and 15% for heavy vehicles would in fact be higher. This test has been undertaken to determine a sensible level of familiarity to undertake the option testing and check for any traffic issues as a result within Portlethen, with particular reference to the mini roundabout at Cookston Road/Muirend Road.

2.3.2 This test includes the additional industrial development to the north of Badentoy Industrial Estate (Site EmpC in the Aberdeenshire Local Plan), which comprises 39.79 acres (16.1 Ha) in total, with a link connecting Badentoy Industrial Estate to Cookston Road as proposed by AC.

2.3.3 The proposed development and link road are shown in Figure 2.1.

2.3.4 Full details of the additional development and link road can be found in the *Portlethen Link Road Report* (SIAS Ref. TPATCPO1/71591).





Figure 2.1 : Badentoy Extension and proposed link road

2.3.5 Sensitivity testing was carried out on the familiarity of trips that are associated with Badentoy Industrial Estate. At present light vehicle (Car and LGV) trips have a familiarity proportion of 30%, meaning that 30% of light vehicle trips associated with Badentoy have the potential to re-route rather than travelling via Badentoy Road.

2.3.6 Testing was undertaken on Badentoy Industrial Estate trips with a familiarity of:

- 100%
- 70%
- 50%

2.3.7 As a result of the different levels of familiarity, the effect upon the mini roundabout at the junction of Cookston Road/Muirend Road was assessed. None of the options tested showed any significant problems at the mini roundabout at the junction of Cookston Road/Muirend Road.

2.3.8 Following discussion with AC, it was proposed to undertake subsequent testing using a familiarity of 70%, to permit some level of re-routing due to known congestion issues.

2.4 ARCADY Assessment of Cookston Road/Muirend Road

2.4.1 A traditional peak hour capacity assessment has also been carried out for the Cookston Road/Muirend Road mini roundabout at the request of AC. This assessment is required for the following scenarios:

- 2008 Base (Calibrated to observed on site queues)
- 2012 Do-Minimum
- 2012 Do-Minimum with Badentoy Extension and Link Road.

2.4.2 The testing has been undertaken to again check, that as a result of the higher vehicle familiarity and re-routing that no capacity issues are shown at this junction.



- 2.4.3 The operation of the Cookston Road/Muirend Road mini roundabout has been assessed with the addition of development generated traffic from the Badentoy Extension using the industry standard ARCADY computer program. The program provides an indication of the operation of the junctions in terms of maximum queue length and the Ratio of Flow to Capacity (RFC) of an approach, with values of 0.85 or greater highlighting that an approach is operating close to its theoretical capacity.
- 2.4.4 Traffic flow data was extracted from the Portlethen S-Paramics model with the morning and evening peak hours of network operation identified as 07:15 – 08:15 and 16:30 – 17:30.
- 2.4.5 Figures 2.2 and 2.3 show the traffic flows for the different scenarios in the AM and PM peak.

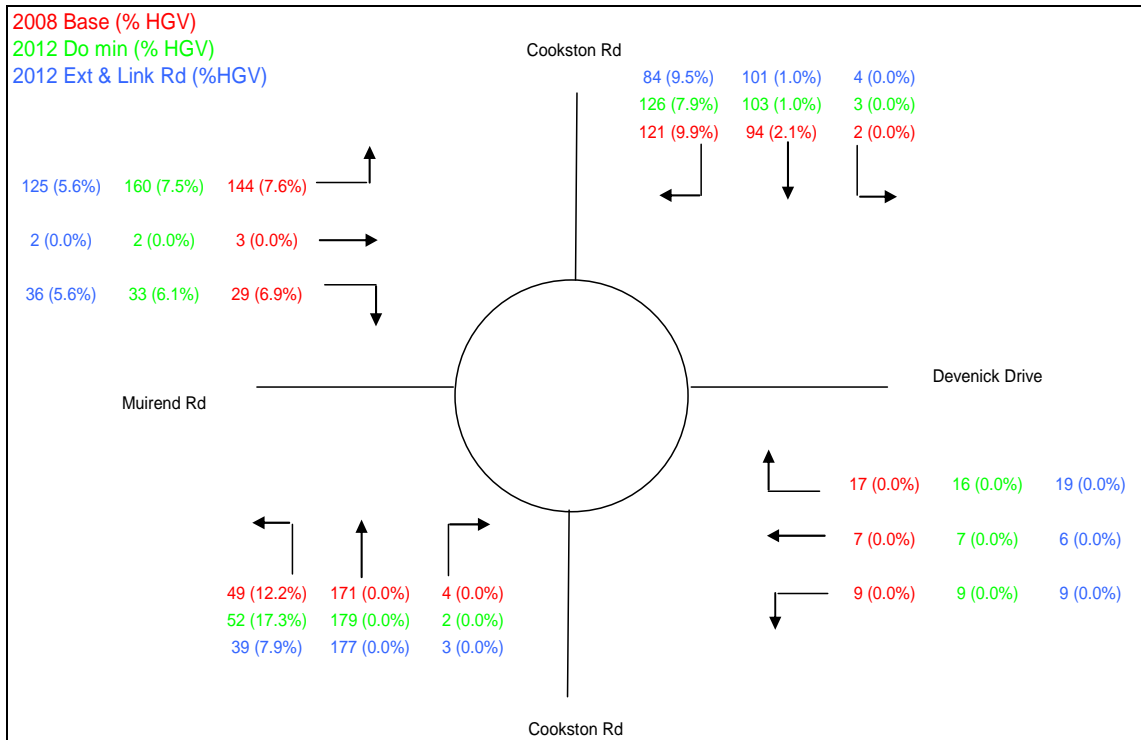


Figure 2.2 : AM Peak hour traffic flows Muirend Rd/Cookston Rd



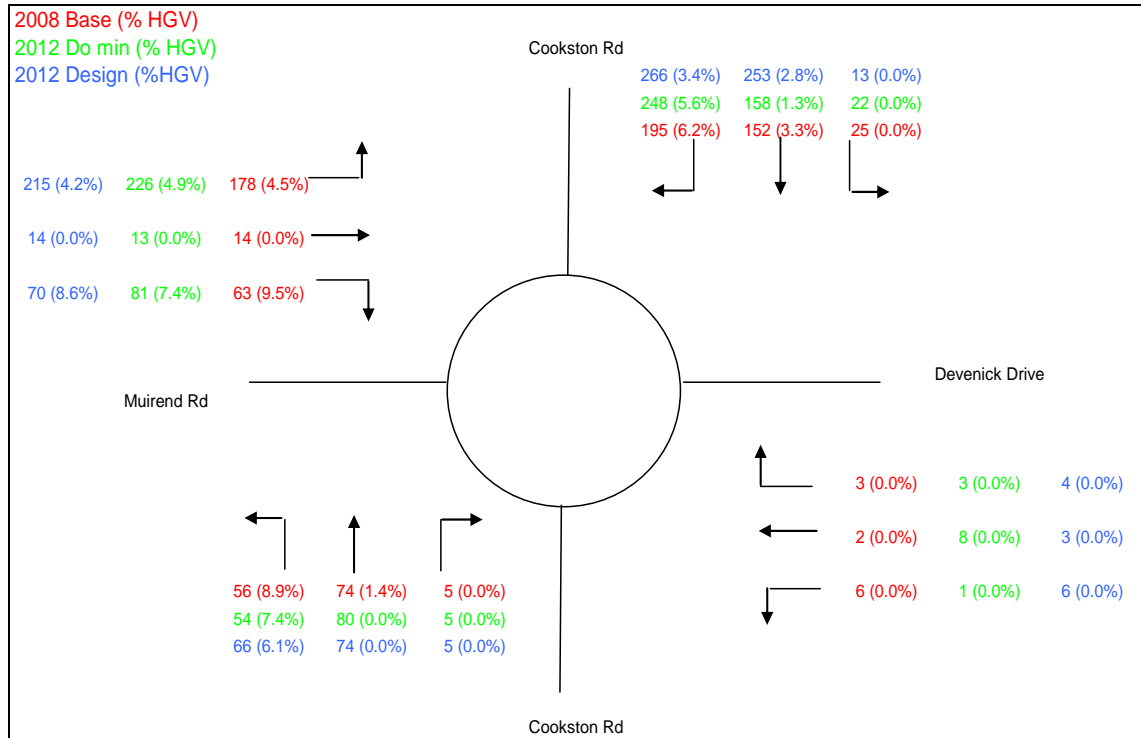


Figure 2.3 : PM Peak hour traffic flows Muirend Rd/Cookston Rd

2.4.6 Tables 2.4 and 2.5 summarise the results of the junction assessment for the AM and PM peak hours of operation.

Table 2.4 : AM Peak Hour Analysis

AM Peak (07:15-08:15) Arm	2008 Observed		2012 Do-Minimum		2012 With Development	
	RFC	Q	RFC	Q	RFC	Q
Cookston Road North	0.319	1	0.336	1	0.275	1
Devenick Drive	0.060	1	0.059	1	0.061	1
Cookston Road South	0.361	1	0.381	1	0.344	1
Muirend Road	0.333	1	0.370	1	0.305	1

Table 2.5 : PM Peak Hour Analysis

PM Peak (16:30-17:30) Arm	2008 Observed		2012 Do-Minimum		2012 With Development	
	RFC	Q	RFC	Q	RFC	Q
Cookston Road North	0.559	2	0.646	2	0.793	4
Devenick Drive	0.024	0	0.029	0	0.035	0
Cookston Road South	0.233	1	0.249	1	0.262	1
Muirend Road	0.430	1	0.541	2	0.508	1

2.4.7 In 2008 when the junction was surveyed, the junction is shown to operate well within capacity with minimum levels of delay and queueing.

2.4.8 In the tested scenarios the roundabout is shown to operate with greater efficiency in the AM peak hour when compared to the PM peak hour of operation. The introduction of development



generated traffic is shown to have a negligible impact on the junction's operation. The roundabout is predicted to operate with a maximum queue length of one vehicle in the 2012 AM peak with the addition of development generated traffic.

- 2.4.9 The roundabout is predicted to operate within capacity in the equivalent PM peak hour. The addition of development traffic is shown to generate a maximum queue of four vehicles on the Cookston Road (north) approach to the junction. The remaining arms are forecast to generate a maximum queue of one vehicle throughout the peak hour of operation.
- 2.4.10 Based on the ARCADY assessment of forecast traffic flows, it is considered that the Cookston Road/Muirend Road roundabout should operate within capacity with minimal levels of delay or queueing in 2012 with the addition of development generated traffic.

2.5 Test Signalisation of Badentoy Link Road/Schoolhill Spine Road

- 2.5.1 Following on from the introduction of the Badentoy link road and the increased vehicle familiarity and therefore potential re-routeing, AC requested SIAS to undertake a test with traffic signal control at the junction of the Badntoy Link Road/Schoolhill Spine Road to cater for any traffic issues that may result from the additional vehicles re-routeing.
- 2.5.2 On running the models it was noted that there would be little benefit in signalising this junction, as no significant delays were evident at this location that would require signalisation.
- 2.5.3 Signalisation will not be considered at this location in any subsequent testing, although traffic signals may provide pedestrian crossing options in the future.

2.6 Test Signalisation of Findon Interchange

- 2.6.1 Previously undertaken testing has shown that there are capacity issues, in part due to the design of Findon Interchange, where the traffic heading northbound to Aberdeen crosses the path of the traffic coming from the north towards the Schoolhill link road in Portlethen.
- 2.6.2 This option looks at the signalisation of Findon Interchange, to try and improve the balance of flow and prevent the northbound on slip blocking the vehicles that are heading into Portlethen from the north.
- 2.6.3 The first test of signalisation at Findon Interchange was to test partial signalisation of the west roundabout. One arm was signalised, the Findon underpass arm on to the roundabout. Model observations suggested that this did reduce the queueing of traffic, particularly in the PM peak as the traffic from Badentoy Industrial Estate using the new link road conflicts with the traffic from the A90 North coming back to Portlethen. The signal timings associated with the west roundabout are shown in Figure 2.4.

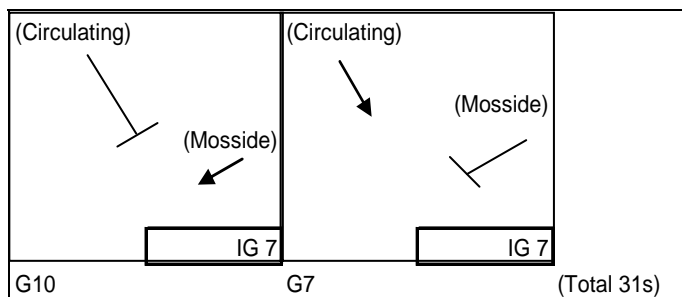


Figure 2.4 : Findon West Roundabout Signalisation

- 2.6.4 A further test was run, which involved additionally signalising the Mosside arm of the east roundabout. This combined with the signalisation of the west roundabout significantly



improved the flow of traffic, particularly from the Mossie approach to the junction. The signal timings associated with the east roundabout are shown in Figure 2.5.

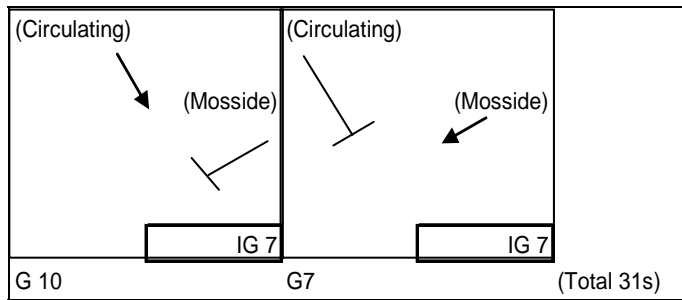


Figure 2.5 : Findon East Roundabout Signalisation

2.7 Cairnrobin Pipeyard Testing

2.7.1 A trip generation report was submitted to AC by Fairhurst & Partners in May 2009 for the former pipeyard at Mains of Cairnrobin. At present this Report only contains peak hour trip generation and distribution. It was agreed with AC that the peak hour trips would be factored using the Mossie peak hour to peak period factor.

2.7.2 The following scenarios will be considered with the inclusion of the Pipeyard development:

- 2012 Do-Minimum
- 2012 Do-Minimum with Badentoy Extension and Link Road
- 2012 Do-Minimum with Badentoy Extension and Link Road and Findon Signals

2.7.3 With the introduction of the Cairnrobin Pipeyard development, additional pressure was placed on the Mossie approach to Findon Interchange. The new roundabout associated with development was coded into the network, this also extended the road network in this area.

2.7.4 Figure 2.6 shows the infrastructure before and after the development was in place.



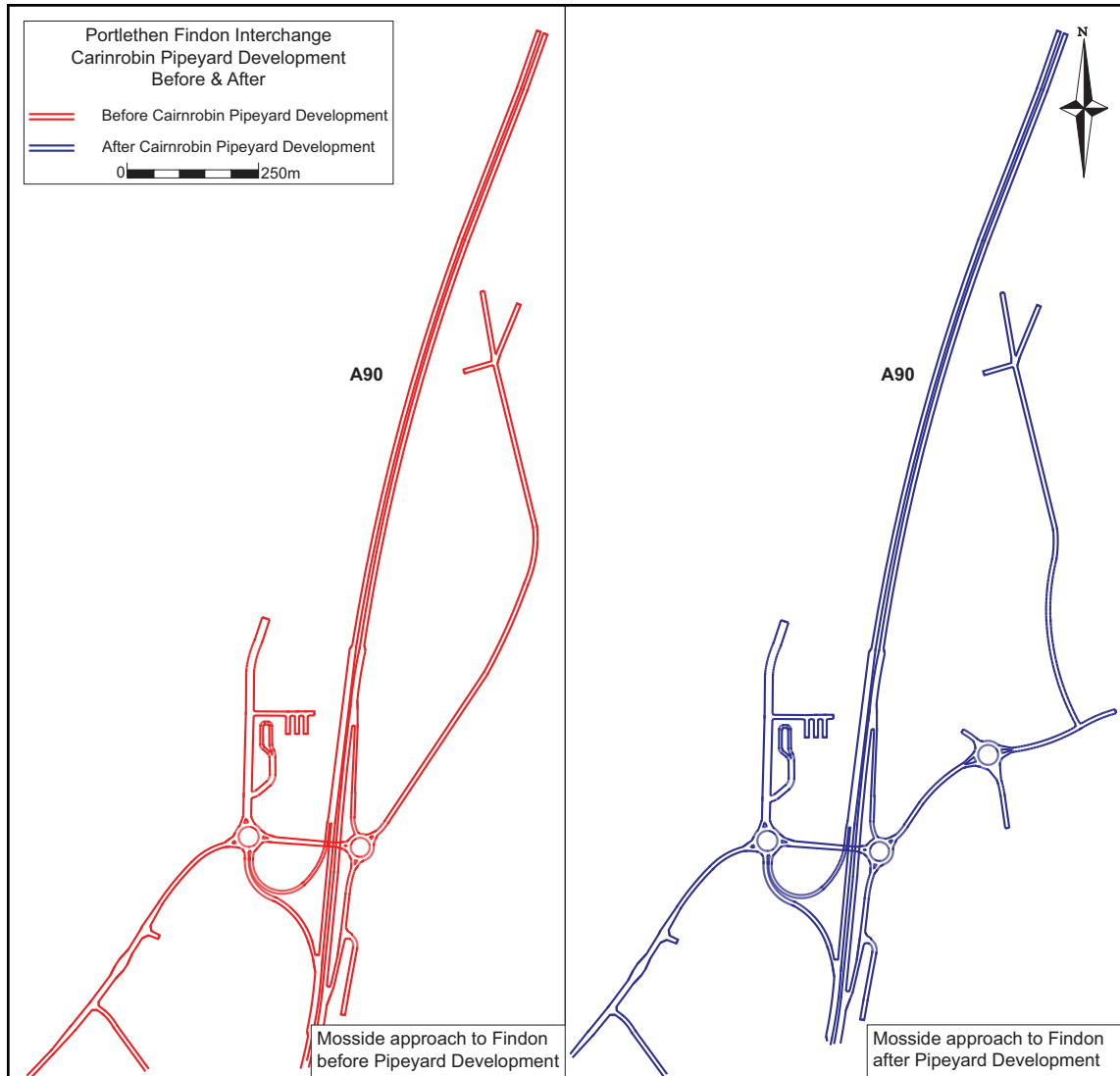


Figure 2.6 : Cairnrobin Pipeyard Infrastructure

2.7.5 Both options for signalisation at Findon Interchange were tested, with the best results again being the signalisation of the east and west roundabouts. While queueing was still evident, it was quicker to clear with both sets of signals in place.

3 MODEL RESULTS

3.1 Introduction

3.1.1 The following graphs have been split into two sets of option testing, the first dealing with the 2012 Do-Min and the second dealing with the 2012 Do-Min with the addition of the Cairnrobin Pipeyard Development.

3.2 Journey Time Results (Do-Min and Badentoy Extension only)

3.2.1 Journey time routes were analysed for the following paths

- Portlethen northbound and southbound – From Findon Interchange via Cookston Road to Bruntland Road (A90)
- A90 northbound and southbound – From Findon Interchange to Newtonhill via the A90



3.2.2 Figure 3.1 shows the journey path information in the AM peak for the following scenarios:

- 2012 Revised Do-Minimum Content
- 2012 Revised Do-Minimum with Badentoy extension and Link Road with no Findon Signalisation (70% Familiarity)
- 2012 Revised Do-Minimum with Badentoy extension and Link Road with Findon West Signalised (70% Familiarity)
- 2012 Revised Do-Minimum with Badentoy extension and Link Road with Findon East and West Signalised (70% Familiarity)

3.2.3 Figure 3.1 demonstrates that in the main the journey times remain consistent throughout the scenarios in the AM peak.

