



Huntingdonshire Strategic Transport Study

Development Scenario Comparative Assessment

30 May 2017

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	17/01/17	Paul Parkhouse	Oliver Hague	Paresh Shingadia	Working Draft
B	03/03/17	Paul Parkhouse	Mike Salter	Paresh Shingadia	First issue
C	06/04/17	Paul Parkhouse	Mike Salter	Paresh Shingadia	Second issue
D	30/05/17	Paul Parkhouse	Mike Salter	Paresh Shingadia	Final

Document reference: 370397 | 2 | D

Information class: Standard

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1 Introduction

1.1 Study Background

Mott MacDonald has been commissioned by Huntingdonshire District Council and Cambridgeshire County Council to provide a transport evidence base for preparation and examination of the Huntingdonshire Local Plan that runs to 2036 (HLP2036). The scope of the study is to:

- Identify and test the transport implications of committed development and four potential development scenarios
- Recommend the most sustainable development scenario in transport terms for delivering the 21,000+ homes required
- Highlight where there are opportunities for increasing the usage of sustainable transport modes
- Identify and cost where amended or additional transport infrastructure is required to mitigate the predicted impacts of each potential development scenario
- Form the basis of a district-wide transport strategy that mitigates the transport implications of the chosen development scenario

1.2 Report Purpose

In accordance with the above study scope, this report provides a summary of the modelling and analysis to assess the highway network implications of the four development scenarios in Huntingdonshire. The document has been prepared to:

- Understand the impact of development in Huntingdonshire on the highway network
- Test the impact of four different growth scenarios in 2036 using CSRM2
- Develop costed mitigation measures to alleviate the impacts
- Retest the growth scenarios with mitigation measures in place
- Recommend a preferred growth scenario, from a transport perspective

Though the potential public transport demands of the potential development sites are considered in this report, the main focus is the impact of each development scenario on the highway network and the potential mitigation required to alleviate that. This approach reflects the findings of the study Baseline Report which shows that, even in the larger market towns in the District where non-car transport provision is relatively good, car remains the dominant mode.

Walking, cycling, and public transport provision will of course be key to maximising development sustainability and the details of this will need to be explored through detailed Transport Assessment work accompanying any planning applications, but there will still likely be significant residual highway demand associated with further growth in the district.

The modelling work undertaken in compiling this report therefore assesses the potential impact of this residual highway demand and considers the order of highway measures which might need to be introduced to mitigate these impacts, so that the Development Scenario which is likely to be the most deliverable on transport grounds can be identified.

1.3 Report Structure

The report is structured as follows:

- Modelling results for the pre-mitigation Development Scenarios are presented and discussed in Section 2
- Potential mitigation measures and outline cost estimates are described in Section 3
- Modelling results for the post-mitigation Development Scenarios are discussed in Section 4
- An assessment of the relative transport merits of each Development Scenario and mitigation package is described in Section 5
- A fifth Development Scenario is proposed, tested and analysed in Section 6
- A summary of the analysis and arising conclusions is provided in Section 7

Supporting information is provided in appendices as follows:

- Appendix A contains the 'HDC Strategic Transport Study Modelling Strategy' note, dated July 2016
- Appendix B contains pre- and post-mitigation scenario journey time impact plots
- Appendix C contains development site traffic flow distribution plots
- Appendix D details mitigation measure cost estimates
- Appendix E shows modelling results for Development Scenarios 1-4 and mitigation package combination
- Appendix F contains all analysis results for Development Scenario 5

2 Pre-Mitigation Modelling Assessment

2.1 Introduction

The purpose of this section is to present the results of the pre-mitigation scenario modelling process.

2.2 Modelling Approach

2.2.1 Modelling Scenarios

The modelling approach by which the assessment of the Development Scenarios has been undertaken is as described in our separate 'HDC Strategic Transport Study Modelling Strategy' note, dated July 2016 and attached for reference in Appendix A. However, in summary, the approach is based on:

- Highway assignment model runs of the CSRM2 model
- Forecast year of 2036
- AM (08:00-09:00) and PM (17:00-18:00) weekday peak hour scenarios

Results for each Development Scenario are compared against an equivalent Core Scenario in order to identify development impact. The different scenarios are described in the modelling strategy note, but are summarised as follows:

- Core Scenario
 - This scenario tests what the traffic flows could look like in 2036 with a core set of sites, including committed development, which amount to 13,166 new dwellings by 2036. This is used as a future baseline against which to compare the four development scenarios. Many of the sites included in this scenario already have planning permission or an SPD and therefore there is an agreed package of mitigation measures for these sites. Full details of the sites included in the core scenario can be found in the Modelling Strategy Note which is included at Appendix A.
- Development Scenario 1 – This scenario includes:
 - Core Scenario sites (13,166 new dwellings)
 - Full build-out of Wyton Airfield (4,550 new dwellings)
 - Intensification of Alconbury Weald (1,500 new dwellings)
 - RAF Alconbury released (1,450 new dwellings)
- Development Scenario 2 – This scenario includes:
 - Core Scenario sites (13,166 new dwellings)
 - Slower build-out of Wyton Airfield (2,880 new dwellings)
 - Intensification of Alconbury Weald (1,500 new dwellings)
 - RAF Alconbury released (1,450 new dwellings)
- Development Scenario 3 – This scenario includes:
 - Core Scenario sites (13,166 new dwellings)
 - Giffords Park (2,200 new dwellings)
 - Riversfield, Little Paxton (240 new dwellings)
 - Intensification of Alconbury Weald (1,500 new dwellings)
 - RAF Alconbury released (1,450 new dwellings)

- Development Scenario 4 – This scenario includes:
 - Core Scenario sites (13,166 new dwellings)
 - Full build-out of Wyton Airfield (4,550 new dwellings)
 - Ermine Street (1,440 new dwellings)
 - Sapley Park Farm (1,300 new dwellings)
 - Lodge Farm (3,820 new dwellings)
 - Intensification of Alconbury Weald (1,500 new dwellings)
 - RAF Alconbury released (1,450 new dwellings)

2.2.2 Network Performance Reporting

As described in the Baseline Report for this study, the whole study area is the area of the District of Huntingdonshire, as shown in Figure 1 below. However, as most of the new development tested by this study is concentrated towards the south eastern side of the district, most of the modelled highway network impacts take place in and around that area. The images which show network impact in this document are therefore zoomed into this smaller area in order to reveal as much detail about the main impacts as possible. It can be assumed that areas not shown on the plans are not predicted to experience significant transport impacts as a result of the development scenarios considered by this study.

Figure 1: Wider study area



2.2.3 Junction Performance Reporting

The following table and figure show the junctions which, with reference to the modelling results and in agreement with the client team, are considered most likely to be affected by the proposed development scenarios. These are the junctions for which performance data is reported throughout this analysis and for which mitigation is considered where shown by the modelling results to be potentially required.

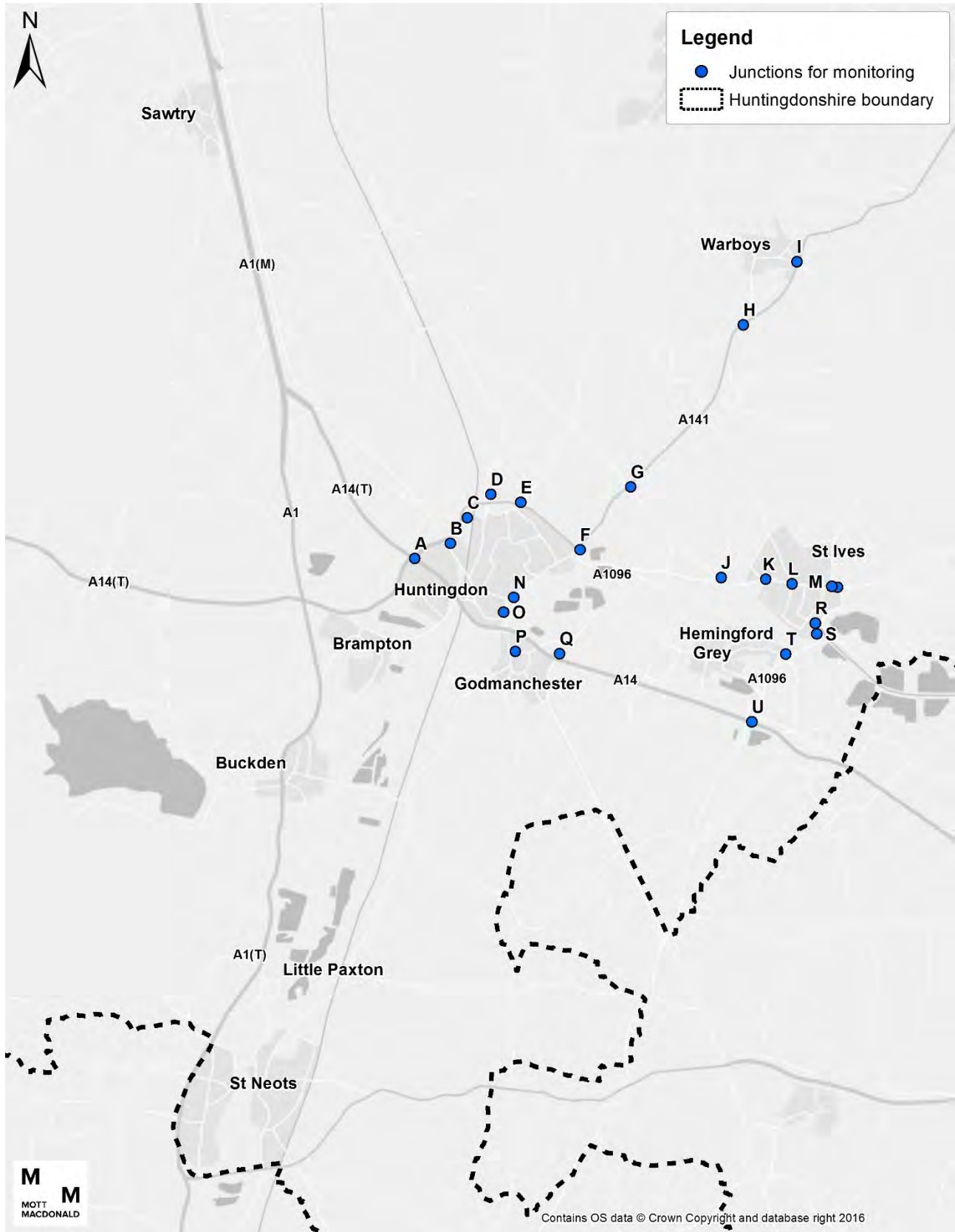
Significant development impact is not anticipated south of the A14, eg in St Neots etc, due to the location of the proposed development sites. Any development of the listed sites would need to be assessed at planning application stage through detailed Transport Assessment work.

Table 1: Key junctions for reporting and potential mitigation

Junction	Map Ref
Spittals Interchange	A
A141/Ermine Street/Stukeley Road	B
A141/Washingley Road/Latham Road	C
A141/ Huntingdon Road/Abbots Ripton Road	D
A141/Kings Ripton Road	E
A141/B1514/A1123	F
A141/B1090 Sawtry Way	G
A141/B1040 Church Road	H
A141/B1040 Fenton Road	I*
A1123 Houghton Hill/B1090 Sawtry Way	J
A1123 Houghton Road/Hill Rise	K
A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	L
A1123 St Audrey Lane/B1040 Somersham Road/A1123/A1096 Harrison Way	M
B1514 Hartford Road/B1514 Nursery Road	N
B1514 Castle Moat Road/The Avenue	O
Post Street/Cambridge Street/Causeway (Godmanchester)	P
B1040/A1198/A14 J24	Q
A1096 Harrison Way/The Quadrant/Meadow Lane	R
A1096 Harrison Way/Guided Busway crossing	S
A1096 Harrison Way/Low Road	T
A1096/A14 J26	U

*Junction I is outside simulated model area, so detailed results not available for this node

Figure 2: Key junctions for reporting and potential mitigation



Source: MM

2.3 Core Scenario Results

As described in Section 2.2.1 above, the Core Scenario tests what traffic flows could look like in 2036 with a core set of sites, including committed development, which amount to 13,166 new dwellings by 2036. This is used as a future baseline against which to compare the four development scenarios.

Pre-mitigation modelling results for this scenario are presented in the following sub-sections.

2.3.1 Core Scenario Network Performance Statistics

The following table summarises the Core Scenario performance at a network-wide level using the following parameters:

- Total PCU¹ trips – this is a measure of the total number of highway trips modelled for each peak hour
- Total veh-km – this is a measure of the total distance travelled by all PCU trips in the modelled peak hour
- Average vehicle travel distance per PCU trip (km) – this is a measure of the average distance travelled by each PCU trip in the modelled peak hour and is calculated by dividing the above total travel distance by the above total number of PCU trips
- Average RFC² for all Huntingdonshire junctions (%) – this is a measure of highway network performance within Huntingdonshire. As noted in the footnote below, RFC stands for 'Ratio of Flow to Capacity' and in this case is a measure of what proportion of the District's total modelled junction capacity is predicted to be taken up by the forecast traffic flow. Since junctions are the primary source of congestion on any highway network, this parameter provides a reliable relative measure of network performance in Huntingdonshire, where an increase in the value would represent a deterioration in performance and a decrease represents an improvement. The absolute value of the parameter is of secondary importance for this purpose. However, absolute RFC values are presented and considered for individual junctions in the junction-level reporting for each scenario.

These same parameters are used for all network-level performance reporting in the relevant sections below.

Table 2: Core Scenario network-level performance statistics

Parameter	AM	PM
Total PCU trips	117,472	125,246
Total veh-km	2,072,215	2,118,589
Avg veh travel distance per PCU trip (km)	17.6	16.9
Avg RFC for all Hunts junctions (%)	30.6	31.2

Source: CSRM2

This shows that, at a network level, there are more trips in the PM period than in the AM period and that, on average, spare junction capacity is correspondingly less.

¹ 'PCU' = 'Passenger Car Unit'. PCUs are an industry-standard unit for measuring traffic flows and provide a consistent way to represent flows of differing vehicle compositions by converting each vehicle type into an equivalent number of passenger cars

² RFC = 'Ratio of Flow to Capacity'. This is a standard measure of junction performance and describes what proportion of traffic flow capacity on each junction arm is taken up by the actual predicted traffic flow. RFC values between over 85% and 100% are considered to be 'over operational capacity' as it is in this range that queuing and delay starts to build up noticeably. RFC values of beyond 100% are considered to be 'over absolute capacity', and significant queuing and delay can be expected under these circumstances.

2.3.2 Core Scenario Local Network Results

For the Core Scenario, Figures 1 and 2 show, for the AM and PM weekday peak periods in 2036 respectively:

- Distribution of traffic flows on the modelled network, shown as 'bandwidths' and colour coded from light blue to dark blue to denote flow levels
- Junctions on the network where at least one arm is operating near or at capacity, where the former is defined by an RFC of between 85% and 100% (shown orange), and the latter by an RFC of over 100% (shown red). All junctions operating within capacity (ie <85% RFC) are not shown.
- The key junctions listed in Table 1 above denoted by black circle outlines.

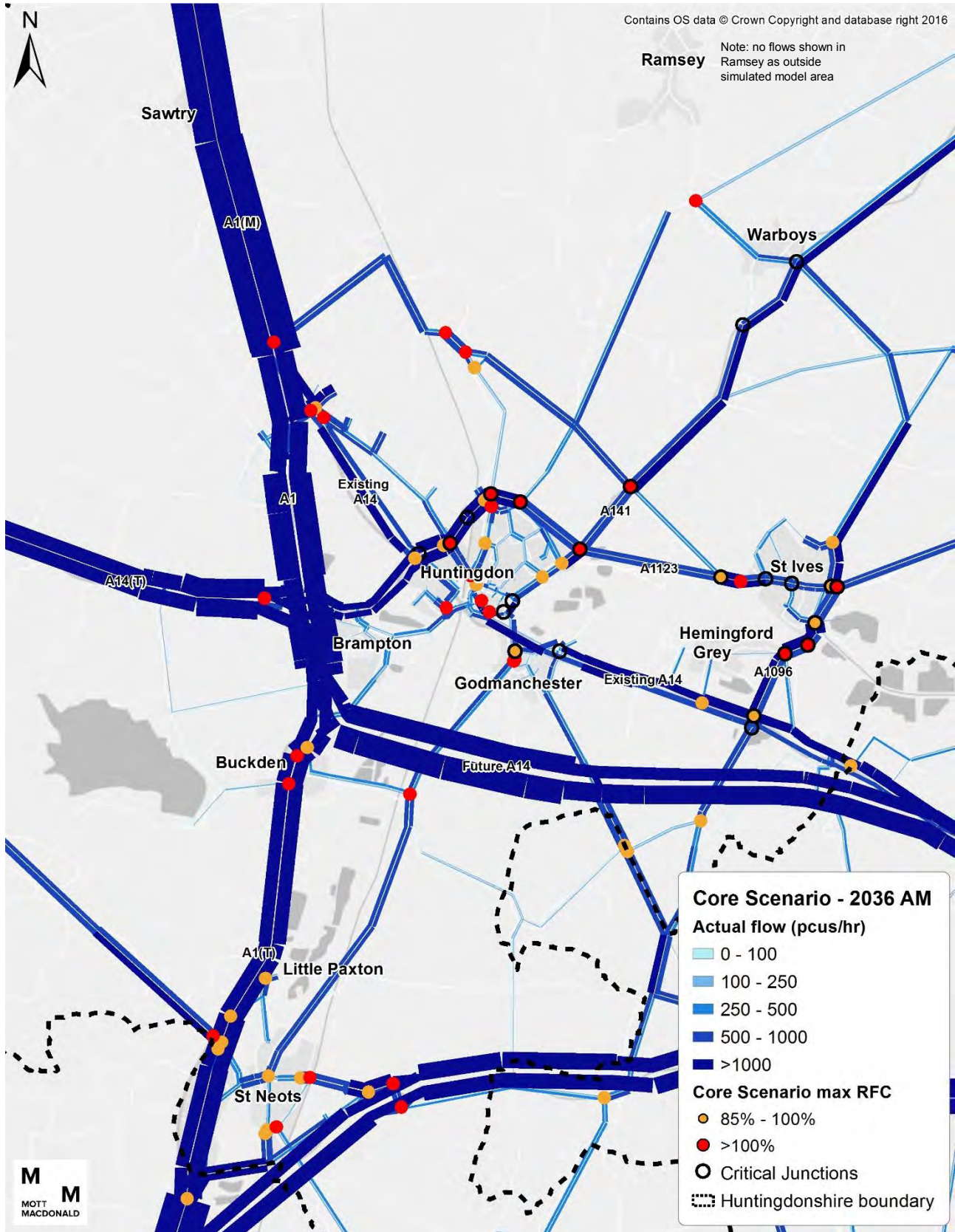
With regard to the AM peak, it is evident that the busiest sections of network in the district are the A1 near Huntingdon and the future A14 westbound, with this new road used much more than the existing A14 route. The A141 west and north of Huntingdon is also particularly busy in both directions, as well as southbound from the north east. In and around St Ives, the A1096 northbound and B1040 southbound are the busiest stretches of highway; whilst the A428 is also busy in both directions to the south and east of St Neots.

In terms of junction capacity in the AM peak, there are six junctions that are over capacity on the A1 and A141 each, as well as a further six in the vicinity of Huntingdon, mainly on the B1514 and existing A14 route. Most delay in St Ives is found on junctions on the A1096, whilst junctions on the A428 and B4128 in St Neots are also chief sources of delay.

With regard to the PM peak, the highest flows can again be seen on the A1 and future A14, with reasonably equal flows in both directions. In addition, the A428 east of St Neots, the existing A14 south east of Huntingdon, and the A141 west of Huntingdon in both directions and northbound north east of Huntingdon, are also particularly busy.

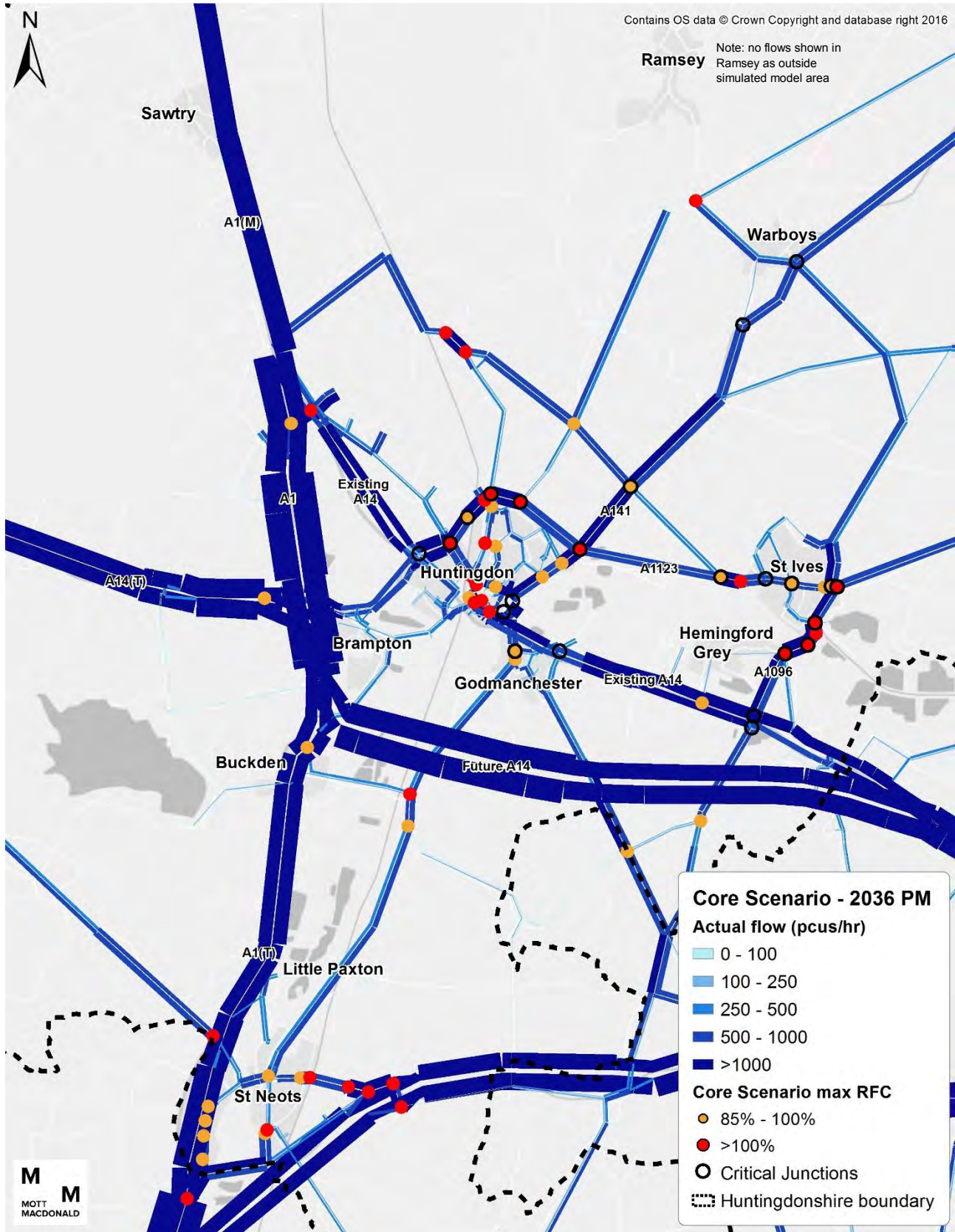
In terms of junction capacity in the PM peak, the number of junctions that are over capacity are slightly more spread out than in the AM peak. There are five junctions on the A141, five on the A1096 in St Ives, four on the A1, six in the vicinity of St Neots and eight close to Huntingdon town centre that are all over capacity.

Figure 3: Core Scenario traffic flows and congested junctions - AM



Source: CSR2

Figure 4: Core Scenario traffic flows and congested junctions - PM



2.3.3 Core Scenario Junction Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction. As noted above, RFC values over 85% indicate a junction approaching capacity which would likely be generating queuing and delays. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

Table 3: Key junction worst-arm RFC performance results for Core Scenario

Map Ref	Junction	Worst-Arm RFC	
		AM	PM
A	Spittals Interchange	76	84
B	A141/Ermine Street/Stukeley Road	109	111
C	A141/Washingley Road/Latham Road	83	85
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116
E	A141/Kings Ripton Road	109	113
F	A141/B1514/A1123	116	114
G	A141/B1090 Sawtry Way	114	96
H	A141/B1040 Church Road	80	54
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93
K	A1123 Houghton Road/Hill Rise	70	60
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123/A1096 Harrison Way	95	88
N	B1514 Hartford Road/B1514 Nursery Road	52	67
O	B1514 Castle Moat Road/The Avenue	65	66
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96
Q	B1040/A1198/A14 J24	50	61
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103
S	A1096 Harrison Way/Guided Busway crossing	103	103
T	A1096 Harrison Way/Low Road	106	112
U	A1096/A14 J26	84	84

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

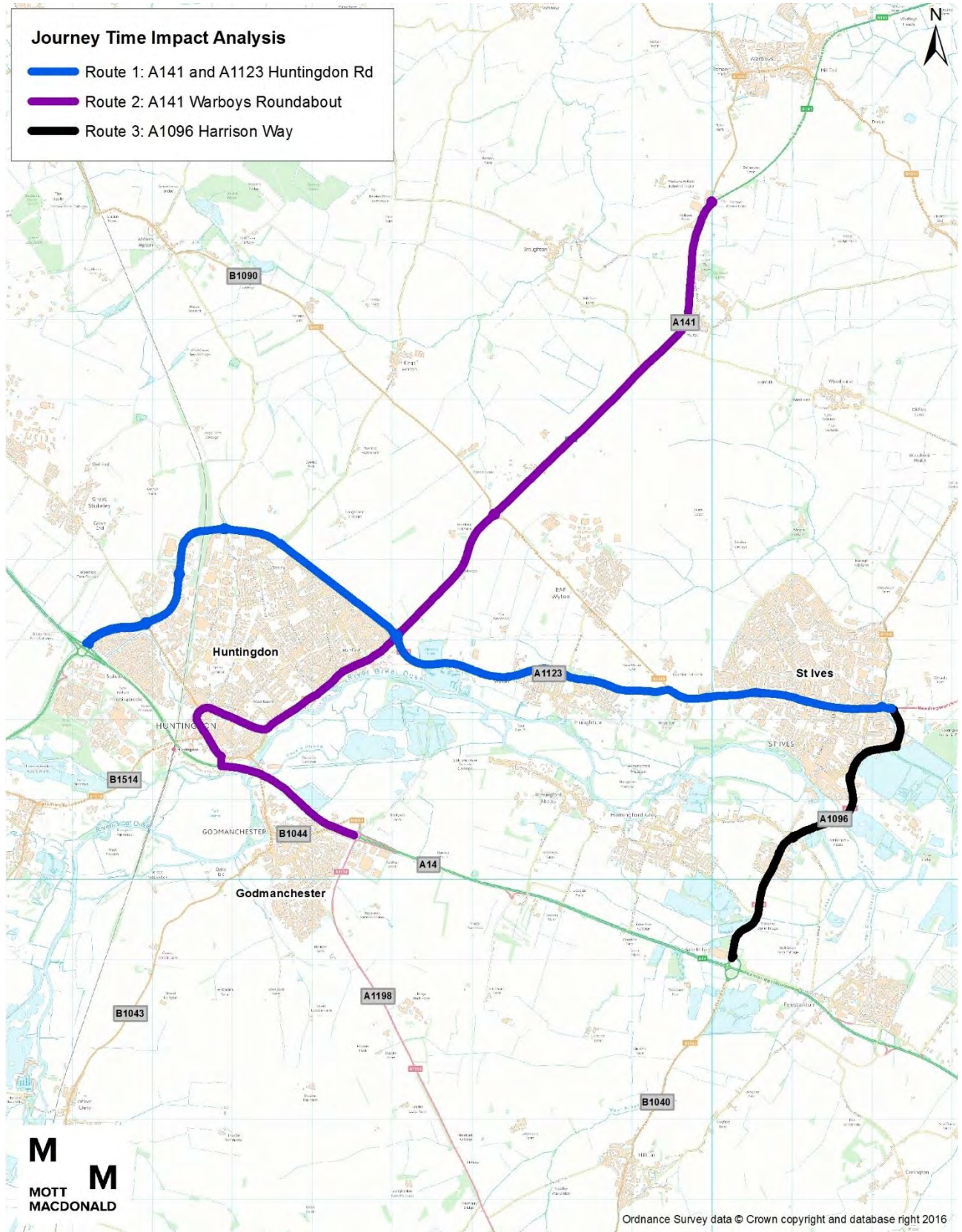
This table shows that of the 22 junctions listed:

- 4 are predicted to operate over operational capacity in the AM and 6 in the PM, of which 3 are over operational capacity in both periods
- 7 are predicted to operate over absolute capacity in the AM and 7 in the PM, of which 6 are over absolute capacity in both periods

2.3.4 Core Scenario Journey Time Results

Journey time analysis has been undertaken for all modelled scenarios over three key routes agreed with the client team. These routes are shown in Figure 5 below.

Figure 5: Routes selected for journey time analysis



The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

Appendix B.1 shows modelled journey times along these routes in both the AM and PM peak hours for the the Core Scenario (labelled as DM) only. These provide the basis for journey time impact assessments for each development scenario below.

The results for the Core Scenario are summarised in the following table which shows, for the AM peak and PM peak, Core Scenario total route journey time for each route and by direction.

Table 4: Core Scenario journey times, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)	
		AM	PM
A141 & A1123	EB	26:16	34:29
	WB	36:24	35:12
A141 Warboys Rbt	SB	32:29	24:30
	NB	22:06	30:21
Harrison Way	SB	20:10	15:33
	NB	09:25	15:05

Source: CSRM2

It can be seen from this data that:

- The routes are all tidal in nature, with one direction being slower than the other in one peak and then the opposite result in the other peak
- The most significant tidality is seen on the Harrison Way route in the AM peak, where southbound journey times towards the A14 are over double northbound journey times
- Despite the tidality, PM peak journey times are generally greater overall than in the AM, suggesting greater congestion levels during that period

2.4 Development Scenario 1 Results

As described in Section 2.2.1 above, Development Scenario 1 comprises the Core Scenario plus:

- Full build-out of Wyton Airfield (4,550 new dwellings)
- Intensification of Alconbury Weald (1,500 new dwellings)
- RAF Alconbury released (1,450 new dwellings)

Pre-mitigation modelling results for this scenario are presented in the following sub-sections.

2.4.1 Scenario 1 Network Performance Statistics

The following table summarises the Scenario 1 performance at a network-wide level and compares this with the Core Scenario result.

Table 5: Scenario 1 network-level performance statistics and change from Core Scenario

Parameter	Scenario 1 Results		% Change from Core Scenario	
	AM	PM	AM	PM
Total PCU trips	119,379	127,444	+1.6%	+1.8%
Total veh-km	2,085,238	2,134,572	+0.6%	+0.8%
Avg veh travel distance per PCU trip (km)	17.5	16.7	-1.0%	-1.0%
Avg RFC for all Hunts junctions (%)	31.1	32.7	+1.8%	+4.8%

Source: CSRM2

The table shows an average RFC value for all junctions in Huntingdonshire and is included to provide an indication of overall network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made. It is recognised that an average can mask individual junction performance. For this reason, changes in individual junction performance are also considered in subsequent tables.

The table shows that, at a network level, Scenario 1 results in a 1.8% to 4.8% increase in the average RFC of all Huntingdonshire junctions compared to the Core Scenario, which indicates an overall deterioration in network performance, but shortens average journey lengths by -1%. This shortening is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

2.4.2 Scenario 1 Local Network Impact Results

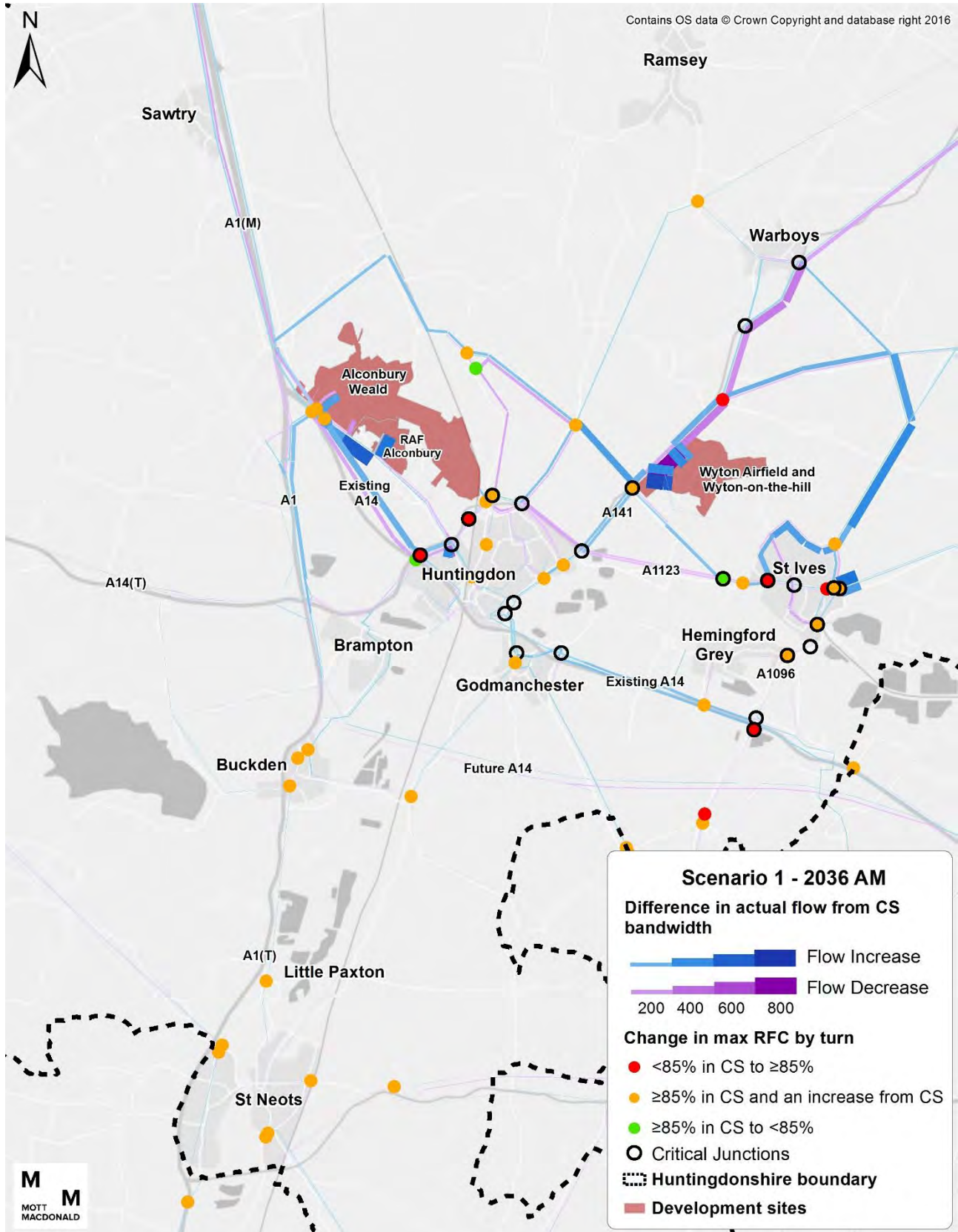
For Development Scenario 1, the following two figures show, for the AM and PM weekday peak periods:

- Potential development sites which are additional to the Core Scenario
- Change in traffic flows compared to the equivalent Core Scenario, shown as 'bandwidths'
- Significant changes in junction performance compared to the equivalent Core Scenario
- The key junctions listed in Table 1 above denoted by black circle outlines

The changes in traffic flows are a function of the distribution of development-generated flows which have been added to the network. For reference, these flows are shown for each development site in Appendix C.1.

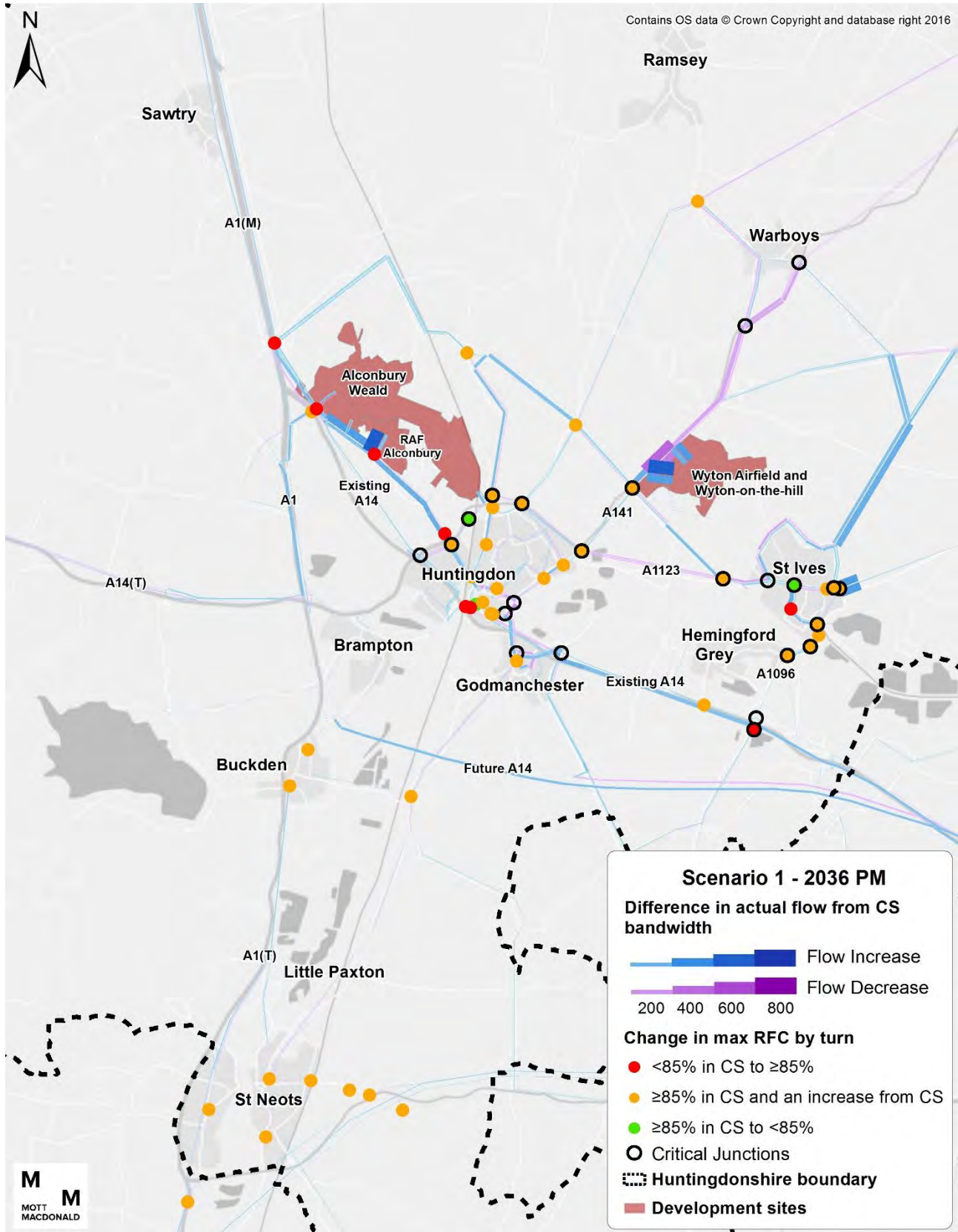
In some cases the model results shown may not necessarily align with what might initially be expected. This is not unusual in a dynamic model where traffic flows are not just additive, and complex traffic re-routing and other demand responses can occur.

Figure 6: Scenario 1 change in traffic flows and junction performance vs Core Scenario – AM



Source: CSRM2

Figure 7: Scenario 1 change in traffic flows and junction performance vs Core Scenario – PM



With regard to the AM peak, the key flow increases in comparison to the Core Scenario are seen on:

- the A14(T) to A1(M) spur southbound north of Huntingdon, on A1 southbound south of Alconbury, and on the A141 north west of Huntingdon – this is primarily related to increased demand associated with additional development at Alconbury Weald and at RAF Alconbury
- the B1040 southbound north of St Ives and on Marley Road and Hill Rise in St Ives – this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to St Ives via the B1040 as an alternative to the more congested A141, together with the displacement of background traffic
- the B1090 (Kings Ripton to A141) – there is some increased traffic, in part due to development at Wyton Airfield and in part due to existing traffic seeking to bypass the A141 and A1123

There are some minor decreases in flow on:

- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with Wyton Airfield and St Ives appears to displace some existing traffic onto the old A14 which uses this as an alternative route to access destinations within Huntingdon
- the A141 north of Warboys – longer distance traffic from beyond Warboys appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for southbound movements
- the A1(M) southbound suggesting there may be some minor, insignificant, strategic diversions of longer distance traffic out of the corridor due to increased development-related traffic

The actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development traffic does travel along this corridor but this results in existing traffic being displaced due to queuing at upstream junctions, or making other demand responses such as retiming the journey.

In terms of junction capacity in the AM peak, there are seven junctions which go from being within-capacity to being over-capacity, with three of these being on the A141. There are also three junctions which improve in performance, with one of these being located close to or on the existing A14.

With regard to the PM peak, the greatest flow increases can be seen on:

- the existing A14 northbound, both north and south of Huntingdon – north of Huntingdon this is primarily due to traffic associated with development at Alconbury, whereas south of Huntingdon this appears to be traffic displaced from the parallel A1123 due to increased development-related traffic on that route
- the B1040 north of St Ives – this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to/from St Ives via the B1040 as an alternative to the more congested A141, together with the displacement of background traffic

There are some minor flow decreases on:

- the A141 north of Wyton – longer distance traffic to Warboys and beyond appears to be seeking to avoid the A141 due to increased development-related traffic and to be using other northbound routes instead
- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with Wyton Airfield and St Ives appears to displace some existing traffic onto the old A14 which uses this as an alternative route to access destinations within Huntingdon.

As noted above for the AM peak, the actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development traffic does travel along this corridor but this results in existing traffic being displaced, due to queuing at upstream junctions, or making other demand responses such as retiming the journey.

In terms of junction capacity in the PM peak, there are eight junctions which go from being within-capacity to being over-capacity. Just two junctions perform better: one in Huntingdon and one in St Ives.

2.4.3 Scenario 1 Junction Impact Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in Scenario 1. The equivalent results for the Core Scenario are shown for reference. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions there can be a net reduction in the RFC, even though there are greater traffic flows on the network overall due to development-related traffic. This is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can, in turn, result in improvements in junction performance elsewhere due to the balance of flows at those junctions changing.

Table 6: Key junction worst-arm RFC performance results for Scenario 1

Map Ref	Junction	Core Scenario		Scenario 1	
		AM	PM	AM	PM
A	Spittals Interchange	76	84	91	78
B	A141/Ermine Street/Stukeley Road	109	111	108	116
C	A141/Washingley Road/Latham Road	83	85	87	81
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	115	126
E	A141/Kings Ripton Road	109	113	103	117
F	A141/B1514/A1123	116	114	109	116
G	A141/B1090 Sawtry Way	114	96	147	113
H	A141/B1040 Church Road	80	54	52	44
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93	81	106
K	A1123 Houghton Road/Hill Rise	70	60	94	64
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	83	77
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	100	98
N	B1514 Hartford Road/B1514 Nursery Road	52	67	56	62
O	B1514 Castle Moat Road/The Avenue	65	66	66	66
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96	93	88
Q	B1040/A1198/A14 J24	50	61	47	63
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	92	104
S	A1096 Harrison Way/Guided Busway crossing	103	103	100	106
T	A1096 Harrison Way/Low Road	106	112	106	120
U	A1096/A14 J26	84	84	87	94

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

As agreed with the client team, mitigation is recommended for consideration at any junction meeting the following conditions within each time period:

- Junctions with a maximum RFC of under 85% in the Core Scenario but a maximum RFC of more than or equal to 85% in Scenario 1

- Junctions with a maximum RFC of more than or equal to 85% in the Core Scenario but a maximum RFC in Scenario 1 which is higher still

Of the 22 junctions listed, the above table shows that Scenario 1 results in a performance deterioration requiring potential mitigation for 15 of them.

2.4.4 Scenario 1 Journey Time Impact Results

Appendix B.2 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 1 (Ref)

It also shows results for post-mitigation packages applied to this scenario, but these are reported on in the post-mitigation section below.

As noted above, the selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following table which shows, for the AM peak and PM peak:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for the pre-mitigation Scenario 1

These tables therefore provide a ready indication of how the added development flows of Scenario 1 affect Core Scenario journey times over these key routes.

Table 7: Change in journey time from Core Scenario, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)		Change in Journey Time from CS (MM:SS)	
		AM	PM	AM	PM
A141 & A1123	EB	26:16	34:29	+02:03	+04:12
	WB	36:24	35:12	+02:01	+03:52
A141 Warboys Rbt	SB	32:29	24:30	+14:03	+12:44
	NB	22:06	30:21	+01:20	+07:12
Harrison Way	SB	20:10	15:33	-00:09	+02:35
	NB	09:25	15:05	-00:36	+01:49
Net change from CS		-	-	+18:41	+32:25

Source: CSRM2

This data shows:

- Little journey time impact in the AM peak, except on the A141 Warboys Rbt route in the southbound direction. The chart in the appendix shows that most of this delay occurs on the approach to the A141 / B1090 junction, which is predicted to be heavily affected by the Wyton development
- Greater impact in the PM peak but, again, the greatest impact being on the A141 Warboys Rbt route in the southbound direction due to the Wyton development

2.5 Development Scenario 2 Results

As described in Section 2.2.1 above, Development Scenario 2 comprises the Core Scenario plus:

- Slower build-out of Wyton Airfield (2,880 new dwellings)
- Intensification of Alconbury Weald (1,500 new dwellings)
- RAF Alconbury released (1,450 new dwellings)

Pre-mitigation modelling results for this scenario are presented in the following sub-sections.

2.5.1 Scenario 2 Network Performance Statistics

The following table summarises the Scenario 2 performance at a network-wide level and compares this with the Core Scenario results.

Table 8: Scenario 2 network-level performance statistics and change from Core Scenario

Parameter	Scenario 2 Results		% Change from Core Scenario	
	AM	PM	AM	PM
Total PCU trips	119,077	127,049	+1.4%	+1.4%
Total veh-km	2,083,128	2,131,024	+0.5%	+0.6%
Avg veh travel distance per PCU trip (km)	17.5	16.8	-0.8%	-0.8%
Avg RFC for all Hunts junctions (%)	31.1	32.5	+1.6%	+4.1%

Source: CSR2

The table shows an average RFC value which is an average across all junctions in Huntingdonshire and is included to provide an indication of overall network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made. It is recognised that an average can mask individual junction performance. For this reason, changes in individual junction performance are also considered in subsequent tables.

The table shows that, at a network level, Scenario 2 results in a 1.6% to 4.1% increase in the average RFC of all Huntingdonshire junctions compared to the Core Scenario, which indicates an overall deterioration in network performance, but shortens average journey lengths by -0.8%. This shortening is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

2.5.2 Scenario 2 Local Network Impact Results

For Development Scenario 2, the following two figures show, for the AM and PM weekday peak periods respectively:

- Potential development sites which are additional to the Core Scenario
- Change in traffic flows compared to the equivalent Core Scenario, shown as 'bandwidths'
- Change in junction performance compared to the equivalent Core Scenario
- The key junctions listed in Table 1 above denoted by black circle outlines

The change in traffic flows are a function of the distribution of development-generated flows which have been added to the network. For reference, these flows are shown for each development site in Appendix C.2.

In some cases the model results shown may not necessarily align with what might initially be expected. This is not unusual in a dynamic model where traffic flows are not just additive, and complex traffic re-routing and other demand responses can occur.

Figure 8: Scenario 2 change in traffic flows and junction performance vs Core Scenario – AM

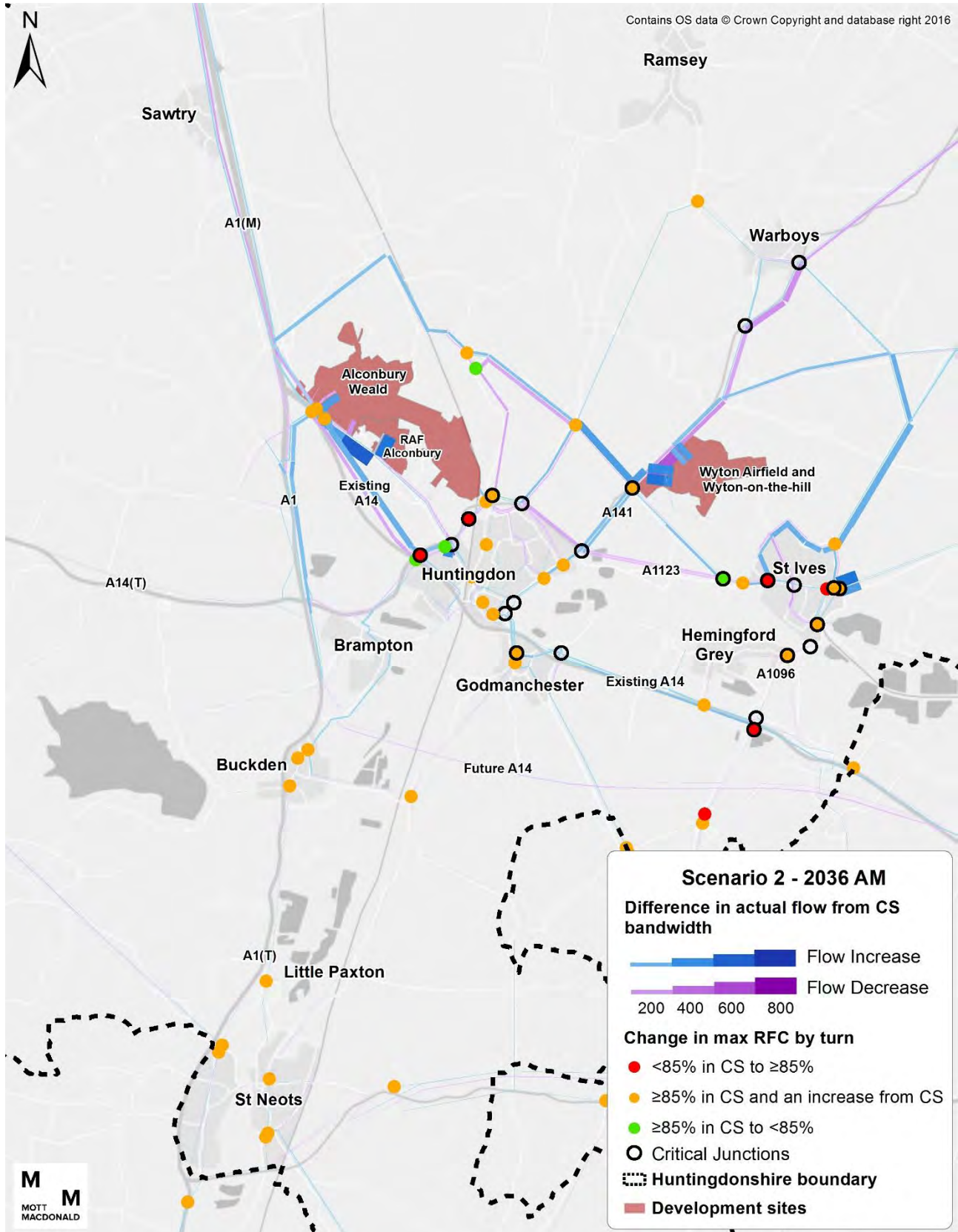
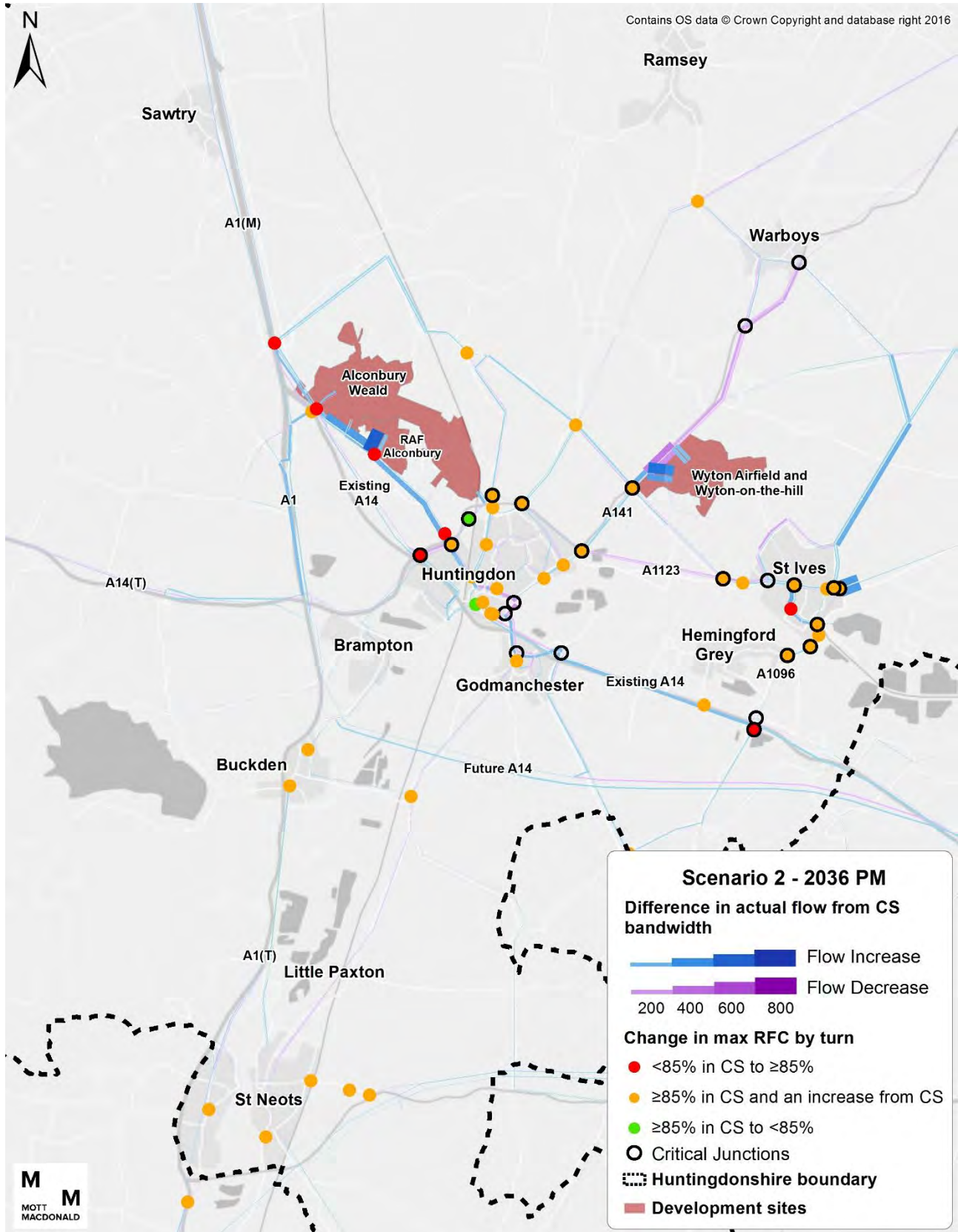


Figure 9: Scenario 2 change in traffic flows and junction performance vs Core Scenario – PM



Source: CSRM2

With regard to the AM peak, the key flow increases in comparison to the Core Scenario are seen on:

- the A14(T) to A1(M) spur southbound north of Huntingdon, on A1 southbound south of Alconbury, and on the A141 north west of Huntingdon – this is primarily related to increased demand associated with additional development at Alconbury Weald and at RAF Alconbury
- on the B1040 southbound north of St Ives and on Marley Road and Hill Rise in St Ives – this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to St Ives via the B1040 as an alternative to the more congested A141, together with the displacement of background traffic
- the B1090 (Kings Ripton to A141) – there is some increased traffic, in part due to development at Wyton Airfield and in part due to existing traffic seeking to bypass the A141 and A1123

There are some minor decreases in flow on:

- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with Wyton Airfield and St Ives appears to displace some existing traffic onto the old A14 which uses this as an alternative route to access destinations within Huntingdon
- the A141 north of Warboys - longer distance traffic from beyond Warboys appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for southbound movements
- the A1(M) southbound suggesting there may be some minor, insignificant, strategic diversions of longer distance traffic out of the corridor due to increased development-related traffic

The actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development traffic does travel along this corridor but this results in existing traffic, being displaced, experiencing queuing at upstream junctions, or making other demand responses such as retiming the journey.

In terms of junction capacity in the AM peak, six junctions go from being within-capacity to being over-capacity in Scenario 2, with two of these located close to Huntingdon and two close to St Ives. There are also four junctions whose capacity improves, with two of these being on the A141 near Huntingdon, one on the A1096 near St Ives and one on the B1090 Abbots Ripton Road junction.

With regard to the PM peak, the greatest flow increases can be seen on:

- the existing A14 northbound, both north and south of Huntingdon – north of Huntingdon this is primarily due to traffic associated with development at Alconbury, whereas south of Huntingdon this appears to primarily be traffic displaced from the parallel A1123 due to increased development-related traffic on that route
- the B1040 north of St Ives - this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to/from St Ives via the B1040 as an alternative to the more congested A141, together with the displacement of background traffic

There are some minor flow decreases on:

- the A141 north of Wyton – longer distance traffic to Warboys and beyond appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for northbound movements
- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with Wyton Airfield and St Ives appears to displace some existing traffic onto the old A14 which uses this as an alternative route to access destinations within Huntingdon.

As noted above for the AM peak, the actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development

traffic does travel along this corridor but this results in existing traffic, being displaced, experiencing queuing at upstream junctions, or making other demand responses such as retiming the journey.

In terms of junction capacity in the PM peak, there are seven junctions which go from being within-capacity to being over-capacity in Scenario 2. There are also two junctions operating at improved capacity, both being located in and around Huntingdon.

2.5.3 Scenario 2 Junction Impact Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in Scenario 2. The equivalent results for the Core Scenario are shown for reference. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

At some junctions there can be a net reduction in the RFC, even though there are greater traffic flows on the network overall due to development-related traffic. This is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can, in turn, result in improvements in junction performance elsewhere due to the balance of flows at those junctions changing.

Table 9: Key junction worst-arm RFC performance results for Scenario 2

Map Ref	Junction	Core Scenario		Scenario 2	
		AM	PM	AM	PM
A	Spittals Interchange	76	84	94	85
B	A141/Ermine Street/Stukeley Road	109	111	108	116
C	A141/Washingley Road/Latham Road	83	85	87	82
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	115	125
E	A141/Kings Ripton Road	109	113	102	114
F	A141/B1514/A1123	116	114	109	116
G	A141/B1090 Sawtry Way	114	96	140	112
H	A141/B1040 Church Road	80	54	60	46
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93	74	101
K	A1123 Houghton Road/Hill Rise	70	60	86	58
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	67	99
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	100	98
N	B1514 Hartford Road/B1514 Nursery Road	52	67	55	63
O	B1514 Castle Moat Road/The Avenue	65	66	66	69
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96	95	87
Q	B1040/A1198/A14 J24	50	61	48	61
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	93	104
S	A1096 Harrison Way/Guided Busway crossing	103	103	101	104
T	A1096 Harrison Way/Low Road	106	112	106	119
U	A1096/A14 J26	84	84	87	91
Average		88	90	90	93

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

As agreed with the client team, mitigation is recommended for consideration at any junction meeting the following conditions within each time period:

- Junctions with a maximum RFC of under 85% in the Core Scenario but a maximum RFC of more than or equal to 85% in Scenario 2
- Junctions with a maximum RFC of more than or equal to 85% in the Core Scenario but a maximum RFC in Scenario 2 which is higher still

Of the 22 junctions listed, the above table shows that Scenario 2 results in a performance deterioration requiring potential mitigation for 17 of them.

2.5.4 Scenario 2 Journey Time Impact Results

Appendix B.3 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 2 (Ref)

It also shows results for post-mitigation packages applied to this scenario, but these are reported on in the post-mitigation section below.

As noted above, the selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following table which shows, for the AM peak and PM peak:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for the pre-mitigation Scenario 2

These tables therefore provide a ready indication of how the added development flows of Scenario 2 affect Core Scenario journey times over these key routes.

Table 10: Change in journey time from Core Scenario, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)		Change in Journey Time from CS (MM:SS)	
		AM	PM	AM	PM
A141 & A1123	EB	26:16	34:29	+02:14	+04:36
	WB	36:24	35:12	+01:30	+09:52
A141 Warboys Rbt	SB	32:29	24:30	+10:13	+10:28
	NB	22:06	30:21	+01:06	+04:59
Harrison Way	SB	20:10	15:33	-00:13	+02:11
	NB	09:25	15:05	-00:28	+01:17
Net change from CS		-	-	+14:22	+33:23

Source: CSRM2

This data shows:

- Little journey time impact in the AM peak, except on the A141 Warboys Rbt route in the southbound direction. As for Scenario 1, the chart in the appendix shows that most of this delay occurs on the

approach to the A141 / B1090 junction, which is predicted to be heavily affected by the Wyton development

- Greater impact in the PM peak, with the greatest impact being on the A141 Warboys Rbt route in the southbound direction, and also on the A141/A1123 route in the westbound direction at the junction of the A1123 and B1090, both due to the Wyton development

2.6 Development Scenario 3 Results

As described in Section 2.2.1 above, Development Scenario 3 comprises the Core Scenario plus:

- Giffords Park (2,200 new dwellings)
- Riversfield, Little Paxton (240 new dwellings)
- Intensification of Alconbury Weald (1,500 new dwellings)
- RAF Alconbury released (1,450 new dwellings)

Pre-mitigation modelling results for this scenario are presented in the following sub-sections.

2.6.1 Scenario 3 Network Performance Statistics

The following table summarises the Scenario 3 performance at a network-wide level and compares this with the Core Scenario result.

Table 11: Scenario 3 network-level performance statistics and change from Core Scenario

Parameter	Scenario 3 Results		% Change from Core Scenario	
	AM	PM	AM	PM
Total PCU trips	118,745	126,858	+1.1%	+1.3%
Total veh-km	2,080,015	2,129,340	+0.4%	+0.5%
Avg veh travel distance per PCU trip (km)	17.5	16.8	-0.7%	-0.8%
Avg RFC for all Hunts junctions (%)	31.0	31.2	+1.4%	+3.3%

Source: CSRM2

The table shows an average RFC value which is an average across all junctions in Huntingdonshire and is included to provide an indication of overall network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made. It is recognised that an average can mask individual junction performance. For this reason, changes in individual junction performance are also considered in subsequent tables.

The table shows that, at a network level, Scenario 3 results in a 1.4% to 3.3% increase in the average RFC of all Huntingdonshire junctions compared to the Core Scenario, which indicates an overall deterioration in network performance, but shortens average journey lengths by -0.7% to -0.8%. This shortening is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

2.6.2 Scenario 3 Local Network Impact Results

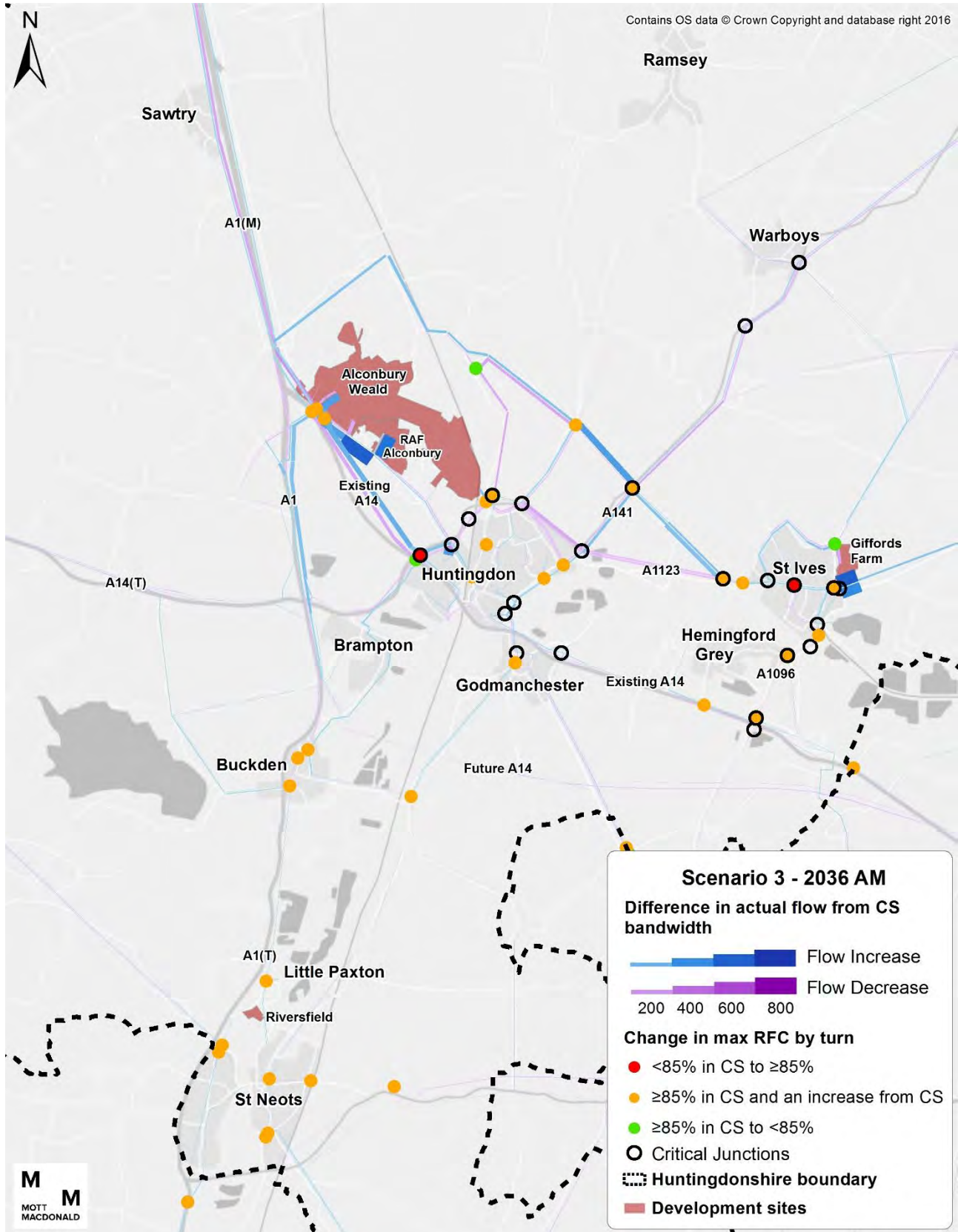
For Development Scenario 3, the following two figures show, for the AM and PM weekday peak periods respectively:

- Potential development sites which are additional to the Core Scenario
- Change in traffic flows compared to the equivalent Core Scenario, shown as 'bandwidths'
- Change in junction performance compared to the equivalent Core Scenario
- The key junctions listed in Table 1 above denoted by black circle outlines

The change in traffic flows are a function of the distribution of development-generated flows which have been added to the network. For reference, these flows are shown for each development site in Appendix C.3.

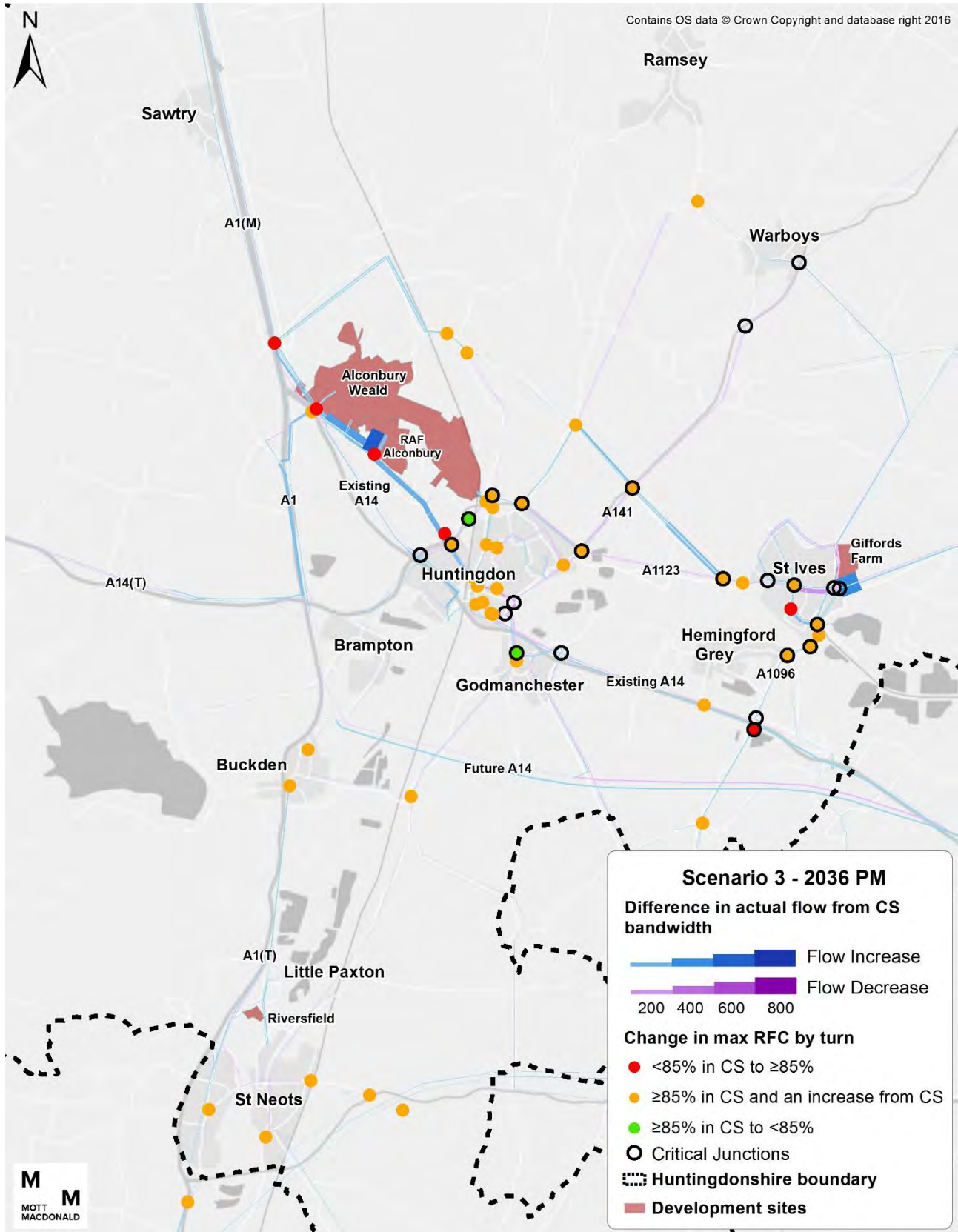
In some cases the model results shown may not necessarily align with what might initially be expected. This is not unusual in a dynamic model where traffic flows are not just additive and complex reassignment, and other demand response, effects can occur.

Figure 10: Scenario 3 change in traffic flows and junction performance vs Core Scenario – AM



Source: CSRM2

Figure 11: Scenario 3 change in traffic flows and junction performance vs Core Scenario – PM



Source: CSRM2

With regard to the AM peak, the key flow increases in comparison to the Core Scenario are seen on:

- the A14(T) to A1(M) spur southbound north of Huntingdon, on A1 southbound south of Alconbury, and on the Ermine Street (north) in the vicinity of Alconbury Weald and RAF Alconbury – this is primarily related to increased demand associated with additional development at Alconbury Weald and at RAF Alconbury
- the B1090, due in part to existing traffic re-routeing to avoid the A141 and the A1123

There are some minor decreases in flow on:

- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with the Alconbury sites and St Ives appears to displace some existing traffic onto the B1090; this traffic is making east-west movements round/through Huntingdon and using B1090 as an alternative route to avoid the A141 and A1123.
- the A141 to, and north of, Warboys - longer distance traffic from beyond Warboys appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for southbound movements
- the A1(M) southbound suggesting there may be some minor, insignificant, strategic diversions of longer distance traffic out of the corridor due to increased development-related traffic

The actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development traffic, for example that associated with Giffords Park, does travel along this corridor but this results in existing traffic being displaced, due to queuing at upstream junctions, or making other demand responses such as retiming the journey.

There are localised, but small scale, increases in traffic flow in St Neots due to development at Riversfield including on B1040 Mill Lane to/from the town centre, and on the A1 north of Little Paxton.

In terms of junction capacity in the AM peak, there are two junctions which go from being within-capacity to being over-capacity in Development Scenario 3, with one on the A141 near Huntingdon and one in central St Ives. Although other junctions appear to be operating within their absolute theoretical capacity, this does not give a full picture. For example, the A1096 corridor is at capacity and, although this leads to some re-routeing to avoid this congestion, the model also redistributes some trips away from the area completely ie: there are destination changes too.

With regard to the PM peak, the greatest flow increases can be seen on:

- the existing A14 northbound, particularly north of Huntingdon –this is primarily due to traffic associated with development at Alconbury Weald and RAF Alconbury
- Ermine Street north of Huntingdon – again this is primarily related to development-related traffic associated with the Alconbury sites
- the B1090, due in part to existing traffic re-routeing to avoid the A141 and the A1123
- there are also small increases on the B1040 north of St Ives, and A1123 east of St Ives, primarily related to development at Giffords Park

Flows remain stable, or decrease slightly, on the A141 north of Huntingdon, the A1123 and the A1096. This is due to existing traffic avoiding these routes due to increased development-related traffic, and existing network constraints meaning that these links are unable to carry more traffic. Therefore development traffic does travel along these corridor but this results in existing traffic, being displaced, experiencing queuing at upstream junctions, or making other demand responses such as retiming the journey.

There are localised, but small scale, increases in traffic flow in St Neots due to development at Riversfield. As with the AM peak these are mainly focussed on B1040 Mill Lane to/from the town centre, and on the A1 north of Little Paxton.

In terms of junction capacity in the PM peak, there are six junctions which go from being within-capacity to being over-capacity in Development Scenario 3. Four of these are in close proximity to the RAF Alconbury development. There are also two junctions operating at improved capacity, both being in the vicinity of Huntingdon on the A141 and B1043 in Godmanchester. As for the AM peak, the picture for the A1096 corridor is more complex. Because the corridor is at capacity this leads to some re-routeing to avoid this congestion, but the model also redistributes some trips away from the area completely, i.e. some people choose to travel elsewhere to different destinations to avoid this congestion.

2.6.3 Scenario 3 Junction Impact Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in Scenario 3. The equivalent results for the Core Scenario are shown for reference. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

At some junctions there can be a net reduction in the RFC, even though there are greater traffic flows on the network overall due to development-related traffic. This is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routeing, or potentially making other demand responses such as changing its destination. This can, in turn, result in improvements in junction performance elsewhere due to the balance of flows at those junctions changing.

Table 12: Key junction worst-arm RFC performance results for Scenario 3

Map Ref	Junction	Core Scenario		Scenario 3	
		AM	PM	AM	PM
A	Spittals Interchange	76	84	88	79
B	A141/Ermine Street/Stukeley Road	109	111	108	116
C	A141/Washingley Road/Latham Road	83	85	84	80
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	114	121
E	A141/Kings Ripton Road	109	113	104	113
F	A141/B1514/A1123	116	114	110	115
G	A141/B1090 Sawtry Way	114	96	128	104
H	A141/B1040 Church Road	80	54	73	52
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93	87	100
K	A1123 Houghton Road/Hill Rise	70	60	76	67
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	91	104
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	101	87
N	B1514 Hartford Road/B1514 Nursery Road	52	67	59	63
O	B1514 Castle Moat Road/The Avenue	65	66	67	66
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96	88	83
Q	B1040/A1198/A14 J24	50	61	49	62
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	92	105
S	A1096 Harrison Way/Guided Busway crossing	103	103	101	106
T	A1096 Harrison Way/Low Road	106	112	107	117
U	A1096/A14 J26	84	84	83	89

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

As agreed with the client team, mitigation is recommended for consideration at any junction meeting the following conditions within each time period:

- Junctions with a maximum RFC of under 85% in the Core Scenario but a maximum RFC of more than or equal to 85% in Scenario 3
- Junctions with a maximum RFC of more than or equal to 85% in the Core Scenario but a maximum RFC in Scenario 3 which is higher still

Of the 22 junctions listed, the above table shows that Scenario 3 results in a performance deterioration requiring potential mitigation for 14 of them.

2.6.4 Scenario 3 Journey Time Impact Results

Appendix B.4 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 3 (Ref)

It also shows results for post-mitigation packages applied to this scenario, but these are reported on in the post-mitigation section below.

As noted above, the selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following table which shows, for the AM peak and PM peak:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for the pre-mitigation Scenario 3

These tables therefore provide a ready indication of how the added development flows of Scenario 3 affect Core Scenario journey times over these key routes.

Table 13: Change in journey time from Core Scenario, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)		Change in Journey Time from CS (MM:SS)	
		AM	PM	AM	PM
A141 & A1123	EB	26:16	34:29	+01:16	+03:36
	WB	36:24	35:12	+01:56	+03:44
A141 Warboys Rbt	SB	32:29	24:30	+03:24	+04:35
	NB	22:06	30:21	-00:09	+00:58
Harrison Way	SB	20:10	15:33	+02:29	+02:02
	NB	09:25	15:05	-00:27	+02:05
Net change from CS		-	-	+08:29	+16:59

Source: CSRM2

This data shows little journey time impact in either peak hour, with mostly just small increases on each route.

2.7 Development Scenario 4 Results

As described in Section 2.2.1 above, Development Scenario 4 comprises the Core Scenario plus:

- Full build-out of Wyton Airfield (4,550 new dwellings)
- Ermine Street (1,440 new dwellings)
- Sapley Park Farm (1,300 new dwellings)
- Lodge Farm (3,820 new dwellings)
- Intensification of Alconbury Weald (1,500 new dwellings)
- RAF Alconbury released (1,450 new dwellings)

Pre-mitigation modelling results for this scenario are presented in the following sub-sections.

2.7.1 Scenario 4 Network Performance Statistics

The following table summarises the Scenario 4 performance at a network-wide level and compares this with the Core Scenario results.

Table 14: Scenario 4 network-level performance statistics and change from Core Scenario

Parameter	Scenario 4 Results		% Change from Core Scenario	
	AM	PM	AM	PM
Total PCU trips	120,593	128,987	+2.7%	+3.0%
Total veh-km	2,089,076	2,144,490	+0.8%	+1.2%
Avg veh travel distance per PCU trip (km)	17.3	16.6	-1.8%	-1.7%
Avg RFC for all Hunts junctions (%)	31.6	34.2	+3.4%	+9.6%

Source: CSRM2

The table shows an average RFC value which is an average across all junctions in Huntingdonshire and is included to provide an indication of overall network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made. It is recognised that an average can mask individual junction performance. For this reason, changes in individual junction performance are also considered in subsequent tables.

The table shows that, at a network level, Scenario 4 results in a 3.4% to 9.6% increase in the average RFC of all Huntingdonshire junctions compared to the Core Scenario, which indicates an overall deterioration in network performance, but shortens average journey lengths by -1.7% to -1.8%. This shortening is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

2.7.2 Scenario 4 Local Network Impact Results

For Development Scenario 4, the following two figures show, for the AM and PM weekday peak periods respectively:

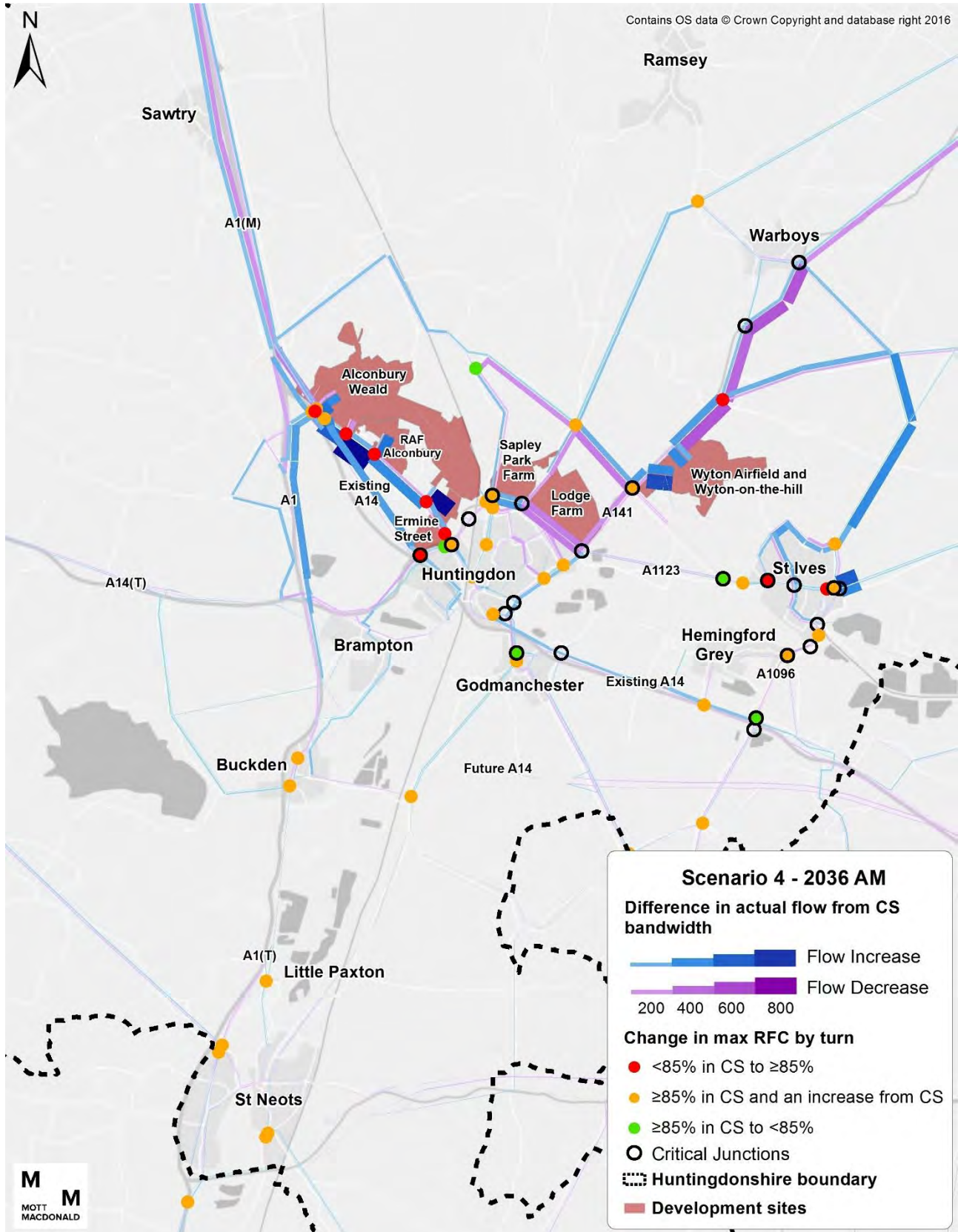
- Potential development sites which are additional to the Core Scenario
- Change in traffic flows compared to the equivalent Core Scenario, shown as 'bandwidths'
- Change in junction performance compared to the equivalent Core Scenario
- The key junctions listed in Table 1 above denoted by black circle outlines

The change in traffic flows are a function of the distribution of development-generated flows which have been added to the network. For reference, these flows are shown for each development site in Appendix C.4.

In some cases the model results shown may not necessarily align with what might initially be expected. This is not unusual in a dynamic model where traffic flows are not just additive and complex reassignment, and other demand response, effects can occur.

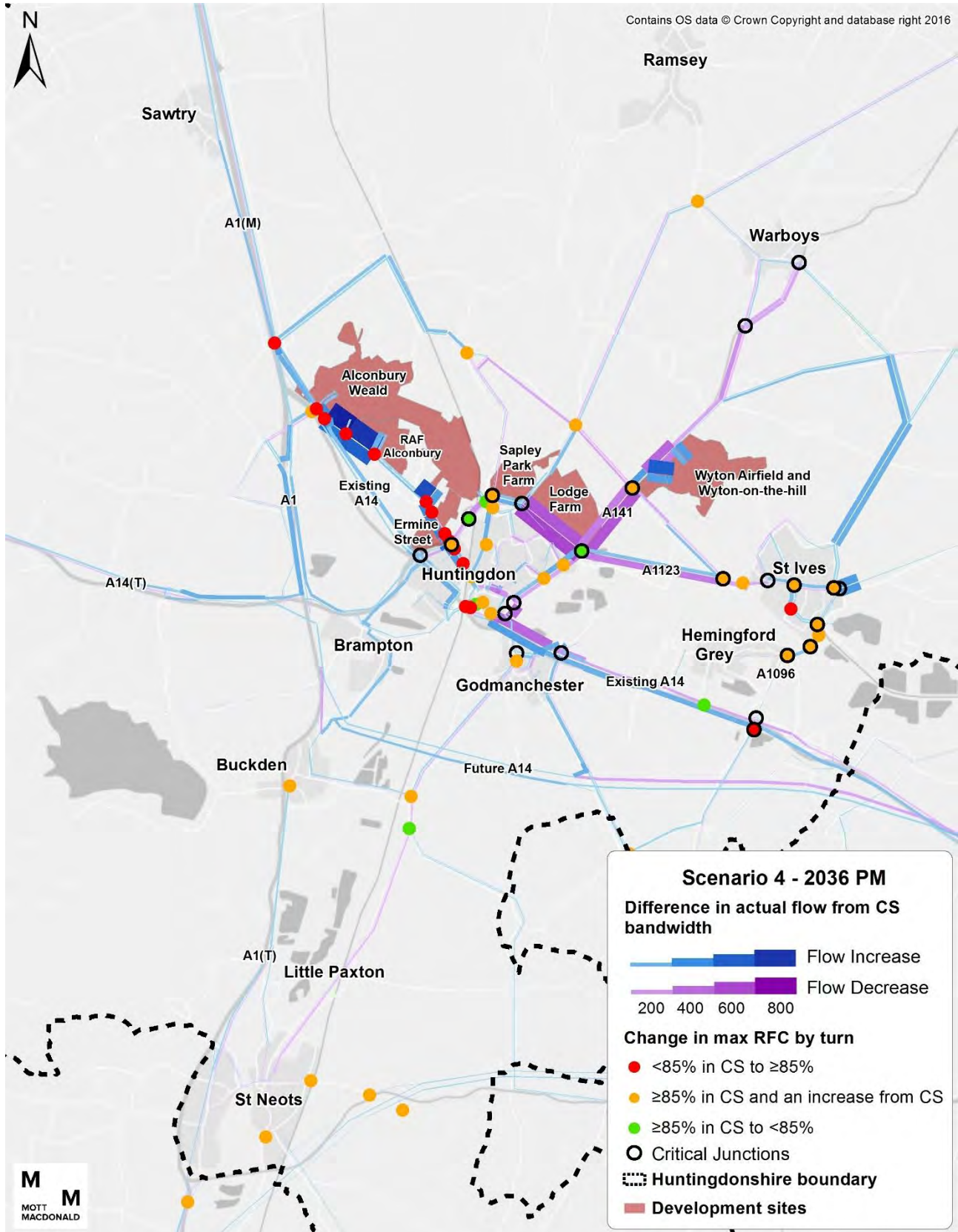
It is also noted that the modelling of this scenario includes a new internal link road through the Lodge Farm site, which would run between the junction of the A141 / Kings Ripton Road and the junction of the A141 / B1090. This link would primarily be for development access purposes, but would also provide a potential new routeing option for A141 through-traffic. This new link in the model accounts for some of the localised flow reductions seen on the A141 around this proposed development site.

Figure 12: Scenario 4 change in traffic flows and junction performance vs Core Scenario – AM



Source: CSRM2

Figure 13: Scenario 4 change in traffic flows and junction performance vs Core Scenario – PM



Source: CSRM2

With regard to the AM peak, the key flow increases in comparison to the Core Scenario are seen on:

- the A14(T) to A1(M) spur southbound north of Huntingdon, on A1 southbound south of Alconbury, and on Ermine Street north of Huntingdon – this is primarily related to increased demand associated with additional development at Alconbury Weald and at RAF Alconbury
- the B1040 southbound north of St Ives and on Marley Road and Hill Rise in St Ives – this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to St Ives via the B1040 as an alternative to the more congested A141, together with the displacement of background traffic
- the B1090 (Kings Ripton to A141) – there is some increased traffic, in part due to development at Wyton Airfield and in part due to existing traffic seeking to bypass the A141 and A1123
- A141 adjacent to the Sapley Park Farm site
- there are also some relatively small flow increases on the old A14 alignment eastbound and also through Godmanchester, due to general development-related increases in traffic flow

There are some decreases in flow on:

- the A1123 between Huntingdon and St Ives, and on the A141 north of Huntingdon – increased development traffic associated with Wyton Airfield, other developments north of the A141, and St Ives appears to displace some existing traffic onto the old A14 and B1090 routes which uses these as alternatives to access destinations within Huntingdon and beyond
- the A141, both north and south of Warboys - longer distance traffic from beyond Warboys appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for southbound movements

Investigation suggests that actual flows on the A1096, and on the section of the A141 north west of Huntingdon, are unchanged. This is due to the existing level of network constraints meaning that the links are unable to carry more traffic. Therefore development traffic does travel along these corridors but this results in existing traffic, being displaced, experiencing queuing at upstream junctions, or making other demand responses such as retiming or changing the destination of the journey.

In terms of junction capacity, there are nine junctions which go from being within-capacity to being over-capacity in the AM peak, with four of these on Ermine Street north of Huntingdon, two on the A141 and two in St Ives. There are also five junctions operating with improved capacity in the AM peak, with two of these being close to Huntingdon and one close to St Ives. Although other junctions appear to be operating within their absolute theoretical capacity, this does not give a full picture. For example, the A1096 corridor is at capacity and, although this leads to some re-routing to avoid this congestion, the model also redistributes some trips away from the area completely, i.e. there are destination changes too.

With regard to the PM peak, the greatest flow increases can be seen on:

- the existing A14 northbound, both north and south of Huntingdon – north of Huntingdon this is primarily due to traffic associated with the development sites at Alconbury, whereas south of Huntingdon this appears to primarily be traffic displaced from the parallel A1123 due to increased development-related traffic on that route
- the A1 and A1(M), again primarily due to Alconbury-related development traffic
- the B1040 north of St Ives - this reflects increased demand associated with development at Wyton Airfield with some of this traffic routing to/from St Ives via the B1040 as an alternative to the more congested A141 and A1123, together with the displacement of background traffic also seeking to avoid the A1123 and A141

There are some flow decreases on:

- the A141 north and south of Wyton – longer distance traffic to Warboys and beyond appears to be seeking to avoid the A141 due to increased development-related traffic and instead use other routes for northbound movements
- the A1123 westbound between St Ives and Huntingdon, and on the A141 north west of Huntingdon – increased development-related traffic in the area appears to displace some existing traffic onto the old A14, the B1040 and (to a lesser extent) the A14 Huntingdon Southern Bypass as alternative routes.

As noted above for the AM peak, the actual flows on the A1096 are unchanged. This is due to the existing level of network constraints meaning that the link is unable to carry more traffic. Therefore development traffic does travel along this corridor but this results in existing traffic being displaced, due to queuing at upstream junctions, or making other demand responses such as retiming the journey.

In terms of junction capacity, there are fourteen junctions operating over capacity in the PM peak, including ten on Ermine Street and one in St Ives. There are also five junctions operating at improved capacity, with three of these being in the vicinity of Huntingdon. As for the AM peak, this does not necessarily give a full picture. For example, the A1096 corridor is at capacity and, although this leads to some re-routing to avoid this congestion, the model also redistributes some trips away from the area completely ie: there are destination changes too.

2.7.3 Scenario 4 Junction Impact Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in Scenario 4. The equivalent results for the Core Scenario are shown for reference. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie ≥85% but <100% RFC)
- Red for over absolute capacity junctions (ie ≥100% RFC)

At some junctions there can be a net reduction in the RFC, even though there are greater traffic flows on the network overall due to development-related traffic. This is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can, in turn, result in improvements in junction performance elsewhere due to the balance of flows at those junctions changing.

Table 15: Key junction worst-arm RFC performance results for Scenario 4

Map Ref	Junction	Core Scenario		Scenario 4	
		AM	PM	AM	PM
A	Spittals Interchange	76	84	86	75
B	A141/Ermine Street/Stukeley Road	109	111	114	117
C	A141/Washingley Road/Latham Road	83	85	81	71
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	118	138
E	A141/Kings Ripton Road	109	113	100	107
F	A141/B1514/A1123	116	114	88	66
G	A141/B1090 Sawtry Way	114	96	150	117
H	A141/B1040 Church Road	80	54	44	45
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93	67	120
K	A1123 Houghton Road/Hill Rise	70	60	112	75
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	70	102
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	101	101
N	B1514 Hartford Road/B1514 Nursery Road	52	67	62	53
O	B1514 Castle Moat Road/The Avenue	65	66	65	64
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96	85	91
Q	B1040/A1198/A14 J24	50	61	49	64
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	89	105
S	A1096 Harrison Way/Guided Busway crossing	103	103	96	104
T	A1096 Harrison Way/Low Road	106	112	106	119
U	A1096/A14 J26	84	84	79	97

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

As agreed with the client team, mitigation is recommended for consideration at any junction meeting the following conditions within each time period:

- Junctions with a maximum RFC of under 85% in the Core Scenario but a maximum RFC of more than or equal to 85% in Scenario 4
- Junctions with a maximum RFC of more than or equal to 85% in the Core Scenario but a maximum RFC in Scenario 4 which is higher still

Of the 22 junctions listed, the above table shows that Scenario 4 results in a performance deterioration requiring potential mitigation for 13 of them. It is also noted that, for some junctions, performance improves.

2.7.4 Scenario 4 Journey Time Impact Results

Appendix B.5 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 4 (Ref)

It also shows results for post-mitigation packages applied to this scenario, but these are reported on in the post-mitigation section below.

As noted above, the selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound

- Harrison Way, northbound and southbound

These results are summarised in the following table which shows, for the AM peak and PM peak:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for the pre-mitigation Scenario 4

These tables therefore provide a ready indication of how the added development flows of Scenario 4 affect Core Scenario journey times over these key routes.