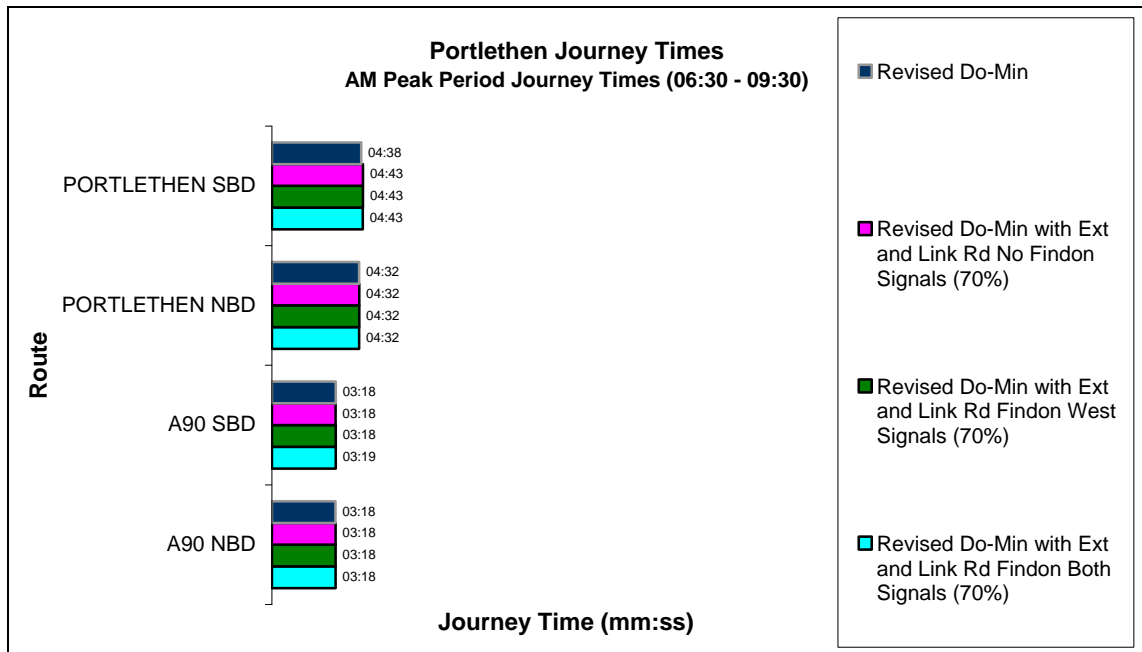


Figure 3.1 : AM Peak Journey Times



3.2.4 Figure 3.2 shows the journey path information in the PM peak.

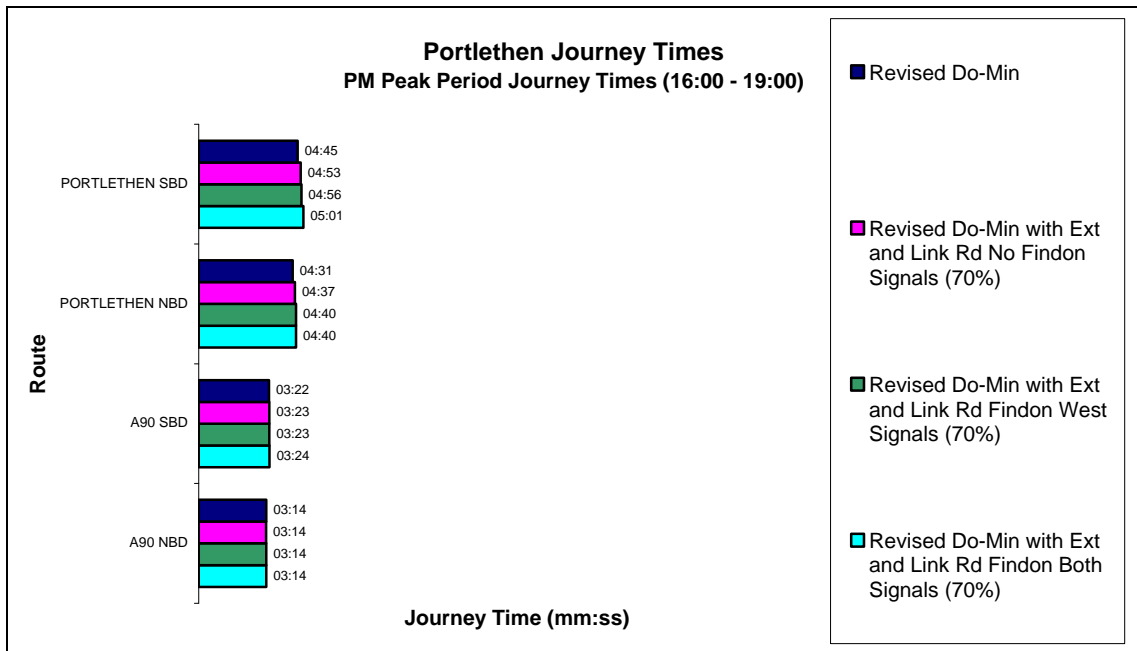


Figure 3.2 : PM Peak Journey Times

3.2.5 Figure 3.2 shows that again the journey times remain relatively consistent, with only minor increases through Portlethen, due to re-routeing traffic with the introduction of the link road.

3.2.6 These journey time paths do not take account of the delays at Findon, as the journey paths begin and end at the Schoolhill Distributor link at the West roundabout of Findon Interchange.

3.3 Queue Length Results (Do-Min and Badentoy Extension Only)

3.3.1 Queue length graphs have been extracted from the model for the AM and PM peaks at Badentoy Interchange and Findon Interchange.

3.3.2 Queue Length graphs for Badentoy Interchange in the AM peak can be found in Appendix A. These have not been included in the main report as there were no notable differences between the options during the AM peak.

3.3.3 Figure 3.3 shows the queues on the A90 Southbound off slip at Findon interchange in the AM peak. Graphs for the other approaches can be found in Appendix A.



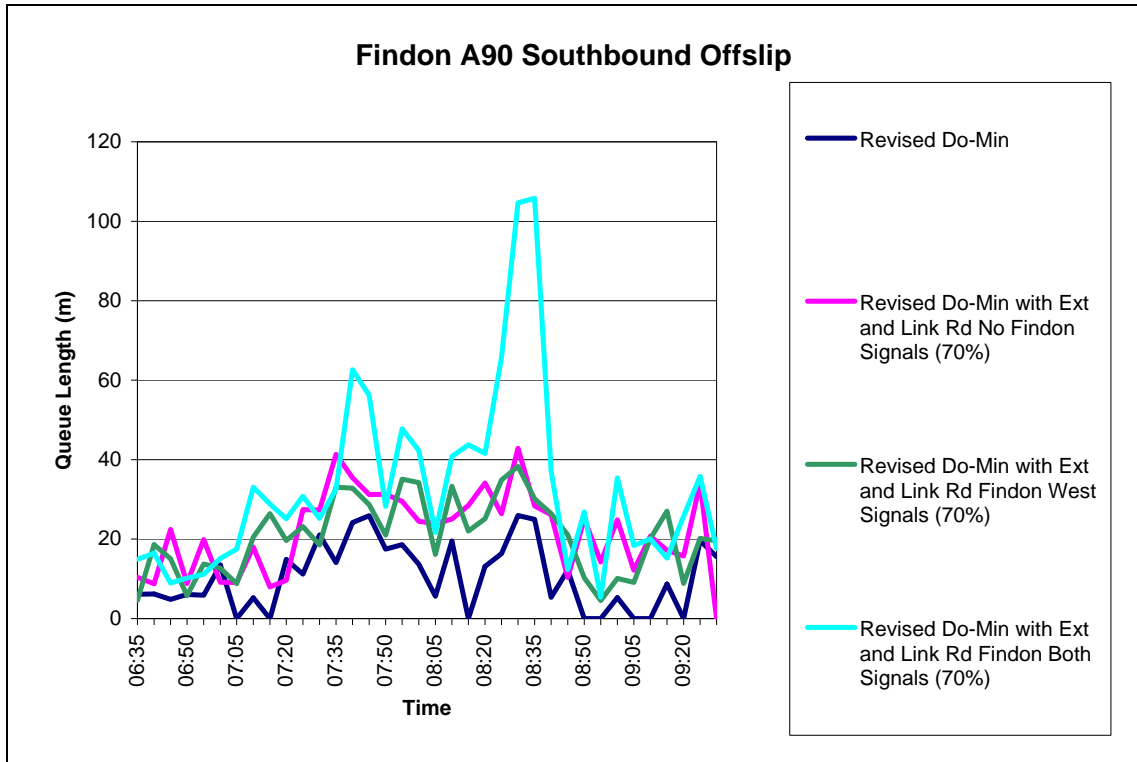


Figure 3.3 : Findon Southbound Off Slip AM Peak Queue Lengths

- 3.3.4 Figure 3.3 shows that the queue lengths remain consistent in the scenarios without the signals on the east roundabout at Findon Interchange. With the introduction of the signals at both roundabouts, the maximum queue length on the slip road is approximately 110m.
- 3.3.5 Figure 3.4 shows the total length of queuing vehicles within the cordon area of Badentoy Road to Badentoy Interchange and includes the whole industrial area in the PM peak. Graphs for the other approaches can be found in Appendix A.



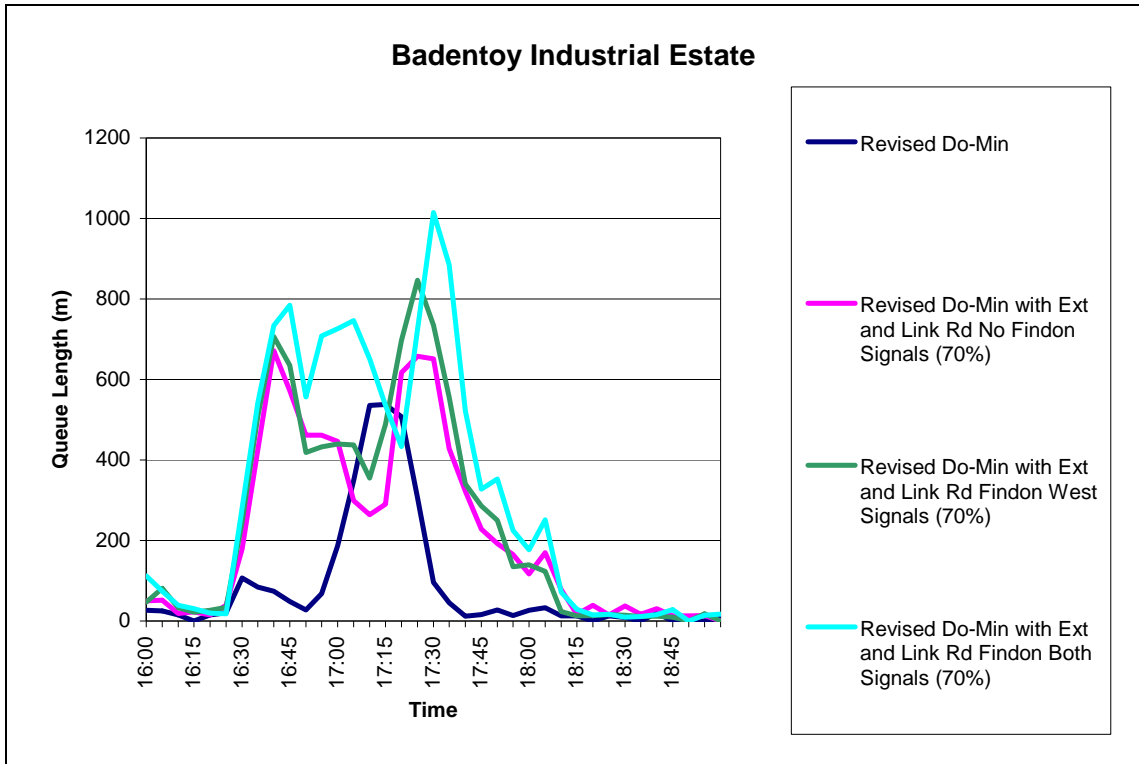


Figure 3.4 : Badentoy Industrial Estate approach PM Peak Queue Lengths

3.3.6 Figure 3.4 shows that with the introduction of the extension and Link Road the queueing remains relatively consistent, but with the introduction of signalisation at Findon, that route is less attractive for vehicles heading north to Aberdeen due to the delay introduced. When the signals are introduced, there is an increase in the queueing within Badentoy, as vehicles route via Badentoy Road to the A90.



3.3.7 Figure 3.5 shows the queue length for the Cookston Road approach to Findon Interchange.

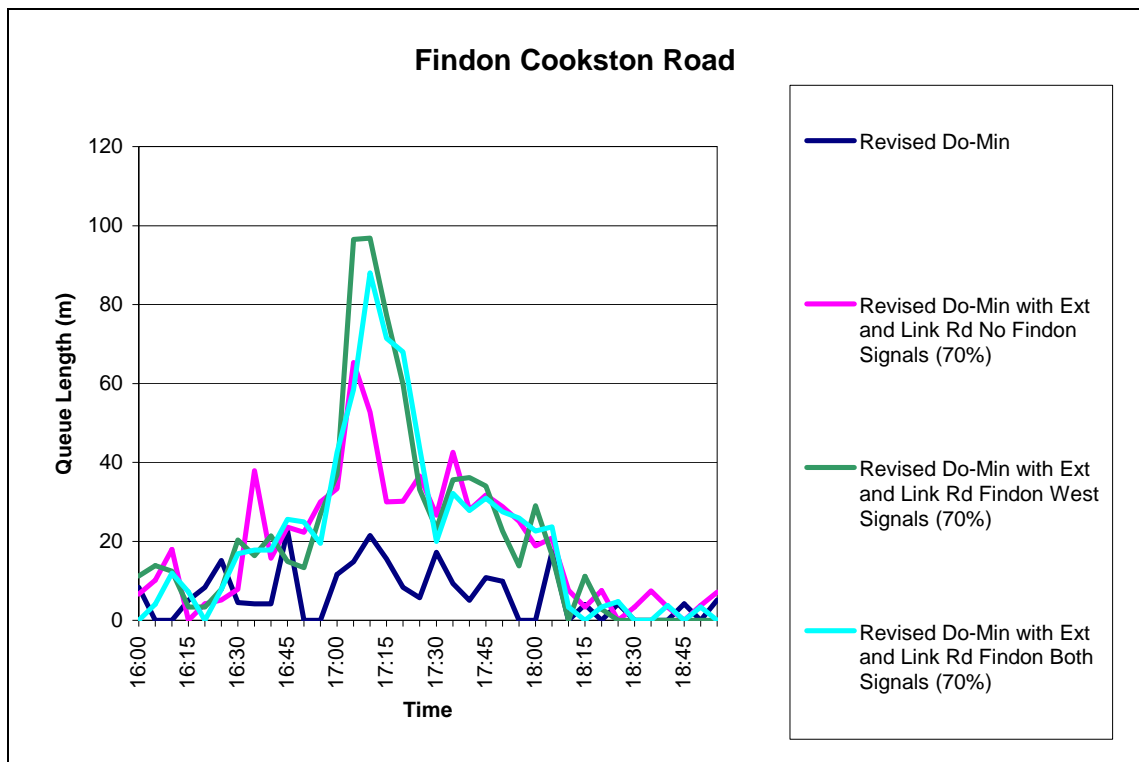


Figure 3.5 : Findon Cookston Road approach PM Peak Queue Length

3.3.8 Figure 3.5 shows that with the introduction of signals at Findon Interchange, the queue on Cookston Road extends from approximately 60m to approximately 80m in the PM peak period.

3.3.9 Figure 3.6 shows the queue length on the A90 Southbound Off Slip at Findon Interchange in the PM Peak.

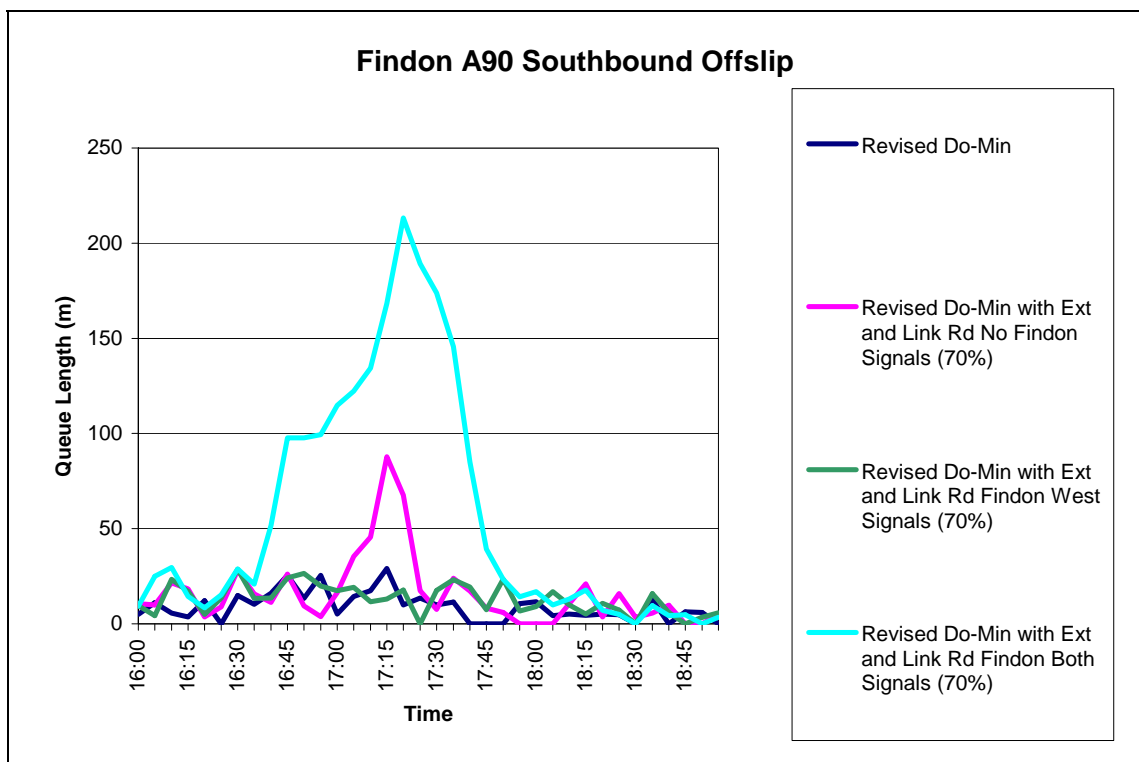


Figure 3.6 : Findon Southbound Off Slip PM Peak Queue Lengths



3.3.10 Figure 3.6 shows that the queueing remains relatively consistent, until the east roundabout is signalised. At this point the queues extend back around 200m, in any future installation the signal settings would have to be designed such that the queue did not interfere with the main A90.

3.3.11 Figure 3.7 shows the queue length on the Marywell approach to Findon Interchange.

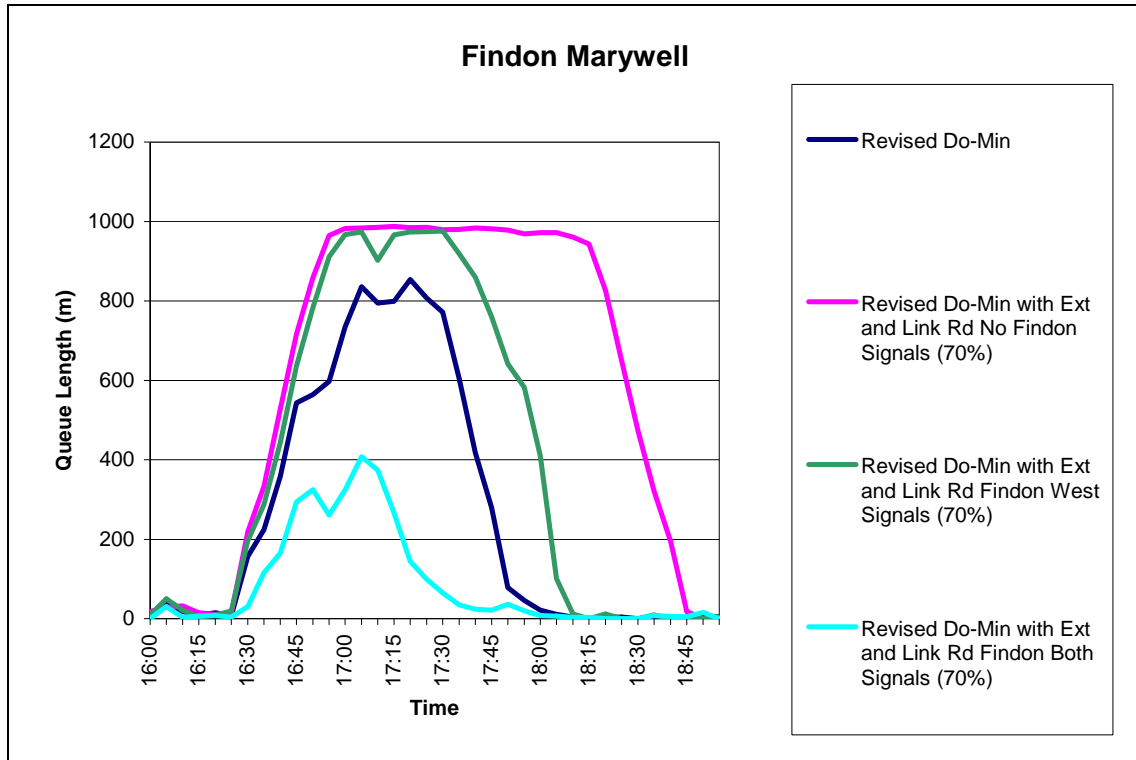


Figure 3.7 : Findon Marywell PM Peak Queue Lengths

3.3.12 Figure 3.7 shows that with the introduction of the development in the Do-Min scenario, the maximum queue length extends to approximately 800/1,000m, with either no signals or signals at the west roundabout only, with additional vehicles which are queueing off the network. With no signals in place there are approximately 179 vehicles off the network, and with the West roundabout only signalized there are approximately 5 vehicles off the network.. With the introduction of signals at the east roundabout the maximum queue length drops to around 400m with no vehicles queued off the network.

3.3.13 The remaining graphs for the PM peak can be found in Appendix B.

3.4 Journey Time Results (Do-min and Badentoy Extension with Cairnrobin Pipeyard)

3.4.1 Journey time routes were analysed for the following paths

- Portlethen northbound and southbound – From Findon Interchange via Cookston Road to Bruntland Road (A90)
- A90 northbound and southbound – From Findon Interchange to Newtonhill via the A90

3.4.2 Figure 3.8 shows the journey path information in the AM peak for the following scenarios:

- 2012 Revised Do-Minimum Content with Cairnrobin Pipeyard
- 2012 Revised Do-Minimum with Badentoy extension and Link Road and Cairnrobin Pipeyard with no Findon Signalisation (70% Familiarity)



- 2012 Revised Do-Minimum with Badentoy extension and Link Road and Cairnrobin Pipeyard with Findon West Signalised (70% Familiarity)
- 2012 Revised Do-Minimum with Badentoy extension and Link Road and Cairnrobin Pipeyard with Findon East and West Signalised (70% Familiarity)

3.4.3 Figure 3.8 demonstrates that in the main the journey times remain consistent throughout the scenarios in the AM peak.

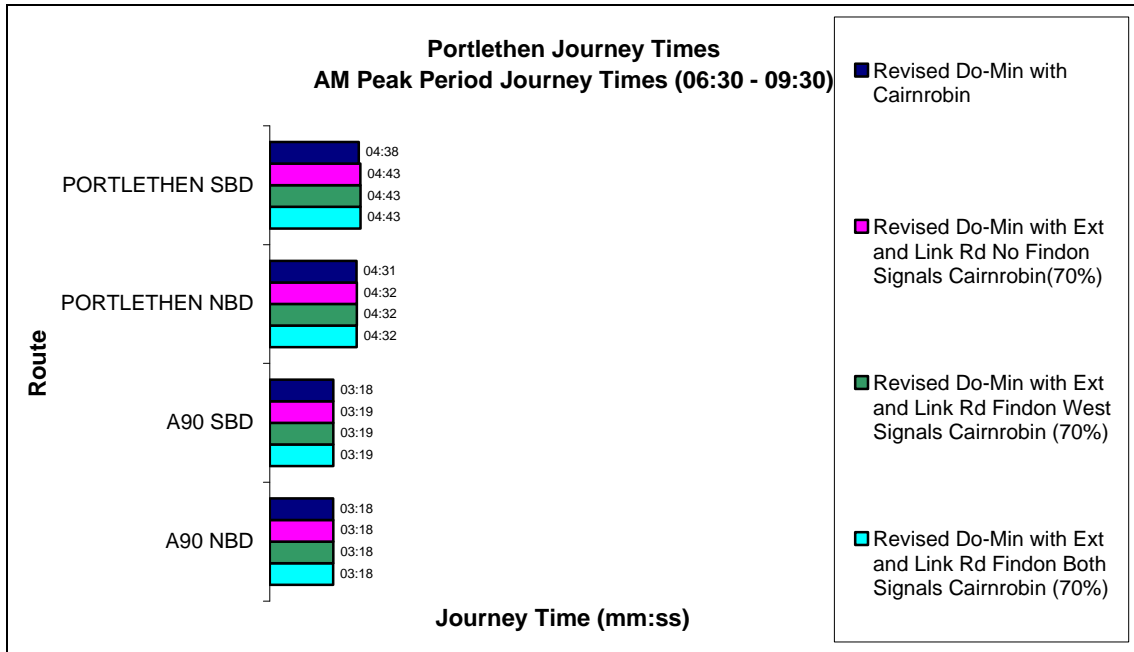


Figure 3.8 : AM Peak Journey Times

3.4.4 Figure 3.9 shows the journey path information in the PM peak.

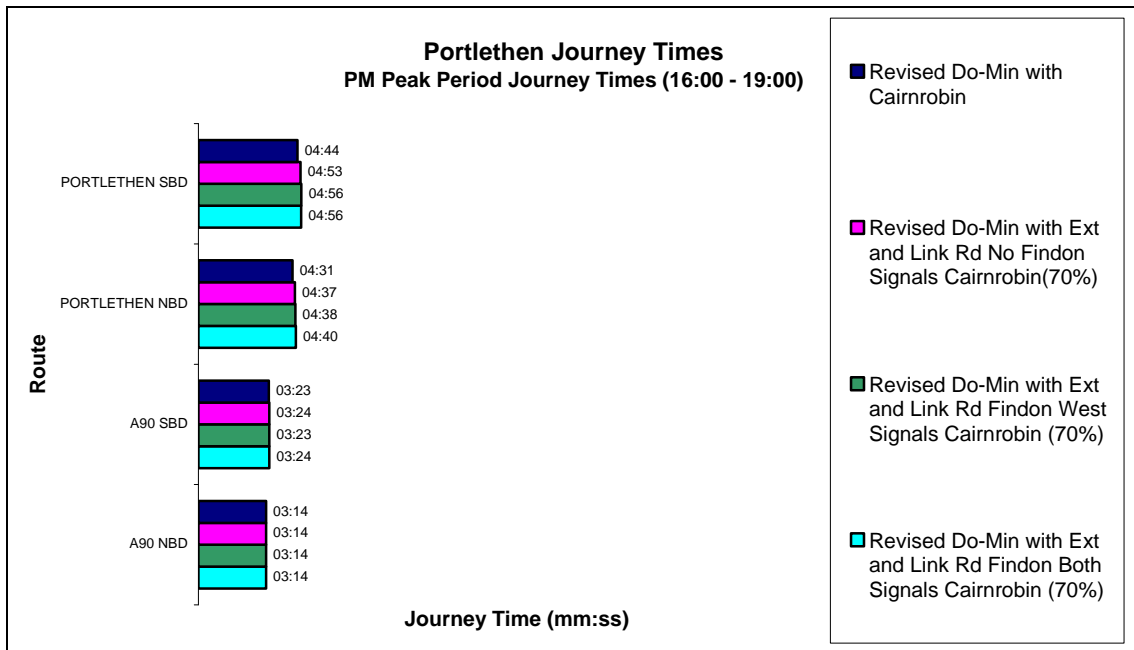


Figure 3.9 : PM Peak Journey Times

3.4.5 Figure 3.9 shows that again the journey times remain relatively consistent, with only minor increases through Portlethen, due to re-routeing traffic with the introduction of the link road.



3.4.6 These journey time paths do not take account of the delays at Findon, as the journey paths begin and end at the Schoolhill Distributor link at the West roundabout of Findon Interchange.

3.5 Queue Length Results (Do-Min and Badentoy Extension with Cairnrobin Pipeyard)

3.5.1 Queue length graphs have been extracted from the model for the AM and PM peaks at Badentoy Interchange and Findon Interchange.

3.5.2 Queue Length graphs for Badentoy Interchange in the AM peak can be found in Appendix B. These have not been included in the main report as there were no notable differences between the options during the AM peak.

3.5.3 Figure 3.10 shows the queues on the A90 Southbound off slip at Findon interchange in the AM peak. Graphs for the other approaches can be found in Appendix B.

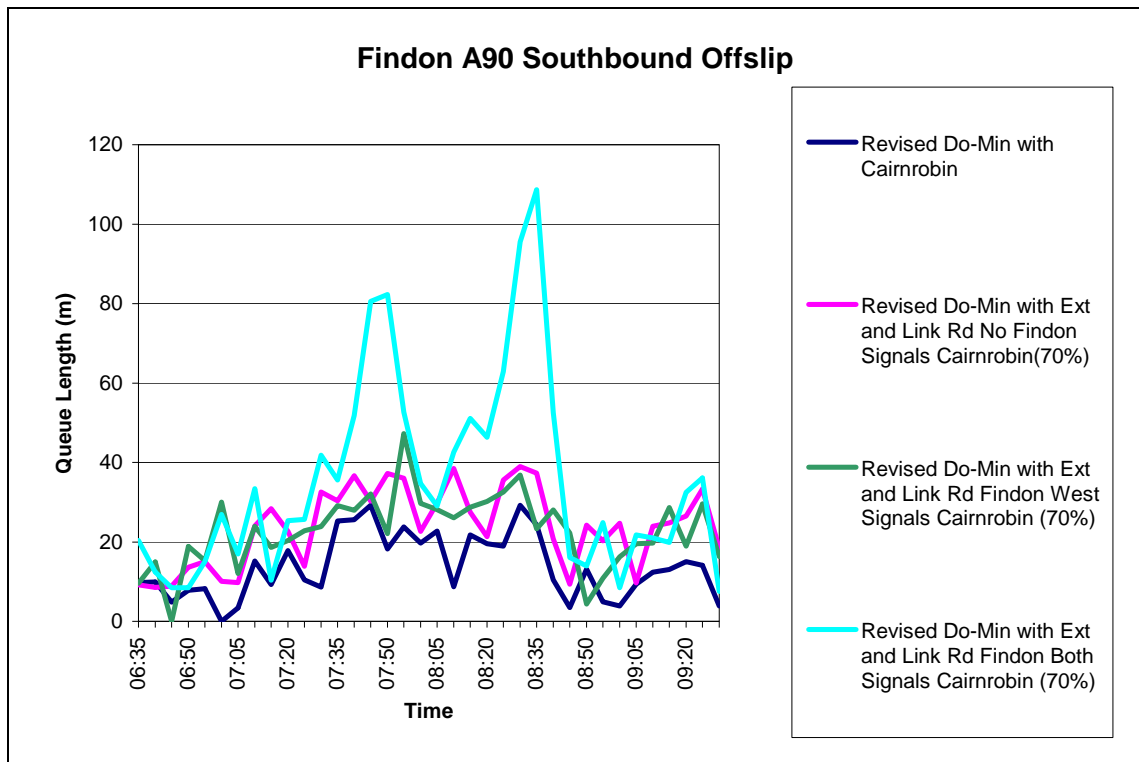


Figure 3.10 : Findon Southbound Off Slip AM Peak Queue Lengths

3.5.4 Figure 3.10 shows that the queue lengths remain consistent in the scenarios without the signals on the east roundabout at Findon Interchange. With the introduction of the signals at both roundabouts, the maximum queue length peaks on the slip road at approximately 110m. Figure 3.11 shows the total length of queuing vehicles in the cordon area of Badentoy Road to Badentoy Interchange and includes the whole industrial area in the PM peak. Graphs for the other approaches can be found in Appendix B.



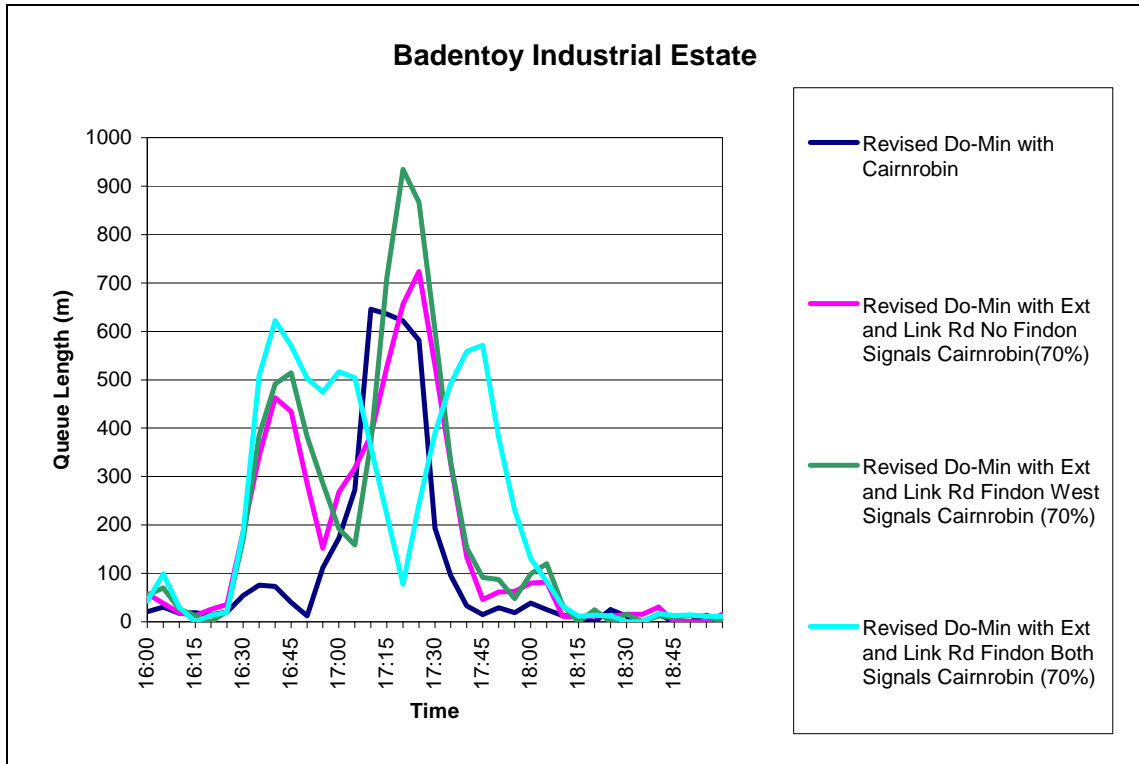


Figure 3.11 : Badentoy Industrial Estate approach PM Peak Queue Lengths

3.5.5 Figure 3.11 shows that with the introduction of the extension at Badentoy, the queue length remain relatively consistent, with a slight extension of the queue without signalization at both roundabouts at Findon Interchange.

3.5.6 Figure 3.12 shows the queue length for the Cookston Road approach to Findon Interchange.

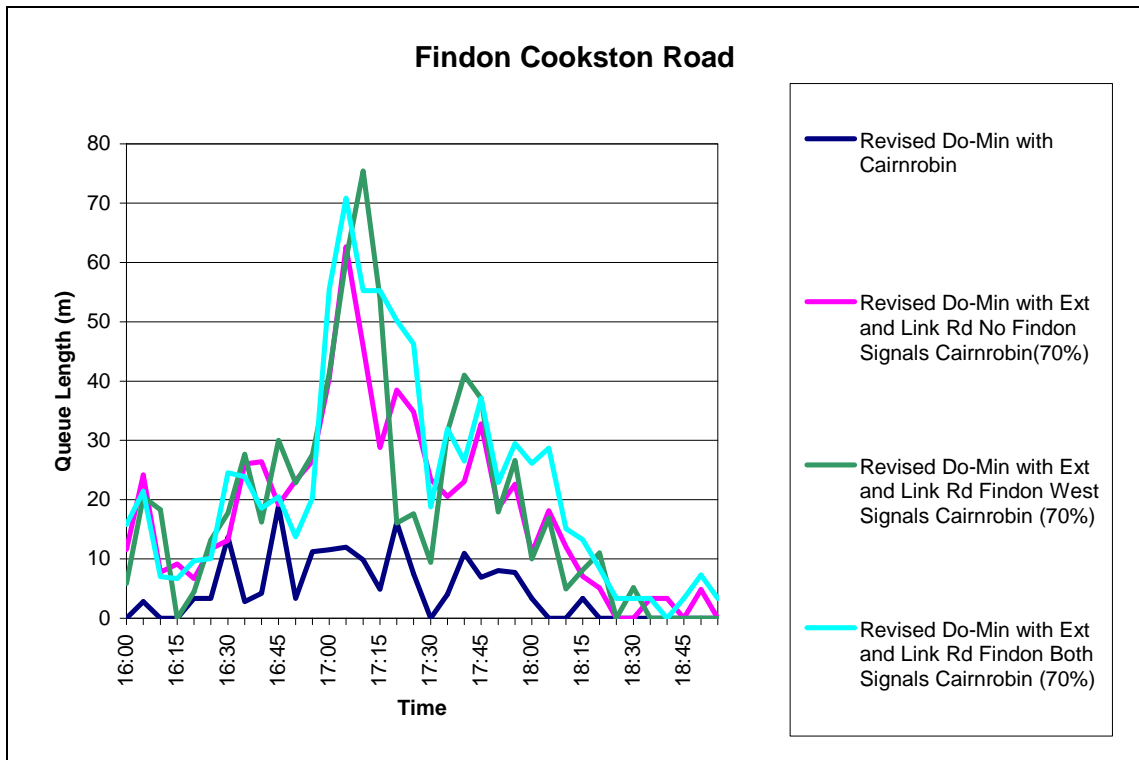


Figure 3.12 : Findon Cookston Road approach PM Peak Queue Length



3.5.7 Figure 3.12 shows that with the introduction of signals at Findon Interchange, the queue on Cookston Road extends from approximately 10m to approximately 80m in the PM peak period.