Table 16: Change in journey time from Core Scenario, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)		Change in Journey Time from CS (MM:SS)	
		AM	PM	AM	PM
A141 & A1123	EB	26:16	34:29	+02:53	+10:58
	WB	36:24	35:12	+00:49	+06:48
A141 Warboys Rbt	SB	32:29	24:30	+13:45	+16:04
	NB	22:06	30:21	-00:23	+06:31
Harrison Way	SB	20:10	15:33	-00:21	+03:19
	NB	09:25	15:05	-01:08	+01:36
Net change from CS		-	-	+15:36	+45:16

Source: CSRM2

This data shows:

- Little journey time impact in the AM peak, except on the A141 Warboys Rbt route in the southbound direction. As for Scenario 1, the chart in the appendix shows that most of this delay occurs on the approach to the A141 / B1090 junction, which is predicted to be heavily affected by the Wyton development
- Greater impact in the PM peak, with the greatest impact being on the A141 Warboys Rbt route in the southbound direction due to the Wyton development, and also on the A141/A1123 route in the eastbound direction at the junction of the A141 and Huntingdon Road due to the Sapley Park Farm and Lodge Farm developments

2.8 Development Scenario Impacts Summary

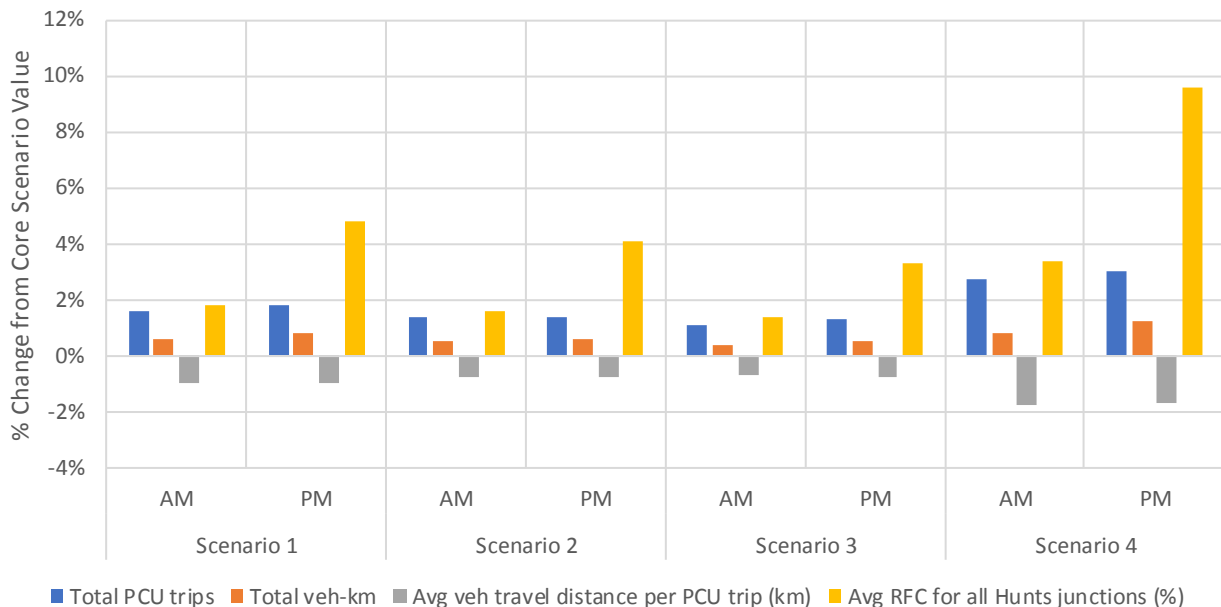
For each development scenario modelling result, the following table and chart summarises the above network-level performance statistics in terms of their percentage change from the equivalent Core Scenario results.

Table 17: Change in network-level performance statistics from Core Scenario

Parameter	% Change from Core Scenario							
	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	AM	PM	AM	PM	AM	PM	AM	PM
Total PCU trips	+1.6%	+1.8%	+1.4%	+1.4%	+1.1%	+1.3%	+2.7%	+3.0%
Total veh-km	+0.6%	+0.8%	+0.5%	+0.6%	+0.4%	+0.5%	+0.8%	+1.2%
Avg veh travel distance per PCU trip (km)	-1.0%	-1.0%	-0.8%	-0.8%	-0.7%	-0.8%	-1.8%	-1.7%
Avg RFC for all Hunts junctions (%)	+1.8%	+4.8%	+1.6%	+4.1%	+1.4%	+3.3%	+3.4%	+9.6%

Source: CSR2

Chart 1: % Change in network level statistics compared to Core Scenario



Source: CSR2

This summary data shows that:

- All scenarios result in an increase in PCU trips within the modelled area and therefore an increase in total vehicle kms travelled on the network. However, the increase in the latter parameter is not as great as the former, as the development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips. This effect increases with the size of development proposed and hence is least pronounced for Scenario 3 and most pronounced for Scenario 4.
- All scenarios result in an overall detriment to network performance in Huntingdonshire compared to the equivalent Core Scenario situation. This is more pronounced in the PM peak compared to the AM peak, and increases with the scale of development. Scenario 3 therefore shows the lowest detriment in

performance, with an average 3.3% increase in the average Huntingdonshire junction RFC in the PM peak, and Scenario 4 the greatest detriment, at with an average 9.6% increase in the PM peak.

Based on these results, all the above development scenarios will require the introduction of some mitigation measures to support the proposed increased development levels. The following table lists those key junctions, most affected by development, which are identified in the above sub-sections as potentially requiring mitigation in one or more of the development scenario results. Details of potential highway mitigation measures and the associated estimated costs are presented in the next section.

Table 18: Key junctions potentially requiring mitigation in one or more development scenarios

Map Ref	Junction
A	Spittals Interchange
B	A141/Ermine Street/Stukeley Road
C	A141/Washingley Road/Latham Road
D	A141/ Huntingdon Road/Abbots Ripton Road
E	A141/Kings Ripton Road
F	A141/B1514/A1123
G	A141/B1090 Sawtry Way
J	A1123 Houghton Hill/B1090 Sawtry Way
K	A1123 Houghton Road/Hill Rise
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123
P	Post Street/Cambridge Street/Causeway (Godmanchester)
R	A1096 Harrison Way/The Quadrant/Meadow Lane
S	A1096 Harrison Way/Guided Busway crossing
T	A1096 Harrison Way/Low Road
U	A1096/A14 J26

3 Mitigation Measures

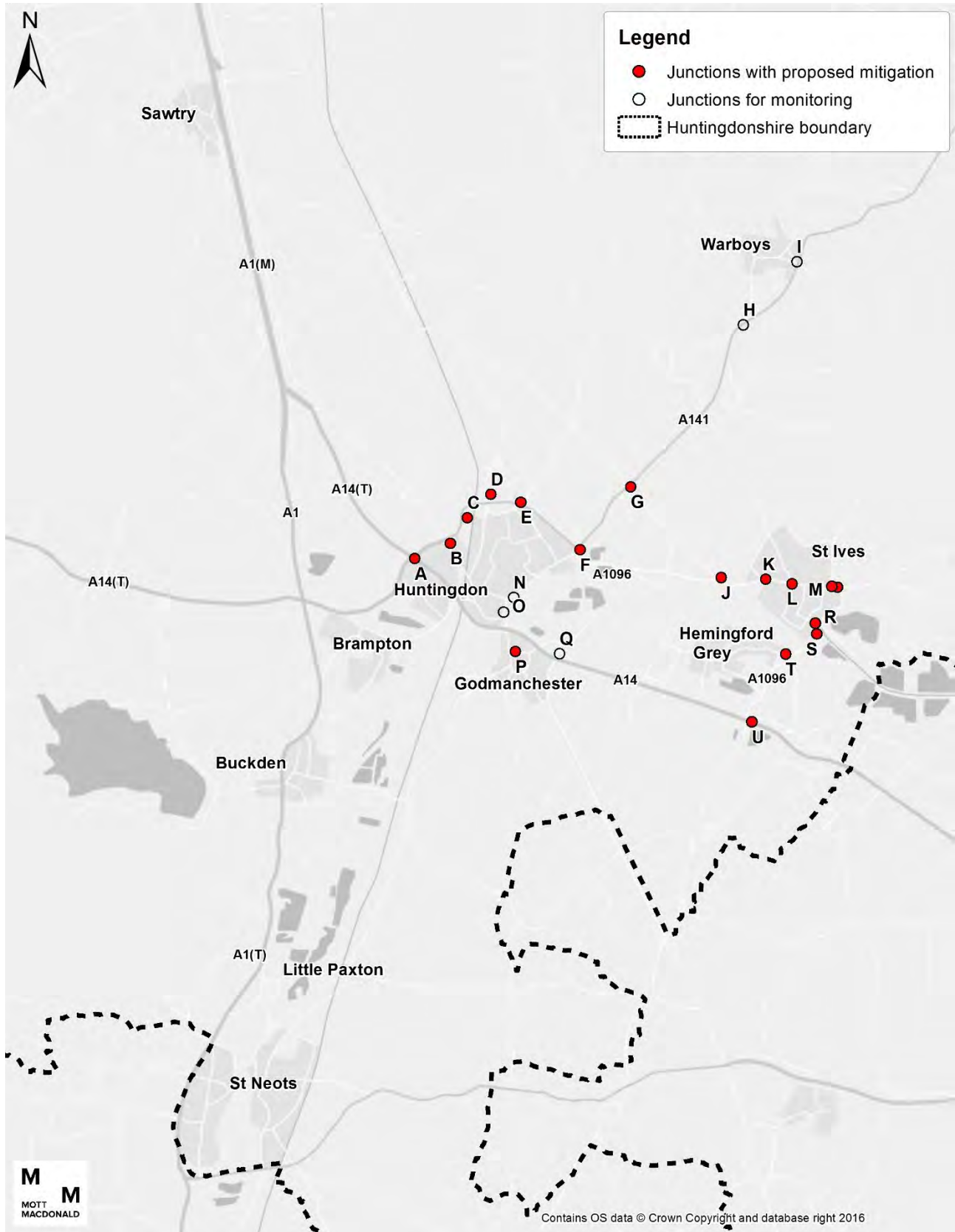
3.1 Introduction

The purpose of this section is to describe the schemes and scheme packages which have been developed to potentially mitigate the transport impacts of the four development scenarios.

3.2 Local Junction Mitigation Measures

Based on the above modelling results per development scenario, Table 18 above lists those key junctions at which at least one development scenario generates a negative performance impact. These are the junctions for which mitigation is therefore considered in this section, and the locations are shown in Figure 14 below.

Figure 14: Junction mitigation location plan



Source: MM

For the junctions at which mitigation is proposed, the following subsections provide a short description of the works proposed and the associated outline cost estimates. See Appendix D for detail on the assumptions, inclusions and exclusions on which these costs are based.

It is noted that the details of any mitigation measures, including those associated with non-car provision, would of course have to be explored and examined in detail through Transport Assessments associated with any planning applications. At this stage in the process, this study simply considers what measures could potentially be delivered to support potential Local Plan allocations.

3.2.1 Site Ref A – Spittals Interchange

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. Though it is appreciated that the proposed A14 improvements will reduce background traffic levels at this junction, the model predicts that added development flows will generate peak hour impacts in some scenarios and will change the balance of flows.

The total cost of this measure is estimated to be in the region of £330,200.

3.2.2 Site Ref B – A141/Ermine Street/Stukeley Road

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. One key constraint is the Shell petrol station and garage between the eastern and southern arms of the roundabout, limiting space for widening.

The total cost of this measure is estimated to be in the region of £179,000.

3.2.3 Site Ref D – A141/ Huntingdon Road/Abbots Ripton Road

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements.

The total cost of this measure is estimated to be in the region of £329,000.

3.2.4 Site Ref E – A141/Kings Ripton Road

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements.

The total cost of this measure is estimated to be in the region of £107,000.

3.2.5 Site Ref F – A141/B1514/A1123

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements.

One key constraint is the BP petrol station and garage to the north of the roundabout.

The total cost of this measure is estimated to be in the region of £506,000.

3.2.6 Site Ref G – A141/B1090 Sawtry Way

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements.

The total cost of this measure is estimated to be in the region of £463,000.

3.2.7 Site Ref J – A1123 Houghton Hill/B1090 Sawtry Way

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements..

The total cost of this measure is estimated to be in the region of £531,000.

3.2.8 Site Ref K – A1123 Houghton Road/Hill Rise

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £342,800.

3.2.9 Site Ref L – A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £106,300.

3.2.10 Site Ref M – A1123 St Audrey Lane/B1040 Somersham Road/A1123

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. Constraints include a petrol station and garage on the A1123/ B1040 roundabout and a Tesco Express and car park located opposite.

The total cost of this measure is estimated to be in the region of £1,405,300.

3.2.11 Site Ref P – Post Street/Cambridge Street/Causeway (Godmanchester)

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £534,300.

3.2.12 Site Ref R – A1096 Harrison Way/The Quadrant/Meadow Lane

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £380,000.

3.2.13 Site Ref S – A1096 Harrison Way/Guided Busway Crossing

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £558,900.

3.2.14 Site Ref T – A1096 Harrison Way/Low Road

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £643,000.

3.2.15 Site Ref U – A1096/A14 J26

Localised capacity enhancements have been introduced into the model as a proxy for local junction improvements. The total cost of this measure is estimated to be in the region of £57,200.

3.3 Other Potential Mitigation Measures

In addition to the above local junction schemes, other mitigation measures measures have been considered and tested as part of this study. These are schemes which have the potential to alleviate specific impacts of the development scenarios and have been proposed in agreement with the client team.

The following subsections provide a short description of the works proposed and the associated outline cost estimates. See Appendix D for detail on the assumptions, inclusions and exclusions on which these costs are based.

3.3.1 A141 improvements

In addition to the above junction schemes, the impact of increased highway capacity in the A141 corridor north of Huntingdon has been tested. It is not appropriate to define the detail of improvement schemes at this stage as this would need to be subject to much more detailed scheme development and assessment work. However, for the purposes of modelling, the following potential measures have been assumed:

- Provision of dual-carriageway capacity in a corridor between the A141/ B1090 roundabout and the A141/ A1123/ B1514 roundabout
- Increased capacity at the A141/ A1123/ B1514 roundabout
- Dual-carriageway capacity in the corridor from this roundabout to the A141/ Kings Ripton Road signalised junction, together with provision of an outer A141 route from broadly this location, on an alignment that would need to be developed and assessed in detail, towards the A141/ A14 Spittals Interchange roundabout

For a single-lane carriageway, the total estimated cost is in the region of £31.3m.

For a dual lane carriageway, the total estimated cost is in the region of £80.6m.

See Appendix D for detail on the assumptions, inclusions and exclusions on which these costs are based.

3.3.2 Third River Crossing

A general representation of a potential third river crossing of the River Great Ouse has also been tested for all scenarios. Should such an intervention come forward, it would need to be subject to significant detailed development, design and assessment work.

For a single lane crossing, the total estimated cost is in the region of £78.7m.

For a dual lane crossing, the total estimated cost is in the region of £136.2m.

See Appendix D for detail on the assumptions, inclusions and exclusions on which these costs are based.

3.3.3 Closure of Town Bridge

This measure involves closing the B1044 river bridge between Huntingdon and Godmanchester to general traffic in order to encourage traffic to use the proposed new junction on Mill Common to access the A14 route. The bridge would remain open, however, to public transport, cycling and walking.

3.4 Mitigation Measure Packages

The following table provides a summary of:

- The packaging of the above mitigation measures, as agreed with the Client Group
- The estimated cost of each package, based on the costs detailed above

Table 19: Mitigation measure packages and total estimated package cost

Package Ref	Measures Included	Total Estimated Cost
1	All junction improvements only	£6.7m
2	All junction improvements & A141 Improvement	£87.3m
3	All junction improvements & A141 Improvement & 3 rd River Crossing	£223.5m

Package Ref	Measures Included	Total Estimated Cost
4	All junction improvements & 3 rd River Crossing	£142.9m
5	All junction improvements & 3 rd River Crossing & Town Bridge Closure	£143.0m

Source: MM / HDC / CCC

The above packaging of measures allows the individual and cumulative impact of the various options to be understood. However, it can be seen from the package costings that only package 1 is likely to be deliverable through developer contributions alone. Packages 2 to 5 would need external funding sources to be deliverable.

In order to allow direct comparison between post-mitigation modelling results for each development scenario, mitigation package 1 includes the same junction mitigation measures for all scenarios. Once the preferred scenario is selected, this package will be refined further to reflect the particular mitigation requirements of that scenario.

3.5 Provision for Sustainable Modes

High quality walking, cycling and public transport provision, together with measures to reduce the need to travel, such as co-location of complementary land uses and travel planning, is clearly key to enhancing site accessibility and seeking to maximise the overall transport sustainability of development.

These measures, and their detailed impacts, will need to be explored through detailed Transport Assessment work accompanying any subsequent planning applications and secured through planning condition and legal agreements.

However, analysis set out in the parallel transport Baseline Report shows that, even in the larger market towns in the District where non-car transport provision is relatively good, car remains a dominant mode and there will likely be significant residual highway demand associated with further growth in Huntingdonshire.

The modelling work undertaken in compiling this report therefore assesses the potential impact of this residual highway demand and considers potential highway measures that might need to be introduced to mitigate these impacts which might potentially sit alongside non-highway measures. As with non-highway transport measures, the detail of these would, of course, have to be worked up and developed through the detailed planning application process.

4 Post-Mitigation Modelling Assessment

4.1 Introduction

The purpose of this section is to present the results of the post-mitigation scenario modelling process.

4.2 Development Scenario 1 Modelling Results

4.2.1 Scenario 1 Network Impact Results

For each mitigation package model run, Appendix E.1 shows for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

The following table summarises, for each mitigation package model run (see Table 19 above), the overall performance of the Huntingdonshire network by listing the average RFC result measured across all Huntingdonshire junctions in the model and by showing the percentage change from the equivalent Core Scenario result presented above in Table 2. This metric is used for all scenario tests to allow a high level comparison of network performance across scenarios to be made. It is recognised that an average can mask individual junction performance but, for this reason, changes in individual junction performance are also considered in subsequent tables below.

Table 20: Scenario 1 Huntingdonshire junctions average RFC result and change from Core Scenario

Mitigation Package	All Hunts Jns Avg RFC (%)		% Change from Core Scenario	
	AM	PM	AM	PM
No mitigation	31.1	32.7	+1.8%	+4.8%
1 – Junction improvements only	30.4	32.4	-0.5%	+3.9%
2 – Package 1 & A141 Improvement	29.3	31.6	-4.3%	+1.4%
3 – Package 2 & 3 rd River Crossing	28.2	30.8	-7.9%	-1.4%
4 – Package 1 & 3 rd River Crossing	29.6	31.7	-3.4%	+1.6%
5 – Package 4 & Town Bridge Closure	29.6	31.6	-3.1%	+1.4%

Source: CSR2

This table shows that:

- All mitigation packages yield an overall network performance improvement compared to the equivalent no-mitigation result
- In the AM peak, all mitigation packages also deliver an improvement in overall performance over the equivalent Core Scenario result
- In the PM peak, however, only package 3 delivers an improvement over the Core Scenario result

The following table presents the same comparison with the Core Scenario but against the other network-level parameters presented in Table 2 above.

Table 21: Change in network-level parameters for Scenario 1 compared with Core Scenario

Mitigation Package	Total PCU Trips		Total veh-km		Avg Dist per Trip (km)	
	AM	PM	AM	PM	AM	PM
No mitigation	1.6%	1.8%	0.6%	0.8%	-1.0%	-1.0%
1 – Junction improvements only	1.6%	1.7%	0.9%	0.9%	-0.7%	-0.8%
2 – Package 1 & A141 Improvement	1.6%	1.7%	0.8%	1.3%	-0.8%	-0.4%
3 – Package 2 & 3rd River Crossing	1.6%	1.7%	0.7%	1.8%	-0.9%	0.1%
4 – Package 1 & 3rd River Crossing	1.6%	1.7%	1.1%	1.4%	-0.5%	-0.3%
5 – Package 4 & Town Bridge Closure	1.6%	1.7%	1.0%	1.3%	-0.6%	-0.4%

Source: CSRM2

This table shows that:

- The total level of PCU trips is about the same in all pre and post mitigation scenarios
- There is a general trend for the total travel distance to increase with greater mitigation levels compared to the no mitigation test. This is a reflection of how vehicles will divert to travel further on new infrastructure for the sake of avoiding congestion
- Despite the increased total travel distances, the average distance per trip for all Scenario 1 tests is lower than in the Core Scenario for nearly all tests, which is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

4.2.2 Scenario 1 Junction Impact Results

The following tables provide performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in the AM and PM peak hours, and for the:

- The Core Scenario (CS)
- The pre-mitigation Development Scenario 1 (S1)
- Development Scenario 1 with mitigation packages 1 to 5 applied (S1-X)

Comparison between the post-mitigation results below and the Core Scenario results show whether each junction is predicted to improve or deteriorate as a result of the applied measures. Colour coding is used to assist with interpretation where:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions where mitigation has been applied in the model, the RFC value can actually increase compared to the pre-mitigation value which would indicate that performance has deteriorated as a result of the improvements. This type of result is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can equally cause some junctions where no changes have been made to show a reduction in RFC and therefore an improvement in performance. The more common result is that junction improvements deliver performance improvements and the values shown in the following tables are appropriate for comparative purposes, but it is noted that RFC values taken directly from a strategic model should be interpreted with these considerations in mind.

Table 22: Scenario 1 junction-level worst-arm RFC results – AM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S1	S1-1	S1-2	S1-3	S1-4	S1-5
A	Spittals Interchange	Y	76	91	60	66	65	65	66
B	A141/Ermine Street/Stukeley Rd	Y	109	108	102	64	60	103	104
C	A141/Washingley Road/Latham Rd	Y	83	87	103	43	37	102	100
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	108	115	113	96	94	112	112
E	A141/Kings Ripton Rd	Y	109	103	89	67	55	100	101
F	A141/B1514/A1123	Y	116	109	101	106	101	90	90
G	A141/B1090 Sawtry Way	Y	114	147	134	134	141	141	141
H	A141/B1040 Church Rd		80	52	64	71	58	54	56
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	86	81	66	75	61	64	65
K	A1123 Houghton Rd/Hill Rise	Y	70	94	79	82	78	75	76
L	A1123 Houghton Rd/Ramsey Rd	Y	71	83	62	59	55	63	66
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	95	100	103	103	102	101	101
N	B1514 Hartford Rd/B1514 Nursery Rd		52	56	53	47	30	32	33
O	B1514 Castle Moat Rd/The Avenue		65	66	65	57	33	41	35
P	Post St/Cambridge St/Causeway	Y	93	93	39	39	31	30	36
Q	B1040/A1198/A14 J24		50	47	48	48	71	65	71
R	A1096 Harrison Way/The Quadrant	Y	92	92	93	86	83	81	81
S	A1096 Harrison Way/Busway crossing	Y	103	100	100	95	91	91	90
T	A1096 Harrison Way/Low Rd	Y	106	106	86	87	89	89	87
U	A1096/A14 J26	Y	84	87	76	77	79	81	76

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Table 23: Scenario 1 junction-level worst-arm RFC results – PM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S1	S1-1	S1-2	S1-3	S1-4	S1-5
A	Spittals Interchange	Y	84	78	62	69	68	56	56
B	A141/Ermine Street/Stukeley Rd	Y	111	116	102	85	71	103	102
C	A141/Washingley Road/Latham Rd	Y	85	81	95	53	56	98	93
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	116	126	106	102	96	120	117
E	A141/Kings Ripton Rd	Y	113	117	116	73	67	110	109
F	A141/B1514/A1123	Y	114	116	119	132	127	112	115
G	A141/B1090 Sawtry Way	Y	96	113	116	113	116	122	123
H	A141/B1040 Church Rd		54	44	49	55	51	51	52
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	93	106	82	83	73	64	71
K	A1123 Houghton Rd/Hill Rise	Y	60	64	63	57	61	58	57
L	A1123 Houghton Rd/Ramsey Rd	Y	92	77	79	99	98	75	79
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	88	98	82	80	80	82	81
N	B1514 Hartford Rd/B1514 Nursery Rd		67	62	62	64	57	55	57
O	B1514 Castle Moat Rd/The Avenue		66	66	84	66	49	53	61
P	Post St/Cambridge St/Causeway	Y	96	88	40	54	43	32	46
Q	B1040/A1198/A14 J24		61	63	65	61	75	74	72
R	A1096 Harrison Way/The Quadrant	Y	103	104	101	101	101	101	101
S	A1096 Harrison Way/Busway crossing	Y	103	106	110	108	98	99	99
T	A1096 Harrison Way/Low Rd	Y	112	120	94	92	81	87	82
U	A1096/A14 J26	Y	84	94	81	75	67	79	64

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Overall, these tables show that, based on these key junctions, mitigation packages 2 and 3 provide the greatest improvement in junction performance overall.

It is noted that not all mitigated junctions show an improvement in some package test scenarios. As observed above, this is due to the dynamic responses of the model re-routing traffic as a result of the mitigation measures, which can in some cases result in certain arms of a mitigated junction performing worse than before. It would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

4.2.3 Scenario 1 Journey Time Impact Results

Appendix B.2 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 1 (Ref)
- Development Scenario 1 with mitigation packages 1 to 5 applied (Test X)

The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following two tables which show, for the AM peak and PM peak separately:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for each development scenario test as follows:
 - The pre-mitigation Development Scenario 1 (S1)
 - Development Scenario 1 with mitigation packages 1 to 5 applied (S1-X)

These tables therefore provide a ready indication of those mitigation scenarios which result in an increase in journey time over the Core Scenario and those which result in an improvement.

Table 24: Change in journey time per development scenario test – AM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S1	S1-1	S1-2	S1-3	S1-4	S1-5
A141 & A1123	EB	26:16	+02:03	+00:18	-05:43	-06:40	+00:37	+00:37
	WB	36:24	+02:01	-06:00	-09:27	-10:57	-05:55	-06:04
A141 Warboys Rbt	SB	32:29	+14:03	+02:55	+02:26	-00:31	-01:21	-01:17
	NB	22:06	+01:20	-00:56	+00:20	-09:44	-11:06	-09:49
Harrison Way	SB	20:10	-00:09	-06:52	-06:41	-09:14	-08:18	-09:08
	NB	09:25	-00:36	-00:41	-01:13	-02:06	-02:08	-01:53
Net change from CS		-	+18:41	-11:17	-20:19	-39:13	-28:11	-27:34

Source: CSRM2

Table 25: Change in journey time per development scenario test – PM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S1	S1-1	S1-2	S1-3	S1-4	S1-5
A141 & A1123	EB	34:29	+04:12	+02:00	-04:44	-06:34	+00:43	+00:23
	WB	35:12	+03:52	-05:45	-08:31	-12:29	-06:50	-06:22
A141 Warboys Rbt	SB	24:30	+12:44	+01:08	+00:04	-05:18	-07:01	-06:13
	NB	30:21	+07:12	+05:03	+03:53	-11:11	-11:54	-11:34
Harrison Way	SB	15:33	+02:35	-07:12	-07:51	-08:32	-07:59	-08:36
	NB	15:05	+01:49	+01:09	+00:17	-03:03	-03:08	-02:34
Net change from CS		-	+32:25	-03:37	-16:52	-47:07	-36:08	-34:56

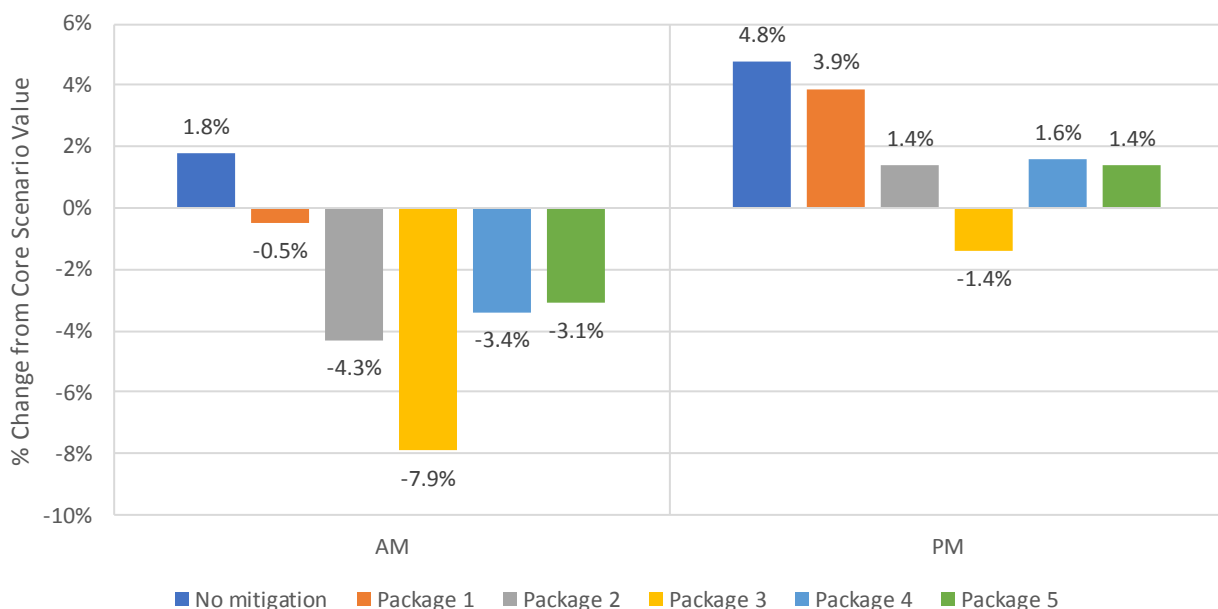
These tables show that:

- Journey times are higher overall in the pre-mitigation (S1) scenario than in the Core Scenario in both peak hours. This is the case for all routes and directions in the PM, and for all but Harrison Way in the AM, where journey times for the latter improve slightly
- Journey times are improved overall in both peak hours for all post-mitigation scenarios compared to the Core Scenario. Greatest improvements are seen for mitigation package 3, which improves times on all routes in both directions and in both peak hours. Package 1 provides the lowest overall improvement, followed by packages 2, 5 and 4.

4.2.4 Scenario 1 Post-Mitigation Assessment Summary

Based on a measure of average junction performance across Huntingdonshire, and as summarised in the chart below, only mitigation package 3 delivers improved performance against the equivalent Core Scenario result in both peak hours. All other mitigation packages deliver an improvement against the equivalent pre-mitigation results, but not against the Core Scenario.

Chart 2: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



When considering the key local junctions for which specific mitigation has been considered, all mitigation scenarios show an overall improvement in junction performance when compared to the Core Scenario, with

mitigation packages 2 and 3 providing the greatest improvement. However, not all junctions show an improvement with mitigation and so it would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

In terms of journey times measured over three key local routes, the pre-mitigation scenario shows a journey time deterioration overall in both peak hours, but all post-mitigation scenarios show an overall improvement in both peak hours. Mitigation package 3 shows the greatest improvement, followed by packages 4, 5, 2 & 1.

Overall for this Development Scenario, only mitigation package 3 restores the performance of the network back to Core Scenario levels in both peak hours when measured on a Huntingdonshire-wide basis. However, this package includes two very significant infrastructure schemes and is the most expensive of the packages. This scale of mitigation would not be deliverable through developer contributions alone.

4.3 Development Scenario 2 Modelling Results

4.3.1 Scenario 2 Network Impact Results

For each mitigation package model run, Appendix E.2 shows for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

The following table summarises, for each mitigation package model run (see Table 19 above), the overall performance of the Huntingdonshire network by listing the average RFC result measured across all Huntingdonshire junctions in the model and by showing the percentage change from the equivalent Core Scenario result (presented above in Table 2). This metric is used for all scenario tests to allow a high level comparison of network performance across scenarios to be made. It is recognised that an average can mask individual junction performance but, for this reason, changes in individual junction performance are also considered in subsequent tables below.

Table 26: Scenario 2 Huntingdonshire junctions average RFC result and change from Core Scenario

Mitigation Package	All Hunts Jns Avg RFC (%)		% Change from Core Scenario	
	AM	PM	AM	PM
No mitigation	31.1	32.5	+1.6%	+4.1%
1 – Junction improvements only	30.5	32.2	-0.3%	+3.3%
2 – Package 1 & A141 Improvement	29.3	31.4	-4.1%	+0.8%
3 – Package 2 & 3 rd River Crossing	28.4	30.4	-7.2%	-2.6%
4 – Package 1 & 3 rd River Crossing	29.8	31.6	-2.7%	+1.3%
5 – Package 4 & Town Bridge Closure	29.9	31.3	-2.2%	+0.3%

Source: CSRM2

This table shows that:

- All mitigation packages yield an overall network performance compared to the equivalent no-mitigation result
- In the AM peak, all mitigation packages also deliver an improvement in overall performance over the equivalent Core Scenario result
- In the PM peak, however, only package 3 delivers an improvement over the Core Scenario result

The following table presents the same comparison with the Core Scenario but against the other network-level parameters presented in Table 2 above.

Table 27: Change in network-level parameters for Scenario 2 compared with Core Scenario

Mitigation Package	Total PCU Trips		Total veh-km		Avg Dist per Trip (km)	
	AM	PM	AM	PM	AM	PM
No mitigation	1.4%	1.4%	0.5%	0.6%	-0.8%	-0.8%
1 – Junction improvements only	1.3%	1.4%	0.8%	0.8%	-0.5%	-0.6%
2 – Package 1 & A141 Improvement	1.3%	1.4%	0.6%	1.0%	-0.7%	-0.4%
3 – Package 2 & 3rd River Crossing	1.3%	1.4%	0.8%	1.5%	-0.6%	0.1%
4 – Package 1 & 3rd River Crossing	1.3%	1.4%	1.0%	1.2%	-0.3%	-0.2%
5 – Package 4 & Town Bridge Closure	1.3%	1.4%	1.0%	1.0%	-0.4%	-0.4%

Source: CSRM2

This table shows that:

- The total level of PCU trips is about the same in all pre and post mitigation scenarios
- There is a general trend for the total travel distance to increase with greater mitigation levels compared to the no mitigation test. This is a reflection of how vehicles will divert to travel further on new infrastructure for the sake of avoiding congestion
- Despite the increased total travel distances, the average distance per trip for all Scenario 2 tests is lower than in the Core Scenario for nearly all tests, which is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

4.3.2 Scenario 2 Junction Impact Results

The following tables provide performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in the AM and PM peak hours respectively, and for the:

- The Core Scenario (CS)
- The pre-mitigation Development Scenario 2 (S2)
- Development Scenario 2 with mitigation packages 1 to 5 applied (S2-X)

Comparison between the post-mitigation results below and the Core Scenario results show whether each junction is predicted to improve or deteriorate as a result of the applied measures. Colour coding is used to assist with interpretation where:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions where mitigation has been applied in the model, the RFC value can actually increase compared to the pre-mitigation value which would indicate that performance has deteriorated as a result of the improvements. This type of result is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can equally cause some junctions where no changes have been made to show a reduction in RFC and therefore an improvement in performance. The more common result is that junction improvements deliver performance improvements and the values shown in the following tables are appropriate for comparative purposes, but it is noted that RFC values taken directly from a strategic model should be interpreted with these considerations in mind.

Table 28: Scenario 2 junction-level worst-arm RFC results – AM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S2	S2-1	S2-2	S2-3	S2-4	S2-5
A	Spittals Interchange	Y	76	94	62	68	66	66	69
B	A141/Ermine Street/Stukeley Rd	Y	109	108	103	65	61	104	105
C	A141/Washingley Road/Latham Rd	Y	83	87	102	44	39	101	98
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	108	115	113	97	95	113	113
E	A141/Kings Ripton Rd	Y	109	102	90	65	56	100	98
F	A141/B1514/A1123	Y	116	109	103	106	104	101	102
G	A141/B1090 Sawtry Way	Y	114	140	126	127	134	131	132
H	A141/B1040 Church Rd		80	60	71	79	67	66	66
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	86	74	66	82	63	65	66
K	A1123 Houghton Rd/Hill Rise	Y	70	86	77	84	75	76	75
L	A1123 Houghton Rd/Ramsey Rd	Y	71	67	66	58	61	63	66
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	95	100	103	105	102	102	102
N	B1514 Hartford Rd/B1514 Nursery Rd		52	55	53	46	31	34	35
O	B1514 Castle Moat Rd/The Avenue		65	66	65	57	36	42	37
P	Post St/Cambridge St/Causeway	Y	93	95	39	41	29	29	35
Q	B1040/A1198/A14 J24		50	48	47	48	66	64	70
R	A1096 Harrison Way/The Quadrant	Y	92	93	92	87	84	81	80
S	A1096 Harrison Way/Busway crossing	Y	103	101	100	96	90	91	90
T	A1096 Harrison Way/Low Rd	Y	106	106	86	86	88	89	87
U	A1096/A14 J26	Y	84	87	76	76	76	79	72

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Table 29: Scenario 2 junction-level worst-arm RFC results – PM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S2	S2-1	S2-2	S2-3	S2-4	S2-5
A	Spittals Interchange	Y	84	85	61	68	68	58	56
B	A141/Ermine Street/Stukeley Rd	Y	111	116	102	85	69	103	103
C	A141/Washingley Road/Latham Rd	Y	85	82	95	53	59	97	95
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	116	125	106	102	95	117	114
E	A141/Kings Ripton Rd	Y	113	114	115	73	67	105	108
F	A141/B1514/A1123	Y	114	116	119	128	126	111	116
G	A141/B1090 Sawtry Way	Y	96	112	115	107	112	118	119
H	A141/B1040 Church Rd		54	46	52	57	50	50	51
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	93	101	90	83	74	68	70
K	A1123 Houghton Rd/Hill Rise	Y	60	58	66	66	56	61	60
L	A1123 Houghton Rd/Ramsey Rd	Y	92	99	97	85	90	74	79
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	88	98	78	77	74	74	74
N	B1514 Hartford Rd/B1514 Nursery Rd		67	63	64	63	58	57	56
O	B1514 Castle Moat Rd/The Avenue		66	69	67	66	49	54	59
P	Post St/Cambridge St/Causeway	Y	96	87	39	49	42	33	48
Q	B1040/A1198/A14 J24		61	61	61	61	72	72	69
R	A1096 Harrison Way/The Quadrant	Y	103	104	101	101	101	101	101
S	A1096 Harrison Way/Busway crossing	Y	103	104	109	107	98	98	98
T	A1096 Harrison Way/Low Rd	Y	112	119	93	90	81	83	82
U	A1096/A14 J26	Y	84	91	76	73	65	72	62

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Overall, these tables show that, based on these key junctions, mitigation packages 2 and 3 provide the greatest improvement in junction performance overall.

It is noted that not all mitigated junctions show an improvement in some package test scenarios. As observed above, this is due to the dynamic responses of the model re-routing traffic as a result of the mitigation measures, which can in some cases result in certain arms of a mitigated junction performing worse than before. It would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

4.3.3 Scenario 2 Journey Time Impact Results

Appendix B.3 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 2 (Ref)
- Development Scenario 2 with mitigation packages 1 to 5 applied (Test X)

The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following two tables which show, for the AM peak and PM peak separately:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for each development scenario test as follows:
 - The pre-mitigation Development Scenario 2 (S2)
 - Development Scenario 2 with mitigation packages 1 to 5 applied (S2-X)

These tables therefore provide a ready indication of those mitigation scenarios which result in an increase in journey time over the Core Scenario and those which result in an improvement.

Table 30: Change in journey time per development scenario test – AM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S2	S2-1	S2-2	S2-3	S2-4	S2-5
A141 & A1123	EB	26:16	+02:14	+00:28	-05:53	-05:22	+01:10	+01:06
	WB	36:24	+01:30	-06:09	-10:25	-12:05	-07:06	-07:01
A141 Warboys Rbt	SB	32:29	+10:13	-01:31	-01:42	-05:11	-06:07	-05:58
	NB	22:06	+01:06	-01:03	-01:22	-09:15	-11:00	-09:26
Harrison Way	SB	20:10	-00:13	-06:32	-06:52	-09:12	-08:55	-09:33
	NB	09:25	-00:28	-00:36	-01:10	-01:53	-02:02	-01:42
Net change from CS		-	+14:22	-15:21	-27:25	-42:58	-34:00	-32:33

Source: CSRM2

Table 31: Change in journey time per development scenario test – PM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S2	S2-1	S2-2	S2-3	S2-4	S2-5
A141 & A1123	EB	34:29	+04:36	+01:40	-05:30	-06:41	+00:09	-00:08
	WB	35:12	+09:52	-06:28	-10:00	-13:20	-07:42	-06:34
A141 Warboys Rbt	SB	24:30	+10:28	-02:52	-02:54	-07:25	-08:41	-08:16
	NB	30:21	+04:59	+03:54	+02:33	-11:56	-12:48	-12:02
Harrison Way	SB	15:33	+02:11	-07:31	-07:58	-08:42	-08:20	-08:46
	NB	15:05	+01:17	+00:45	-00:03	-03:06	-03:22	-02:48
Net change from CS		-	+33:23	-10:33	-23:51	-51:10	-40:44	-38:33

Source: CSRM2

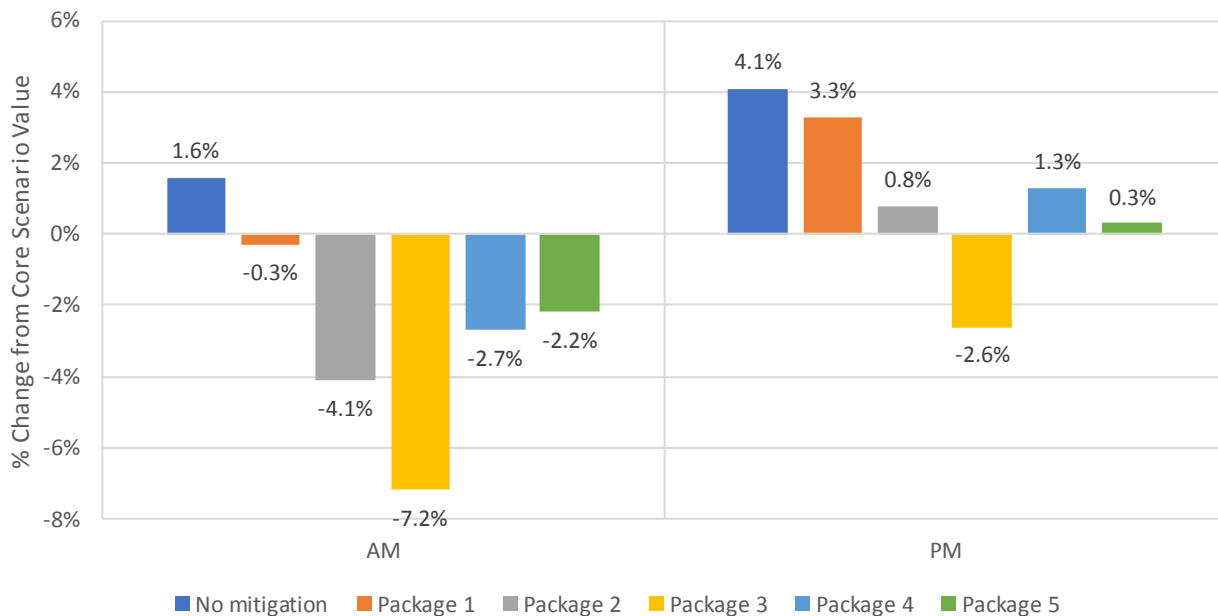
These tables show that:

- Journey times are higher overall in the pre-mitigation (S2) scenario than in the Core Scenario in both peak hours. This is the case for all routes and directions in the PM, and for all but Harrison Way in the AM, where journey times for the latter improve slightly
- Journey times are improved overall in both peak hours for all post-mitigation scenarios compared to the Core Scenario. Greatest improvements are seen for mitigation package 3, which improves times on all routes in both directions and in both peak hours. Package 1 provides the lowest overall improvement, followed by packages 2, 5 and 4.
- Journey times overall are lower than for Development Scenario 1

4.3.4 Scenario 2 Post-Mitigation Assessment Summary

Based on a measure of average junction performance across Huntingdonshire, and as summarised in the chart below, only mitigation package 3 delivers improved performance against the equivalent Core Scenario result in both peak hours. All other mitigation packages deliver an improvement against the equivalent pre-mitigation results, but not against the Core Scenario.

Chart 3: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



When considering the key local junctions for which specific mitigation has been considered, all mitigation scenarios show an overall improvement in junction performance when compared to the Core Scenario, with mitigation packages 2 and 3 providing the greatest improvement. However, not all junctions show an improvement with mitigation and so it would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

In terms of journey times measured over three key local routes, the pre-mitigation scenario shows a journey time deterioration overall in both peak hours, but all post-mitigation scenarios show an overall improvement in both peak hours and more so than in Development Scenario 1. Mitigation package 3 shows the greatest improvement, followed by packages 4, 5, 2 and 1.

Overall for this Development Scenario, only mitigation package 3 restores the performance of the network back to Core Scenario levels in both peak hours when measured on a Huntingdonshire-wide basis. However, this package includes two very significant infrastructure schemes and is the most expensive of the packages. This scale of mitigation would not be deliverable through developer contributions alone.

4.4 Development Scenario 3 Modelling Results

4.4.1 Scenario 3 Network Impact Results

For each mitigation package model run, Appendix E.3 shows for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

The following table summarises, for each mitigation package model run (see Table 19 above), the overall performance of the Huntingdonshire network by listing the average RFC result measured across all Huntingdonshire junctions in the model and by showing the percentage change from the equivalent Core Scenario result (presented above in Table 2). This metric is used for all scenario tests to allow a high level comparison of network performance across scenarios to be made. It is recognised that an average can mask individual junction performance but, for this reason, changes in individual junction performance are also considered in subsequent tables below.

Table 32: Scenario 3 Huntingdonshire junctions average RFC result and change from Core Scenario

Mitigation Package	All Hunts Jns Avg RFC (%)		% Change from Core Scenario	
	AM	PM	AM	PM
No mitigation	31.0	32.2	1.4%	3.3%
1 – Junction improvements only	30.2	31.7	-1.3%	1.7%
2 – Package 1 & A141 Improvement	28.8	30.8	-5.9%	-1.1%
3 – Package 2 & 3 rd River Crossing	28.1	30.0	-8.2%	-3.7%
4 – Package 1 & 3 rd River Crossing	29.3	31.1	-4.3%	-0.2%
5 – Package 4 & Town Bridge Closure	29.5	31.0	-3.5%	-0.6%

Source: CSRM2

This table shows that:

- All mitigation packages yield an overall network performance compared to the equivalent no-mitigation result
- In the AM peak, all mitigation packages also deliver an improvement in overall performance over the equivalent Core Scenario result
- In the PM peak, all packages but package 1 deliver an improvement over the Core Scenario result

The following table presents the same comparison with the Core Scenario but against the other network-level parameters presented in Table 2 above.

Table 33: Change in network-level parameters for Scenario 3 compared with Core Scenario

Mitigation Package	Total PCU Trips		Total veh-km		Avg Dist per Trip (km)	
	AM	PM	AM	PM	AM	PM
No mitigation	1.1%	1.3%	0.4%	0.5%	-0.7%	-0.8%
1 – Junction improvements only	1.1%	1.3%	0.5%	0.8%	-0.6%	-0.5%
2 – Package 1 & A141 Improvement	1.1%	1.3%	0.4%	1.1%	-0.7%	-0.1%
3 – Package 2 & 3rd River Crossing	1.1%	1.3%	0.6%	1.5%	-0.5%	0.2%
4 – Package 1 & 3rd River Crossing	1.1%	1.3%	0.8%	1.2%	-0.3%	0.0%
5 – Package 4 & Town Bridge Closure	1.1%	1.3%	0.8%	1.0%	-0.3%	-0.2%

Source: CSRM2

This table shows that:

- The total level of PCU trips is about the same in all pre and post mitigation scenarios
- There is a general trend for the total travel distance to increase with greater mitigation levels compared to the no mitigation test. This is a reflection of how vehicles will divert to travel further on new infrastructure for the sake of avoiding congestion
- Despite the increased total travel distances, the average distance per trip for all Scenario 3 tests is lower than in the Core Scenario for nearly all tests, which is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

4.4.2 Scenario 3 Junction Impact Results

The following tables provide performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in the AM and PM peak hours respectively, and for the:

- The Core Scenario (CS)
- The pre-mitigation Development Scenario 3 (S3)
- Development Scenario 3 with mitigation package 1 applied (S3-X)

Comparison between the post-mitigation results below and the Core Scenario results show whether each junction is predicted to improve or deteriorate as a result of the applied measures. Colour coding is used to assist with interpretation where:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions where mitigation has been applied in the model, the RFC value can actually increase compared to the pre-mitigation value which would indicate that performance has deteriorated as a result of the improvements. This type of result is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can equally cause some junctions where no changes have been made to show a reduction in RFC and therefore an improvement in performance. The more common result is that junction improvements deliver performance improvements and the values shown in the following tables are appropriate for comparative purposes, but it is noted that RFC values taken directly from a strategic model should be interpreted with these considerations in mind.

Table 34: Scenario 3 junction-level worst-arm RFC results – AM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S3	S3-1	S3-2	S3-3	S3-4	S3-5
A	Spittals Interchange	Y	76	88	61	67	67	60	61
B	A141/Ermine Street/Stukeley Rd	Y	109	108	103	61	58	103	103
C	A141/Washingley Road/Latham Rd	Y	83	84	103	42	40	104	101
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	108	114	112	91	94	111	110
E	A141/Kings Ripton Rd	Y	109	104	84	71	58	97	100
F	A141/B1514/A1123	Y	116	110	91	106	102	69	88
G	A141/B1090 Sawtry Way	Y	114	128	123	113	113	124	123
H	A141/B1040 Church Rd		80	73	73	83	81	74	76
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	86	87	64	87	61	71	67
K	A1123 Houghton Rd/Hill Rise	Y	70	76	85	77	72	69	70
L	A1123 Houghton Rd/Ramsey Rd	Y	71	91	102	63	55	54	75
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	95	101	99	100	100	100	100
N	B1514 Hartford Rd/B1514 Nursery Rd		52	59	53	46	30	34	33
O	B1514 Castle Moat Rd/The Avenue		65	67	58	53	31	41	35
P	Post St/Cambridge St/Causeway	Y	93	88	35	37	32	34	38
Q	B1040/A1198/A14 J24		50	49	48	50	64	57	64
R	A1096 Harrison Way/The Quadrant	Y	92	92	90	87	84	84	83
S	A1096 Harrison Way/Busway crossing	Y	103	101	101	96	94	94	91
T	A1096 Harrison Way/Low Rd	Y	106	107	87	87	92	92	89
U	A1096/A14 J26	Y	84	83	70	69	76	75	70

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Table 35: Scenario 3 junction-level worst-arm RFC results – PM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S3	S3-1	S3-2	S3-3	S3-4	S3-5
A	Spittals Interchange	Y	84	79	60	68	67	53	53
B	A141/Ermine Street/Stukeley Rd	Y	111	116	101	96	71	99	94
C	A141/Washingley Road/Latham Rd	Y	85	80	93	58	59	99	91
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	116	121	106	85	78	112	112
E	A141/Kings Ripton Rd	Y	113	113	112	86	74	102	108
F	A141/B1514/A1123	Y	114	115	115	124	122	106	111
G	A141/B1090 Sawtry Way	Y	96	104	100	95	99	106	108
H	A141/B1040 Church Rd		54	52	50	56	58	56	56
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	93	100	80	82	76	88	80
K	A1123 Houghton Rd/Hill Rise	Y	60	67	62	60	58	64	61
L	A1123 Houghton Rd/Ramsey Rd	Y	92	104	86	92	100	78	81
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	88	87	74	72	62	61	63
N	B1514 Hartford Rd/B1514 Nursery Rd		67	63	62	63	58	54	55
O	B1514 Castle Moat Rd/The Avenue		66	66	66	64	47	50	58
P	Post St/Cambridge St/Causeway	Y	96	83	36	41	44	33	50
Q	B1040/A1198/A14 J24		61	62	62	62	74	77	70
R	A1096 Harrison Way/The Quadrant	Y	103	105	101	101	101	101	101
S	A1096 Harrison Way/Busway crossing	Y	103	106	111	109	100	101	101
T	A1096 Harrison Way/Low Rd	Y	112	117	96	94	84	85	85
U	A1096/A14 J26	Y	84	89	76	68	58	67	58

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Overall, these tables show that, based on these key junctions, mitigation packages 2 and 3 provide the greatest improvement in junction performance overall.

It is noted that not all mitigated junctions show an improvement in some package test scenarios. As observed above, this is due to the dynamic responses of the model re-routing traffic as a result of the mitigation measures, which can in some cases result in certain arms of a mitigated junction performing worse than before. It would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

4.4.3 Scenario 3 Journey Time Impact Results

Appendix B.4 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 3 (Ref)
- Development Scenario 3 with mitigation packages 1 to 5 applied (Test X)

The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following two tables which show, for the AM peak and PM peak separately:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for each development scenario test as follows:
 - The pre-mitigation Development Scenario 3 (S3)
 - Development Scenario 3 with mitigation packages 1 to 5 applied (S3-X)

These tables therefore provide a ready indication of those mitigation scenarios which result in an increase in journey time over the Core Scenario and those which result in an improvement.

Table 36: Change in journey time per development scenario test – AM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S3	S3-1	S3-2	S3-3	S3-4	S3-5
A141 & A1123	EB	26:16	+01:16	-00:08	-06:03	-06:59	-00:28	-00:25
	WB	36:24	+01:56	-04:00	-08:52	-11:27	-05:56	-05:37
A141 Warboys Rbt	SB	32:29	+03:24	-03:03	-04:10	-10:49	-09:48	-09:52
	NB	22:06	-00:09	-13:04	-02:02	-11:24	-11:34	-10:45
Harrison Way	SB	20:10	+02:29	-04:02	-04:23	-07:32	-07:04	-07:24
	NB	09:25	-00:27	-00:36	-01:13	-02:16	-02:11	-01:58
Net change from CS		-	+08:29	-24:53	-26:43	-50:26	-37:03	-36:00

Source: CSRM2

Table 37: Change in journey time per development scenario test – PM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S3	S3-1	S3-2	S3-3	S3-4	S3-5
A141 & A1123	EB	34:29	+03:36	+01:57	-06:22	-08:01	-00:31	+01:43
	WB	35:12	+03:44	-06:40	-11:17	-11:59	-08:02	-07:17
A141 Warboys Rbt	SB	24:30	+04:35	-03:29	-05:36	-11:58	-11:50	-11:20
	NB	30:21	+00:58	+00:18	+00:32	-13:02	-14:23	-13:59
Harrison Way	SB	15:33	+02:02	-06:38	-07:31	-08:56	-08:31	-08:50
	NB	15:05	+02:05	+01:23	+00:52	-02:34	-02:49	-02:17
Net change from CS		-	+16:59	-13:10	-29:21	-56:29	-46:05	-42:00

Source: CSRM2

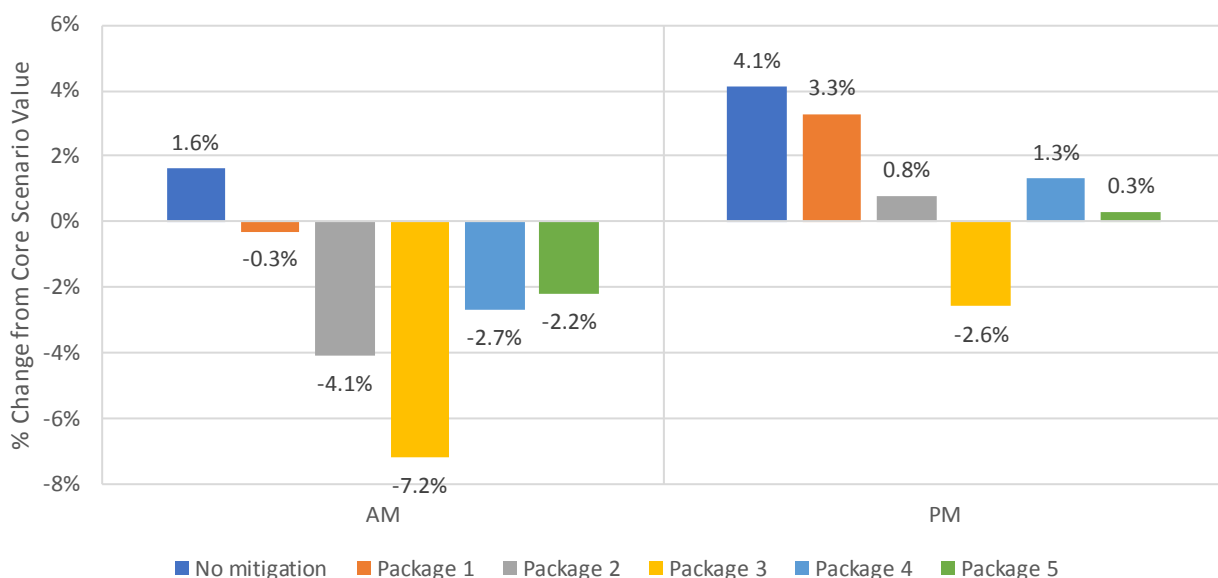
These tables show that:

- Journey times are higher overall in the pre-mitigation (S3) scenario than in the Core Scenario in both peak hours. This is the case for all routes and directions in the PM, and for all but Harrison Way NB and A141 Warboys Rbt NB in the AM, where journey times for the latter improve slightly
- Journey times are improved overall in both peak hours for all post-mitigation scenarios compared to the Core Scenario. Greatest improvements are seen for mitigation packages 3 and 4, which improve times on all routes in both directions and in both peak hours. Package 1 provides the lowest overall improvement, followed by packages 2 and 5.
- Journey times overall are lower than for Development Scenarios 1 and 2

4.4.4 Scenario 3 Post-Mitigation Assessment Summary

Based on a measure of average junction performance across Huntingdonshire, and as summarised in the chart below, all mitigation packages except package 1 deliver improved performance against the equivalent Core Scenario result in both peak hours, with package 3 delivering the greatest improvement. Mitigation package 1 delivers an improvement against the equivalent pre-mitigation results, but not against the Core Scenario.

Chart 4: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



When considering the key local junctions for which specific mitigation has been considered, all mitigation scenarios show an overall improvement in junction performance when compared to the Core Scenario, with mitigation packages 2 and 3 providing the greatest improvement. However, not all junctions show an improvement with mitigation and so it would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

In terms of journey times measured over three key local routes, the pre-mitigation scenario shows a journey time deterioration overall in both peak hours, but all post-mitigation scenarios show an overall improvement in both peak hours and more so than in Development Scenarios 1 and 2. Mitigation package 3 shows the greatest improvement, followed by packages 4, 5, 2 and 1.

Overall for this Development Scenario, mitigation packages 2 to 5 all restore the performance of the network back to Core Scenario levels in both peak hours when measured on a Huntingdonshire-wide basis, with package 3 delivering the greatest improvement. However, these packages all include at least one very significant infrastructure scheme and would require an order of investment which would not be deliverable through developer contributions alone.

4.5 Development Scenario 4 Modelling Results

4.5.1 Scenario 4 Network Impact Results

For each mitigation package model run, Appendix E.4 shows for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

The following table summarises, for each mitigation package model run (see Table 19 above), the overall performance of the Huntingdonshire network by listing the average RFC result measured across all Huntingdonshire junctions in the model and by showing the percentage change from the equivalent Core Scenario result (presented above in Table 2). This metric is used for all scenario tests to allow a high level comparison of network performance across scenarios to be made. It is recognised that an average can mask individual junction performance but, for this reason, changes in individual junction performance are also considered in subsequent tables below.

Table 38: Scenario 4 Huntingdonshire junctions average RFC result and change from Core Scenario

Mitigation Package	All Hunts Jns Avg RFC (%)		% Change from Core Scenario	
	AM	PM	AM	PM
No mitigation	31.6	34.2	+3.4%	+9.6%
1 – Junction improvements only	31.0	34.7	+1.5%	+11.1%
2 – Package 1 & A141 Improvement	29.9	33.0	-2.1%	+5.8%
3 – Package 2 & 3 rd River Crossing	29.0	32.0	-5.2%	+2.6%
4 – Package 1 & 3 rd River Crossing	30.6	33.5	+0.2%	+7.4%
5 – Package 4 & Town Bridge Closure	31.0	33.4	+1.3%	+7.1%

Source: CSRM2

This table shows that:

- All mitigation packages, apart from package 1 in the PM peak, yield an overall network performance compared to the equivalent no-mitigation result
- In the AM peak, however, only packages 2 and 3 deliver an overall performances improvement compared to the equivalent Core Scenario result, while no packages achieve this in the PM peak

The following table presents the same comparison with the Core Scenario but against the other network-level parameters presented in Table 2 above.

Table 39: Change in network-level parameters for Scenario 4 compared with Core Scenario

Mitigation Package	Total PCU Trips		Total veh-km		Avg Dist per Trip (km)	
	AM	PM	AM	PM	AM	PM
No mitigation	2.7%	3.0%	0.8%	1.2%	-1.8%	-1.7%
1 – Junction improvements only	2.6%	3.0%	1.0%	1.4%	-1.6%	-1.5%
2 – Package 1 & A141 Improvement	2.6%	3.0%	1.2%	1.6%	-1.4%	-1.3%
3 – Package 2 & 3 rd River Crossing	2.6%	3.0%	1.4%	2.5%	-1.2%	-0.5%
4 – Package 1 & 3 rd River Crossing	2.6%	3.0%	1.2%	1.9%	-1.4%	-1.1%
5 – Package 4 & Town Bridge Closure	2.6%	3.0%	1.3%	1.7%	-1.3%	-1.2%

Source: CSRM2

This table shows that:

- The total level of PCU trips is about the same in all pre and post mitigation scenarios
- There is a general trend for the total travel distance to increase with greater mitigation levels compared to the no mitigation test. This is a reflection of how vehicles will divert to travel further on new infrastructure for the sake of avoiding congestion
- Despite the increased total travel distances, the average distance per trip for all Scenario 4 tests is lower than in the Core Scenario for nearly all tests, which is a reflection of how new development distributions and densities allow a shorter average journey distance to be achieved, through increased opportunities for internalised trips and new closer destinations for existing trips.

4.5.2 Scenario 4 Junction Impact Results

The following tables provide performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in the AM and PM peak hours respectively, and for the:

- The Core Scenario (CS)
- The pre-mitigation Development Scenario 4 (S4)
- Development Scenario 4 with mitigation packages 1 to 5 applied (S4-X)

Comparison between the post-mitigation results below and the Core Scenario results show whether each junction is predicted to improve or deteriorate as a result of the applied measures. Colour coding is used to assist with interpretation where:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions where mitigation has been applied in the model, the RFC value can actually increase compared to the pre-mitigation value which would indicate that performance has deteriorated as a result of the improvements. This type of result is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can equally cause some junctions where no changes have been made to show a reduction in RFC and therefore an improvement in performance. The more common result is that junction improvements deliver performance improvements and the values shown in the following tables are appropriate for comparative purposes, but it is noted that RFC values taken directly from a strategic model should be interpreted with these considerations in mind.

Table 40: Scenario 4 junction-level worst-arm RFC results – AM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S4	S4-1	S4-2	S4-3	S4-4	S4-5
A	Spittals Interchange	Y	76	86	67	76	75	67	68
B	A141/Ermine Street/Stukeley Rd	Y	109	114	116	87	81	116	115
C	A141/Washingley Road/Latham Rd	Y	83	81	100	39	29	97	95
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	108	118	116	101	100	114	112
E	A141/Kings Ripton Rd	Y	109	100	102	92	97	104	101
F	A141/B1514/A1123	Y	116	88	66	100	97	105	109
G	A141/B1090 Sawtry Way	Y	114	150	137	135	142	138	138
H	A141/B1040 Church Rd		80	44	52	60	54	51	52
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	86	67	69	62	66	67	67
K	A1123 Houghton Rd/Hill Rise	Y	70	112	85	82	85	82	82
L	A1123 Houghton Rd/Ramsey Rd	Y	71	70	59	59	55	49	50
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	95	101	101	101	104	101	102
N	B1514 Hartford Rd/B1514 Nursery Rd		52	62	60	55	32	38	39
O	B1514 Castle Moat Rd/The Avenue		65	65	62	55	28	40	40
P	Post St/Cambridge St/Causeway	Y	93	85	32	36	36	32	38
Q	B1040/A1198/A14 J24		50	49	49	51	77	70	71
R	A1096 Harrison Way/The Quadrant	Y	92	89	87	85	82	82	82
S	A1096 Harrison Way/Busway crossing	Y	103	96	96	94	93	92	91
T	A1096 Harrison Way/Low Rd	Y	106	106	87	87	91	90	89
U	A1096/A14 J26	Y	84	79	77	75	82	76	75

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Table 41: Scenario 4 junction-level worst-arm RFC results – PM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S4	S4-1	S4-2	S4-3	S4-4	S4-5
A	Spittals Interchange	Y	84	75	67	73	71	62	62
B	A141/Ermine Street/Stukeley Rd	Y	111	117	112	104	101	112	113
C	A141/Washingley Road/Latham Rd	Y	85	71	94	70	58	91	87
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	116	138	112	95	100	127	134
E	A141/Kings Ripton Rd	Y	113	107	126	111	111	111	113
F	A141/B1514/A1123	Y	114	66	72	119	112	113	122
G	A141/B1090 Sawtry Way	Y	96	117	129	111	120	119	118
H	A141/B1040 Church Rd		54	45	51	52	52	53	54
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	93	120	101	73	74	69	72
K	A1123 Houghton Rd/Hill Rise	Y	60	75	72	63	58	59	58
L	A1123 Houghton Rd/Ramsey Rd	Y	92	102	100	102	93	93	83
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	88	101	93	82	82	81	85
N	B1514 Hartford Rd/B1514 Nursery Rd		67	53	51	63	49	52	55
O	B1514 Castle Moat Rd/The Avenue		66	64	65	68	44	54	57
P	Post St/Cambridge St/Causeway	Y	96	91	53	42	38	33	43
Q	B1040/A1198/A14 J24		61	64	61	60	80	71	71
R	A1096 Harrison Way/The Quadrant	Y	103	105	101	101	101	101	101
S	A1096 Harrison Way/Busway crossing	Y	103	104	111	107	99	101	103
T	A1096 Harrison Way/Low Rd	Y	112	119	100	90	83	86	86
U	A1096/A14 J26	Y	84	97	96	65	64	74	62

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Overall, these tables show that, based on these key junctions, mitigation packages 2 and 3 provide the greatest improvement in junction performance overall.

It is noted that not all mitigated junctions show an improvement in some package test scenarios. As observed above, this is due to the dynamic responses of the model re-routing traffic as a result of the mitigation measures, which can in some cases result in certain arms of a mitigated junction performing worse than before. It would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

4.5.3 Scenario 4 Journey Time Impact Results

Appendix B.5 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 4 (Ref)
- Development Scenario 4 with mitigation packages 1 to 5 applied (Test X)

The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following two tables which show, for the AM peak and PM peak separately:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for each development scenario test as follows:
 - The pre-mitigation Development Scenario 4 (S4)
 - Development Scenario 4 with mitigation packages 1 to 5 applied (S4-X)

These tables therefore provide a ready indication of those mitigation scenarios which result in an increase in journey time over the Core Scenario and those which result in an improvement.

Table 42: Change in journey time per development scenario test – AM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S4	S4-1	S4-2	S4-3	S4-4	S4-5
A141 & A1123	EB	26:16	+02:53	+01:15	-04:52	-07:10	+02:03	+02:30
	WB	36:24	+00:49	-04:54	-11:27	-11:49	-07:04	-06:06
A141 Warboys Rbt	SB	32:29	+13:45	+05:36	+01:52	-01:18	-01:34	-01:02
	NB	22:06	-00:23	-02:12	-02:35	-10:27	-10:42	-10:29
Harrison Way	SB	20:10	-00:21	-06:12	-08:05	-09:49	-08:31	-08:40
	NB	09:25	-01:08	-01:07	-01:22	-02:18	-02:11	-02:04
Net change from CS		-	+15:36	-07:33	-26:28	-42:50	-27:59	-25:51

Source: CSRM2

Table 43: Change in journey time per development scenario test – PM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S4	S4-1	S4-2	S4-3	S4-4	S4-5
A141 & A1123	EB	34:29	+10:58	+06:44	-04:44	-06:58	+04:54	+05:38
	WB	35:12	+06:48	+03:08	-10:59	-12:31	-05:56	-04:57
A141 Warboys Rbt	SB	24:30	+16:04	+09:56	+00:04	-06:04	-06:02	-05:15
	NB	30:21	+06:31	+05:49	+02:26	-11:33	-10:38	-10:38
Harrison Way	SB	15:33	+03:19	-04:27	-08:33	-08:36	-08:05	-08:35
	NB	15:05	+01:36	+00:47	-00:01	-03:15	-02:24	-01:32
Net change from CS			+45:16	+21:57	-21:47	-48:57	-28:11	-25:19

Source: CSRM2

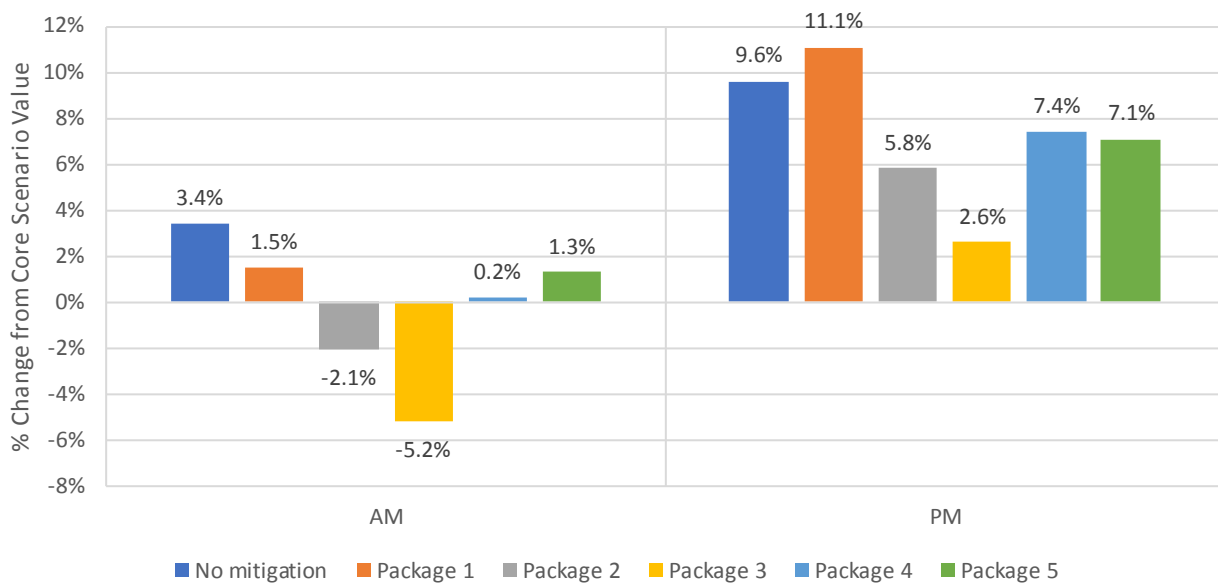
These tables show that:

- Journey times are higher overall in the pre-mitigation (S4) scenario than in the Core Scenario in both peak hours. This is the case for all routes and directions in the PM, and for all but Harrison Way and A141 Warboys Rbt NB in the AM, where journey times for the latter improve slightly
- Journey times are also higher overall for mitigation package 1 in the PM, though lower overall in the AM.
- Journey times are improved overall in both peak hours for the other post-mitigation scenarios compared to the Core Scenario. Greatest improvements are seen for mitigation package 3, which improves times on all routes in both directions and in both peak hours. Package 1 provides the lowest overall improvement, followed by packages 2, 5 and 4.
- Journey times overall are generally higher than for the other Development Scenarios

4.5.4 Scenario 4 Post-Mitigation Assessment Summary

Based on a measure of average junction performance across Huntingdonshire, and as summarised in the chart below, none of the mitigation packages deliver improved performance against the equivalent Core Scenario result in both peak hours, with only packages 2 and 3 delivering an improvement in the AM.

Chart 5: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



When considering the key local junctions for which specific mitigation has been considered, all mitigation scenarios show an overall improvement in junction performance when compared to the Core Scenario, with mitigation packages 2 and 3 providing the greatest improvement. However, not all junctions show an improvement with mitigation and so it would be expected that mitigation measures be developed further for the preferred development scenario as part of the detail planning application process.

In terms of journey times measured over three key local routes, the pre-mitigation scenario shows a journey time deterioration overall in both peak hours as does mitigation package 1 in the PM, but otherwise all other post-mitigation scenarios show an overall improvement in both peak hours, though less so than for the other scenarios. Mitigation package 3 shows the greatest improvement, followed by packages 4, 5 and 2.

Overall for this Development Scenario, none of the mitigation packages restore the performance of the network back to Core Scenario levels in both peak hours when measured on a Huntingdonshire-wide basis, despite most of these packages including at least one very significant infrastructure scheme that would require an order of investment which would not be deliverable through developer contributions alone.

4.6 Summary of Results

In terms of the scale of new development, Development Scenario 3 proposes the fewest new dwellings and Scenario 4 the greatest, with Scenarios 2 and 1 sitting in the middle. Generally speaking, the scale of transport impacts on the highway network follows the same order, with Scenario 3 generating the lowest impacts and Scenario 4 generating the greatest.

In terms of the mitigation packages, a similar pattern is observed. Mitigation package 1, which comprises local junction improvements only, results in the lowest level of improvement, while mitigation package 3, which comprises local junction improvements, a new A141 route and a third river crossing, results in the greatest level of improvement. Of those packages which involve either the new A141 scheme (package 2) or the third river crossing scheme (packages 4 and 5), the new A141 scheme generally delivers greater improvements.

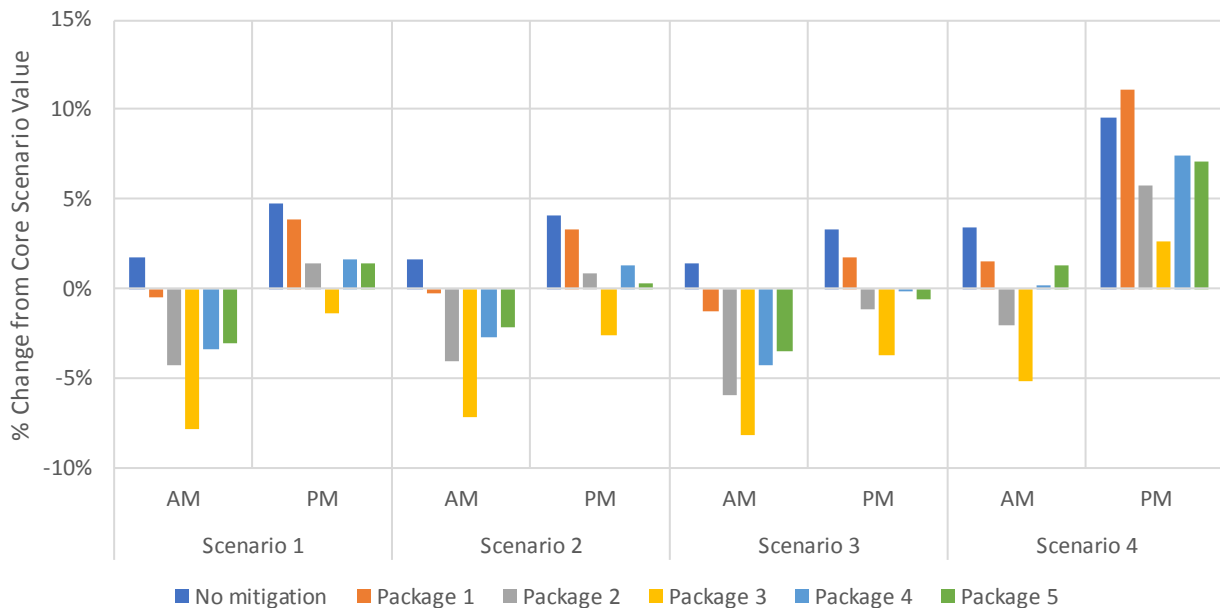
The following table and chart summarise the above network-level results for each development scenario and mitigation test. The results are shown in terms of the percentage change from the Core Scenario of the average RFC of all junctions modelled in Huntingdonshire. This provides a measure of the change in the overall performance of the Huntingdonshire network, where an increase in the average RFC represents a deterioration in performance and a decrease, an improvement. The aim of each mitigation package is to restore the network to Core Scenario levels of operation.

Table 44: Change from Core Scenario in average RFC of all Huntingdonshire junctions

Mitigation Package	% Change from Core Scenario							
	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	AM	PM	AM	PM	AM	PM	AM	PM
No mitigation	+1.8%	+4.8%	+1.6%	+4.1%	1.4%	3.3%	+3.4%	+9.6%
1	-0.5%	+3.9%	-0.3%	+3.3%	-1.3%	1.7%	+1.5%	+11.1%
2	-4.3%	+1.4%	-4.1%	+0.8%	-5.9%	-1.1%	-2.1%	+5.8%
3	-7.9%	-1.4%	-7.2%	-2.6%	-8.2%	-3.7%	-5.2%	+2.6%
4	-3.4%	+1.6%	-2.7%	+1.3%	-4.3%	-0.2%	+0.2%	+7.4%
5	-3.1%	+1.4%	-2.2%	+0.3%	-3.5%	-0.6%	+1.3%	+7.1%

Source: CSRM2

Chart 6: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



Source: CSRM2

This table confirms the above observations about the relative level of impact of each development scenario and the relative level of improvement delivered by each mitigation package: Development Scenario 3 shows the least impacts and Scenario 4 the greatest, while mitigation package 3 delivers the greatest improvements across scenarios and package 1 the least.

However, what is evident from this table is that, for all development scenarios, it is only possible to restore the performance of the network to Core Scenario levels in both peak hours with a mitigation package that involves a significant element of infrastructure. Such a package will not be deliverable based on local developer contributions alone and would require significant external funding. By contrast, mitigation package 1, which involves just local junction improvements, would be deliverable through developer contributions but does not provide the satisfactory level of impact mitigation for any of the development scenarios.

It is therefore concluded from this analysis that none of these development scenario options are deliverable in terms of the level of infrastructure spend required to mitigate their impacts.

Given the potential cost and deliverability challenges associated with larger scale infrastructure projects, a fifth development scenario has therefore been developed in consultation with the Client Team. The rationale behind this Scenario 5 is that:

- The development scale is lower than for the other four scenarios, while still meeting the required housing targets – this lower scale should generate fewer new trips on the network and so fewer pressures.
- The location of the two developments along the Ermine Street corridor to the north-west of Huntingdon are not separated from the A14 and proposed new A14 routes by the river and so are less likely to require significant infrastructure improvements in order to mitigate their transport impact.

This scenario is described and tested in the next section.

5 Development Scenario 5 Assessment

5.1 Introduction

The purpose of this section is to describe and present the modelling results for Development Scenario 5.

5.2 Modelling Approach

Scenario 5 has been modelled using the same method as for Scenarios 1 to 4, ie:

- Highway assignment model runs of CSRM2 model
- Forecast year of 2036
- AM and PM weekday peak hour scenarios

Results for Scenario 5 are compared against the equivalent Core Scenario in order to identify development impact. The Core Scenario and Scenario 5 are defined as follows:

- Core Scenario
 - This scenario tests what traffic flows could look like in 2036 with a core set of sites, including committed development. This is used as a future baseline to compare against.
- Development Scenario 5 – This scenario includes:
 - Core Scenario sites
 - RAF Alconbury released (1,450 dwellings)
 - Ermine Street (1,440 dwellings)

The Core Scenario modelling results are described above in Section 2.3.

As noted in the previous chapter above, the rationale behind Scenario 5 is that:

- The development scale is lower than for the other four scenarios, while still meeting the required housing targets – this lower scale should generate fewer new trips on the network and so fewer pressures.
- The location of the two developments along the Ermine Street corridor to the north-west of Huntingdon are not separated from the A14 and proposed new A14 routes by the river and so are less likely to require significant infrastructure improvements in order to mitigate their transport impact.

5.3 Development Scenario 5 Pre-Mitigation Results

5.3.1 Pre-Mitigation Network Performance Statistics

The following table summarises the Scenario 5 performance at a network-wide level and compares with the Core Scenario result shown above in Section 2.3.

Table 45: Scenario 5 network-level performance statistics and change from Core Scenario

Parameter	Scenario 5 Results		% Change from Core Scenario	
	AM	PM	AM	PM
Total PCU trips	117,108	125,135	-0.3%	-0.1%
Total veh-km	2,076,870	2,135,315	+0.2%	+0.8%
Avg veh travel distance per PCU trip (km)	17.7	17.1	+0.5%	+0.9%
Avg RFC for all Hunts junctions (%)	30.6	31.3	+0.0%	+0.2%

Source: CSRM2

The table shows an average RFC value which is an average across all junctions in Huntingdonshire and is included to provide an indication of overall network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made. It is recognised that an average can mask individual junction performance. For this reason, changes in individual junction performance is also considered in subsequent tables.

The table shows that, at a network level, Scenario 5 results in a 0.0% to 0.2% increase in the average RFC of all Huntingdonshire junctions compared to the Core Scenario. This is a considerably better result than achieved for Scenarios 1 to 4, but still suggests that some mitigation is required.

5.3.2 Pre-Mitigation Local Network Impact Results

For Development Scenario 5, the following two figures show, for the AM and PM weekday peak periods respectively:

- Potential development sites
- Change in traffic flows compared to the equivalent Core Scenario, shown as 'bandwidths'
- Significant changes in junction performance compared to the equivalent Core Scenario
- The key junctions listed in Table 1 above denoted by black circle outlines

The changes in traffic flows are a function of the distribution of development-generated flows which have been added to the network. For reference, these flows are shown for each development site in Appendix F.1. These figures show that impacts for Scenario 5 are largely limited to the Ermine Street corridor and the A141 around Huntingdonshire. In some cases the model results shown may not necessarily align with what might initially be expected. This is not unusual in a dynamic model where traffic flows are not just additive and complex reassignment, and other demand response, effects can occur.

With regard to the AM peak, the key flow increases in comparison to the Core Scenario are seen on:

- the A14(T) to A1(M) spur southbound north of Huntingdon, on A1 southbound south of Alconbury - this is primarily related to increased demand associated with additional development at RAF Alconbury, and existing traffic displaced from Ermine Street due to traffic associated with the Ermine Street site itself
- the B1090 north of Huntingdon – this appears to be due to existing traffic seeking to bypass areas impacted by increased traffic associated with the Ermine Street and RAF Alconbury sites

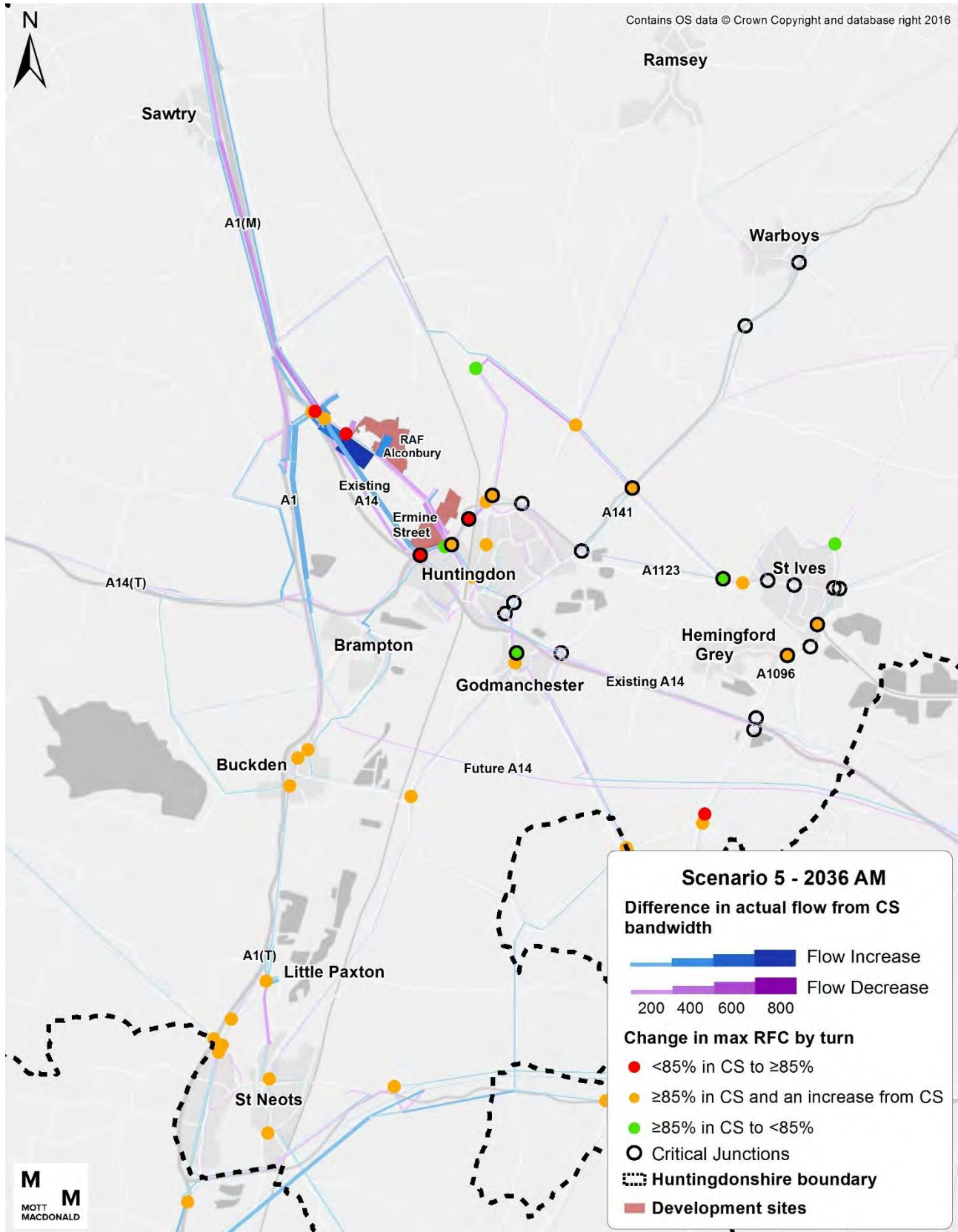
There are some other, generally minor increases and decreases in flow at other locations on the network as traffic flows adjust to the general changes in demand. These are not generally significant at the link flow level but do have junction implications which are considered in the junction-level results sections below.

With regard to the PM peak, the greatest flow increases can be seen on:

- Ermine Street – this is directly development-related
- the existing A14 northwestbound, south east of Huntingdon –this is primarily due to traffic associated with development at RAF Alconbury and Ermine Street returning from the Cambridge direction
- local roads to the north of Huntingdon, including the B1090, which appears to be due to traffic destined for the A141 to Warboys and beyond seeking to avoid the A1123 and A141.

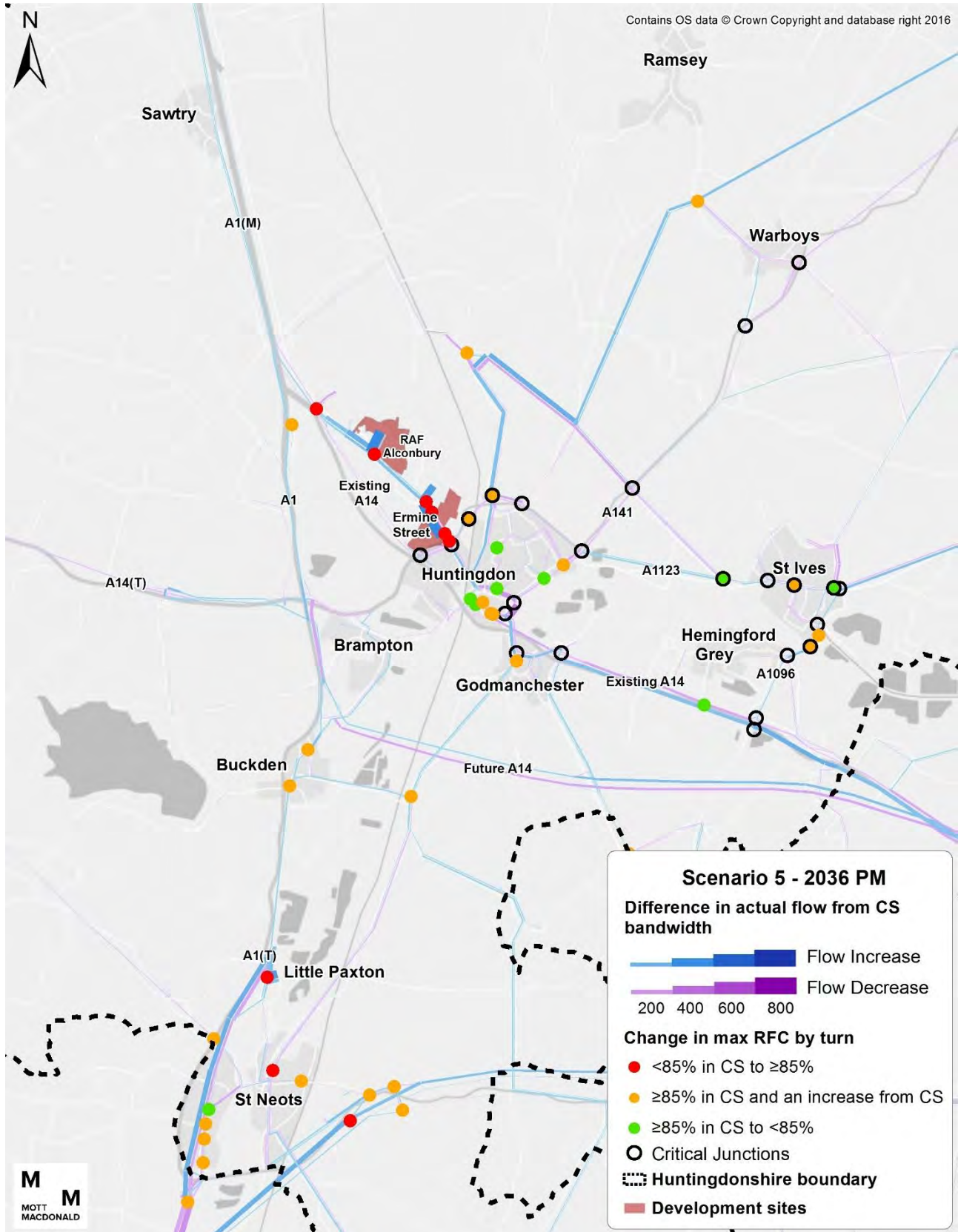
There are some other, generally minor increases and decreases in flow at other locations on the network as traffic flows adjust to the general changes in demand. These are not generally significant at the link flow level but do have junction implications which are considered in the junction-level results sections below.

Figure 15: Scenario 5 change in traffic flows and junction performance vs Core Scenario – AM



Source: CSRM2

Figure 16: Scenario 5 change in traffic flows and junction performance vs Core Scenario – PM



Source: CSRM2

5.3.3 Pre-Mitigation Junction Impact Results

The following table provides performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in Scenario 5. The equivalent results for the Core Scenario are shown for reference. For ease of reference, RFC results are colour coded as follows:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

At some junctions there can be a net reduction in the RFC, even though there are greater traffic flows on the network overall due to development-related traffic. This is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can, in turn, result in improvements in junction performance elsewhere due to the balance of flows at those junctions changing.

Table 46: Key junction worst-arm RFC performance results for Scenario 5 and mitigation requirement

Map Ref	Junction	Core Scenario		Scenario 5	
		AM	PM	AM	PM
A	Spittals Interchange	76	84	89	80
B	A141/Ermine Street/Stukeley Road	109	111	116	110
C	A141/Washingley Road/Latham Road	83	85	88	88
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	113	122
E	A141/Kings Ripton Road	109	113	108	109
F	A141/B1514/A1123	116	114	114	108
G	A141/B1090 Sawtry Way	114	96	115	90
H	A141/B1040 Church Road	80	54	79	53
J	A1123 Houghton Hill/B1090 Sawtry Way	86	93	79	81
K	A1123 Houghton Road/Hill Rise	70	60	68	59
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	73	97
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	91	80
N	B1514 Hartford Road/B1514 Nursery Road	52	67	58	57
O	B1514 Castle Moat Road/The Avenue	65	66	65	64
P	Post Street/Cambridge Street/Causeway (Godmanchester)	93	96	76	90
Q	B1040/A1198/A14 J24	50	61	47	56
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	92	103
S	A1096 Harrison Way/Guided Busway crossing	103	103	102	106
T	A1096 Harrison Way/Low Road	106	112	106	105
U	A1096/A14 J26	84	84	83	85

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

As agreed with the client team, mitigation is recommended for consideration at any junction meeting the following conditions within each time period:

- Junctions with a maximum RFC of under 85% in the Core Scenario but a maximum RFC of more than or equal to 85% in Scenario 2
- Junctions with a maximum RFC of more than or equal to 85% in the Core Scenario but a maximum RFC in Scenario 2 which is higher still

Of the 22 junctions listed, the above table shows that Scenario 5 results in a performance deterioration requiring potential mitigation for 9 of them.

5.3.4 Pre-Mitigation Journey Time Impact Results

Appendix F.3 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 5 (Ref)

It also shows results for post-mitigation packages applied to this scenario, but these are reported on in the post-mitigation section below.

As noted above, the selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following table which shows, for the AM peak and PM peak:

- Core Scenario total route journey time for each route and by direction
- The difference in journey time from the Core Scenario value for the pre-mitigation Scenario 5

These tables therefore provide a ready indication of how the added development flows of Scenario 5 affect Core Scenario journey times over these key routes.

Table 47: Change in journey time from Core Scenario, AM & PM

Route	Direction	Core Scenario Journey Time (MM:SS)		Change in Journey Time from CS (MM:SS)	
		AM	PM	AM	PM
A141 & A1123	EB	26:16	34:29	+02:02	+05:02
	WB	36:24	35:12	-02:23	-08:08
A141 Warboys Rbt	SB	32:29	24:30	-01:29	-07:26
	NB	22:06	30:21	-00:48	+04:13
Harrison Way	SB	20:10	15:33	-00:35	-06:44
	NB	09:25	15:05	-00:13	+06:34
Net change from CS		-	-	-03:26	-06:30

Source: CSRM2

This data shows small journey time improvements on most routes.

5.4 Development Scenario 5 Post-Mitigation Modelling Results

To allow comparison, Development Scenario 5 has been modelled using the same mitigation packages as for Scenarios 1 to 4 and as described in Section 3.4 above.

5.4.1 Post-Mitigation Network Impact Results

For each mitigation package model run, Appendix F.2 shows for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario

- The change in junction RFC compared to the Core Scenario

The following table summarises, for each mitigation package model run (see Table 19 above), the overall performance of the Huntingdonshire network by listing the average RFC result measured across all Huntingdonshire junctions in the model and by showing the percentage change from the equivalent Core Scenario result presented above in Table 2. This metric is used for all scenario tests to allow a high level comparison of network performance across scenarios to be made. It is recognised that an average can mask individual junction performance but, for this reason, changes in individual junction performance are also considered in subsequent tables below.

Table 48: Scenario 5 Huntingdonshire junctions average RFC result and change from Core Scenario

Mitigation Package	All Hunts Jns Avg RFC (%)		% Change from Core Scenario	
	AM	PM	AM	PM
No mitigation	30.6	31.3	+0.0%	+0.2%
1 – Junction improvements only	29.9	30.8	-2.4%	-1.2%
2 – Package 1 & A141 Improvement	28.4	29.4	-7.1%	-5.6%
3 – Package 2 & 3 rd River Crossing	27.5	29.2	-10.0%	-6.4%
4 – Package 1 & 3 rd River Crossing	29.0	30.4	-5.3%	-2.4%
5 – Package 4 & Town Bridge Closure	29.2	30.6	-4.7%	-2.0%

Source: CSR2

This table shows that all mitigation packages deliver an improvement in overall performance in both peaks over the equivalent Core Scenario result, including mitigation package 1. This therefore suggests that Development Scenario 5 only requires a package of individual junction mitigation measures to be deliverable, rather than the significant infrastructure investment required by the other scenarios. This makes Scenario 5 with mitigation package 1 the preferred development option.

For completeness, the following table presents the same comparison with the Core Scenario but against the other network-level parameters presented in Table 2 above.

Table 49: Change in network-level parameters for Scenario 5 compared with Core Scenario

Mitigation Package	Total PCU Trips		Total veh-km		Avg Dist per Trip (km)	
	AM	PM	AM	PM	AM	PM
No mitigation	-0.3%	-0.1%	0.2%	0.8%	0.5%	0.9%
1 – Junction improvements only	-0.3%	0.0%	0.3%	0.8%	0.7%	0.8%
2 – Package 1 & A141 Improvement	-0.3%	0.0%	0.1%	0.9%	0.4%	0.9%
3 – Package 2 & 3 rd River Crossing	-0.3%	0.0%	0.2%	1.3%	0.6%	1.3%
4 – Package 1 & 3 rd River Crossing	-0.3%	0.0%	0.4%	1.3%	0.7%	1.3%
5 – Package 4 & Town Bridge Closure	-0.3%	0.0%	0.5%	1.1%	0.9%	1.1%

Source: CSR2

This table shows that:

- The total level of PCU trips is about the same in all pre and post mitigation scenarios, and also similar to Core Scenario levels
- There is a general trend for the total travel distance to increase with greater mitigation levels compared to the no mitigation test. This is a reflection of how vehicles will divert to travel further on new infrastructure for the sake of avoiding congestion
- Because total trip levels are similar in Scenario 5 to the Core Scenario, the small increases in total travel distance equate to equally small increases in average trip distances. The increase for the mitigation package 1 test, however, is very minor.

5.4.2 Post-Mitigation Junction Impact Results

The following tables provide performance results for each key junction listed in Table 1 above in terms of the highest RFC level reached on any one arm of each junction in the AM and PM peak hours, and for the:

- The Core Scenario (CS)
- The pre-mitigation Development Scenario 1 (S5)
- Development Scenario 1 with mitigation packages 1 to 5 applied (S5-X)

Comparison between the post-mitigation results below and the Core Scenario results show whether each junction is predicted to improve or deteriorate as a result of the applied measures. Colour coding is used to assist with interpretation where:

- Green for within capacity junctions (ie <85% RFC)
- Orange for over operational capacity junctions (ie >=85% but <100% RFC)
- Red for over absolute capacity junctions (ie >=100% RFC)

It is noted that, at some junctions where mitigation has been applied in the model, the RFC value can actually increase compared to the pre-mitigation value which would indicate that performance has deteriorated as a result of the improvements. This type of result is not uncommon when using a dynamic model as increased junction delays in one part of the network can lead to some traffic re-routing, or potentially making other demand responses such as changing its destination. This can equally cause some junctions where no changes have been made to show a reduction in RFC and therefore an improvement in performance. The more common result is that junction improvements deliver performance improvements and the values shown in the following tables are appropriate for comparative purposes, but it is noted that RFC values taken directly from a strategic model should be interpreted with these considerations in mind.

Table 50: Scenario 5 junction-level worst-arm RFC results – AM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S5	S5-1	S5-2	S5-3	S5-4	S5-5
A	Spittals Interchange	Y	76	89	65	68	70	61	63
B	A141/Ermine Street/Stukeley Rd	Y	109	116	105	40	39	103	103
C	A141/Washingley Road/Latham Rd	Y	83	88	87	44	35	95	95
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	108	113	111	92	92	111	109
E	A141/Kings Ripton Rd	Y	109	108	90	64	66	99	98
F	A141/B1514/A1123	Y	116	114	90	104	101	75	88
G	A141/B1090 Sawtry Way	Y	114	115	115	111	117	122	121
H	A141/B1040 Church Rd		80	79	78	83	82	77	78
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	86	79	59	70	63	77	71
K	A1123 Houghton Rd/Hill Rise	Y	70	68	79	72	73	73	72
L	A1123 Houghton Rd/Ramsey Rd	Y	71	73	73	87	65	72	69
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	95	91	100	101	101	101	101
N	B1514 Hartford Rd/B1514 Nursery Rd		52	58	53	45	30	32	33
O	B1514 Castle Moat Rd/The Avenue		65	65	59	51	33	38	35
P	Post St/Cambridge St/Causeway	Y	93	76	35	35	29	29	33
Q	B1040/A1198/A14 J24		50	47	48	50	60	57	69
R	A1096 Harrison Way/The Quadrant	Y	92	92	94	93	78	78	78
S	A1096 Harrison Way/Busway crossing	Y	103	102	103	102	88	89	88
T	A1096 Harrison Way/Low Rd	Y	106	106	87	86	85	86	85
U	A1096/A14 J26	Y	84	83	70	69	69	71	70

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Table 51: Scenario 5 junction-level worst-arm RFC results – PM

Jn Ref	Junction Name	Mitigation Applied?	RFC Values (%)						
			CS	S5	S5-1	S5-2	S5-3	S5-4	S5-5
A	Spittals Interchange	Y	84	80	63	66	68	53	55
B	A141/Ermine Street/Stukeley Rd	Y	111	110	104	43	40	102	101
C	A141/Washingley Road/Latham Rd	Y	85	88	89	44	45	95	92
D	A141/ Huntingdon Rd/Abbots Ripton Rd	Y	116	122	108	83	75	111	110
E	A141/Kings Ripton Rd	Y	113	109	109	72	72	101	106
F	A141/B1514/A1123	Y	114	108	113	121	120	106	109
G	A141/B1090 Sawtry Way	Y	96	90	90	93	100	104	104
H	A141/B1040 Church Rd		54	53	53	57	58	57	56
J	A1123 Houghton Hill/B1090 Sawtry Way	Y	93	81	82	70	75	81	79
K	A1123 Houghton Rd/Hill Rise	Y	60	59	57	55	59	58	58
L	A1123 Houghton Rd/Ramsey Rd	Y	92	97	83	99	90	77	90
M	A1123 St Audrey Ln/B1040 Somersham Rd	Y	88	80	78	74	68	66	66
N	B1514 Hartford Rd/B1514 Nursery Rd		67	57	57	59	54	49	51
O	B1514 Castle Moat Rd/The Avenue		66	64	62	61	48	46	54
P	Post St/Cambridge St/Causeway	Y	96	90	35	34	35	34	51
Q	B1040/A1198/A14 J24		61	56	62	62	71	76	70
R	A1096 Harrison Way/The Quadrant	Y	103	103	101	101	101	101	101
S	A1096 Harrison Way/Busway crossing	Y	103	106	106	106	95	95	95
T	A1096 Harrison Way/Low Rd	Y	112	105	88	89	78	78	78
U	A1096/A14 J26	Y	84	85	69	60	53	56	53

Source: CSRM2 (Junction I results not available for this parameter as this junction is outside simulated model area)

Overall, these tables show that, based on these key junctions, mitigation packages 2 and 3 provide the greatest improvement in junction performance overall.

The above results are based on the same mitigation package 1 composition as applied to the other 4 development scenarios. However, the package specifically required by Scenario 5 is considered in the next section.

5.4.3 Post-Mitigation Journey Time Impact Results

Appendix F.3 shows modelled journey times along three key routes in both the AM and PM peak hours and for the following scenarios:

- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 5 (Ref)
- Development Scenario 5 with mitigation packages 1 to 5 applied (Test X)

The selected routes are:

- A141 and A1123 Huntingdon Rd, eastbound and westbound
- A141 Warboys Roundabout, northbound and southbound
- Harrison Way, northbound and southbound

These results are summarised in the following two tables which show, for the AM peak and PM peak separately:

- Core Scenario total route journey time for each route and by direction

- The difference in journey time from the Core Scenario value for each development scenario test as follows:
 - The pre-mitigation Development Scenario 5 (S5)
 - Development Scenario 5 with mitigation packages 1 to 5 applied (S5-X)

These tables therefore provide a ready indication of those mitigation scenarios which result in an increase in journey time over the Core Scenario and those which result in an improvement.

Table 52: Change in journey time per development scenario test – AM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S5	S5-1	S5-2	S5-3	S5-4	S5-5
A141 & A1123	EB	26:16	+02:02	+01:36	-04:12	-05:59	+00:40	-00:18
	WB	36:24	-02:23	-09:29	-15:45	-15:23	-10:27	-10:11
A141 Warboys Rbt	SB	32:29	-01:29	-06:46	-08:17	-11:10	-11:10	-11:10
	NB	22:06	-00:48	-01:46	-01:57	-11:27	-11:23	-10:30
Harrison Way	SB	20:10	-00:35	-08:39	-10:16	-11:06	-10:49	-10:56
	NB	09:25	-00:13	+00:25	-00:03	-02:03	-01:59	-01:50
Net change from CS		-	-03:26	-24:39	-40:31	-57:08	-45:10	-44:54

Source: CSRM2

Table 53: Change in journey time per development scenario test – PM

Route	Direction	CS JT (MM:SS)	Change in Journey Time from CS (MM:SS)					
			S5	S5-1	S5-2	S5-3	S5-4	S5-5
A141 & A1123	EB	34:29	+05:02	+00:20	-05:54	-10:39	-02:20	-03:39
	WB	35:12	-08:08	-10:09	-17:09	-15:00	-10:57	-10:03
A141 Warboys Rbt	SB	24:30	-07:26	-05:42	-07:19	-11:38	-12:00	-11:45
	NB	30:21	+04:13	-01:35	-00:31	-13:58	-15:20	-15:17
Harrison Way	SB	15:33	-06:44	-08:17	-08:51	-09:11	-09:06	-09:14
	NB	15:05	+06:34	-00:15	-00:18	-04:31	-04:34	-04:20
Net change from CS		-	-06:30	-25:37	-40:03	-01:04:57	-54:16	-54:18

Source: CSRM2

These tables show that:

- Journey times are actually already improved in the pre-mitigation (S5) scenario compared with the Core Scenario in both peak hours when measured across all routes and directions. However, journey times do increase on the A141 & A1123 EB route in both peaks, and on the A141 Warboys NB and Harrison Way NB routes in the PM.
- Journey times are improved overall in both peak hours for all post-mitigation scenarios compared to the Core Scenario. Greatest improvements are seen for mitigation package 3, followed by packages 4/5, 2 and 1.

5.5 Scenario Specific Mitigation Package

The junction-level pre-mitigation results shown in Table 46 above for Scenario 5 suggest that nine of the key junctions experience a negative development-related impact and so potentially require mitigation. Applying mitigation to just these nine junctions resulted in negative development impacts arising at a further four of the key junctions. For these junctions, the post-mitigation RFC results and a preliminary indicative mitigation cost for each (see Section 3.2 above) are listed in the following table.

Table 54: Key junction worst-arm RFC performance results for Scenario 5 mitigation package

Map Ref	Junction	Core Scenario		Scenario 5		Mitigation Cost Est.
		AM	PM	AM	PM	
A	Spittals Interchange	76	84	65	59	£330,200
B	A141/Ermine Street/Stukeley Road	109	111	105	102	£179,400
C	A141/Washingley Road/Latham Road	83	85	91	91	£115,900
D	A141/ Huntingdon Road/Abbots Ripton Road	108	116	111	108	£329,250
E	A141/Kings Ripton Road	109	113	90	110	£107,450
F	A141/B1514/A1123	116	114	89	113	£506,200
G	A141/B1090 Sawtry Way	114	96	115	90	£463,150
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	71	92	58	68	£106,300
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	95	88	102	78	£1,405,300
R	A1096 Harrison Way/The Quadrant/Meadow Lane	92	103	94	101	£379,950
S	A1096 Harrison Way/Guided Busway crossing	103	103	102	106	£558,950
T	A1096 Harrison Way/Low Road	106	112	86	89	£642,950
U	A1096/A14 J26	84	84	70	69	£140,600
Total						£5,265,600

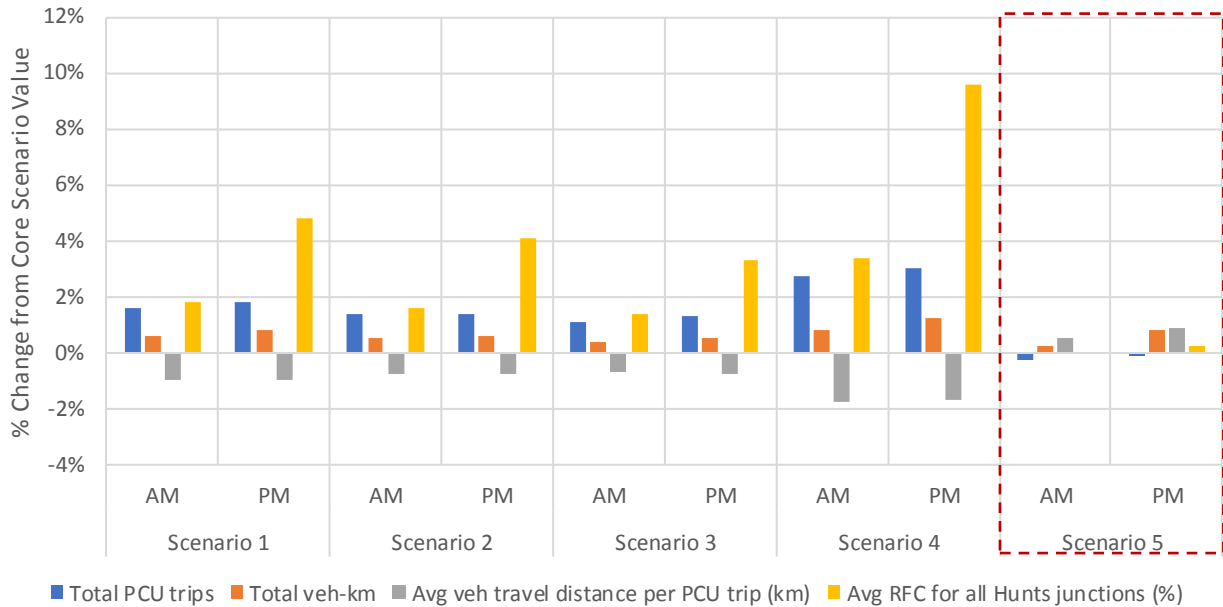
Source: CSR2

This table of results suggests an outline mitigation package cost for Scenario 5 of a little over £5m. However, it is noted that some of the above mitigated junctions are not mitigated to perform at Core Scenario levels, though the wider Huntingdonshire network does as a whole. It would be expected that mitigation measures be developed further as part of the detail planning application process which could therefore result in this cost estimate rising or falling, though it is not considered that the order of cost will change. The above modelling results strongly suggest that Scenario 5 can be delivered with a significantly lower level of spend on highway infrastructure than for the other development scenarios.

5.6 Summary

In view of level of transport impacts predicted above for Developments Scenarios 1 to 4, Development Scenario 5 proposes a lower scale of development and also distributes new development in locations which reduce pressure on cross-river movements to the A14 corridor. This is confirmed by the following chart which shows how the pre-mitigation Scenario 5 (highlighted by red box) compares with the pre-mitigation Scenarios 1 to 4 in terms of the change from Core Scenarios values in key network-level parameters.

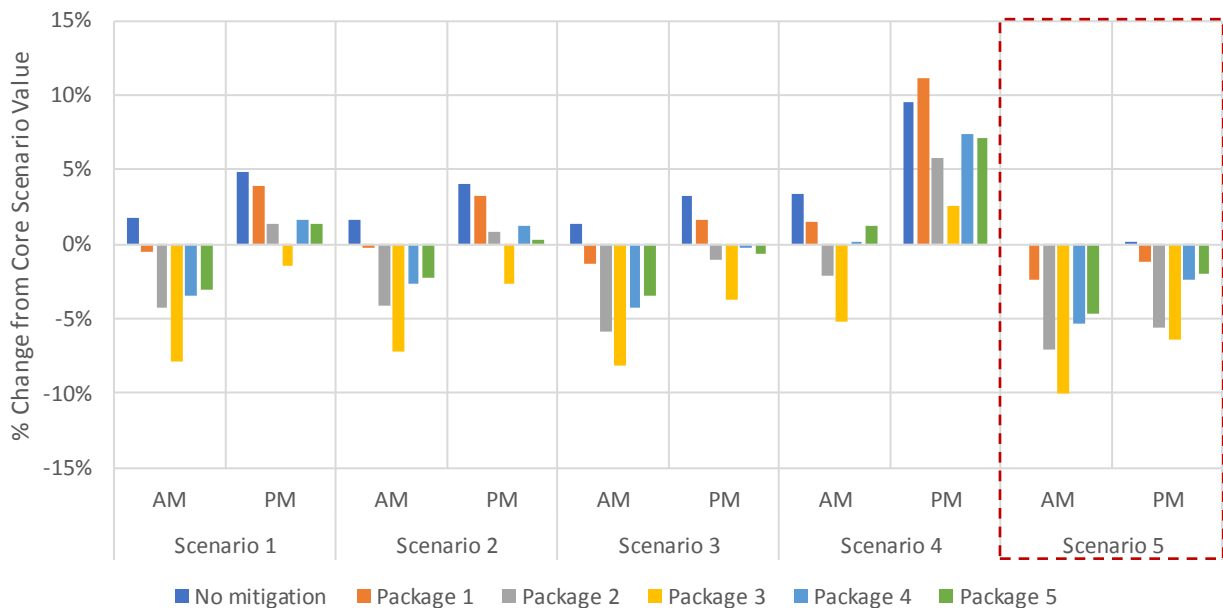
Chart 7: % Change in network level statistics compared to Core Scenario



Source: CSR2

The following chart also compares Scenario 5 (highlighted by red box) with the other Development Scenarios 1 to 4 in terms of its response to the 5 mitigation packages, measured by the percentage change from Core Scenario values in the average RFC of all Huntingdonshire junctions. This shows that Scenario 5 is the only scenario predicted to be mitigated in both peak hours by a package of local junction improvement measures only (ie Package 1 – orange bar in chart), as opposed to also requiring the large infrastructure schemes of the other packages.

Chart 8: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



The above modelling results for Scenario 5 therefore suggest that this scenario could be delivered with a package of junction mitigation measures costing in the order of £5m. As with the other scenarios, this would, of course, need to be accompanied by other transport interventions including for walking, cycling, and public transport, which would need to be explored in detail through the Transport Assessment process.

It should be noted that these are indicative, preliminary, highway cost estimates only, but provide a reasonable indication of potential scale of cost. Although there will be a need for the Local Planning and Highway Authority to consider potential transport-related costs alongside all other development costs in assessing the viability of the Plan, from a transport perspective Scenario 5 is the recommended scenario for incorporation into the Huntingdonshire Local Plan.

6 Summary and Conclusions

6.1 Report Background

Mott MacDonald has been commissioned by Huntingdonshire District Council and Cambridgeshire County Council to provide a transport evidence base for preparation and examination of the Huntingdonshire Local Plan that runs to 2036 (HLP2036). The scope of the study is to:

- Identify and test the transport implications of committed development and four potential development scenarios
- Recommend the most sustainable development scenario in transport terms for delivering the 21,000+ homes required
- Highlight where there are opportunities for increasing the usage of sustainable transport modes
- Identify and cost where amended or additional transport infrastructure is required to mitigate the predicted impacts of each potential development scenario
- Form the basis of a district-wide transport strategy that mitigates the transport implications of the chosen development scenario

In accordance with this scope, this report provides a summary of the modelling and analysis to assess the transport implications of the four development scenarios in Huntingdonshire. The document has been prepared to:

- Understand the impact of development in Huntingdonshire on the transport network
- Test the impact of four different development scenarios in 2036 using CSRM2
- Develop costed mitigation measures to alleviate the impacts
- Retest the growth scenarios with mitigation measures in place
- Recommend a preferred growth scenario, from a transport perspective

6.2 Modelling Results – Scenarios 1 to 4

The modelling approach by which the assessment of the four Development Scenarios has been undertaken is as described in our separate 'HDC Strategic Transport Study Modelling Strategy' note, dated July 2016 and attached for reference in Appendix A. However, in summary, the approach is based on:

- Highway assignment model runs of CSRM2 model
- Forecast year of 2036
- AM and PM weekday peak hour scenarios

Results for each Development Scenario are compared against an equivalent Core Scenario in order to identify development impact. The different scenarios are described in Section 2.2.1 above.

The following table and chart summarise the network-level performance statistics for each Development Scenario in terms of their percentage change from the equivalent Core Scenario results. The table shows an average RFC³ value for all junctions in Huntingdonshire and is included to provide an indication of overall

³ RFC = 'Ratio of Flow to Capacity'. This is a standard measure of junction performance and describes what proportion of traffic flow capacity on each junction arm is taken up by the actual predicted traffic flow. RFC values between over 85% and 100% are considered to be 'over operational capacity' as it is in this range that queueing and delay starts to build up noticeably. RFC values of beyond 100% are considered to be 'over absolute capacity', and significant queueing and delay can be expected under these circumstances.

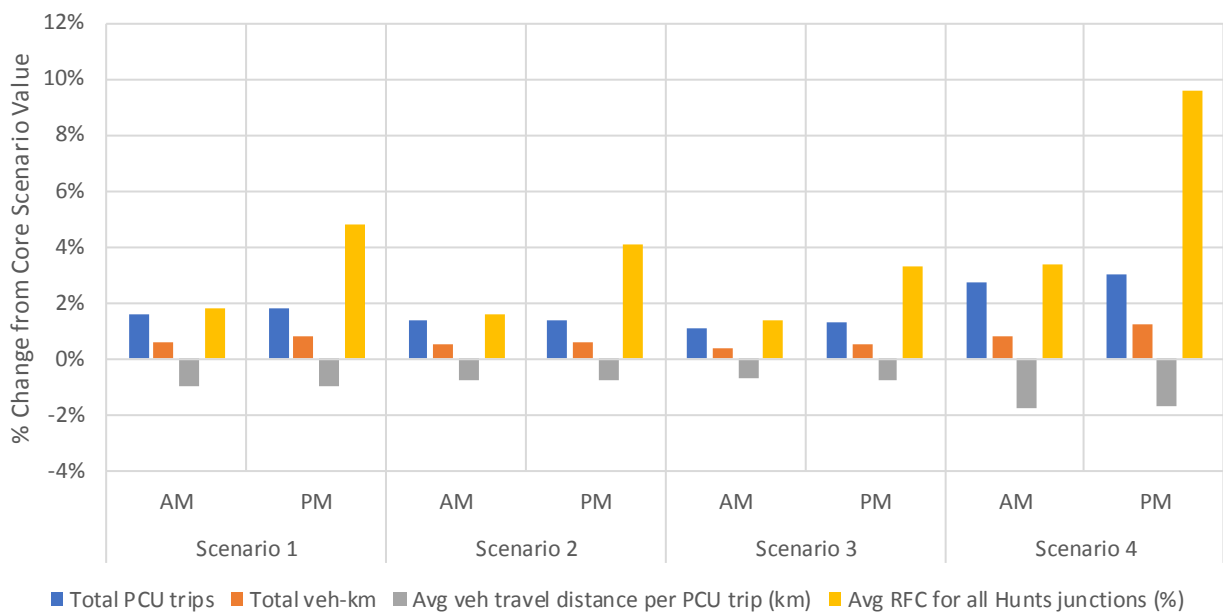
network performance across the District. The same metric is used for all scenario tests to allow a high level comparison across scenarios to be made.

Table 55: Change in network-level performance statistics from Core Scenario

Parameter	% Change from Core Scenario							
	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	AM	PM	AM	PM	AM	PM	AM	PM
Total PCU trips	+1.6%	+1.8%	+1.4%	+1.4%	+1.1%	+1.3%	+2.7%	+3.0%
Total veh-km	+0.6%	+0.8%	+0.5%	+0.6%	+0.4%	+0.5%	+0.8%	+1.2%
Avg veh travel distance per PCU trip (km)	-1.0%	-1.0%	-0.8%	-0.8%	-0.7%	-0.8%	-1.8%	-1.7%
Avg RFC for all Hunts junctions (%)	+1.8%	+4.8%	+1.6%	+4.1%	+1.4%	+3.3%	+3.4%	+9.6%

Source: CSRM2

Chart 9: % Change in network level statistics compared to Core Scenario



Source: CSRM2

This table and chart show that all scenarios result in a reduction in the average trip distance in the model, which suggests each scenario delivers a more sustainable development distribution despite the increased total number of trips, but that all scenarios also result in a deterioration in average junction performance across the district when compared to Core Scenario levels.

In order to mitigate these impacts, five mitigation packages have been tested for each scenario. These packages are described in Section 3.4 above and summarised in Table 56 below.

Table 56: Mitigation measure packages and total estimated package cost

Package Ref	Measures Included	Total Estimated Cost
1	All junction improvements only	£6.7m
2	All junction improvements & A141 Improvement	£87.3m
3	All junction improvements & A141 Improvement & 3 rd River Crossing	£223.5m
4	All junction improvements & 3 rd River Crossing	£142.9m
5	All junction improvements & 3 rd River Crossing & Town Bridge Closure	£143.0m

Source: MM / HDC / CCC

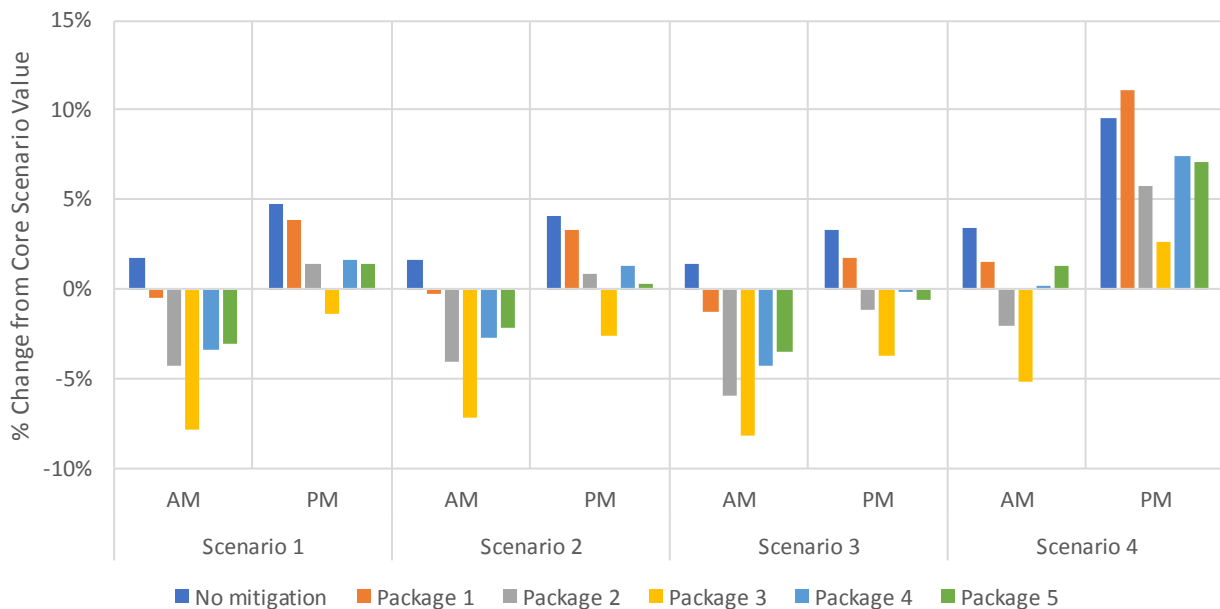
The following table and chart summarise the modelling results for each scenario/package combination in terms of the percentage change in Core Scenario levels of average RFC for all junctions in Huntingdonshire, where an increase in the average RFC represents a deterioration in performance and a decrease, an improvement. The aim of each mitigation package is to restore the network to Core Scenario levels of operation.

Table 57: Change from Core Scenario in average RFC of all Huntingdonshire junctions

Mitigation Package	% Change from Core Scenario							
	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	AM	PM	AM	PM	AM	PM	AM	PM
No mitigation	+1.8%	+4.8%	+1.6%	+4.1%	1.4%	3.3%	+3.4%	+9.6%
1	-0.5%	+3.9%	-0.3%	+3.3%	-1.3%	1.7%	+1.5%	+11.1%
2	-4.3%	+1.4%	-4.1%	+0.8%	-5.9%	-1.1%	-2.1%	+5.8%
3	-7.9%	-1.4%	-7.2%	-2.6%	-8.2%	-3.7%	-5.2%	+2.6%
4	-3.4%	+1.6%	-2.7%	+1.3%	-4.3%	-0.2%	+0.2%	+7.4%
5	-3.1%	+1.4%	-2.2%	+0.3%	-3.5%	-0.6%	+1.3%	+7.1%

Source: CSR2

Chart 10: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



Source: CSR2

The headline result from this data is that the only mitigation packages that restore the network to Core Scenario levels of performance in both peak hours are those which involve significant infrastructure measures such as a third river crossing or a complete upgrade to the A141, all of which will not be deliverable through developer contributions alone. For Development Scenarios 1 and 2, only mitigation package 3 delivers this result, while packages 2 to 5 do so for Scenario 3. For Scenario 4, none of the packages achieve this goal.

It is therefore concluded from this analysis that none of these development scenario options are deliverable in terms of the level of infrastructure spend required to mitigate their impacts.

Given the potential cost and deliverability challenges associated with larger scale infrastructure projects, a fifth development scenario has therefore been developed in consultation with the Client Team and this is described and tested in the next section.

6.3 Modelling Results – Scenario 5

Development Scenario 5 includes the following developments:

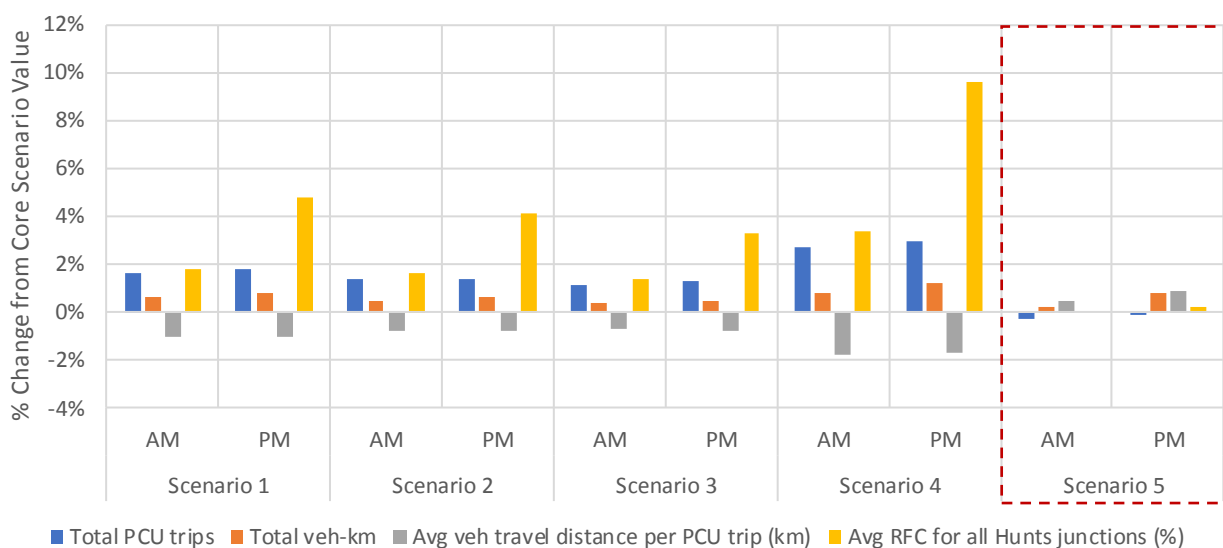
- Core Scenario sites
- RAF Alconbury released (1,450 dwellings)
- Ermine Street (1,440 dwellings)

The rationale behind Scenario 5 is that:

- The development scale is lower than for the other four scenarios, while still meeting the required housing targets – this lower scale should generate fewer new trips on the network and so fewer pressures.
- The location of the two developments along the Ermine Street corridor to the north-west of Huntingdon are not separated from the A14 and proposed new A14 routes by the river and so are less likely to require significant infrastructure improvements in order to mitigate their transport impact.

The difference with this scenario is confirmed by the following chart which shows how the pre-mitigation Scenario 5 (highlighted by red box) compares with the pre-mitigation Scenarios 1 to 4 in terms of the change from Core Scenarios values in key network-level parameters.

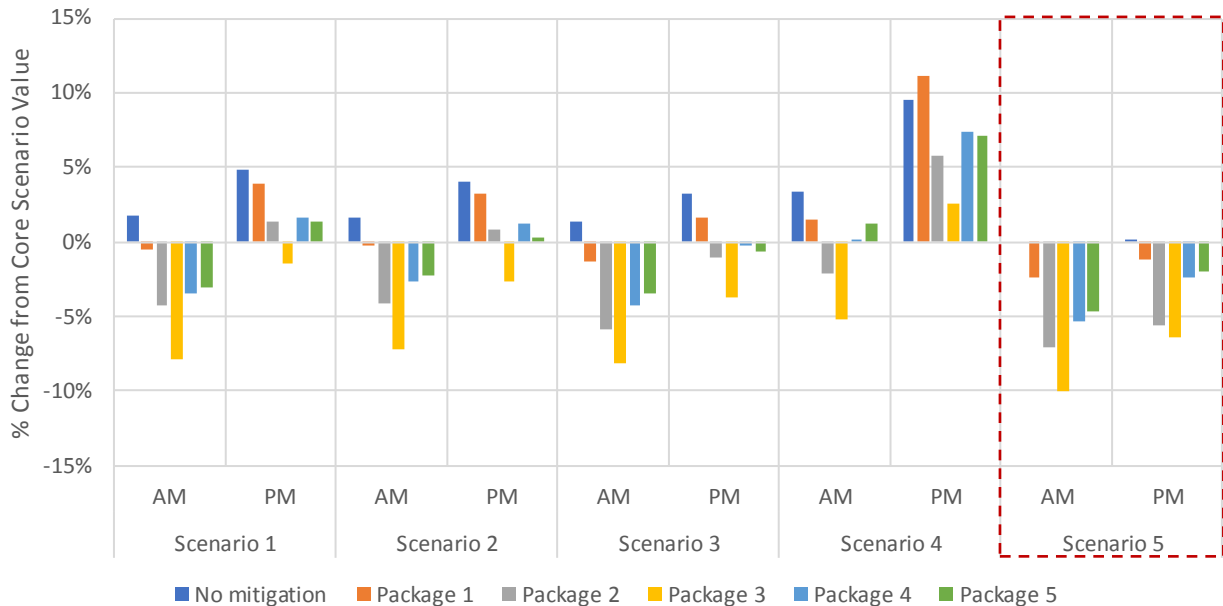
Chart 11: % Change in network level statistics compared to Core Scenario



Source: CSR2

The initial Scenario 5 modelling results showed improved performance compared to Scenarios 1 to 4 but that some mitigation is still required. This scenario was therefore reassessed against the above mitigation packages 1 to 5 and the change in Huntingdonshire wide RFC results are summarised in the following chart and compared with the same results fro Development Scenarios 1 to 4.

Chart 12: % Change in average RFC for all Huntingdonshire junctions compared to Core Scenario



This chart shows that, for Scenario 5, all mitigation packages deliver an improvement in overall performance in both peaks over the equivalent Core Scenario result, including mitigation package 1. This therefore suggests that Development Scenario 5 only requires a package of individual local junction mitigation measures to be deliverable, rather than the more significant infrastructure investment required by the other scenarios.

Further refinement of mitigation package 1 to the specific impacts of this scenario suggest the following junction mitigation and cost combination for Scenario 5 (see Figure 2 for junction locations):

Table 58: Key junction worst-arm RFC performance results for Scenario 5 mitigation package

Map Ref	Junction	Mitigation Cost Est.
A	Spittals Interchange	£330,200
B	A141/Ermine Street/Stukeley Road	£179,400
C	A141/Washingley Road/Latham Road	£115,900
D	A141/ Huntingdon Road/Abbots Ripton Road	£329,200
E	A141/Kings Ripton Road	£107,400
F	A141/B1514/A1123	£506,200
G	A141/B1090 Sawtry Way	£463,200
L	A1123 Houghton Road/Ramsey Road/A1123 St Audrey Lane	£106,300
M	A1123 St Audrey Lane/B1040 Somersham Road/A1123	£1,405,300
R	A1096 Harrison Way/The Quadrant/Meadow Lane	£380,000
S	A1096 Harrison Way/Guided Busway crossing	£558,900
T	A1096 Harrison Way/Low Road	£642,900
U	A1096/A14 J26	£140,600
Total		£5,265,500

Source: CSR2

6.4 Conclusion

The above modelling results for Scenario 5 suggest that this scenario could be delivered with a package of junction mitigation measures costing in the order of £5m. It is considered that this order of investment could be deliverable through appropriate developer contributions. As with the other scenarios, this would, of course, need to be accompanied by other transport interventions including for walking, cycling, and public transport, which would need to be explored in detail through the Transport Assessment process.

It should be noted that these are indicative, preliminary, highway cost estimates only, but provide a reasonable indication of potential scale of cost. Although there will be a need for the Local Planning and Highway Authority to consider potential transport-related costs alongside all other development costs in assessing the viability of the Plan, from a transport perspective Scenario 5 is the recommended scenario for incorporation into the Huntingdonshire Local Plan.

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A. Modelling Strategy Report

Proposed Modelling Strategy

1 Introduction

The purpose of this note is to set out the proposed strategy for undertaking the transport modelling for the Huntingdonshire Strategic Transport Study. The study area of the district of Huntingdonshire is shown in Figure 1.1 below:

Figure 1.1 Huntingdonshire District



Source: Cambridgeshire County Council

Huntingdonshire is a focus for growth with potential for development at strategic sites, spatial planning areas and service centres to 2036 as part of an updated local plan. The HDC study will assess the transportation impact of four proposed growth scenarios against a Do Minimum scenario, develop transport options to mitigate the impacts, and make a recommendation on the preferred growth scenario from a transport perspective. The study will comprise a transport evidence base for the local plan which is expected to be completed and submitted for inspection in 2017.

The proposed growth scenarios are:

- Core Sites: all proposed sites.
- Do Minimum: Core Sites less any sites that are less certain.
- Scenario 1: Core Sites + Full Wyton.
- Scenario 2: Core Sites + slow Wyton.
- Scenario 3: Core Sites + no Wyton.
- Scenario 4: Core Sites + A141 upgrade.

2 Modelling Strategy Overview

The main aims of this element of the study, which will be informed and shaped by the outputs from the modelling are:

1. To identify the transport impacts of the Do Minimum scenario and the proposed growth scenarios. This Do Minimum scenario represents the future baseline against which the impact of all potential growth scenarios can be assessed.
2. To identify transport interventions to mitigate development transport impacts.
3. To retest the impact of the proposed growth scenarios with mitigation measures in place.
4. To make a recommendation on the preferred potential growth scenario based on which is the most acceptable in transport terms.

The general modelling approach to be followed to achieve these aims is as follows:

- Test future with and without-development scenarios with a Do Minimum transport network in order to identify transport impacts of new developments.
- Develop sustainable transport interventions to mitigate development transport impacts, leading to a proposed Do Something transport network.
- Test future with-development scenarios with the Do Something network to demonstrate effective mitigation.

3 Modelling Tools

The Do Minimum and Do Something modelling will be carried out using the updated Cambridgeshire County Council's Cambridgeshire Sub-Regional Model (CSRM2). According to the CSRM1 LMVR:

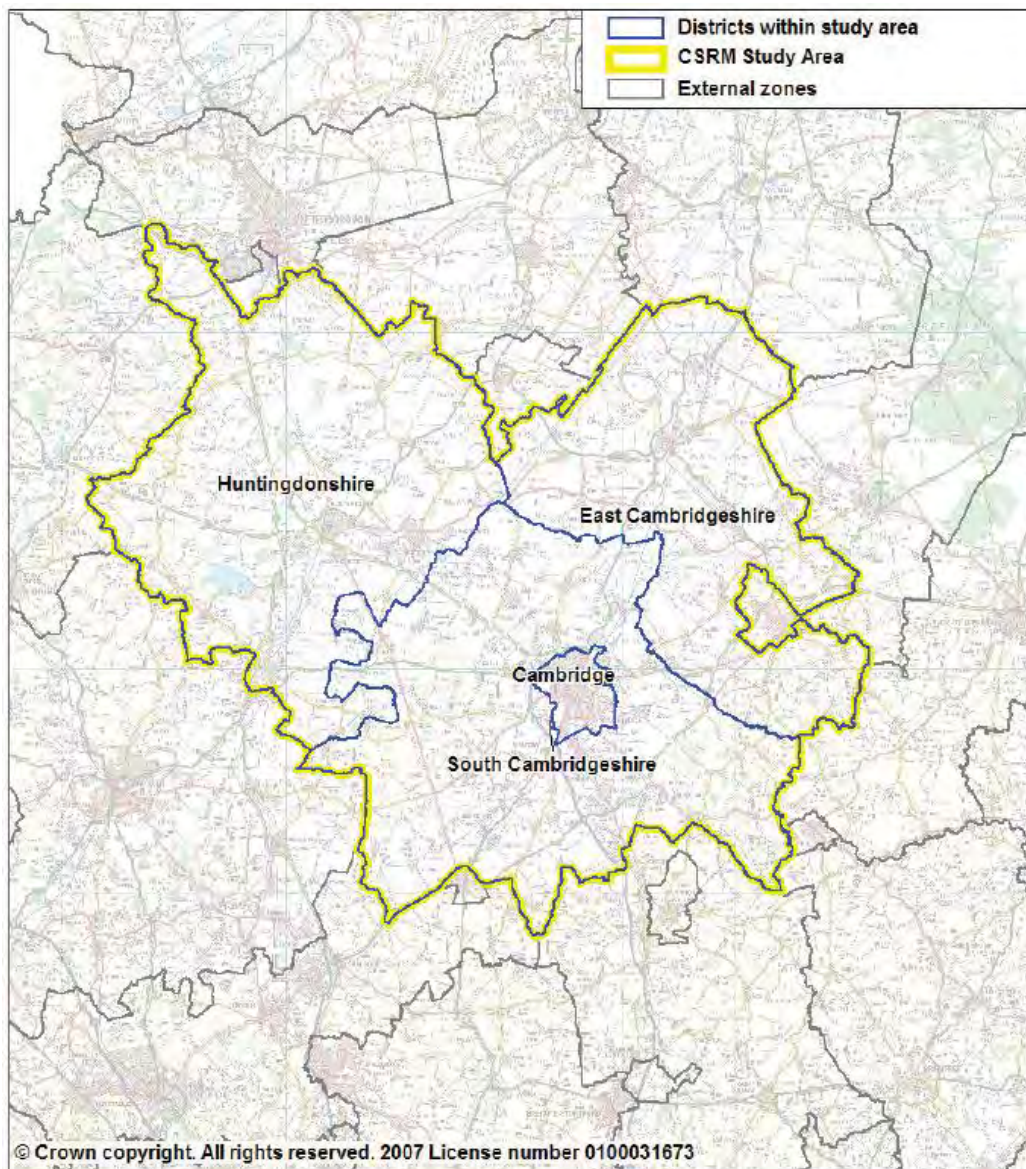
“The CSRM allows stand-alone testing of road, PT, cycle, walk schemes, standard economic benefit tests using the highway and demand model with fixed trip ends, as well as complex tests of strategic policy options incorporating land use responses.”

CSRM2 is a WebTAG compliant strategic model which uses base data from 2015 including:

- Validation against recently collected traffic and transportation counts;
- All networks (highway, PT, walk, cycle);
- Representation of parking and Park & Ride;
- Base transport movement data;
- Base land use data; and
- Matrices with up-to-date mobile phone data.

Figure 3.1 shows the area that the model covers, which shows that it includes detailed representation for the Cambridgeshire districts of Huntingdonshire, East Cambridgeshire, South Cambridgeshire and the City of Cambridge. This study is focused on the district of Huntingdonshire.

Figure 3.1 CSRM study area



Source: CSRM LMVR - Atkins

The main planning inputs required for the model are as follows:

Input	Units
<i>District Level</i>	
Population	Persons
Jobs	Jobs
<i>Development Level</i>	
Houses	Houses
Employment	GFA sqm
Education	Pupils / students

Source: Atkins

Clarification is needed from Atkins as to whether inputs also need to show the number of employees for employment sites where GFA is known, and the number of people per house for residential sites. There is potential for the underestimation of transport impacts if developments, housing or employment, are not assumed to be fully occupied in model runs.

4 Huntingdonshire Proposed Land Use Developments

4.1 Introduction

The main proposed land use schemes which will affect Huntingdonshire are:

- Strategic expansion sites – Alconbury Weald, St Neots East, and Wyton Airfield.
- Spatial planning areas – Huntingdon (including Brampton and Godmanchester), Ramsey, St Ives, and St Neots.
- Service centres – Buckden, Kimbolton, Sawtry, Somersham, Warboys, and Yaxley.

The consultation draft of the Huntingdonshire Local Plan to 2036 provides the quantum and mix of delivery. This has subsequently been updated by Huntingdonshire District Council in a spreadsheet and it is these latest figures that are reported in this note for testing.

4.2 Growth Data

Growth data is broken down into a range of scenarios:

- Core sites – all known potential development.
- Do Minimum – based on the core set of sites with a few sites removed where there is less confidence in them coming forward; for example, where it requires relocation of existing use.
- Scenario 1 Full Wyton – core sites plus full delivery of growth at Wyton by 2036.
- Scenario 2 Slower Wyton – core sites plus Wyton, but delivered at a slower pace.
- Scenario 3 No Wyton – core sites and no delivery of growth at Wyton.
- Scenario 4 A141 Upgrade – core sites, Wyton and additional proposals from developers broadly around the A141 north of Huntingdon.

Detailed information on each of these scenarios is provided in the following tables.

Table 4.1 Development Proposals – Core Sites

Site location	Residential		Commercial - sq m					Employment - sq m						Non-residential Institution - sq m		Comment
	C3 (dwlg)	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	D2	
Alconbury Weald	5000		4500	2500			290000						See comment		Secondary school (8FE) plus 3no. Primary schools (3FE); outline planning permission 12/01128/OUT	
St Neots East	3820	120	4200	1200			77000						See comment		3no primary schools (2/3FE) 2800 @ WP (1300178OUT pco), 1020 @ LF + 120 C2 =72 (1300388OUT pco)	
Forensic Science Lab	105															
Hinchingbrooke Health Campus	214															Further expansion of health uses likely
West of Railway, Brampton Road								6300								
Ermine St/Edison Bell Way	47															Planning perm. 15/01423/FUL retirement/sheltered apts
North of Edison Bell Way			1711													Planning permission 15/02000/FUL for Aldi
South of Edison Bell Way	75															
Ferrars Road		66														Care home almost complete
George Street	28		9455	1095												Based on current Sainsburys permission (10/01750/FUL) although this will not be implemented but likely to be highest transport demand of any potential alternative use.
George St/Edison Bell Way	40															
Chequers Court			4700		150											Planning permission 11/00979/FUL started
Gas Depot	12															
California Rd	54															
Main St	32															
Huntingdon racecourse															300	Floorspace is purely an estimate based on allowance for intensification
Brampton Park	560	70	566					505						425		Planning permissions 15/00368/OUT (437) and 15/643/OUT(78 plus 70 bed care home) pending S106. Application 15/02016 (32 dw) awaiting decision.
West of Brampton	160															Planning application 16/00194/OUT awaiting decision
Tyrells Marina	15				53											
RGE Engineering	70															
Wigmore Farm Buildings	13															
Bearscroft Farm	753		700	250			15400						See comment		1no. Primary school (2FE) Planning permission 12/00685/OUT - various conditions discharged construction just started.	
Eaton Court	29															Planning permission 15/00016/FUL
Huntingdon St	64															
Former Youth Centre	14															
St Mary's Urban Village	26															
Loves Farm Reserved Site	41															Planning applications 13/00389/OUT awaiting S106
Cromwell Rd North	78															
Cromwell Rd Car Park	21															Planning application 09/01288/OUT awaiting S106

Site location	Residential		Commercial - sq m					Employment - sq m						Non-residential Institution - sq m		Comment
	C3 (dwlgs)	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	D2	
Nelson Rd	87	70														Planning permission 14/01248/FUL under construction
St Ives West	274		450													
St Ives Football Club	39															
Giffords Farm																22400
Former Car Showroom	46															
Vindis	56															
Ramsey Gateway (High Lode)	110															
Ramsey Gateway	45															
West Station Yard & Northern Mill	34															
Field Rd	91															Planning application 14/01852/OUT awaiting decision
Whytefield Rd	35															
94 Great Whyte	33															
RAF Upwood	462															7000
East of Silver St	14															
Former Dairy Crest	79							660						279		Planning application 15/01343/FUL awaiting decision
Cambridge Rd	112															Planning application 16/00582/FUL awaiting decision
Ivy Nursery	34															Planning permission 15/01711/REM
West of Station Rd	32															
South of Bicton Industrial Estate																5200
East of Glebe Farm	80															Planning permission 14/01659/OUT
West of St Andrews Way	43															Planning application 13/01274/FUL awaiting S106
Newlands	75	50														15/00917/OUT pco 45 + 50 beds C2 =30
The Pasture	14															
Somersham Town FC	47															
North of The Bank	55															
West of Station Rd	120															Planning permission 13/01790/OUT; reserved matters awaiting decision
West of Ramsey Rd	45															
Manor Farm Buildings	11															
South of Farriers Way	74															Planning application 1401887OUT awaiting decision
Fenton Field Farm	15															
Askew's Lane	12															
Snowcap Mushrooms	78															
Yax Pax																12800
Subtotal	13523	376	31530					437265						1004		

Source: Huntingdonshire District Council

Table 4.2 Development Proposal: Do Minimum

Site location	Residential		Commercial - sq m					Employment - sq m						Non-residential Institution - sq m		Comment
	C3 (dwlgs)	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	D2	
Alconbury Weald	5000		4500	2500			290000						See comment		Secondary school (8FE) plus 3no. Primary schools (3FE); outline planning permission 12/01128/OUT; start made on phase 1	
St Neots East	3820	120	4200	1200			77000						See comment		3no primary schools (2/3FE) 2800 @ WP (1300178OUT pco), 1020 @ LF + 120 C2 =72 (1300388OUT pco)	
Forensic Science Lab	105															
Hinchingbrooke Health Campus West of Railway, Brampton Road	214															Further expansion of health uses likely
Ermine St/Edison Bell Way	47															Planning permission 15/01423/FUL retirement/ sheltered apartments
North of Edison Bell Way			1711													Planning permission 15/02000/FUL for Aldi
South of Edison Bell Way	75															
Ferrars Road		66														Care home almost complete
George Street	28		9455	1095												Based on current Sainsburys permission (10/01750/FUL) although this will not be implemented but likely to be highest transport demand of any potential alternative use.
George St/Edison Bell Way	40															
Chequers Court			4700	150												Planning permission 11/00979/FUL started
Gas Depot	12															
Huntingdon racecourse														300		Floorspace is purely an estimate based on allowance for intensification
Brampton Park	560	70	566				505							425		Planning permissions 15/00368/OUT (437) and 15/643/OUT(78 plus 70 bed care home) pending S106. Application 15/02016 (32 dw) awaiting decision.
West of Brampton	160															Planning application 16/00194/OUT awaiting decision
Tyrells Marina	15			53												
RGE Engineering	70															
Wigmore Farm Buildings	13															
Bearscroft Farm	753		700	250			15400						See comment		1no. Primary school (2FE) Planning permission 12/00685/OUT - various conditions discharged construction just started.	
Eaton Court	29															Planning permission 15/00016/FUL
Former Youth Centre	14															
St Mary's Urban Village	26															
Loves Farm Reserved Site	41															Planning applications 13/00389/OUT awaiting S106
Cromwell Rd North	78															
Cromwell Rd Car Park	21															Planning application 09/01288/OUT awaiting S106
Nelson Rd	87	70														Planning permission 14/01248/FUL under construction
St Ives West	274		450													
Giffords Farm									22400							

Former Car Showroom	46																					
Vindis	56																					
Ramsey Gateway (High Lode)	110																					
Ramsey Gateway	45																					
Field Rd	91																		Planning application 14/01852/OUT awaiting decision			
94 Great Whyte	33																					
RAF Upwood	462																		Planning application 12/01274/OUT pending S106			
Former Dairy Crest	79							660											279	Planning application 15/01343/FUL awaiting decision		
Cambridge Rd	112																			Planning application 16/00582/FUL awaiting decision		
Ivy Nursery	34																			Planning permission 15/01711/REM		
West of Station Rd	32																					
South of Bicton Industrial Estate																						
East of Glebe Farm	80																			Planning permission 14/01659/OUT		
West of St Andrews Way	43																			Planning application 13/01274/FUL awaiting S106		
Newlands	75	50																		15/00917/OUT pco 45 + 50 beds C2 =30		
The Pasture	14																					
North of The Bank	55																					
West of Station Rd	120																			Planning permission 13/01790/OUT; reserved matters awaiting decision		
West of Ramsey Rd	45																					
South of Farriers Way	74																			Planning application 1401887OUT awaiting decision		
Snowcap Mushrooms	78																					
Yax Pax																				12800	Planning permission 1402198REM construction start imminent	
Subtotal	13166	376																		31530	437265	1004

Source: Huntingdonshire District Council

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Table 4.8 Development Proposals: Scenario 1 – Full Wyton plus additional development at Alconbury

Core Sites plus those listed below.

Site location	Residential		Commercial - sq m					Residential					Commercial - sq m		Comment
	C3 (dwlg)s	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	
Wyton Airfield	4500	100	5000					35000					See comment		Secondary school (up to 8FE) plus 2 primary schools (2-3FE)
Alconbury intensification	1500												See comment		May need an additional primary school
RAF Alconbury released	1450												See comment		Anticipated release date 2021; may need an additional primary school
Total	7450	100	5000					35000							

Source: Huntingdonshire District Council

Table 4.9 Development Scenario 2 – Slower Wyton with Alconbury intensification

Core sites plus those listed below.

Site location	Residential		Commercial - sq m					Residential					Commercial - sq m		Comment
	C3 (dwlg)s	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	
Wyton Airfield	2880	60	5000					21000					See comment		Secondary school (up to 8FE) plus 2 primary schools (2-3FE)
Alconbury intensification	1500												See comment		May need an additional primary school
RAF Alconbury released	1450												See comment		Anticipated release date 2021; may need an additional primary school
Total	5830	60	5000					21000							

Source: Huntingdonshire District Council

Table 4.10 Development Scenario 3 – No Wyton, minimising impact on the A141

Core sites plus those listed below.

Site location	Residential		Commercial - sq m					Residential					Commercial - sq m		Comment
	C3 (dwlg)s	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	
Giffords Park	2200	100	1500					28000					See comment		Primary school (2FE) would be required
Riversfield, Little Paxton	240														
Alconbury intensification	1500												See comment		May need an additional primary school
RAF Alconbury released	1450												See comment		Anticipated release date 2021; may need an additional primary school
Total	5390	100	1500					28000							

Source: Huntingdonshire District Council

Table 4.11 Development Scenario 4 – A141 Upgrade Support

Core sites plus those listed below.

Site location	Residential		Commercial - sq m					Residential						Commercial - sq m		Comment
	C3 (dwlg)	C2 (beds)	A1	A2	A3	A4	A5	B1	B1A	B1B	B1C	B2	B8	D1	D2	
Wyton Airfield	4500	100	5000					35000						See comment		Secondary school (up to 8FE) plus 2 primary schools (2-3FE)
North of Wyton Airfield	1340															May need an additional primary school or extra 1 FE within Wyton airfield
Ermine Street	1440		1000													May need an additional primary school or extra 1 FE within Alconbury
Sapley Park Farm	1300		1000													May need an additional primary school
Lodge Farm	3820	100	3000					17500								
Alconbury intensification	1500													See comment		May need an additional primary school
RAF Alconbury released	1450													See comment		Anticipated release date 2021; may need an additional primary school
Total	15350	200	10000					52500								

Source: Huntingdonshire District Council

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4.3 Summary

For the purposes of this modelling exercise, the total figures shown under each of the above tables are assumed to be delivered by 2036.

5 Population and Employment Forecasting

WebTAG unit M4 requires that forecast population and employment levels be constrained to NTEM, making use of TEMPRO, when modelling is being used to develop business cases for major transport schemes. However, as the objective of this study is to understand the impact of different land uses on the transport network it is not necessary to constrain growth to TEMPRO forecasts.

Atkins should, however, provide confirmation as to whether growth in the model area should be constrained to TEMPRO levels, but growth in Huntingdonshire is allowed to reach the levels shown in the proposed development scenarios.

The 2015 consultation draft of Huntingdon's Local Plan forecast growth on the basis shown in Table 5.1.

Table 5.1 Local Plan population growth forecast

Area	Population growth 2011-31		Additional Growth 2031-36	Dwelling Growth 2011-31		Additional Growth 2013-36
	Population	%		Dwellings	%	
Huntingdonshire	31,000	18%	8,000 (23% cumulative growth)	17,000	24%	4,000 (29% cumulative growth)

Source: Huntingdonshire District Council

6 Do Minimum Transport Network

The proposed modelling will be supported by the addition of a range of Do Minimum transport schemes.

The following table outlines the schemes agreed with Huntingdonshire District Council and Cambridgeshire County Council to be included in the modelling scenarios. The development of the Do Minimum transport schemes was conducted in accordance with WebTAG requirements of using uncertainty logs. All future transport schemes that fall into the categories of 'more than likely' or 'near certain' are all deemed by Cambridgeshire County Council to meet that requirement.

A risk in this study is whether the supply and demand in the DM is at equilibrium. It is not possible to confirm this until the DM scenario is run using CSRM2.

Table 6.1 Proposed Do Minimum transport schemes

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
1	Alconbury Weald Transport Interchange	ML Site has planning permission and has started	Major development at Alconbury Weald (Enterprise Zone with 8,000 new jobs planned at Alconbury over the next 25 years and 5,000 homes) offers the opportunity for rail to provide for longer distance and local transport demands. There will be considerable demand for travel between Alconbury and Huntingdon (the main service centre for the new development) with a strong need for sustainable transport links between the two settlements.	A second transport interchange to the west / centre of the Alconbury Weald / Enterprise Zone site to serve the new development.	To be determined	Directly funded by developer	IN DM	LTP 3 (Figure 4.4) LTP 3 (4-111) LTTS (2-10)
2	A141 Alconbury Weald / Enterprise Zone southern access	ML Longer term aspiration if network conditions necessitate it as the development grows	A new access junction for Alconbury Weald on the A141 to the west of the bridge over the East Coast Main Line.	A141 to the west of the bridge over the East Coast Main Line	To be determined	To be determined	IN DM. Included as Alconbury is included in land-use DM	LTTS (4-8)
3	High quality bus network infrastructure, Huntingdon to Alconbury Weald	ML Site has planning permission and has started		Huntingdon to Alconbury Weald	LTP 3 covers period 2011 - 2031		IN DM	LTP 3 (Figure 4.4)
4	A141 junction improvements	RF Likely impacts from growth at Alconbury, and Wyton if approved		Junction capacity enhancements on the A141 Huntingdon northern bypass at the following locations. - Ermine Street - Washingley Road - St Peters Road - A1123 Huntingdon Road / B1514 Main Street - B1090 Sawtry Way	To be determined	To be determined – funding from various sources	IN DM. There will be improvements but not all of them as don't want A141 to cause too much rerouting. Alconbury and Washingley Farm mitigations included	LTP 3 (Figure 4.4) LTTS (4-8)

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
5	High quality bus network infrastructure, St Ives to Huntingdon	ML Likely as Alconbury development grows	A high quality bus corridor providing quick and reliable journeys between the Enterprise Zone at Alconbury and Huntingdon Town Centre / Station.	St Ives to Huntingdon via Huntingdon Hill Road/Houghton Road.	To be determined	To be determined - funding from various sources	PART DM. Alconbury to Huntingdonshire town centre in DM, St Ives should not be.	LTP 3 (Figure 4.4) LTTS (4-8)
6	A14 Cambridge to Huntingdon: Removal of Huntingdon Viaduct and new town centre road layout	NC	Related to item 20	A14 to the south of Huntingdon	LTP 3 covers period 2011 - 2031		IN DM Highways England Scheme	LTP 3 (Figure 4.4)
7	A14 Cambridge to Huntingdon: Link to parallel local road at Fen Drayton	NC	Related to item 20	A14 to the south east of Huntingdon	LTP 3 covers period 2011 - 2031		IN DM Highways England Scheme	LTP 3 (Figure 4.4)
8	Thameslink programme	NC	Connect the East Coast Main Line into London St Pancras, leading to increases in capacity at Peterborough, Huntingdon and St Neots to London	East Coast Main Line between King Lynn and Kings Cross	Trains enter service from 2018	DfT/Network Rail to fund and deliver	IN DM Wider scheme but significance in increased capacity on rail services to London from Huntingdon and St Neots.	LTP 3 (4-106) LTTS (2-9)
9	A428 Black Cat to Caxton Gibbet improvement	ML Still at an early stage but quite probably over the HDC planning period	Major growth is planned on the A428 corridor, including at St Neots, Cambourne, Bourn Airfield and West / North West Cambridge. Congestion already occurs on the approaches to the Caxton Gibbet roundabout, around the south of St Neots, and on the A1303 which takes traffic from the A428 into Cambridge and onto the M11 southbound	A428 Black Cat to Caxton Gibbet Dualling of remaining single carriageway section of the A428 / A421 between Caxton Gibbet west of Cambridge and the M1, including a grade separated junction at the A1 Black Cat roundabout	2020-2023	£250-500 million (HE funded)	IN DM Highways England Scheme included	LTP 3 (4-115)
10	A428 / A1198 Caxton Gibbet Junction Improvements	ML As above - related to item 19	Related to item 18	A428 / A1198 Caxton Gibbet	To be determined	To be determined	IN DM May be delivered as part of the A428 Caxton Gibbet to Black Cat dualling scheme. In directly related to 9.	LTTS (4-7)

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
11	A14 Cambridge to Huntingdon Improvement Scheme.	NC Approved scheme	This vital upgrade will relieve congestion, unlock growth and help to connect communities. See 15 and 16	Major new bypass to the south of Huntingdon, widening part of the existing A14 between Swavesey and Girton, widening part of the A14 Cambridge northern bypass, widening a section of the A1 between Brampton and Alconbury and demolition of the A14 viaduct at Huntingdon.	Start date: End of 2016 End date: Summer 2021	£1.2 - £1.8 billion (HE, CCC, District Council funded)	IN DM Highways England Scheme.	LTP 3 (4-116) http://www.highways.gov.uk/roads/road-projects/a14-cambridge-to-huntingdon-improvement-scheme/
12	A1303 Bus priority measures, West Cambridge	ML	Scheme includes: - On-line or off-line bus priority measures between the A428 and M11. - On-line bus priority measures between the M11 and Queens Road. GCCD Scheme - see 24, 25, 26	High quality segregated bus priority measures between the A428 at its junction with the A1303 and Queens Road in Cambridge.	By March 2018 (A428 to M11 – 2016/17) (M11 and Queens Road - 2018/19)	(A428 to M11 – £9 million) (M11 and Queens Road - £24 million)	IN DM	LTTS (4-6) LTTS (4-7)
13	Northstowe Access Roads	ML Development has commenced		Access roads to Northstowe from the A14 at Bar Hill and to the A14 parallel local access road at Dry Drayton.	To be determined	Directly funded by developer	IN DM	LTTS (4-6)
14	Northstowe Busway Loop	ML Development has commenced		New Busway / segregated bus corridor through the town, linking from the Busway at the Longstanton Park & Ride to the Busway at Oakington.	To be determined	Directly funded by developer	IN DM	LTTS (4-7)
15	West Cambourne bus links	ML GCCD Tranche 1 scheme	Part of the A428 Cambourne to Cambridge better bus journeys	<i>West Cambourne bus links</i> - Segregated bus links from the A428 at Caxton Gibbet through the West Cambourne site, linking to Great Cambourne by the Cambourne Business Park and School Lane Lower Cambourne.	By 2020/21	£20 million	IN DM	LTTS (4-7)
16	Bourn Airfield bus links	ML GCCD Tranche 1 scheme	Part of the A428 Cambourne to Cambridge better bus journeys	Bourn Airfield bus links - A segregated bus link from Cambourne to Bourn Airfield, and on through the development to the junction of St Neots Road with Highfields Road.		Included in £20m above	IN DM	LTTS (4-7)

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
17	Bourn Airfield to A428 / A1303 junction bus links	ML GCCD Tranche 1 scheme	Part of the A428 Cambourne to Cambridge better bus journeys	<i>Bourn Airfield to A428 / A1303 junction bus links</i> - Any measures necessary to ensure that a bus journey between Highfields and the junction of the A428 and the A1303 is direct and unaffected by any congestion suffered by general traffic.		As above	IN DM	LTTS (4-7)
18	A1303 / A428 corridor outer Park & Ride capacity	ML GCCD Tranche 1 scheme	Part of the A428 Cambourne to Cambridge better bus journeys	One or more Park & Ride or rural interchange sites accessed from the A428, to take advantage of the bus priority measures on the A1303 between the A428 and the M11.	By 2016/17	£8 million	IN DM	LTTS (4-7)
19	Wider Cambourne pedestrian / cycle network	RF As growth in Cambourne continues	Direct, segregated high quality pedestrian / cycle links to west Cambridge, Papworth Everard, Highfields, Hardwick, Caxton, Bourn, Caldecote, Comberton, Bar Hill and Dry Drayton.	Direct, segregated high quality pedestrian / cycle links to west Cambridge, Papworth Everard, Highfields, Hardwick, Caxton, Bourn, Caldecote, Comberton, Bar Hill and Dry Drayton.	By 2018/19	£10 million	IN DM Unlikely to be material to HDC work.	LTTS (4-7)
20	Wider Huntingdon area pedestrian/cycle network.	RF Linked to growth at Alconbury in the first instance	A comprehensive network of high quality pedestrian / cycle routes linking the Alconbury Weald with key destinations in Huntingdon	Huntingdon, Alconbury Weald and the surrounding ring of villages	To be determined	To be determined	PART IN DM. Anything that Alconbury is committed to should be included.	LTTS (4-9)
21	Western Orbital	ML GCCD Tranche 1 scheme	A bus priority scheme to link the north and south of Cambridge via a bus route on, or near the M11. It would provide a HQPT connection between housing and employment sites, such as Trumpington Meadows, Addenbrooke's Biomedical Campus, and the West & North Cambridge sites. The scheme would likely provide links to the A428 (Cambourne to City Centre) improvements.	Along the M11 corridor between junctions 11 and 13.	By 2026	To be determined	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/
22	Chisholm Trail	ML GCCD Tranche 1 scheme	Walking and cycling scheme linking a mostly traffic-free route between Cambridge Station and the new Cambridge North Station, and link to Addenbrooke's and the Biomedical Campus and to the Business and Science Park.	Cambridge Station to Cambridge North	By 2026	£8.4m allocated	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/2

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
23	Cross City Cycling	ML GCCD Tranche 1 scheme	Cross City Cycling is a walking and cycling scheme to provide links to cycle routes across the city, as well as to shops, schools and employment sites. Locations are: - Arbury Road - Cambridge North Rail Station and Science Park - Ditton Lane and links to East Cambridge - Hills Road and Addenbrookes Route - Fulbourn/Cherry Hinton Easter Access	Various	By 2026	£4.225m	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/3
24	Milton Road	ML GCCD Tranche 1 scheme	Milton Road bus priority scheme along one of the key radials from the north into the city which is often congested in peak times. Objective is to improve the bus, cycle and walking infrastructure in the area, to make these travel options more attractive and reduce congestion. Under consideration is bus lanes, bus priority signals and some road closures.	Milton Road	By 2026	£24m allocation	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/4
25	Histon Road	ML GCCD Tranche 1 scheme	As above but for Histon Road	Histon Road	By 2026	£4m	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/5
26	A1307	ML GCCD Tranche 1 scheme	A1307 is one of the main arterial routes into Cambridge from the south east. It links Haverhill, Suffolk to the city and passes close to the major employment sites at Granta Park, the Babraham Research Campus and the Cambridge Biomedical Campus. A combination of cycling, walking and bus priority is being investigated.	A1307	By 2026	To be determined	IN DM Greater Cambridge City Deal Tranche 1.	http://www.gccitydeal.co.uk/citydeal/info/2/transport/1/transport_projects_and_consultations/8
27	Bus links to St Neots from St Neots East	ML	Development related links to rail station/St Neots town centre and Cambridge	B1428	By 2031	To be determined	IN DM	
28	St Neots East and improved ped/cycling connectivity	ML	Development related links to rail station and St Neots town centre	B1428	By 2031	To be determined	IN DM	
29	St Neots East improvements to Station Road/B1428/Cromwell road junction improvement	ML	Development Related public realm improvements at the junction to improve pedestrian and cycle connectivity.	B1428	By 2031	To be determined	IN DM	

Ref	Name of Scheme	Likelihood and reasoning	Rationale	Location	Timescale for Implementation	Cost	Comments	Source
30	Any Brampton Park improvements	ML	Development related pedestrian links to village centre and primary school, improvements to the AM peak bus service.	B1514	By 2026	To be determined	IN DM	
31	Bearscroft-related bus improvements	ML	Development related Extension of existing bus services and provision of a bus gate from the A1198 to Kisby Avenue	A1198	By 2026		IN DM	
32	Bearscroft-related A1198 treatment	ML	Development Related public realm improvements and pedestrian crossings over A1198 including reducing speed limit to 30mph	A1198	By 2026		IN DM	

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7 Proposed Do Minimum Modelling Scenarios

The following scenarios are required to understand the impacts of the above land use development proposals which affect the district. Each scenario should include:

- 2036 population and employment forecasts, as described in Section 5.
- 2036 Do Minimum transport network, as described in Section 6.

Each scenario forecast will require a full demand model run.

7.1 Do Minimum Scenario

Represents baseline growth based on the core sites, but removes a few sites where progress is less certain.

7.2 Growth Scenario 1 – Full Wyton

This scenario should represent the hypothetical future situation with the core sites, plus development at Wyton and intensification at Alconbury with delivery by 2036.

7.3 Growth Scenario 2 – Slower Wyton

This scenario should represent the hypothetical future situation with the core sites, plus slower development at Wyton and intensification at Alconbury. In this scenario Wyton would not be fully built out by 2036.

7.4 Growth Scenario 3 – No Wyton

This scenario should represent the hypothetical future situation with the core sites, plus a range of other smaller sites, with no development at Wyton with delivery by 2036.

7.5 Growth Scenario 4 – A141 Upgrade Support

This scenario should represent the hypothetical future situation with the core sites, plus full development at Wyton, and full delivery of sites broadly aligned to the A141 north of Huntingdon with delivery by 2036.

8 Model Outputs Required

Using the above model runs, we will assess the growth scenarios with the Do Minimum in order to identify the absolute values and difference in:

- Vehicle kilometres
- Vehicle hours
- Journey Times
- Modal share

Other output types that will also be required are:

- Link flows
- Volume to capacity ratios
- Modal splits for key development zones
- Identification of congestion 'hot-spots'

Further outputs may be requested once the above outputs have been analysed.

9 Risks

CSRM2 is a strategic model and so should not be directly relied upon for local level flows and turning counts etc. This risk can be mitigated by applying suitable caution to the application of results at specific local levels.

10 Programme and Next Steps

Huntingdonshire District Council is working to specified deadlines to deliver its local plan submission as can be seen below. It is an imperative that this study is able to be completed on schedule to allow submission objectives to be met; the critical path for completion of the study is modelling using CSRM2 in August / September 2016.

Table 10.1 Timetable – Key stages to be completed

Stage	Dates
Strategic Transport Study in collaboration with Cambridgeshire County Council	January 2016 – December 2016
Statutory consultation on proposed submission Local Plan to 2036 (Reg. 19)	June – August 2017
Submission to Secretary of State (Reg. 22)	December 2017
Estimated examination	December 2017 – May 2019
Receipt of Inspector's report	June 2019
Estimated date for adoption	July 2019

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Revision	Date	Originator	Checker	Approver	Description
A	18/07/16	SG	PP	PS	Draft to Client
B	21/07/16	SG		PS	Atkins Submission

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B. Journey Time Impact Analysis

B.1 Core Scenario Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the the Core Scenario (labelled as DM).

Figure 17: A141 and A1123 Huntingdon Rd – Eastbound AM

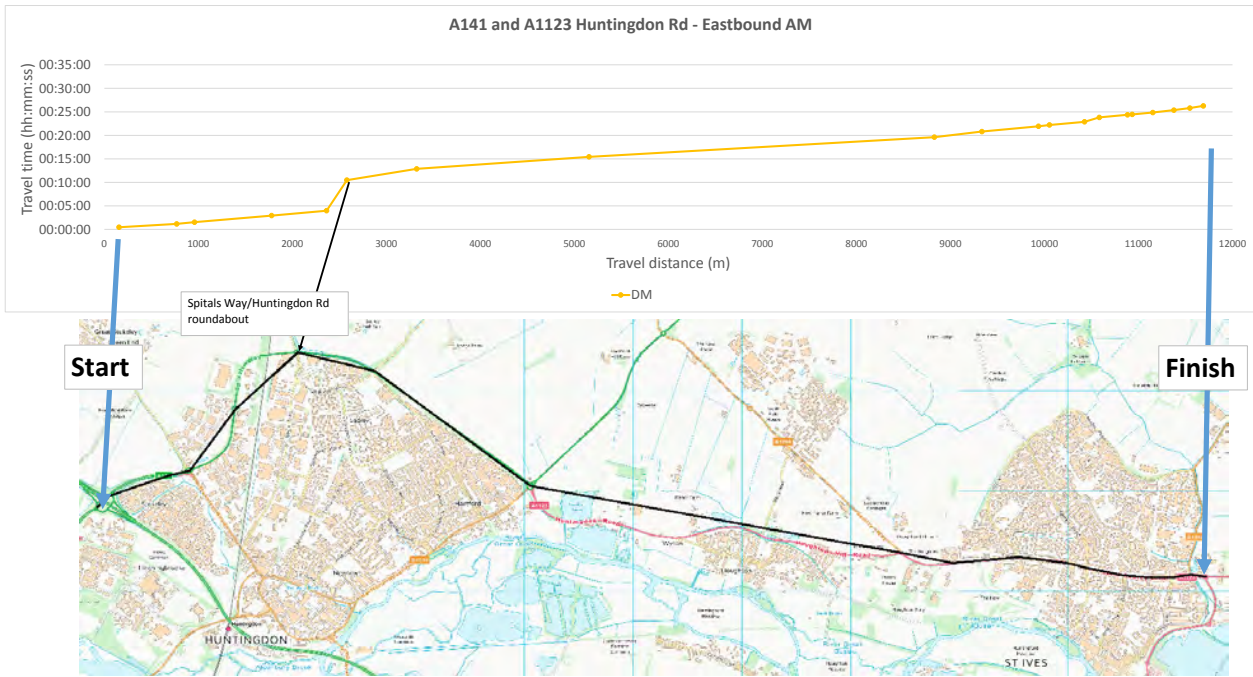


Figure 18: A141 and A1123 Huntingdon Rd – Eastbound PM

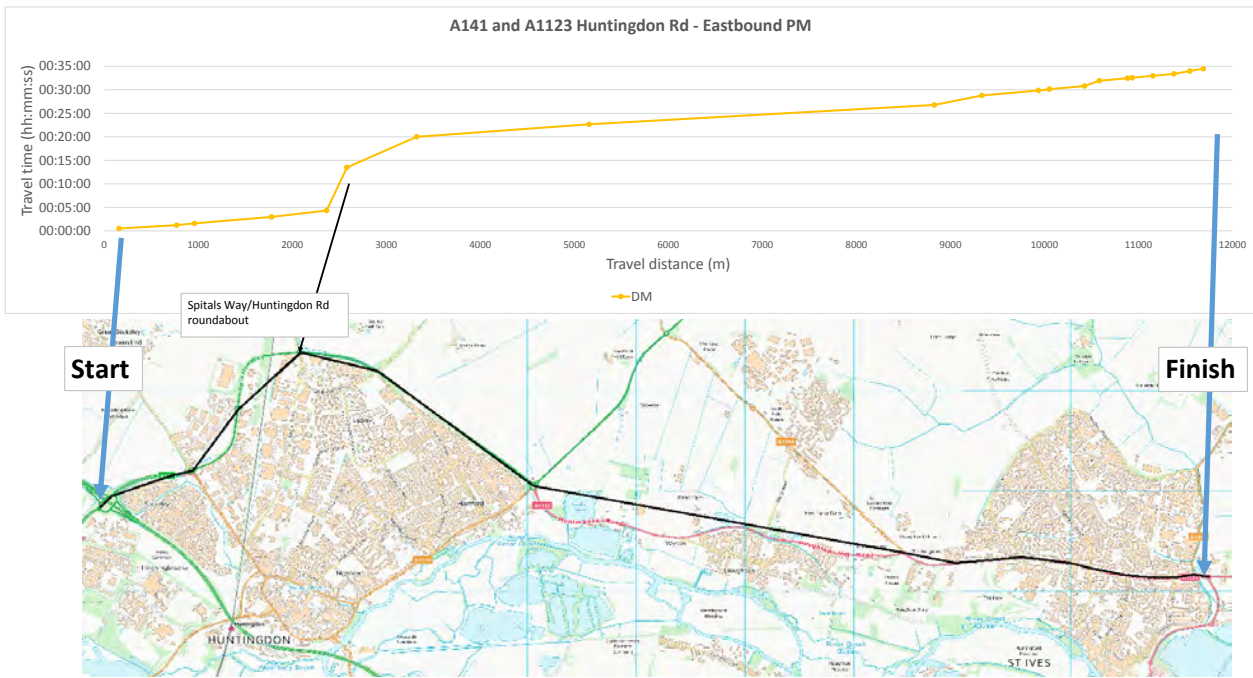


Figure 19: A141 and A1123 Huntingdon Rd – Westbound AM

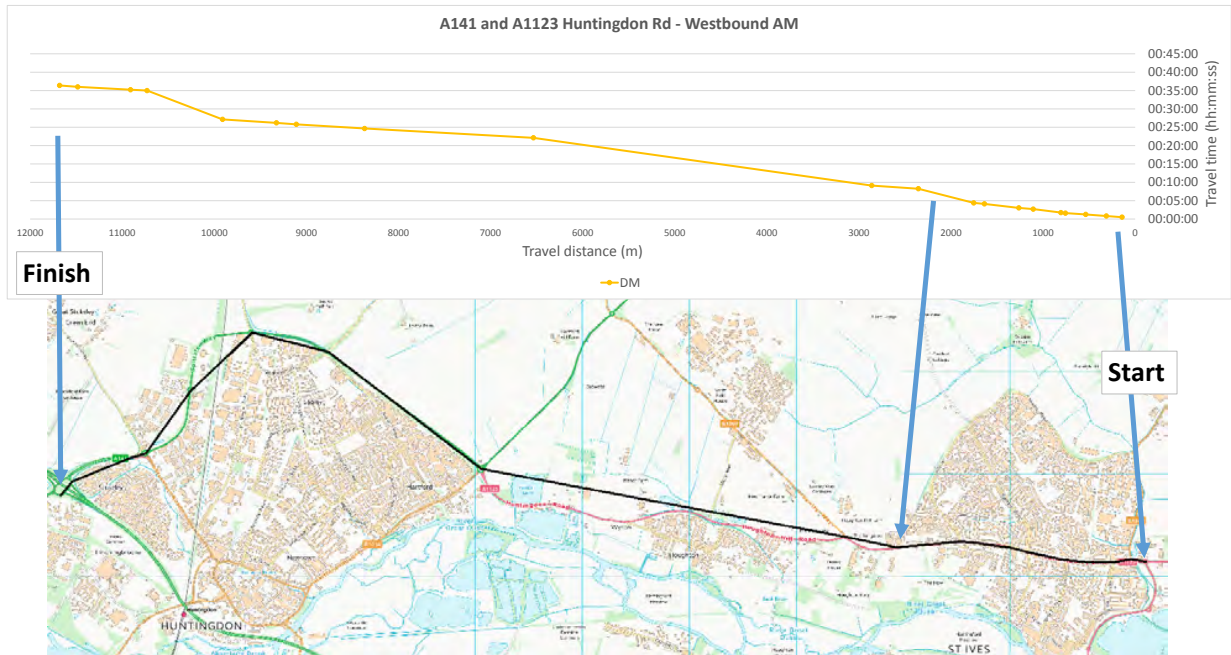


Figure 20: A141 and A1123 Huntingdon Rd – Westbound PM

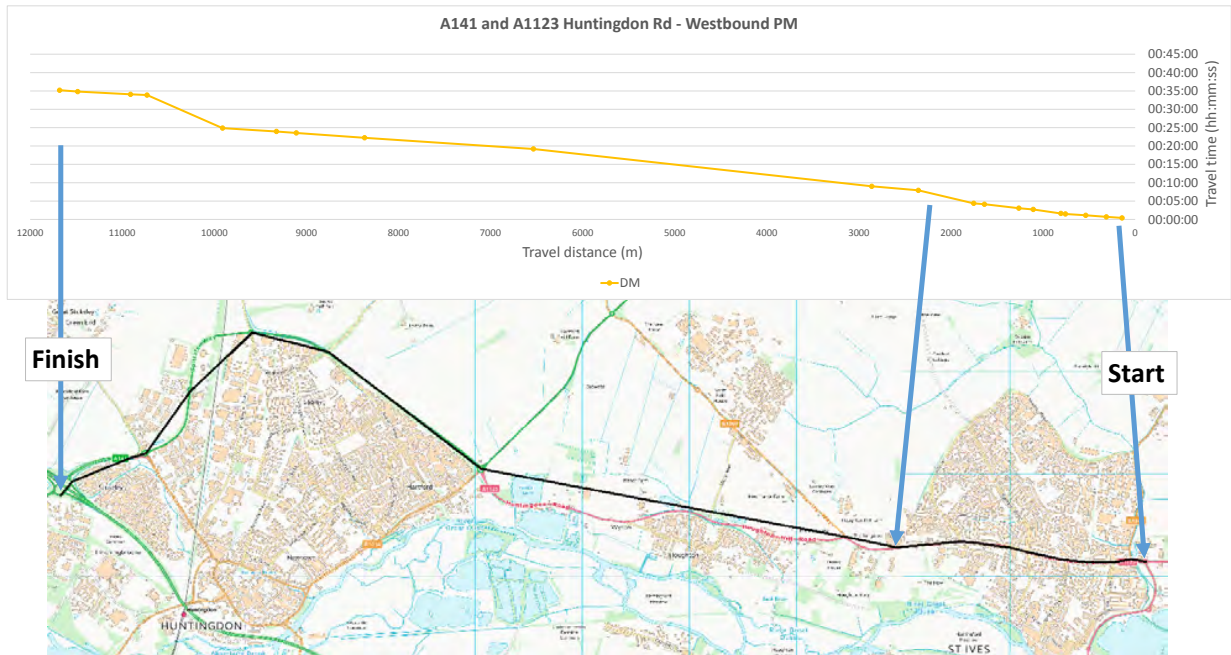


Figure 21: A141 Warboys Roundabout Southbound AM

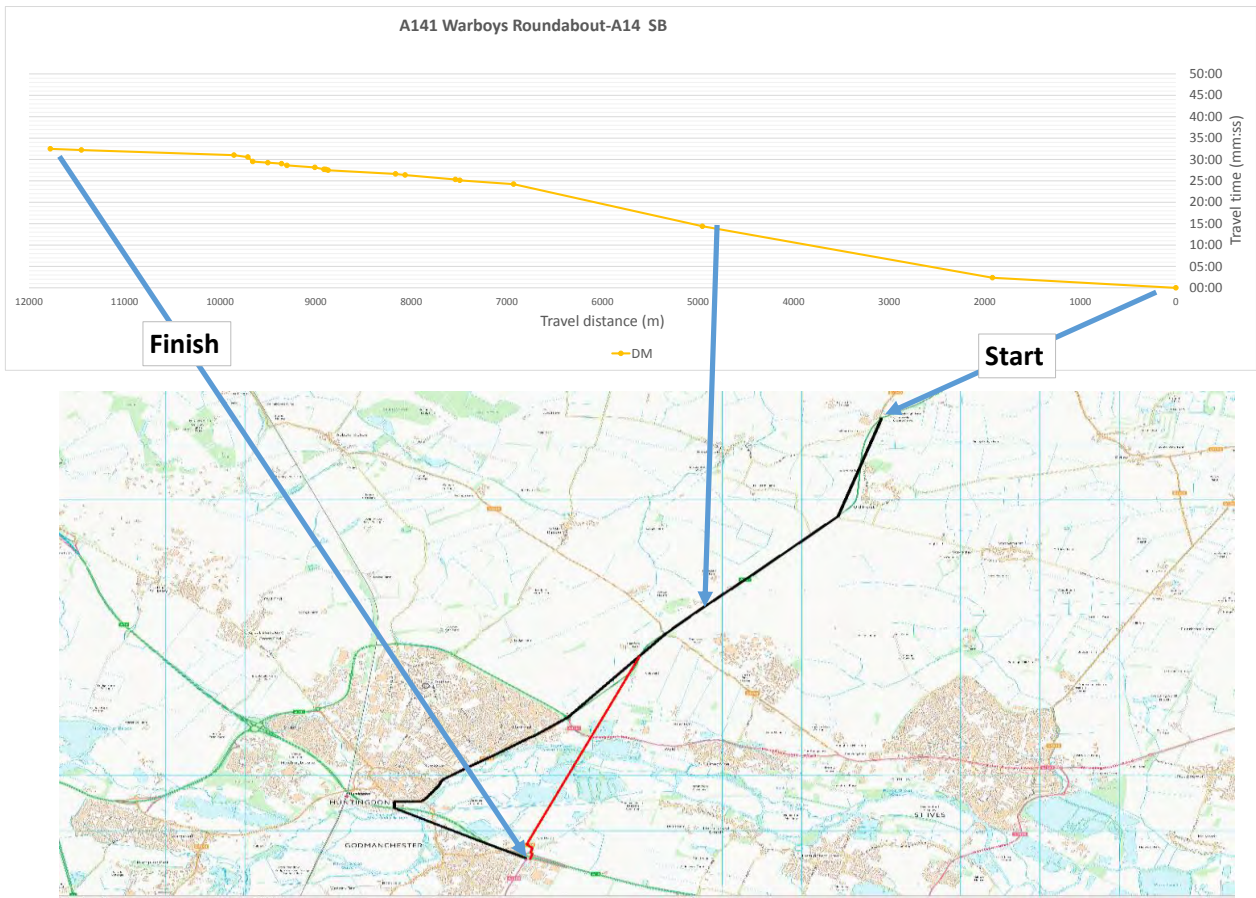
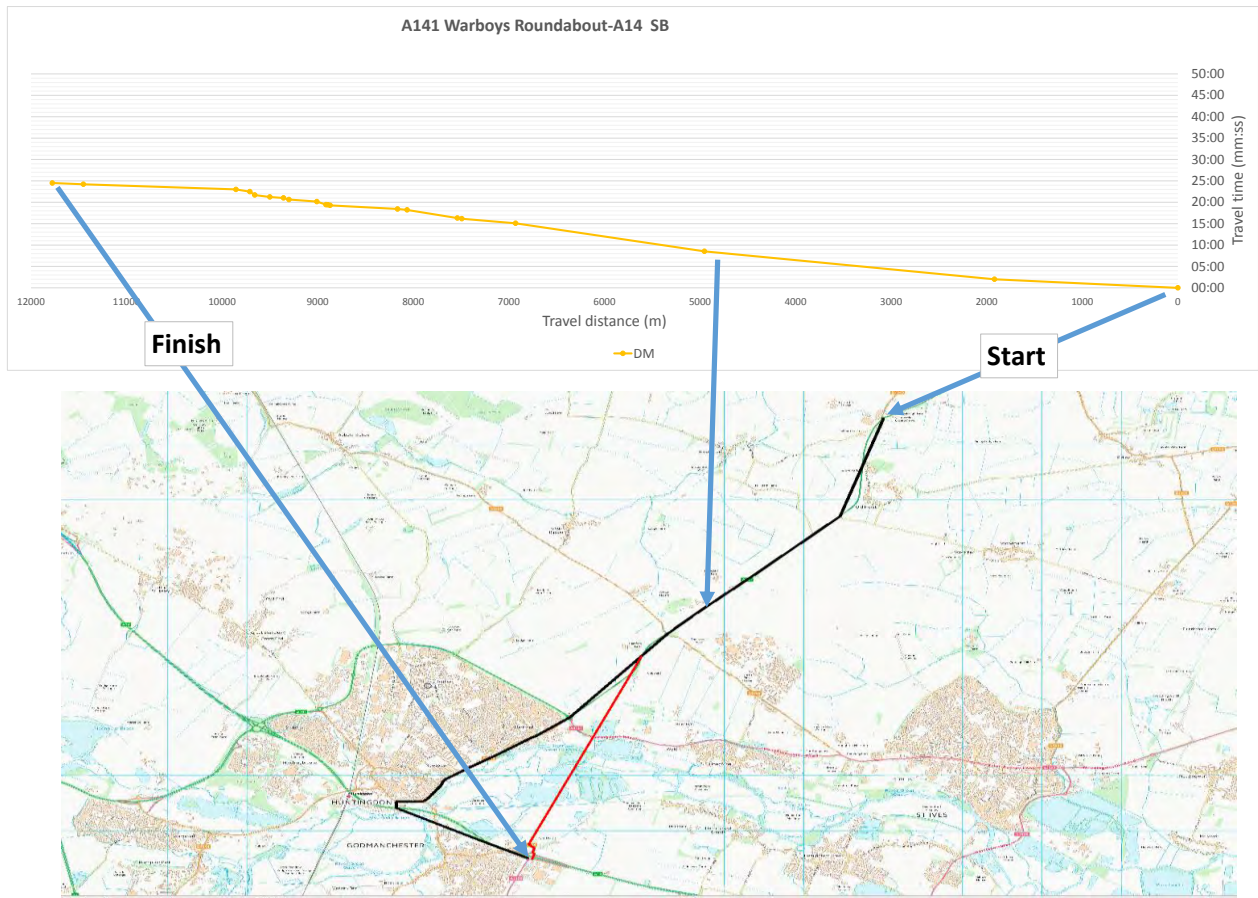


Figure 22: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 23: A141 Warboys Roundabout Northbound AM

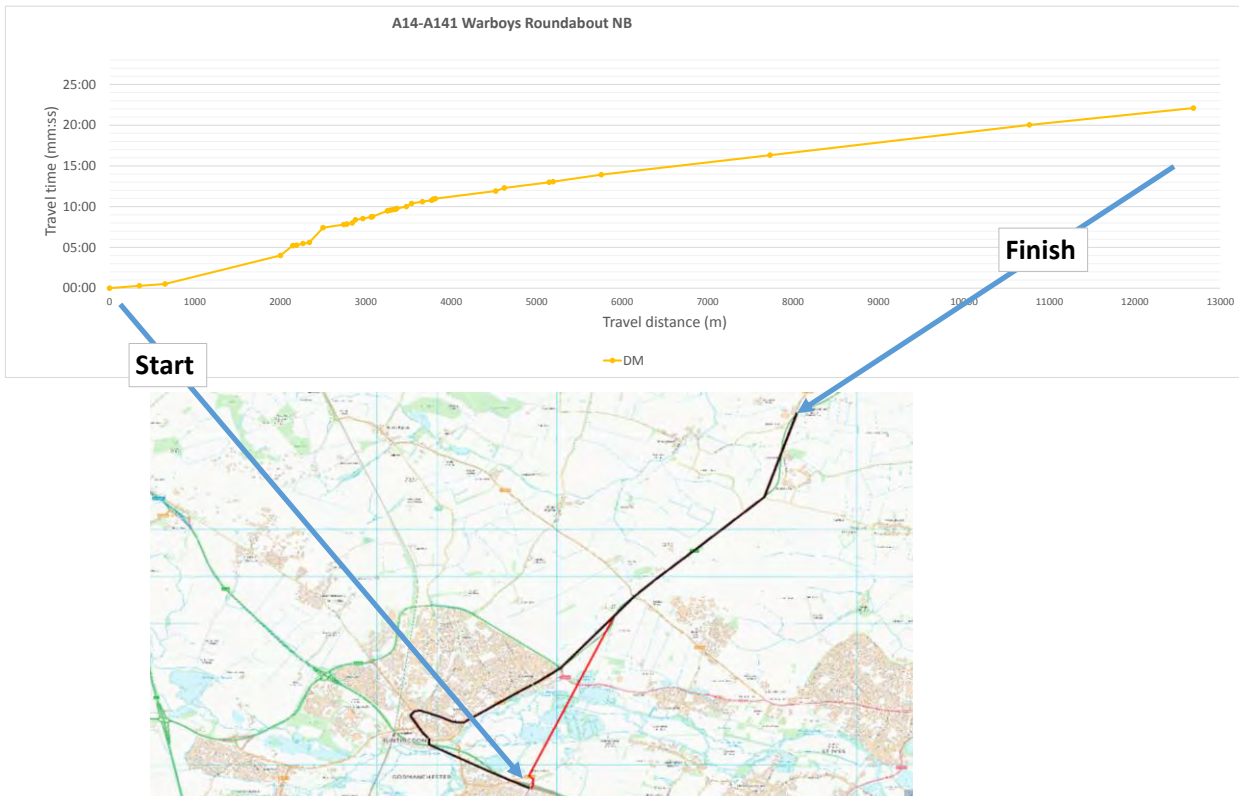
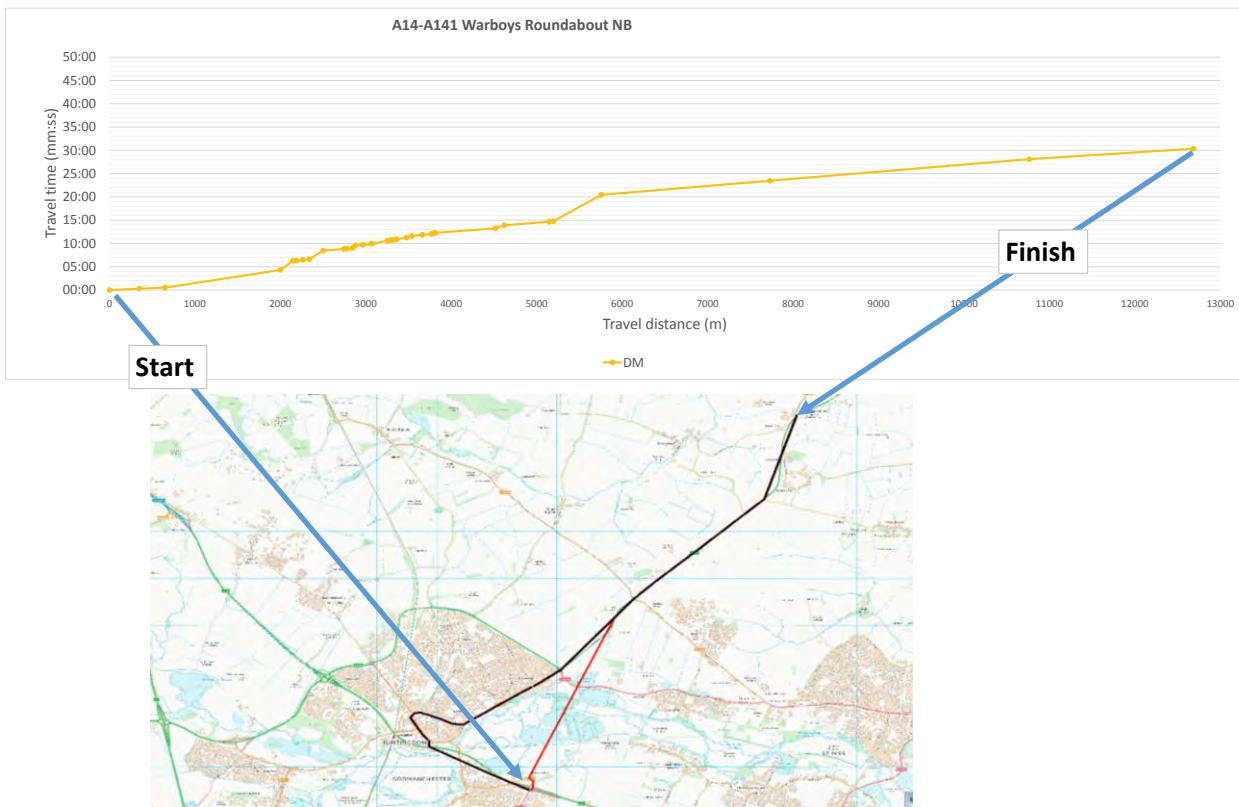