3.5.8 Figure 3.13 shows the queue length on the A90 Southbound Off Slip at Findon Interchange in the PM Peak.

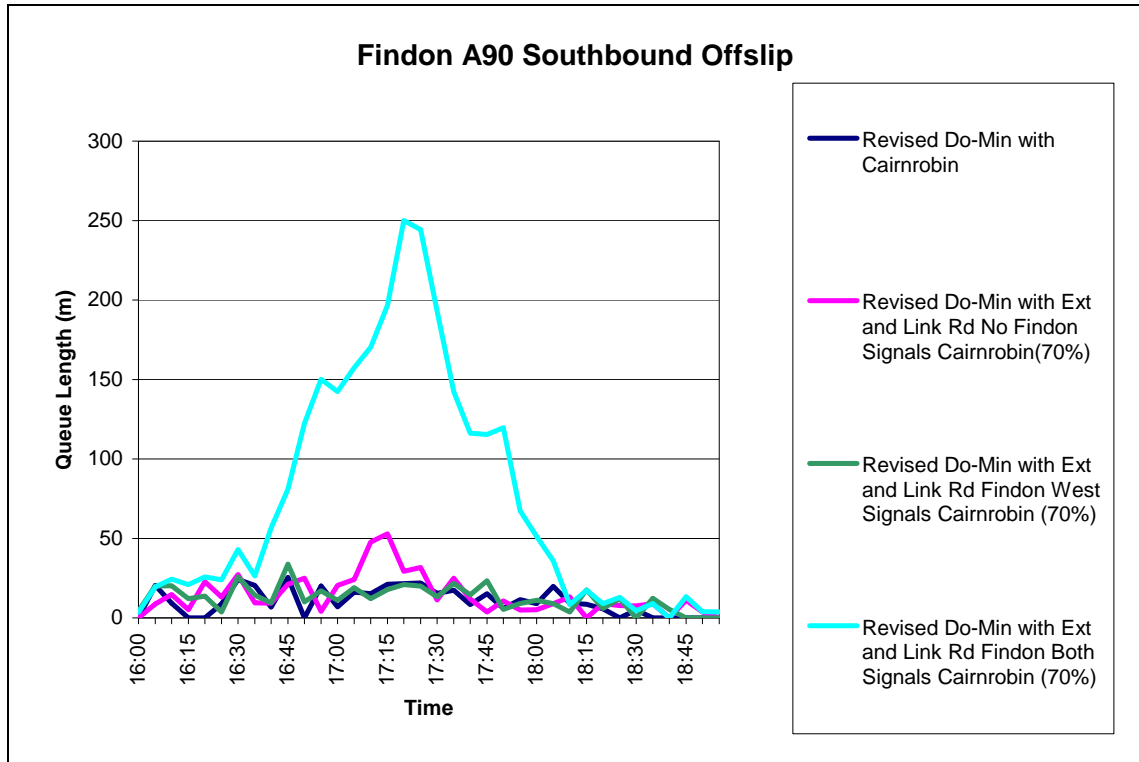


Figure 3.13 : Findon Southbound Off Slip PM Peak Queue Lengths

3.5.9 Figure 3.13 shows that the queueing remains relatively consistent, until the east roundabout is signalized. At this point the queues extend back around 250m, in any future installation the signal settings would have to be designed such that the queue did not interfere with the main A90.



3.5.10 Figure 3.14 shows the queue length on the Marywell approach to Findon Interchange.

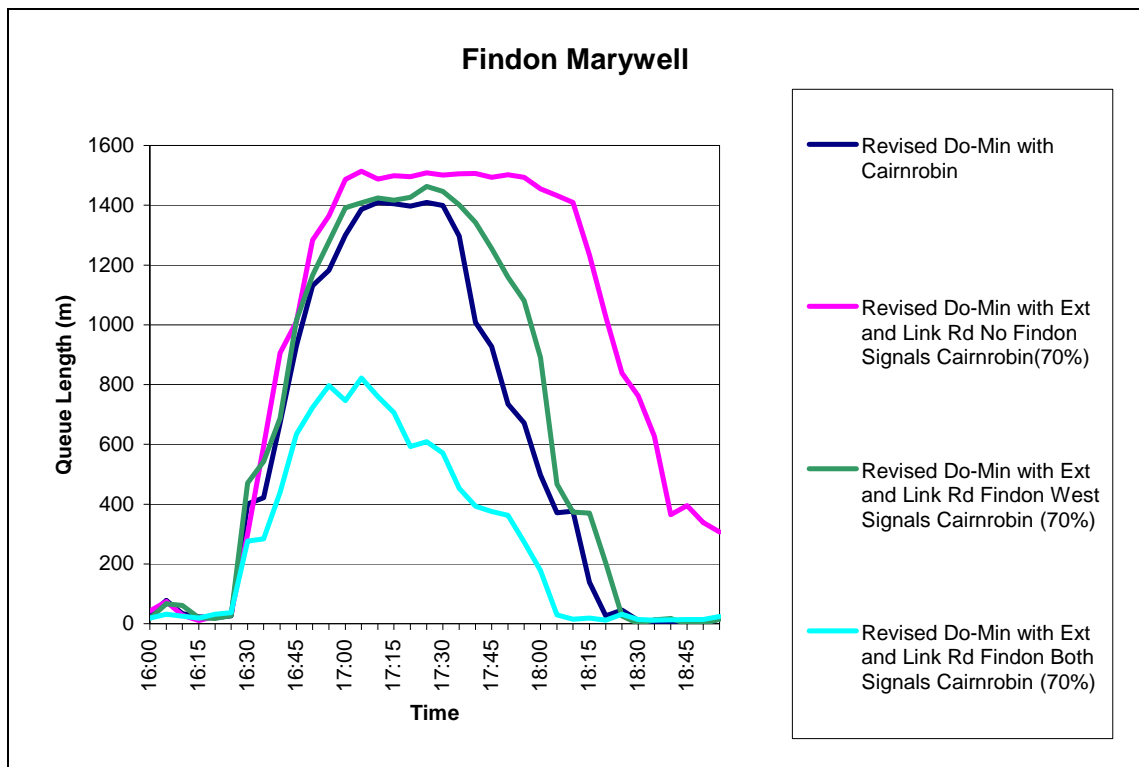


Figure 3.14 : Findon Marywell PM Peak Queue Lengths

3.5.11 Figure 3.14 shows that with the introduction of the Cairnrobin development in the Do-Min scenario, the maximum queue length extends to approximately 1,400m, with either no signals or signals at the west roundabout only the queue is approximately 1,500m. With no signals there is also 110 vehicles queued into Cairnrobin and 200 off the network, and with the West roundabout only signalised there are 100 vehicles in the Cairnrobin zone and 31 off the network. With the introduction of signals at the east roundabout the maximum queue length drops to around 800m, and there are only 42 vehicles queued into the Cairnrobin zone.

3.5.12 The remaining graphs for the PM peak can be found in Appendix B.

4 SUMMARY AND CONCLUSIONS

4.1.1 Portlethen S-Paramics model testing has been carried out under agreement with Aberdeenshire Council.

4.1.2 A revised 2012 Do-Minimum has been created which includes the following developments:

- Schoolhill
- Cairnrobin
- Mosside
- Schoolhill Park & Ride
- AWPR (including additional flows from road closures)

4.1.3 The only area of significant queueing in the 2012 Revised Do-Minimum is on the Marywell approach to Findon Interchange in the PM Peak.



- 4.1.4 The additional employment development at Badentoy Industrial Estate and the link road to the Schoolhill distributor has been included in the option testing.
- 4.1.5 Sensitivity testing was carried out on the familiarity of trips that are associated with Badentoy Industrial Estate. At present light vehicle (Car and LGV) trips have a familiarity proportion of 30%, meaning that 30% of light vehicle trips associated with Badentoy have the potential to re-route rather than travelling via Badentoy Road.
- 4.1.6 Testing was undertaken on Badentoy Industrial Estate trips with a familiarity of:
- 100%
 - 70%
 - 50%
- 4.1.7 As a result of the different levels of familiarity, the effect upon the mini roundabout at the junction of Cookston Road/Muirend Road was assessed. None of the options tested showed any significant problems at the mini roundabout at the junction of Cookston Road/Muirend Road.
- 4.1.8 Following discussion with Aberdeenshire Council, it was proposed to undertake subsequent testing using a familiarity of 70%, to permit some level of re-routeing due to known congestion issues.
- 4.1.9 The operation of the Cookston Road/Muirend Road mini roundabout has been assessed with the addition of development generated traffic from the Badentoy Extension using the industry standard ARCADY computer program. The program provides an indication of the operation of the junctions in terms of maximum queue length and the Ratio of Flow to Capacity (RFC) of an approach, with values of 0.85 or greater highlighting that an approach is operating close to its theoretical capacity.
- 4.1.10 Based on the ARCADY assessment of forecast traffic flows, it is considered that the Cookston Road/Muirend Road roundabout should operate within capacity with minimal levels of delay or queueing in 2012 with the addition of development generated traffic.
- 4.1.11 With the additional development and link road in place, there is no significant queueing in the AM peak, but in the PM peak queueing is evident at Findon interchange and further testing shows that signalisation of both Findon roundabouts may alleviate the issues.
- 4.1.12 Aberdeenshire Council requested SIAS to undertake a test with traffic signal control at the junction of the Badntoy Link Road/Schoolhill Spine Road to cater for any traffic issues that may result from the additional vehicles re-routeing.
- 4.1.13 Upon running the models it was noted that there would be little benefit in signalising this junction, as no significant delays were evident at this location that would require signalisation.
- 4.1.14 With the introduction of the Cairnrobin development, increased queueing is observed on the Marywell approach to Findon Interchange in the PM peak, no issues were noted in the AM peak.
- 4.1.15 Again, the results of the testing show that signalisation of both roundabouts may alleviate the delays.
- 4.1.16 With the introduction of the signalisation on the east roundabout at Findon Interchange, the queue on the A90 Southbound off slip could extend to the main A90, any subsequent design and installation would require careful consideration to ensure that there is no impact on the A90, particularly given the limited stacking capacity.



- 4.1.17 The modelling indicates that the signalisation at Findon Interchange is only required in the PM peak, so the signals at Findon could operate on a part time basis to manage the queueing during the PM period.





A QUEUE LENGTH GRAPHS (DO-MIN & BADENTOY EXTENSION ONLY)





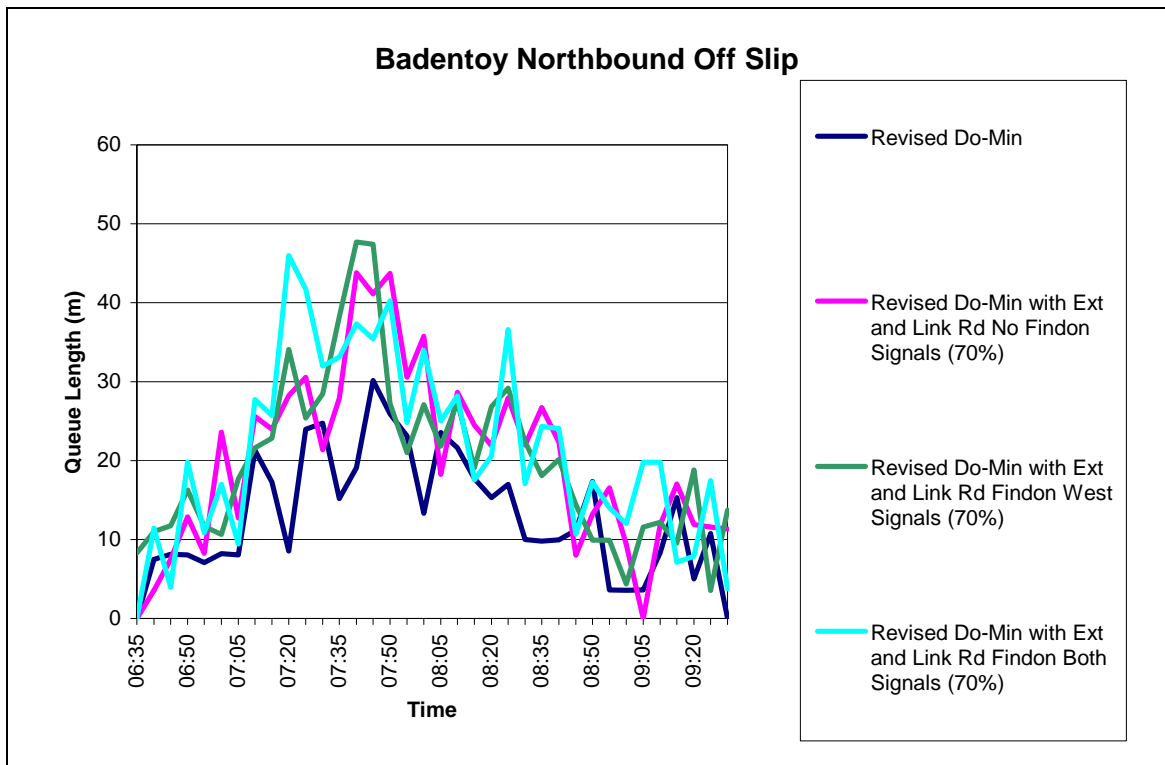


Figure A.1 : Badentoy Northbound Off Slip AM Peak Queue Lengths

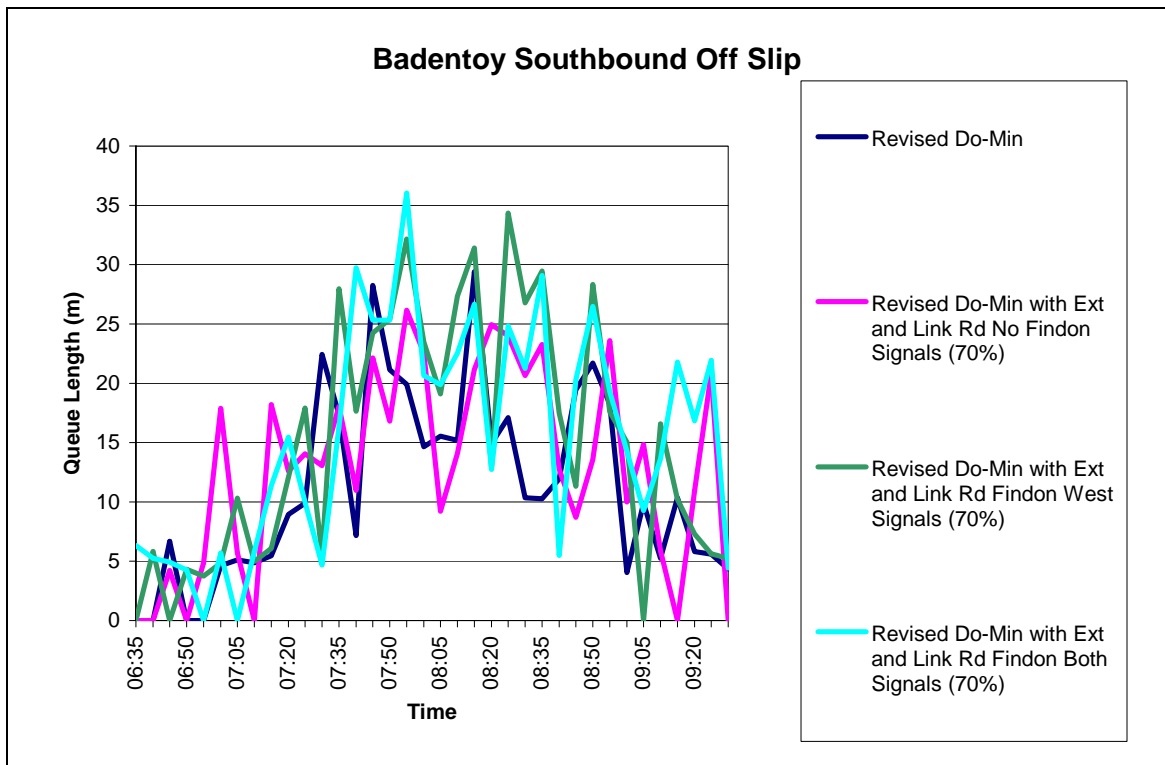


Figure A.2 : Badentoy Southbound Off Slip AM Peak Queue Lengths



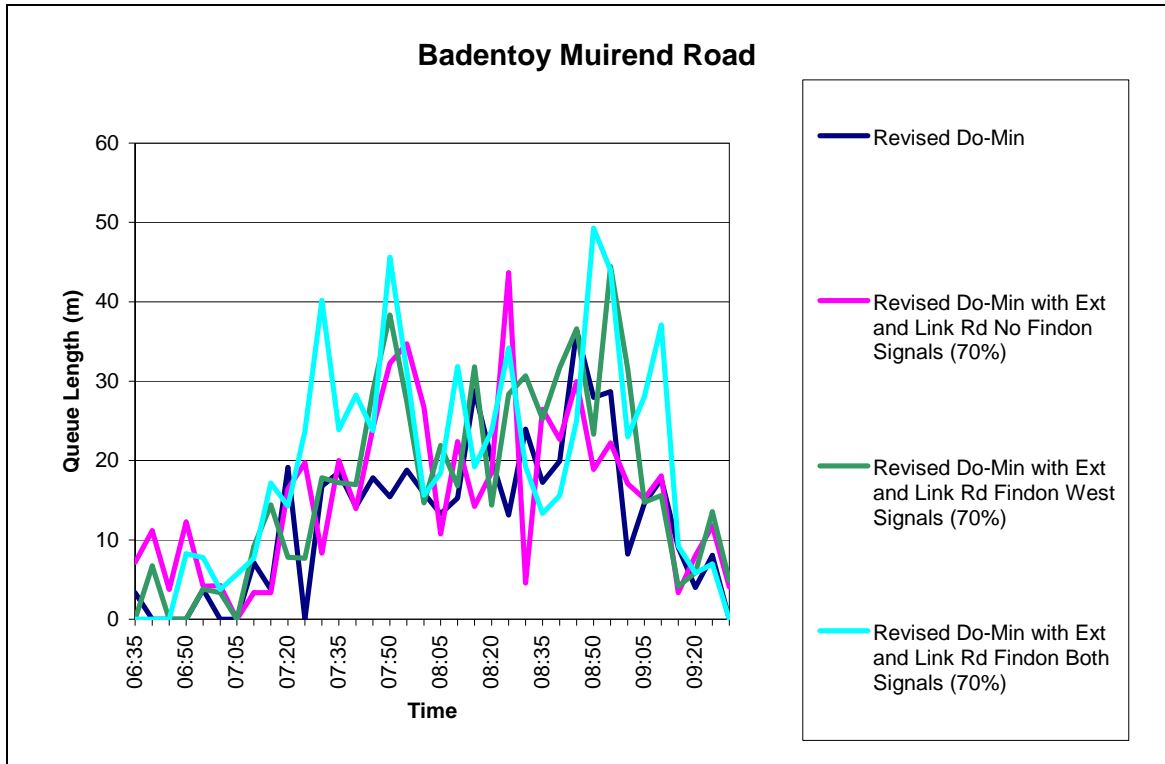


Figure A.3 : Badentoy Muirend Road (South) AM Peak Queue Lengths

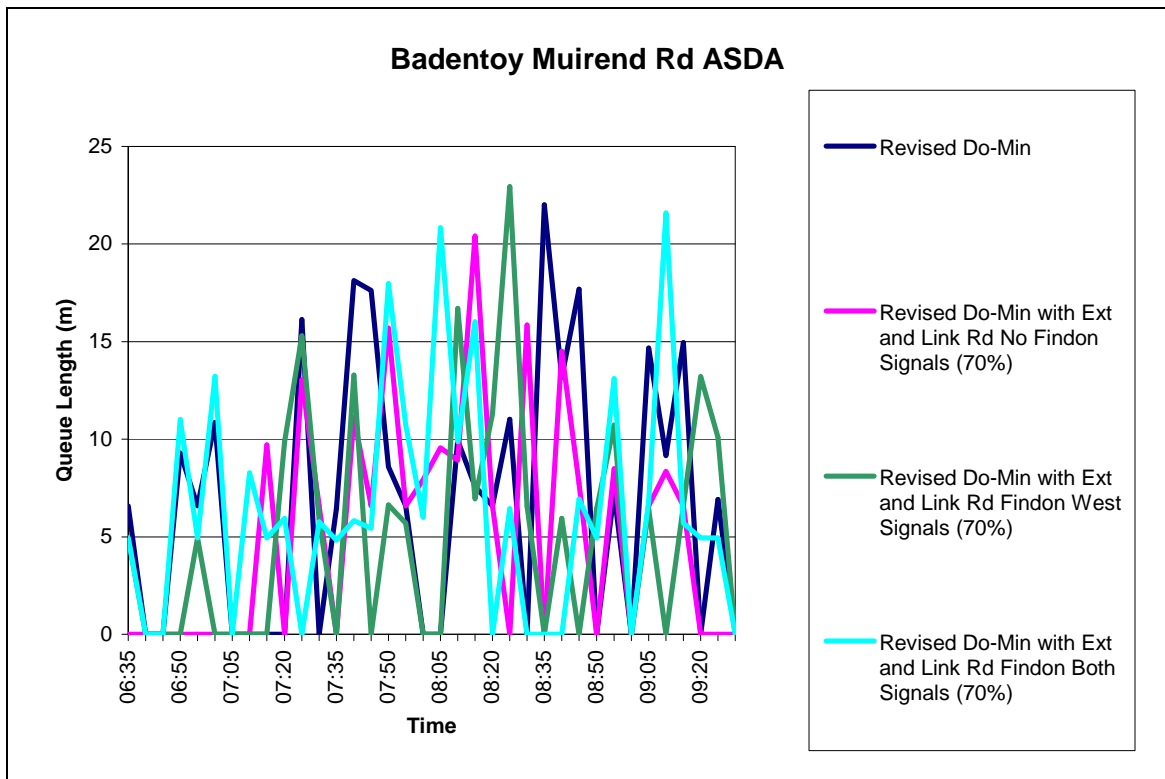


Figure A.4 : Badentoy Muirend Road (ASDA) AM Peak Queue Lengths



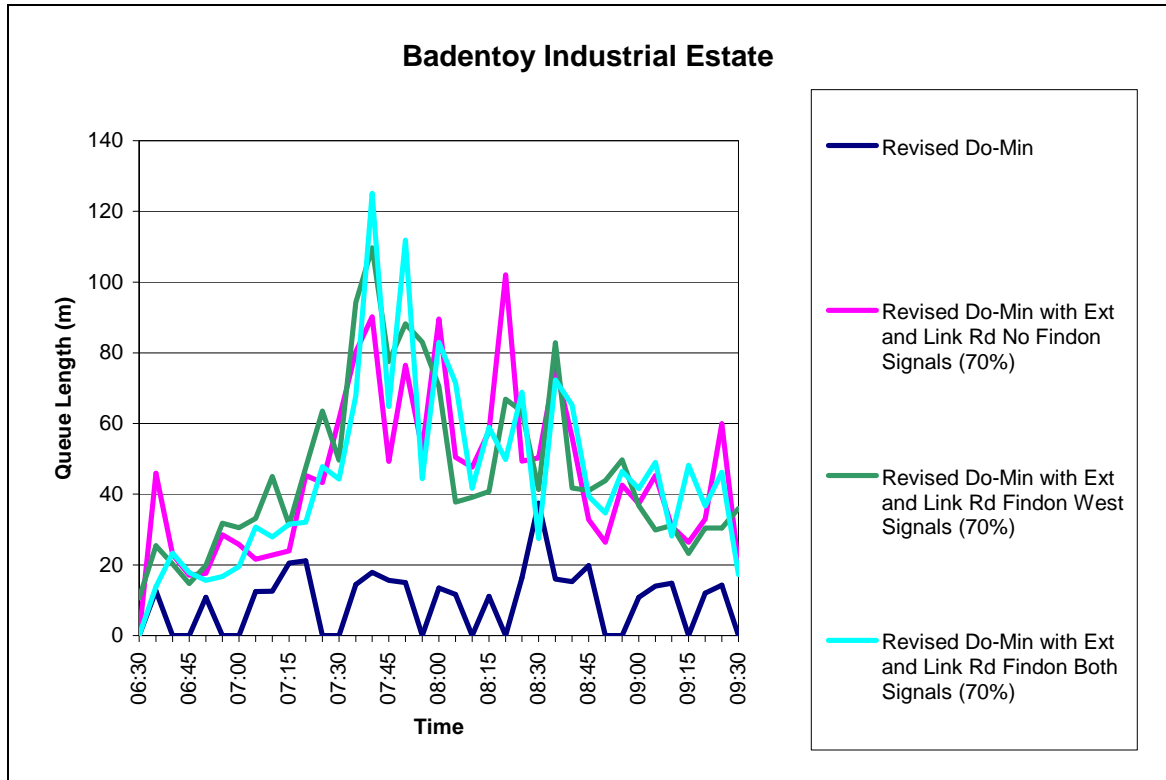


Figure A.5 : Badentoy Industrial Estate approach AM Peak Queue Length Cordon

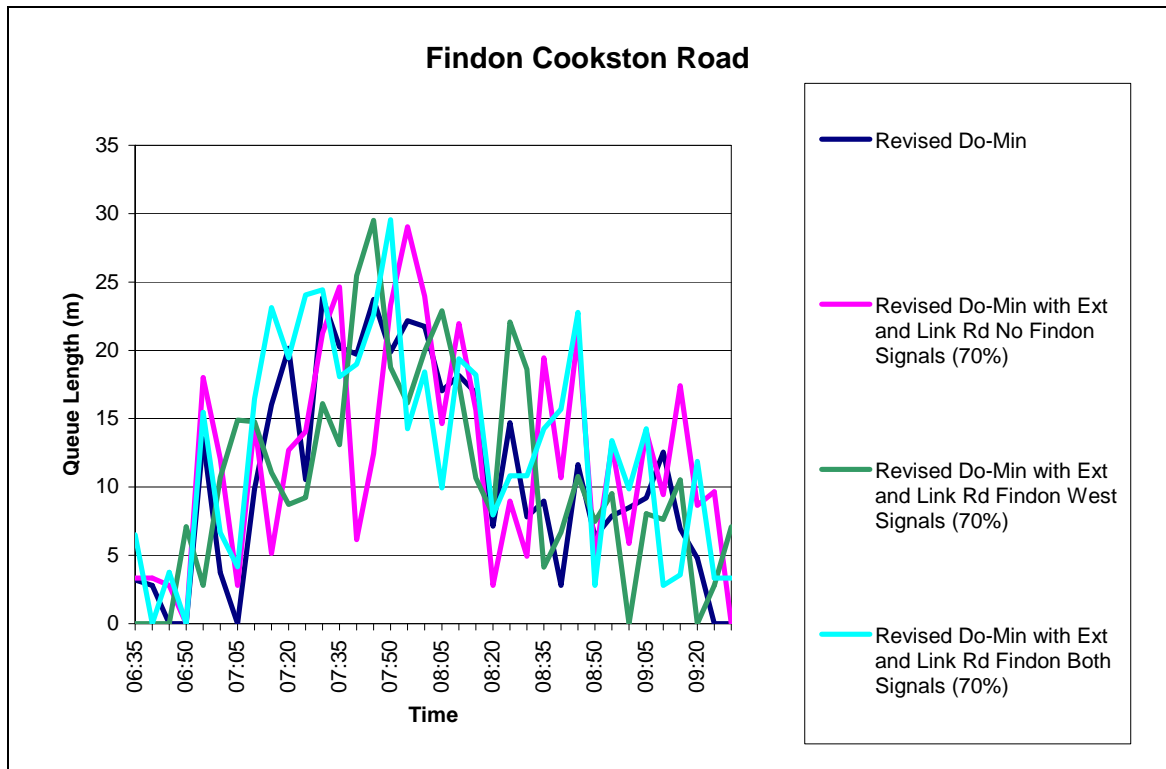


Figure A.6 : Findon Cookston Road AM Peak Queue Length



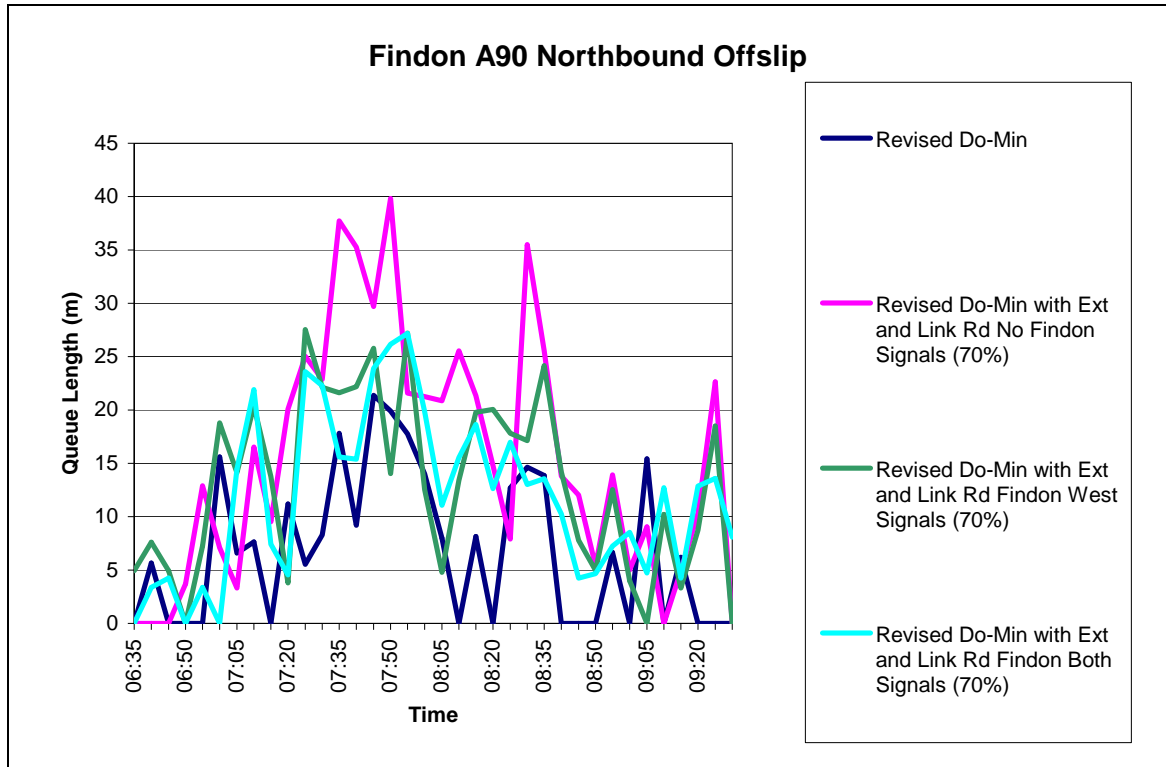


Figure A.7 : Findon A90 Northbound Off Slip AM Peak Queue Length

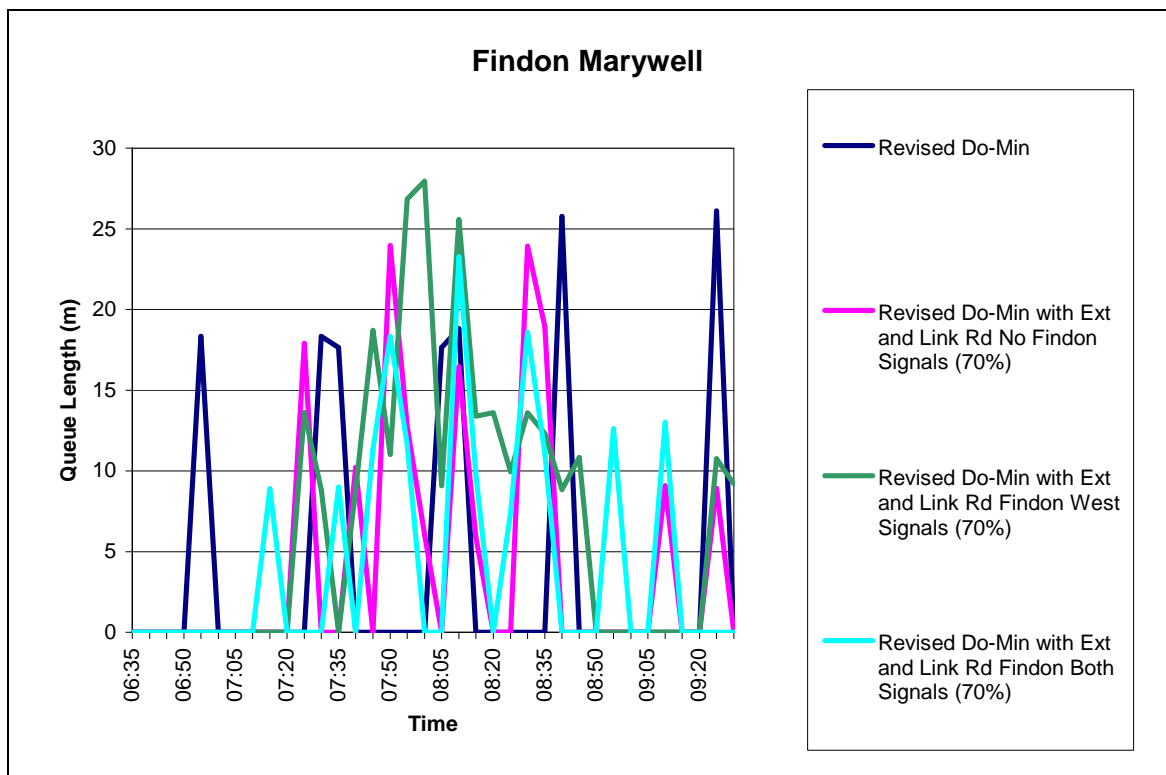