Figure 24: A141 Warboys Roundabout Northbound PM



Source: CSRM

Figure 25: Harrison Way Southbound AM

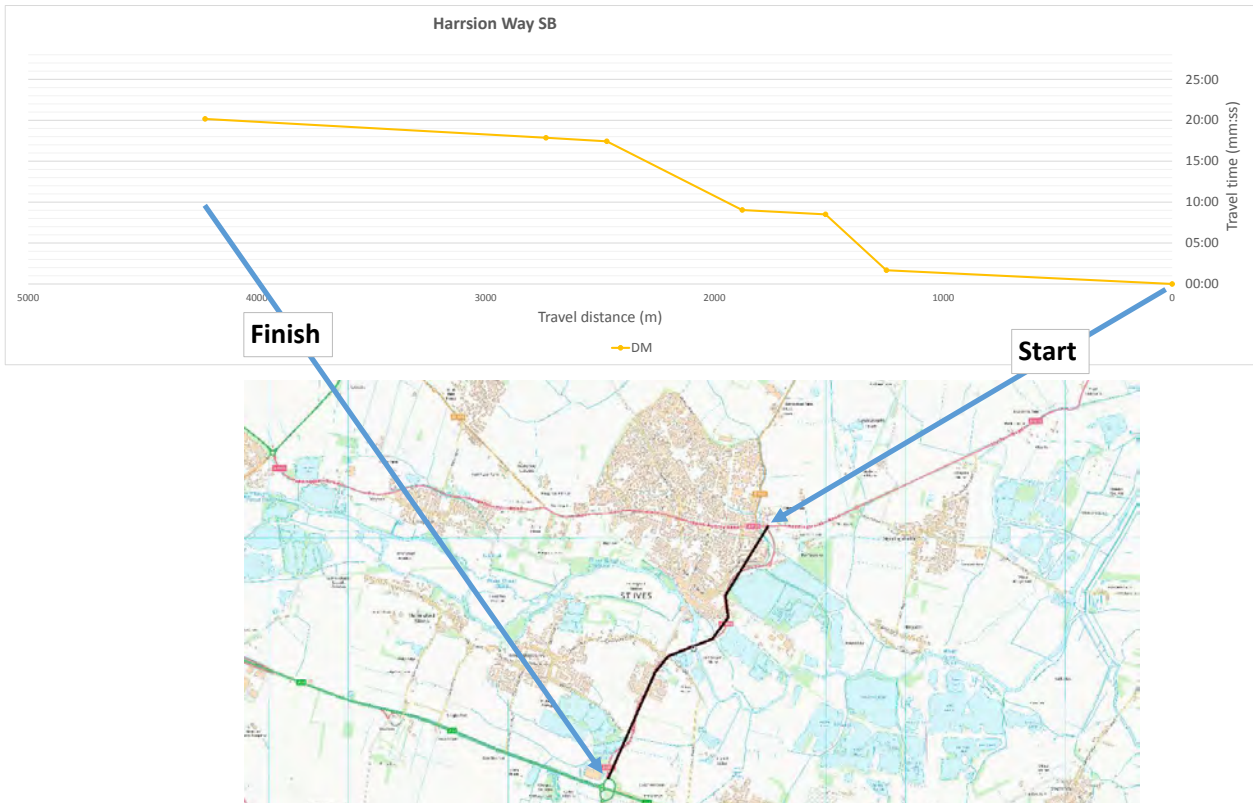
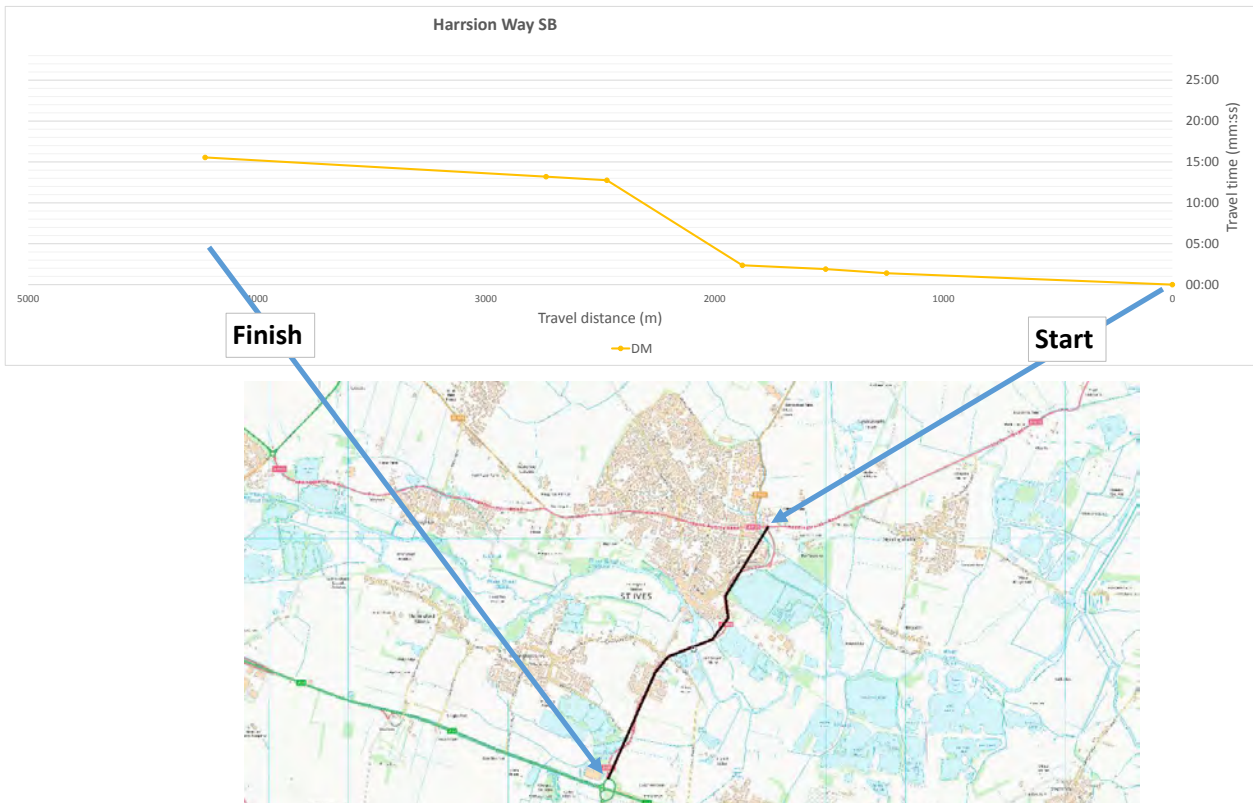


Figure 26: Harrison Way Southbound PM



Source: CSRM

Figure 27: Harrison Way Northbound AM

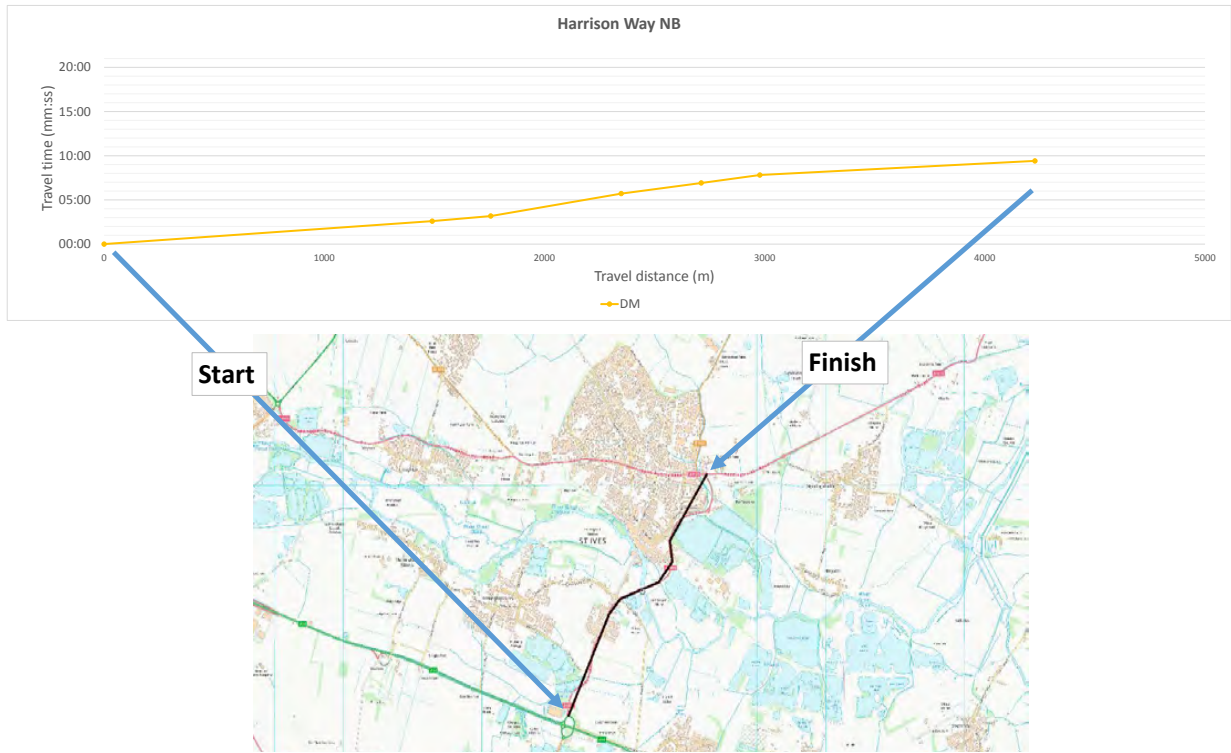
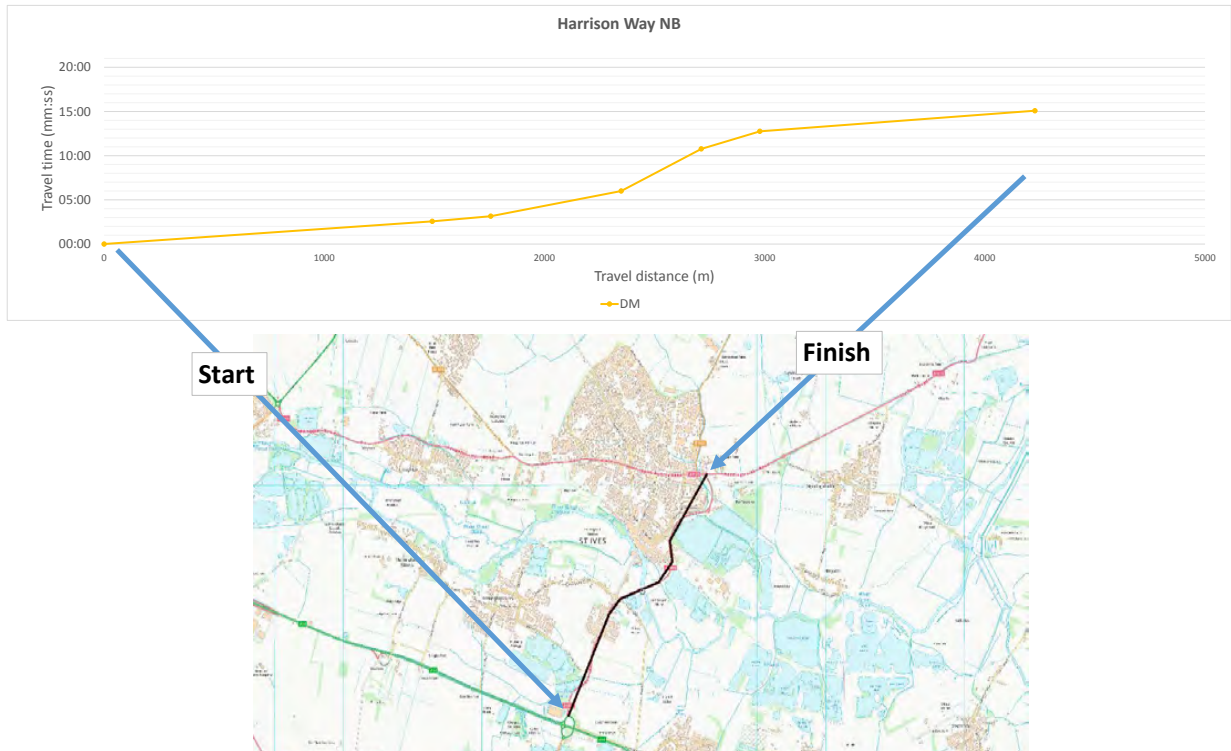


Figure 28: Harrison Way Northbound PM



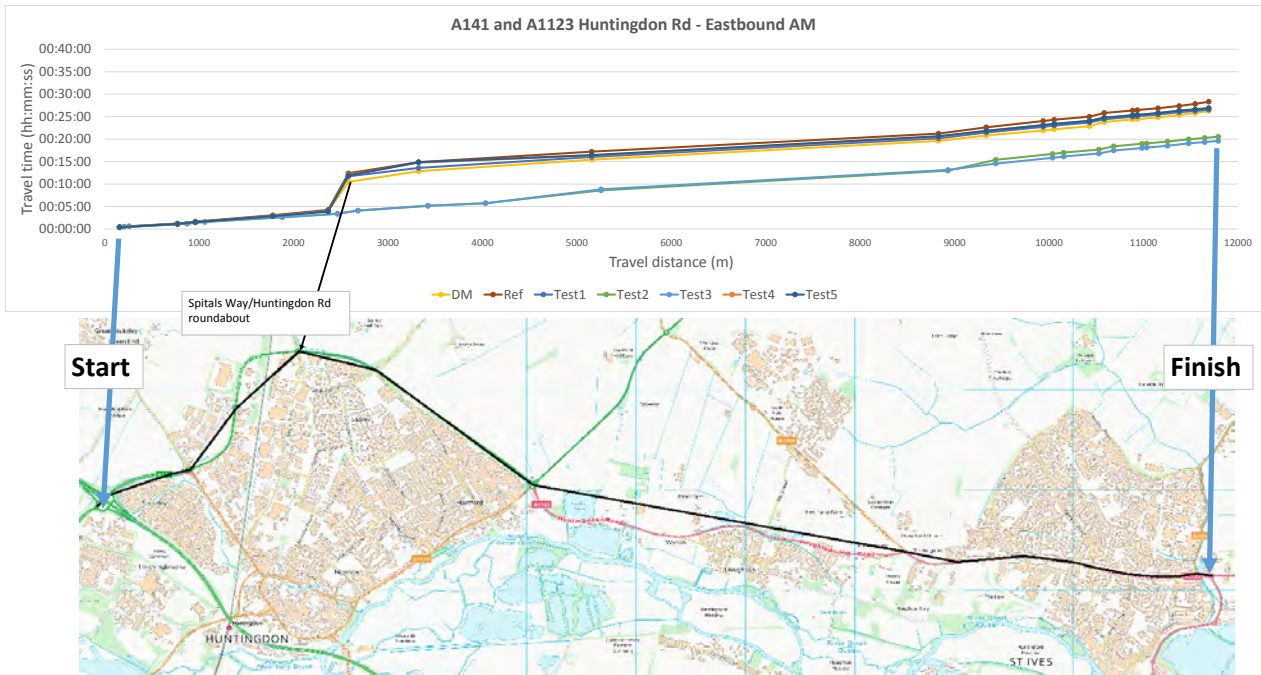
Source: CSRM

B.2 Scenario 1 Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the:

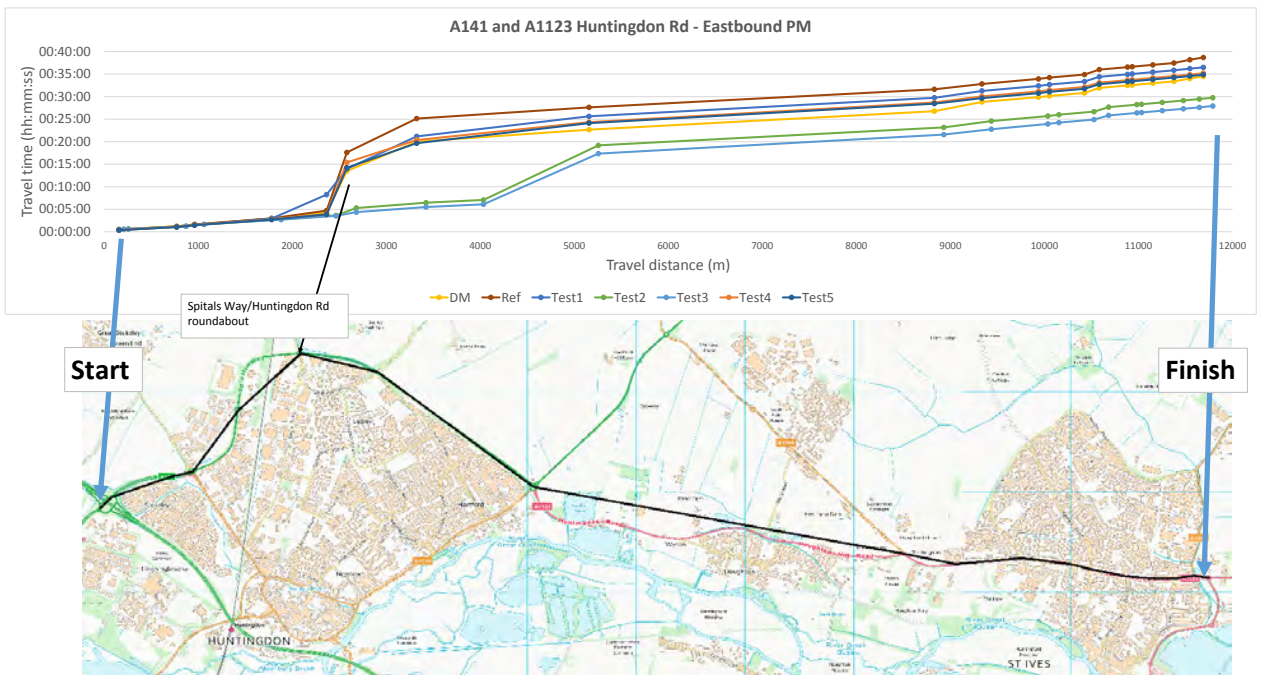
- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 1 (Ref)
- Development Scenario 1 with mitigation packages 1 to 5 applied (Test X)

Figure 29: A141 and A1123 Huntingdon Rd – Eastbound AM



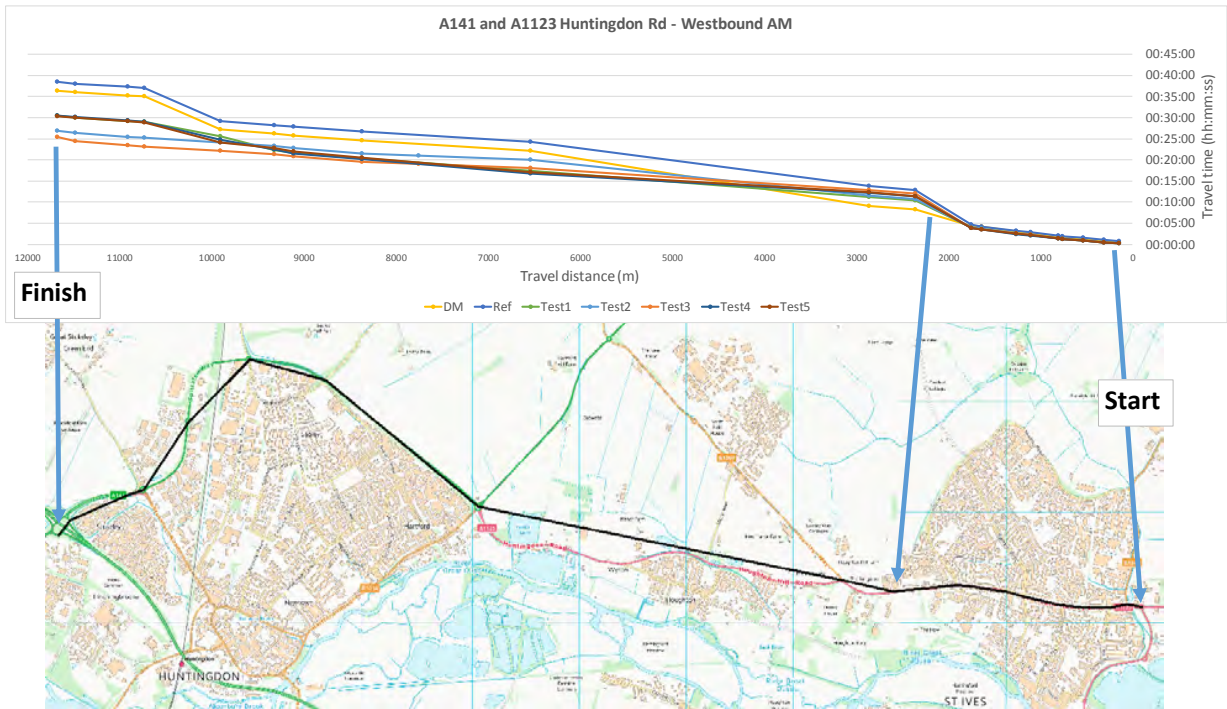
Source: CSRM

Figure 30: A141 and A1123 Huntingdon Rd – Eastbound PM



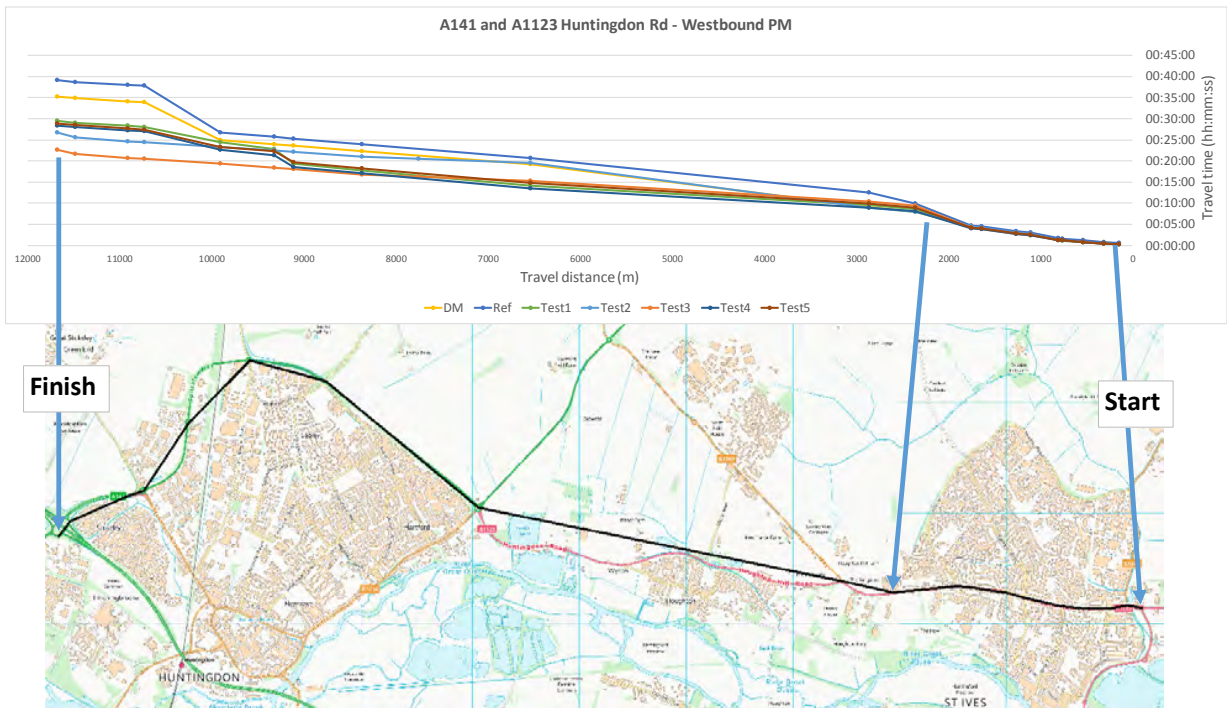
Source: CSRM

Figure 31: A141 and A1123 Huntingdon Rd – Westbound AM



Source: CSRM

Figure 32: A141 and A1123 Huntingdon Rd – Westbound PM



Source: CSRM

Figure 33: A141 Warboys Roundabout Southbound AM

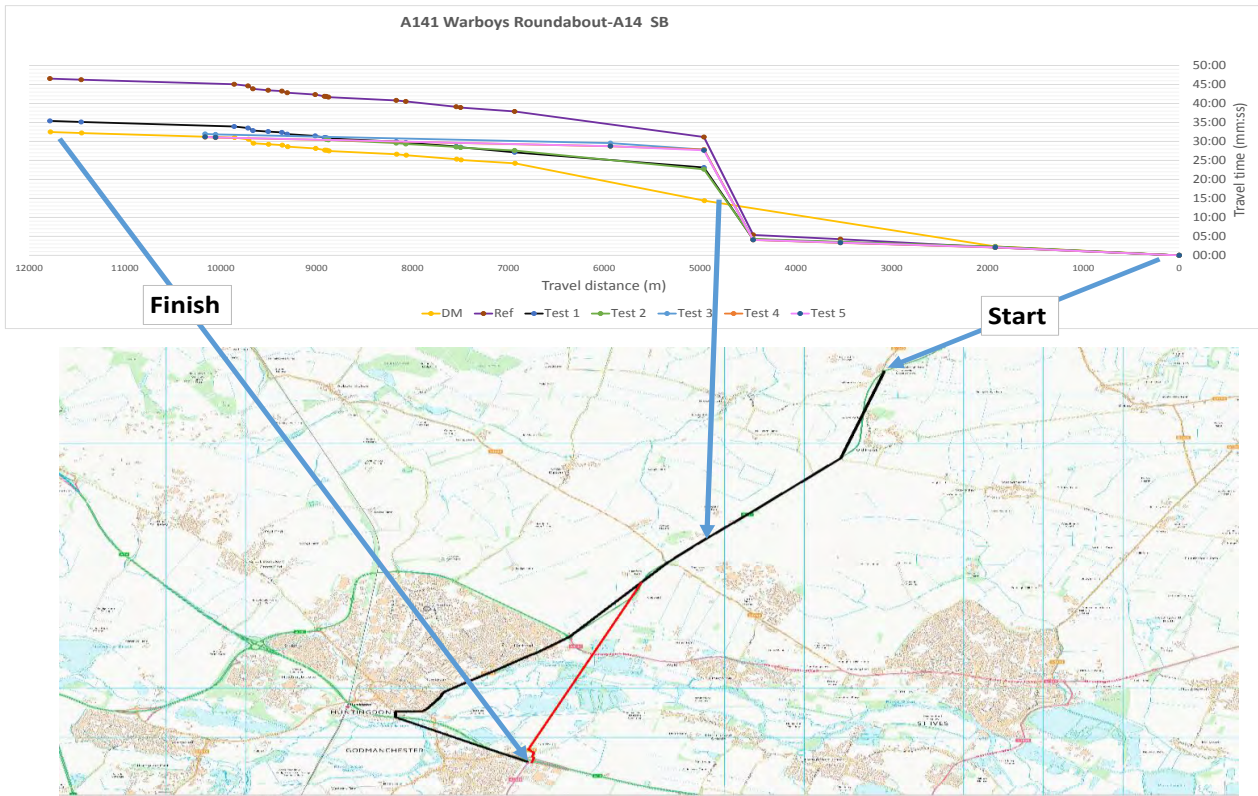
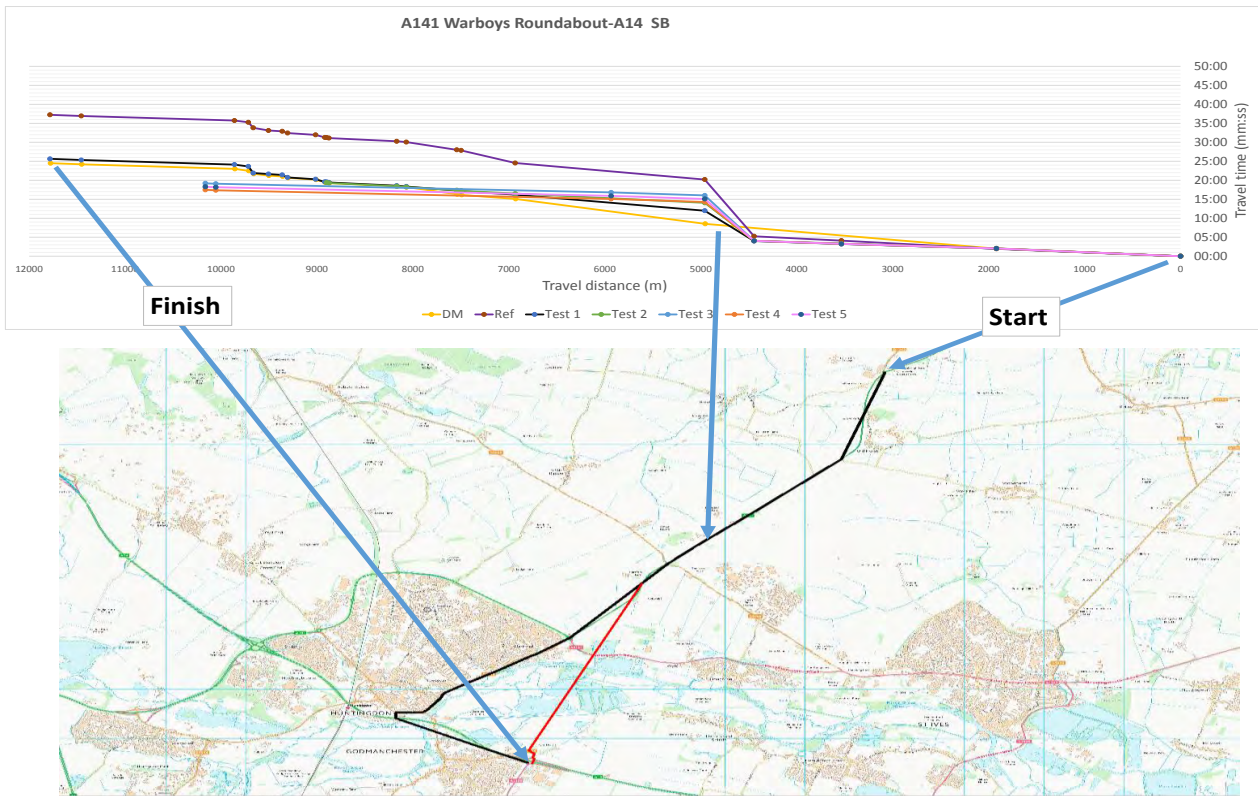


Figure 34: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 35: A141 Warboys Roundabout Northbound AM

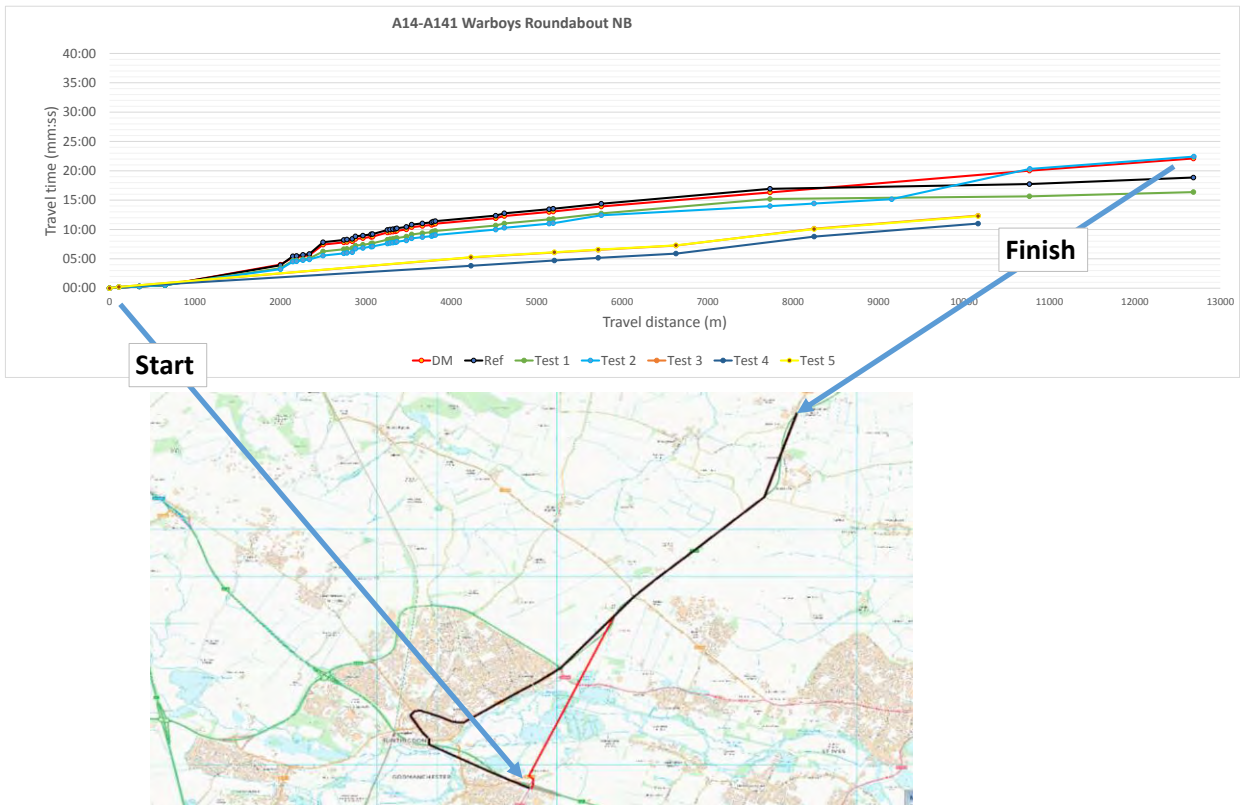
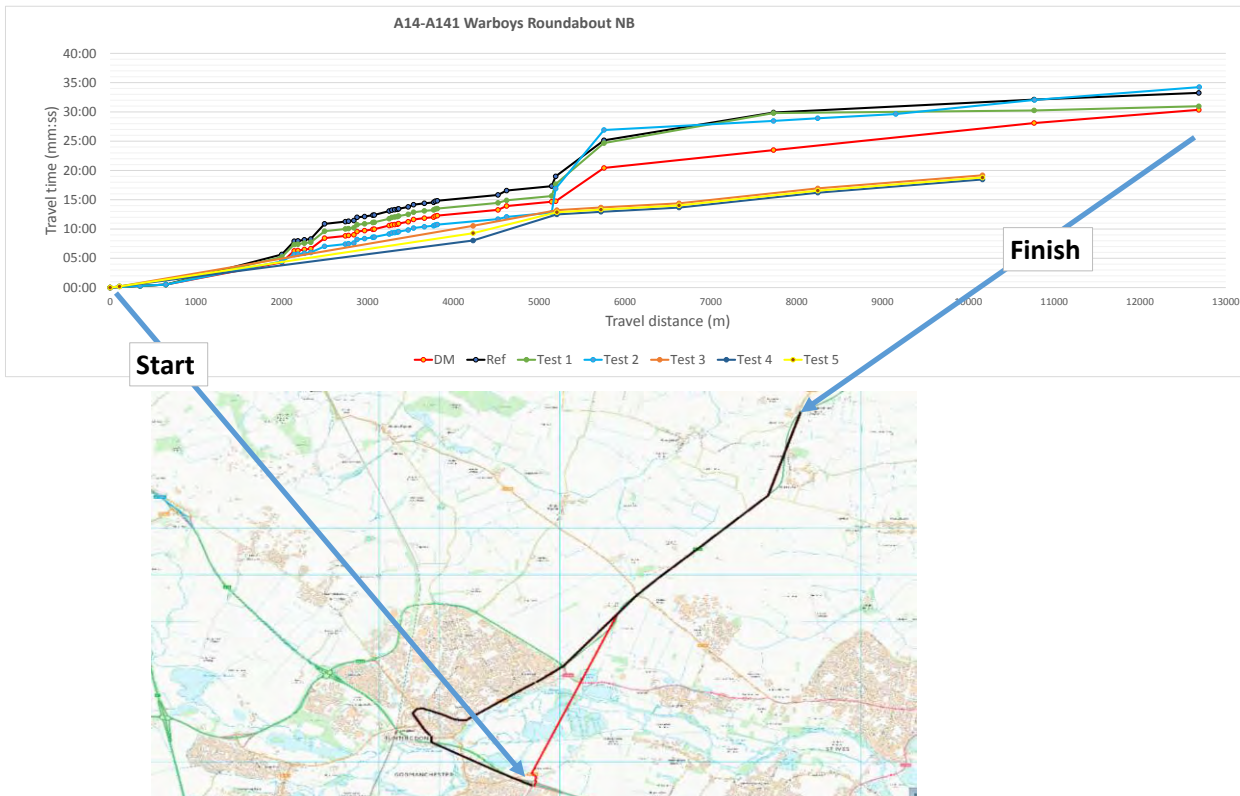


Figure 36: A141 Warboys Roundabout Northbound PM



Source: CSRM

Figure 37: Harrison Way Southbound AM

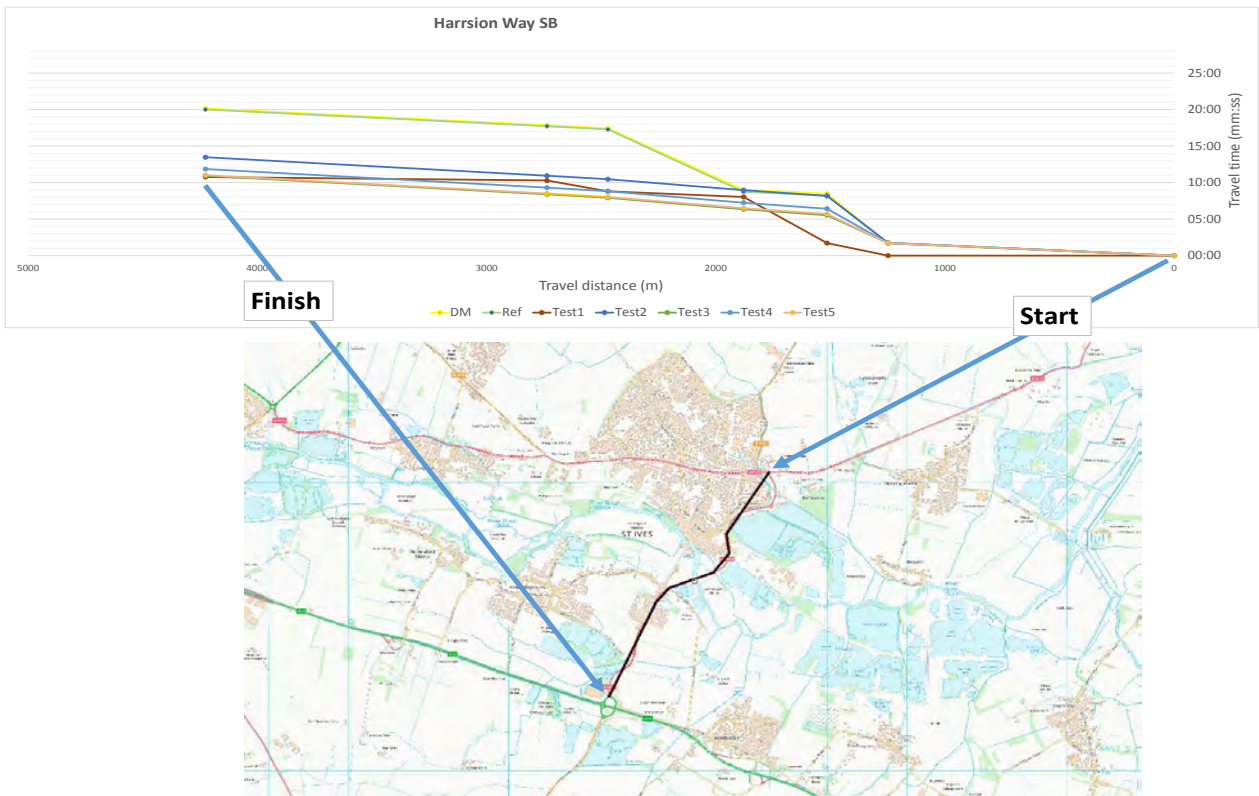
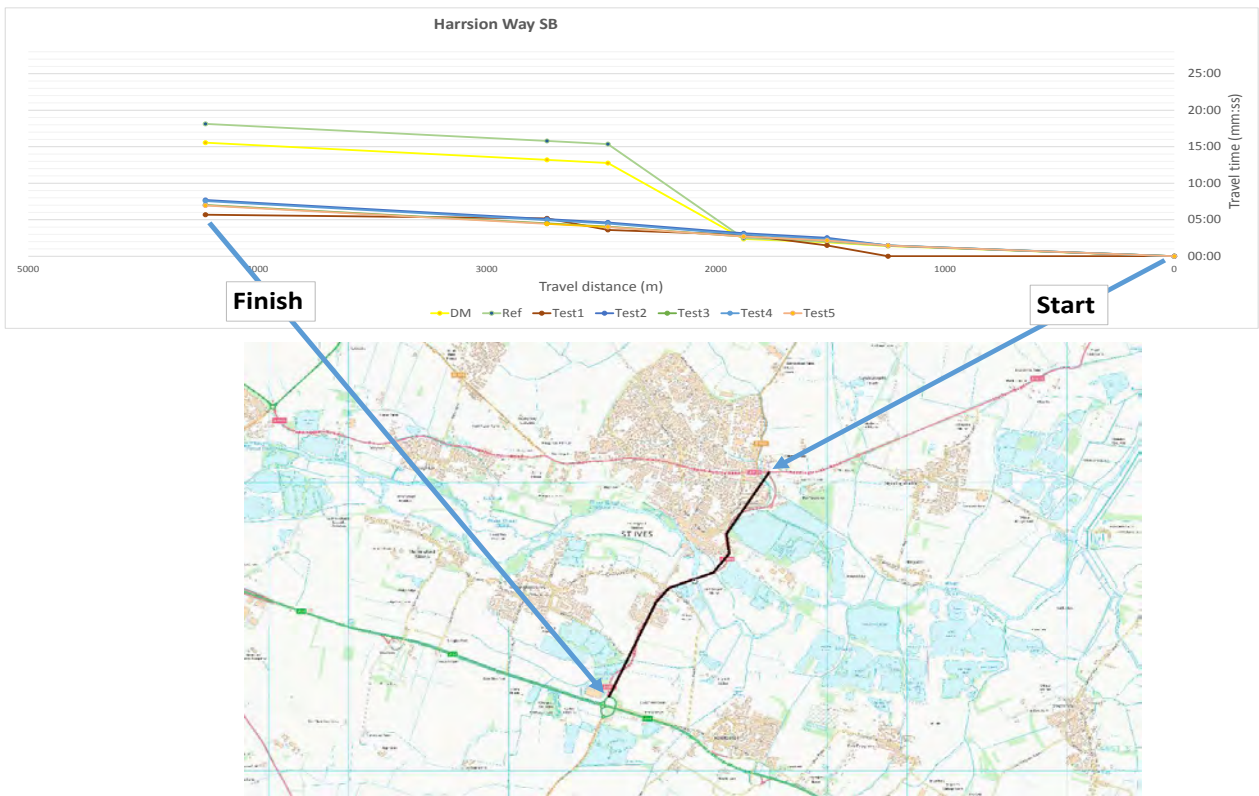


Figure 38: Harrison Way Southbound PM



Source: CSRM

Figure 39: Harrison Way Northbound AM

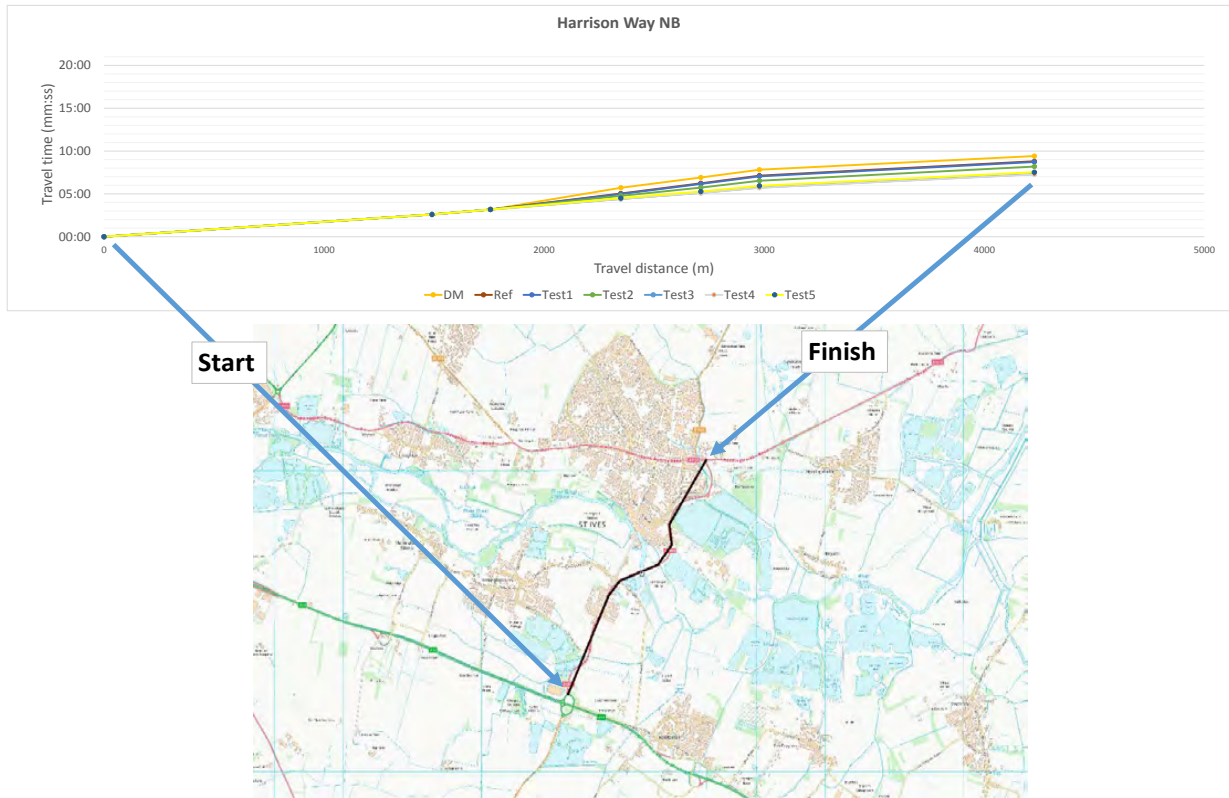
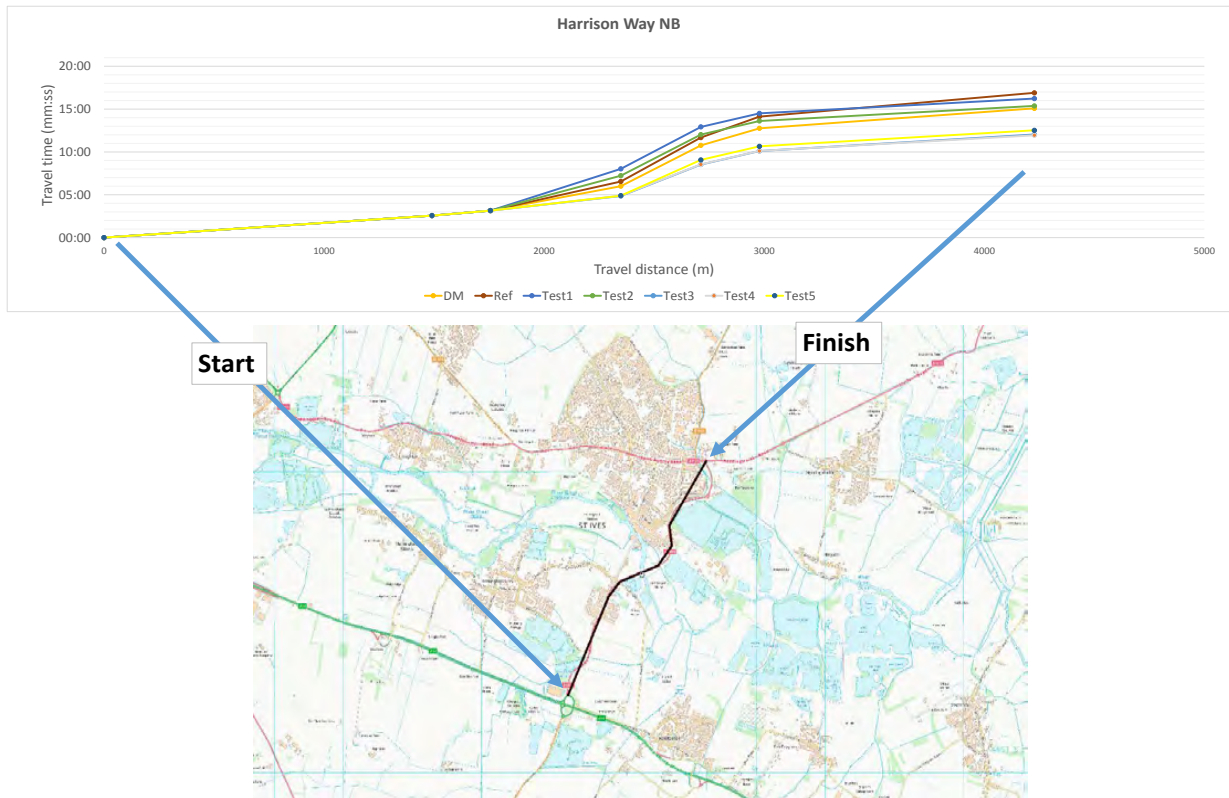


Figure 40: Harrison Way Northbound PM



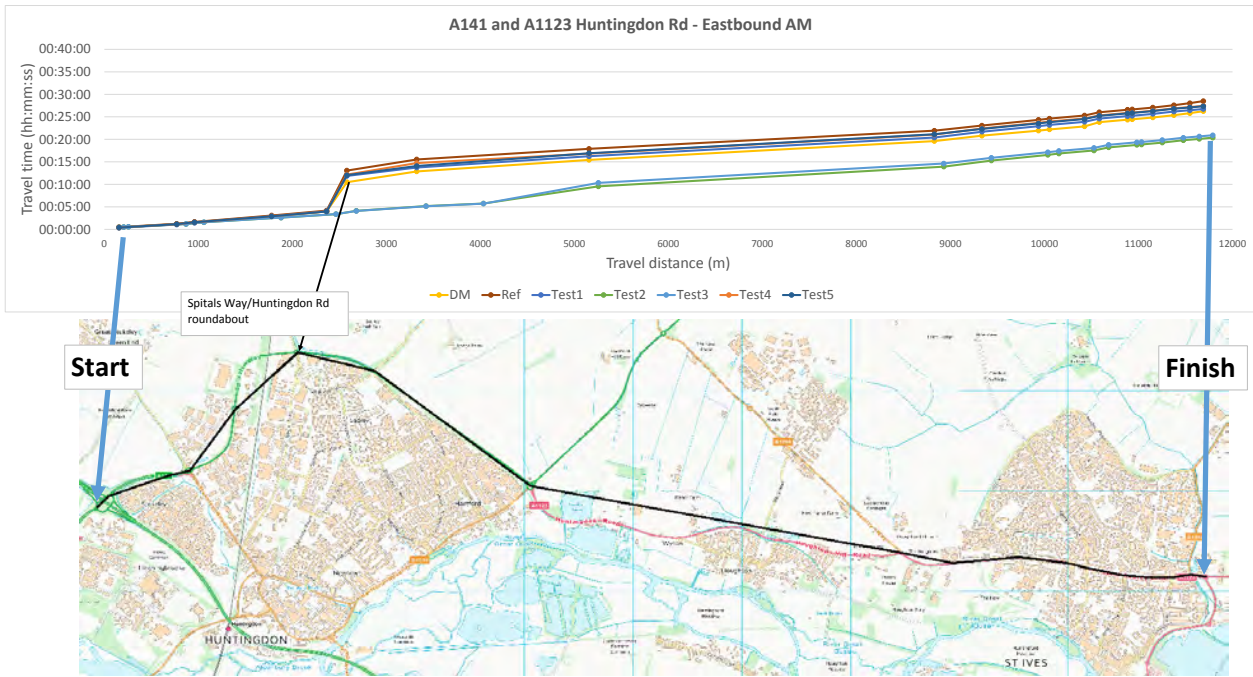
Source: CSRM

B.3 Scenario 2 Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the:

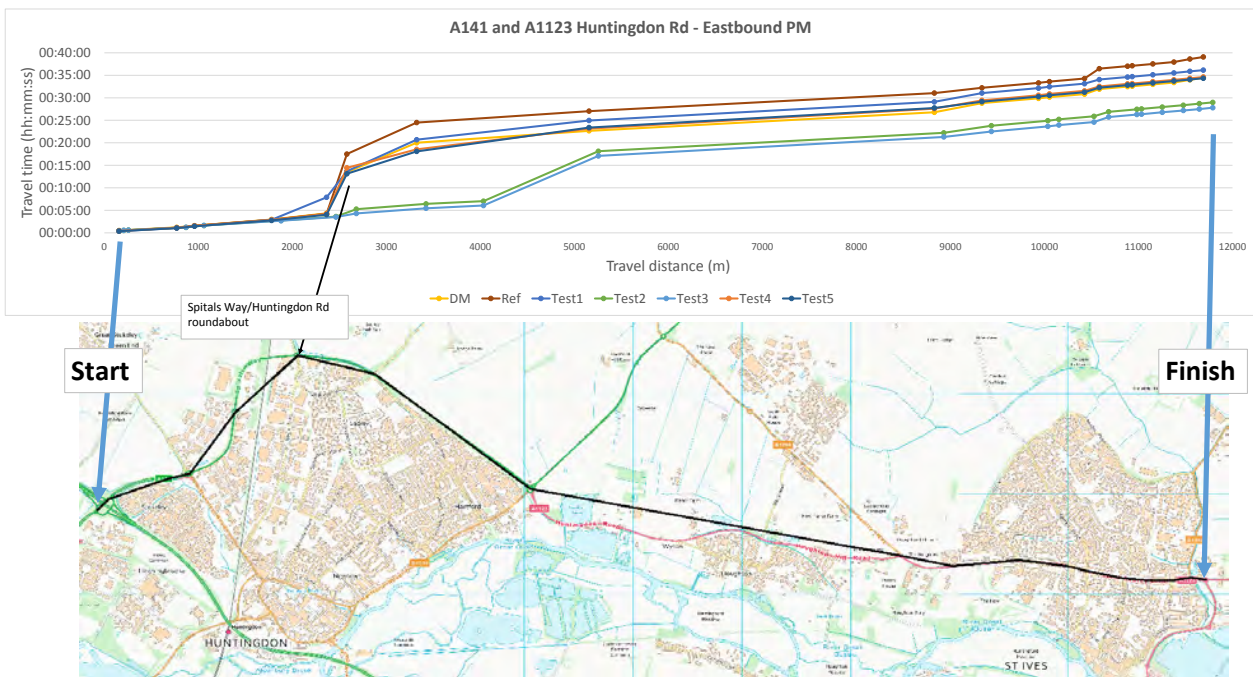
- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 2 (Ref)
- Development Scenario 2 with mitigation packages 1 to 5 applied (Test X)

Figure 41: A141 and A1123 Huntingdon Rd – Eastbound AM



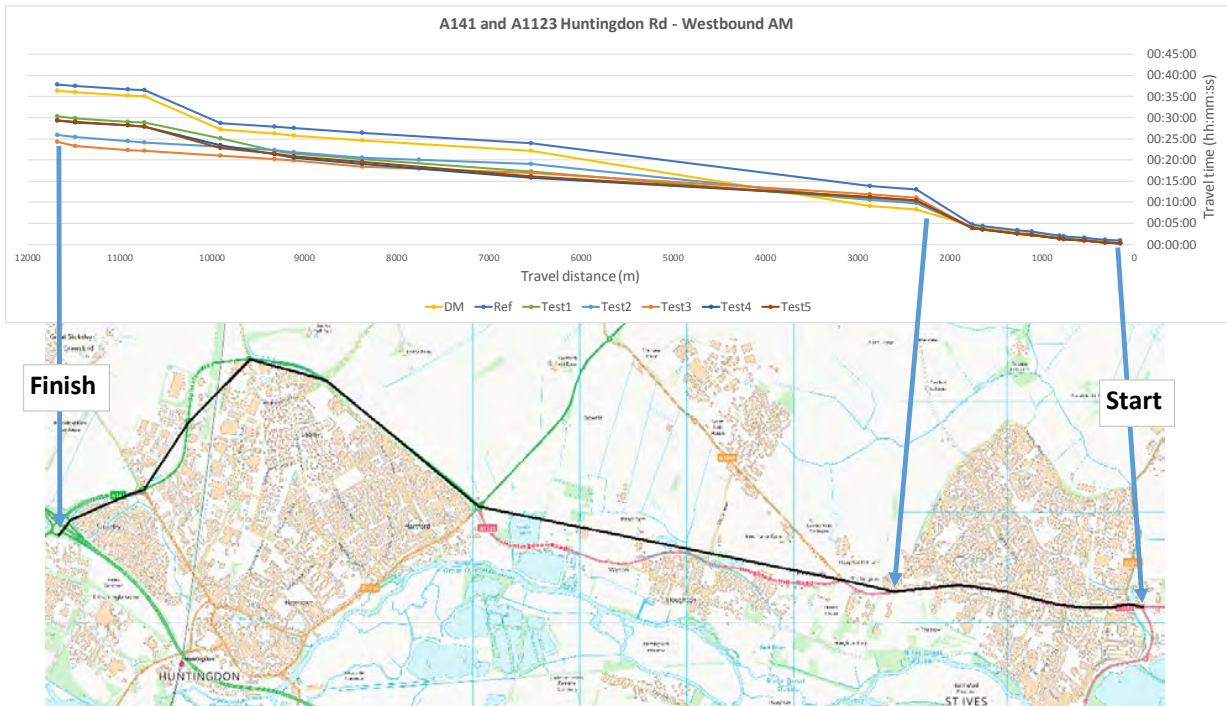
Source: CSRM

Figure 42: A141 and A1123 Huntingdon Rd – Eastbound PM



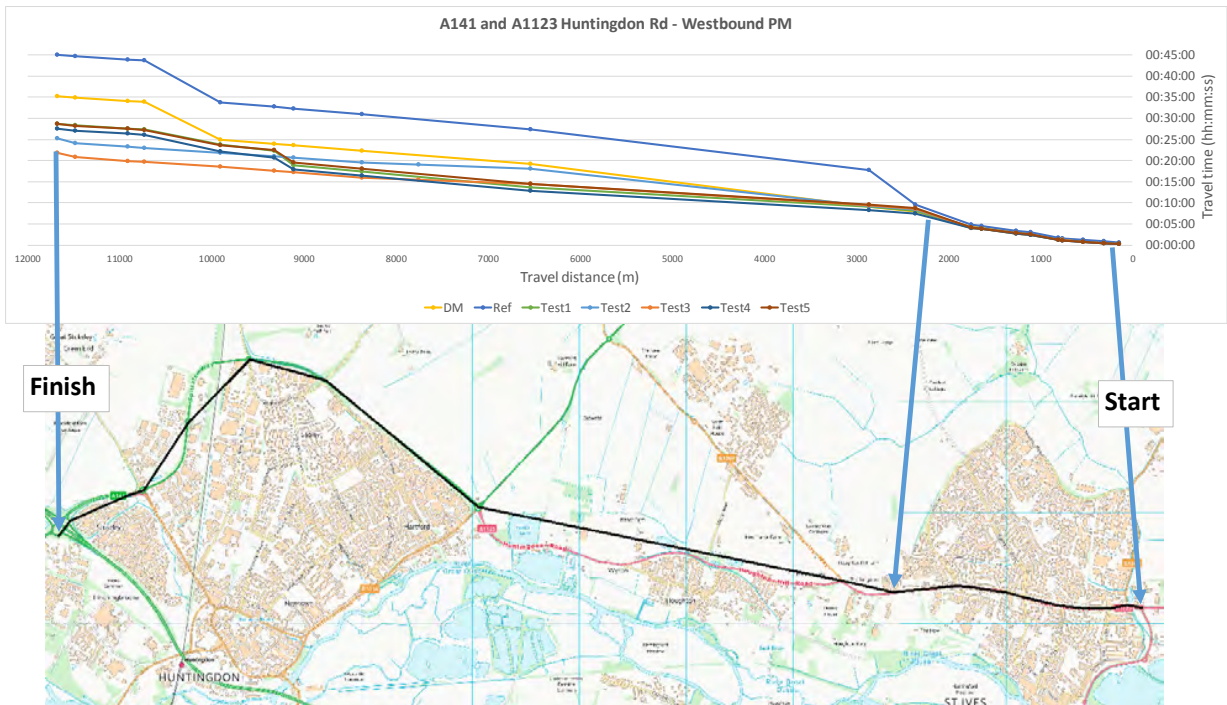
Source: CSRM

Figure 43: A141 and A1123 Huntingdon Rd – Westbound AM



Source: CSRM

Figure 44: A141 and A1123 Huntingdon Rd – Westbound PM



Source: CSRM

Figure 45: A141 Warboys Roundabout Southbound AM

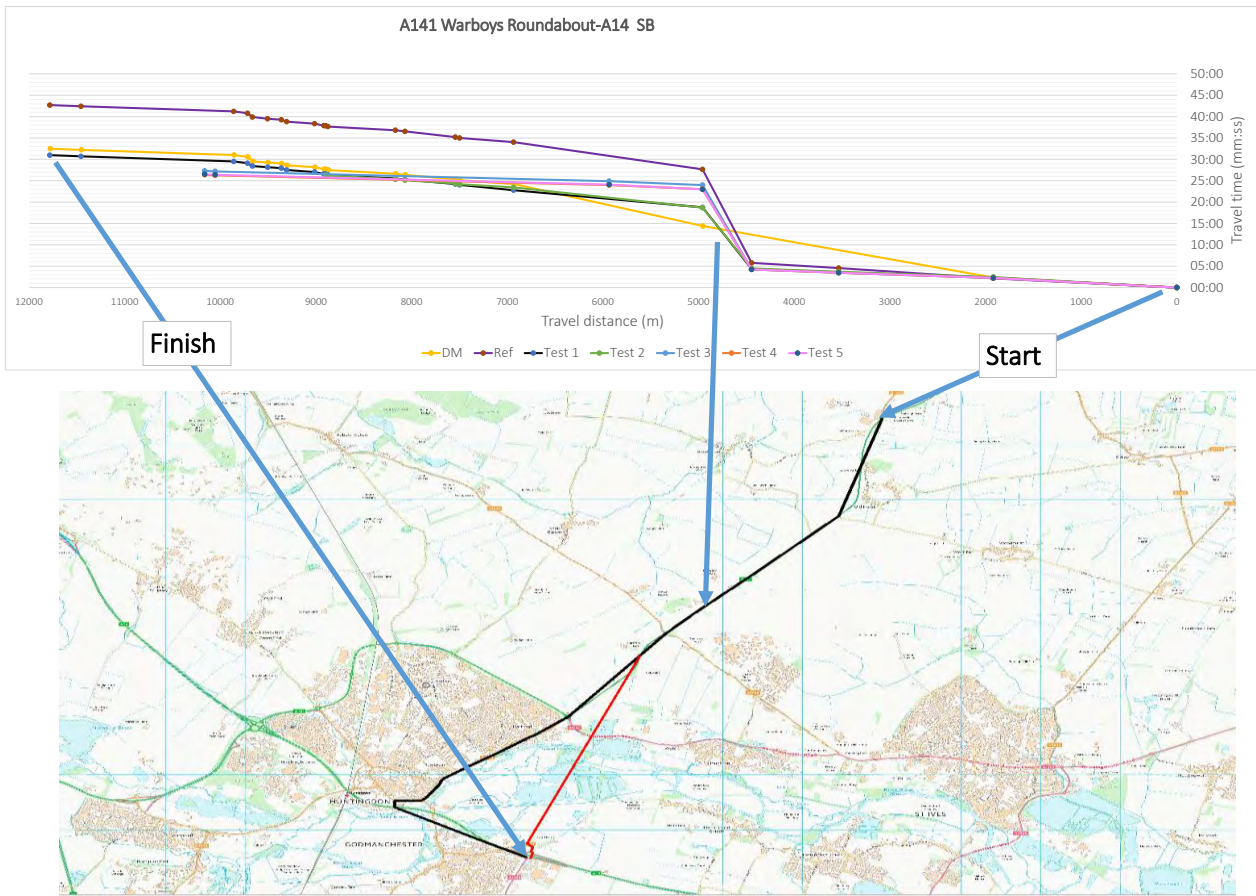
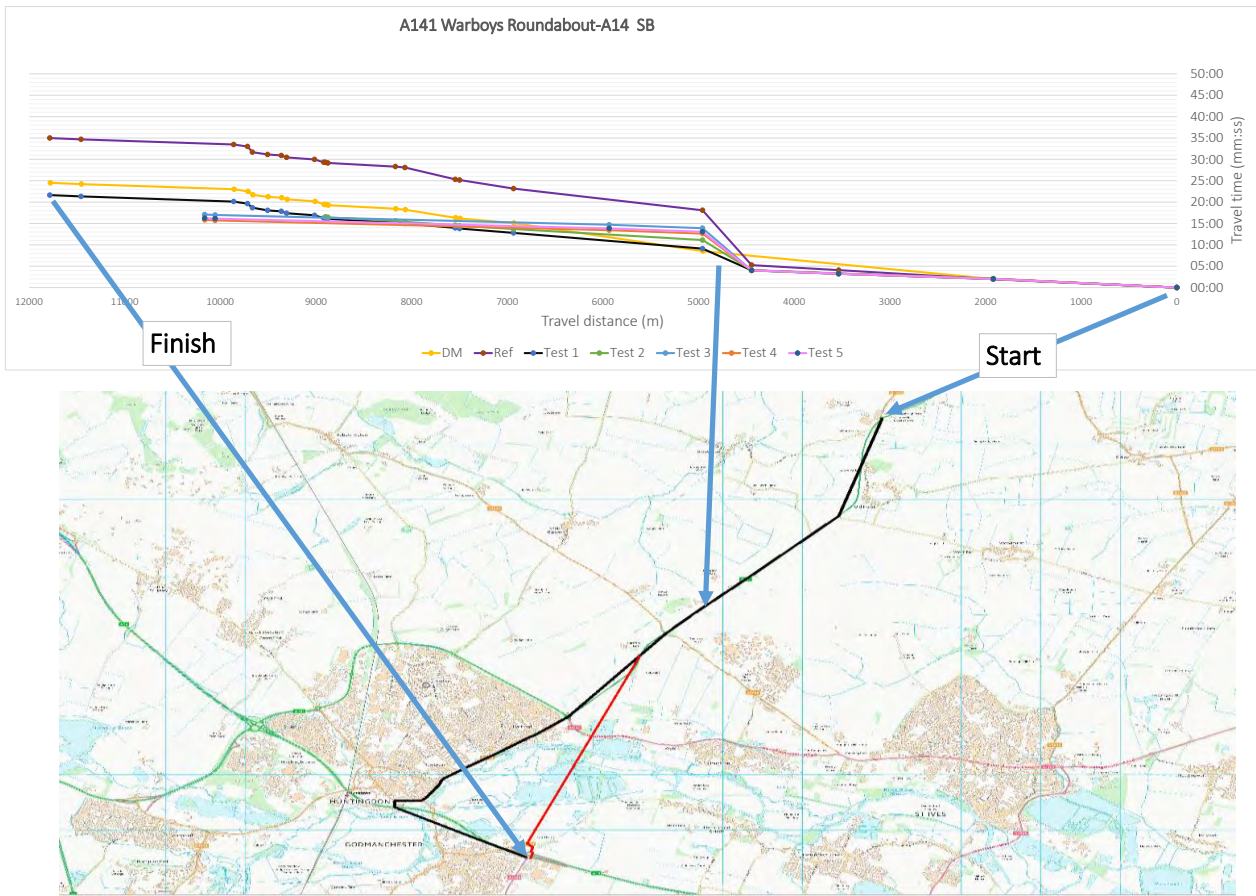


Figure 46: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 47: A141 Warboys Roundabout Northbound AM

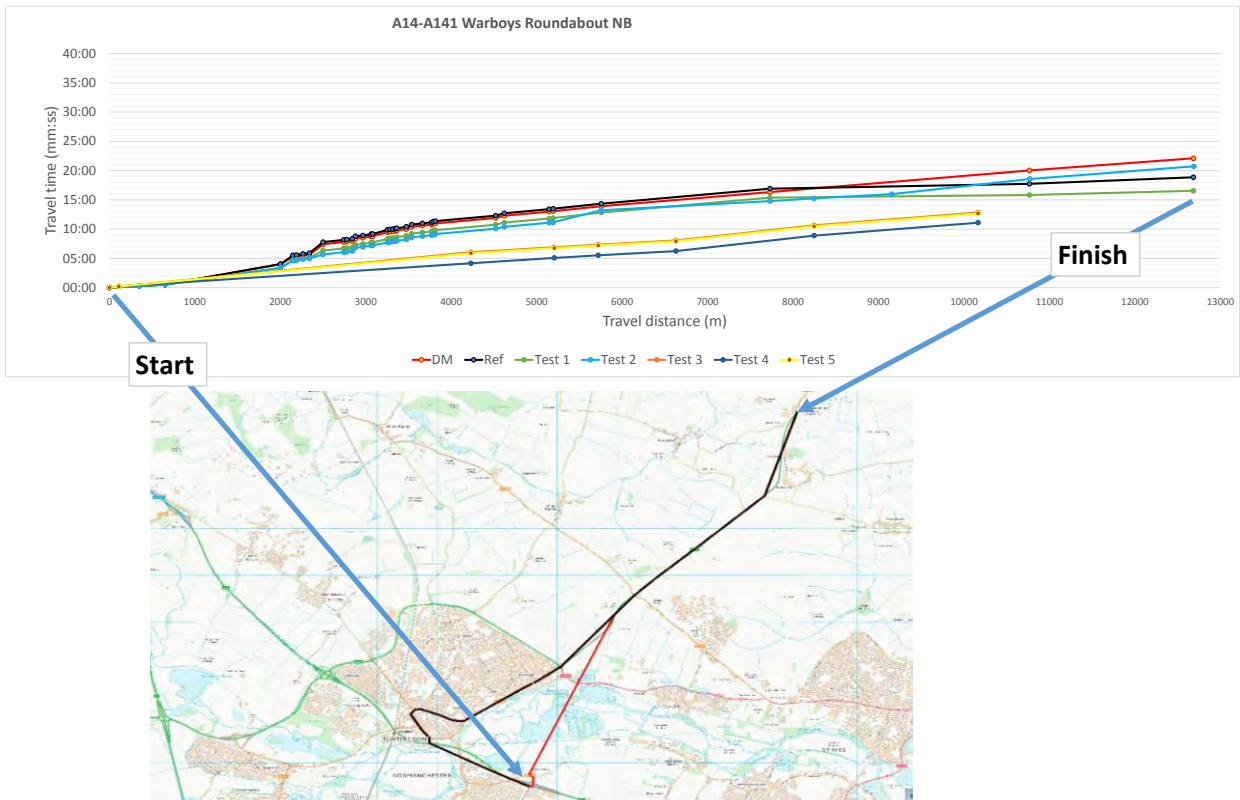
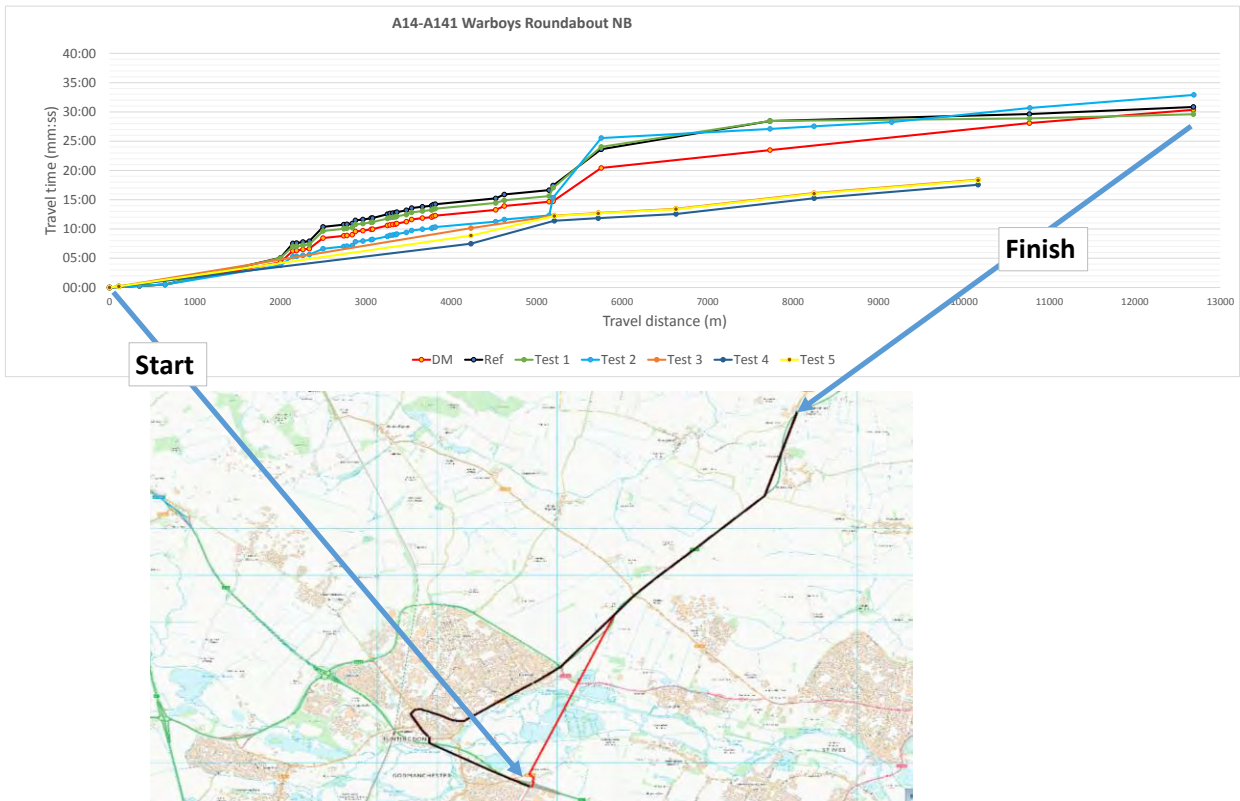


Figure 48: A141 Warboys Roundabout Northbound PM



Source: CSRM

Figure 49: Harrison Way Southbound AM

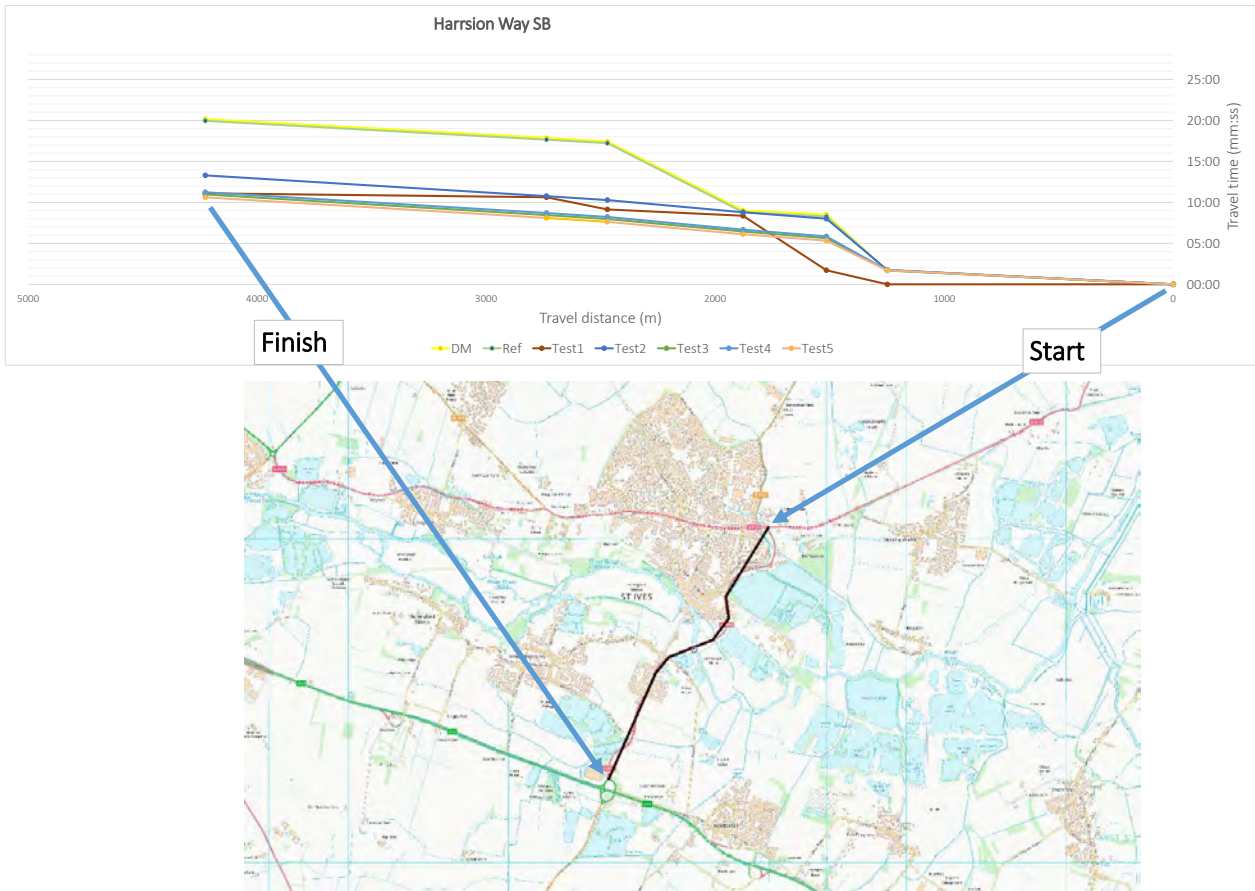


Figure 50: Harrison Way Southbound PM



Source: CSRM

Figure 51: Harrison Way Northbound AM

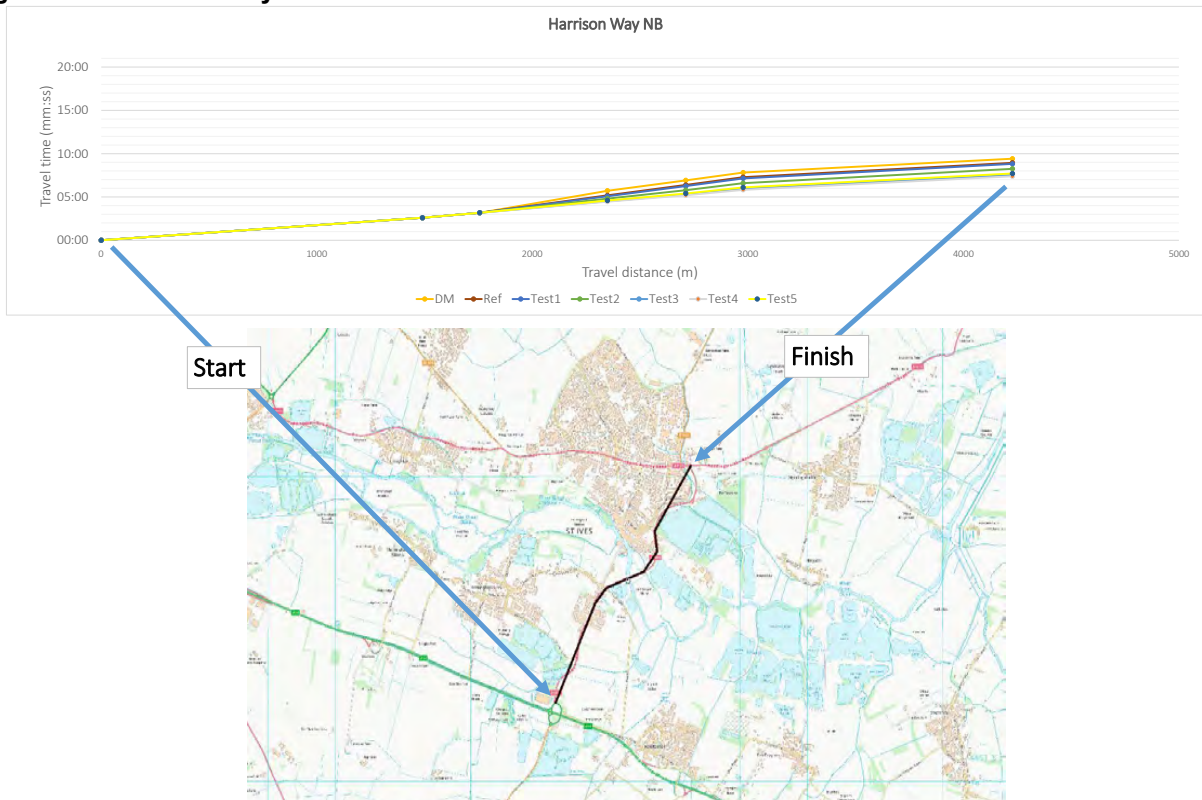
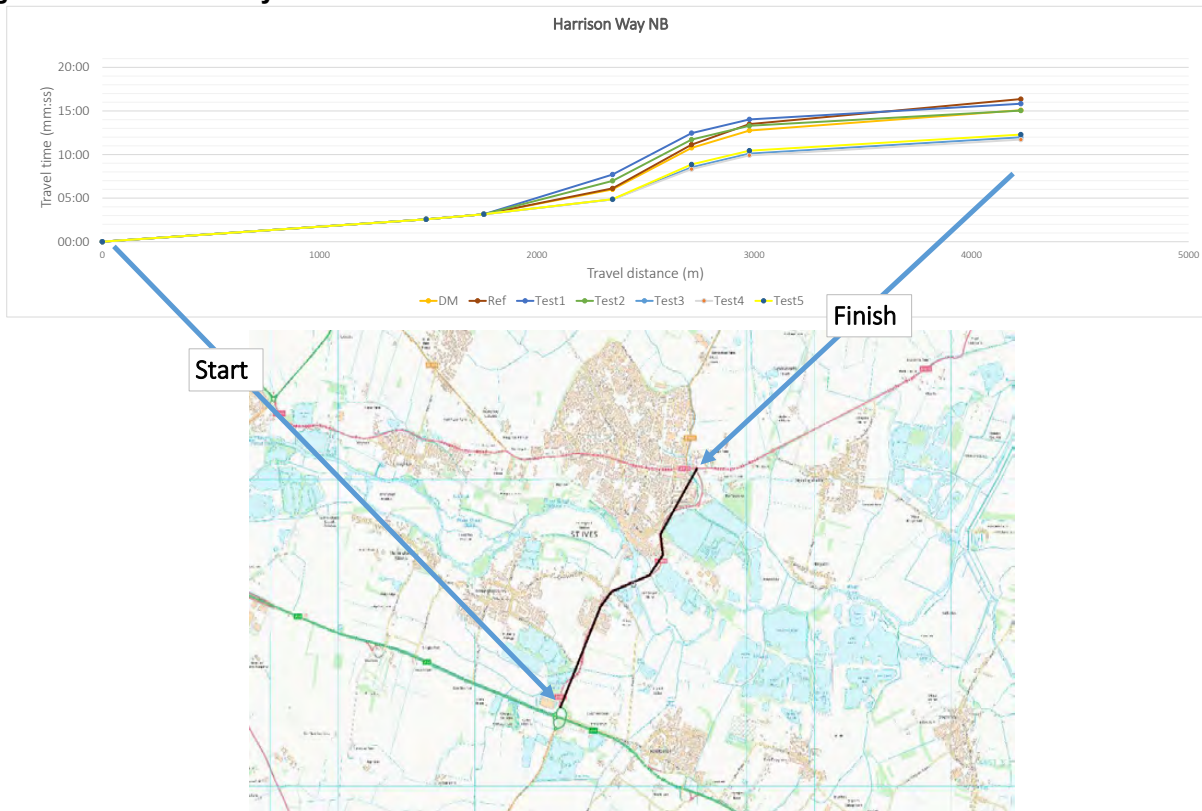


Figure 52: Harrison Way Northbound PM



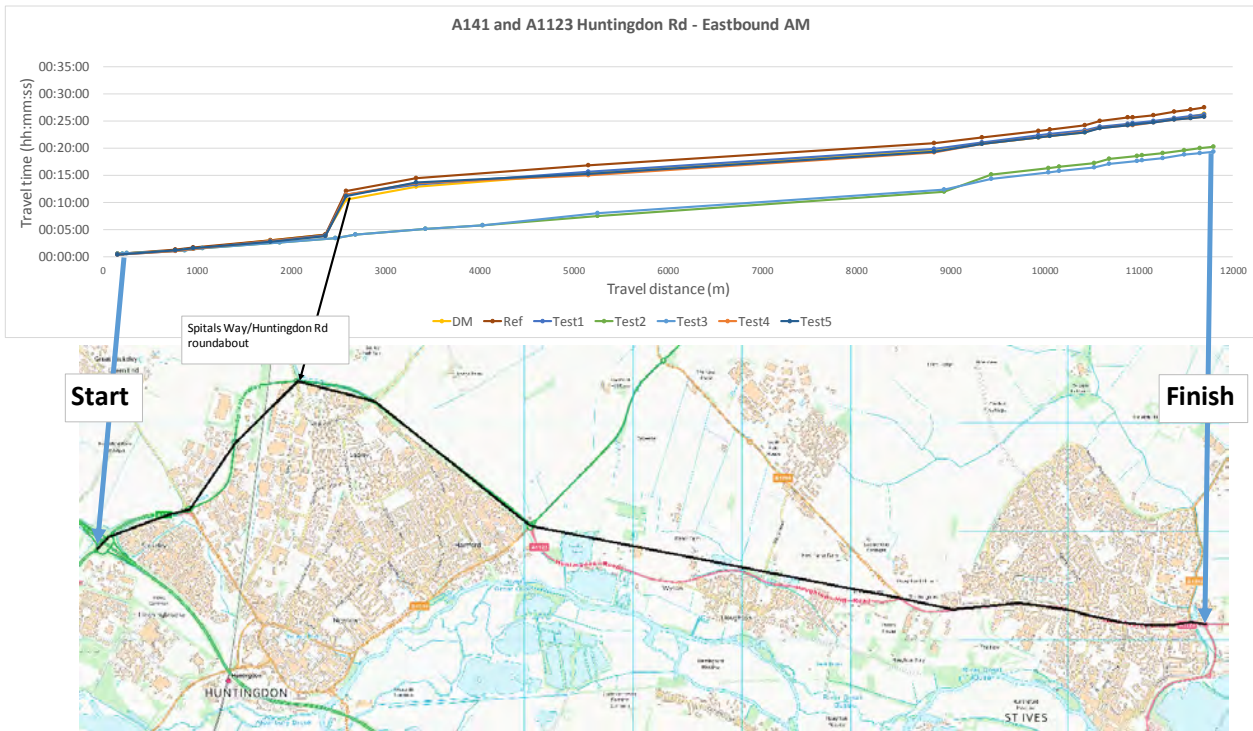
Source: CSRM

B.4 Scenario 3 Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the:

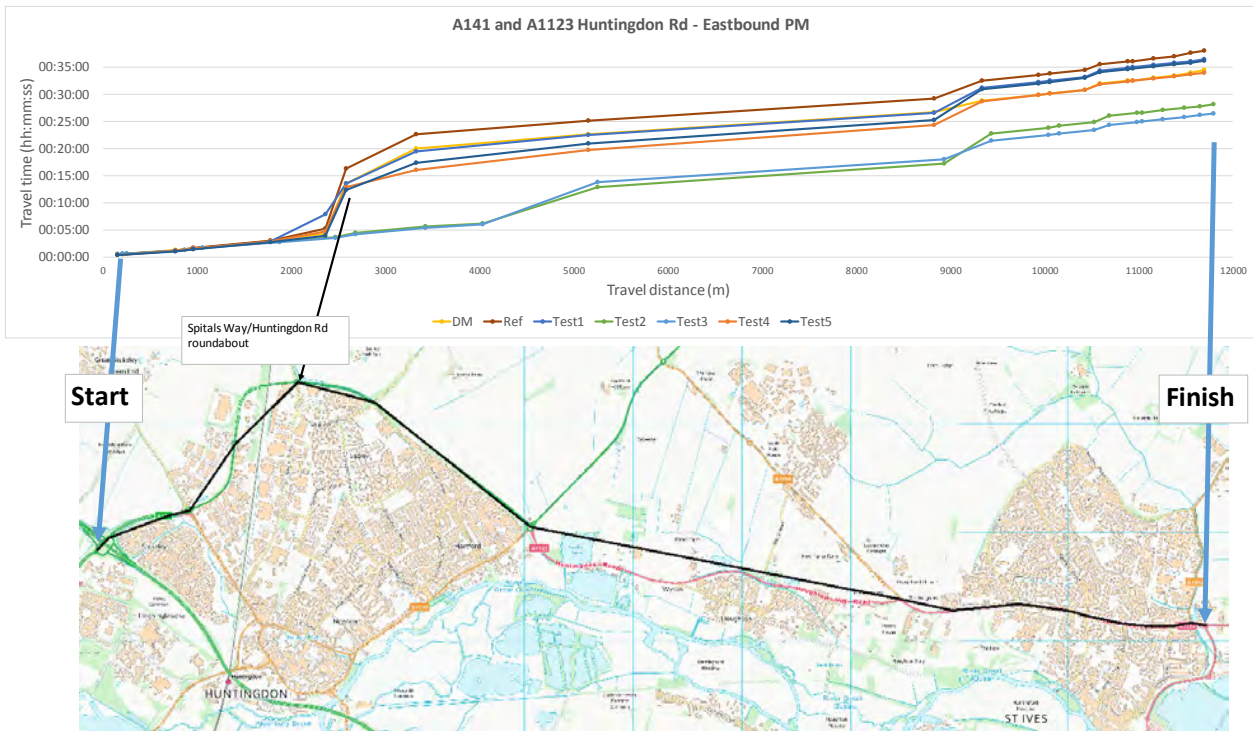
- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 3 (Ref)
- Development Scenario 3 with mitigation packages 1 to 5 applied (Test X)