Figure A.8 : Findon Marywell AM Peak Queue Length





Figure A.9 : Findon 2 way slip AM Peak Queue Length

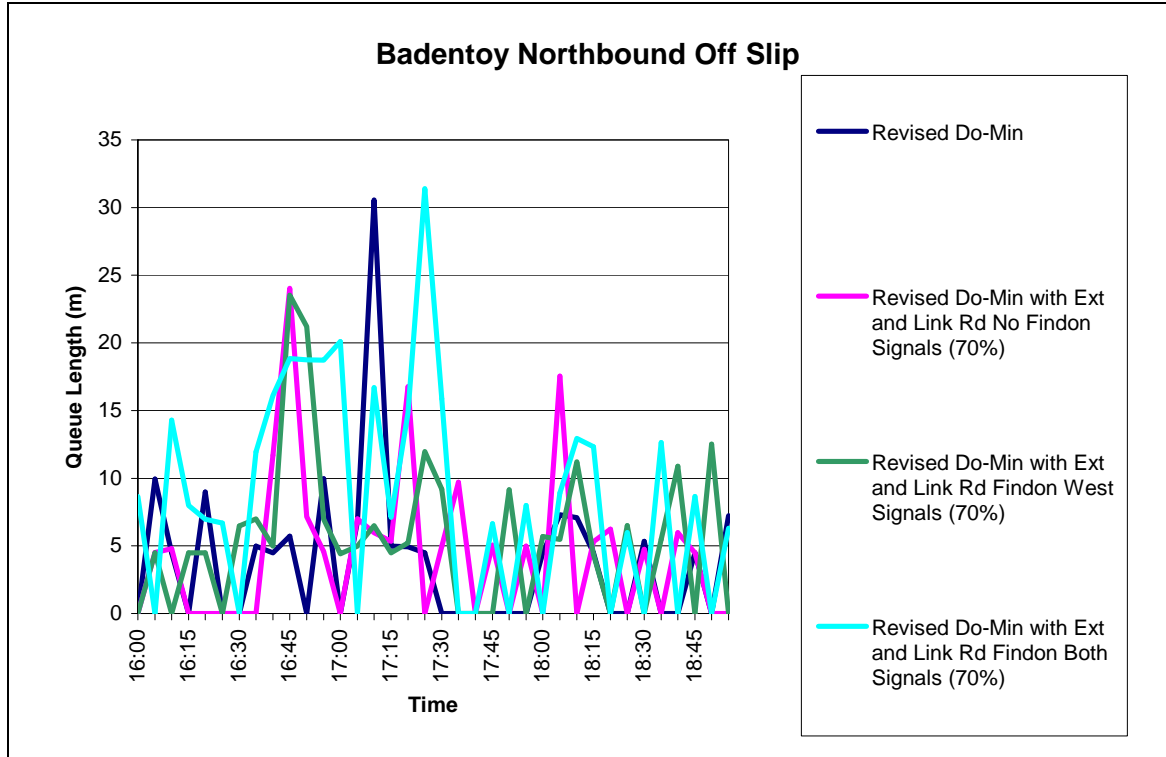


Figure A.10 : Badentoy Northbound Off Slip PM Peak Queue Length



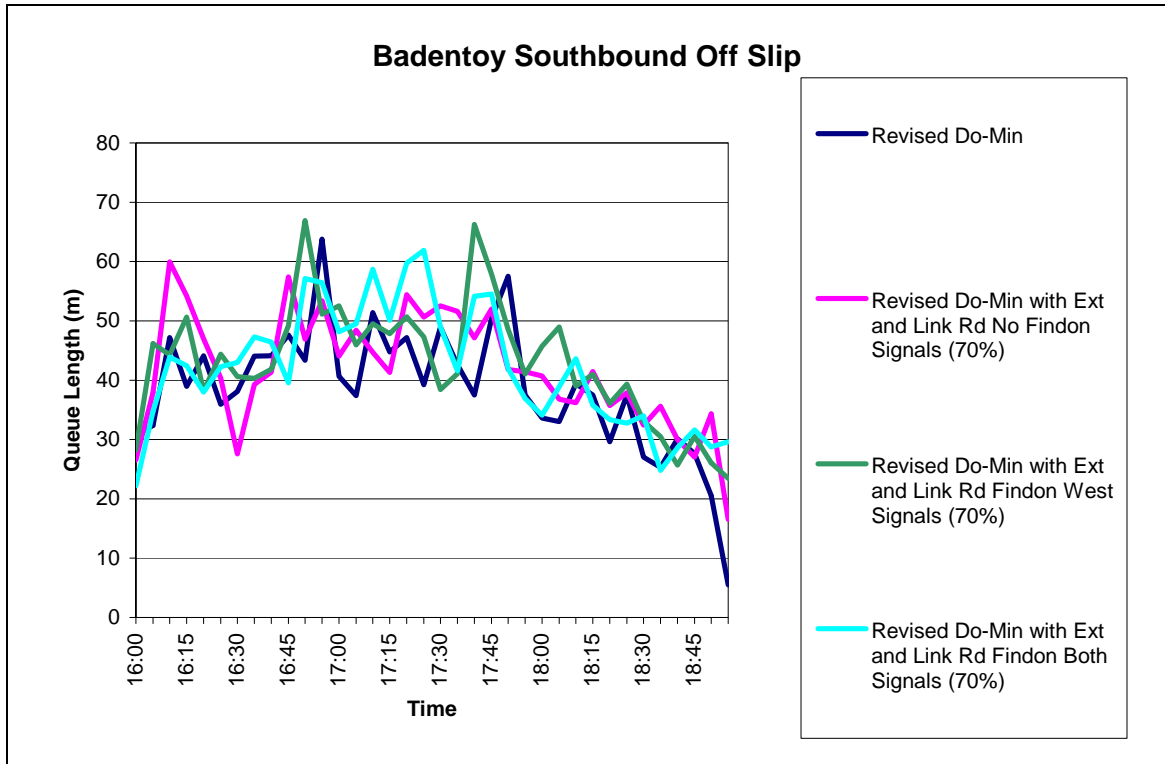


Figure A.11 : Badentoy Southbound Off Slip PM Peak Queue Length

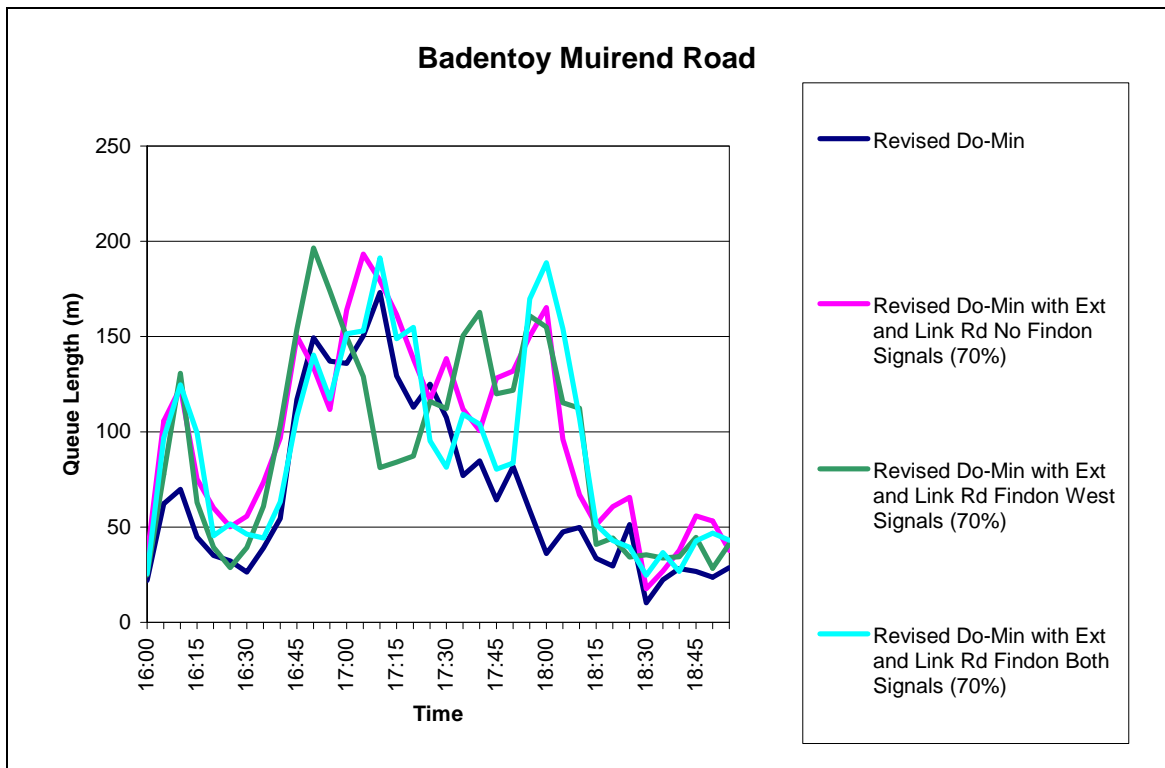


Figure A.12 : Badentoy Muirend Road (South) PM Peak Queue Length



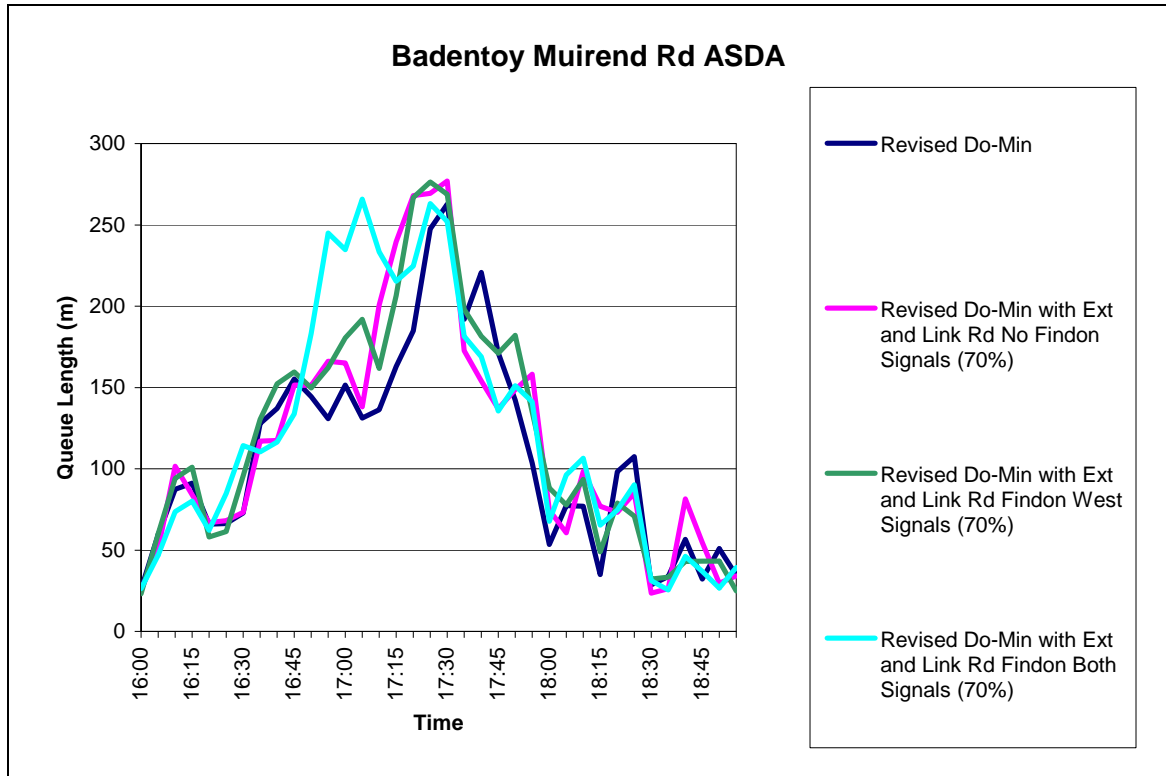


Figure A.13 : Badentoy Muirend Road (ASDA) PM Peak Queue Length

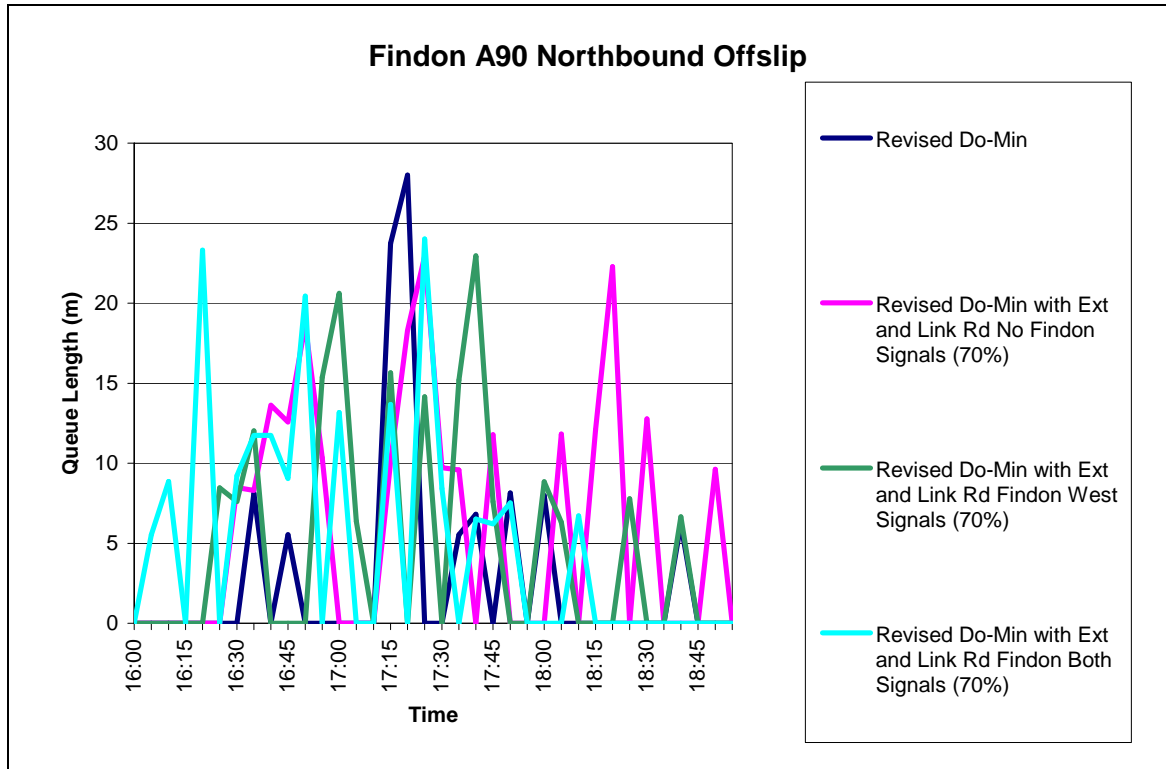


Figure A.14 : Findon Northbound Off Slip PM Peak Queue Length



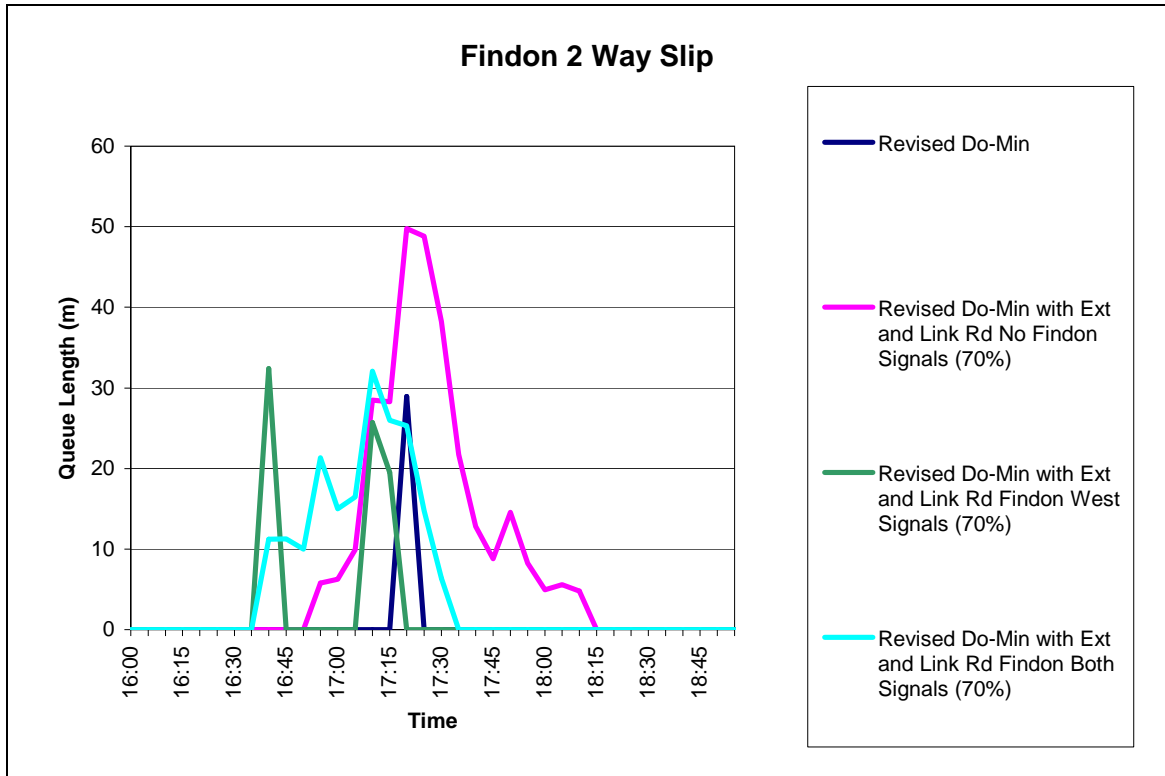


Figure A.15 : Findon 2 Way Slip PM Peak Queue Length



B QUEUE LENGTH GRAPHS (DO-MIN, BADENTOY EXTENSION AND CAIRNROBIN)





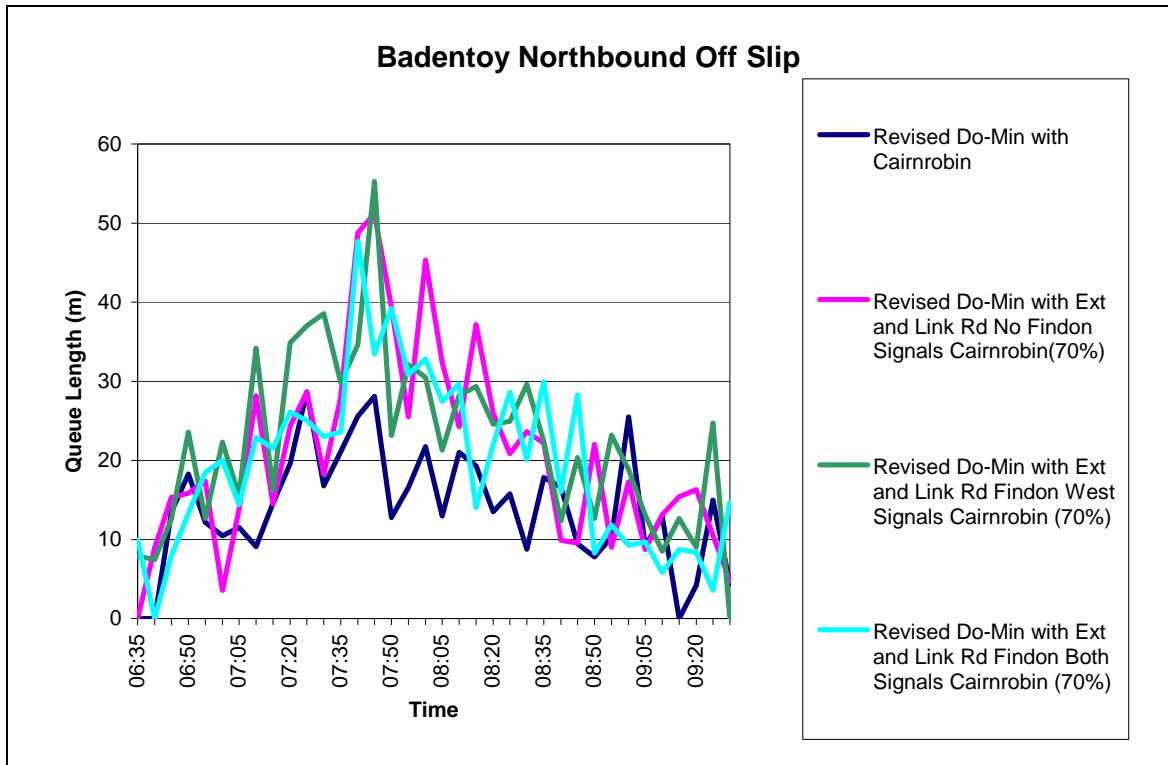


Figure B.1 : Badentoy Northbound Off Slip AM Peak Queue Lengths

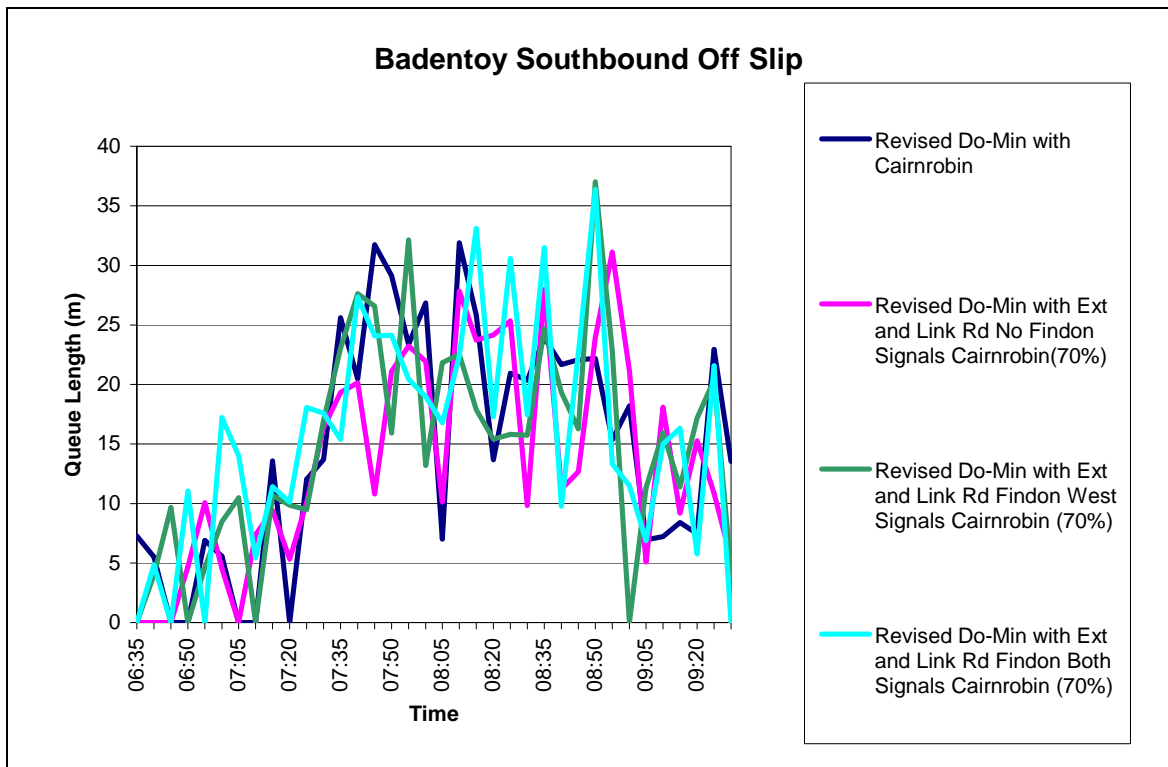


Figure B.2 : Badentoy Southbound Off Slip AM Peak Queue Lengths



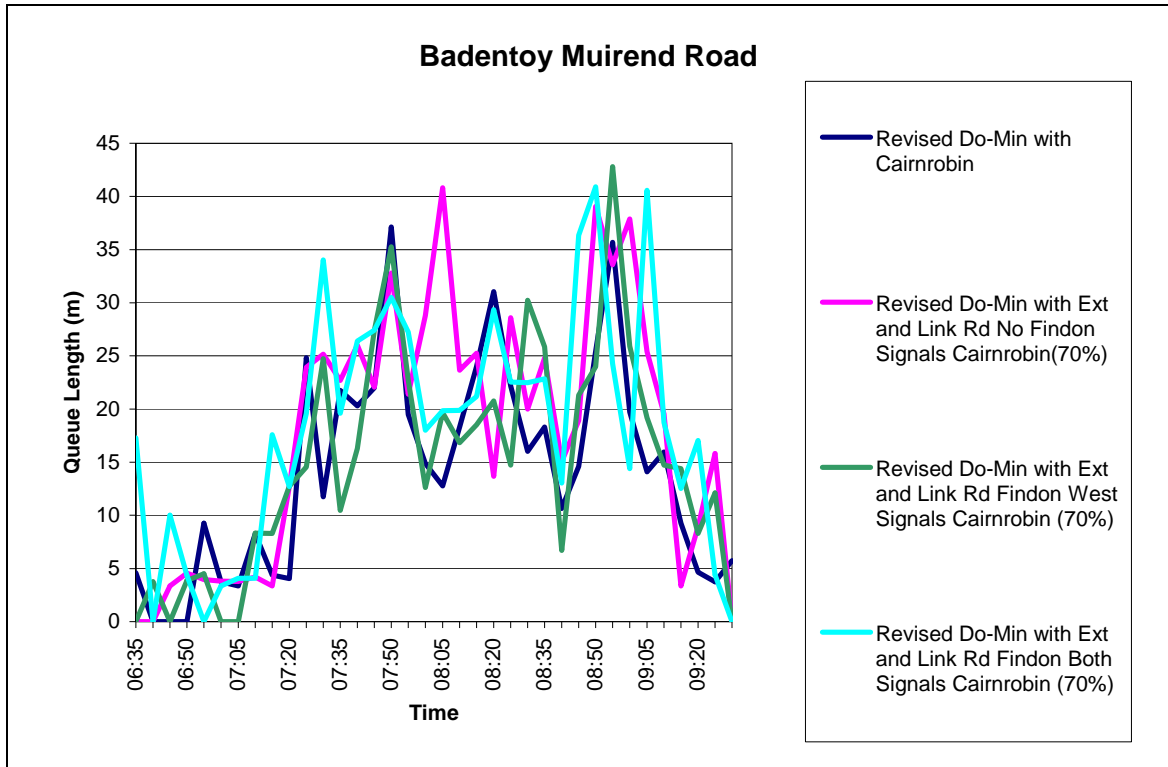


Figure B.3 : Badentoy Muirend Road (South) AM Peak Queue Lengths

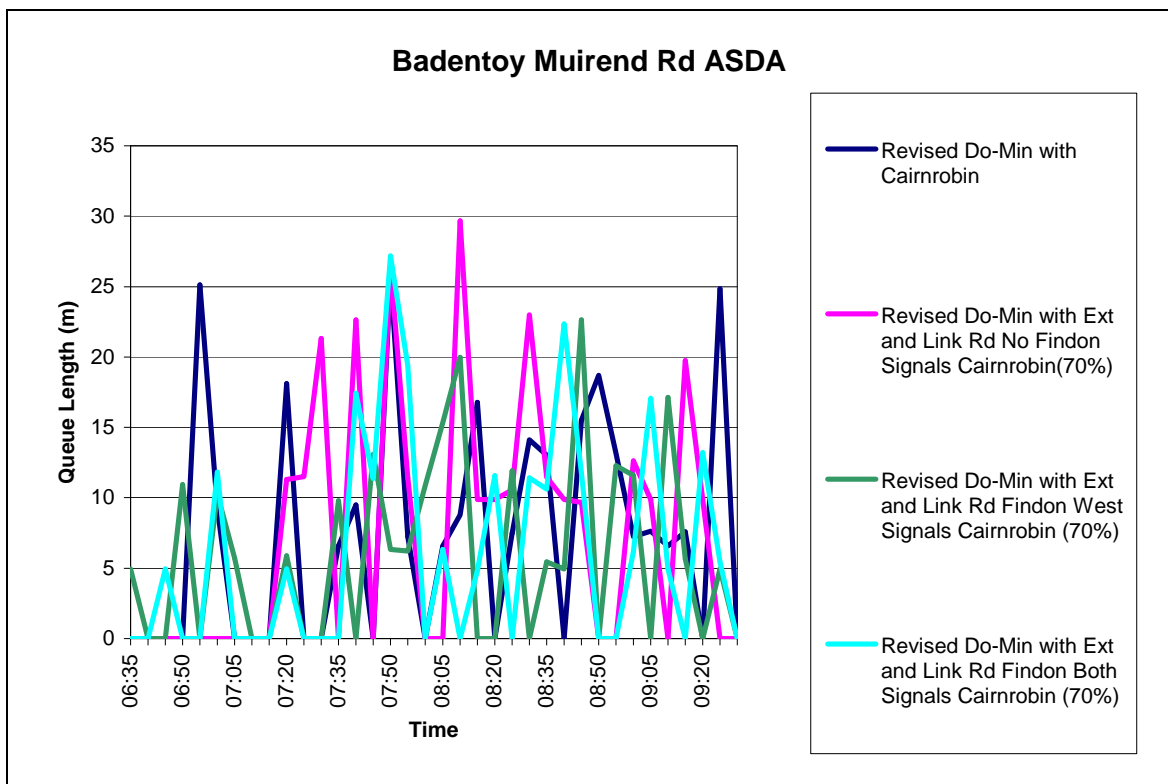


Figure B.4 : Badentoy Muirend Road (ASDA) AM Peak Queue Lengths



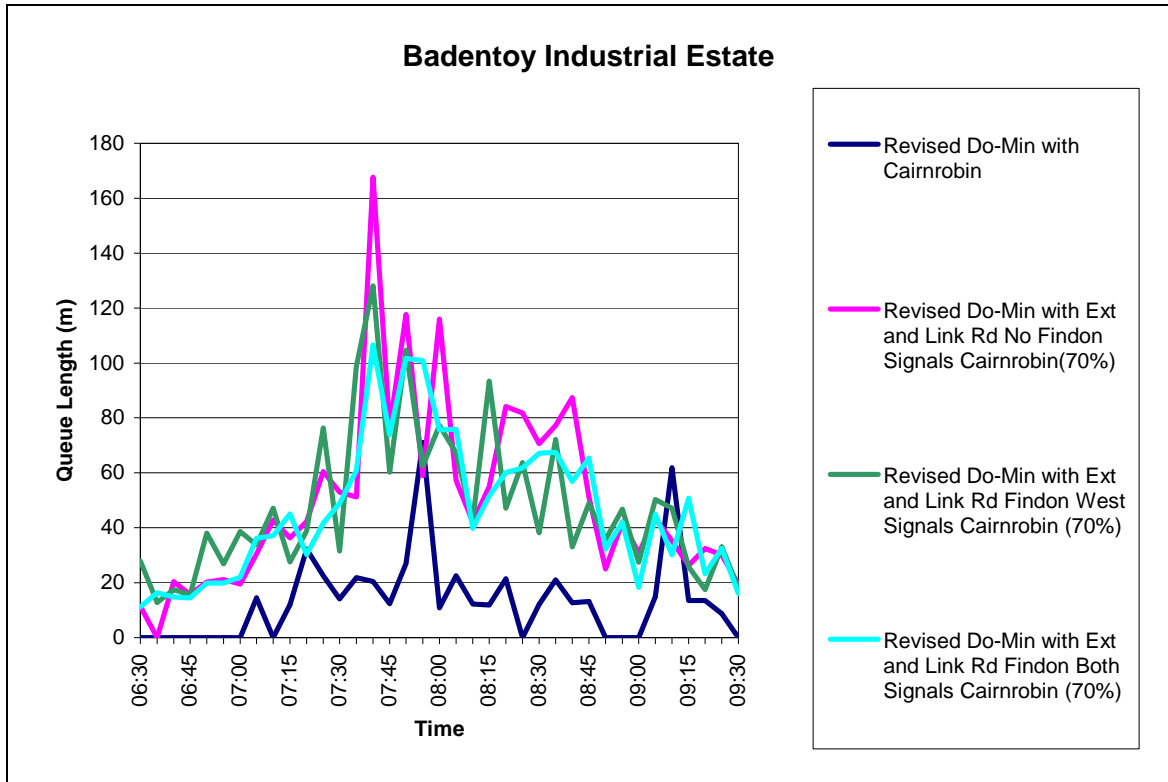


Figure B.5 : Badentoy Industrial Estate approach AM Peak Queue Length Cordon

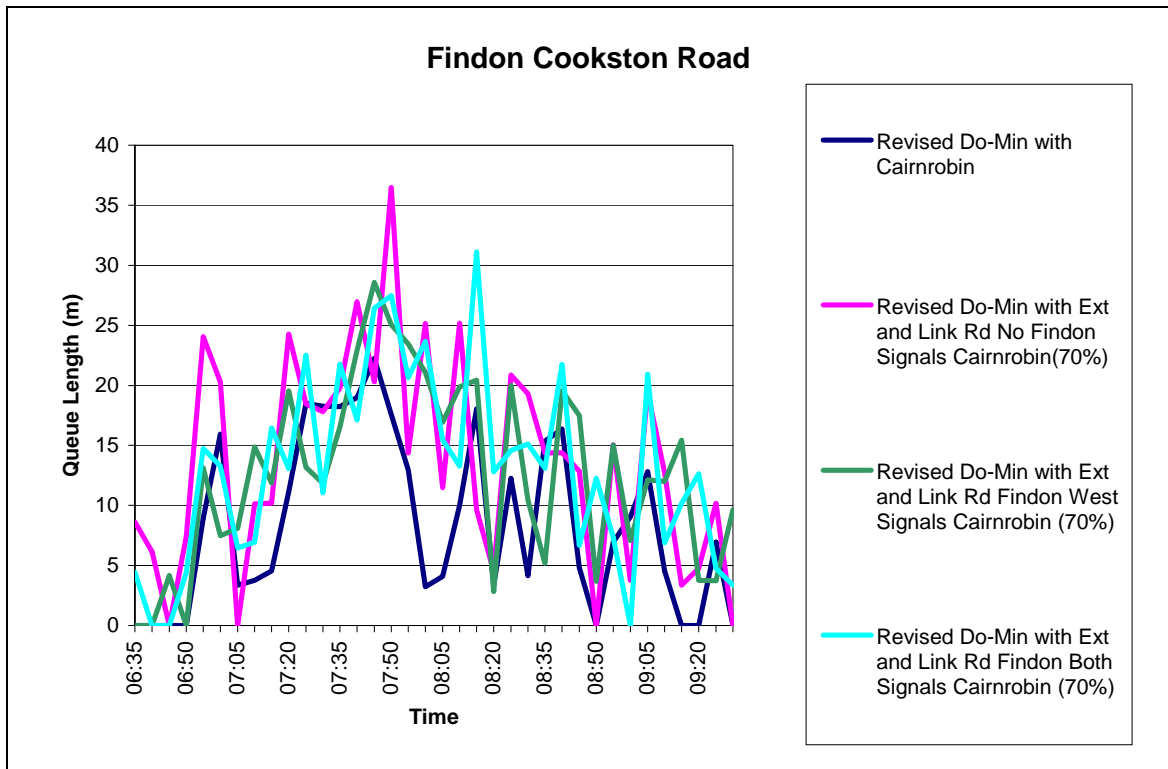


Figure B.6 : Findon Cookston Road AM Peak Queue Length



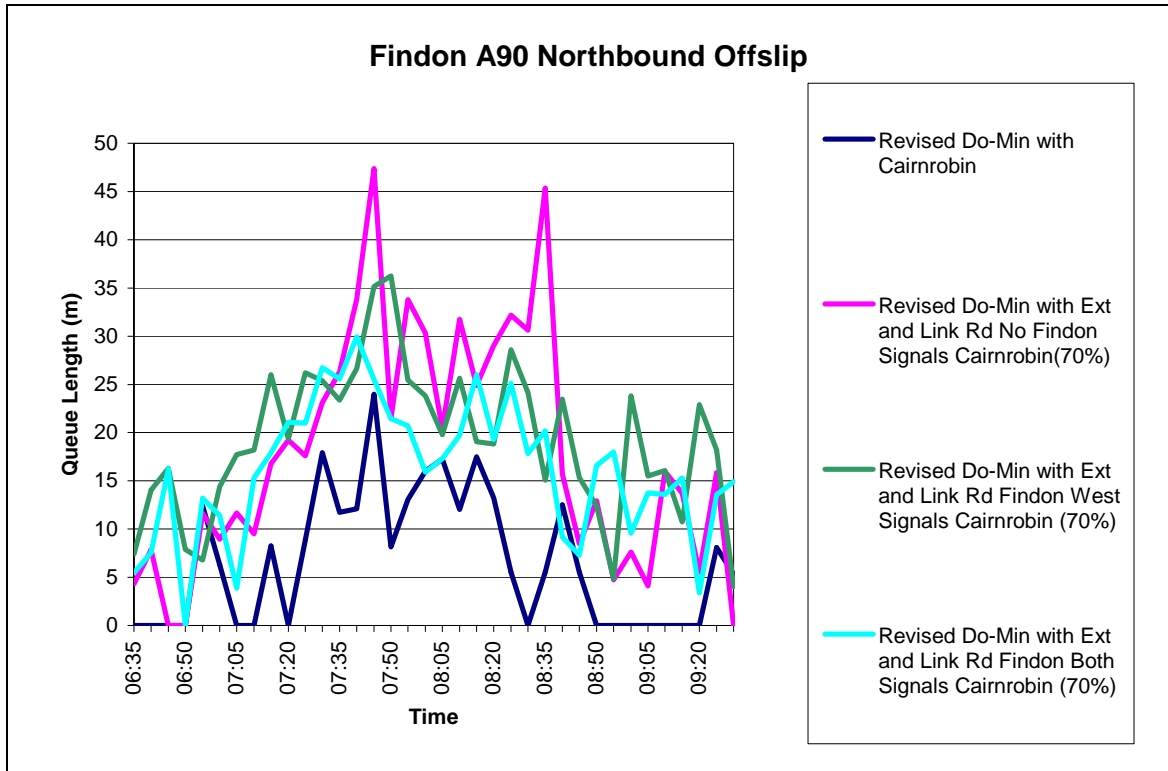


Figure B.7 : Findon A90 Northbound Off Slip AM Peak Queue Length

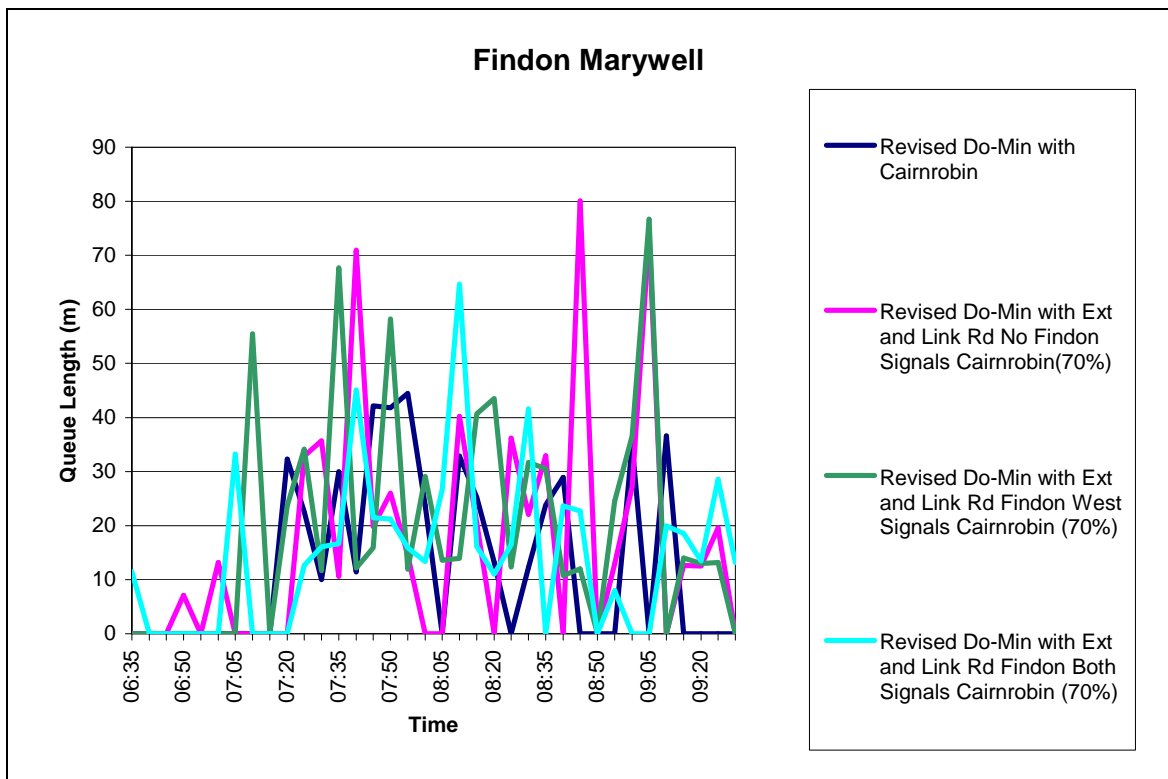