Figure 53: A141 and A1123 Huntingdon Rd – Eastbound AM



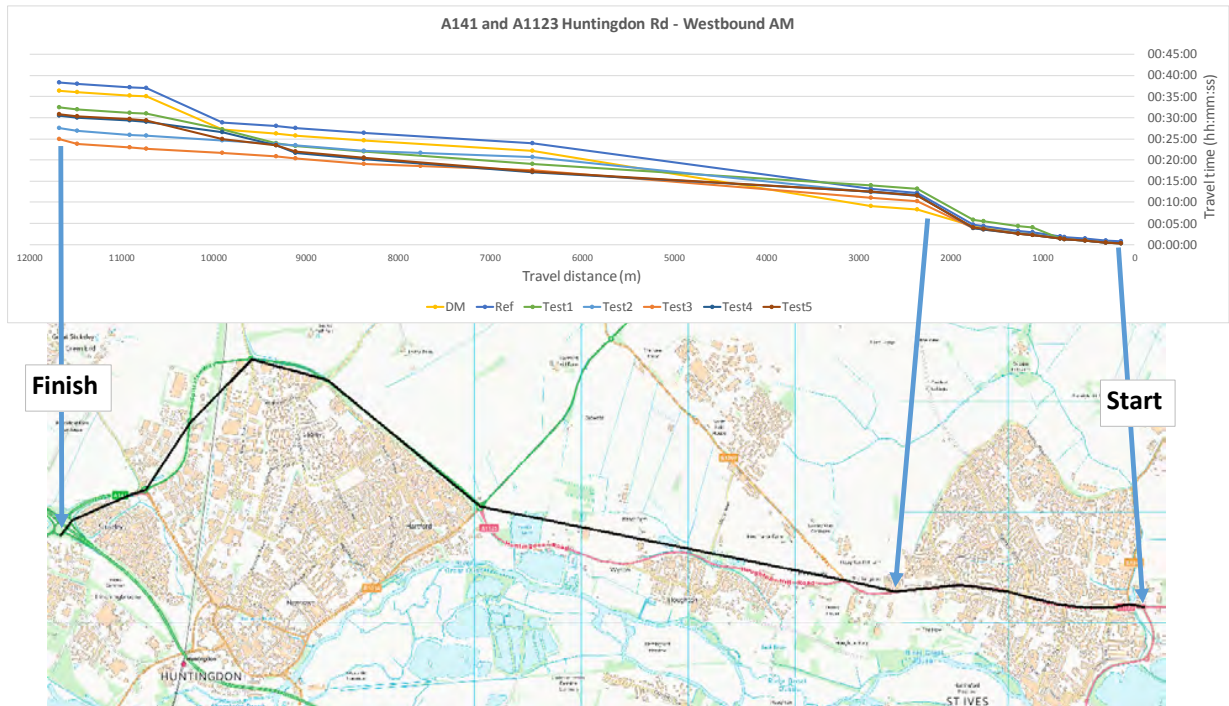
Source: CSRМ

Figure 54: A141 and A1123 Huntingdon Rd – Eastbound PM



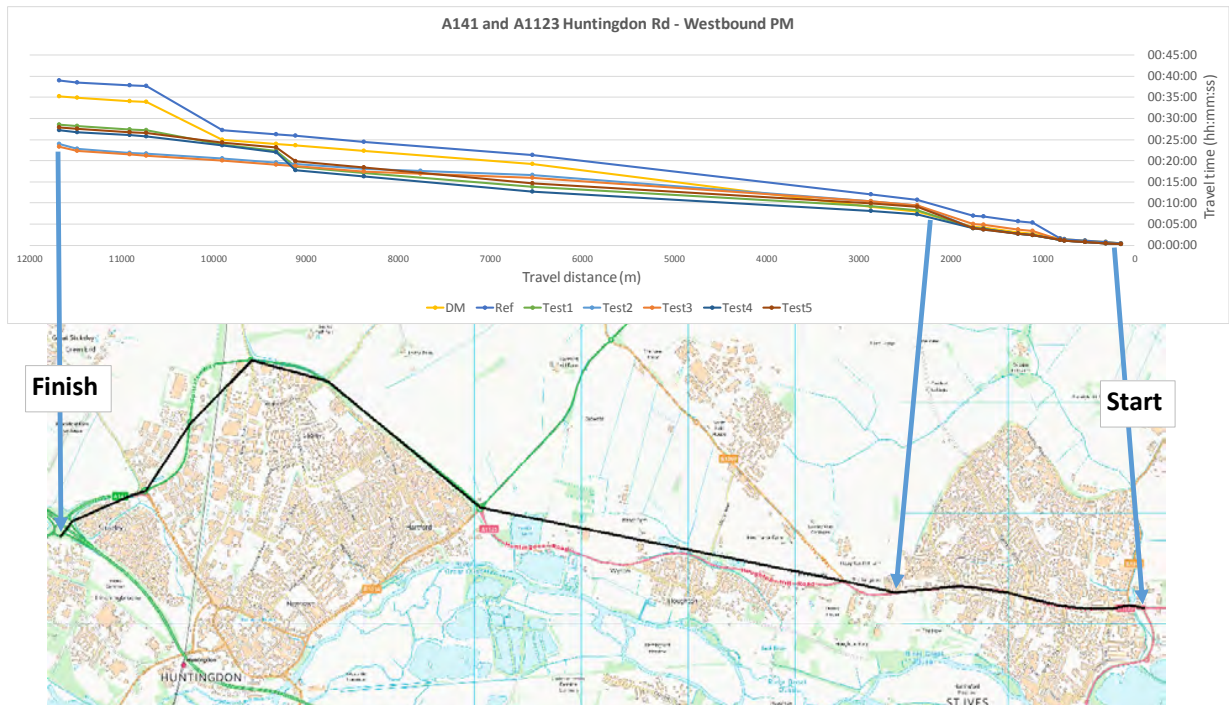
Source: CSRМ

Figure 55: A141 and A1123 Huntingdon Rd – Westbound AM



Source: CSRM

Figure 56: A141 and A1123 Huntingdon Rd – Westbound PM



Source: CSRM

Figure 57: A141 Warboys Roundabout Southbound AM

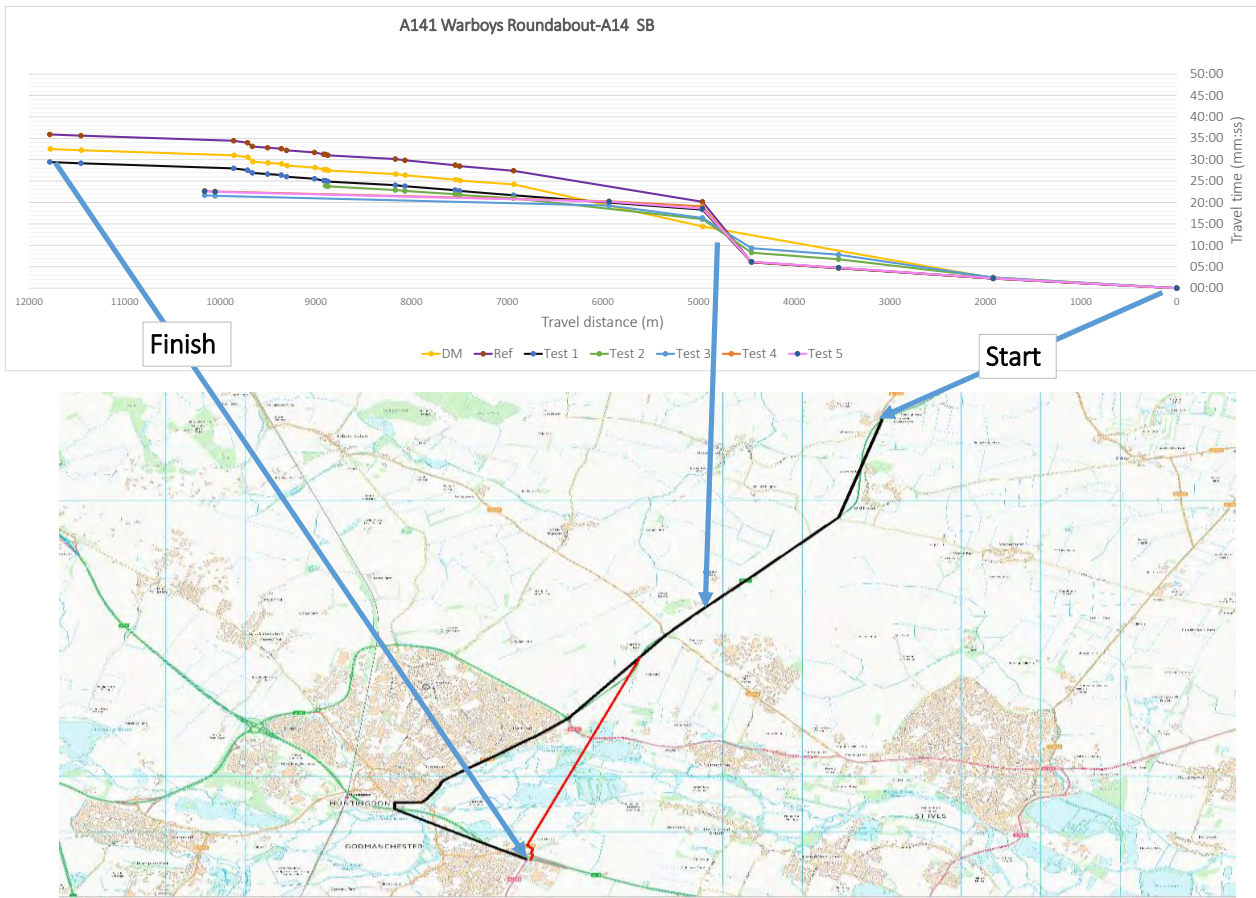
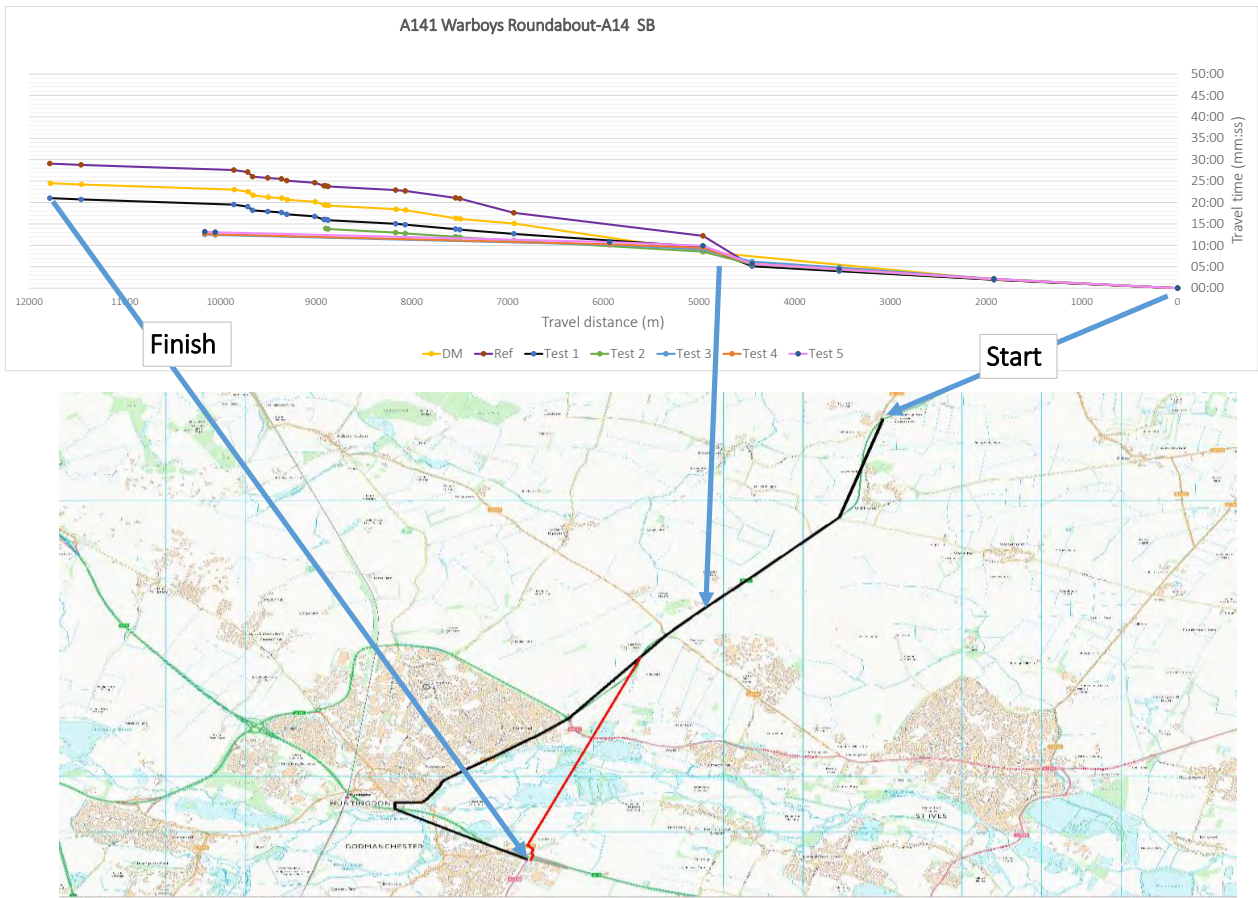


Figure 58: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 59: A141 Warboys Roundabout Northbound AM

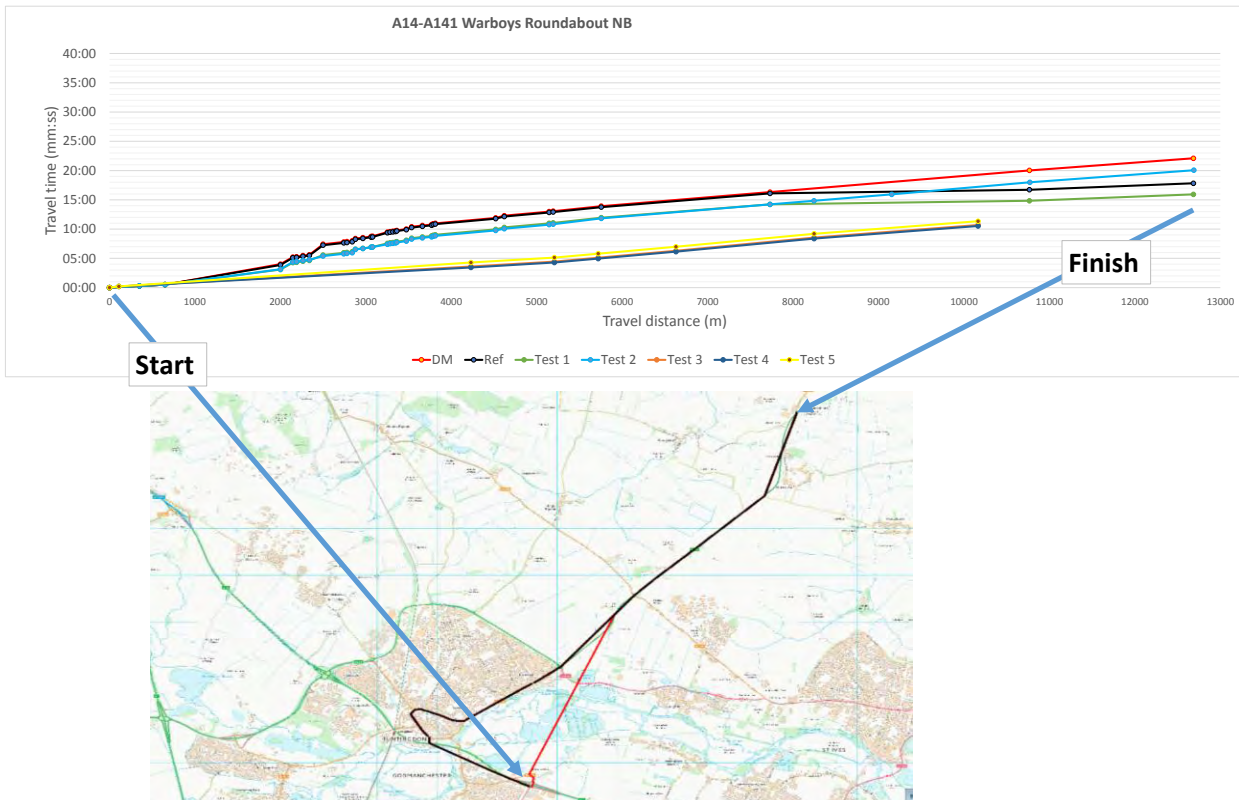
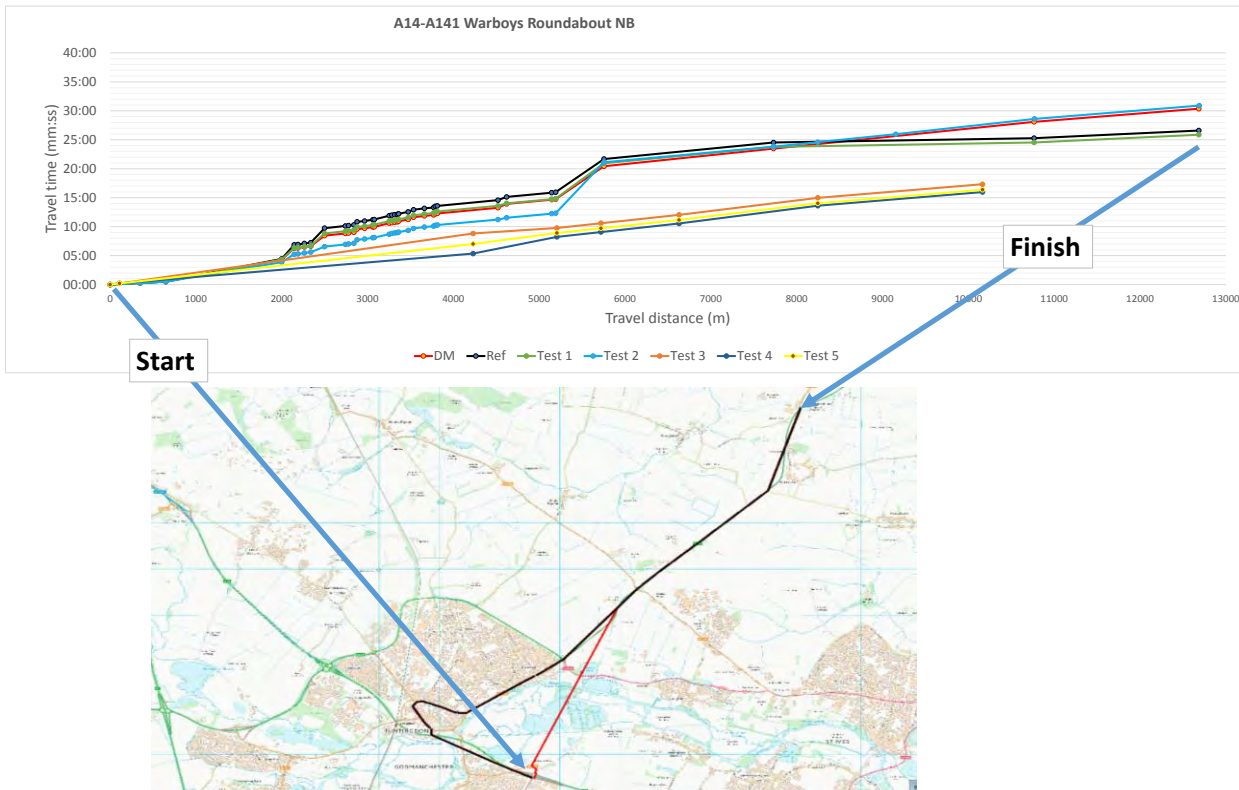
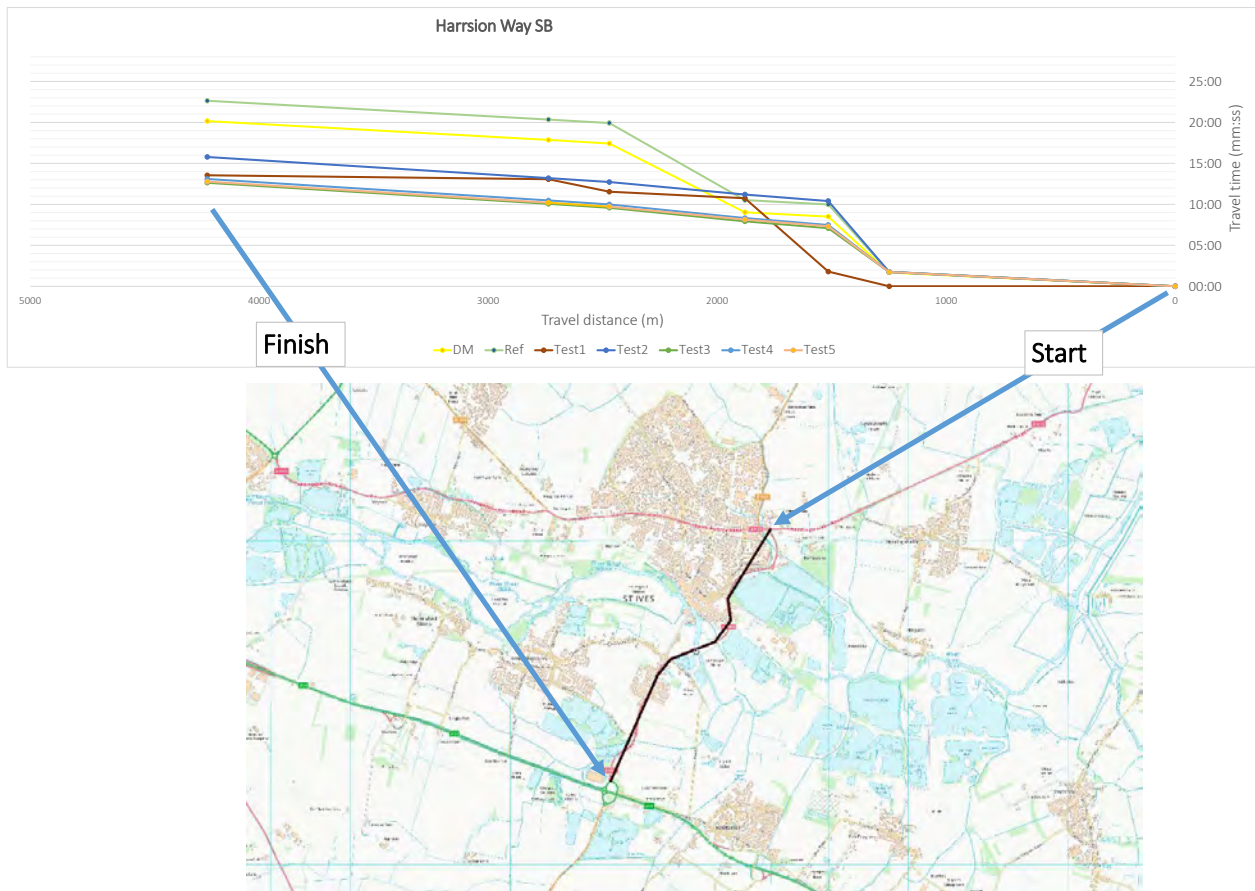


Figure 60: A141 Warboys Roundabout Northbound PM



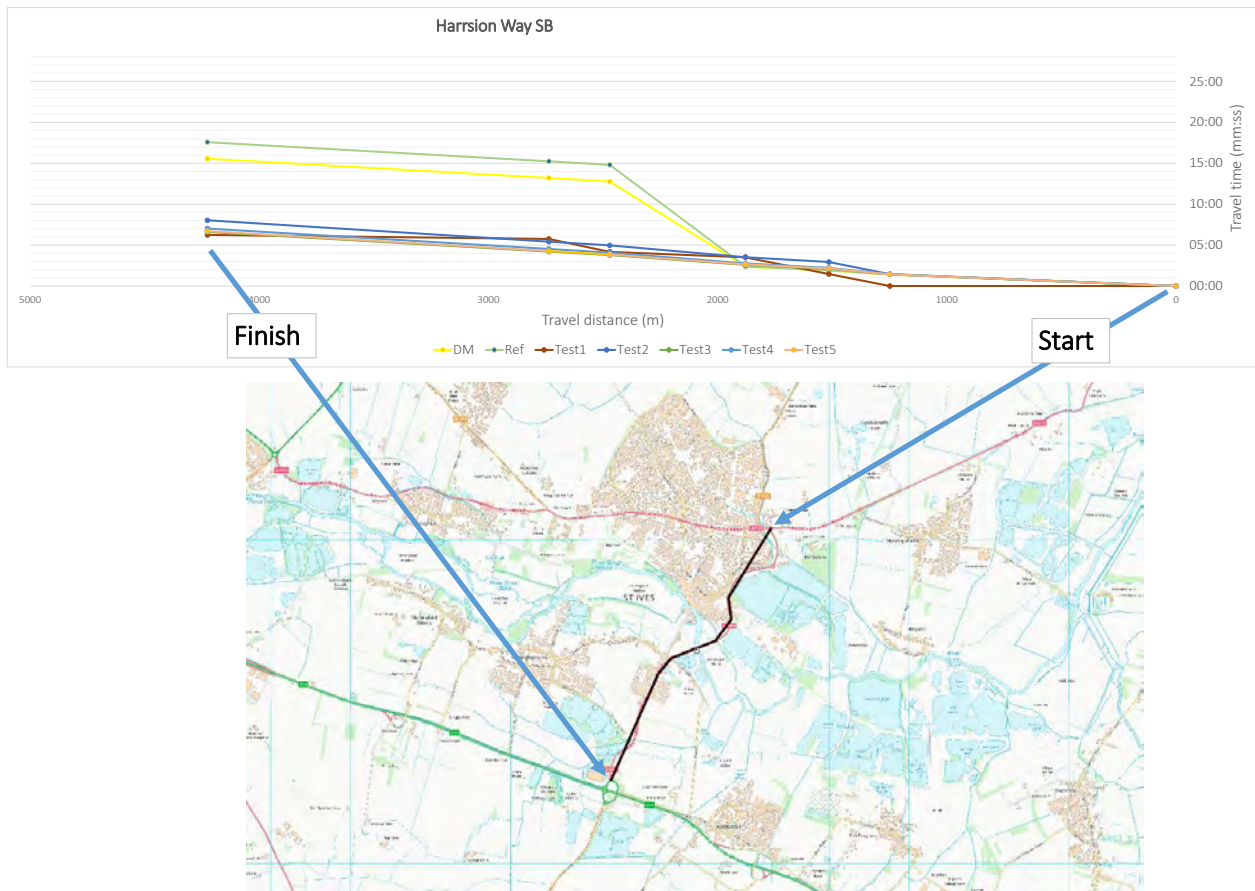
Source: CSRM

Figure 61: Harrison Way Southbound AM



Source: CSRM

Figure 62: Harrison Way Southbound PM



Source: CSRM

Figure 63: Harrison Way Northbound AM

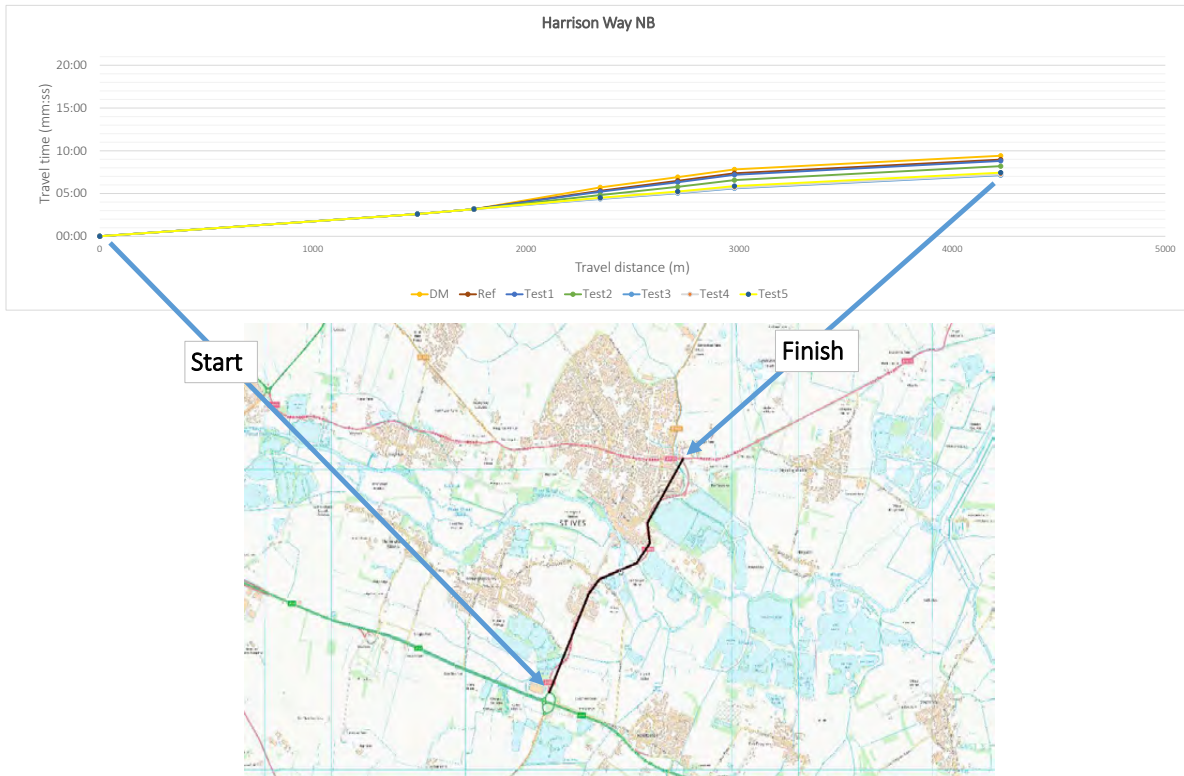
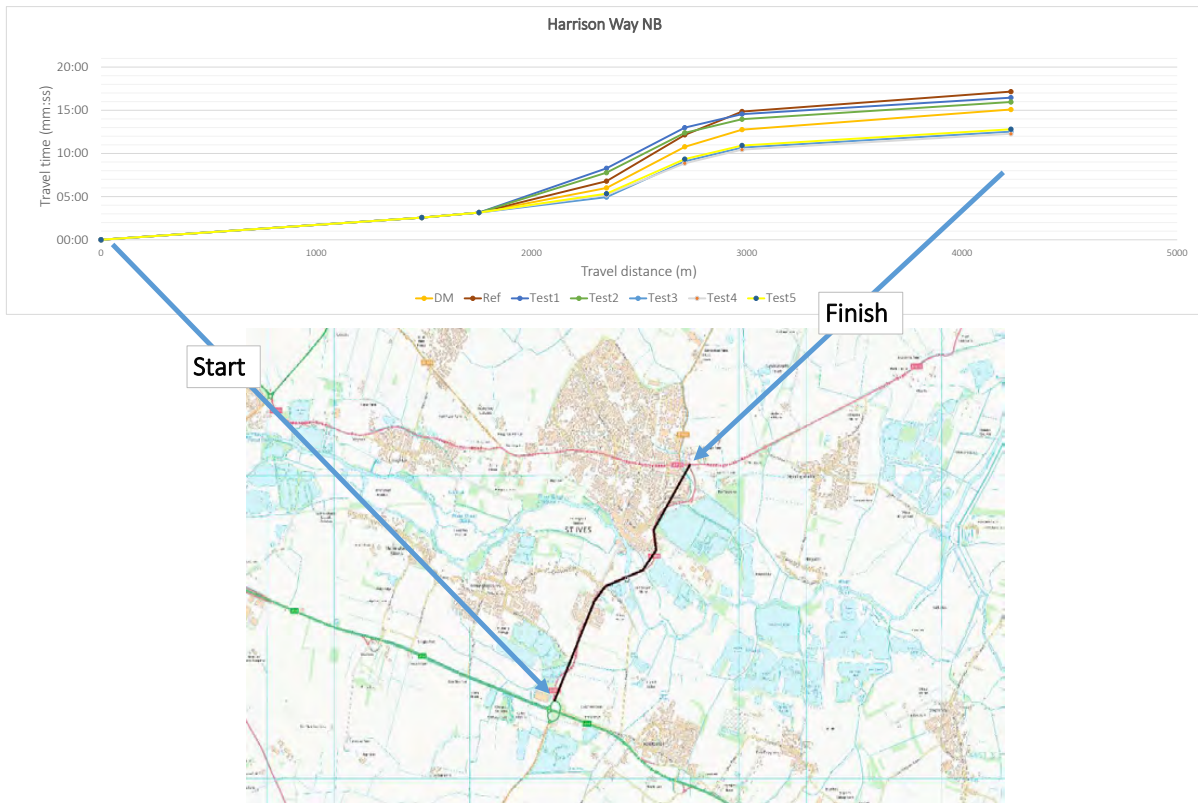


Figure 64: Harrison Way Northbound PM



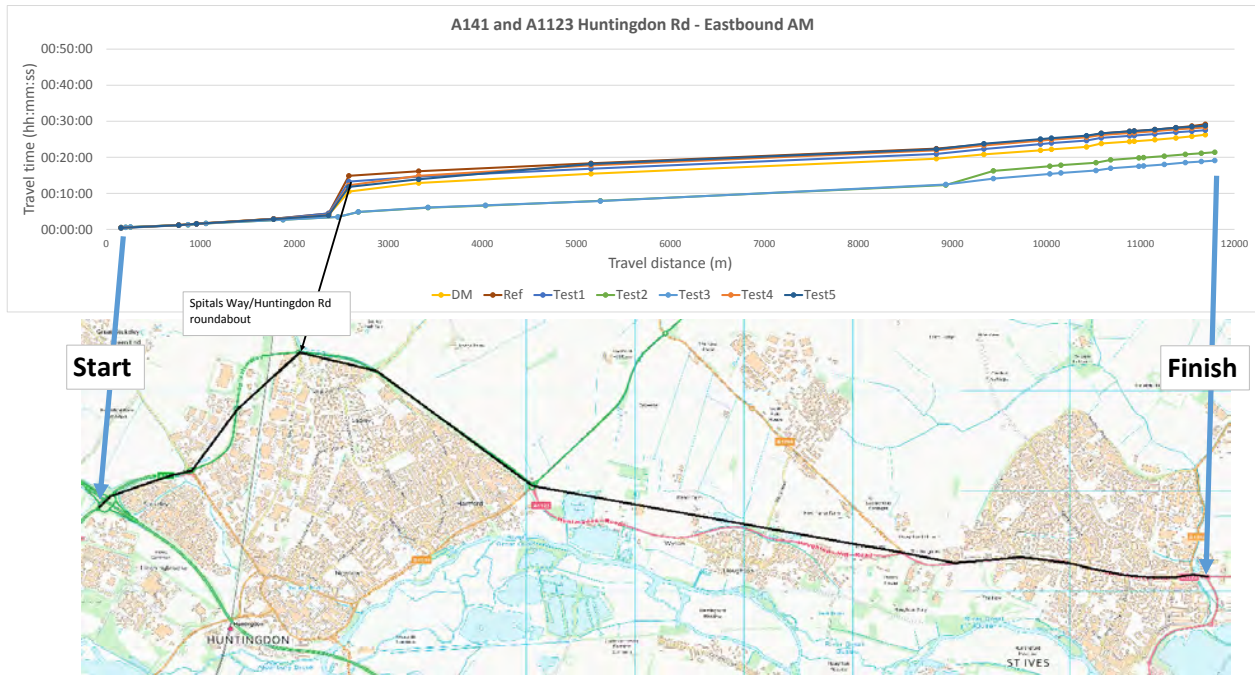
Source: CSRM

B.5 Scenario 4 Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the:

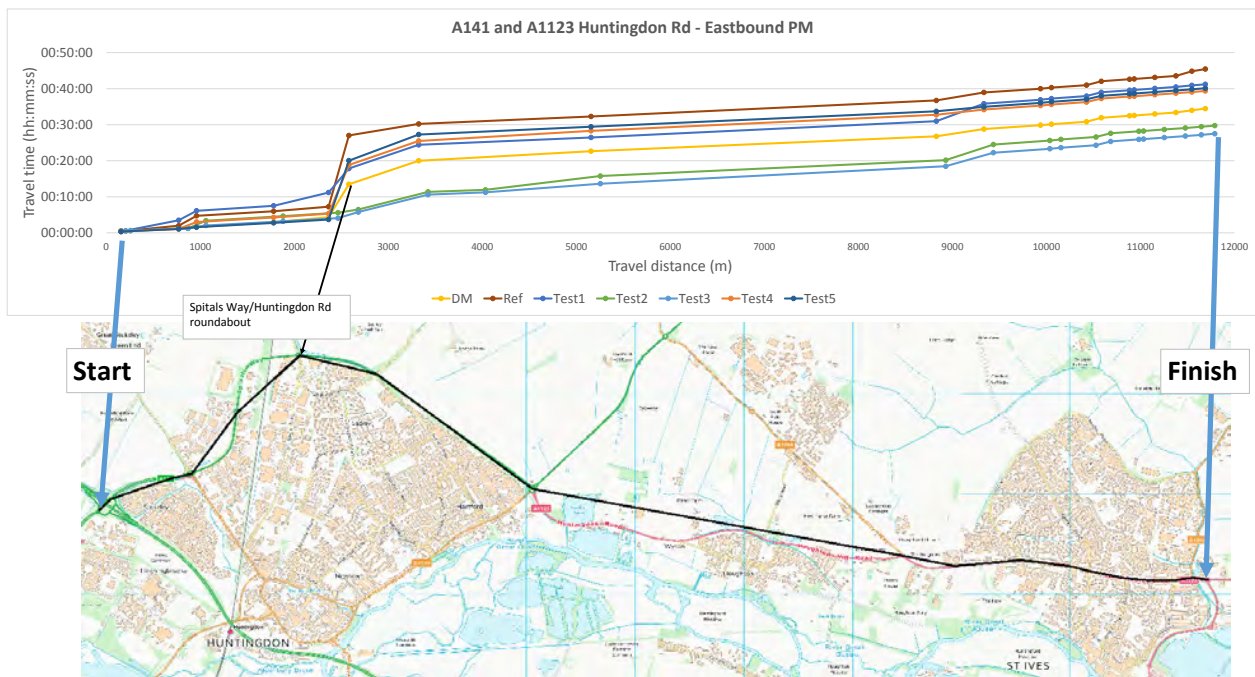
- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 4 (Ref)
- Development Scenario 4 with mitigation packages 1 to 5 applied (Test X)

Figure 65: A141 and A1123 Huntingdon Rd – Eastbound AM



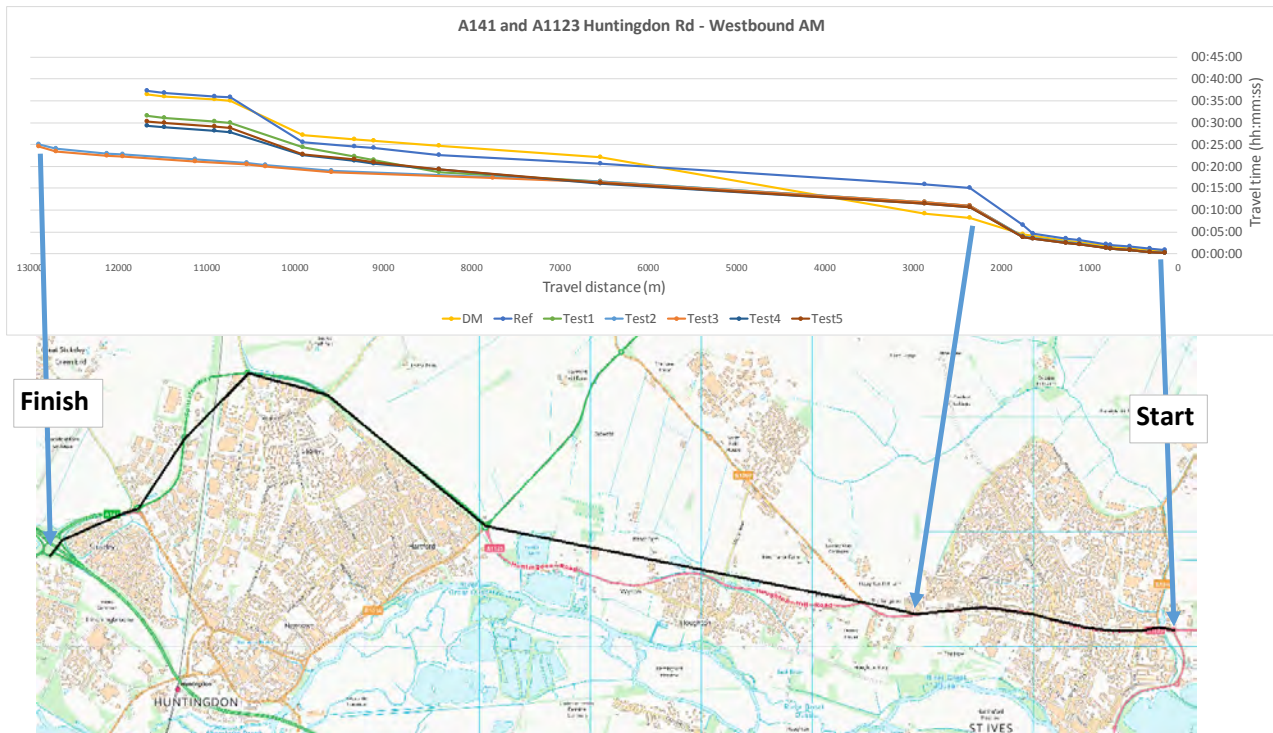
Source: CSRM

Figure 66: A141 and A1123 Huntingdon Rd – Eastbound PM



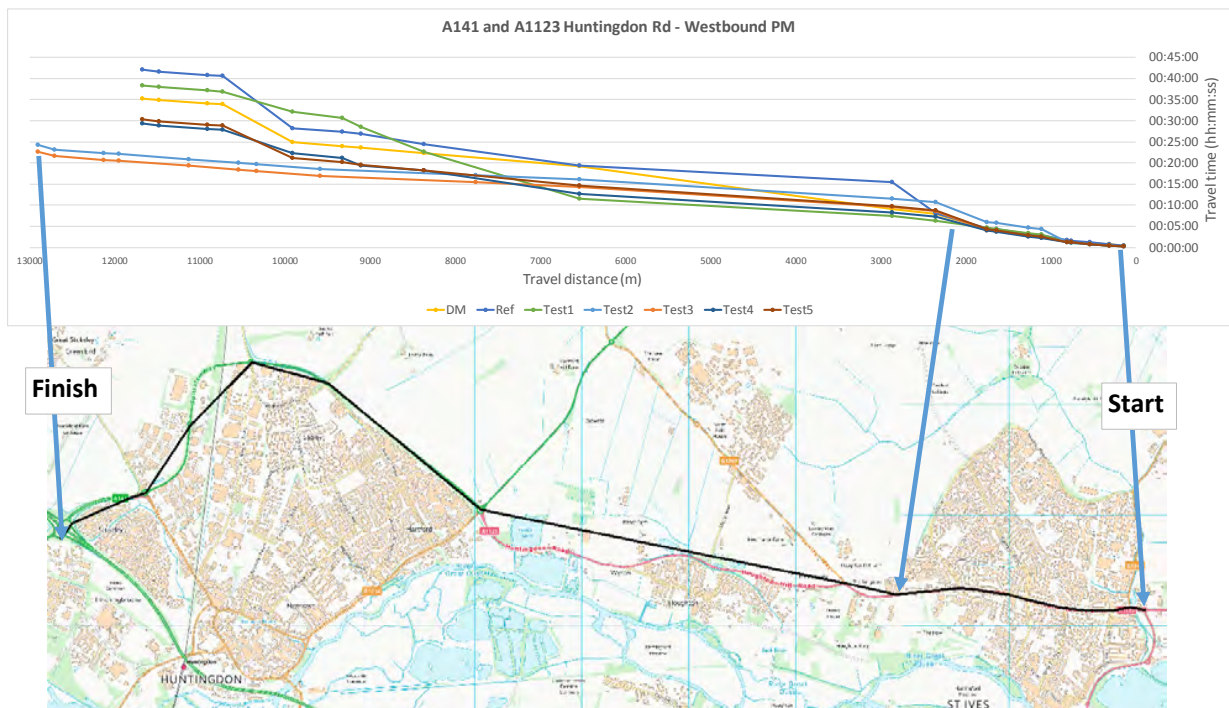
Source: CSRM

Figure 67: A141 and A1123 Huntingdon Rd – Westbound AM



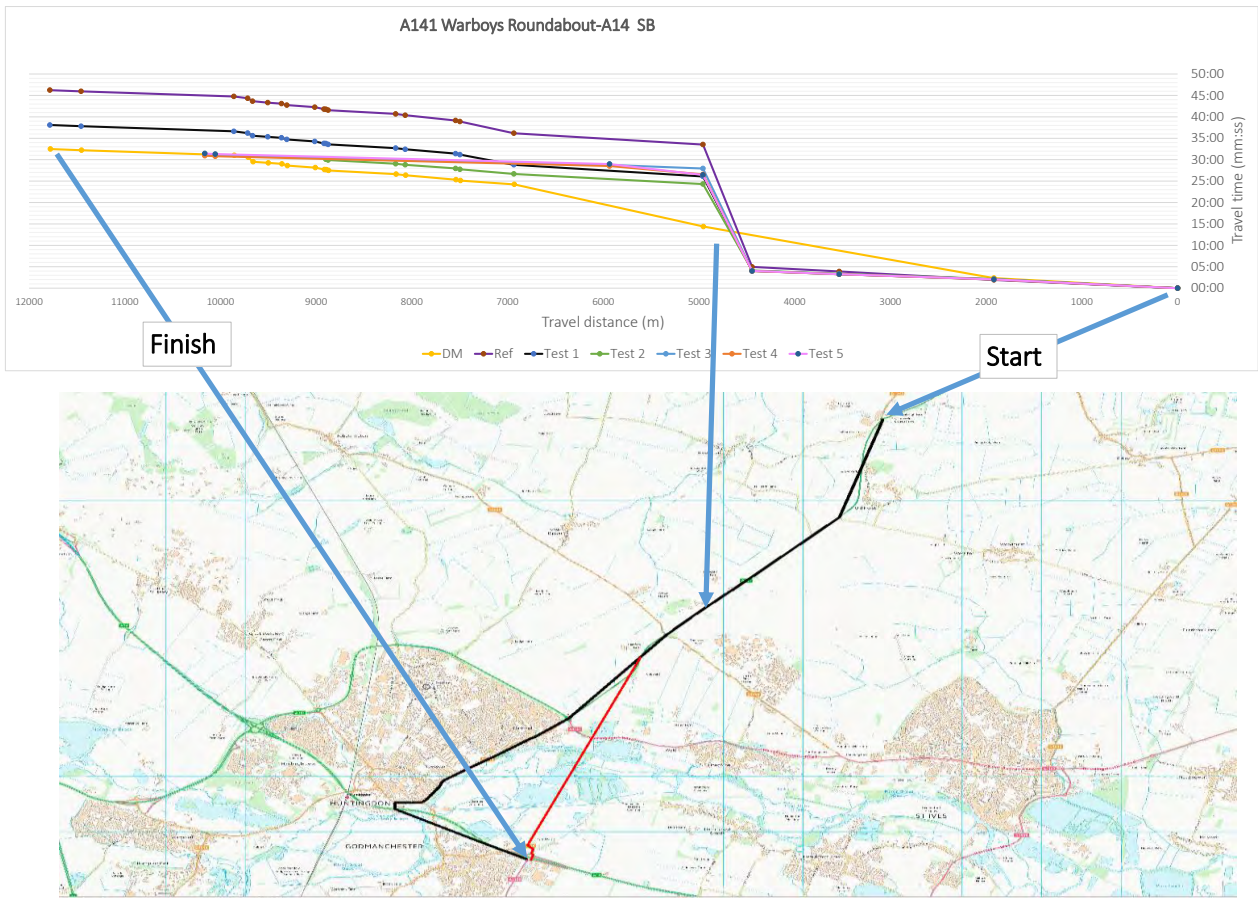
Source: CSRМ

Figure 68: A141 and A1123 Huntingdon Rd – Westbound PM



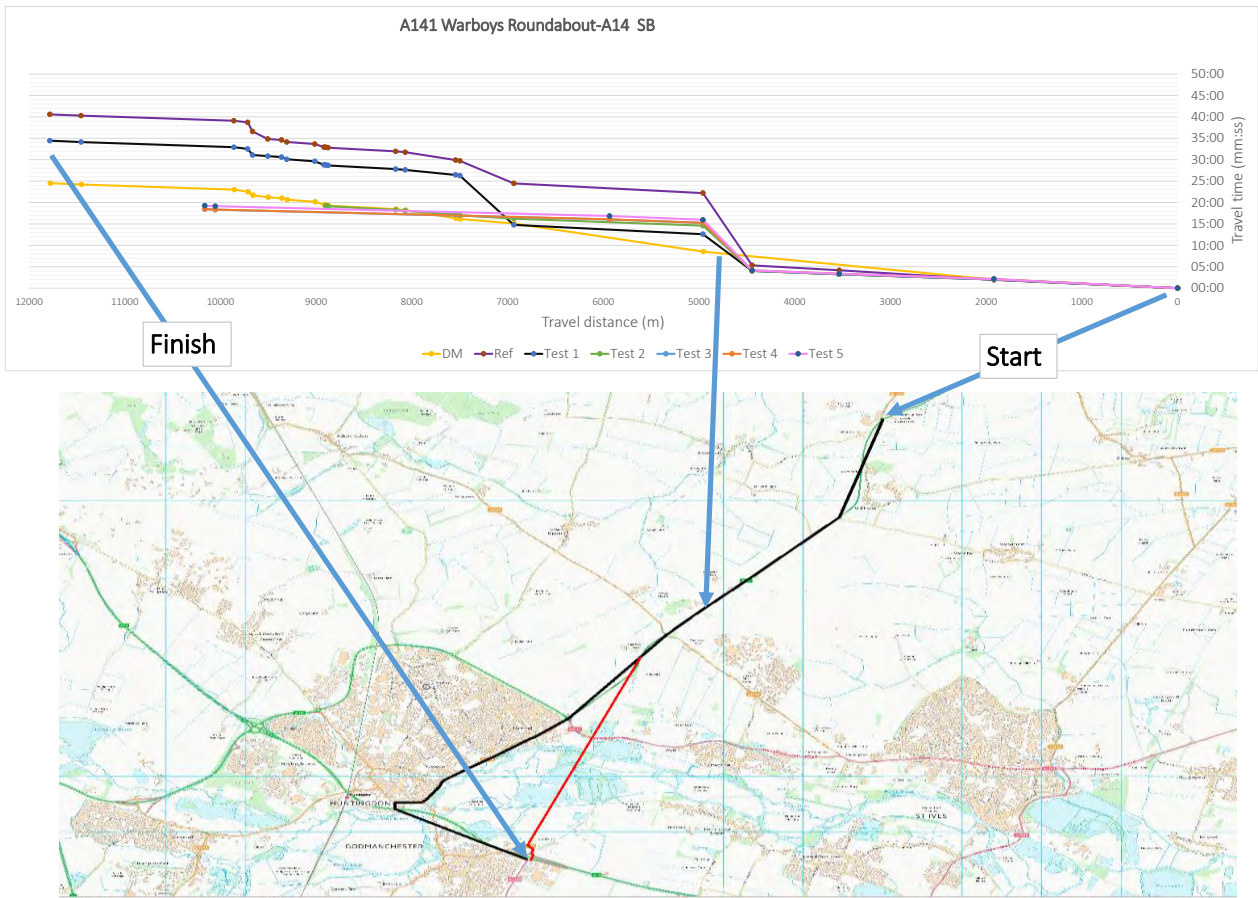
Source: CSRМ

Figure 69: A141 Warboys Roundabout Southbound AM



Source: CSRM

Figure 70: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 71: A141 Warboys Roundabout Northbound AM

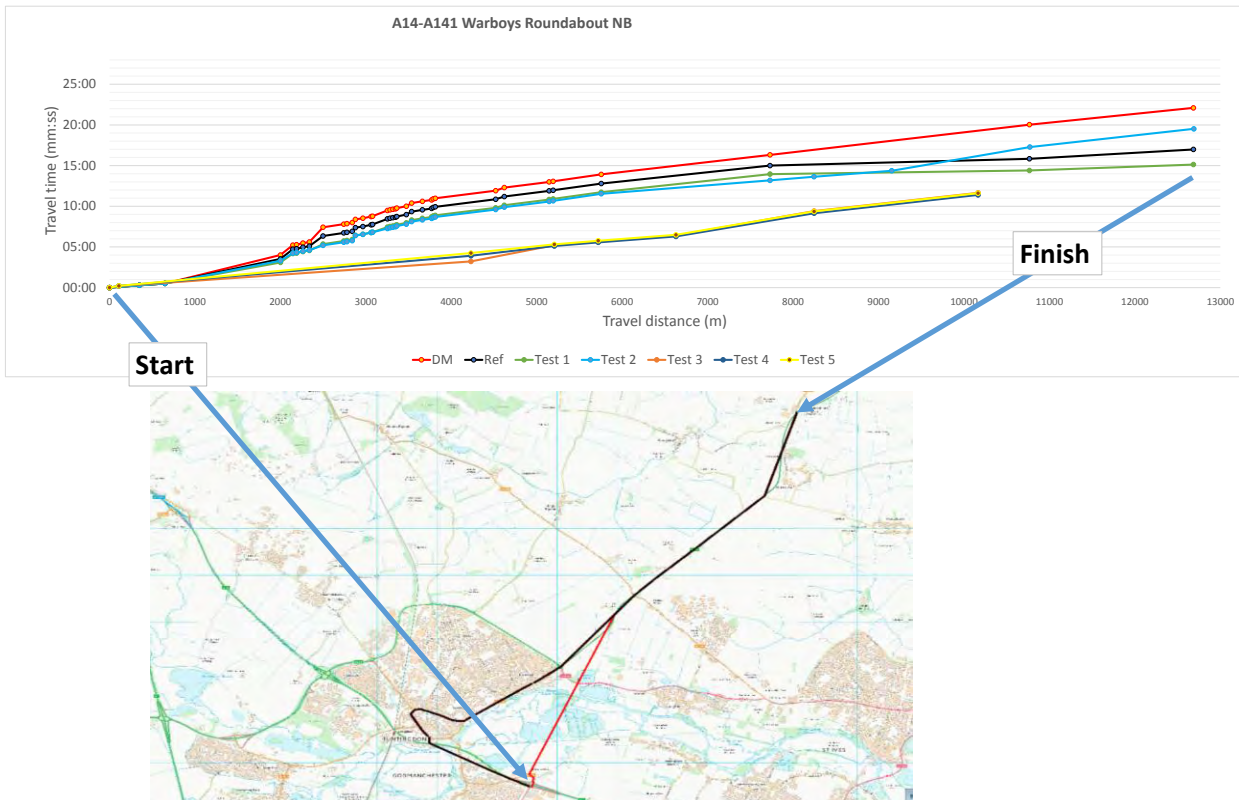
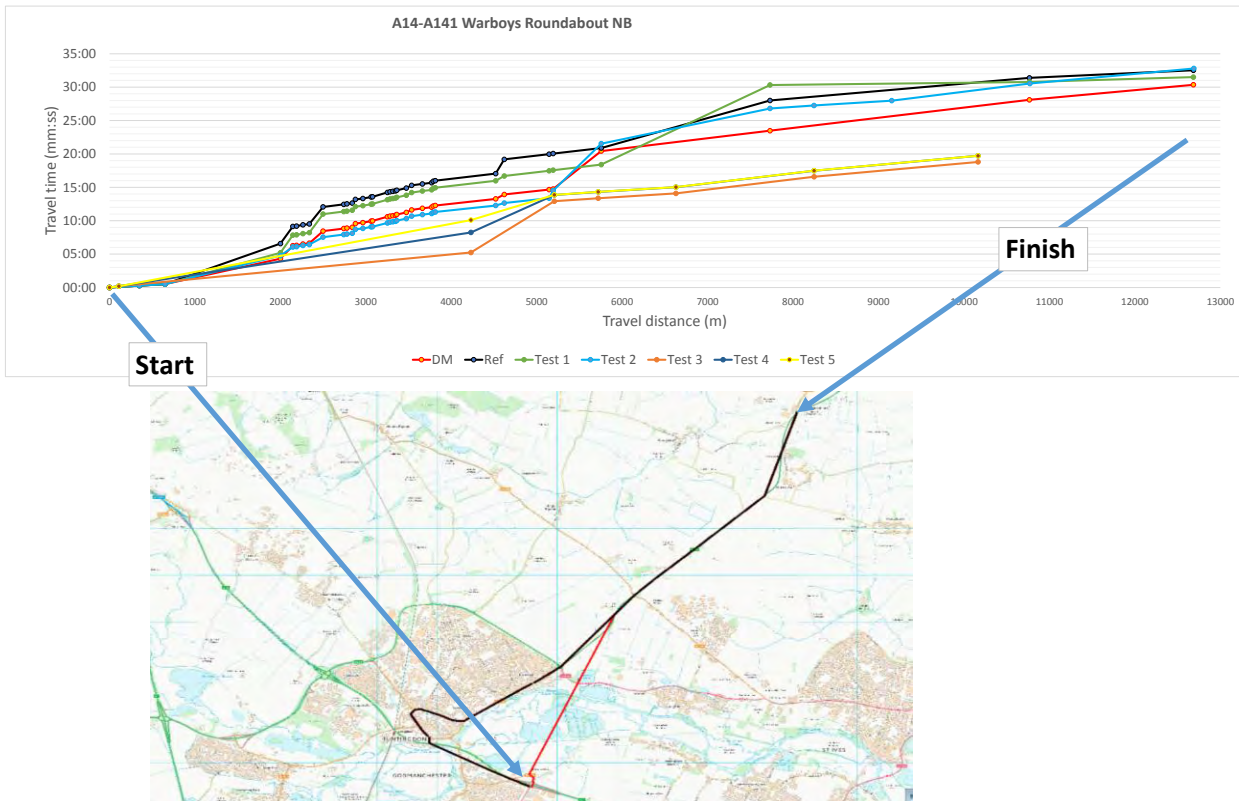
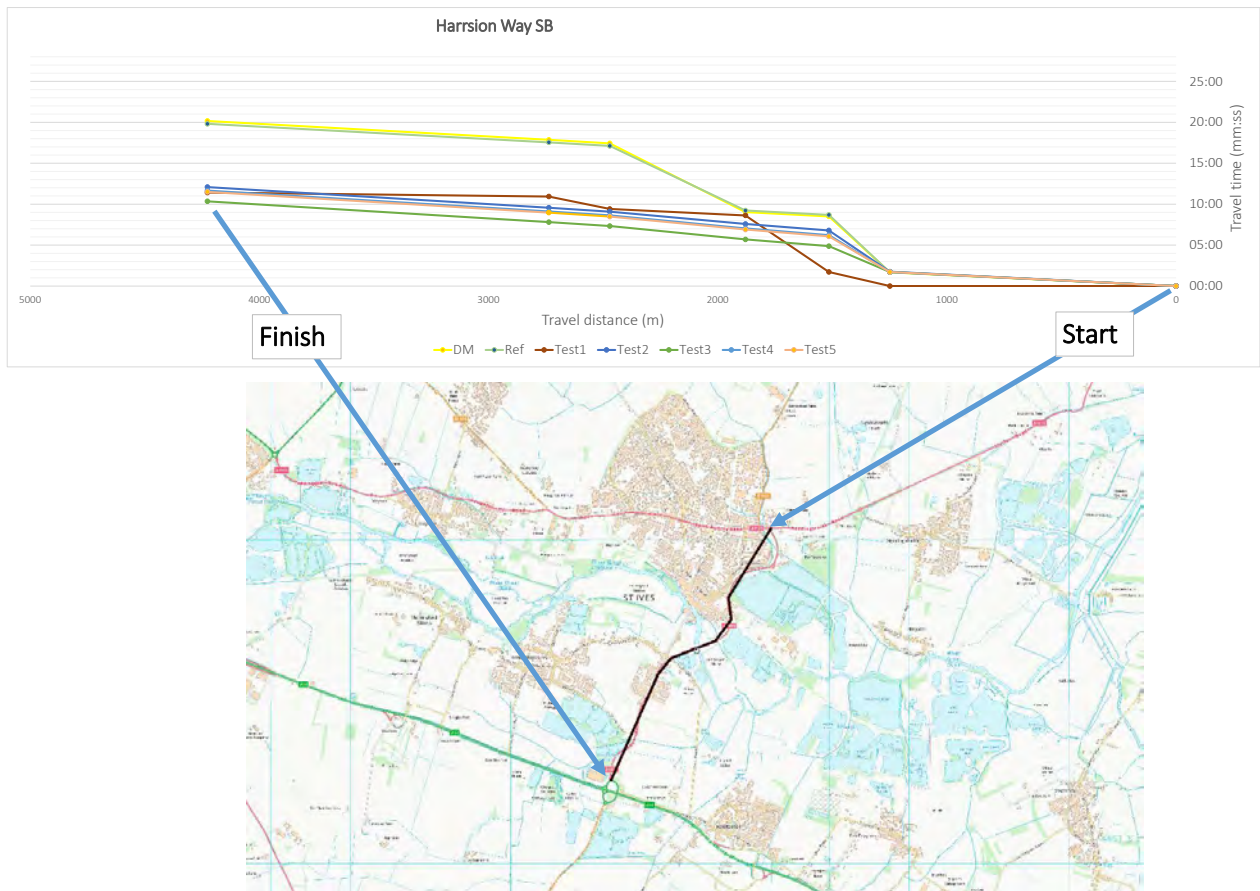


Figure 72: A141 Warboys Roundabout Northbound PM



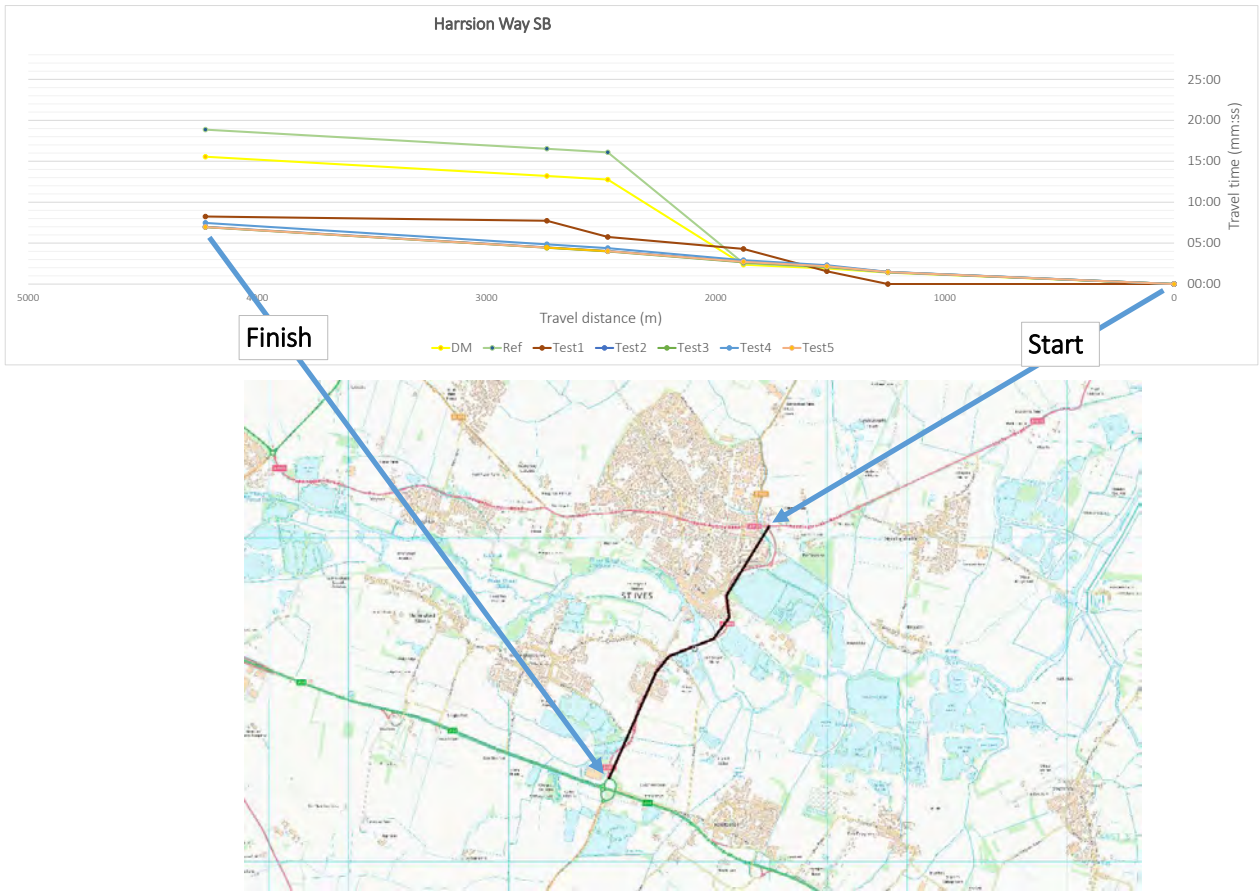
Source: CSRM

Figure 73: Harrison Way Southbound AM



Source: CSRM

Figure 74: Harrison Way Southbound PM



Source: CSRM

Figure 75: Harrison Way Northbound AM

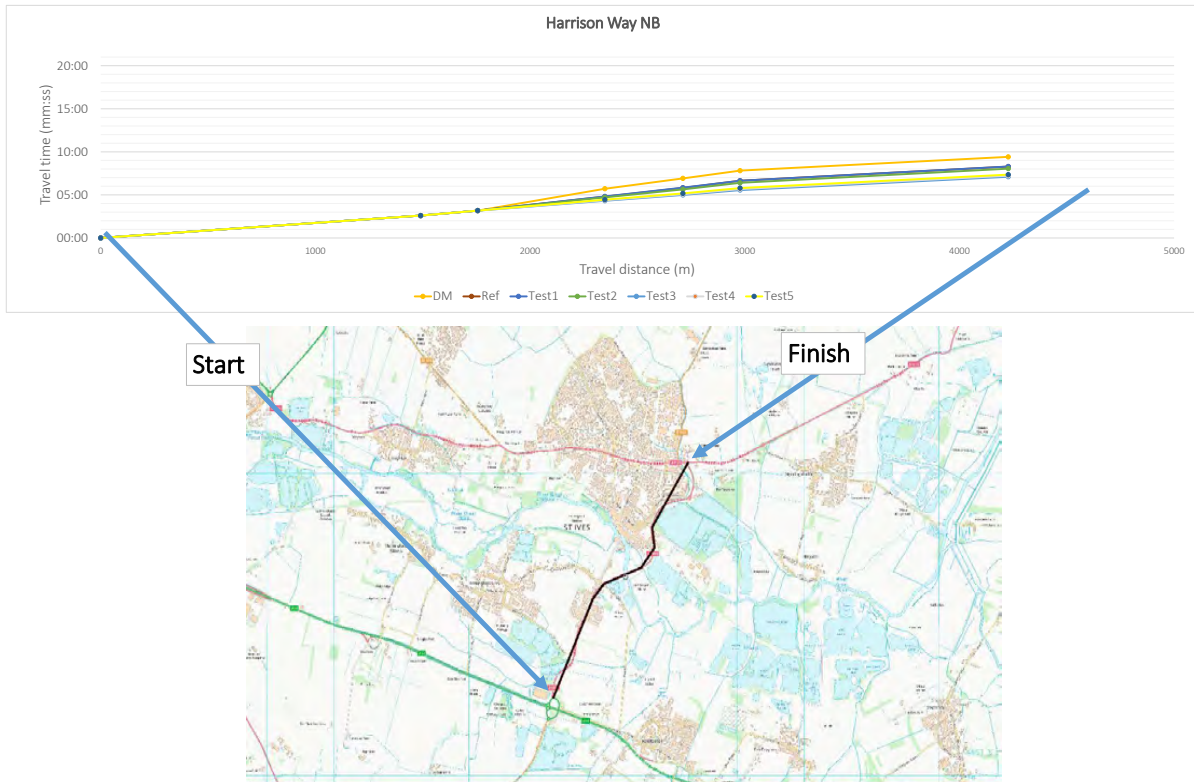
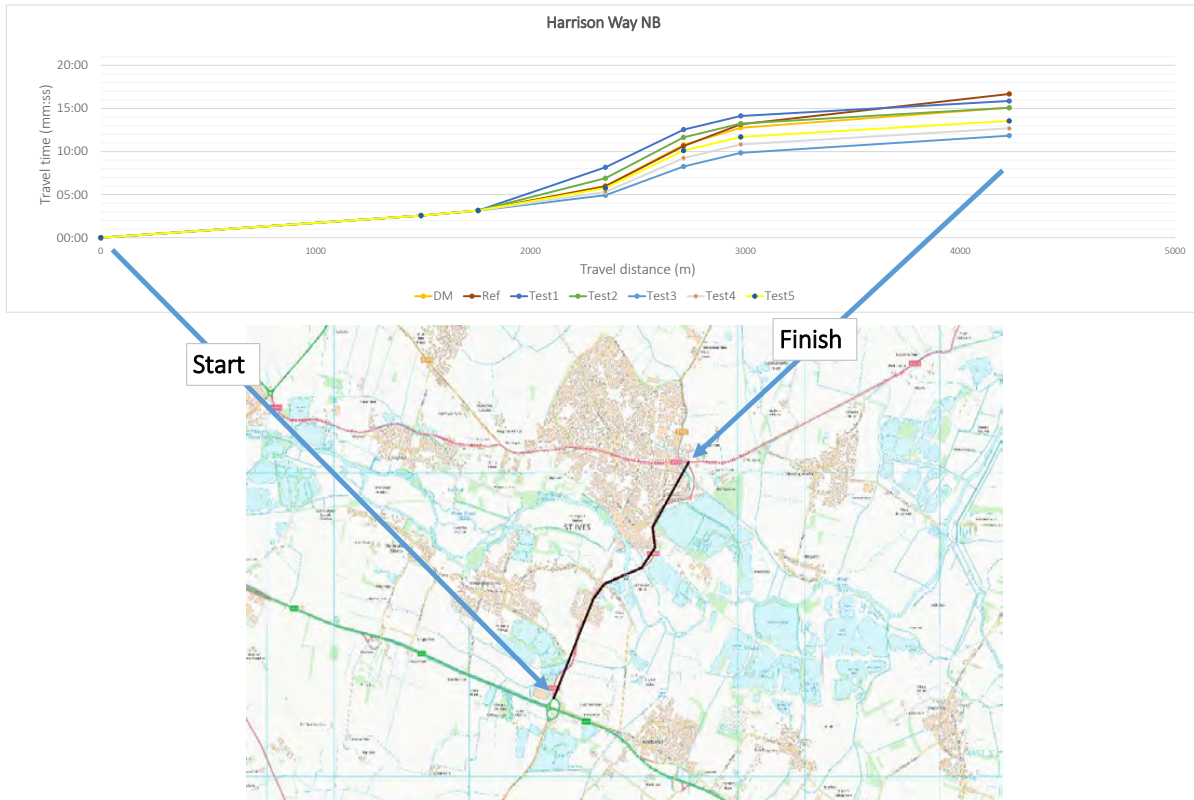


Figure 76: Harrison Way Northbound PM



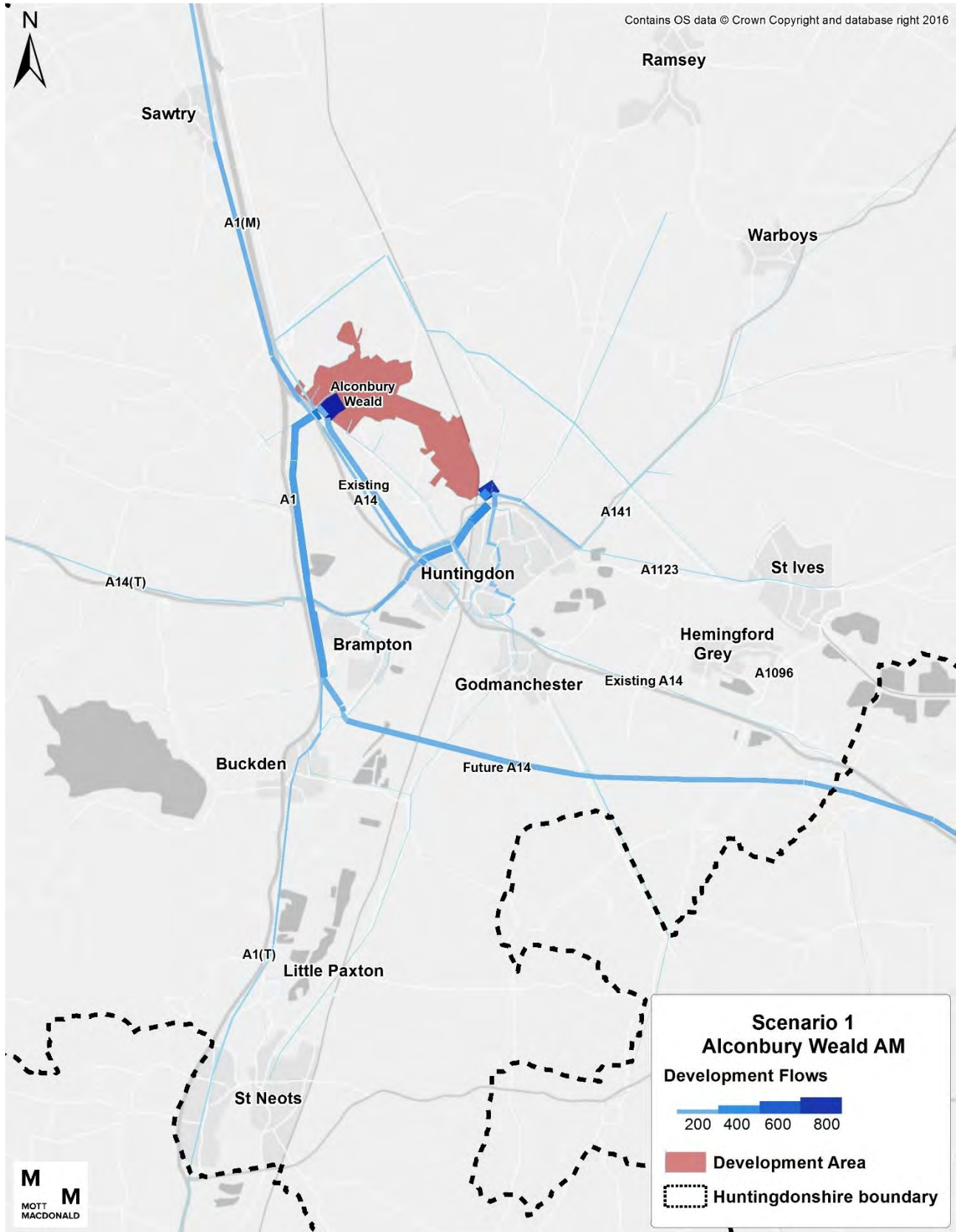
Source: CSRM

C. Development Site Flow Plots

C.1 Scenario 1 Development Site Flow Distribution Plots

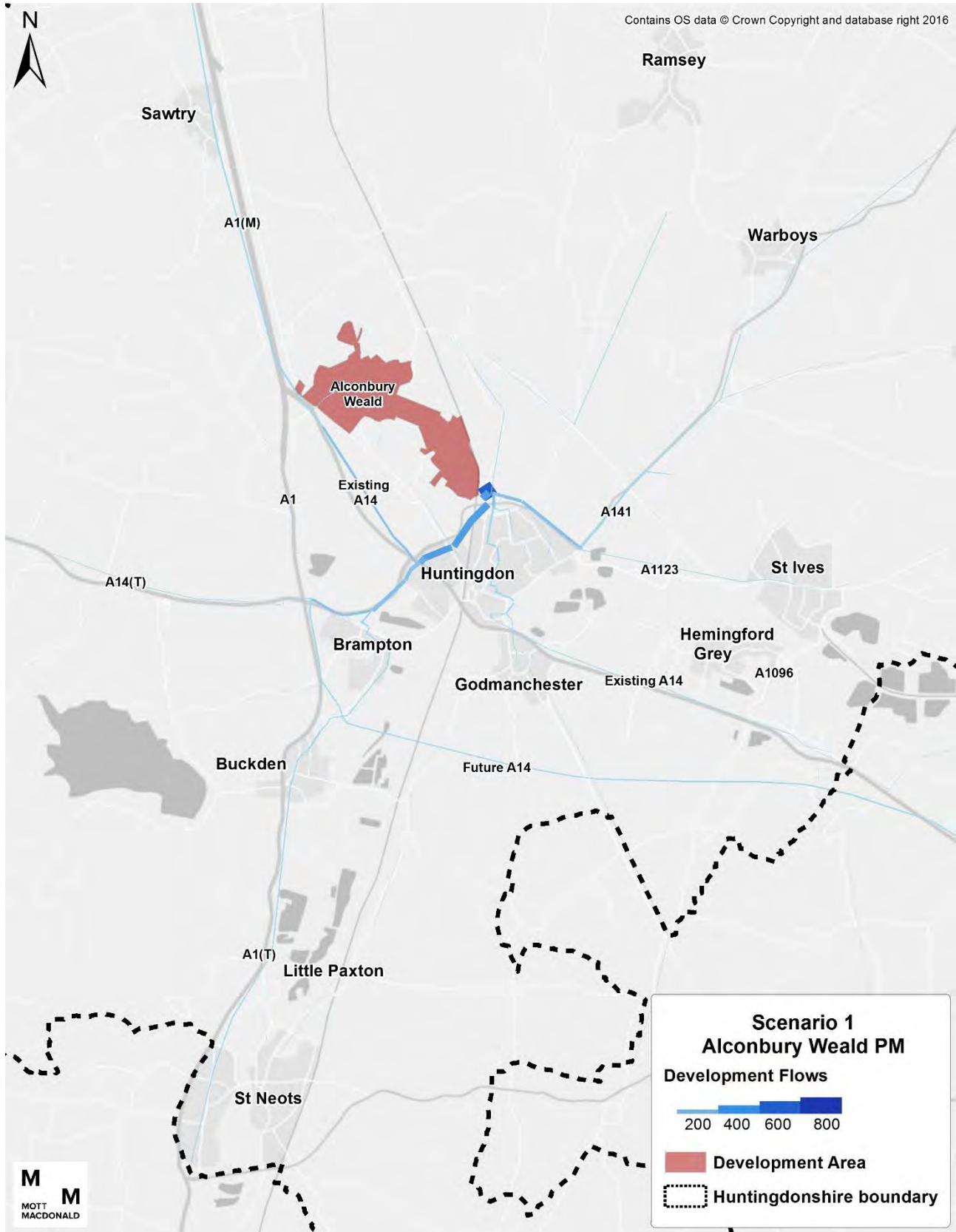
For Development Scenario 1, the following figures show the distribution of development-generated flows on the Huntingdonshire highway network in the AM and PM peak hours.

Figure 77: Scenario 1 Alconbury Airfield development flows – AM



Source: CSRM2

Figure 78: Scenario 1 Alconbury Airfield development flows – PM



Source: CSRM2

Figure 79: Scenario 1 RAF Alconbury development flows – AM

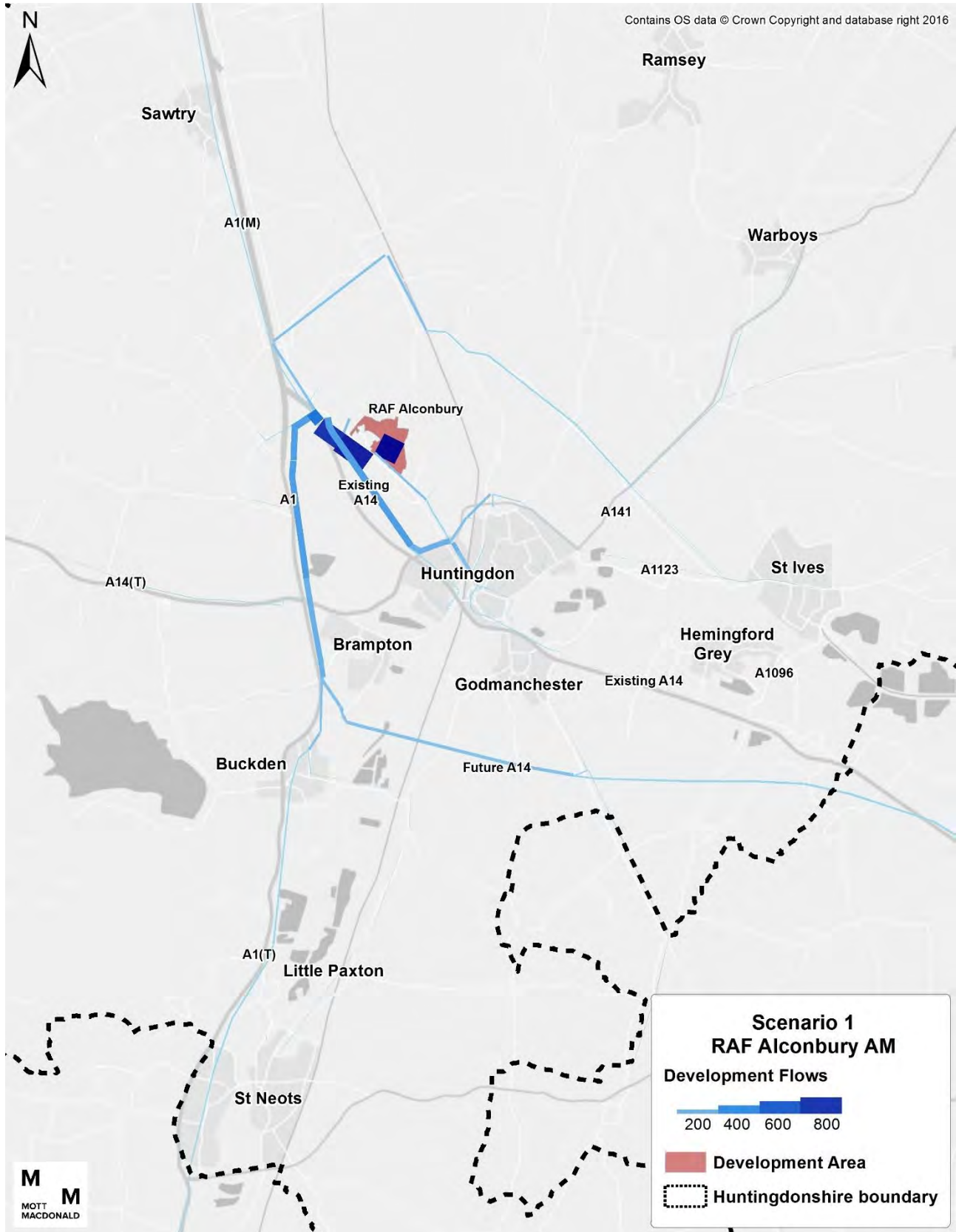


Figure 80: Scenario 1 RAF Alconbury development flows – PM

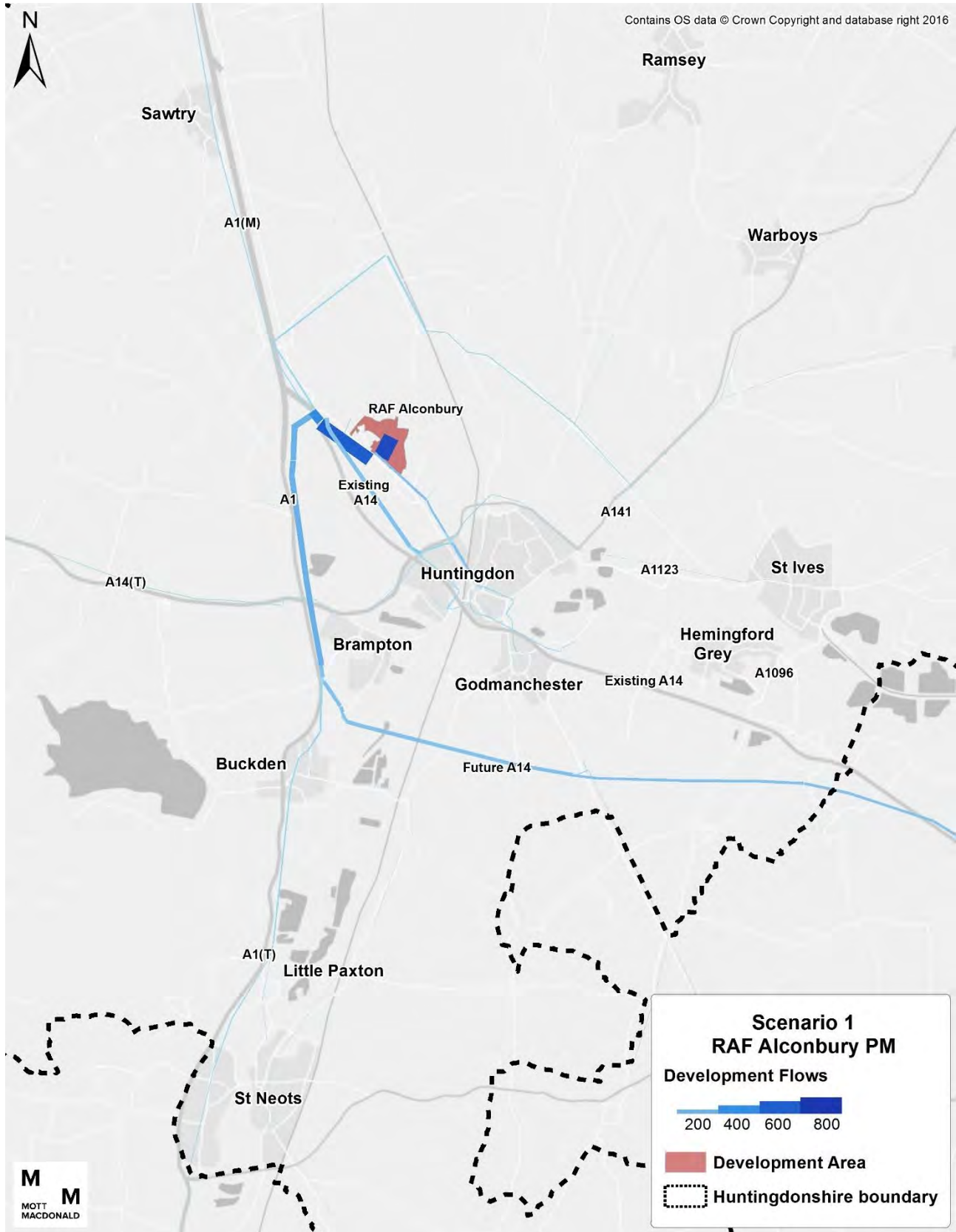
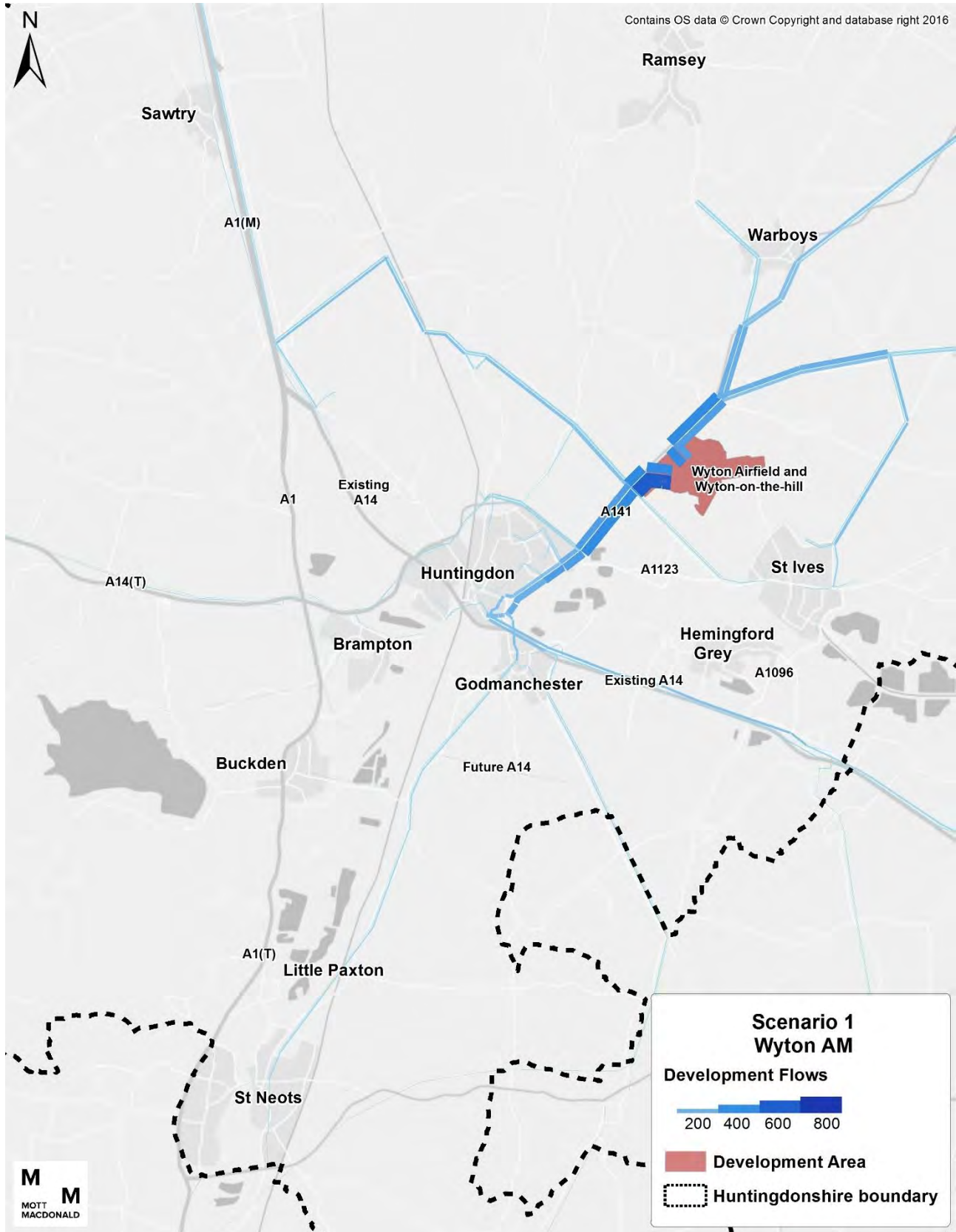
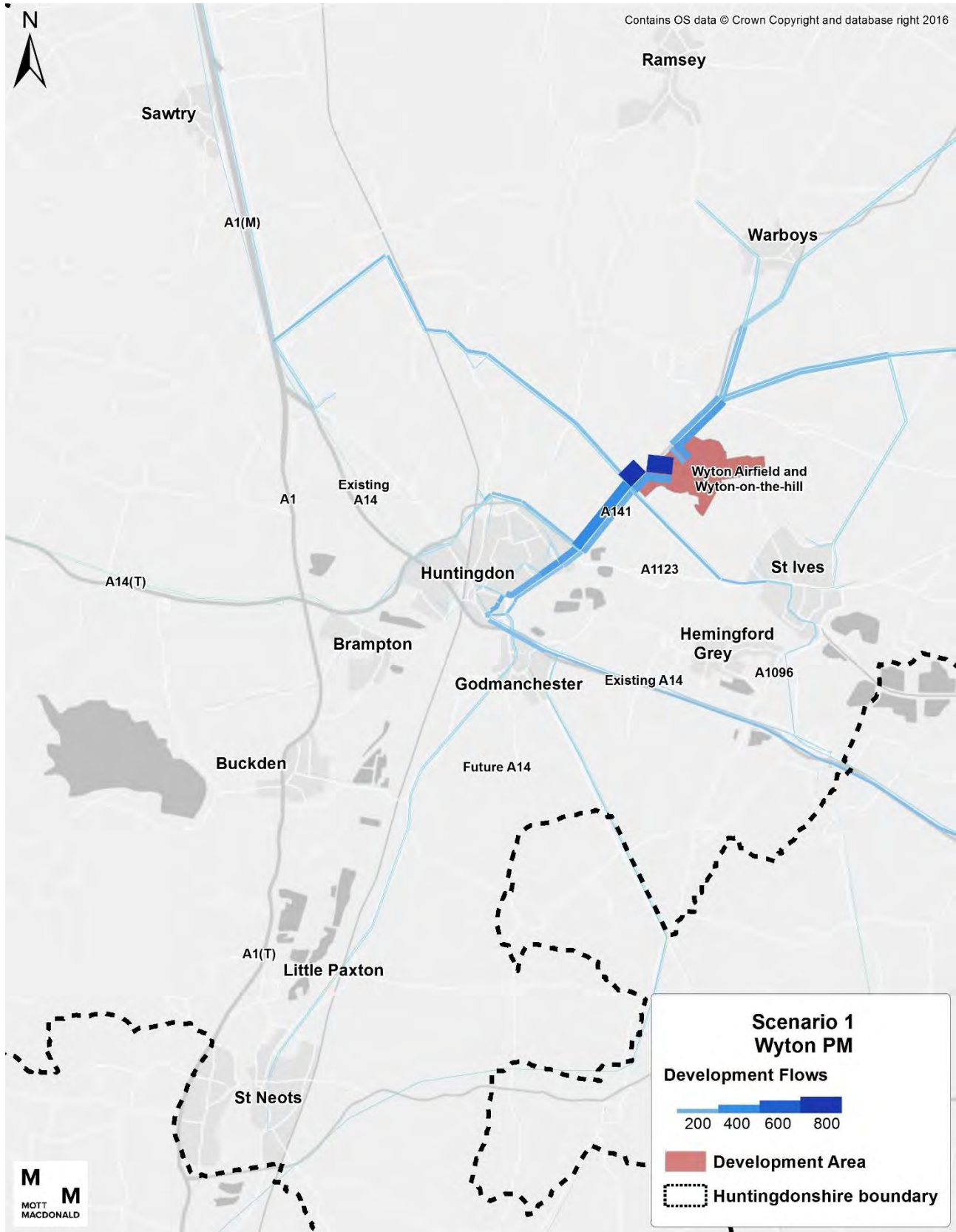


Figure 81: Scenario 1 Wyton development flows – AM



Source: CSRM2

Figure 82: Scenario 1 Wyton development flows – PM

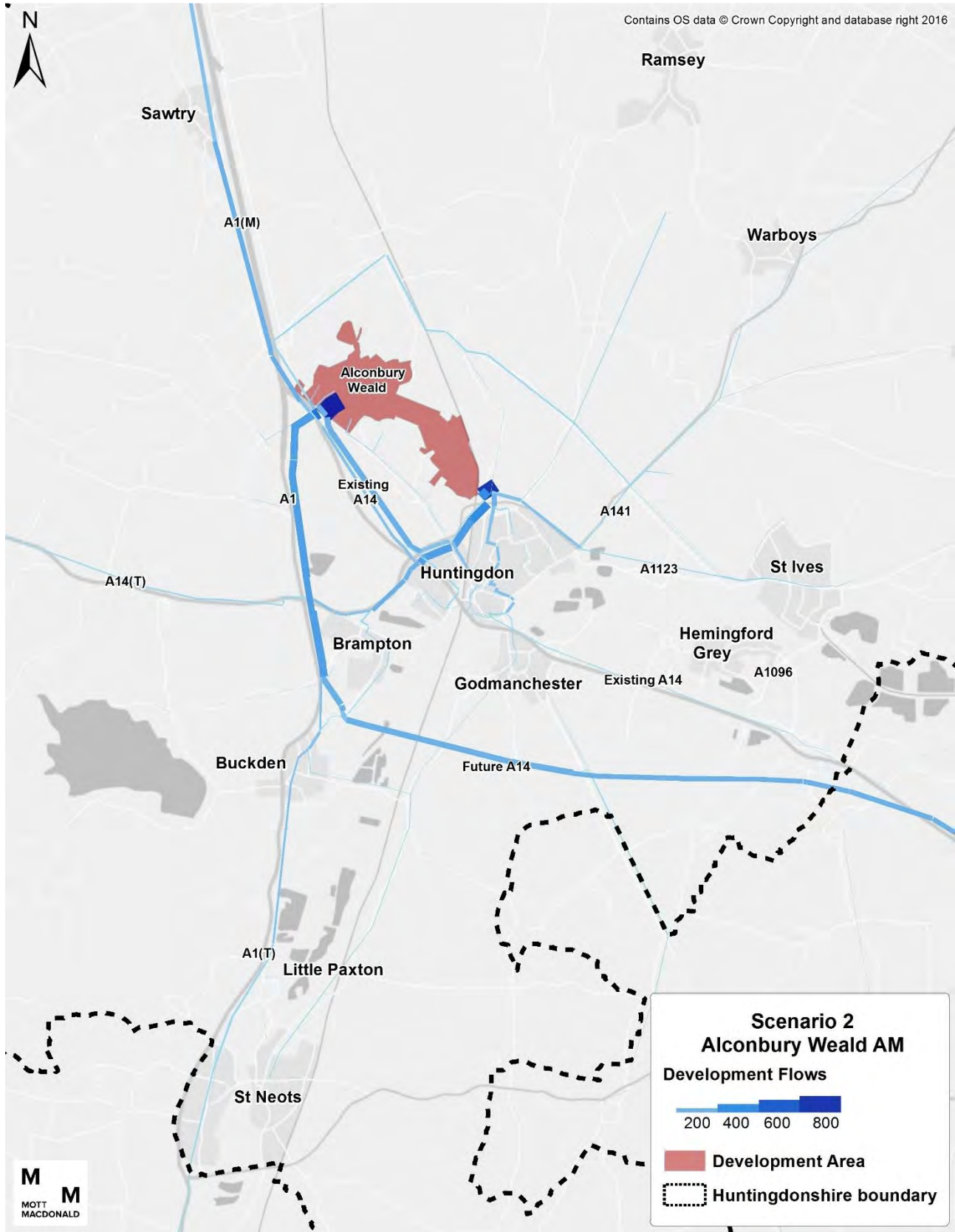


Source: CSRM2

C.2 Scenario 2 Development Site Flow Distribution Plots

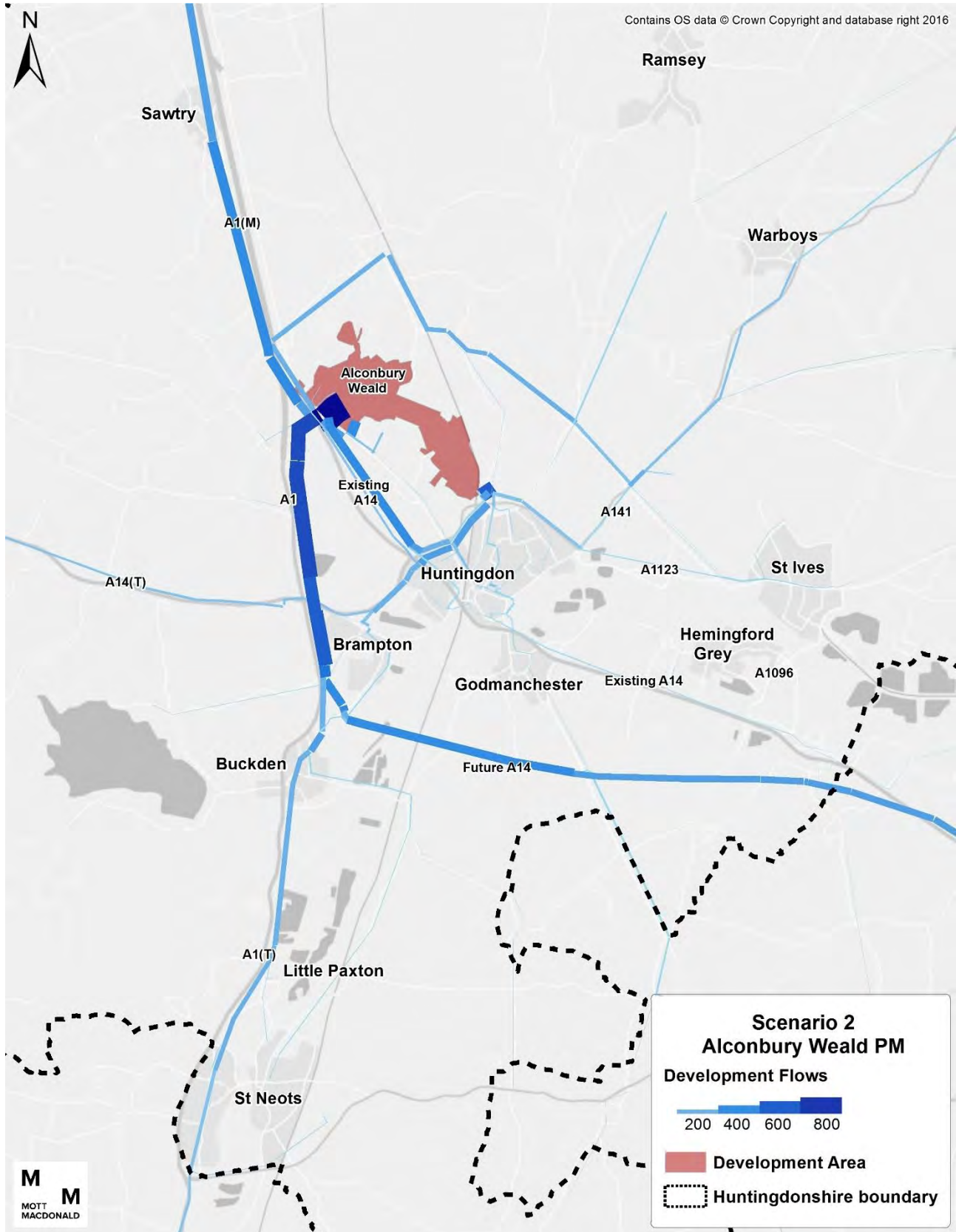
For Development Scenario 2, the following figures show the distribution of development-generated flows on the Huntingdonshire highway network in the AM and PM peak hours.