Figure B.8 : Findon Marywell AM Peak Queue Length



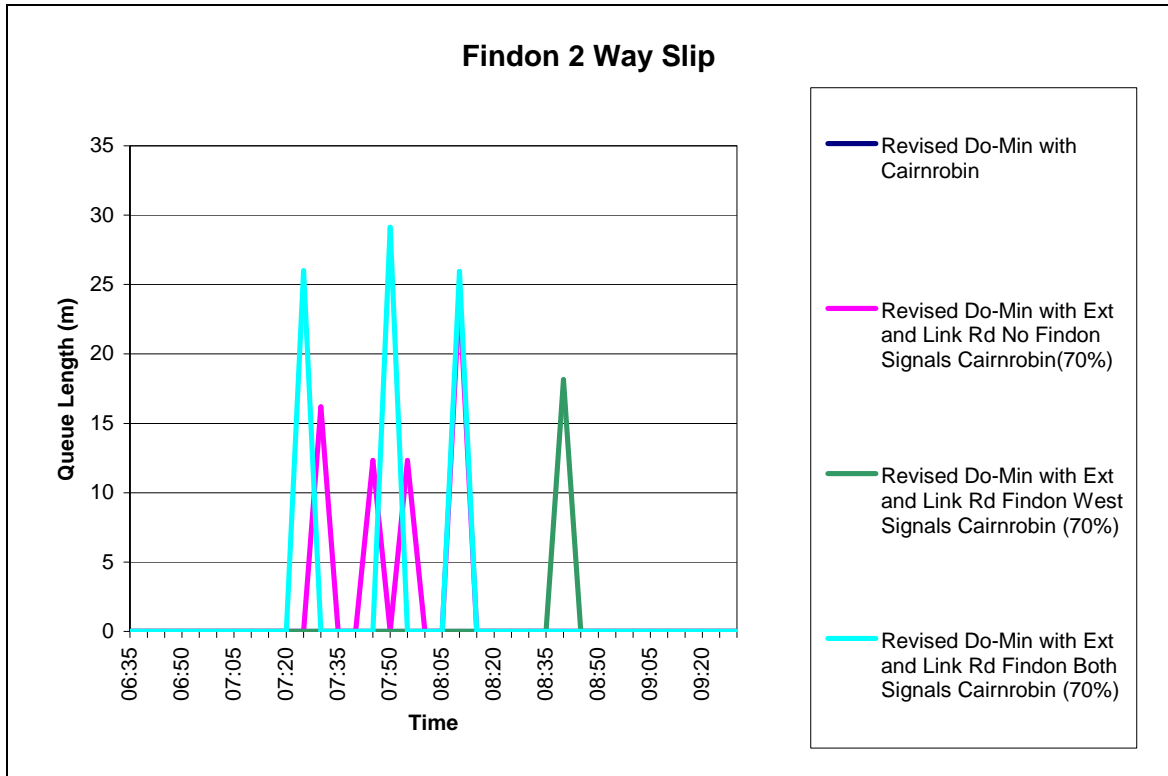


Figure B.9 : Findon 2 way slip AM Peak Queue Length

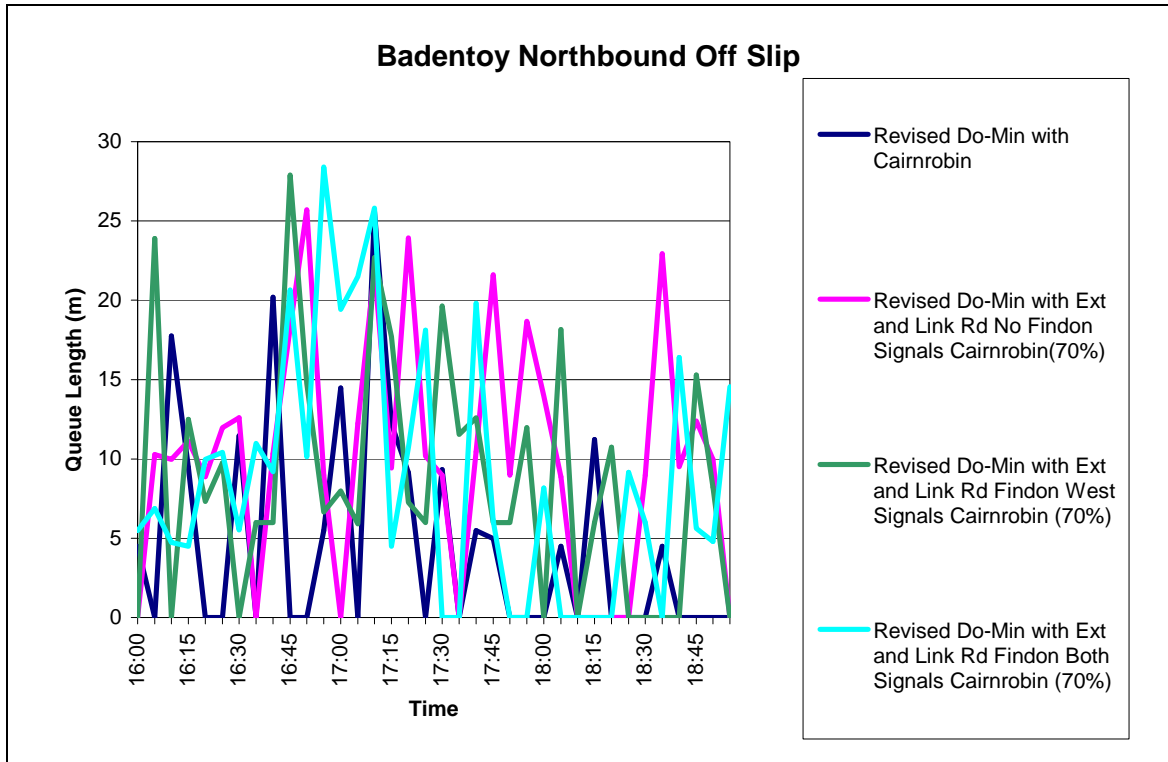


Figure B.10 : Badentoy Northbound Off Slip PM Peak Queue Length



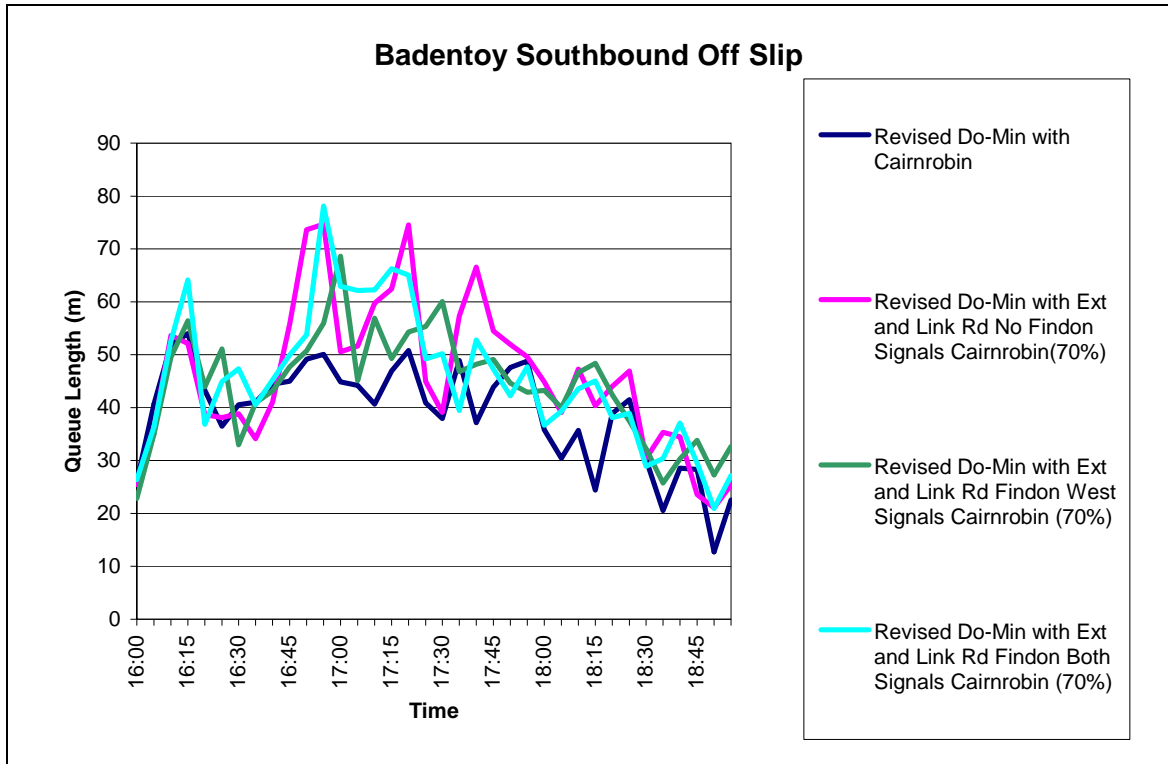


Figure B.11 : Badentoy Southbound Off Slip PM Peak Queue Length

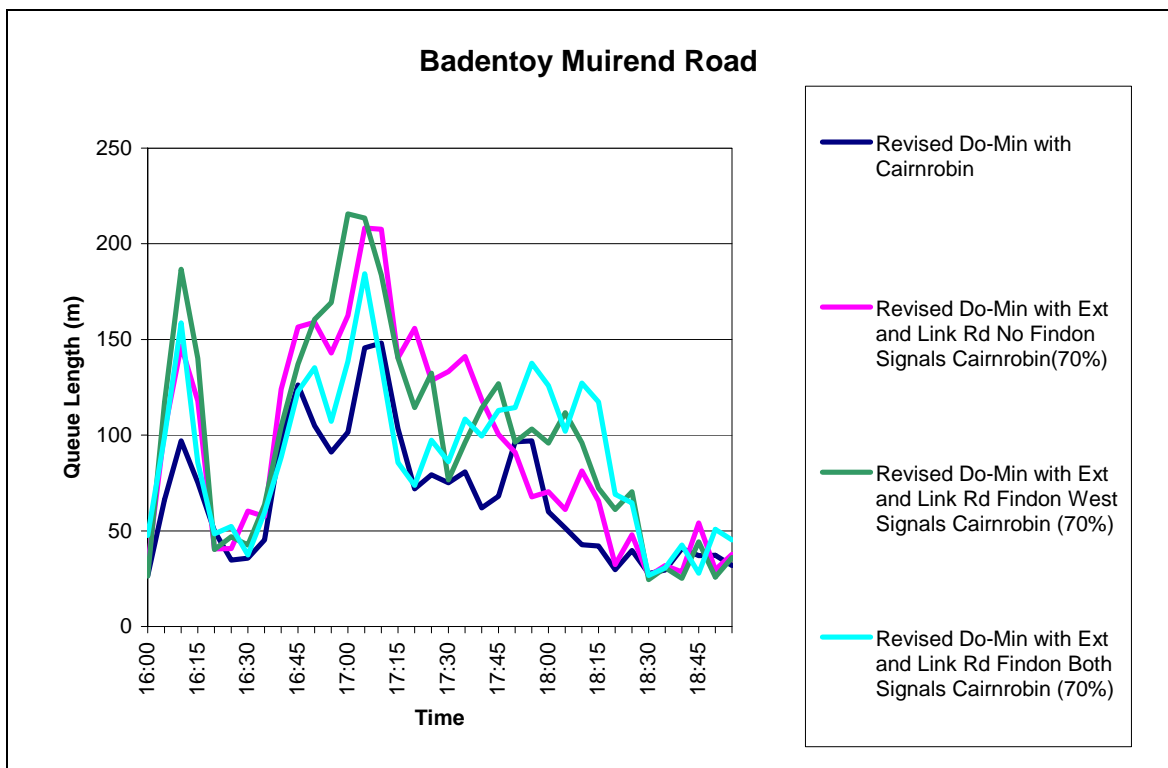


Figure B.12 : Badentoy Muirend Road (South) PM Peak Queue Length



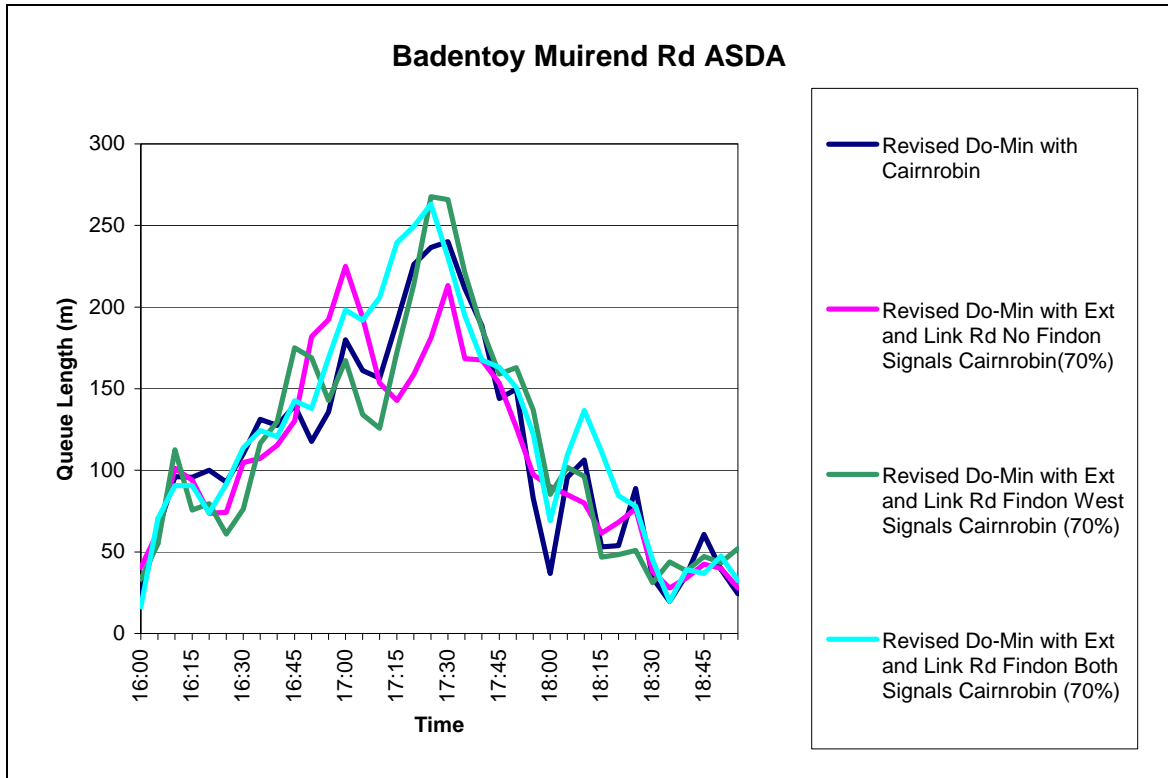


Figure B.13 : Badentoy Muirend Road (ASDA) PM Peak Queue Length

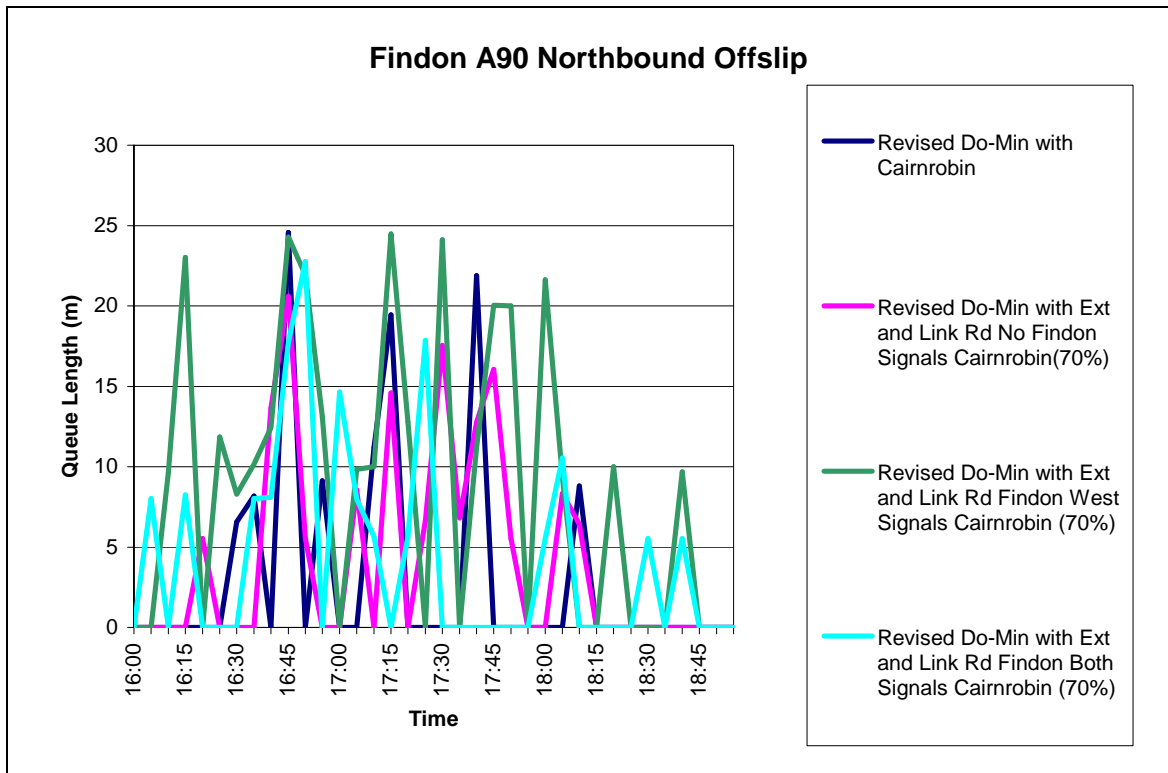


Figure B.14 : Findon Northbound Off Slip PM Peak Queue Length



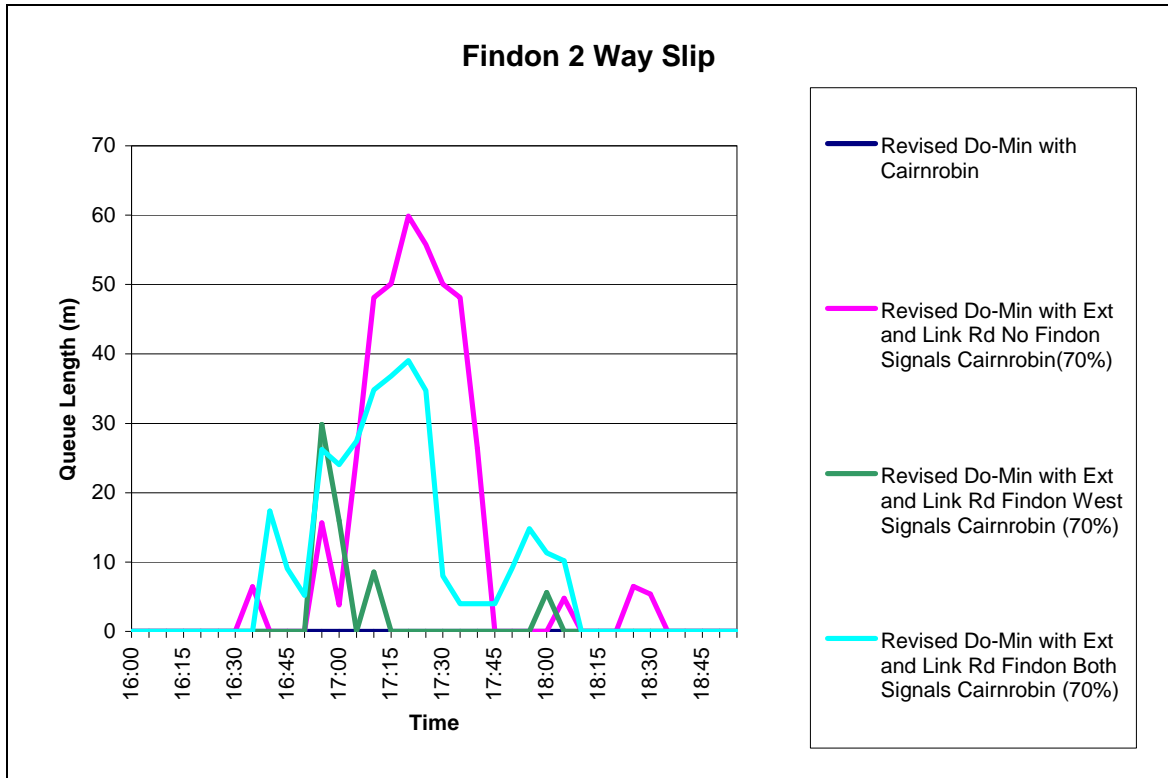


Figure B.15 : Findon 2 Way Slip PM Peak Queue Length