Figure 83: Scenario 2 Alconbury Airfield development flows – AM



Source: CSRM2

Figure 84: Scenario 2 Alconbury Airfield development flows – PM



Source: CSR2

Figure 85: Scenario 2 RAF Alconbury development flows – AM

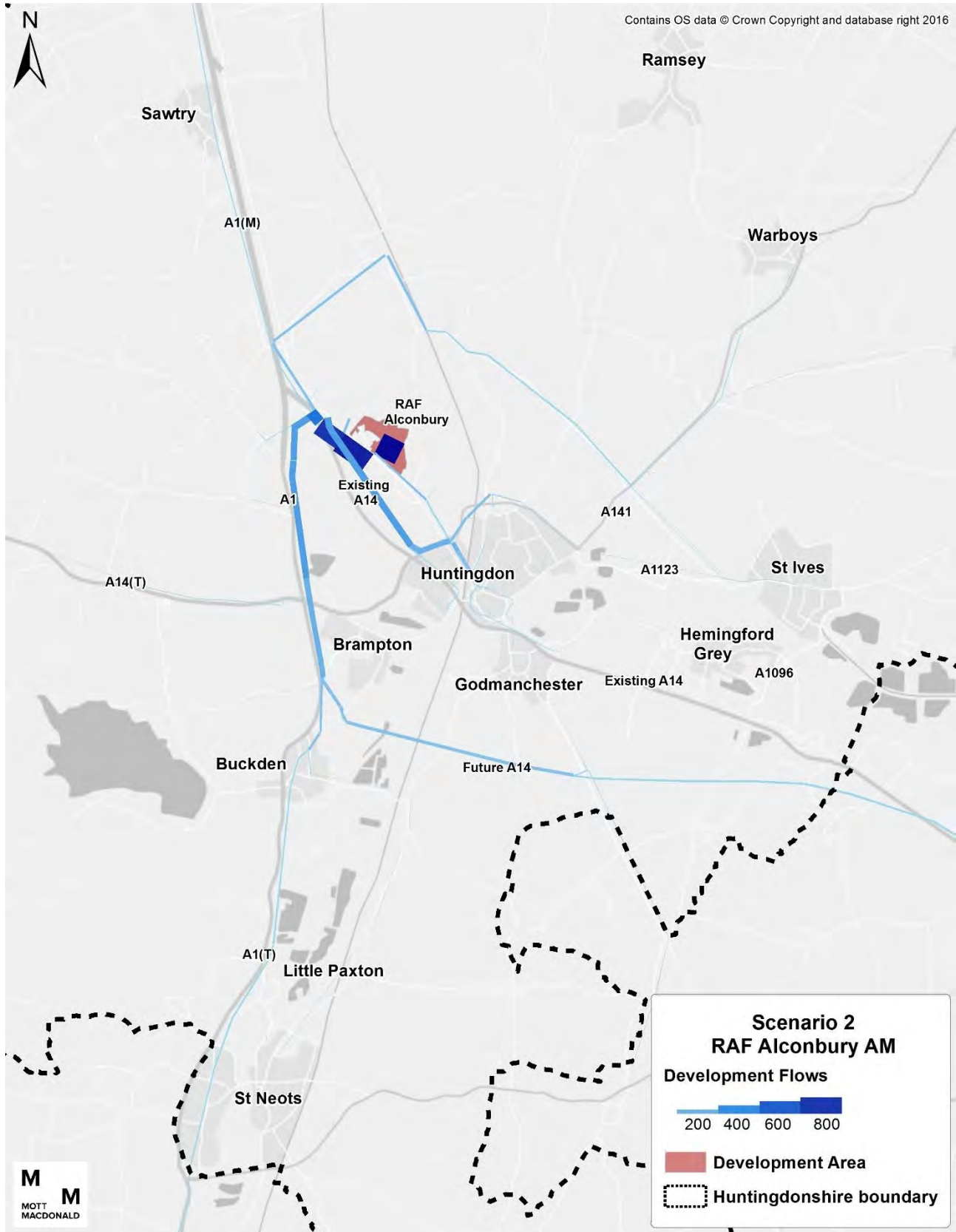


Figure 86: Scenario 2 RAF Alconbury development flows – PM

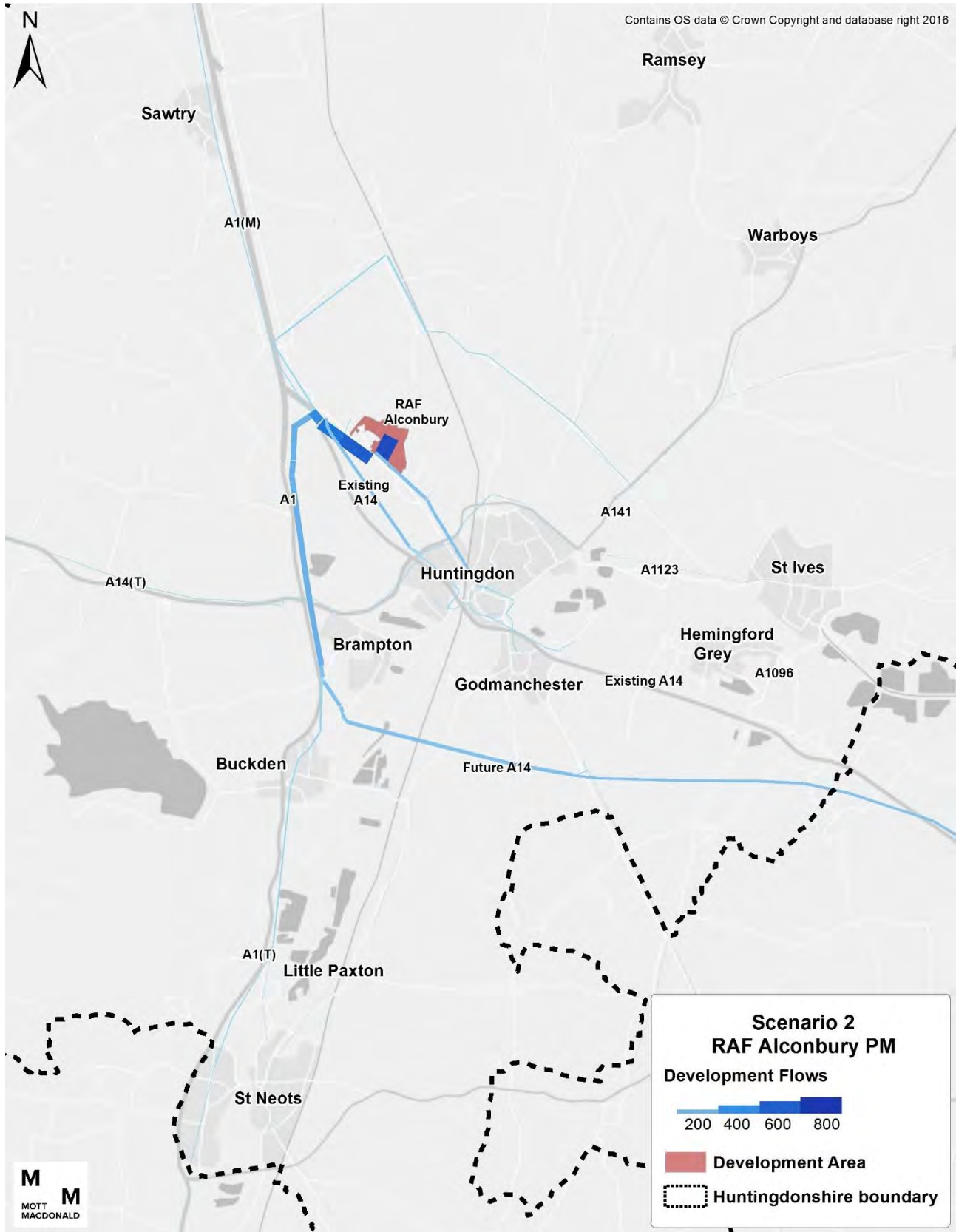


Figure 87: Scenario 2 Wyton development flows – AM

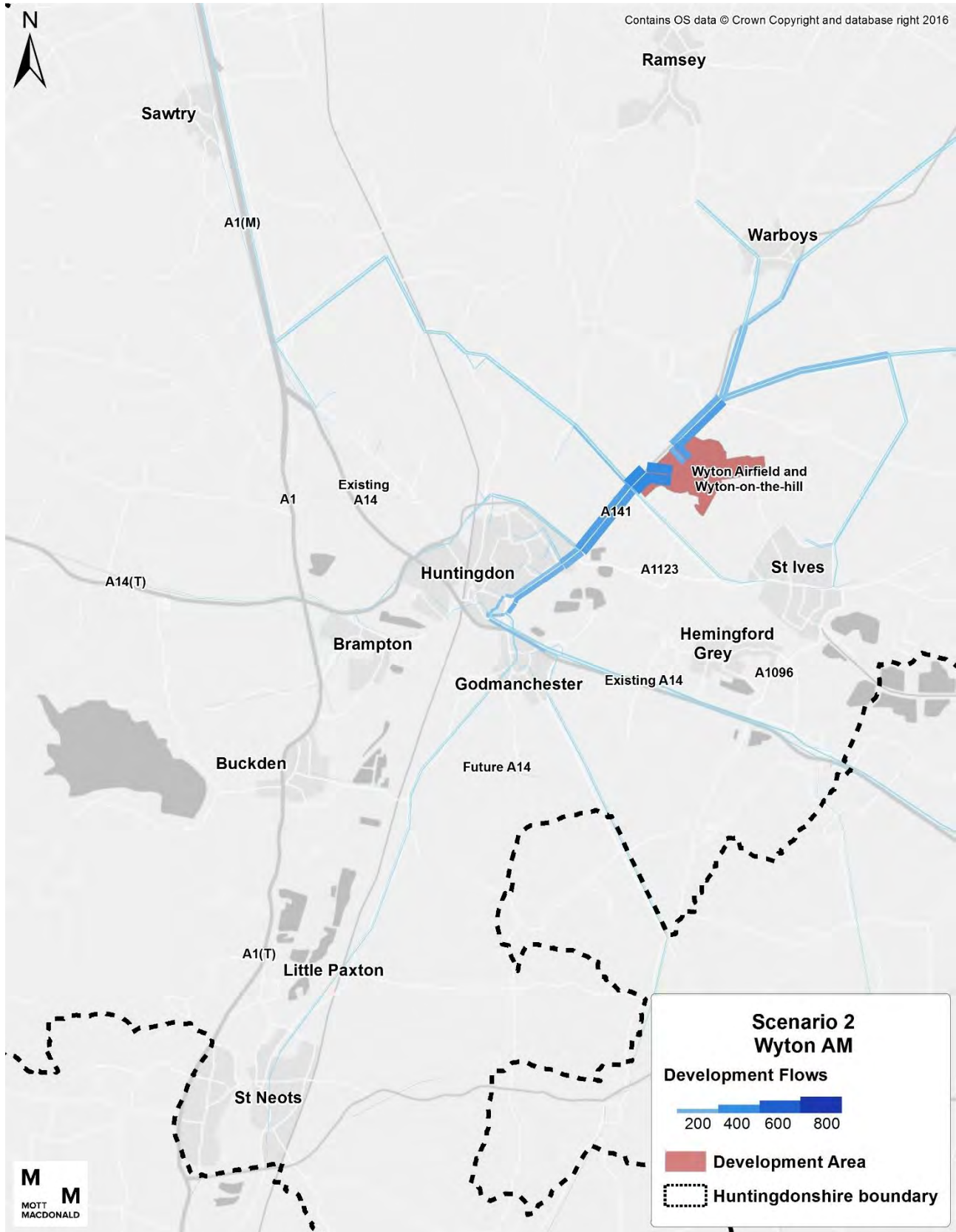
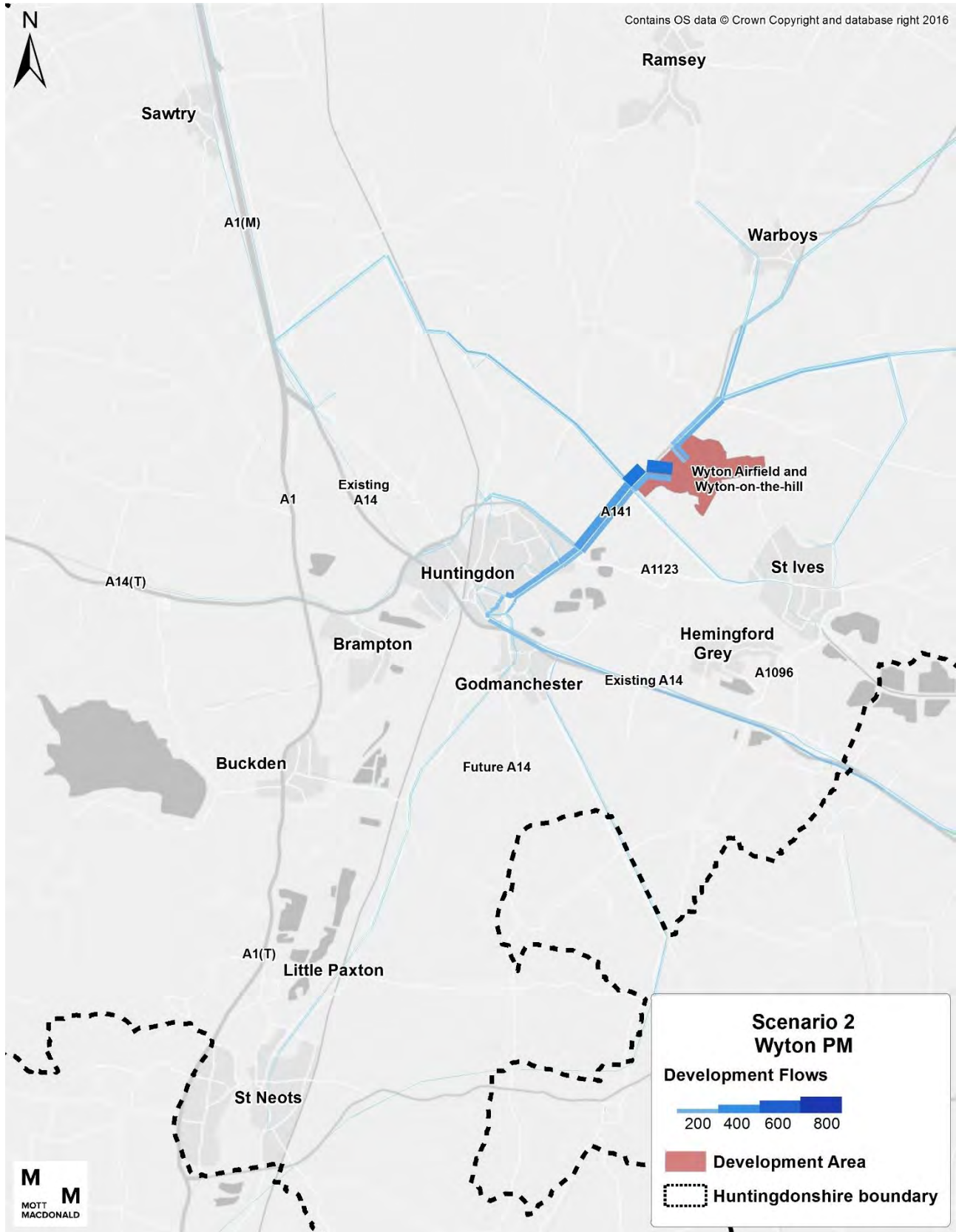


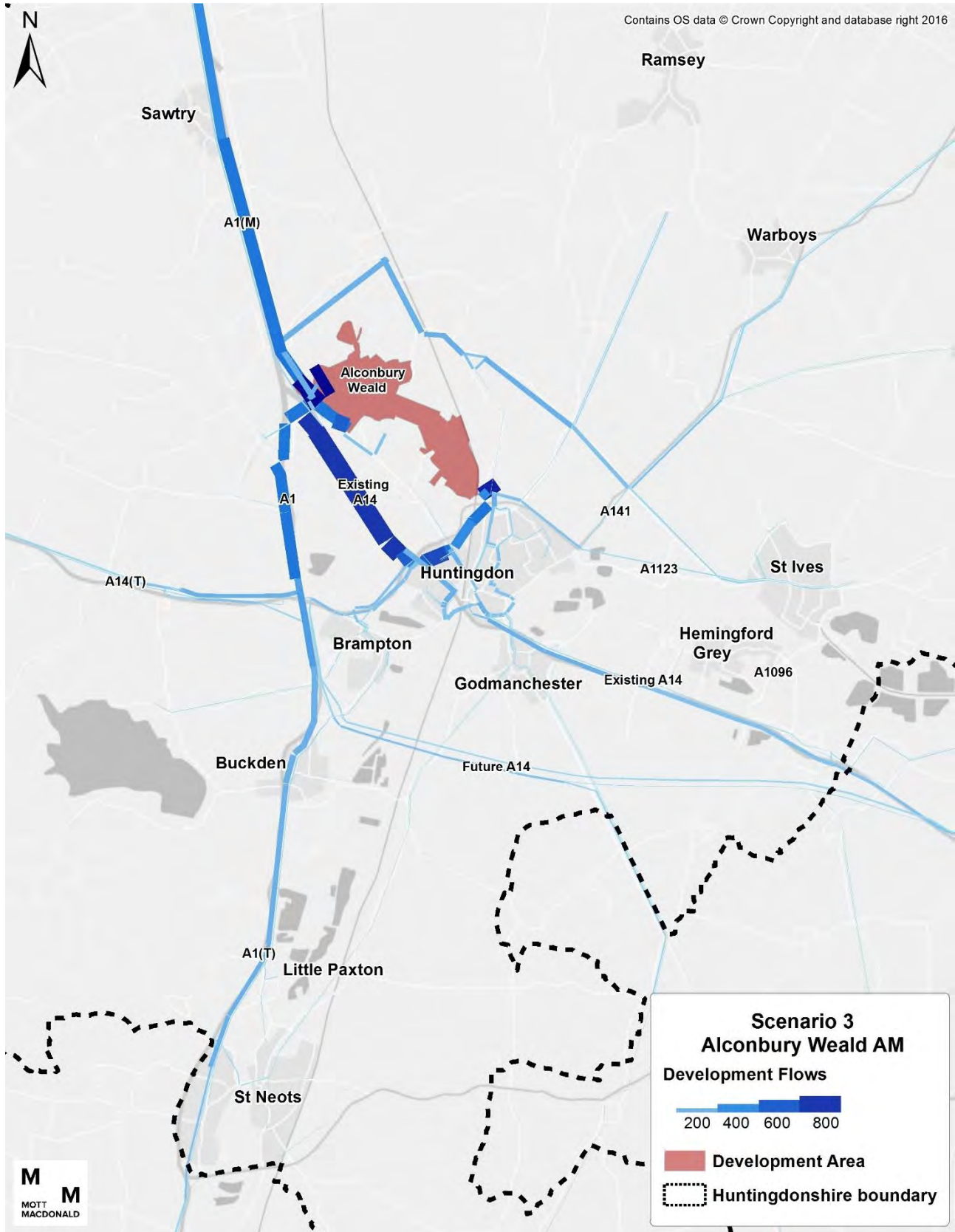
Figure 88: Scenario 2 Wyton development flows – PM



C.3 Scenario 3 Development Site Flow Distribution Plots

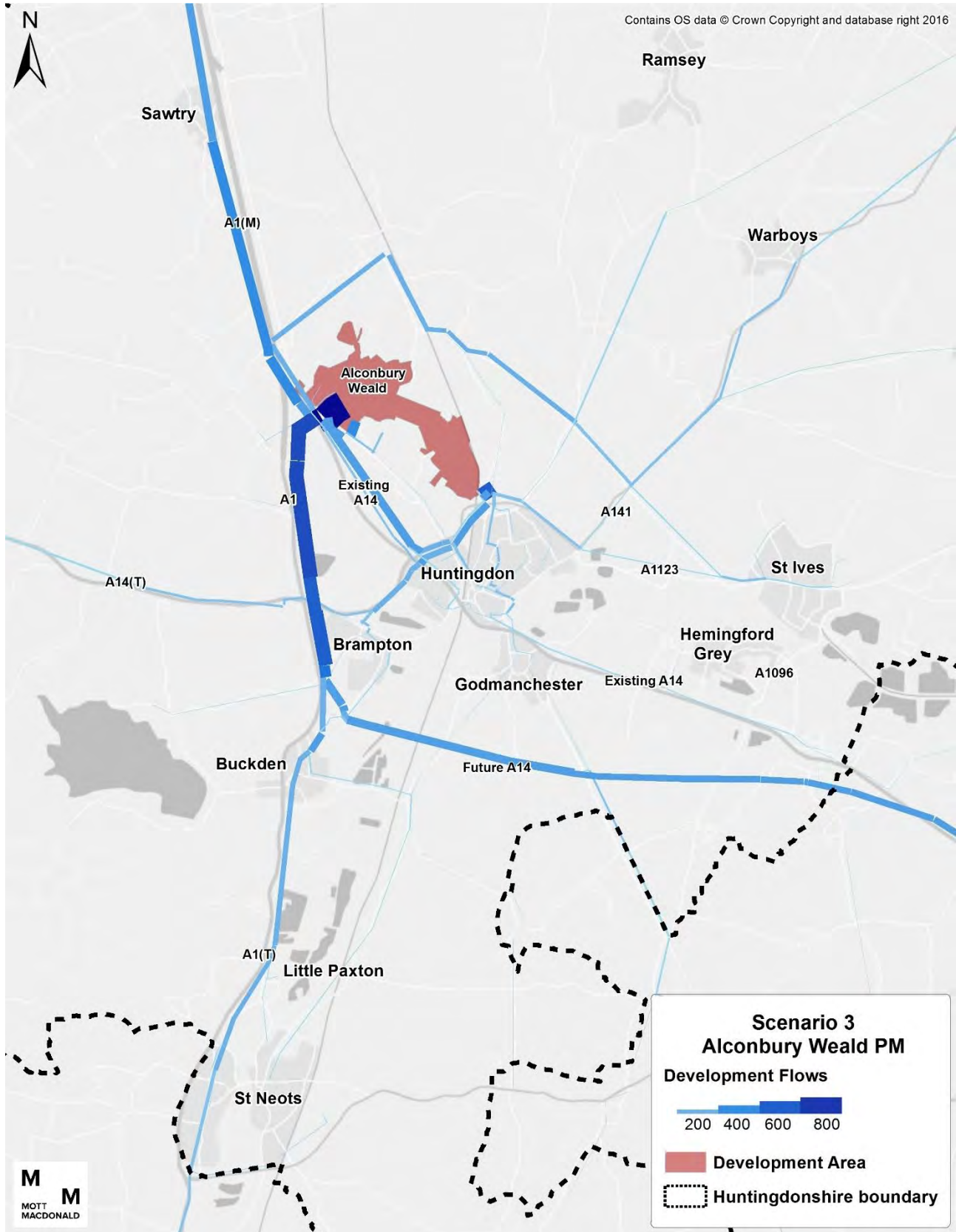
For Development Scenario 3, the following figures show the distribution of development-generated flows on the Huntingdonshire highway network in the AM and PM peak hours.

Figure 89: Scenario 3 Alconbury Airfield development flows – AM



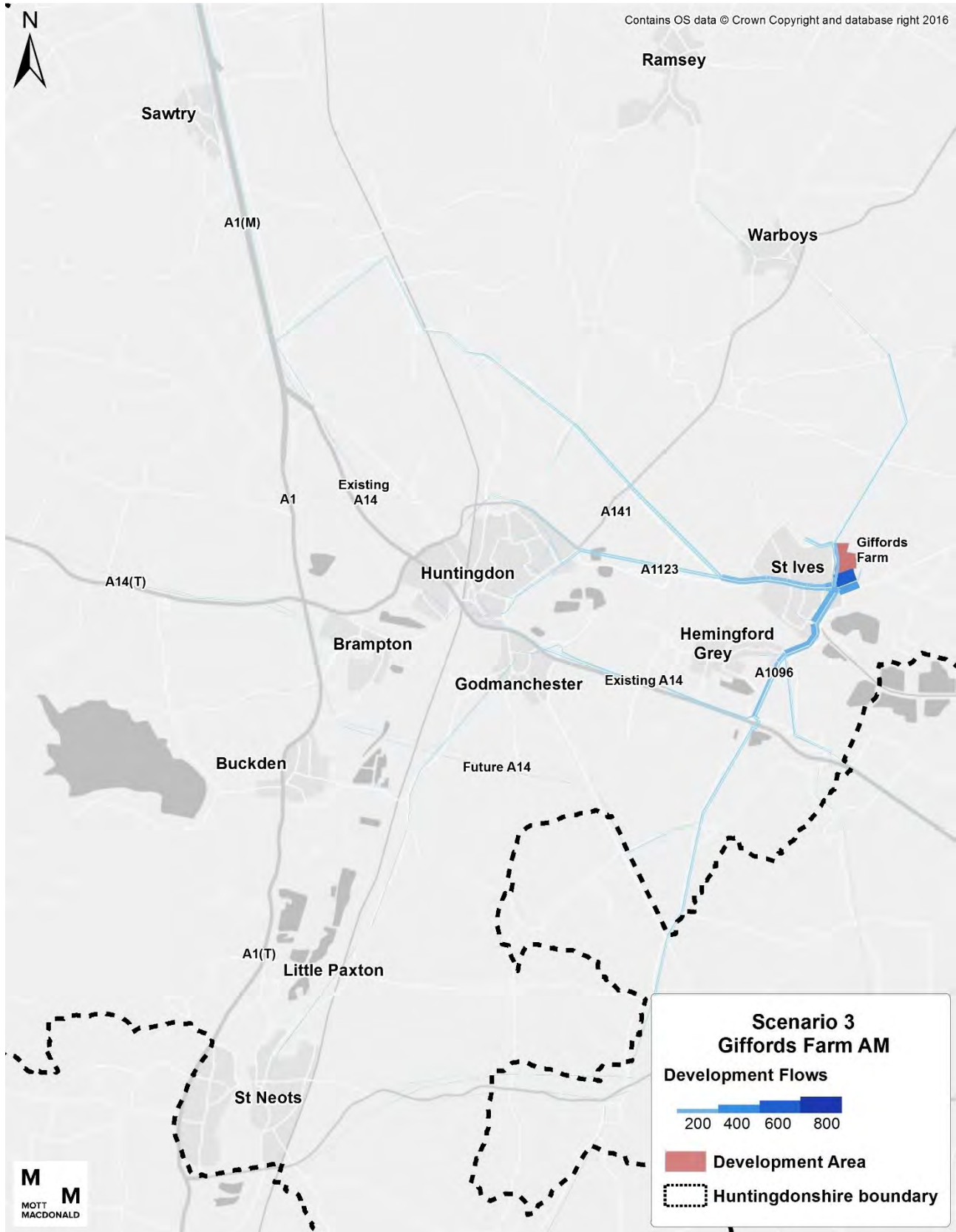
Source: CSR2

Figure 90: Scenario 3 Alconbury Airfield development flows – PM



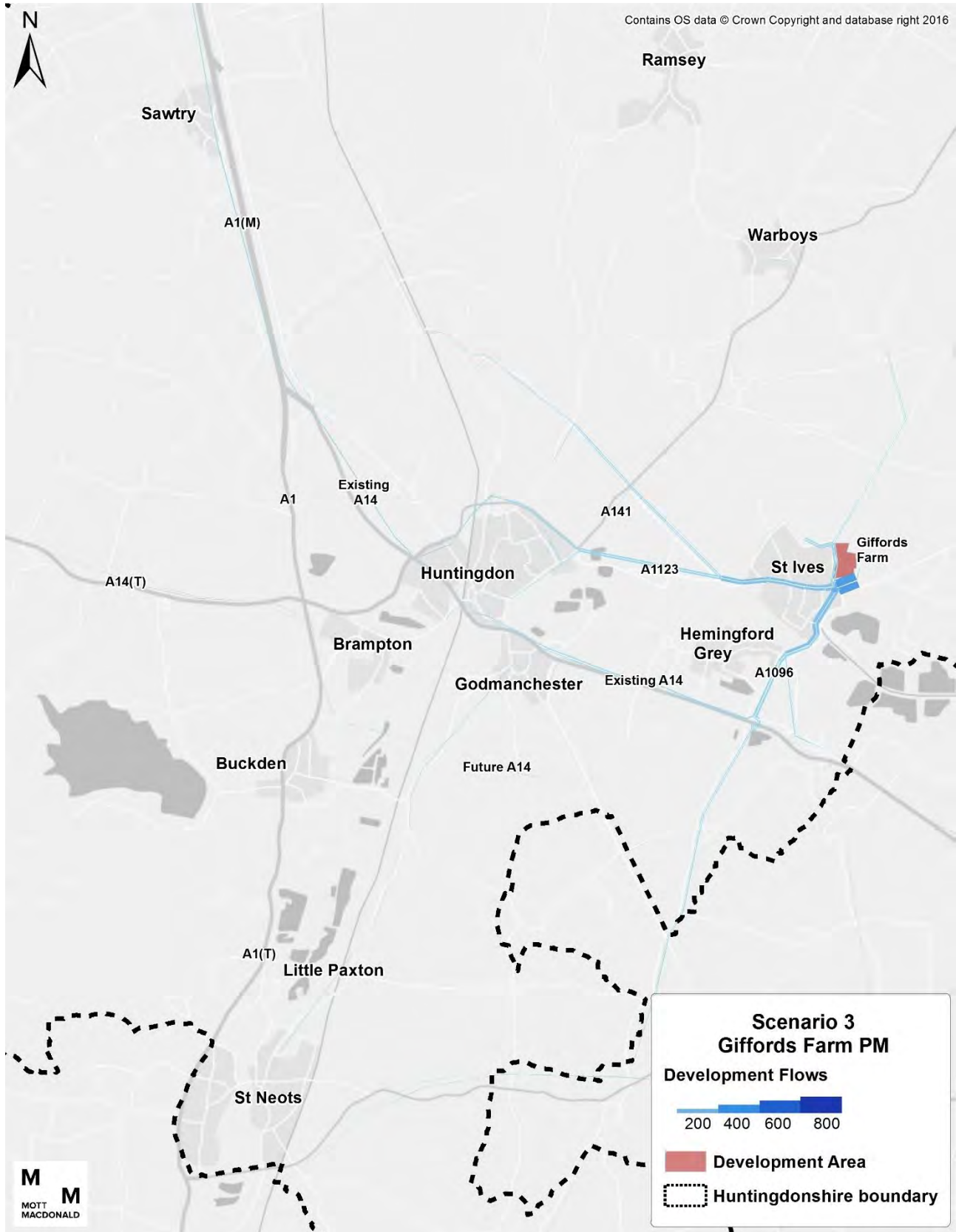
Source: CSR2

Figure 91: Scenario 3 Giffords Farm development flows – AM



Source: CSRM2

Figure 92: Scenario 3 Giffords Farm development flows – PM



Source: CSRM2

Figure 93: Scenario 3 RAF Alconbury development flows – AM

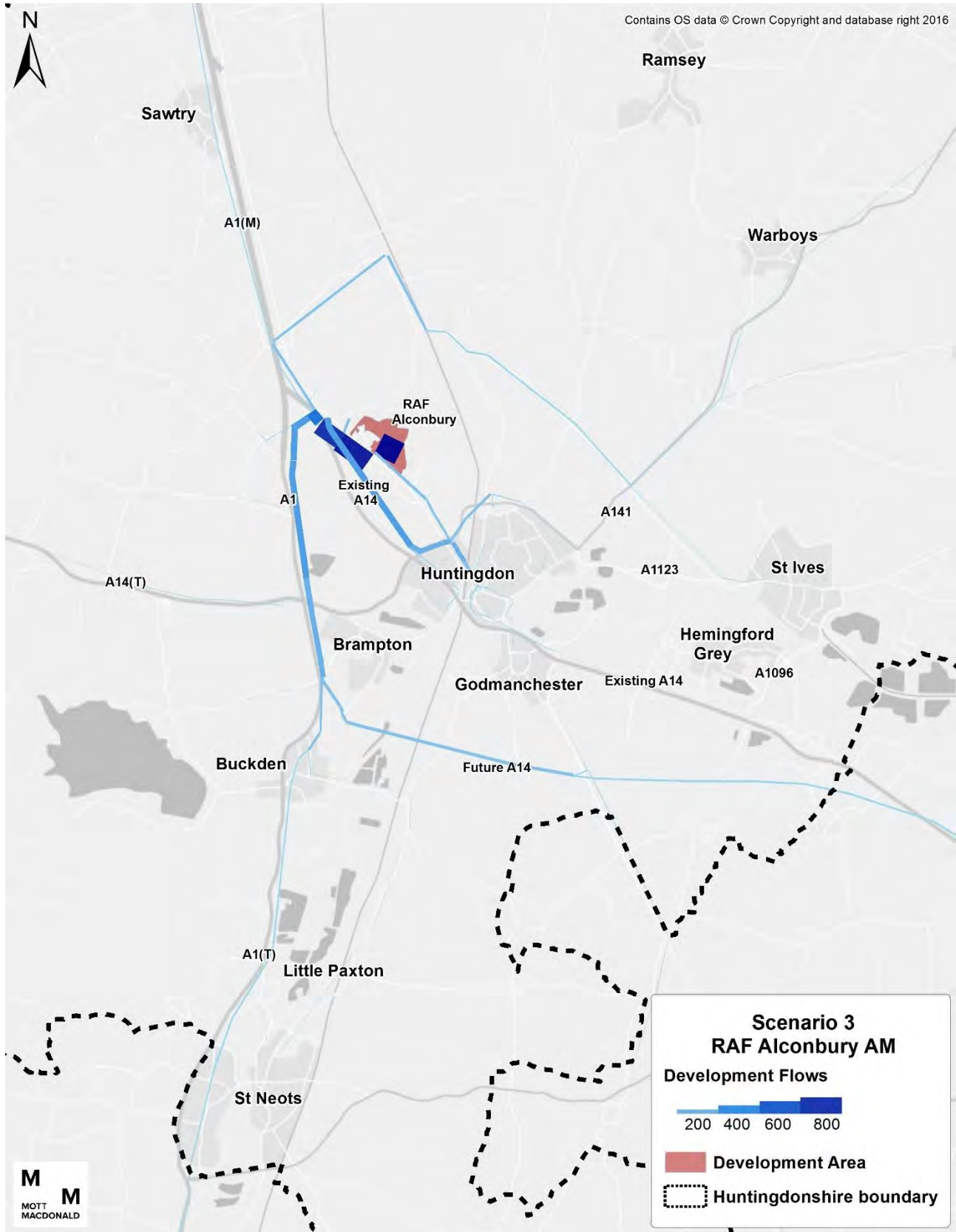
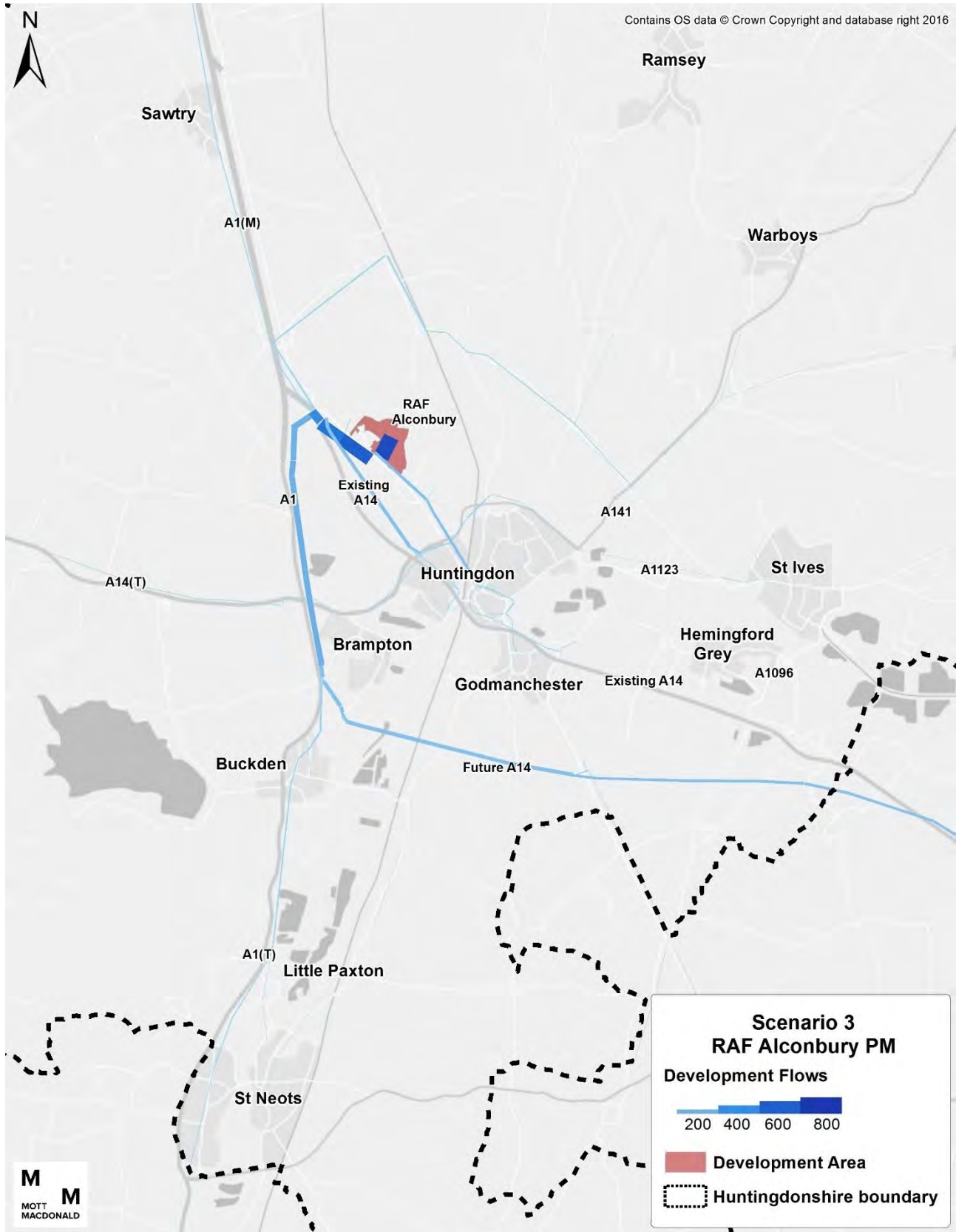
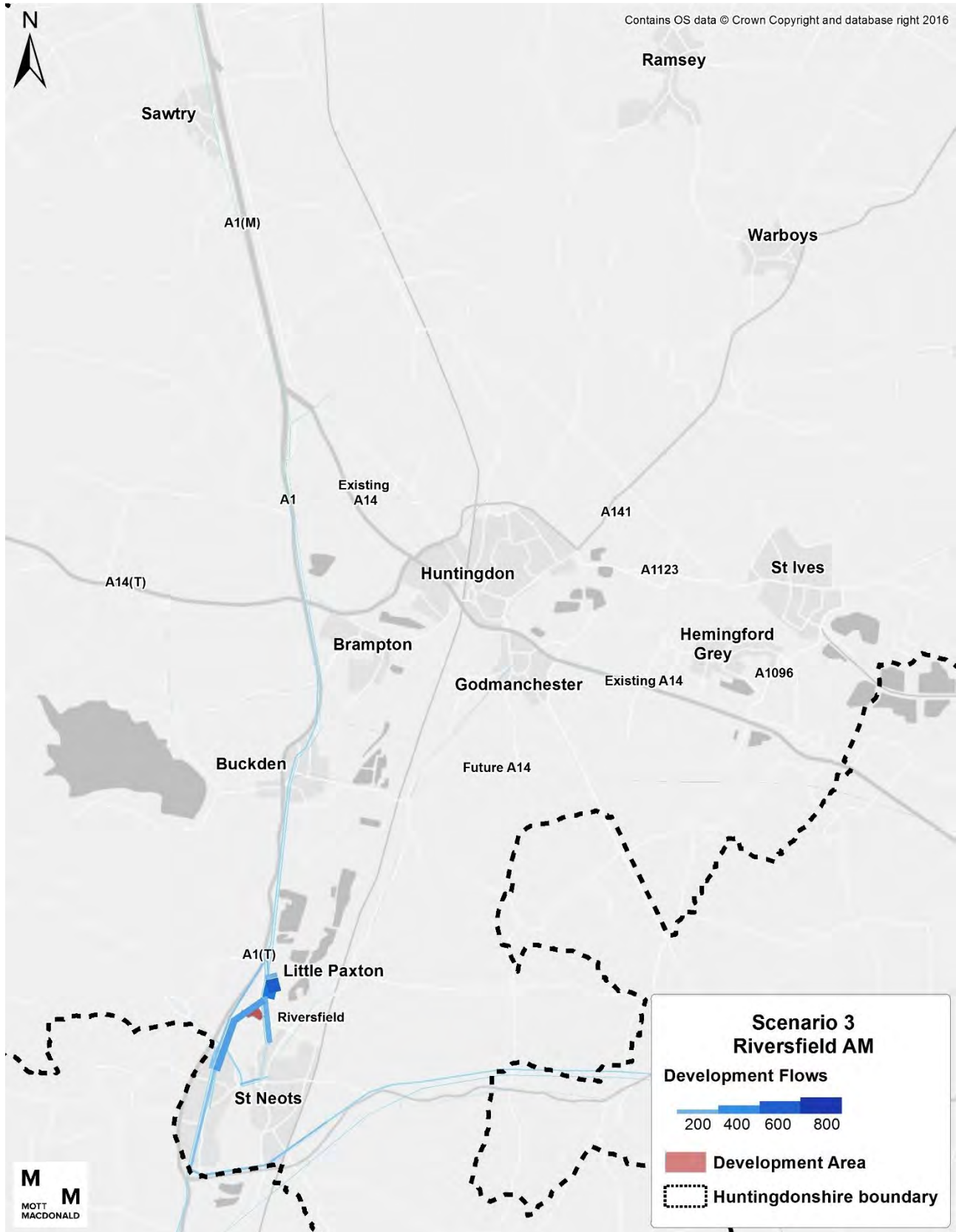


Figure 94: Scenario 3 RAF Alconbury development flows – PM



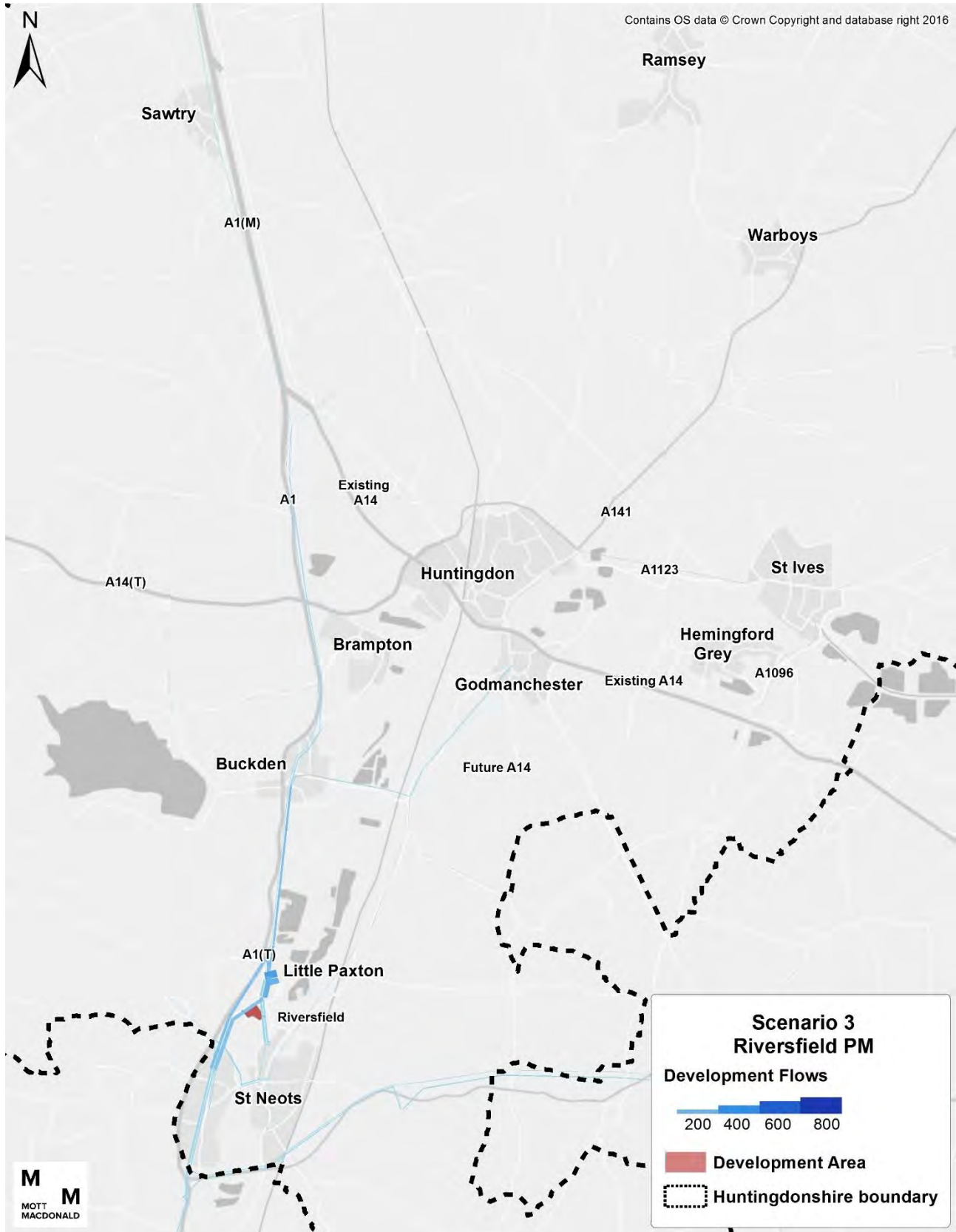
Source: CSR2

Figure 95: Scenario 3 Riversfield development flows – AM



Source: CSR2

Figure 96: Scenario 3 Riversfield development flows – PM

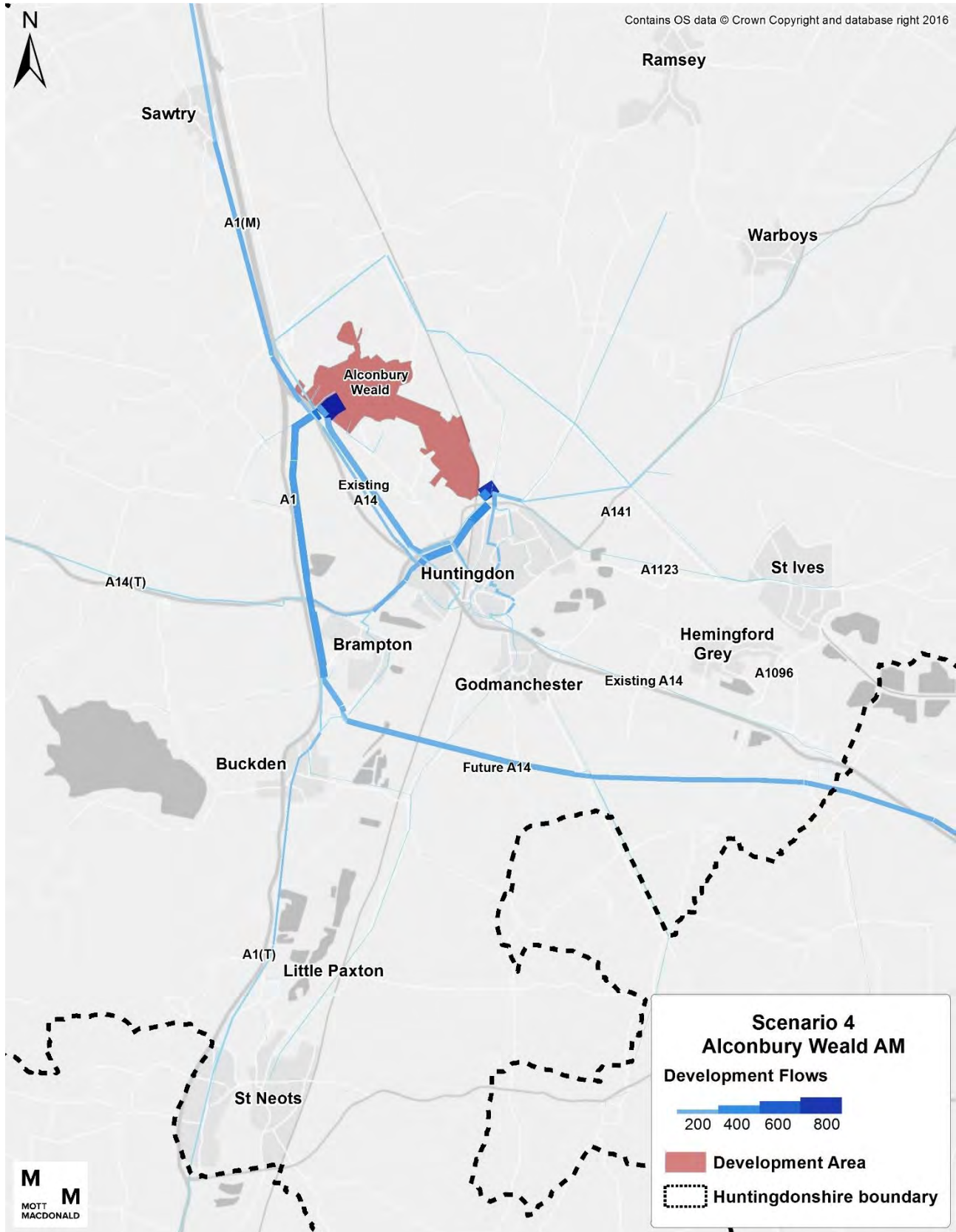


Source: CSR2

C.4 Scenario 4 Development Site Flow Distribution Plots

For Development Scenario 4, the following figures show the distribution of development-generated flows on the Huntingdonshire highway network in the AM and PM peak hours.

Figure 97: Scenario 4 Alconbury Airfield development flows – AM



Source: CSR2

Figure 98: Scenario 4 Alconbury Airfield development flows – PM

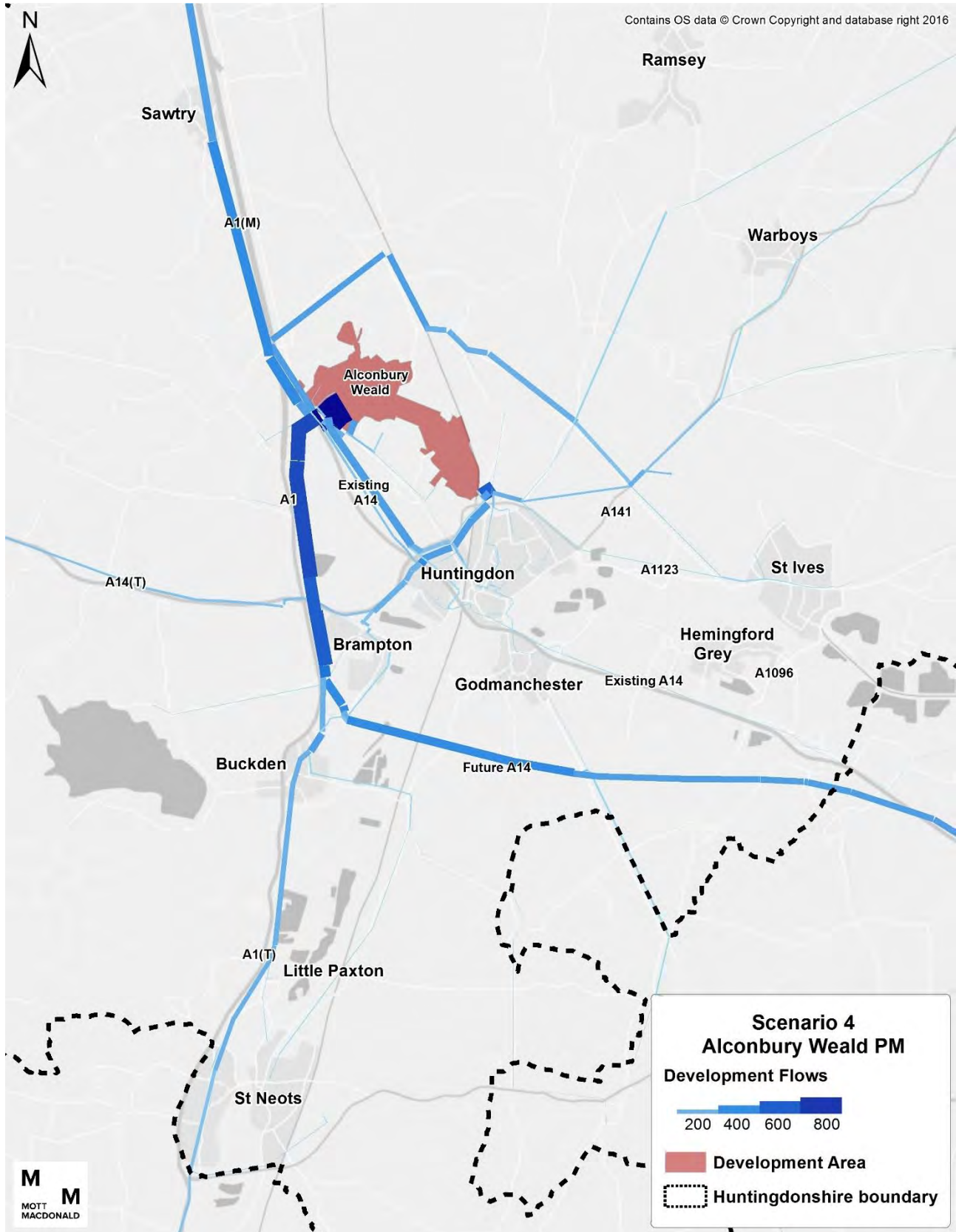


Figure 99: Scenario 4 Ermine Street development flows – AM

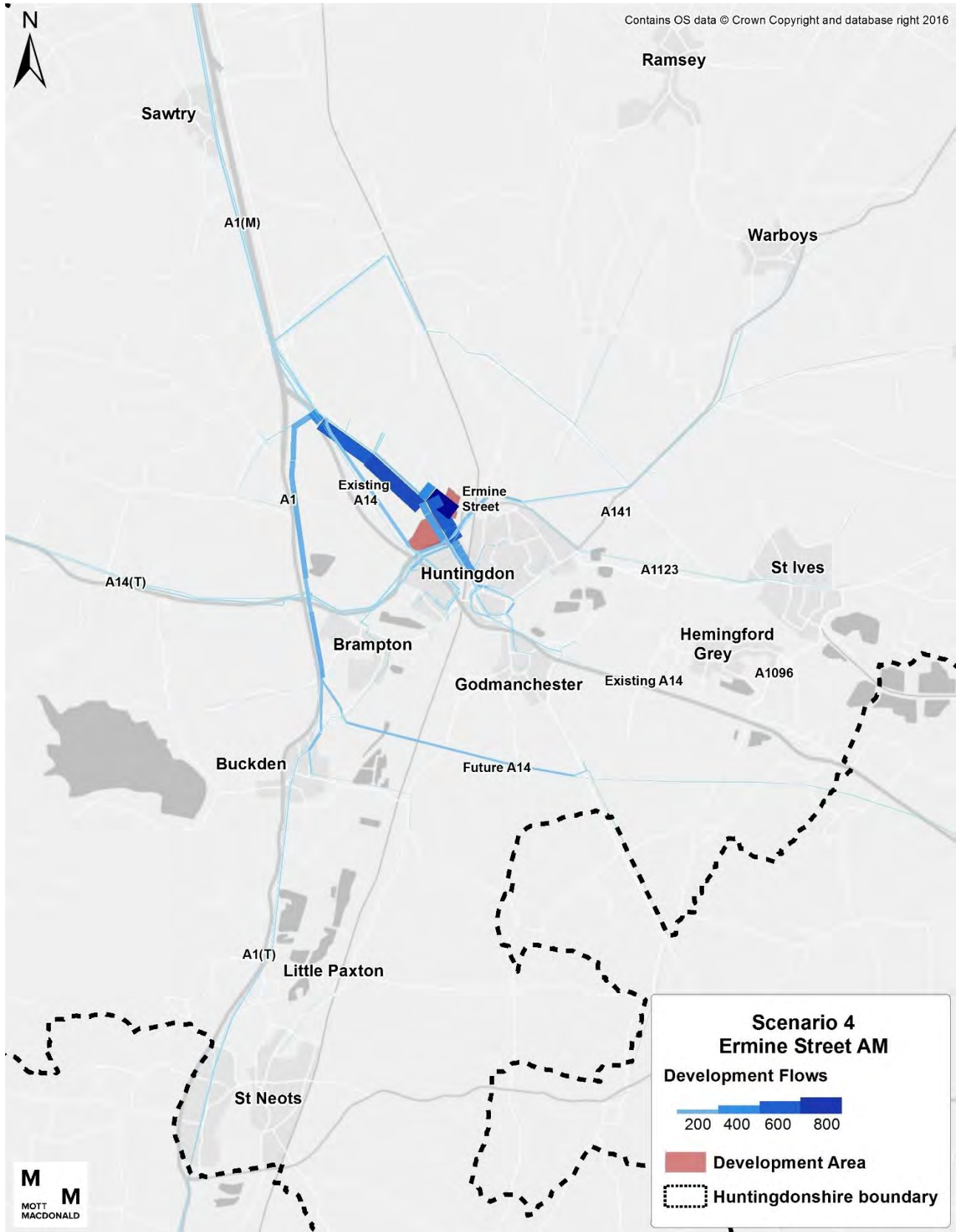
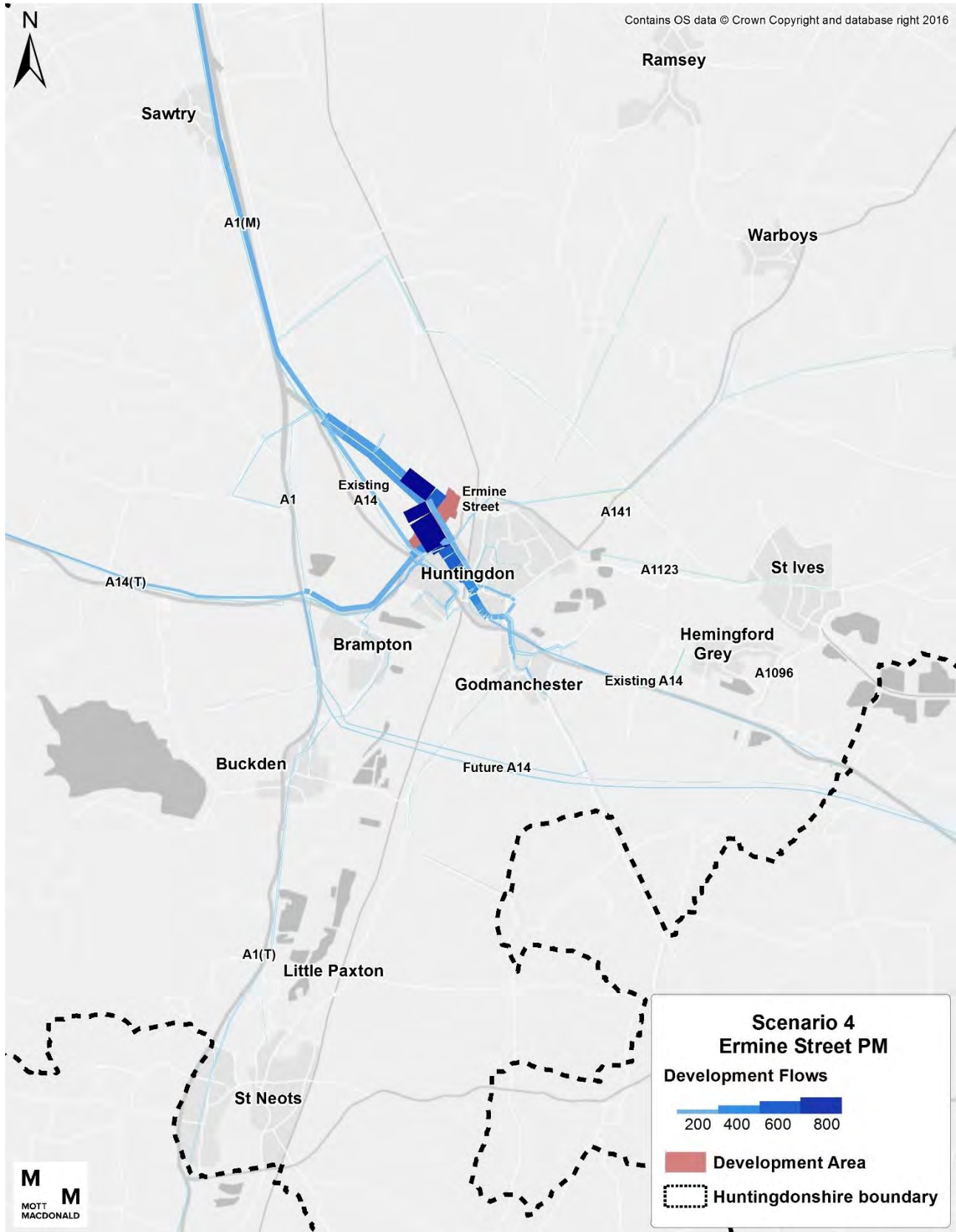
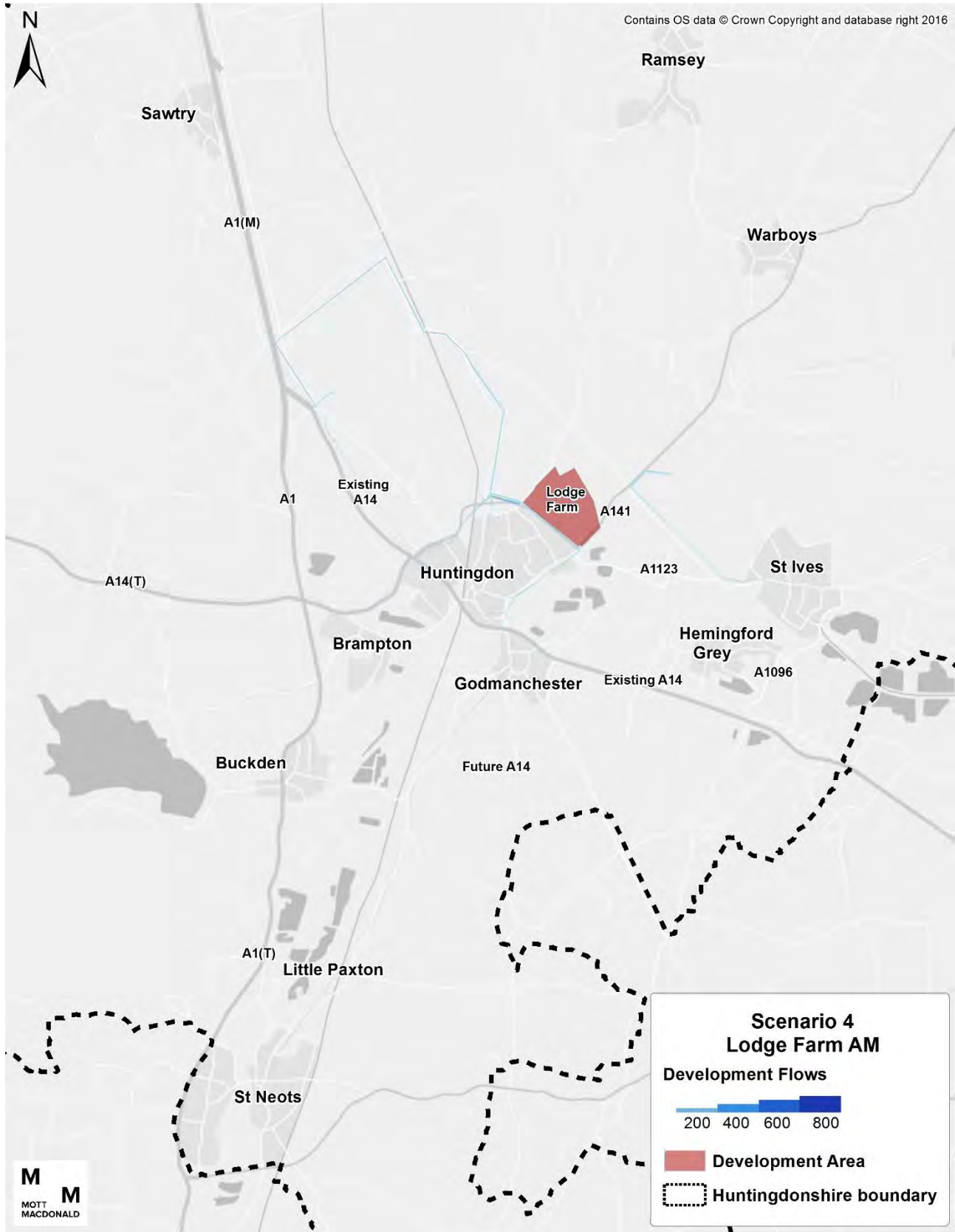


Figure 100: Scenario 4 Ermine Street development flows – PM



Source: CSR2

Figure 101: Scenario 4 Lodge Farm development flows – AM



Source: CSR2

Figure 102: Scenario 4 Lodge Farm development flows – PM

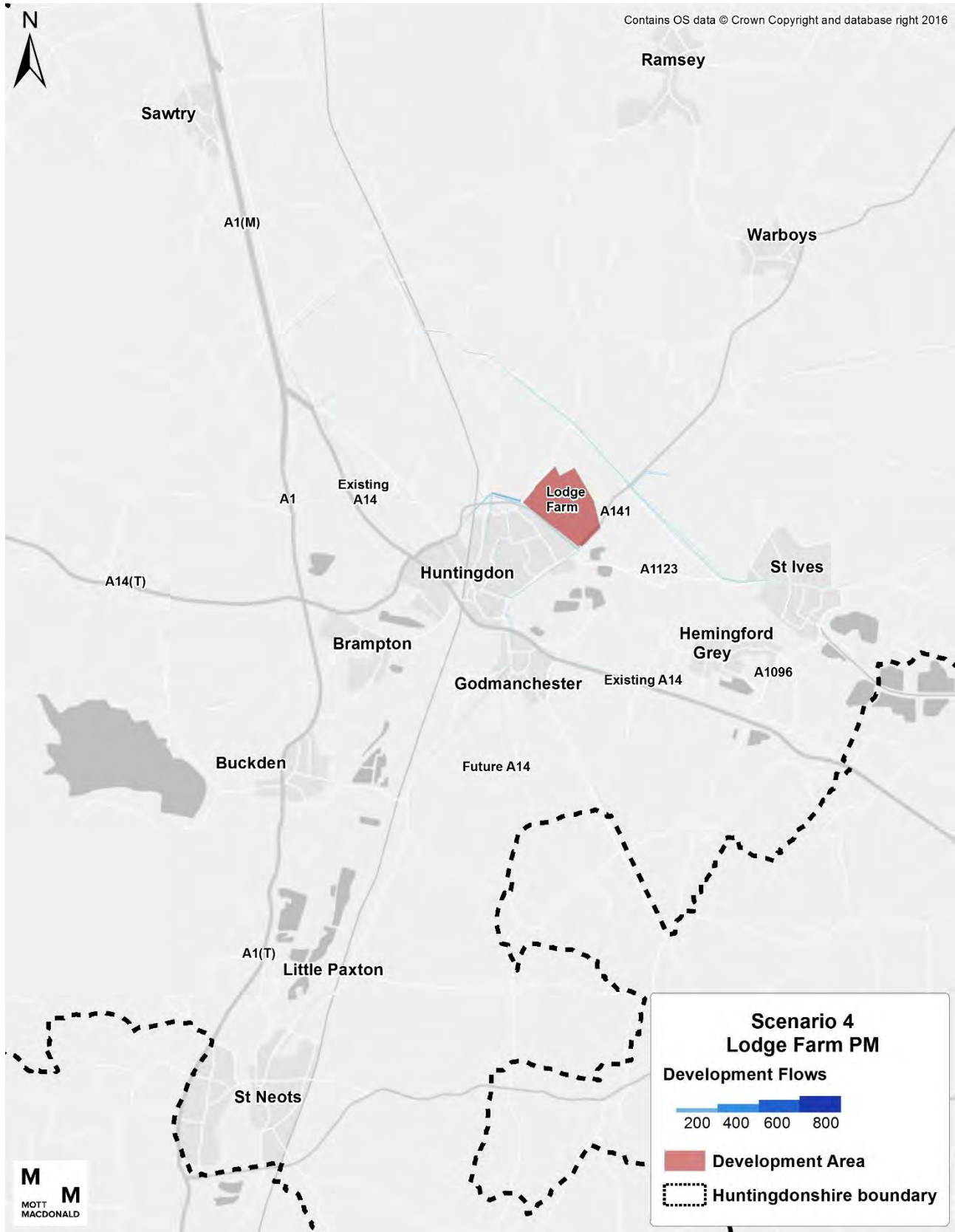
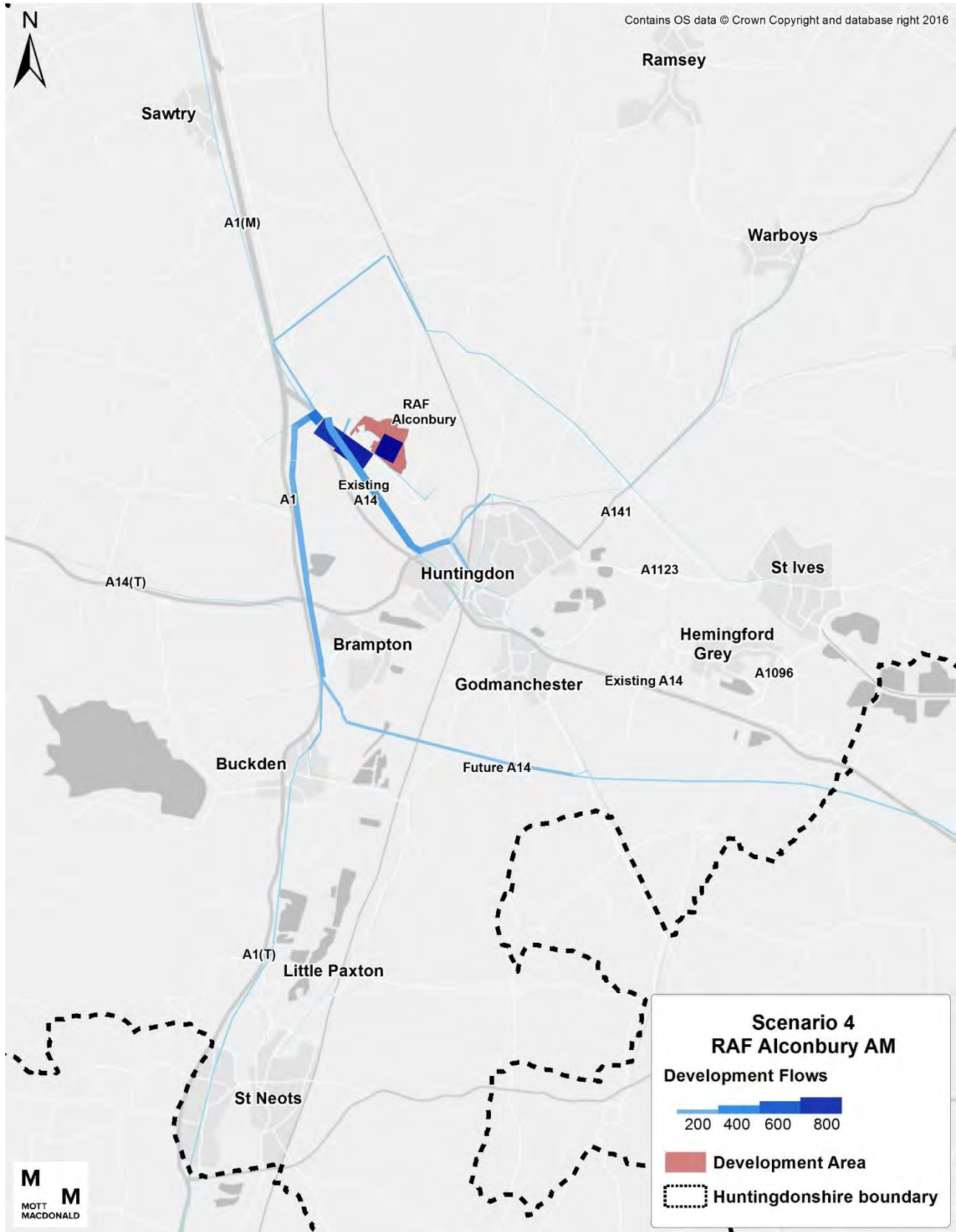


Figure 103: Scenario 4 RAF Alconbury development flows – AM



Source: CSRM2

Figure 104: Scenario 4 RAF Alconbury development flows – PM

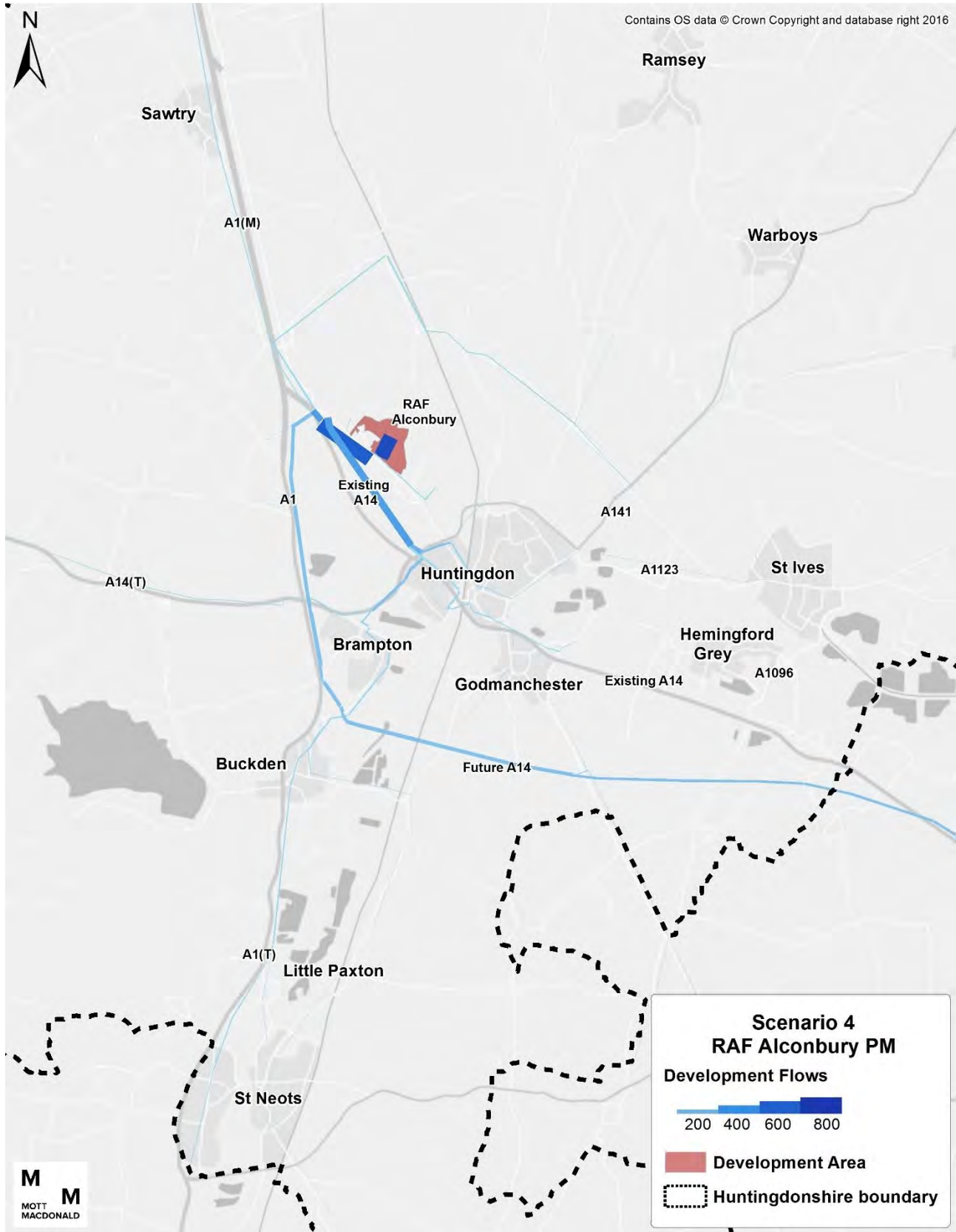


Figure 105: Scenario 4 Sapley Park development flows – AM

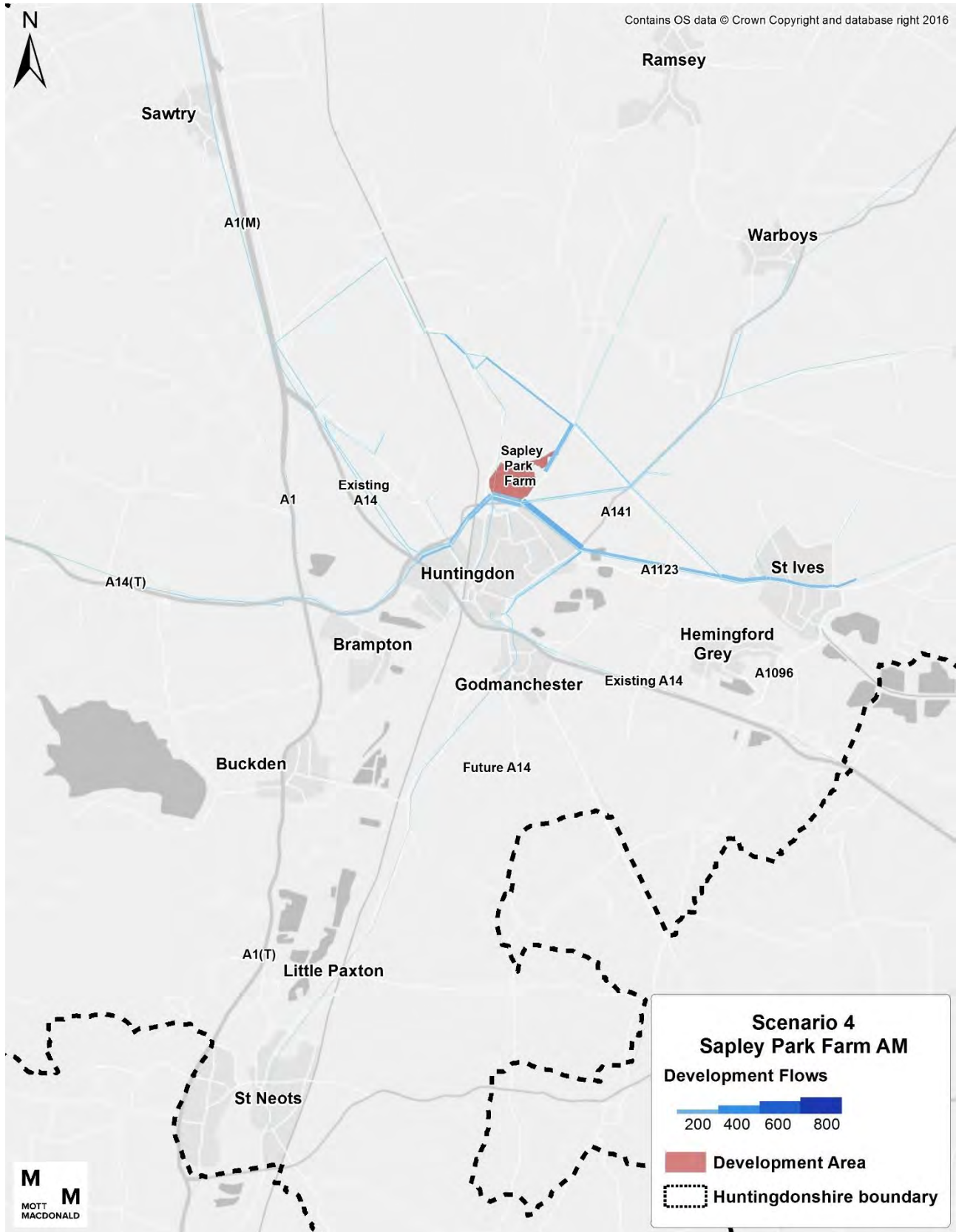
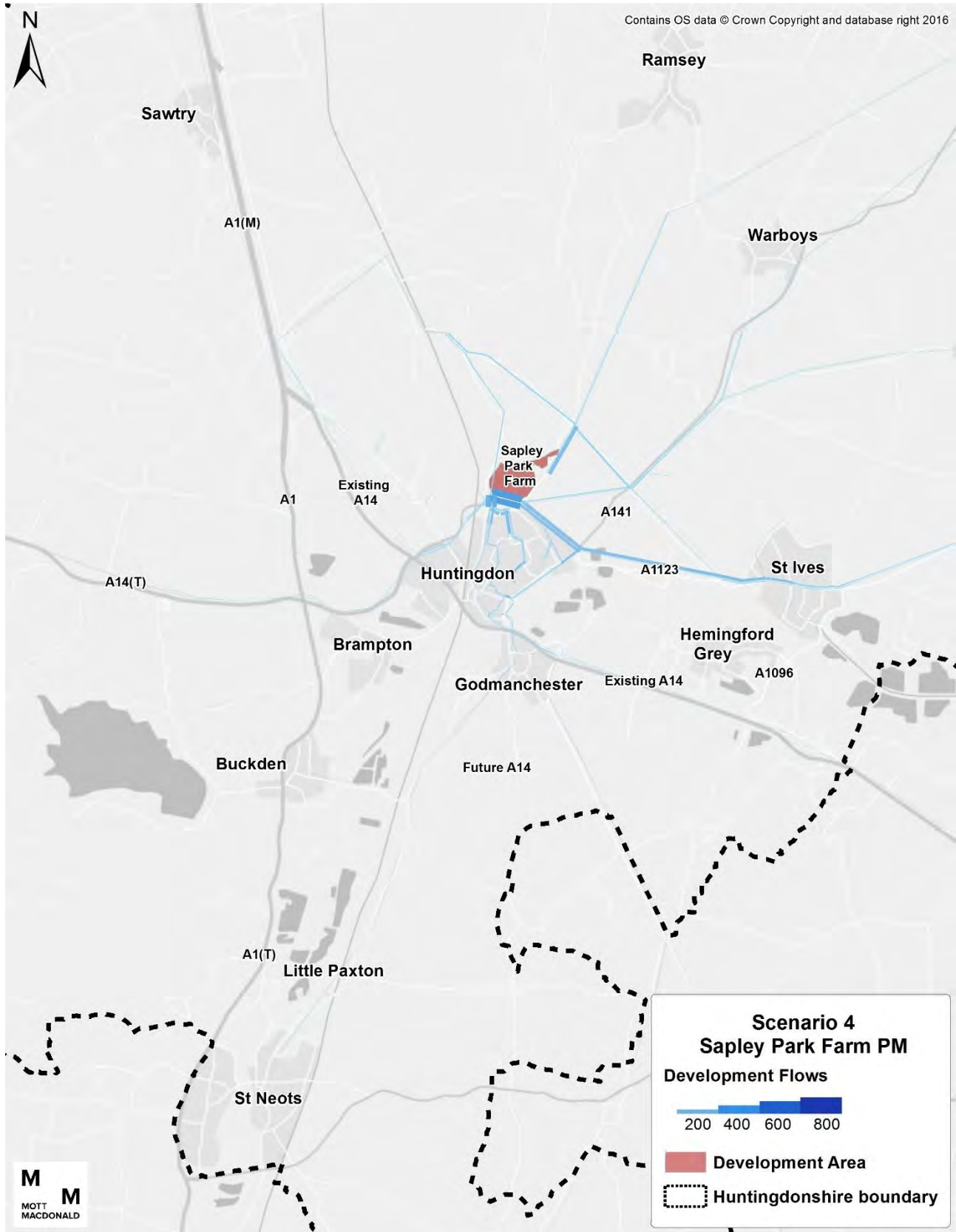


Figure 106: Scenario 4 Sapley Park development flows – PM



Source: CSRM2

Figure 107: Scenario 4 Wyton development flows – AM

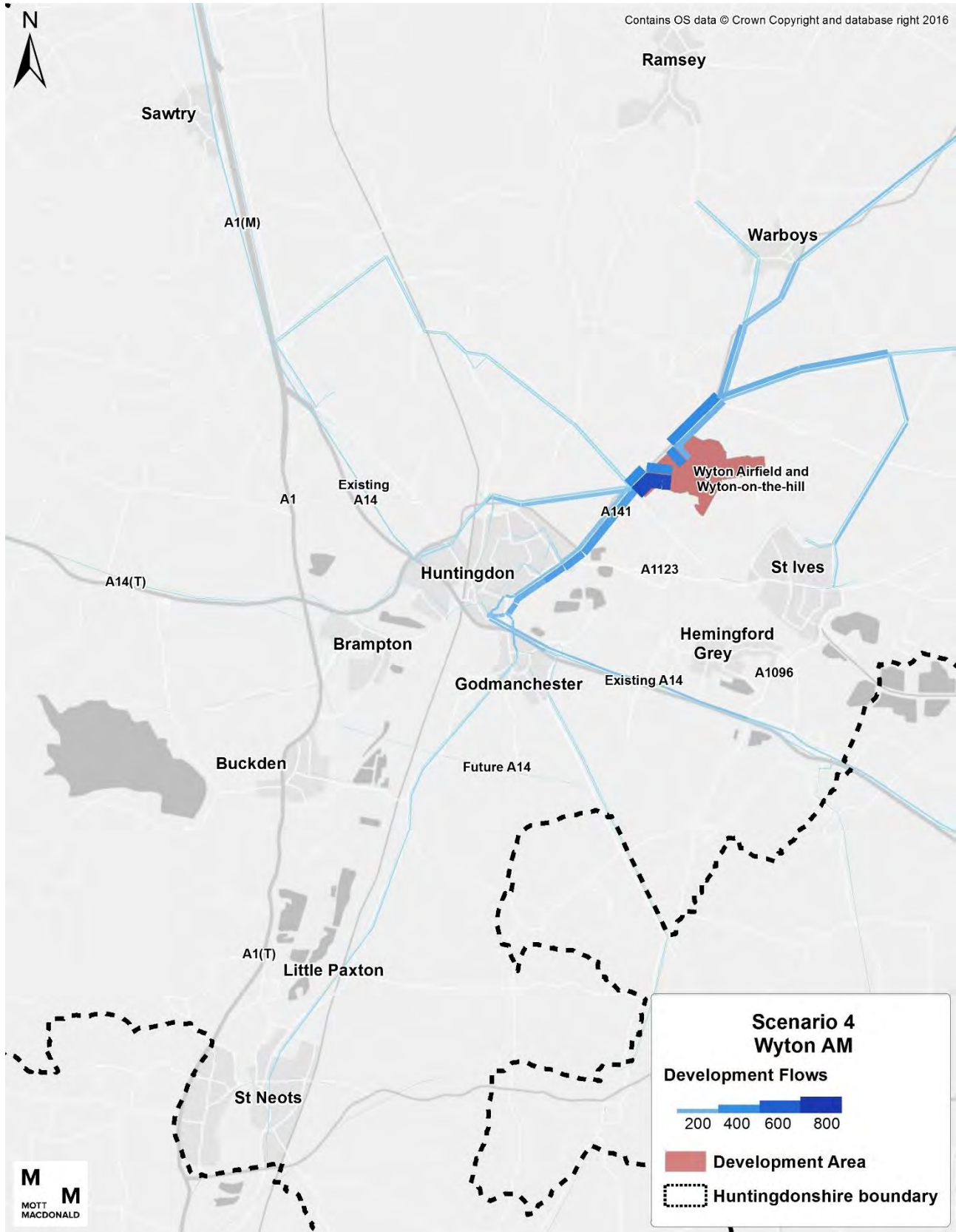
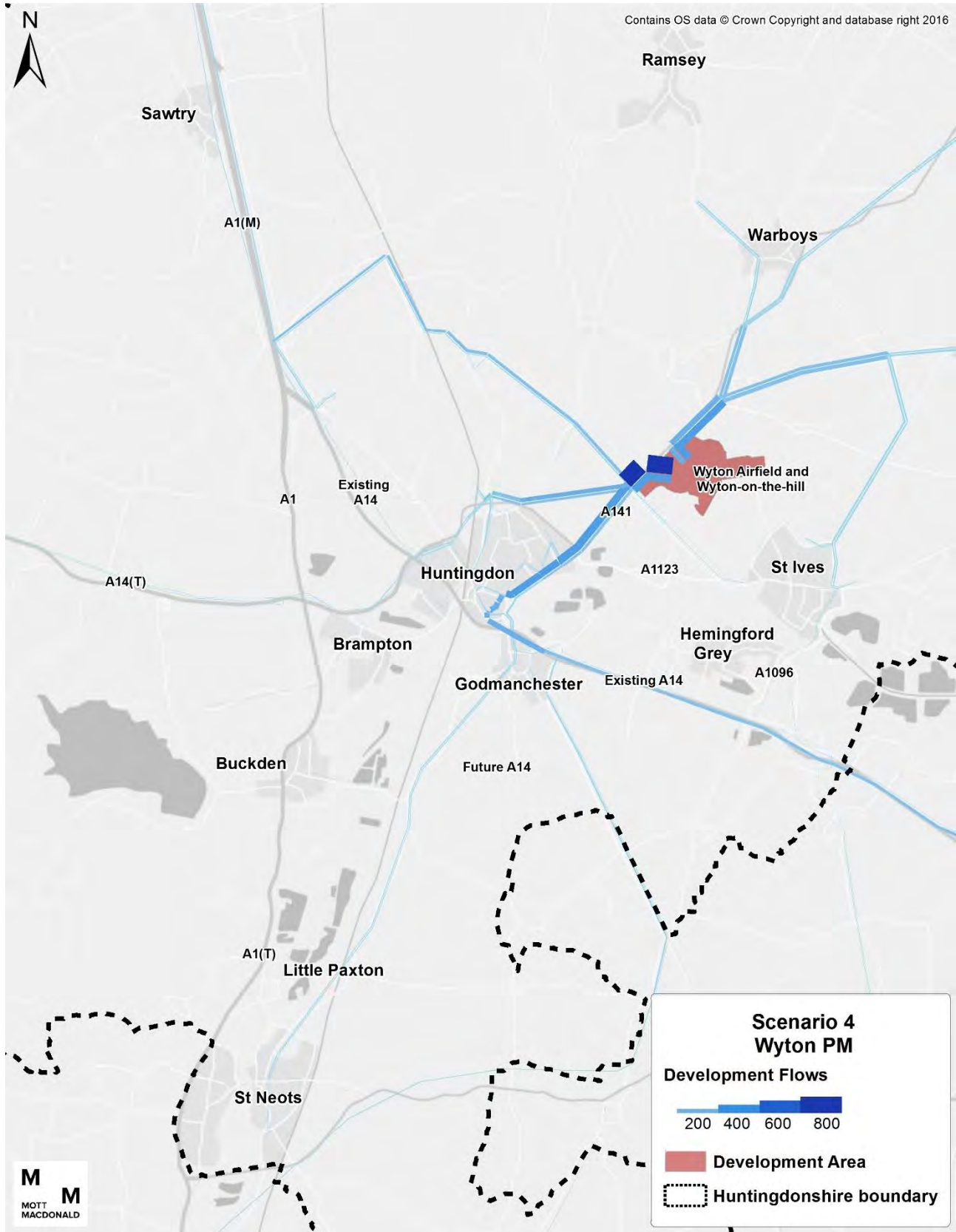


Figure 108: Scenario 4 Wyton development flows – PM



D. Mitigation Measure Cost Estimates

D.1 Cost Estimate Parameters

D.1.1 General Assumptions

1. Estimate is based at 4Q16 (no inflation has been allowed for beyond this time)
2. Estimate uncertainty level is +/- 66%
3. Uplifts have been applied to the estimate to cover any night time or out of hours working that may be required
4. Traffic signal works believed to be minimal (relocation of posts) unless stated otherwise, an allowance has been included in the highway widening works to cover these costs
5. Works can be carried out under half road closure wherever possible
6. All general arisings from excavations are 80% inert and 20% non-hazardous
7. Allowances have been included where we have not received sufficient information to allow us to price the works confidently within the estimate +/-% range. These have been clearly identified in the estimate and will require validation when further information becomes available
8. New road construction consists of 400mm Type 1 sub-base, 200mm base course, 60mm binder course and 40mm wearing course
9. See estimates and rates sheet for further assumptions and details of scope
10. White lining has been allowed for in the rates
11. Footpath allowed as 250mm Type 1 sub-base, 50mm binder course and 25mm wearing course
12. Signalised junctions allowed as 6 nr heads on poles per junction
13. Given the level of detail provided, it is not possible to quantify the extent of utilities to be relocated, protected or diverted. Costs for diversions can be extremely volatile and as such are very difficult to derive, and as such have been excluded from these estimates
14. Assumptions have been made on a site-by-site basis as to measures that could potentially be implemented and costs estimated for these based on the assumptions given above.

D.1.2 Documentation used in the preparation of the estimate

1. D1 Specification for Huntingdonshire Strategic Transport Study
2. D2 Marked up Google map views
3. D3 2 no sketch drawings

D.1.3 Exclusions

1. Optimism Bias
2. VAT
3. 3rd party compensation costs
4. Planning and approval charges
5. Land purchase or rental
6. Costs associated with Statutory Fees (e.g. HMRI, Local Authority, etc.)
7. Costs associated with taxes, levies and licences
8. Costs associated with changes in legislation and any form of applicable standards

9. Allowances for unforeseen ground conditions / provisions for ground stabilisation unless specifically identified
10. Christmas, Easter and Bank Holiday working
11. Environmental mitigation works
12. Archaeological digs
13. Inflation beyond the base date
14. Works that have not been specifically included for in the estimate
15. Utilities diversions, relocation and protection
16. Demolition costs of existing buildings
17. Re-location of affected businesses
18. Road diversions

D.2 Cost Estimate Table

Taking into account the above assumptions, construction cost estimates for potential highway improvements have been estimated. These are presented in the following table.

Table 59: Full outline cost estimate @ 4Q16

Scheme Name	Construction	OH&P	Construction Cost Total inc OH&P	Design	Prelims	T&C	Traffic Mgmt @ say 5%	Client Project Mgmt	Point Estimate Total
Factors	10%			15%	23%	1%	5%	10%	
Huntingdon Third River Crossing - Single Carriageway	46,435,900	4,643,600	51,079,500	7,661,900	11,748,300	510,800	2,554,000	5,107,900	78,662,400
Huntingdon Third River Crossing - Dual Carriageway	80,430,900	8,043,100	88,474,000	13,271,100	20,349,000	884,700	4,423,700	8,847,400	136,250,000
A141 Improvement Single Carriageway	18,486,900	1,848,700	20,335,600	3,050,300	4,677,200	203,400	1,016,800	2,033,600	31,316,900
A141 Improvement Dual Carriageway	47,588,900	4,758,900	52,347,800	7,852,200	12,040,000	523,500	2,617,400	5,234,800	80,615,500
Spittals Interchange	194,900	19,500	214,400	32,150	49,300	2,150	10,700	21,450	330,200
A141/ B1044 Ermine Street / B1044 Stukeley Road	105,900	10,600	116,500	17,500	26,800	1,200	5,800	11,600	179,400
A141/Washingley Road/Latham Road	68,400	6,850	75,250	11,300	17,300	750	3,750	7,550	115,900
A141/ Huntingdon Road / Abbots Ripton Road	194,400	19,400	213,800	32,100	49,200	2,100	10,700	21,400	329,200
A141 / Kings Ripton Road	63,400	6,300	69,800	10,500	16,000	700	3,500	7,000	107,400
A141 A1123 B1514	298,800	29,900	328,700	49,300	75,600	3,300	16,400	32,900	506,200
A141 / B1090 Wyton	273,400	27,300	300,800	45,100	69,200	3,000	15,000	30,100	463,200
B1090 / A1123 Houghton Road	313,300	31,300	344,700	51,700	79,300	3,400	17,200	34,500	530,800
A1123 Houghton Road/Hill Rise	202,400	20,200	222,600	33,400	51,200	2,200	11,100	22,300	342,800
A1123 Houghton Road/Ramsey Road/A1123 St Audrey Ln	62,800	6,300	69,000	10,400	15,900	700	3,500	6,900	106,300
Roundabout A1123 B1040	829,600	83,000	912,500	136,900	209,900	9,100	45,600	91,300	1,405,300
Post Street/Cambridge Street/Causeway (Godmanchester)	315,400	31,500	346,900	52,000	79,800	3,500	17,300	34,700	534,300
A1096 Harrison Way / Meadow Lane	224,300	22,400	246,700	37,000	56,700	2,500	12,300	24,700	380,000
A1096 Harrison Way / Guided Busway crossing	330,000	33,000	362,900	54,400	83,500	3,600	18,100	36,300	558,900
A1096 Harrison Way / Hemingford Way / Low Road	379,500	38,000	417,500	62,600	96,000	4,200	20,900	41,700	642,900
A1096/A14 J26	49,200	4,900	54,100	8,100	12,500	500	2,700	5,400	83,400

Source: MM

E. Post-Mitigation Modelling Results

E.1 Scenario 1 Modelling Results

For each mitigation package model run for Scenario 1, the following plots show, for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

Figure 109: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 1, AM

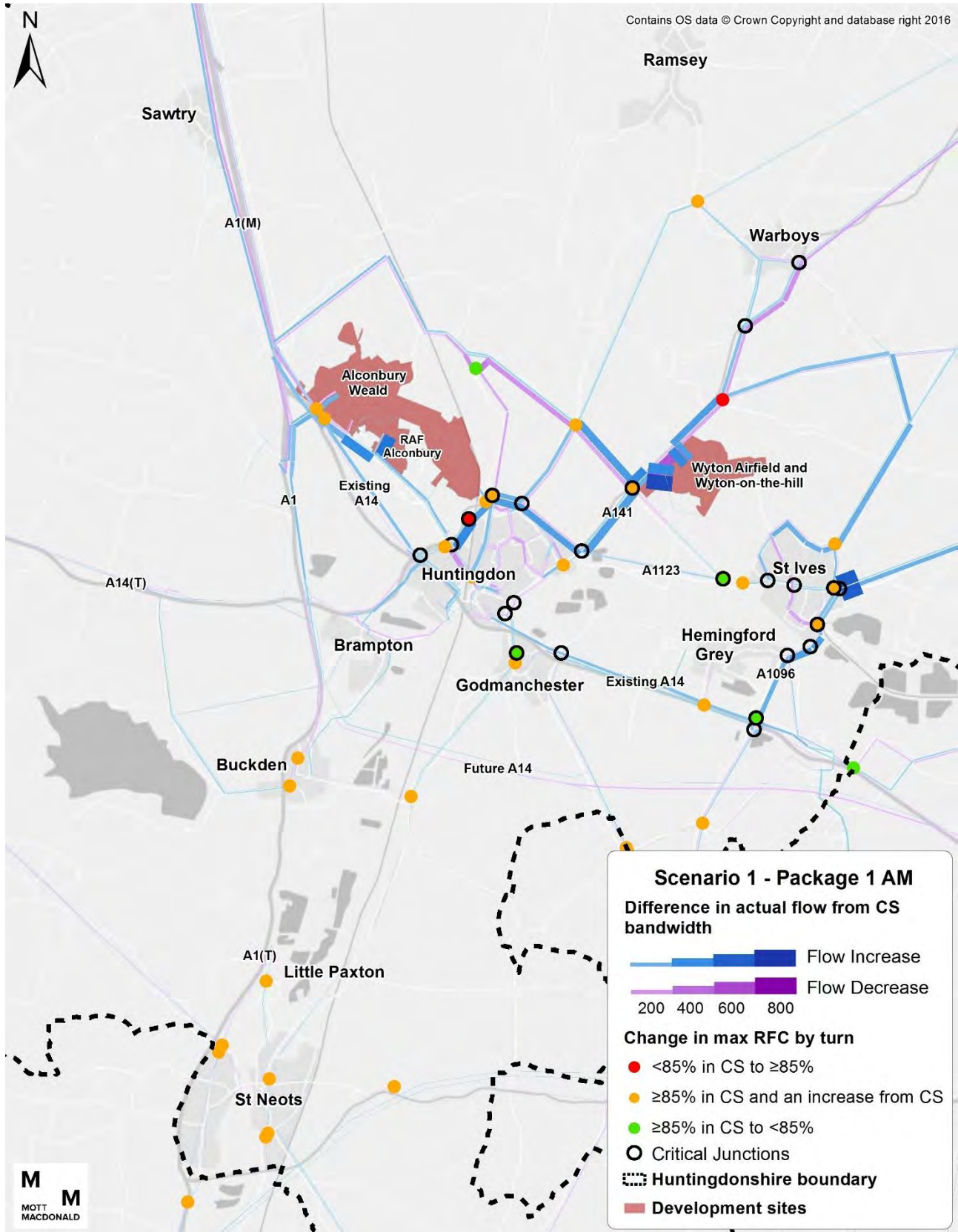


Figure 110: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 1, PM

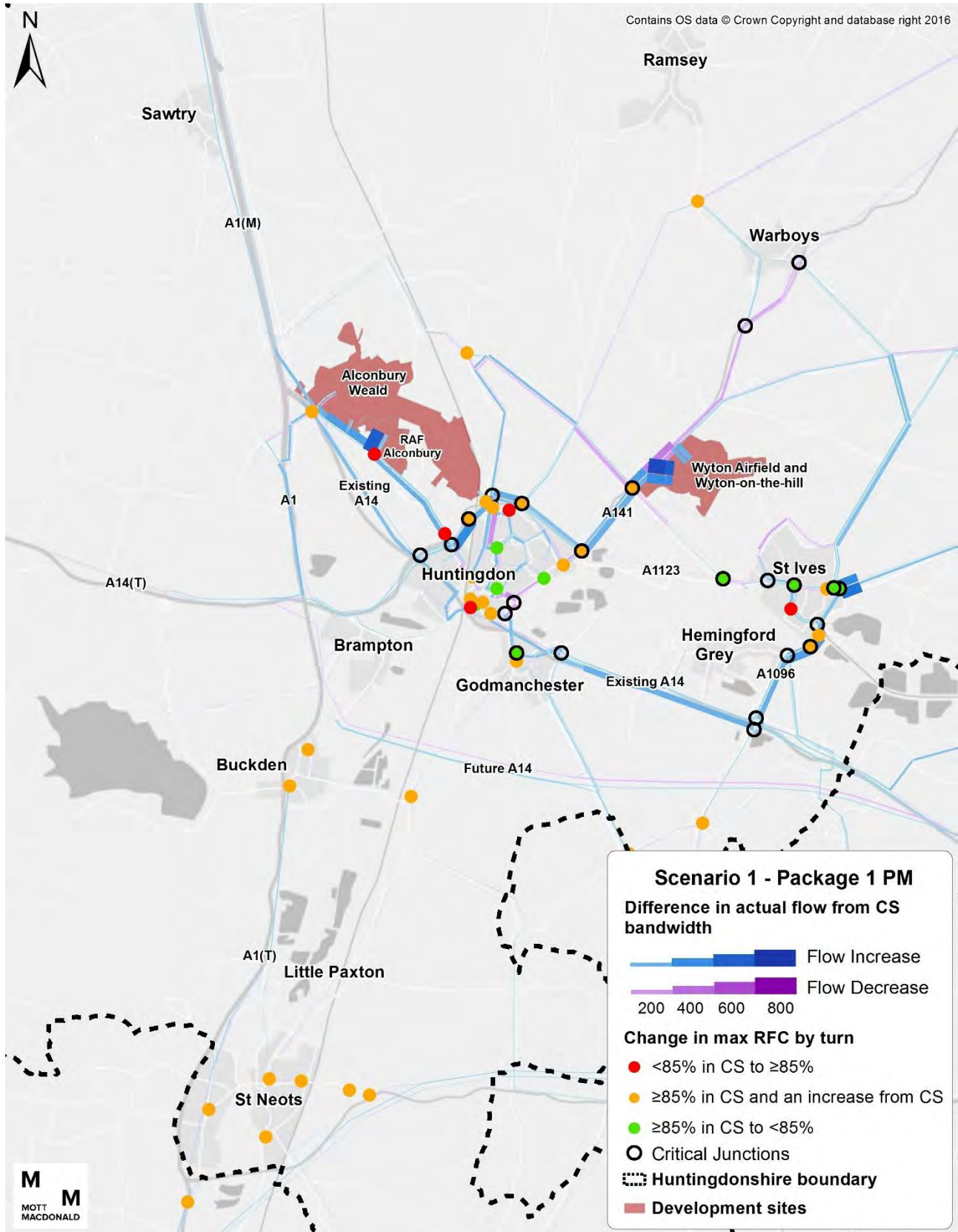
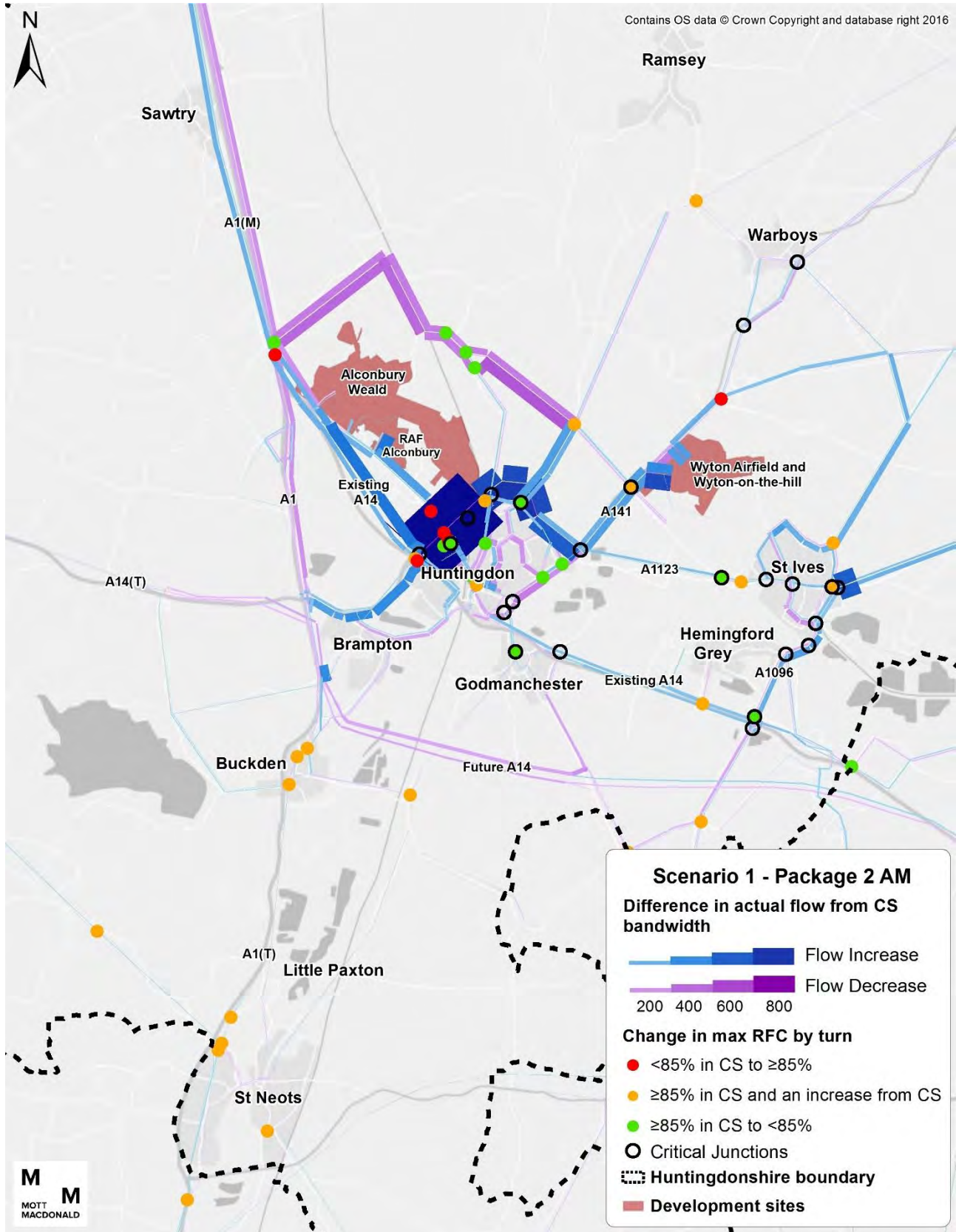


Figure 111: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 2, AM



Source: CSRM

Figure 112: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 2, PM

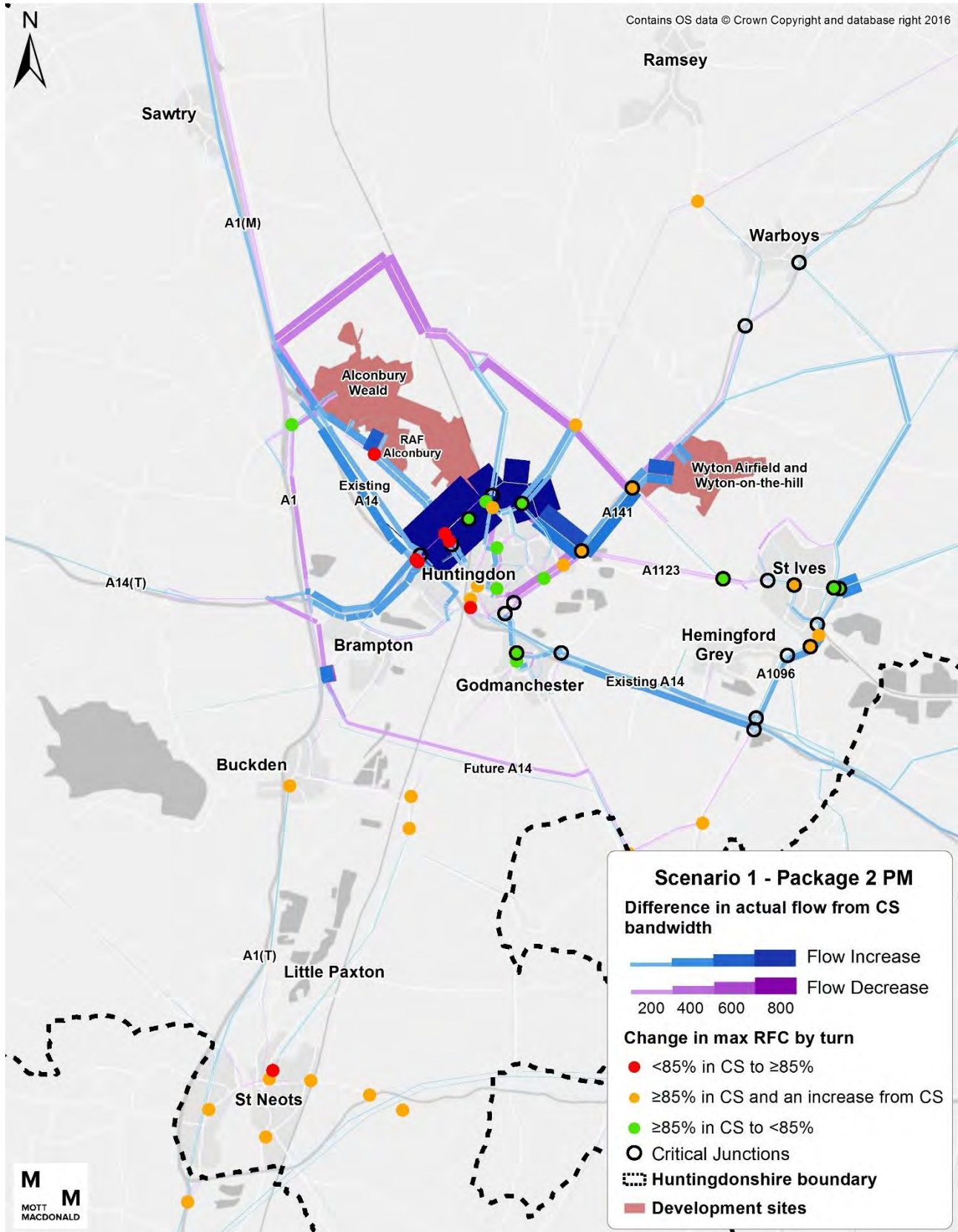
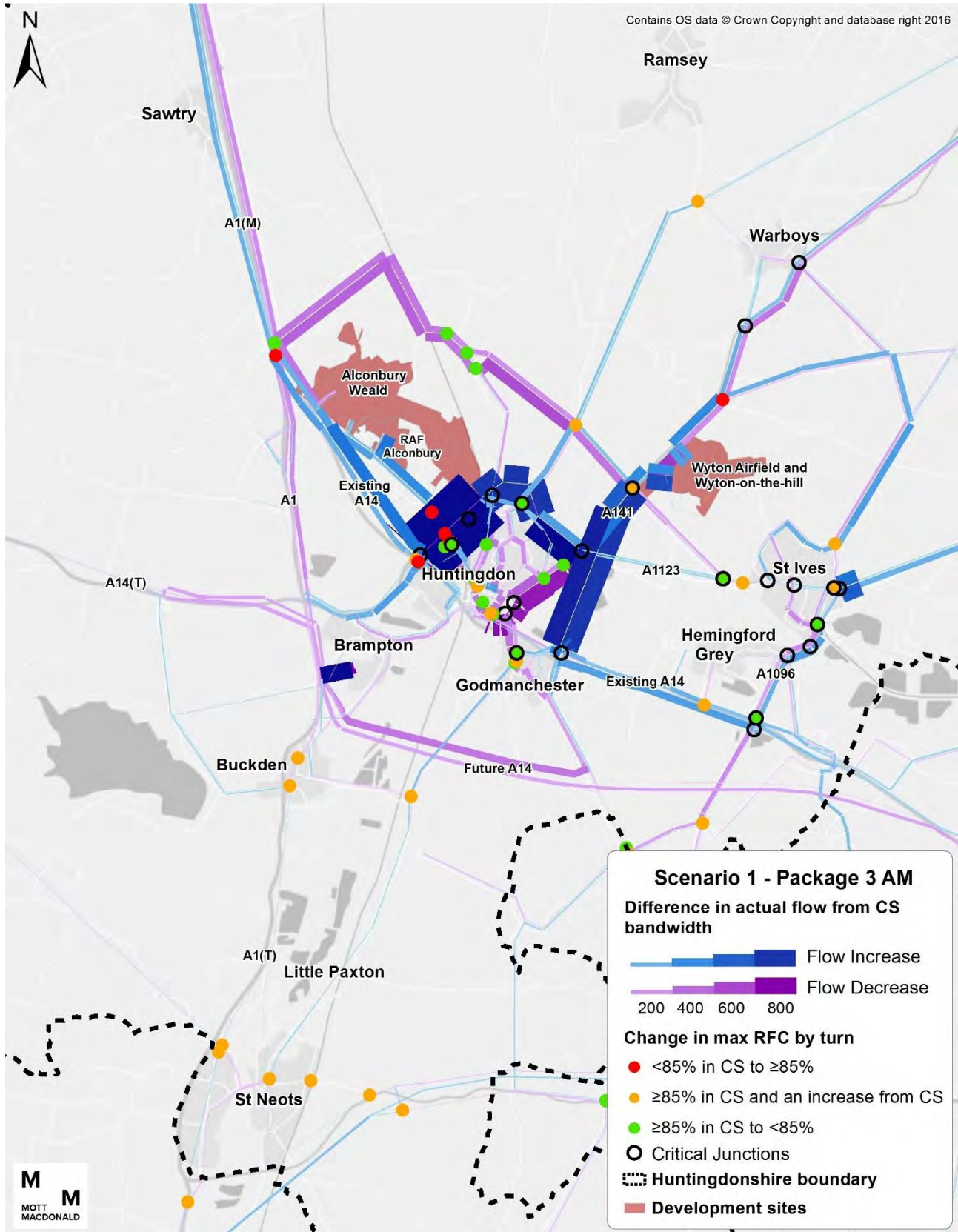


Figure 113: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 3, AM



Source: CSRM

Figure 114: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 3, PM

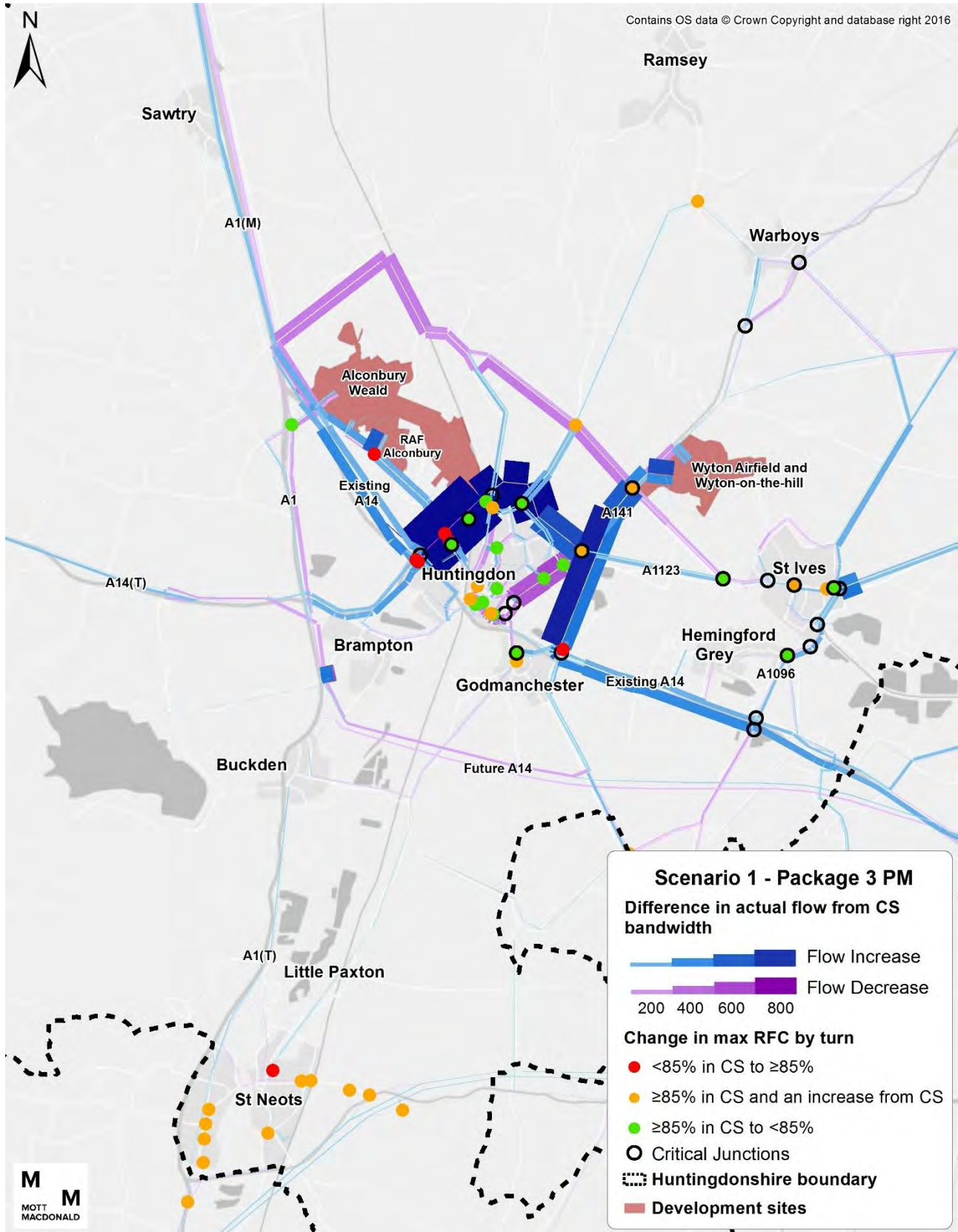


Figure 115: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 4, AM

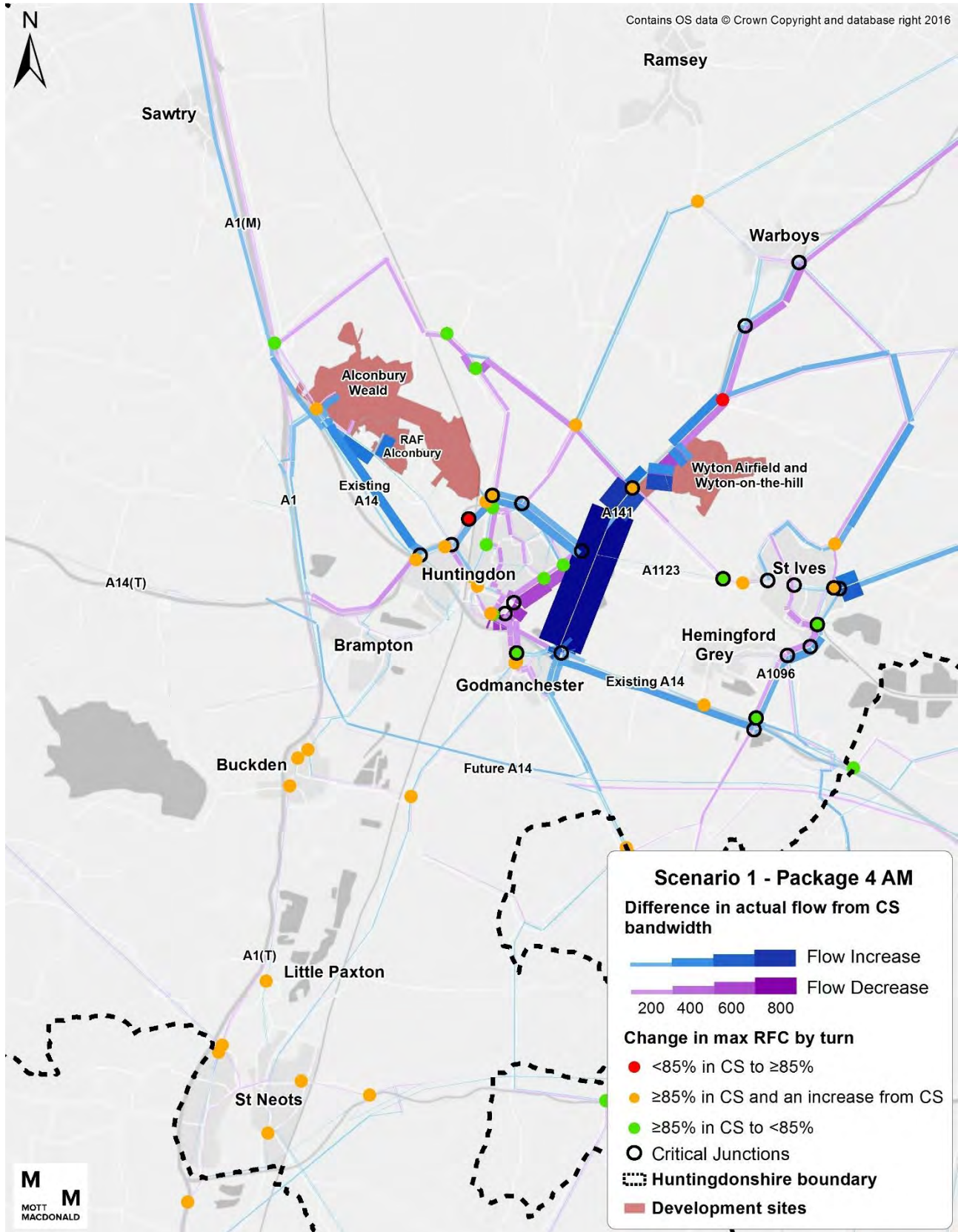
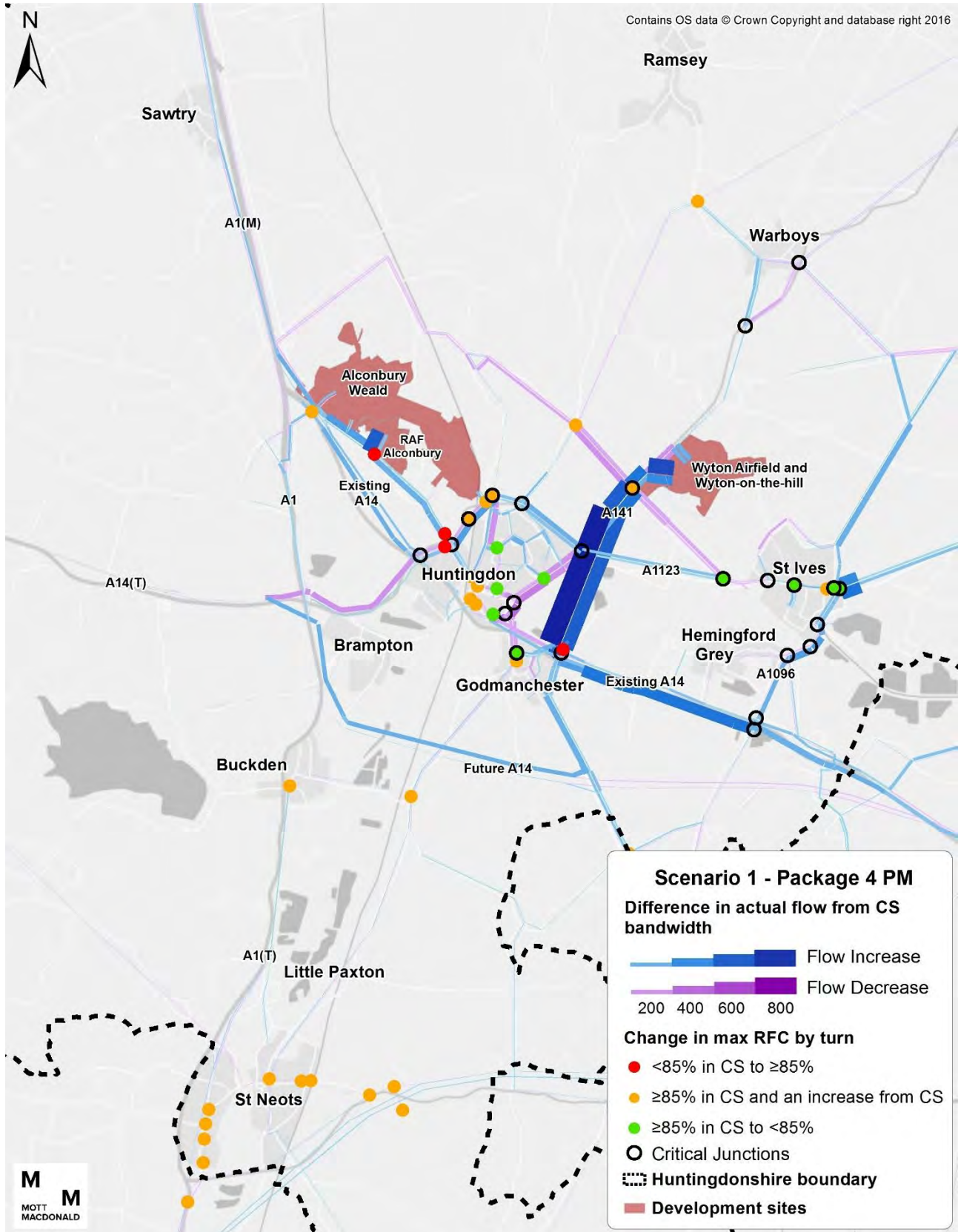


Figure 116: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 4, PM



Source: CSRM

Figure 117: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 5, AM

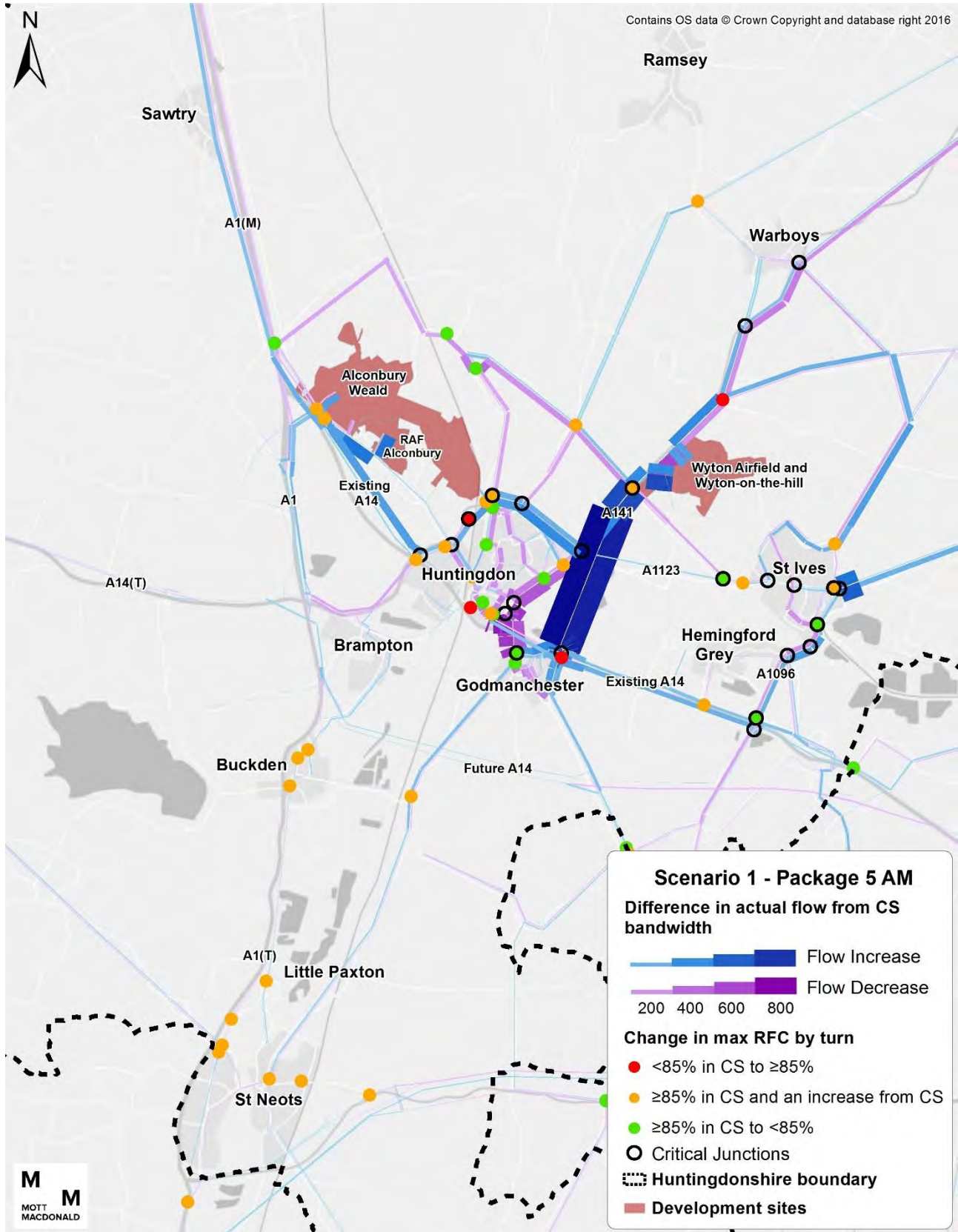
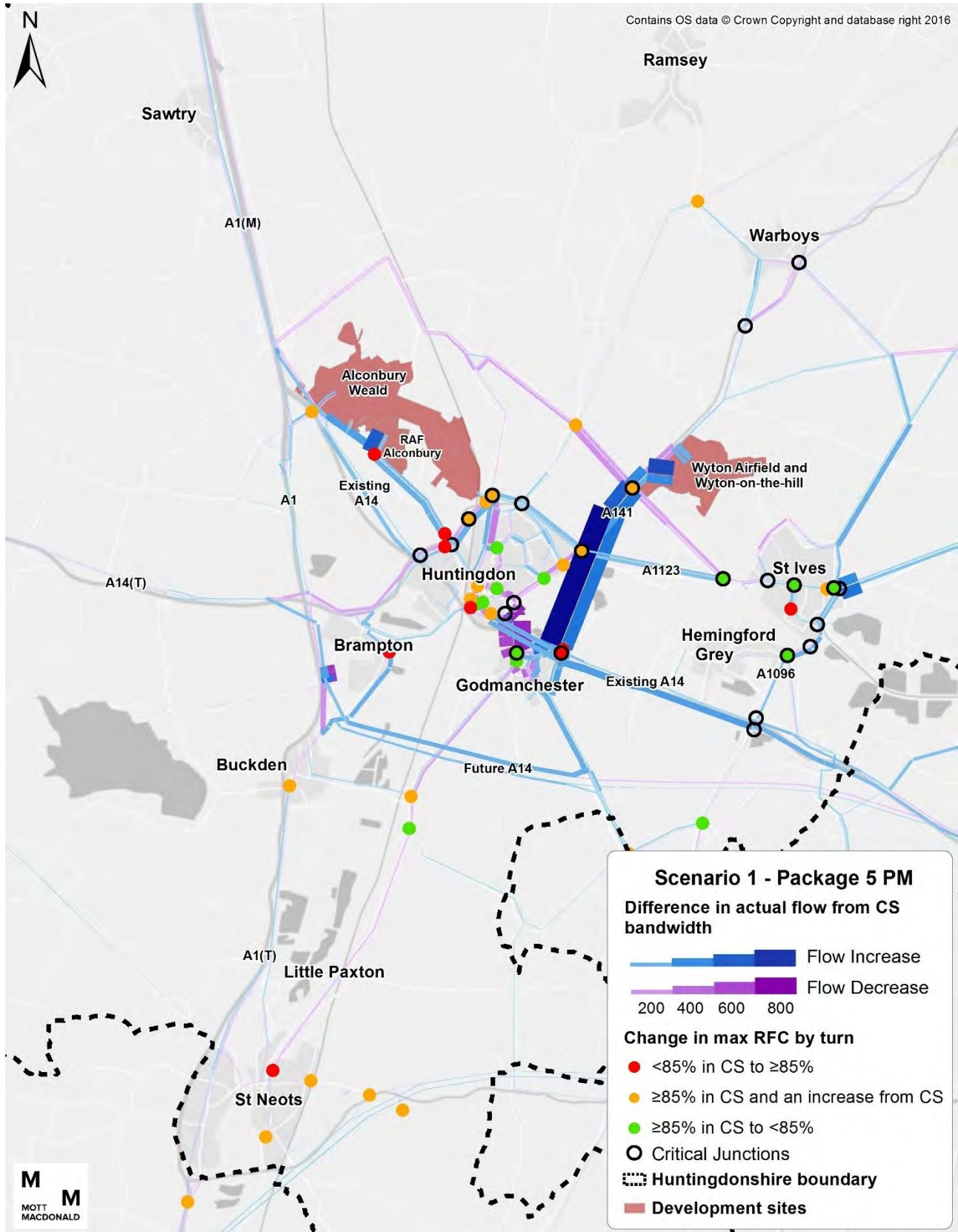


Figure 118: Flow and junction RFC difference from Core Scenario – Scenario 1, Package 5, PM



E.2 Scenario 2 Modelling Results

For each mitigation package model run for Scenario 2, the following plots show, for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

Figure 119: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 1, AM

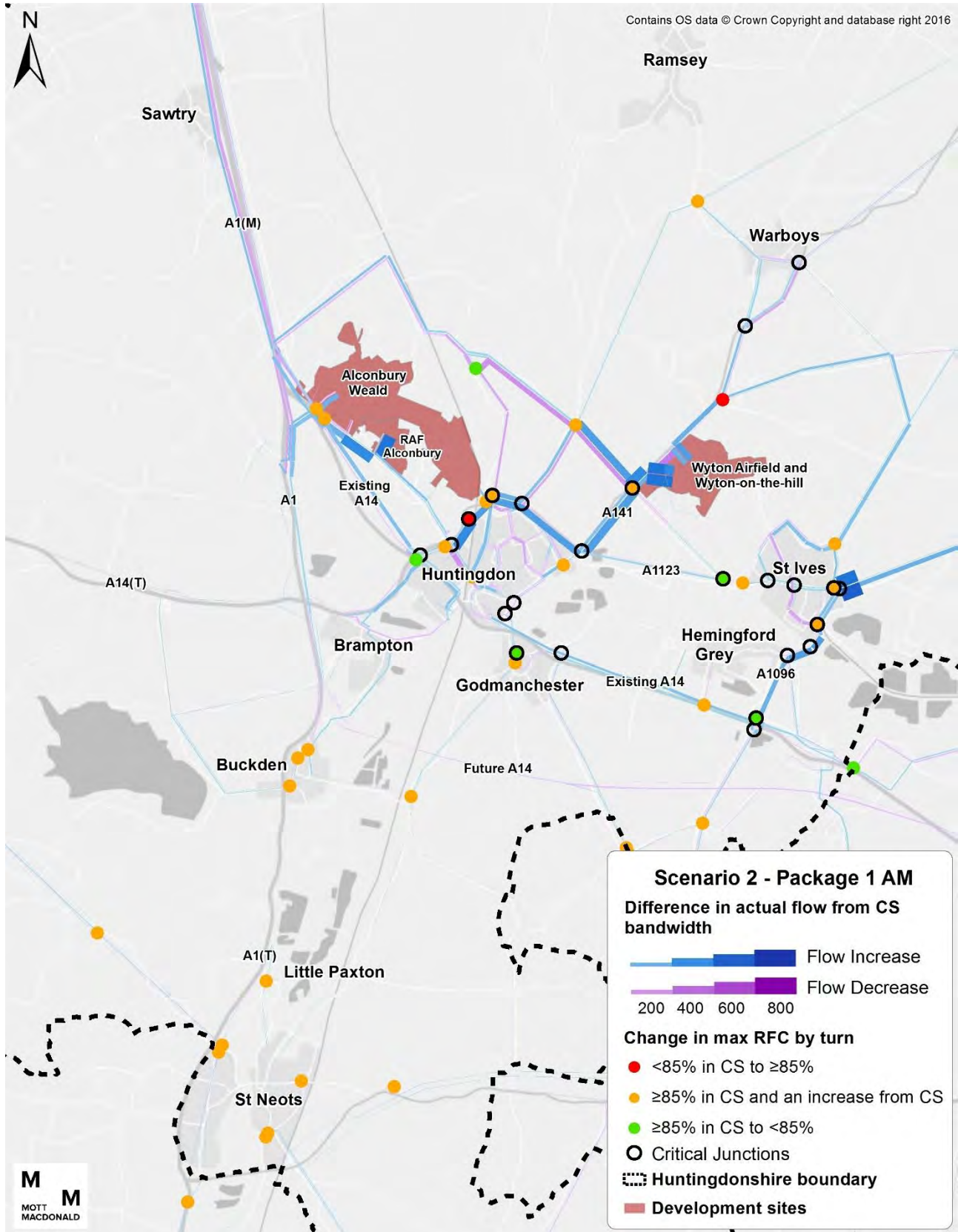


Figure 120: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 1, PM

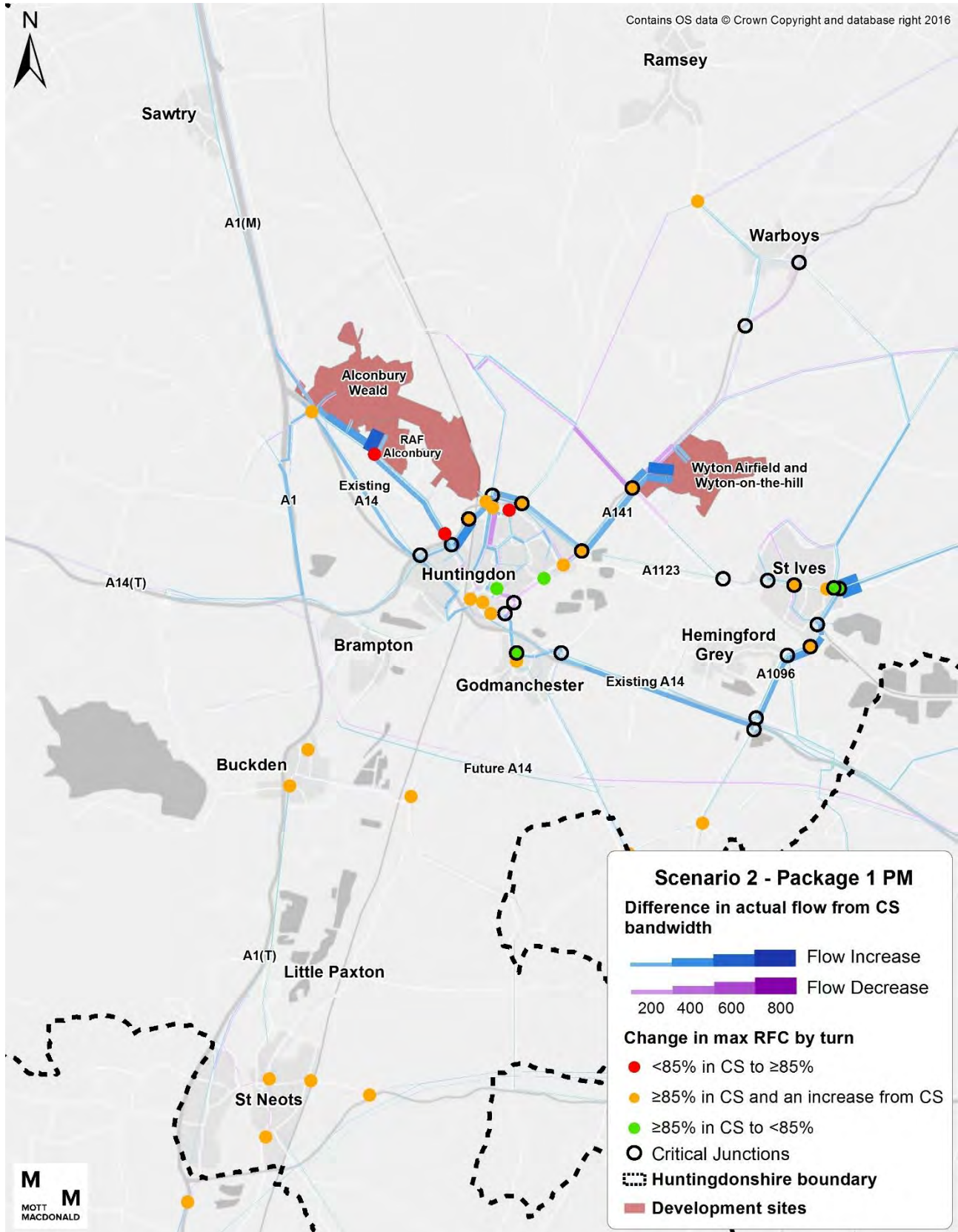
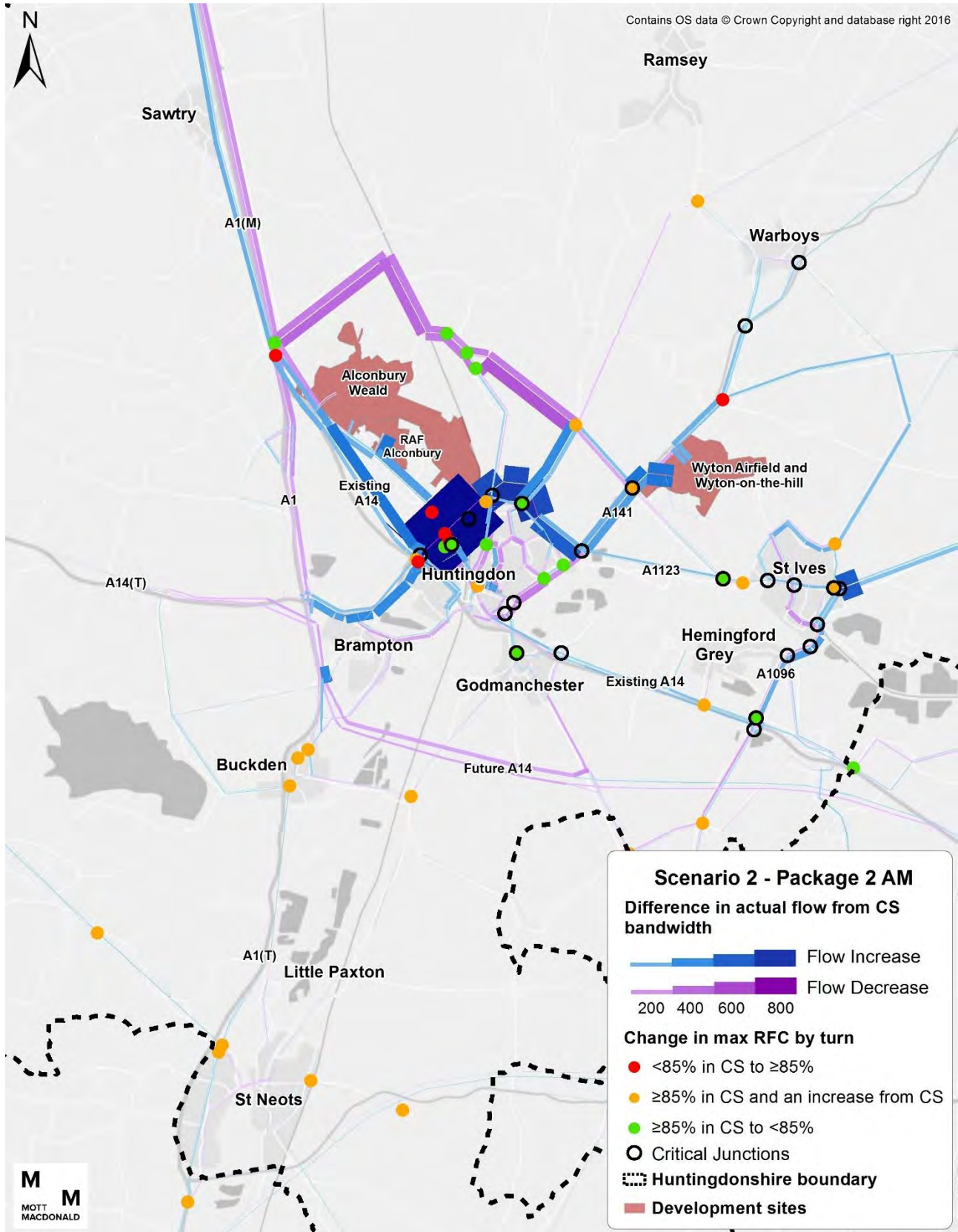


Figure 121: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 2, AM



Source: CSRM

Figure 122: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 2, PM

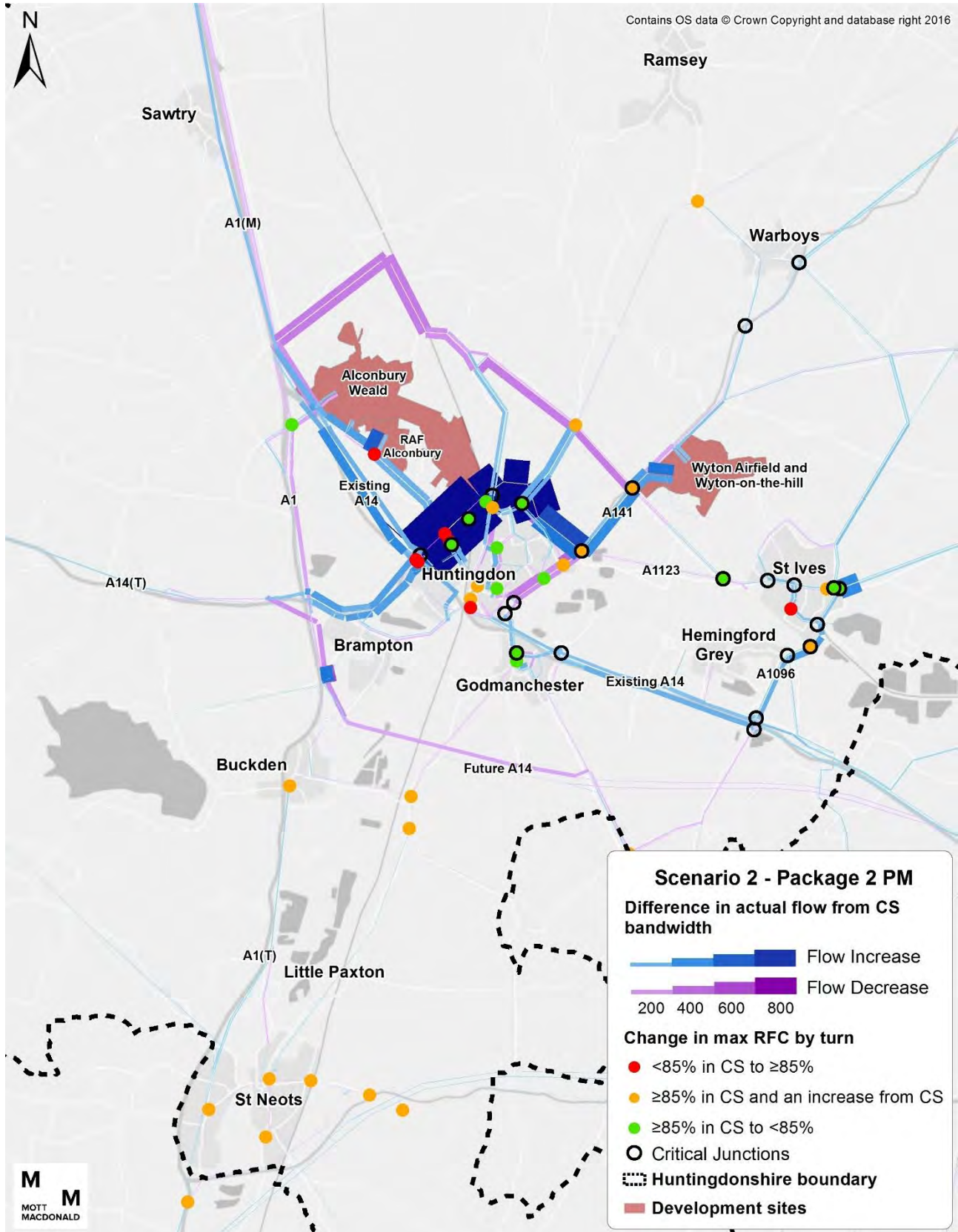
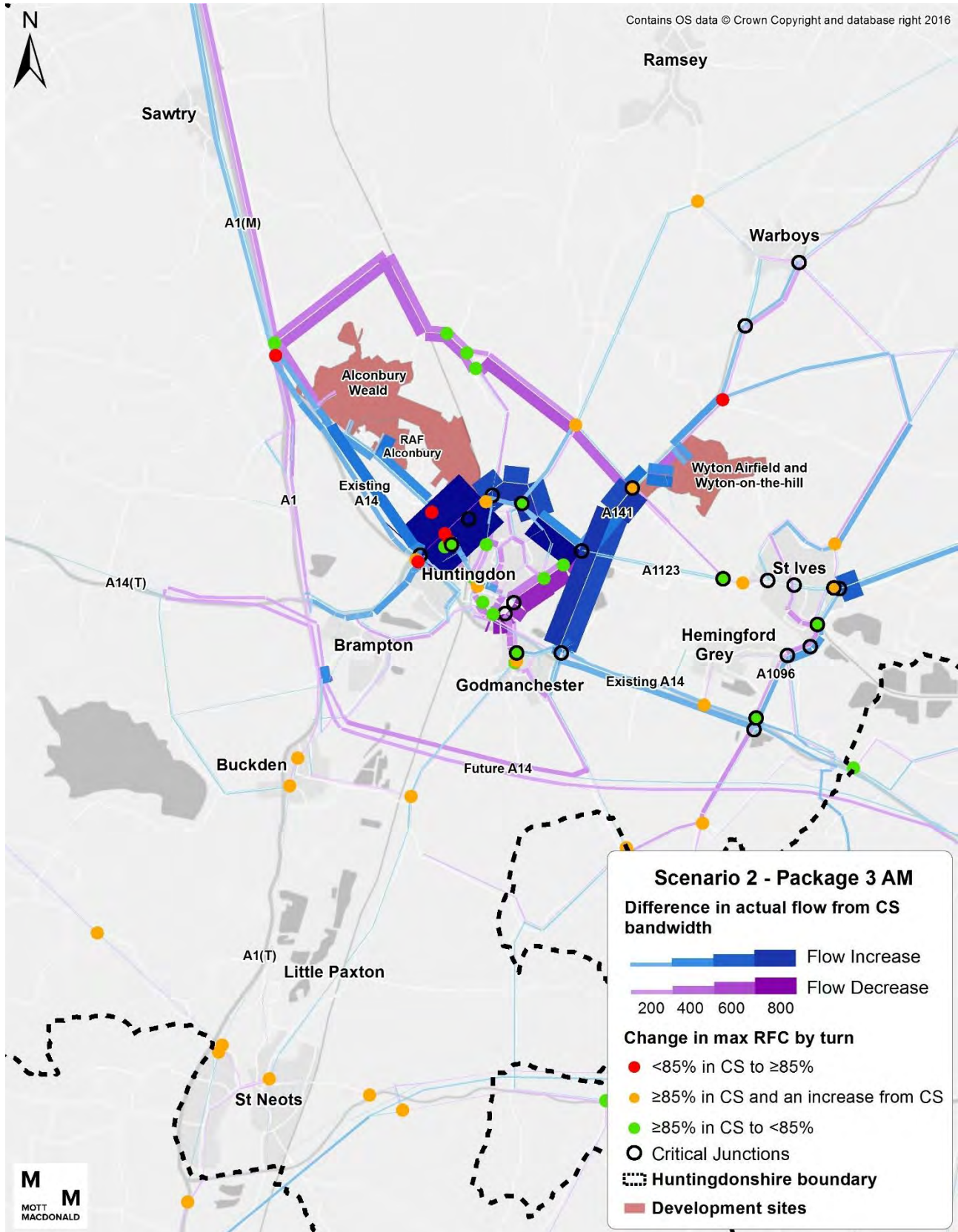
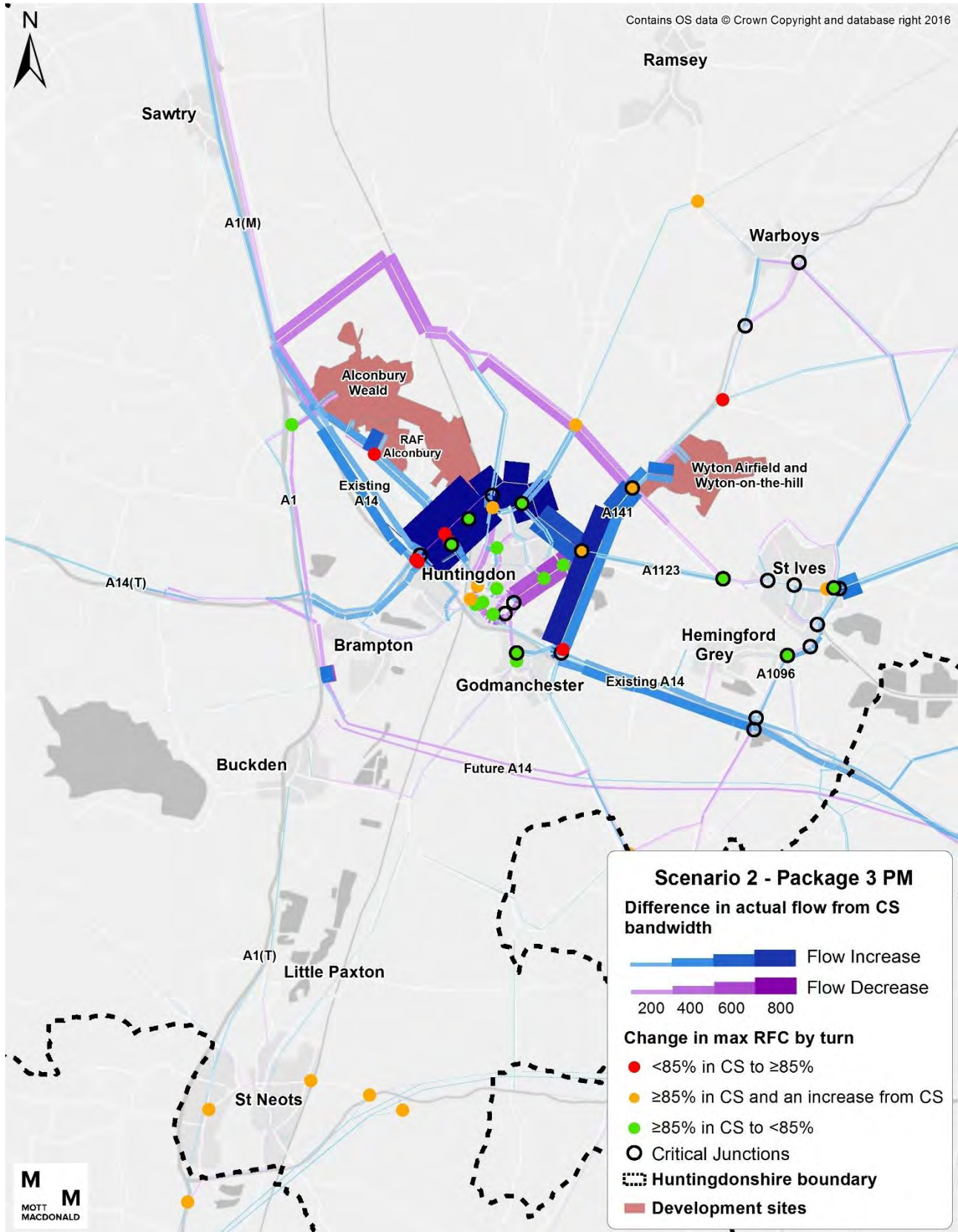


Figure 123: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 3, AM



Source: CSRM

Figure 124: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 3, PM



Source: CSRM

Figure 125: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 4, AM

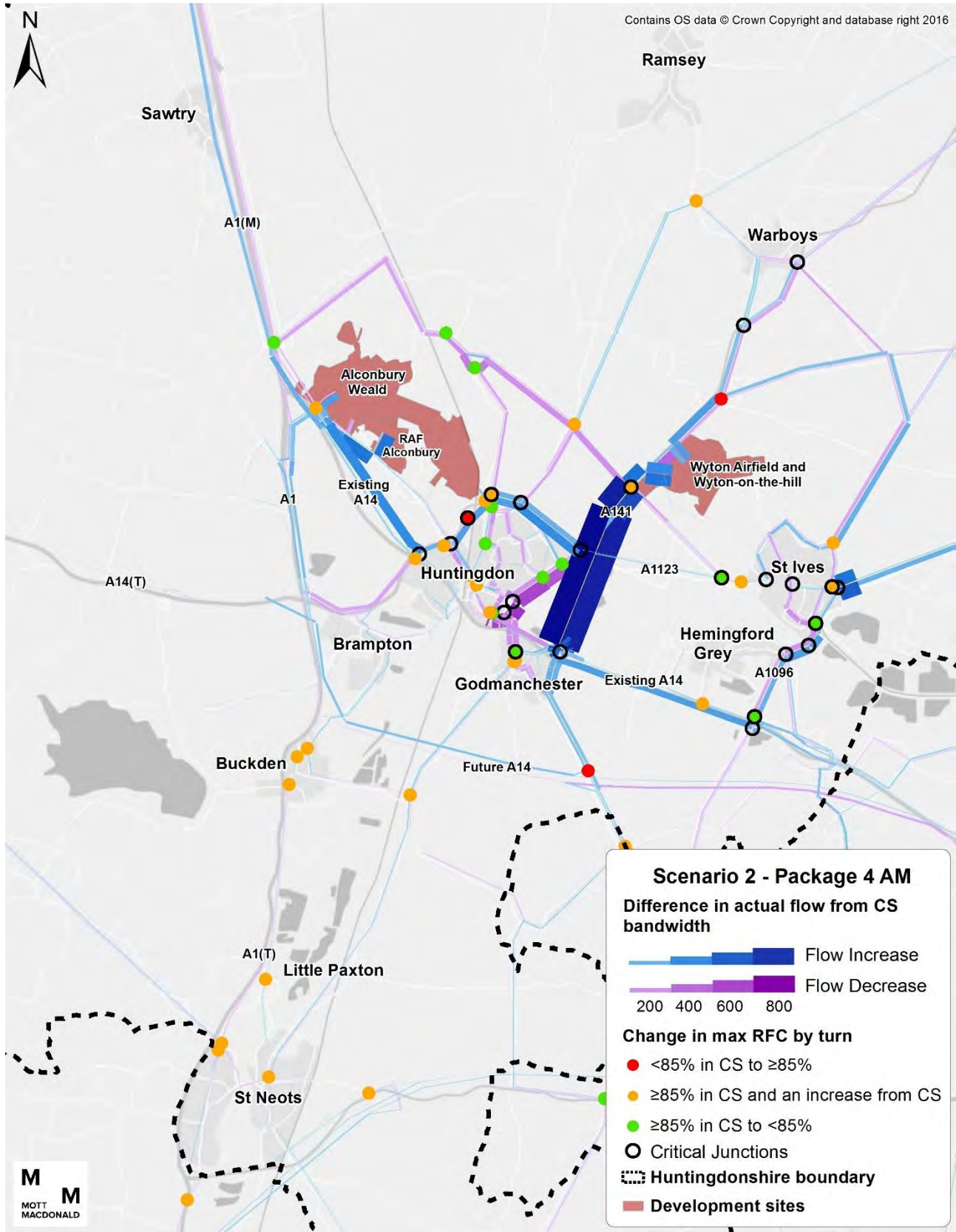


Figure 126: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 4, PM

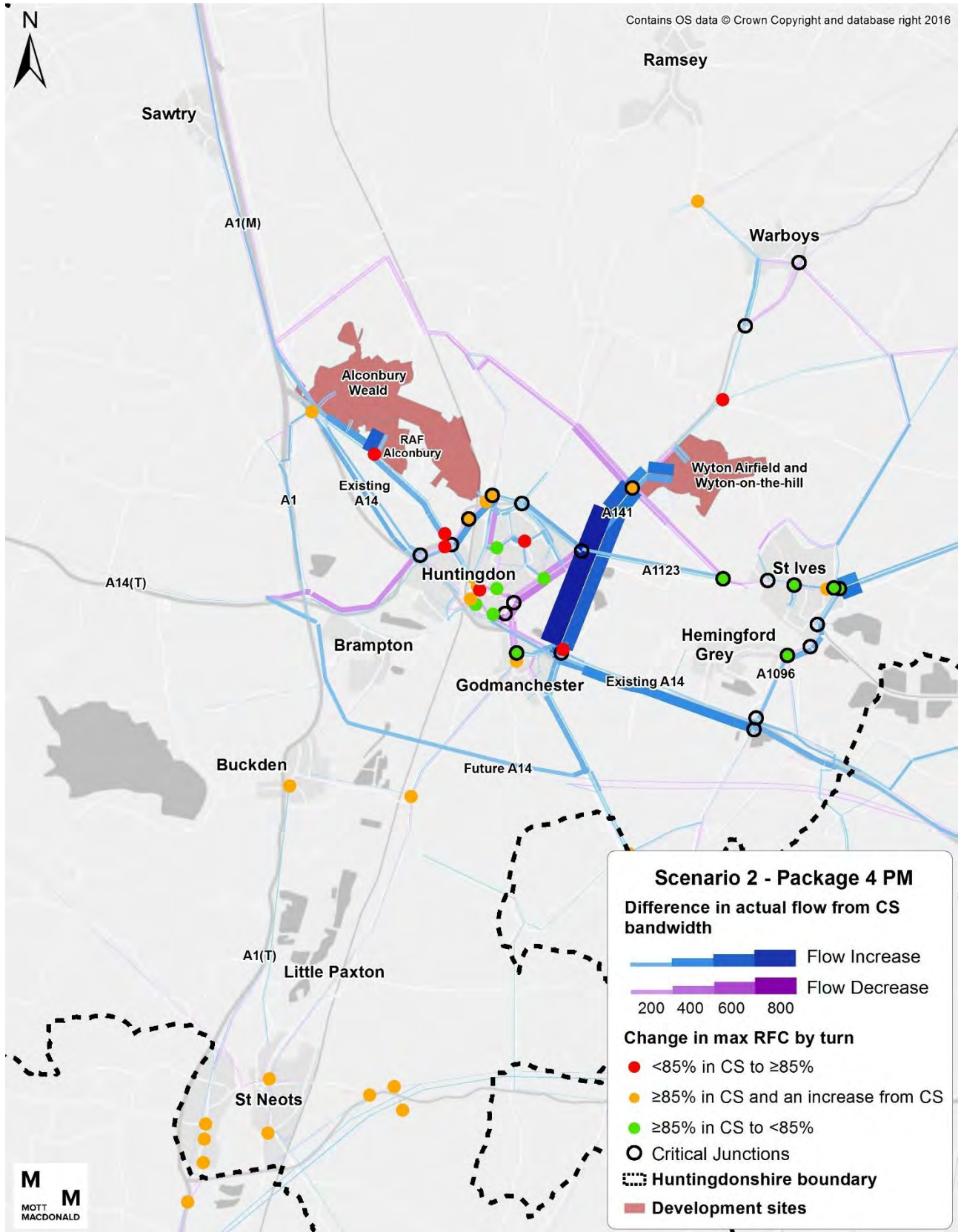


Figure 127: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 5, AM

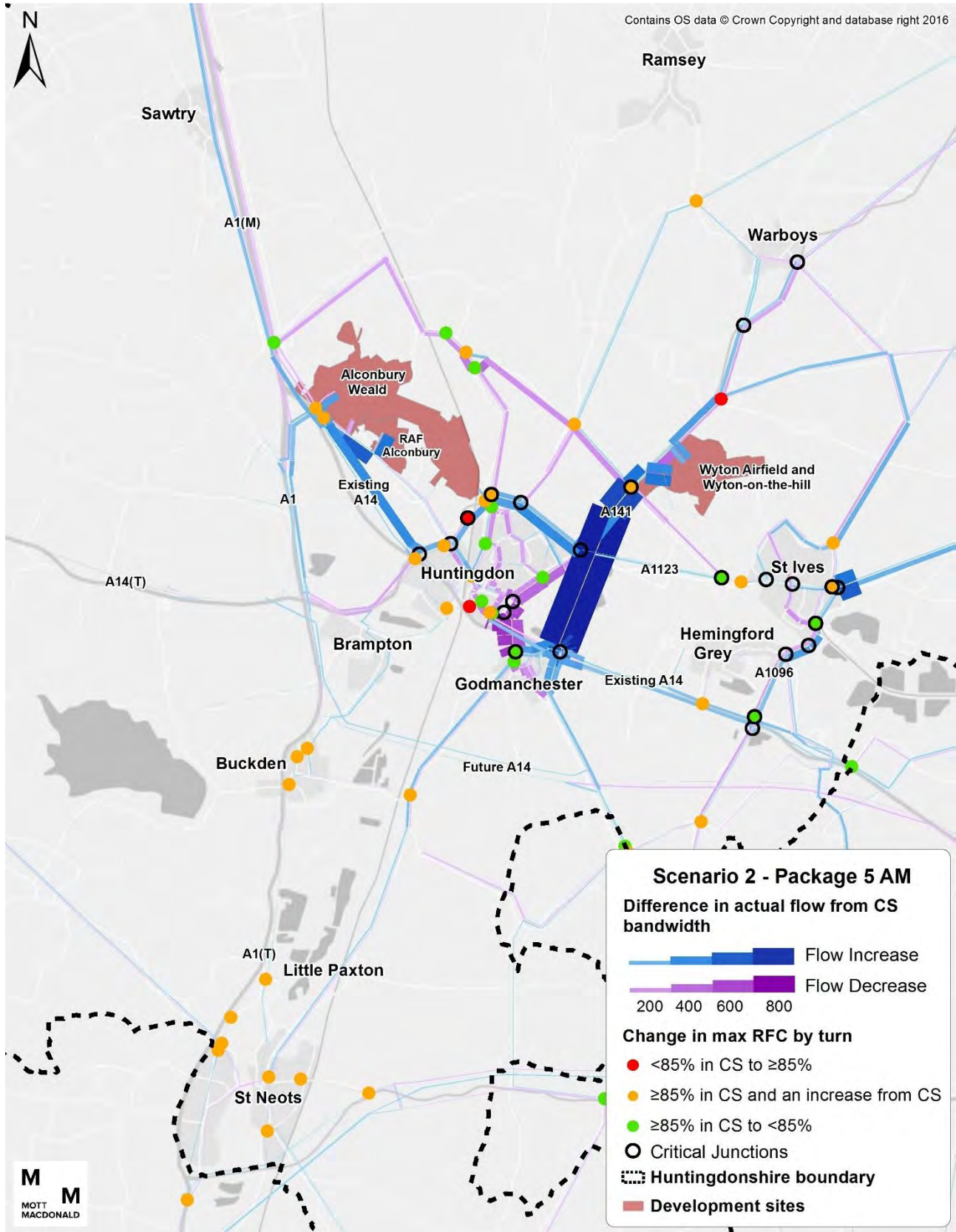
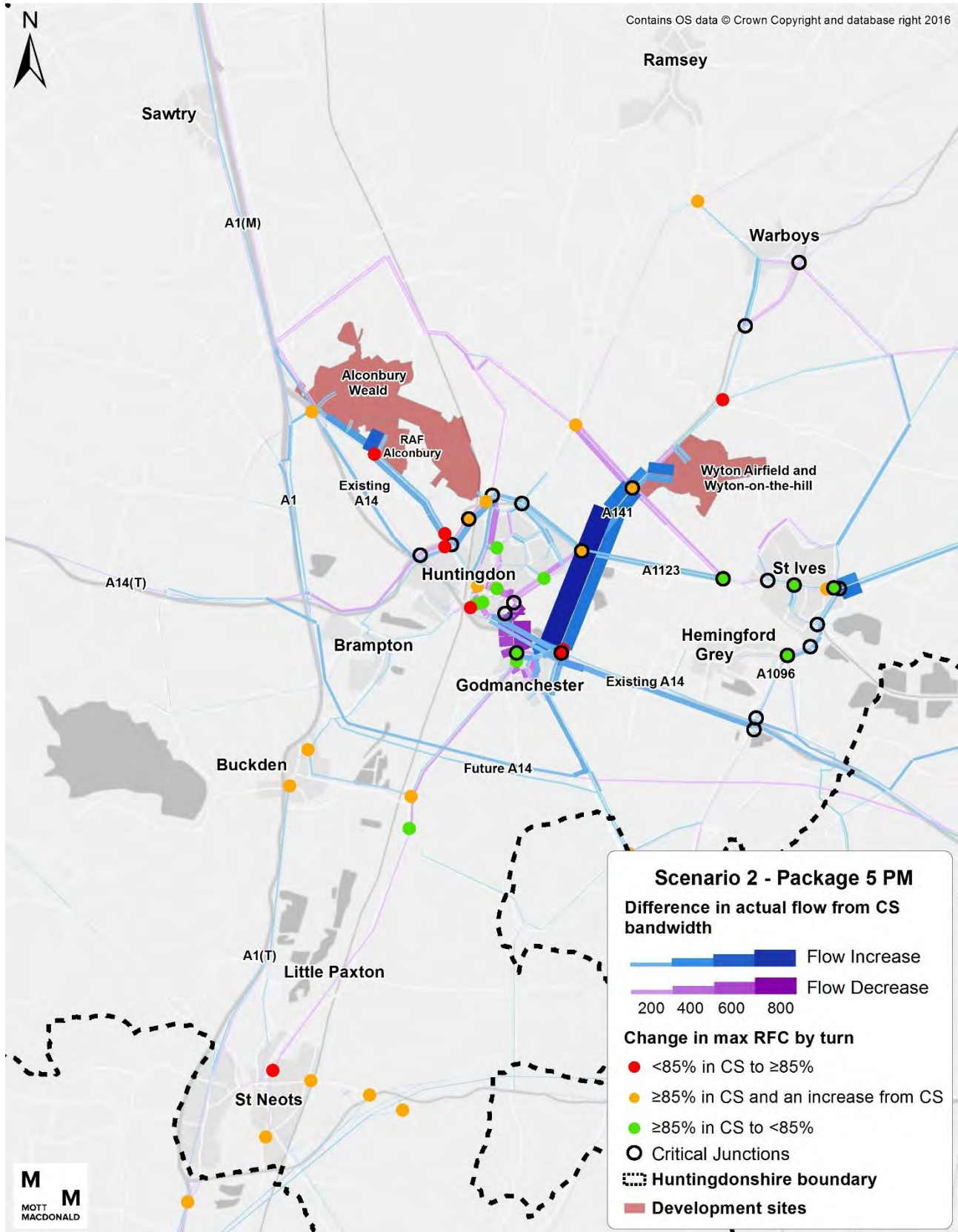


Figure 128: Flow and junction RFC difference from Core Scenario – Scenario 2, Package 5, PM



E.3 Scenario 3 Modelling Results

For each mitigation package model run for Scenario 3, the following plots show, for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

Figure 129: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 1, AM

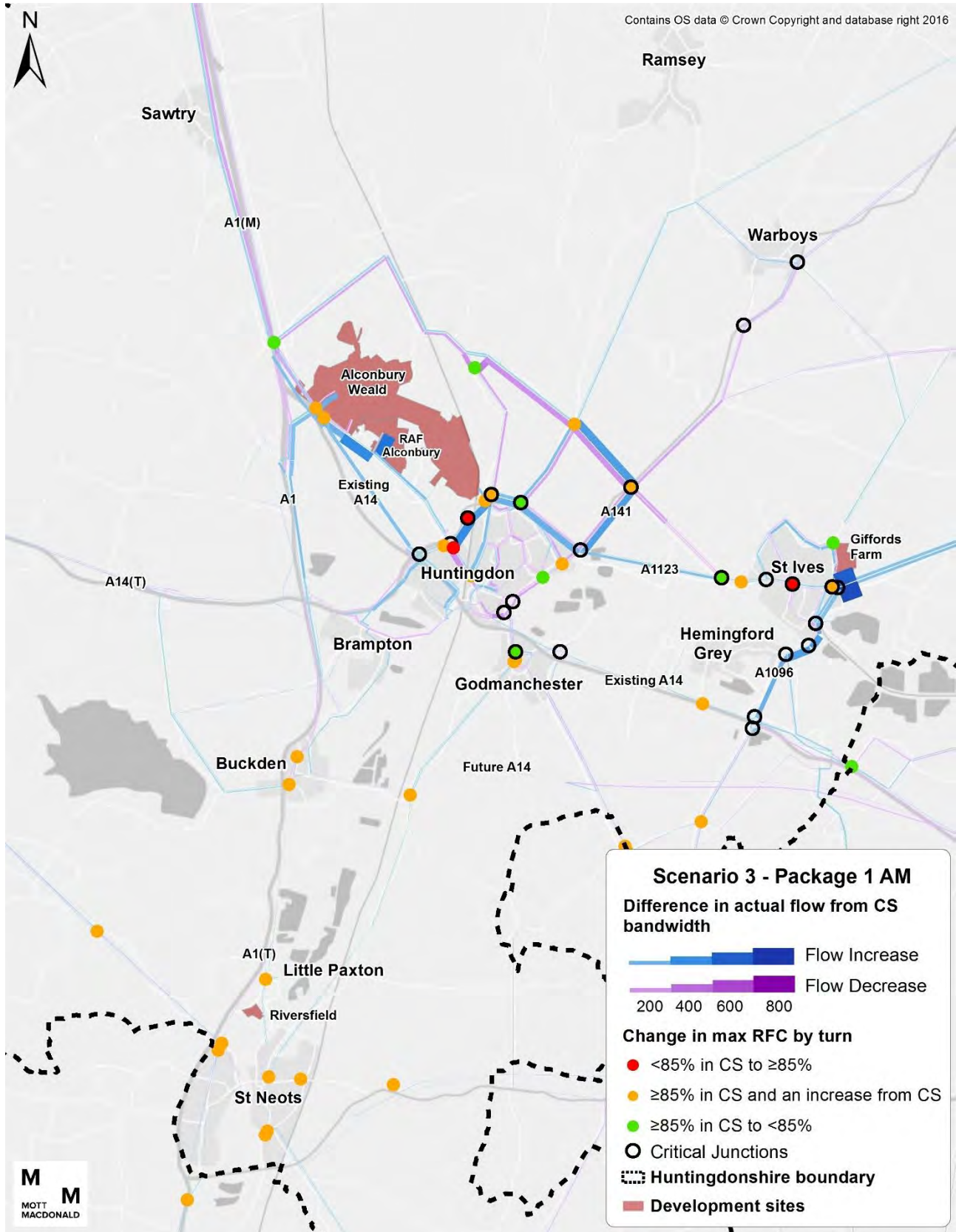


Figure 130: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 1, PM

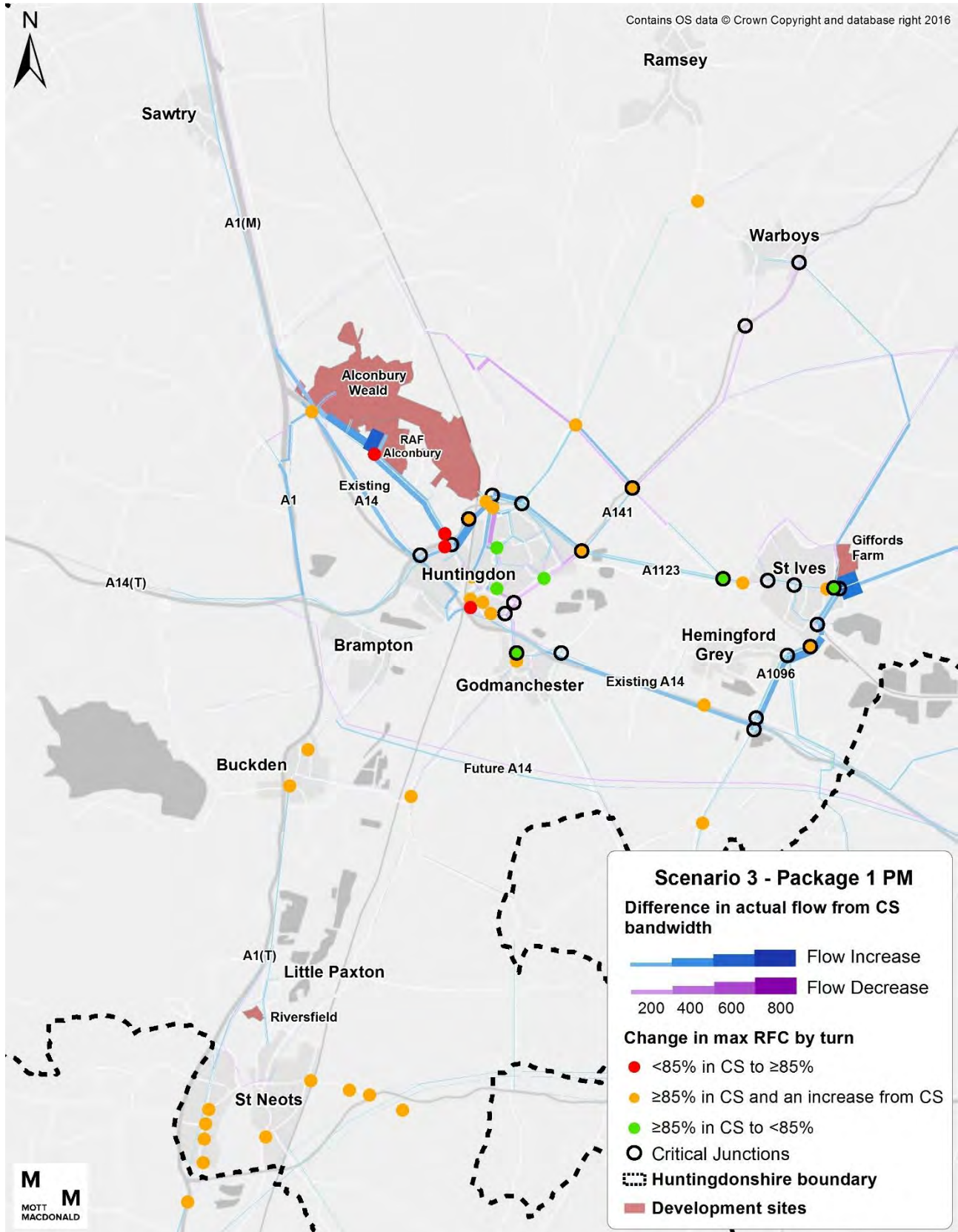


Figure 131: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 2, AM

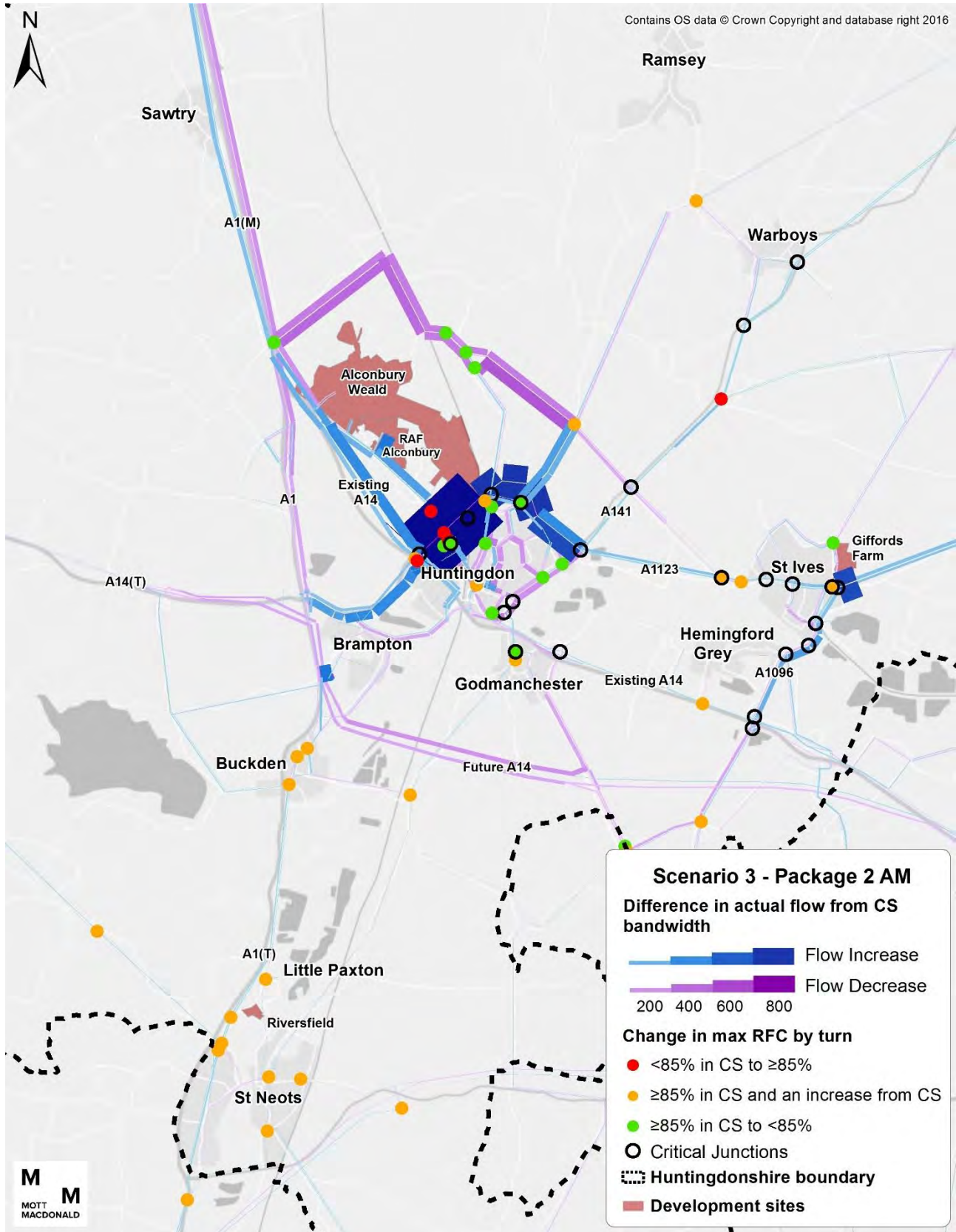


Figure 132: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 2, PM

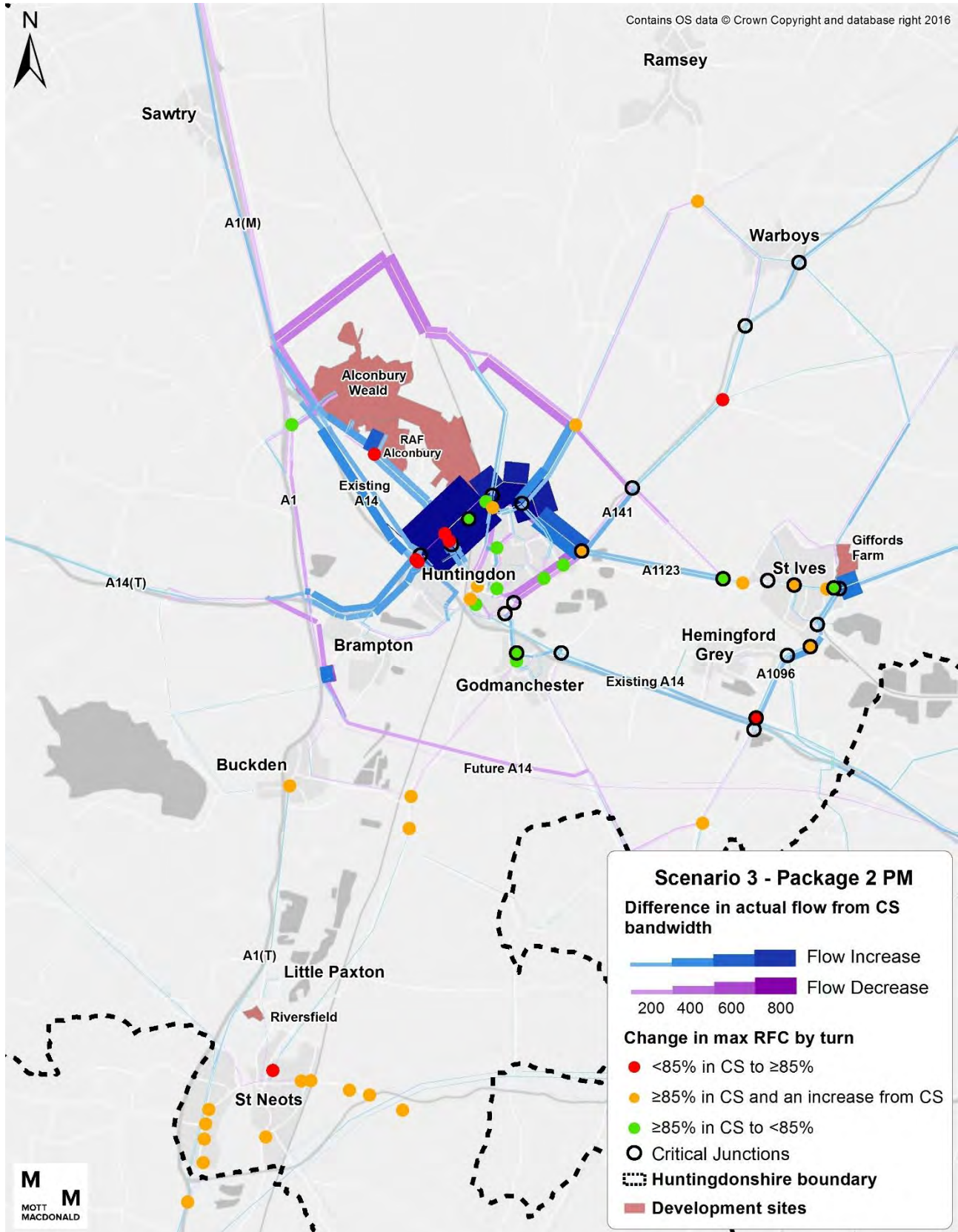
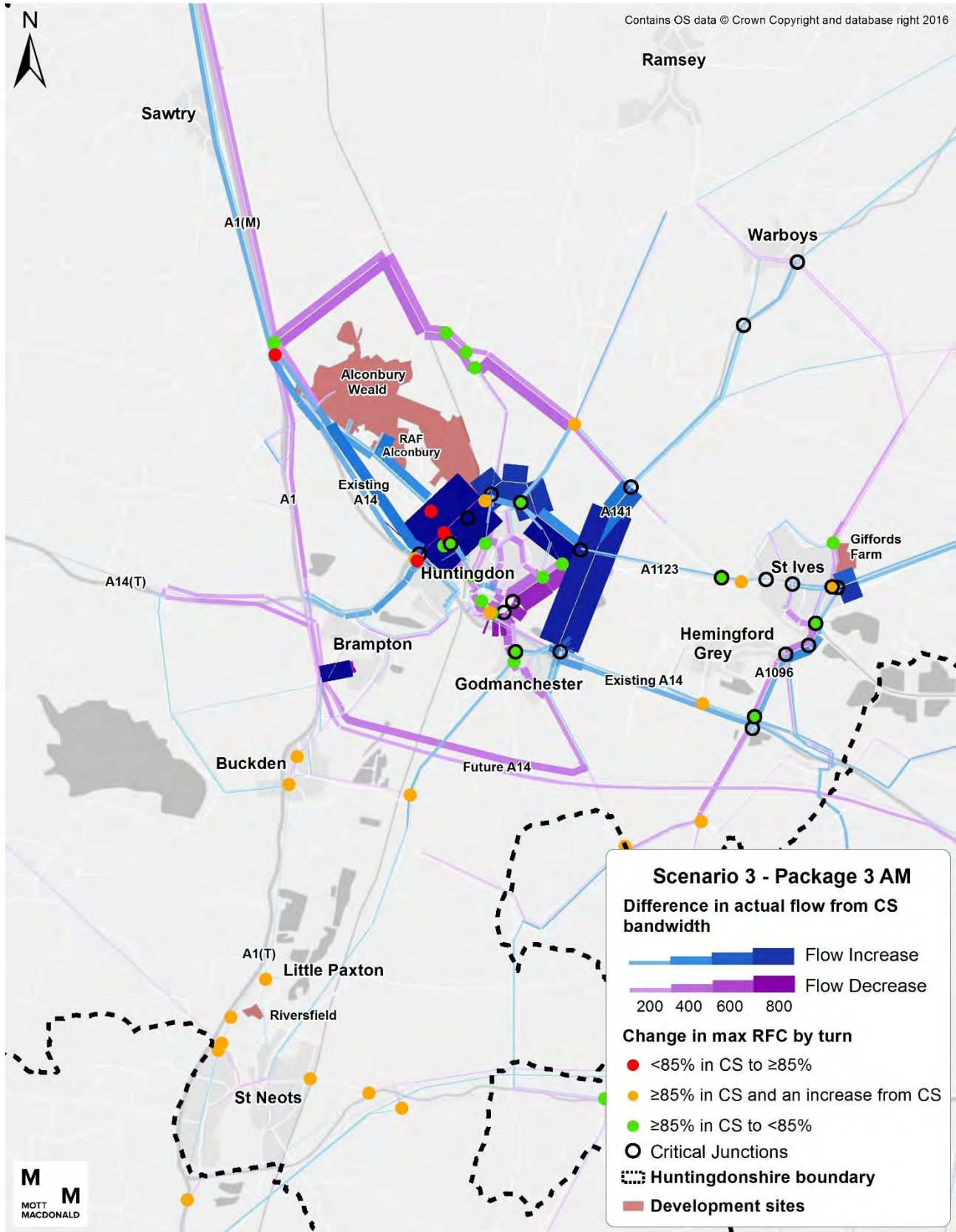


Figure 133: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 3, AM



Source: CSRM

Figure 134: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 3, PM

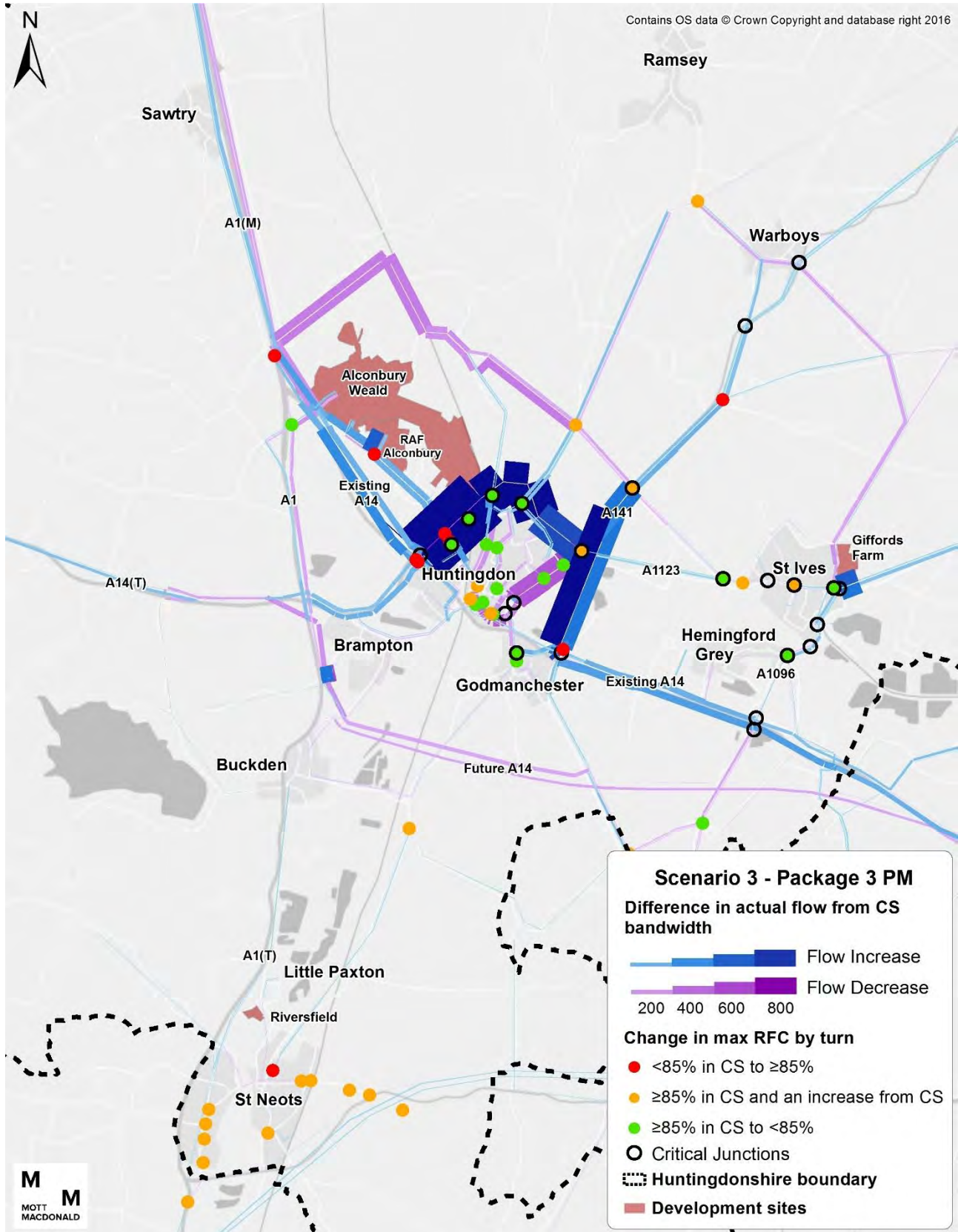


Figure 135: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 4, AM

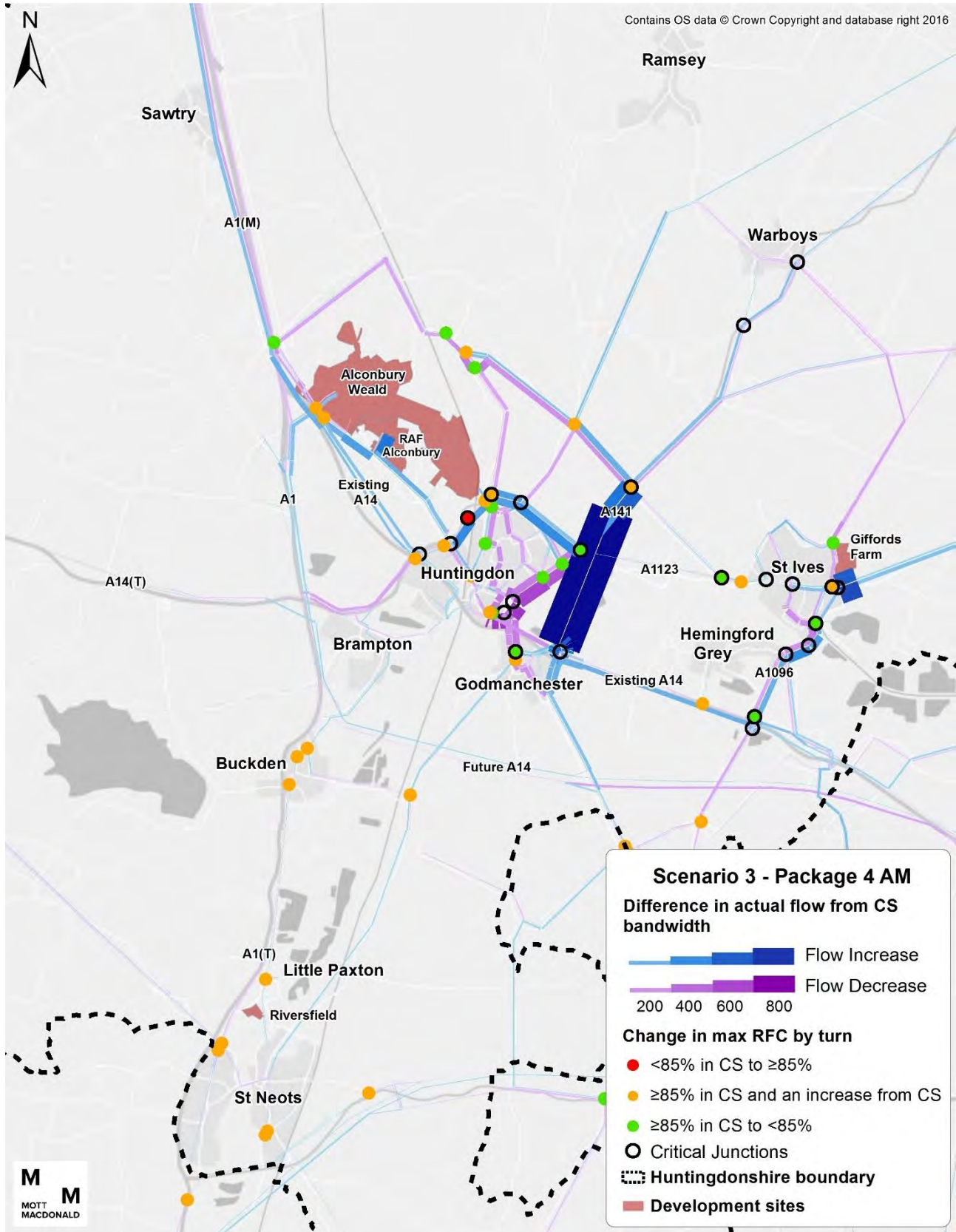


Figure 136: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 4, PM

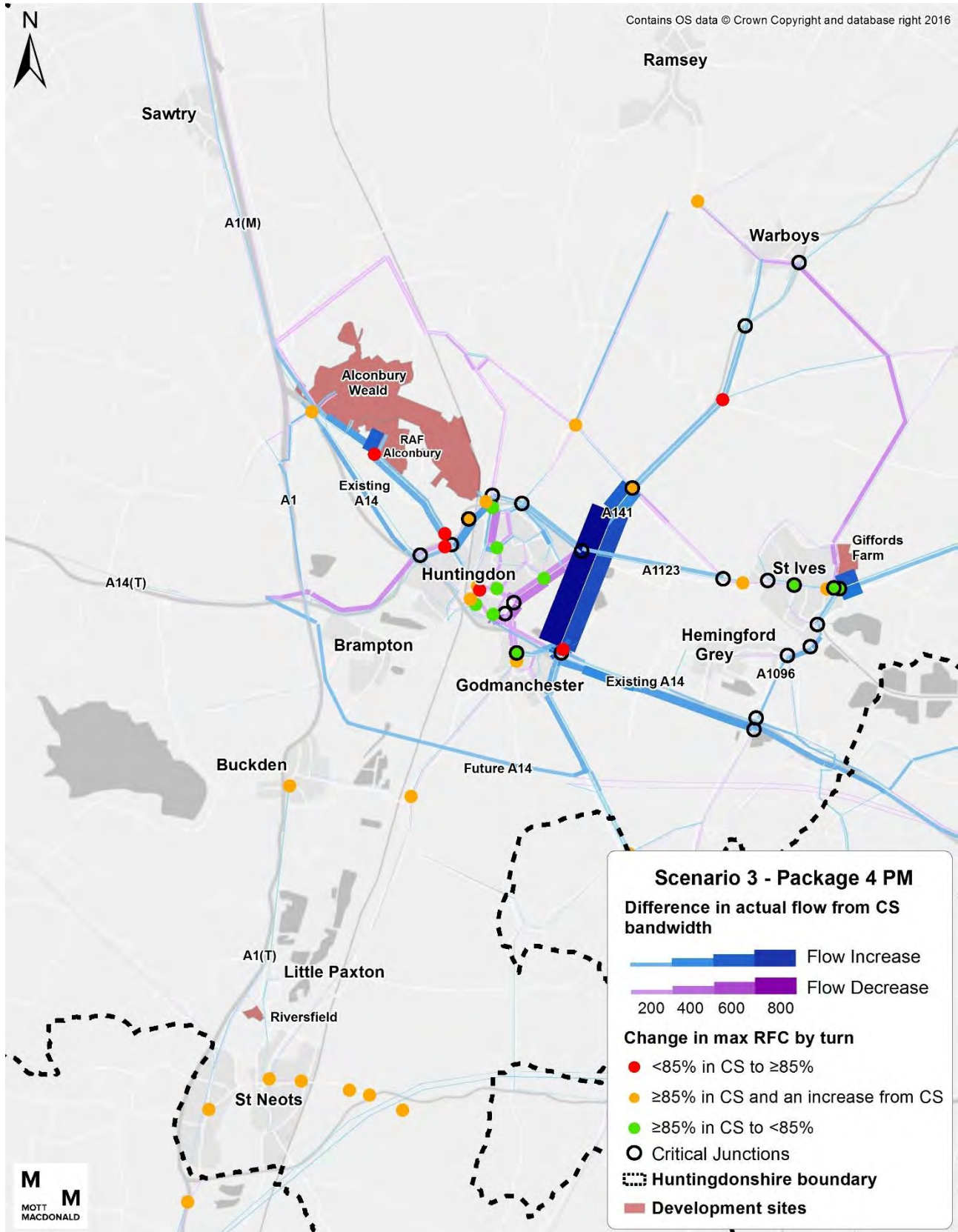


Figure 137: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 5, AM

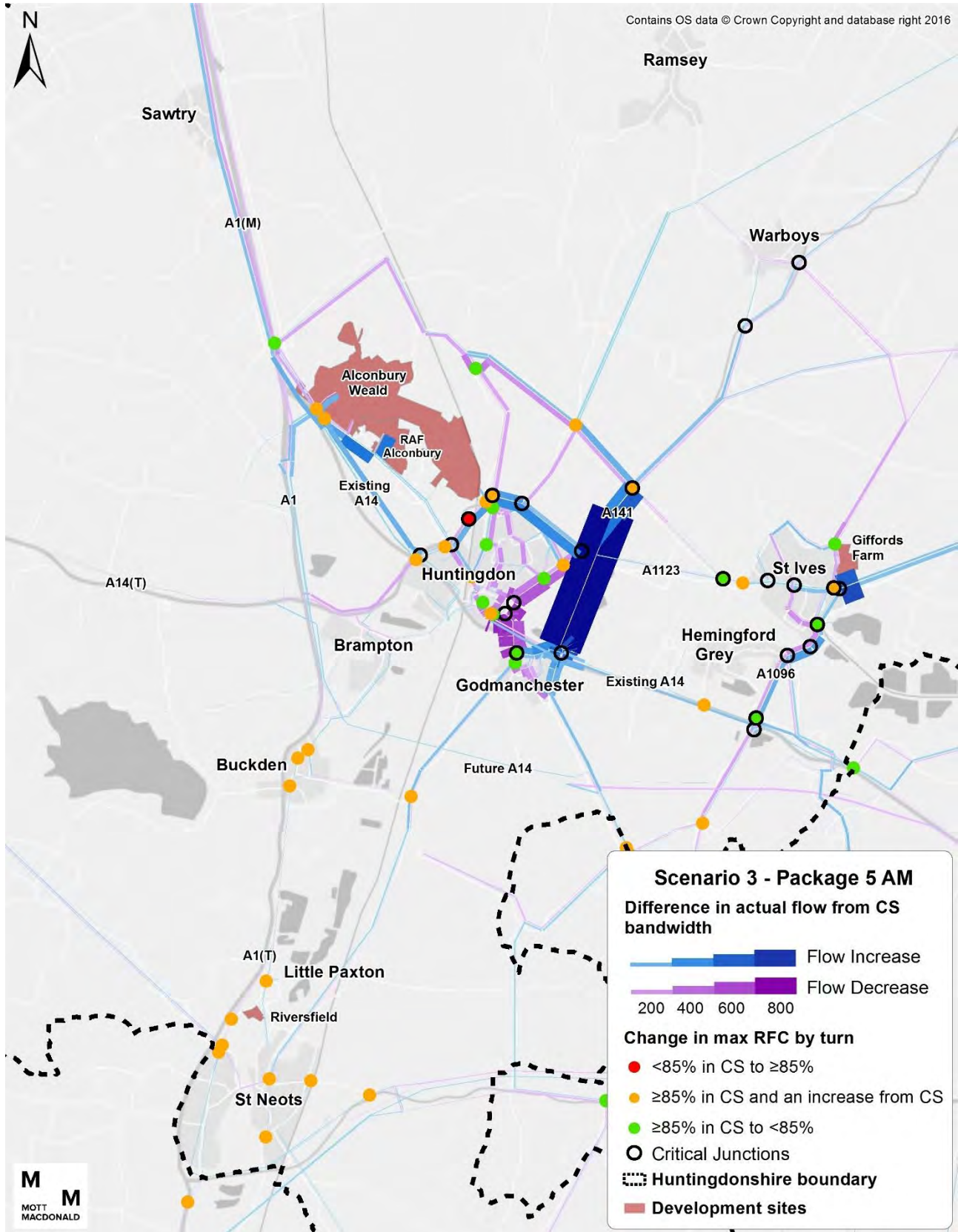
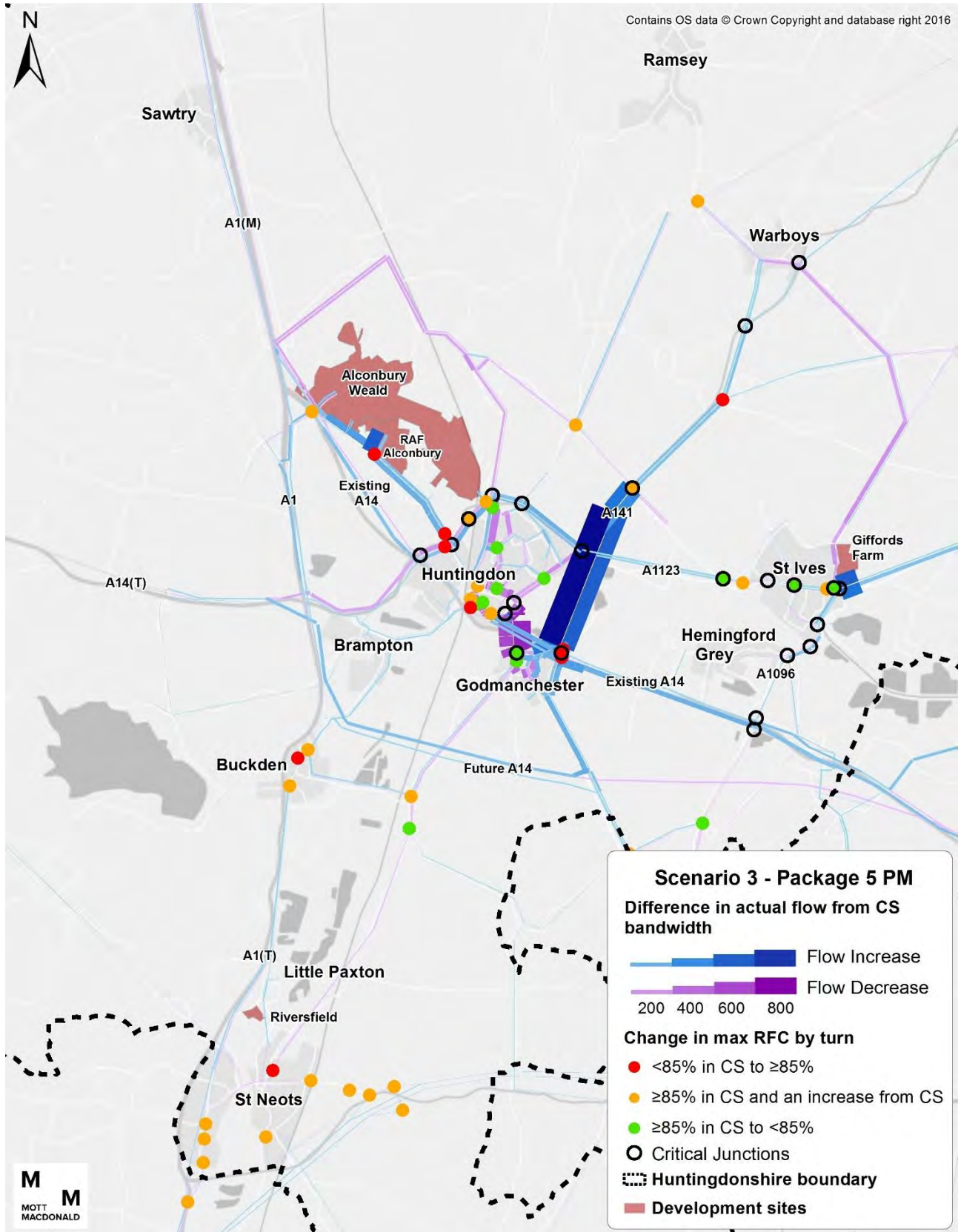


Figure 138: Flow and junction RFC difference from Core Scenario – Scenario 3, Package 5, PM



Source: CSRM

E.4 Scenario 4 Modelling Results

For each mitigation package model run for Scenario 4, the following plots show, for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

Figure 139: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 1, AM

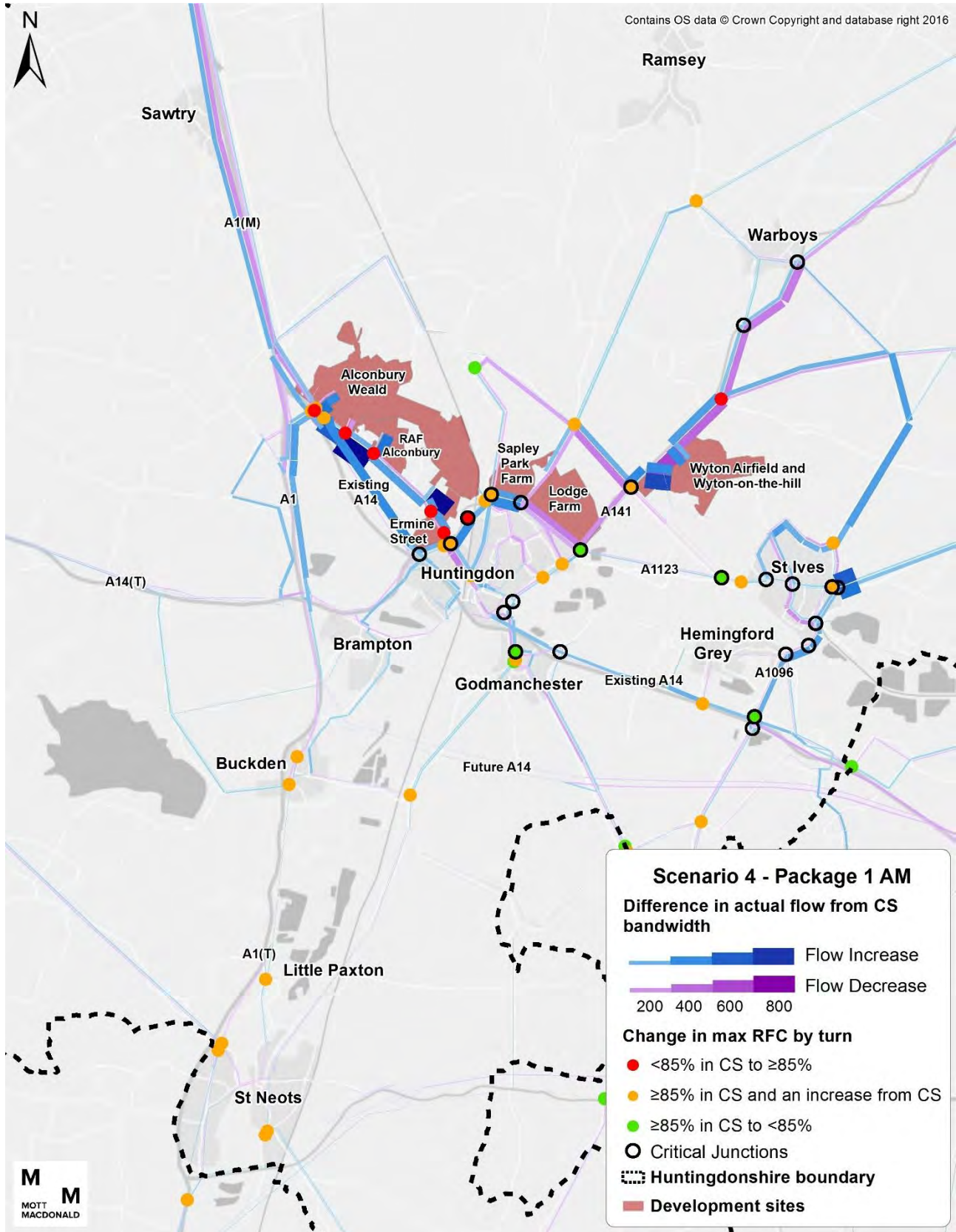


Figure 140: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 1, PM

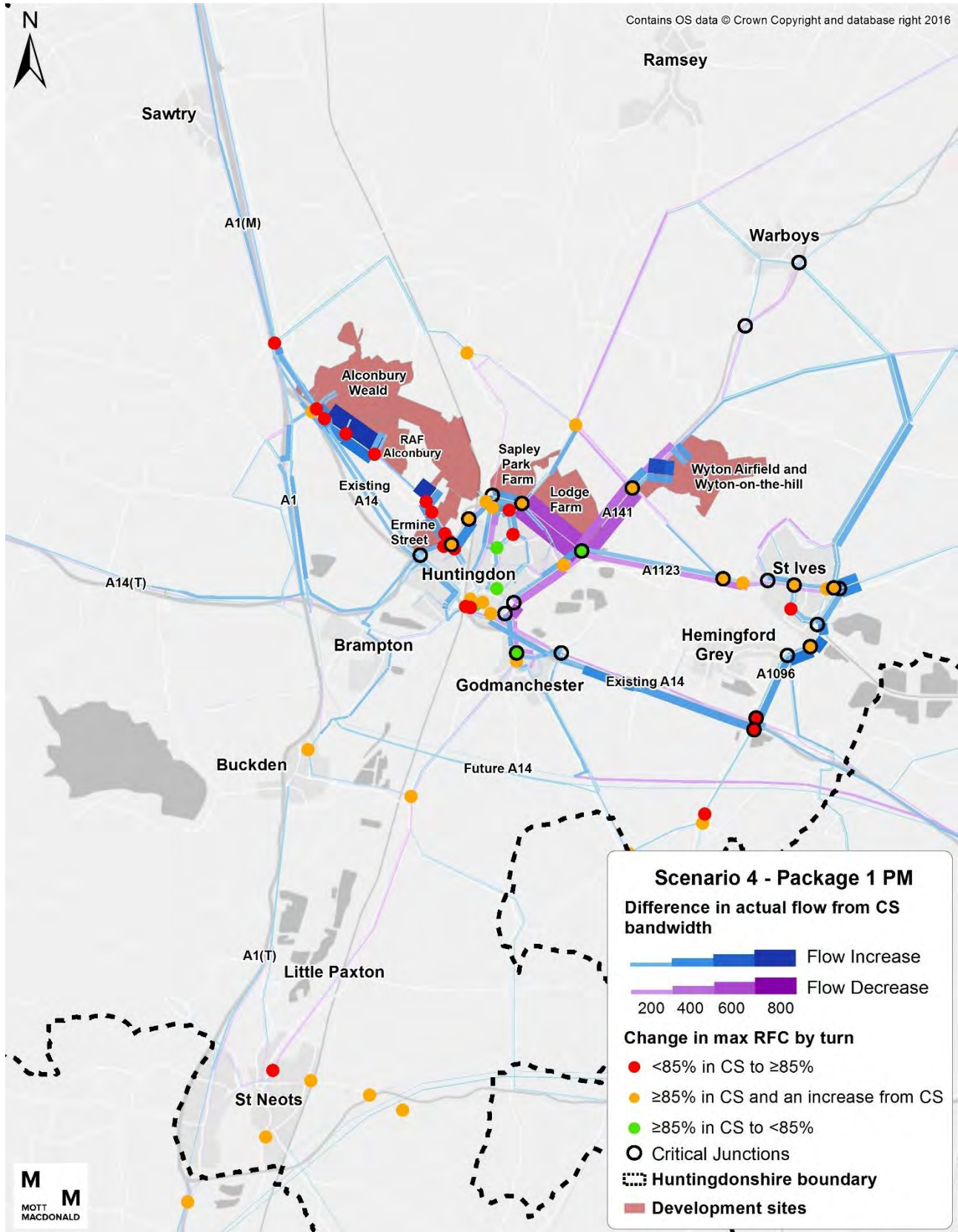


Figure 141: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 2, AM

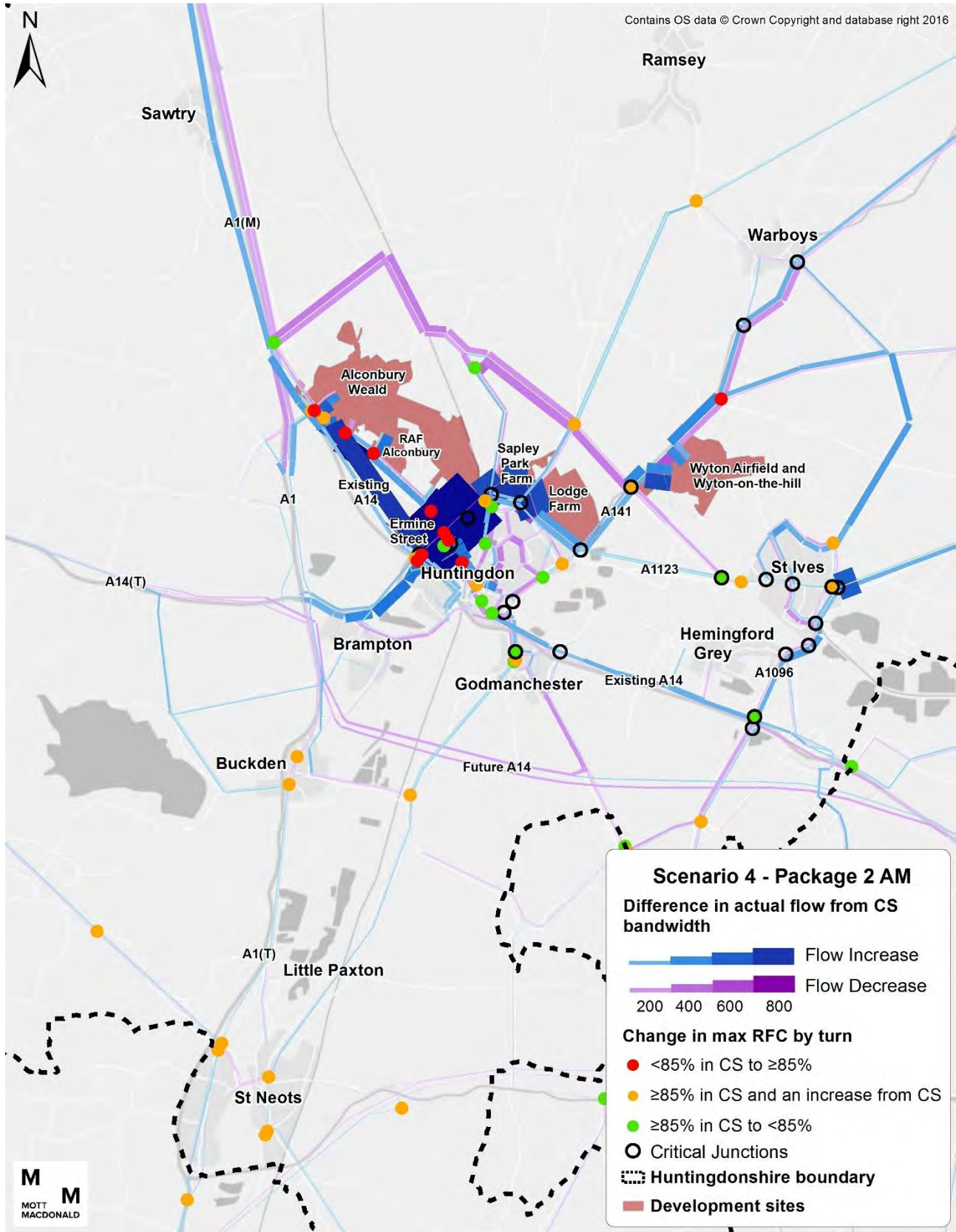


Figure 142: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 2, PM

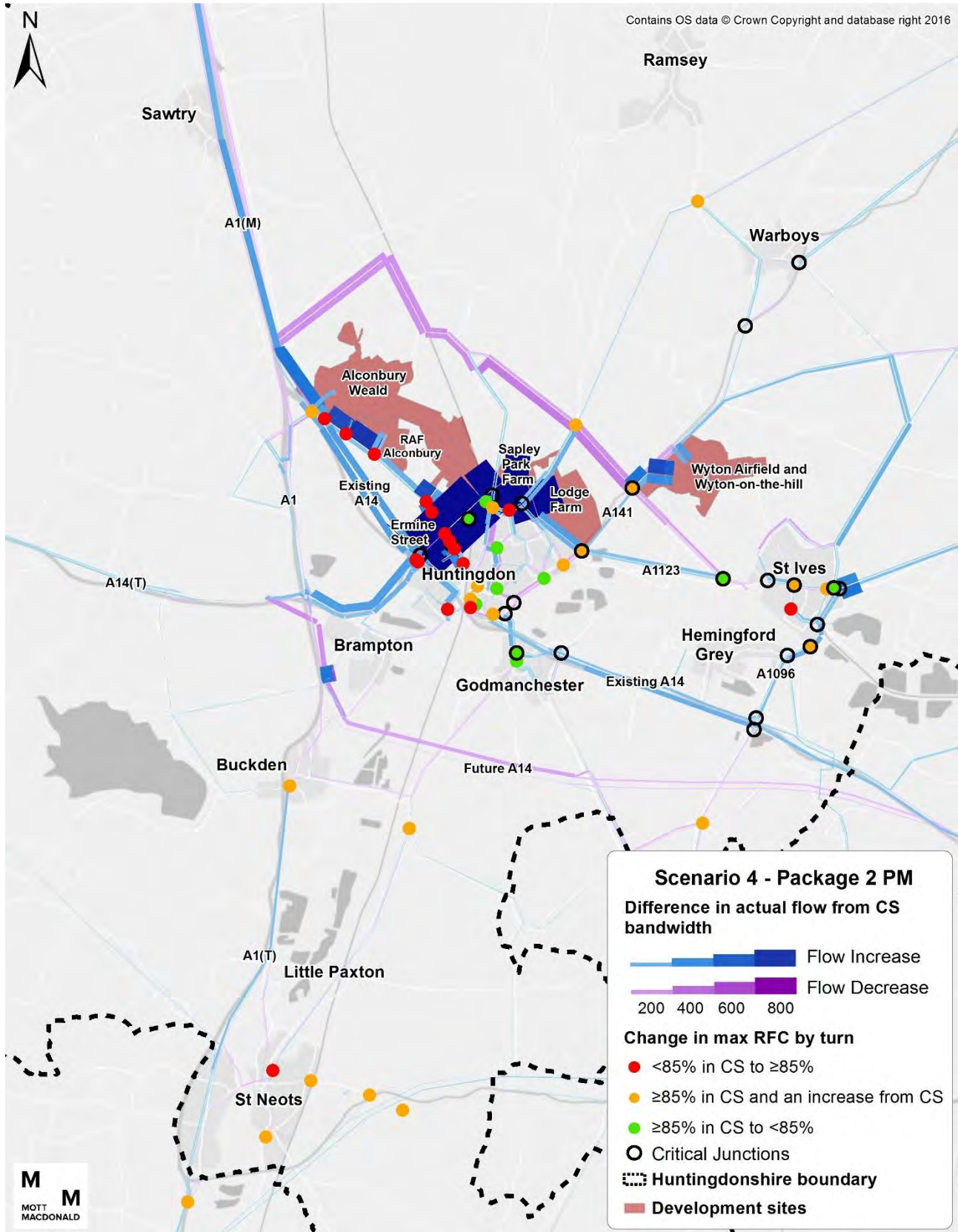


Figure 143: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 3, AM

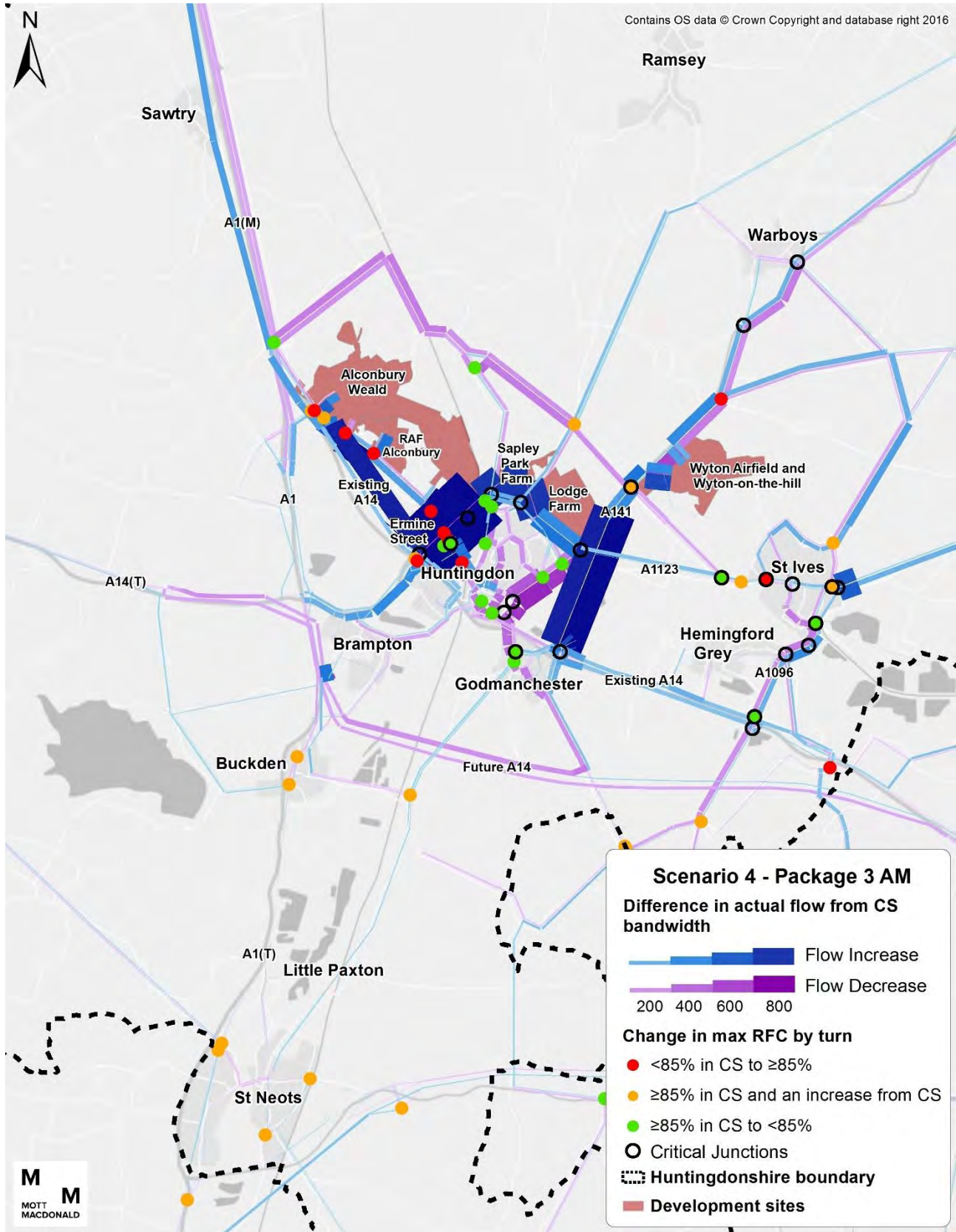


Figure 144: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 3, PM

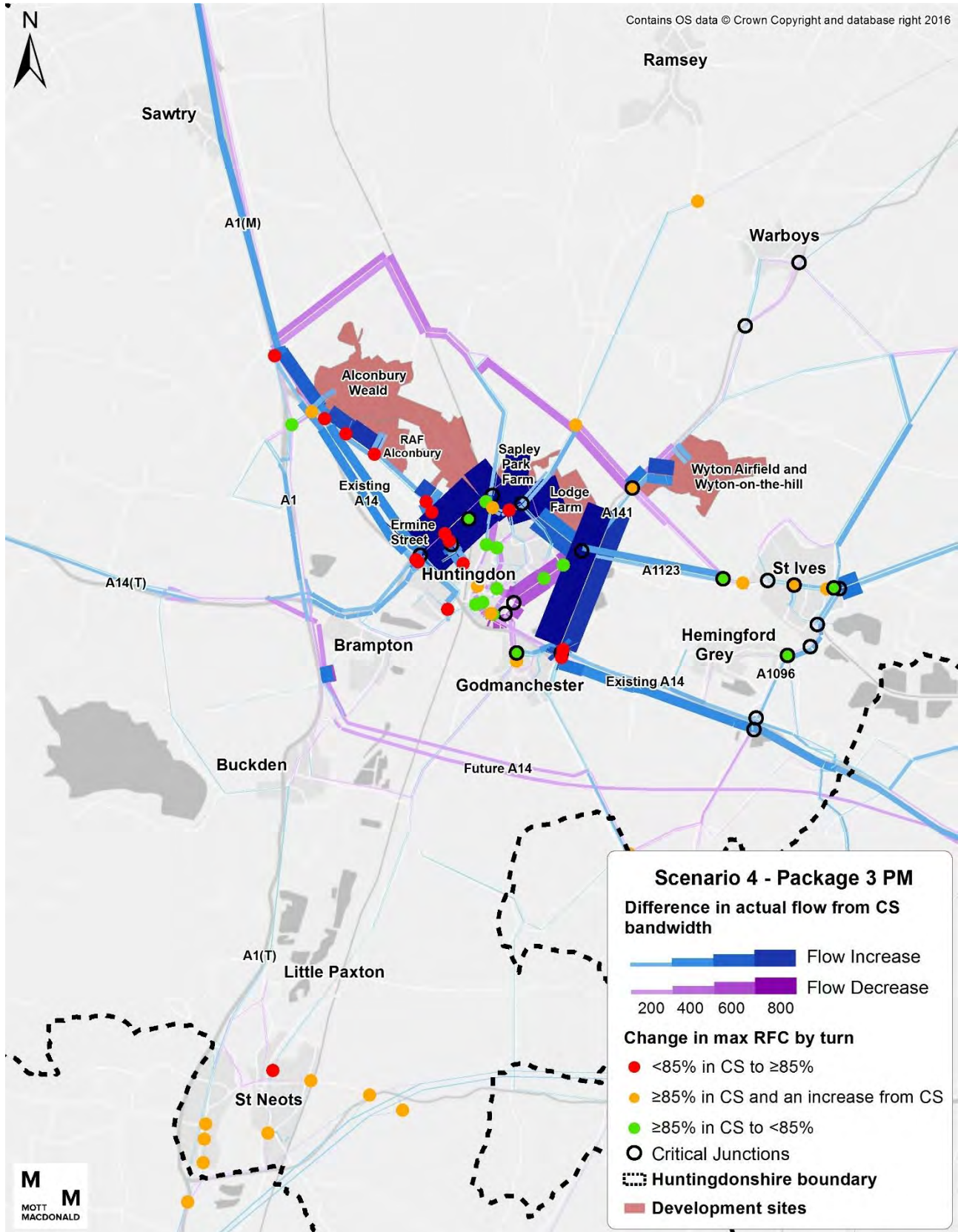


Figure 145: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 4, AM

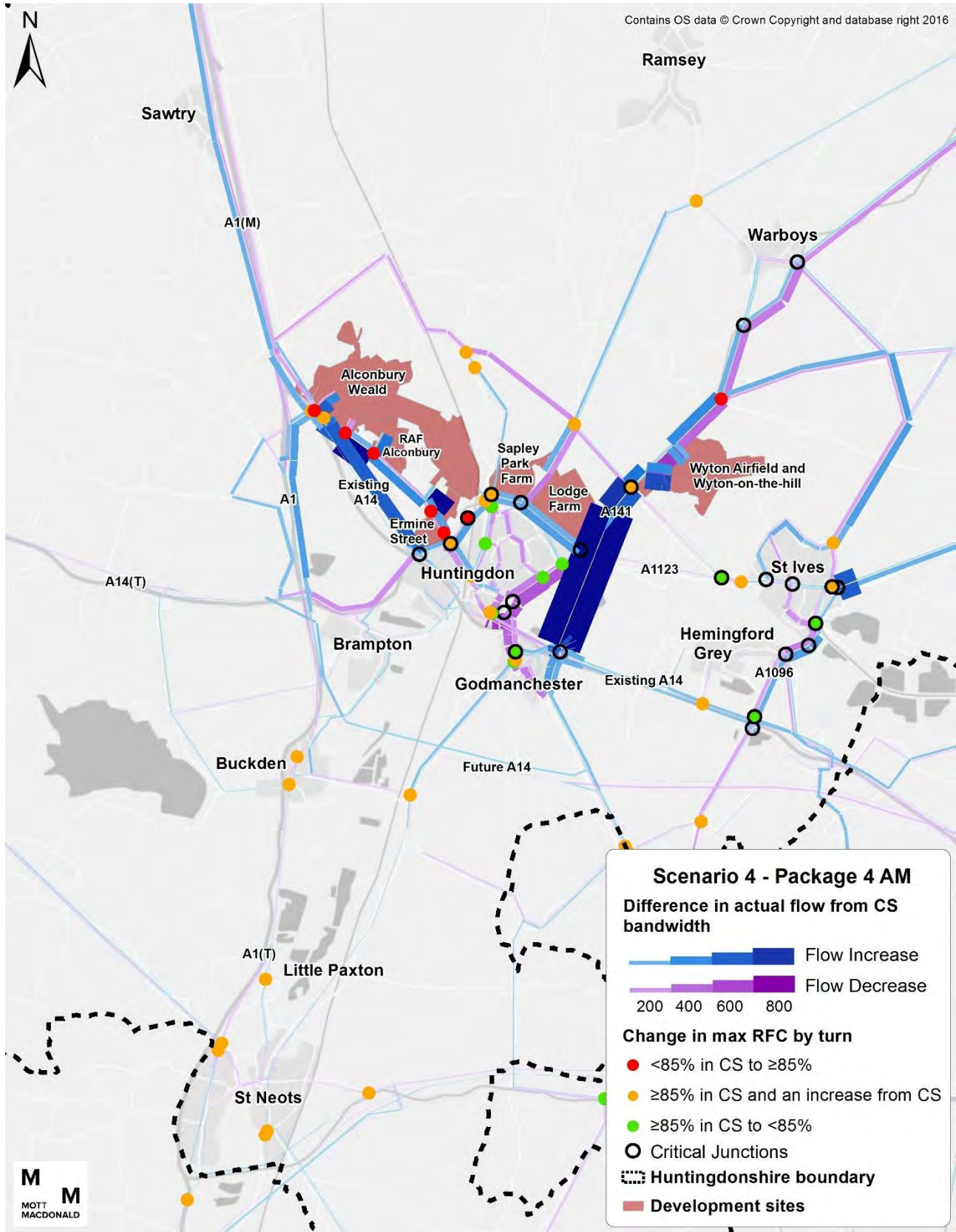


Figure 146: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 4, PM

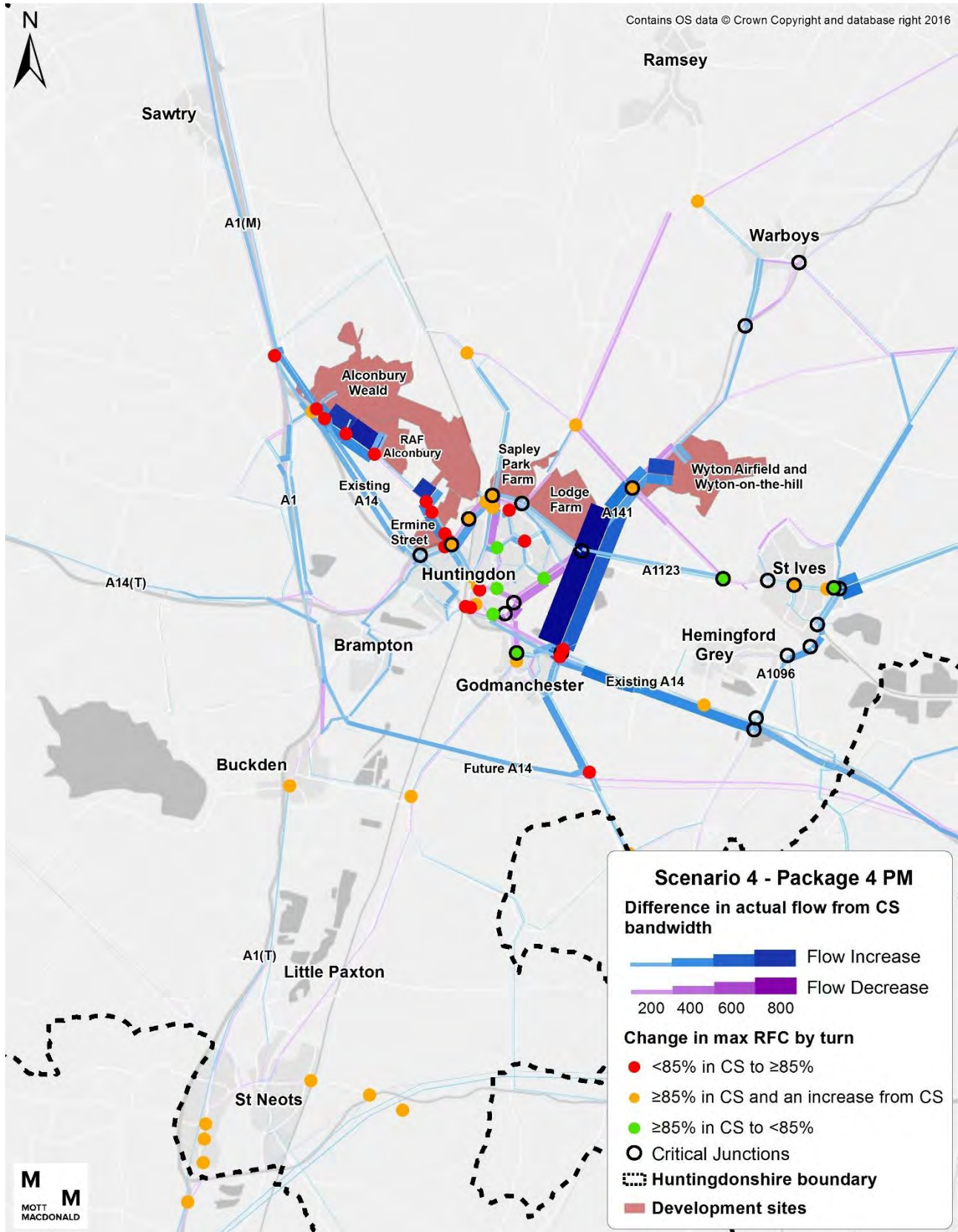
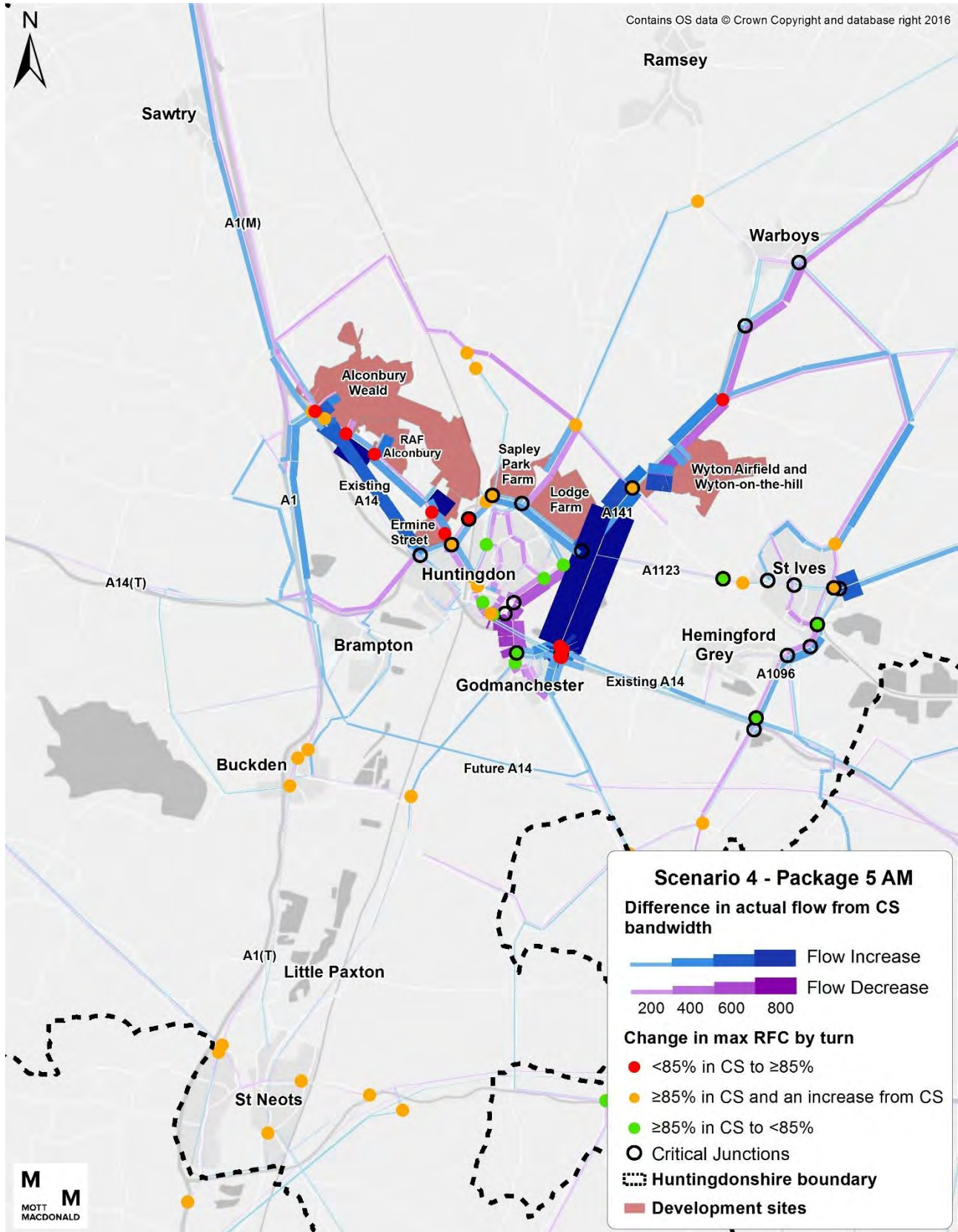
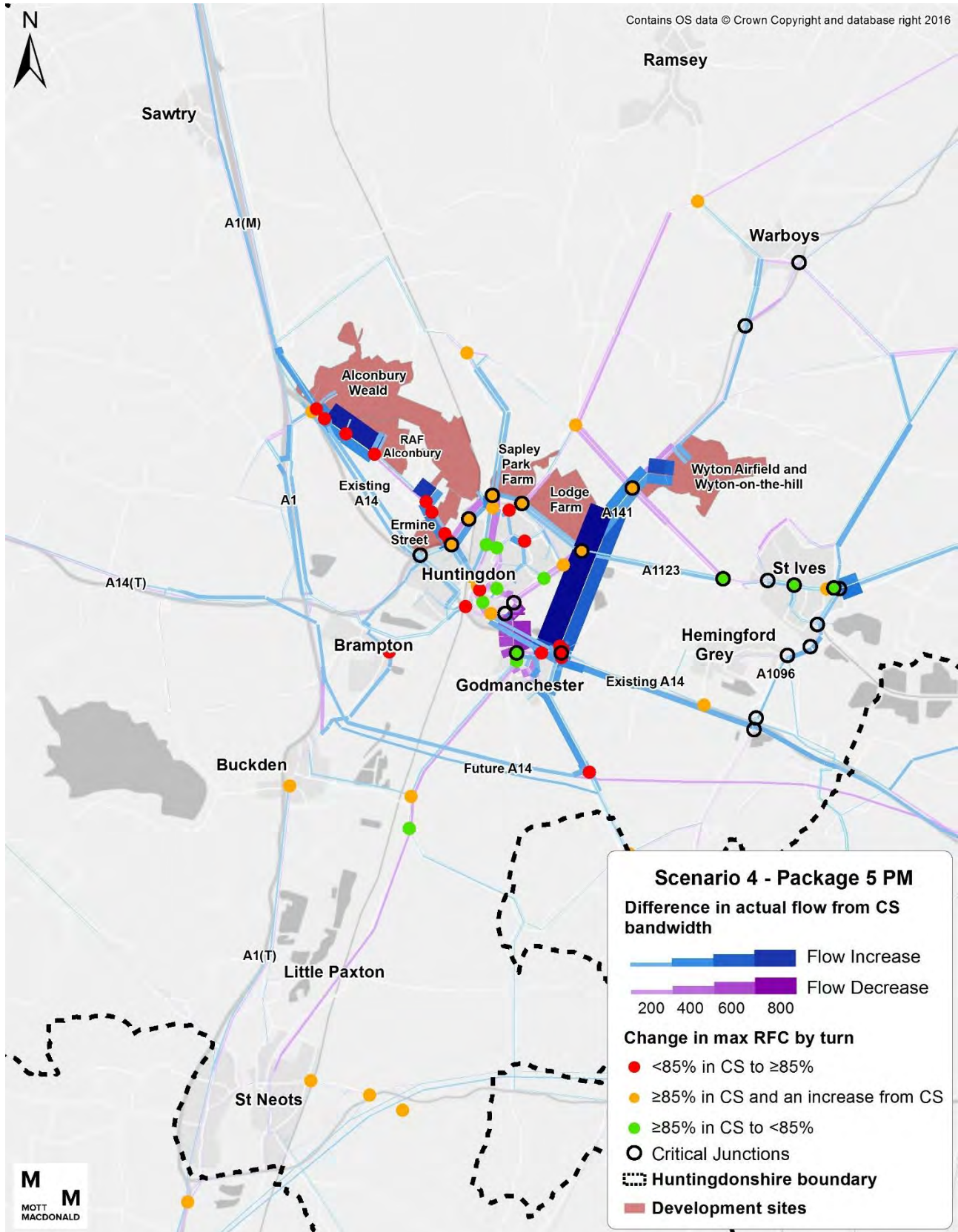


Figure 147: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 5, AM



Source: CSRM

Figure 148: Flow and junction RFC difference from Core Scenario – Scenario 4, Package 5, PM



F. Development Scenario 5 Modelling Outputs

F.1 Scenario 5 Development Site Flow Distribution Plots

For Development Scenario 5, the following figures show the distribution of development-generated flows on the Huntingdonshire highway network in the AM and PM peak hours.

Figure 149: Scenario 5 Ermine Street development flows – AM

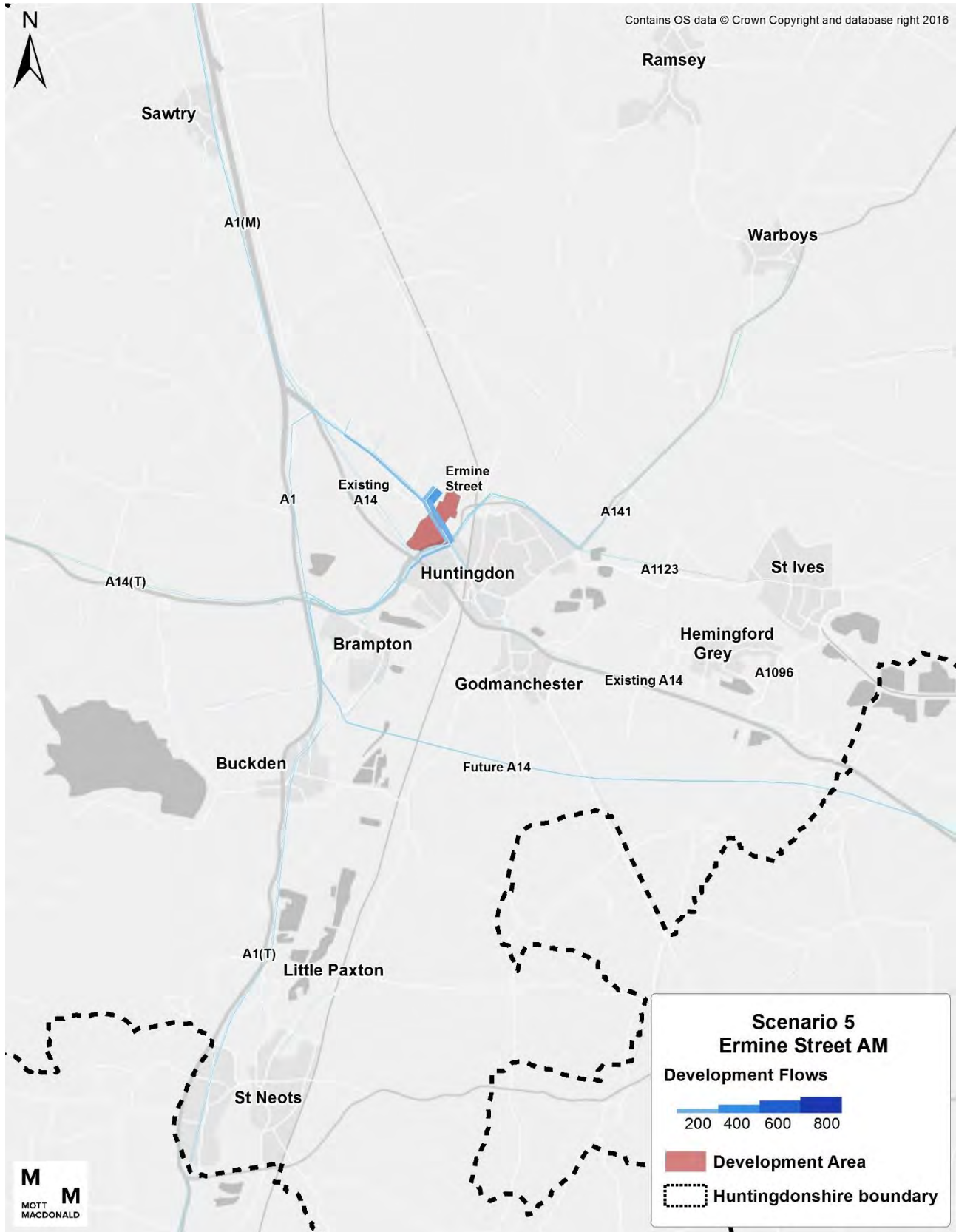
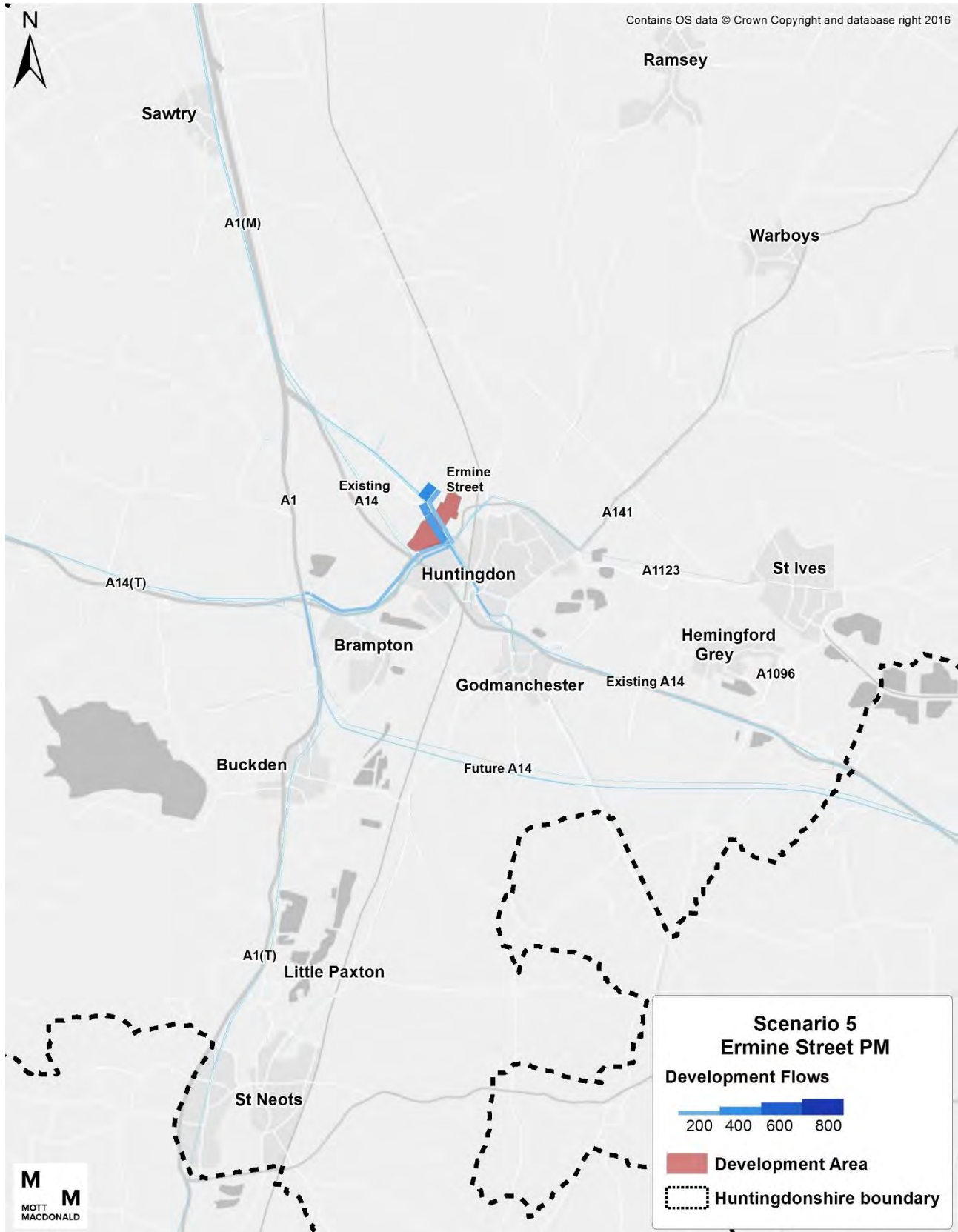
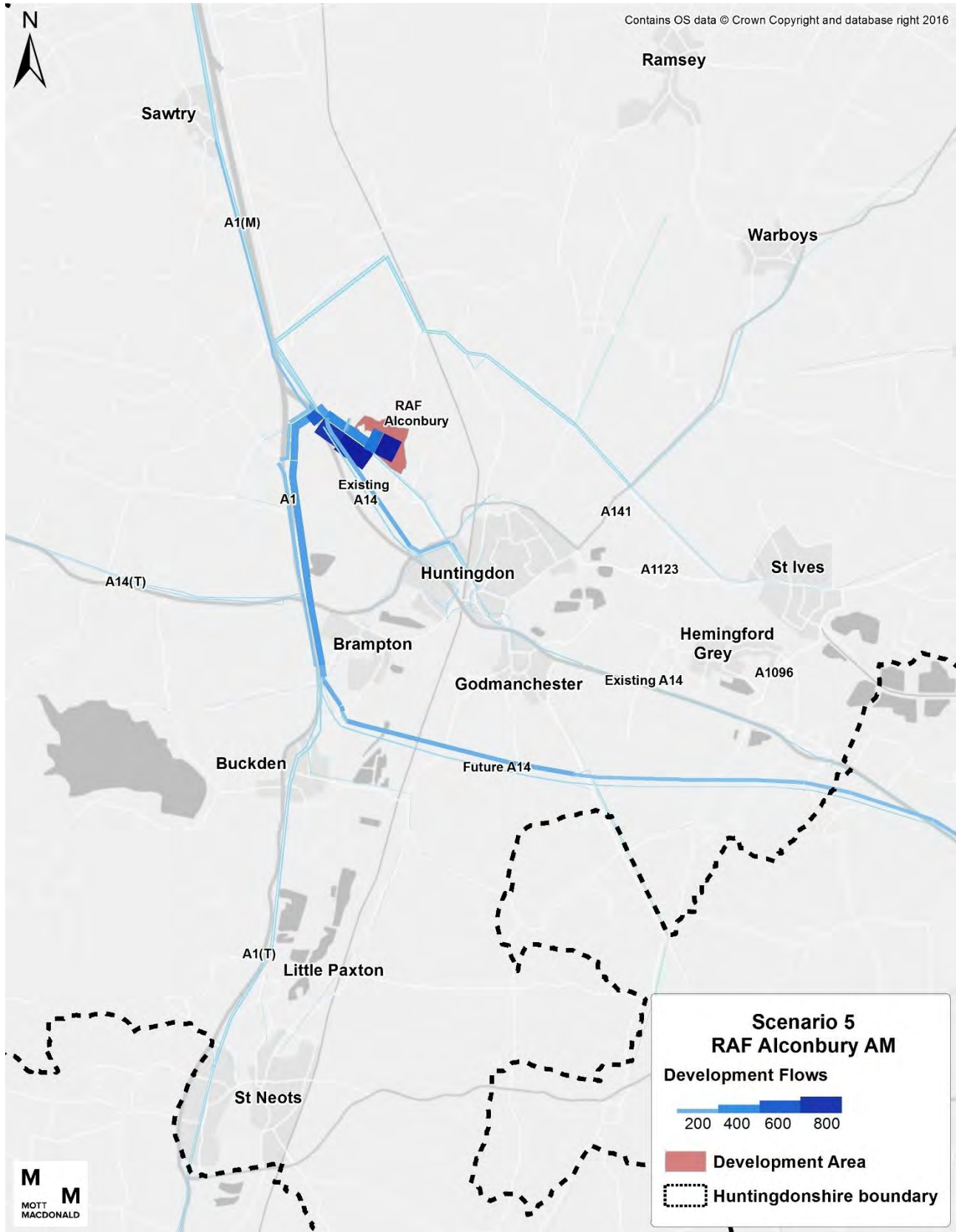


Figure 150: Scenario 5 Ermine Street development flows – PM



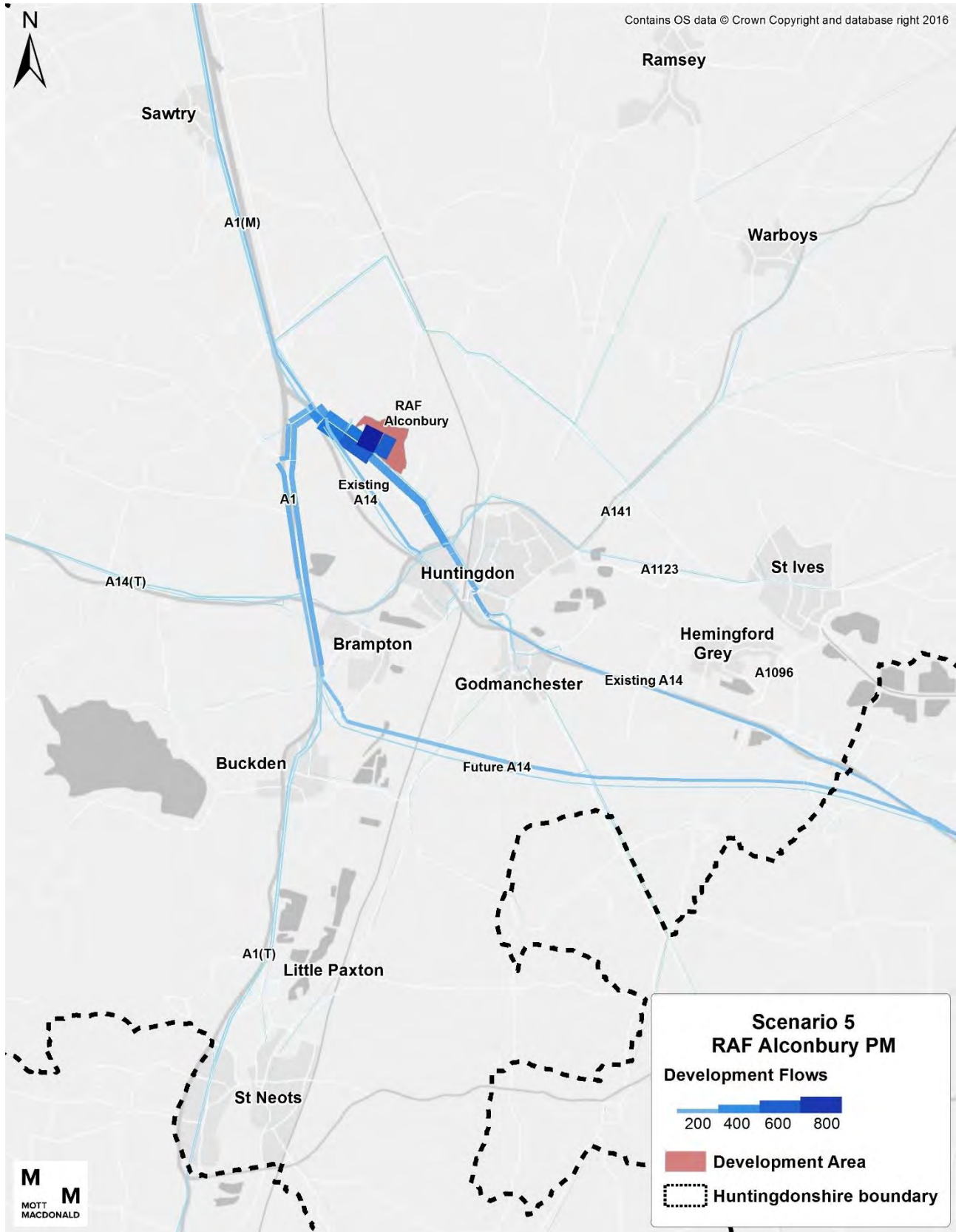
Source: CSRM2

Figure 151: Scenario 5 RAF Alconbury development flows – AM



Source: CSRM2

Figure 152: Scenario 5 RAF Alconbury development flows – PM



Source: CSRM2

F.2 Scenario 5 Post-Mitigation Modelling Results

For each mitigation package model run for Scenario 5, the following plots show, for both the AM and PM weekday peak hours separately:

- The change in traffic flows compared to the Core Scenario
- The change in junction RFC compared to the Core Scenario

Figure 153: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 1, AM

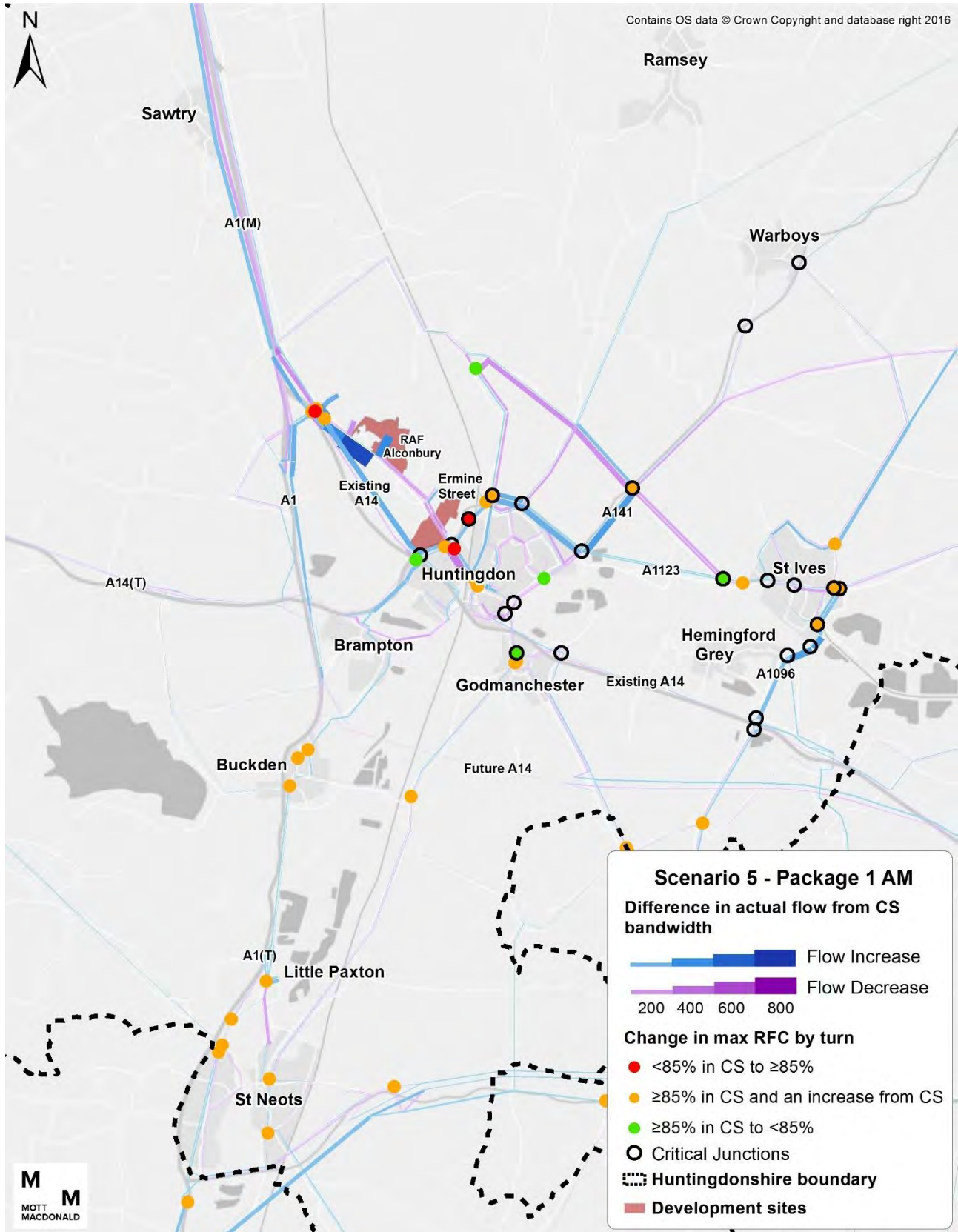
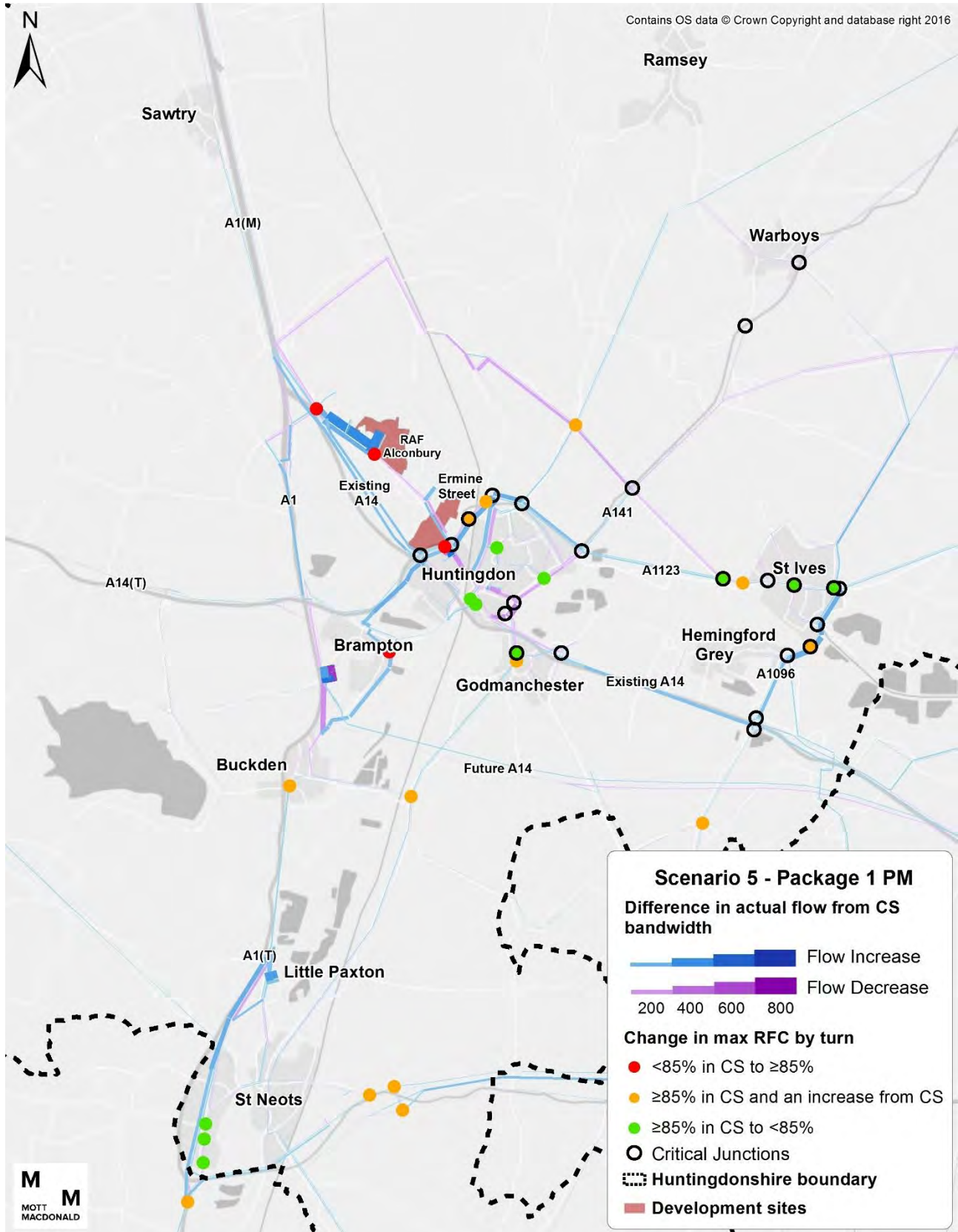


Figure 154: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 1, PM



Source: CSRM

Figure 155: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 2, AM

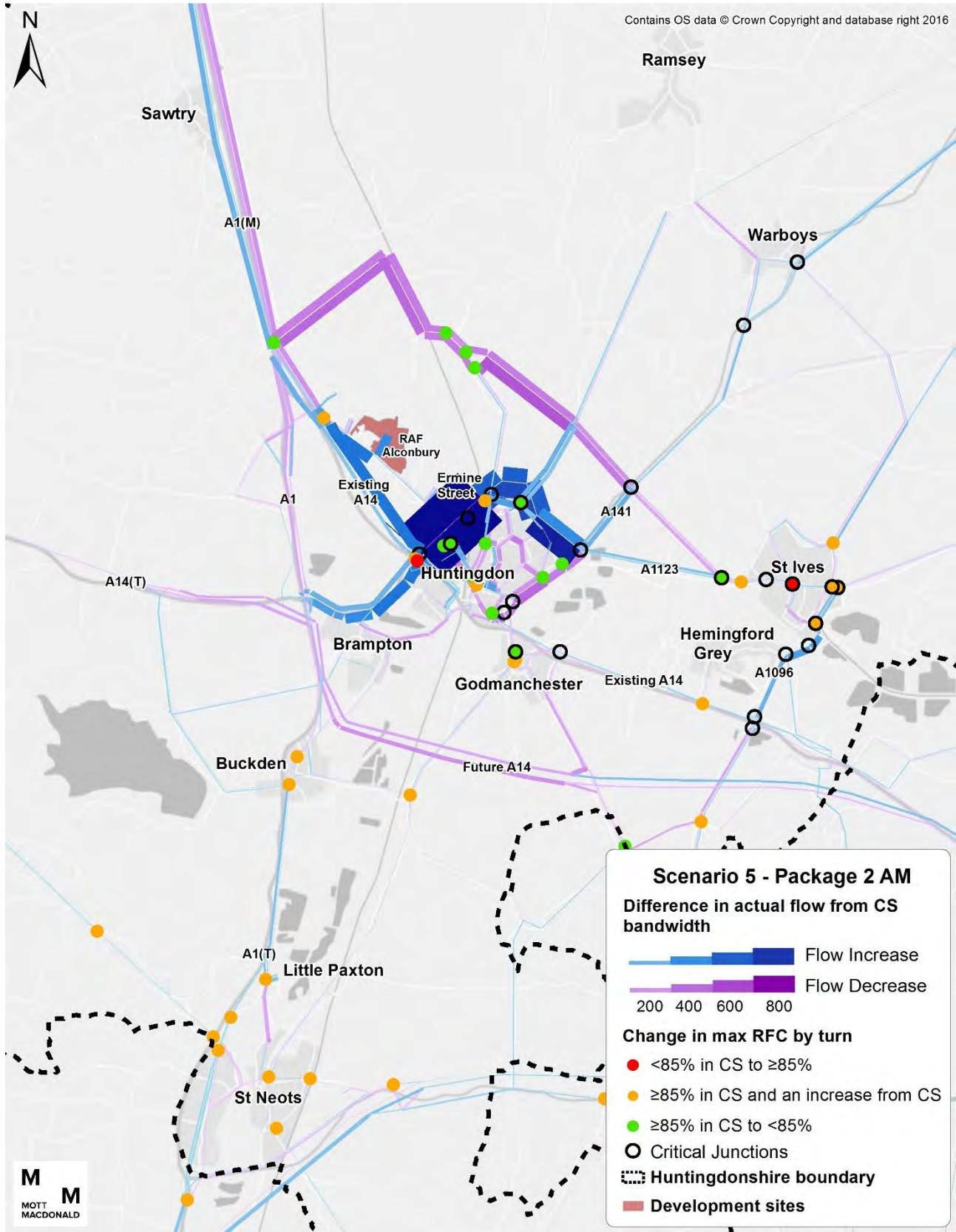


Figure 156: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 2, PM

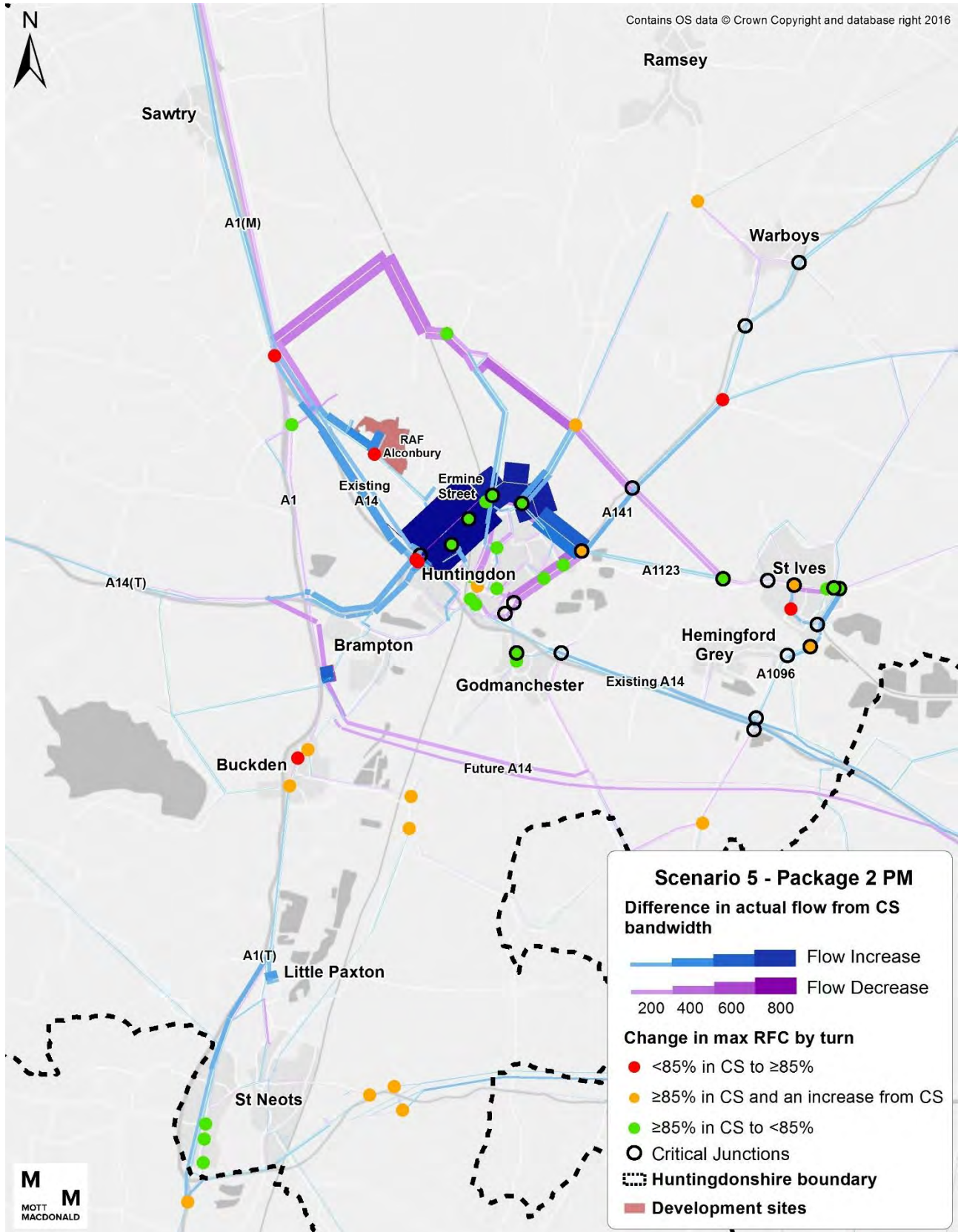


Figure 157: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 3, AM

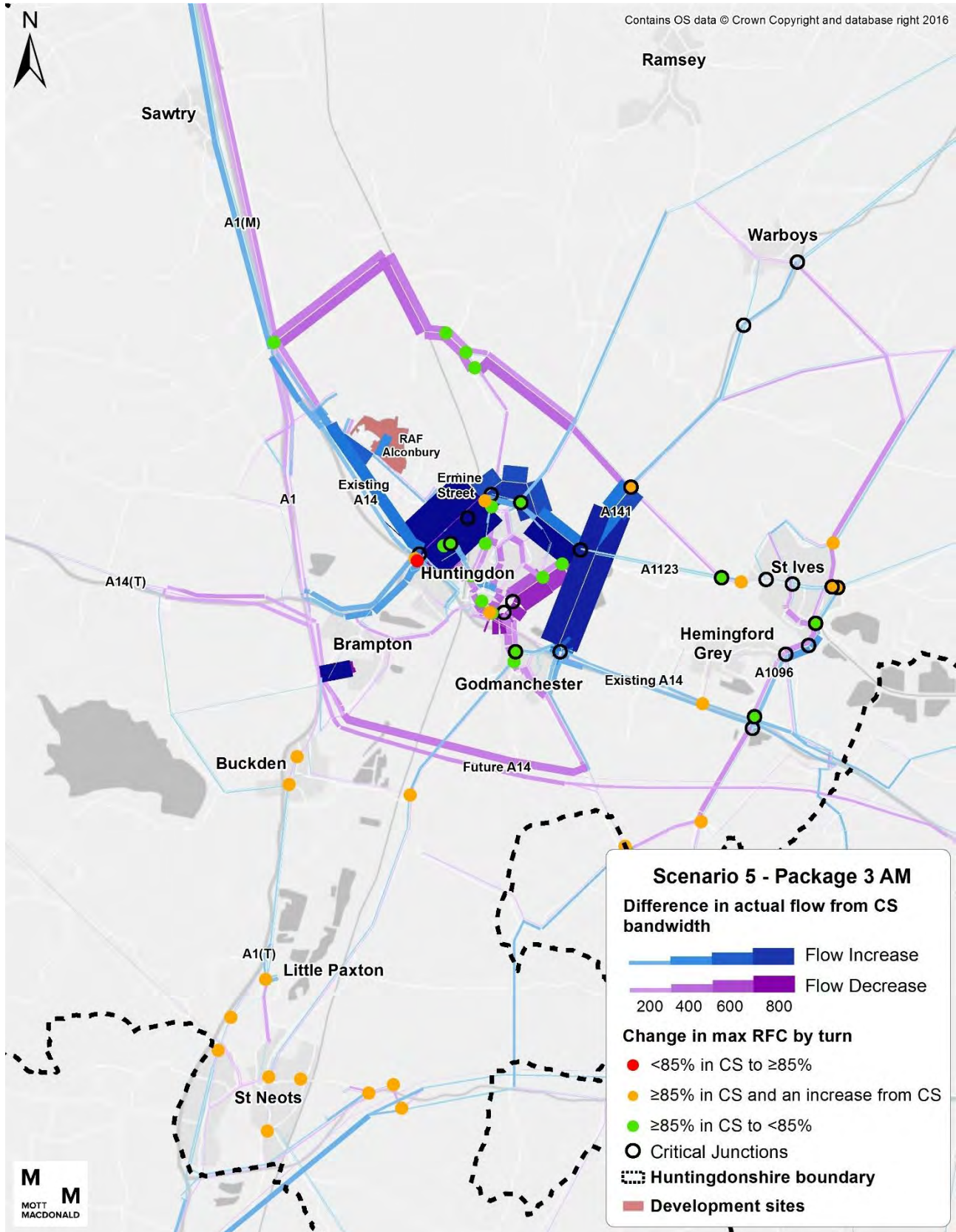


Figure 158: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 3, PM

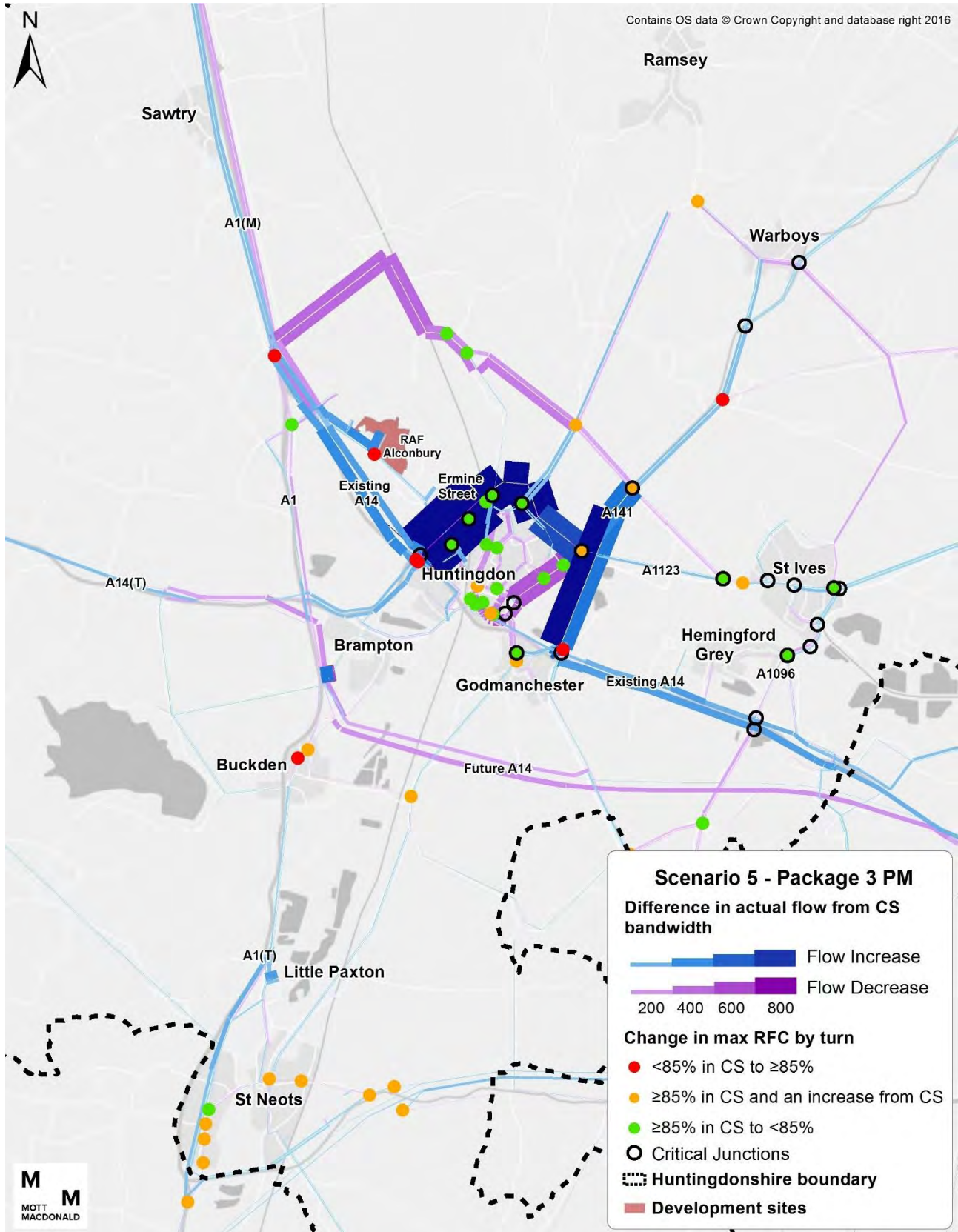


Figure 159: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 4, AM

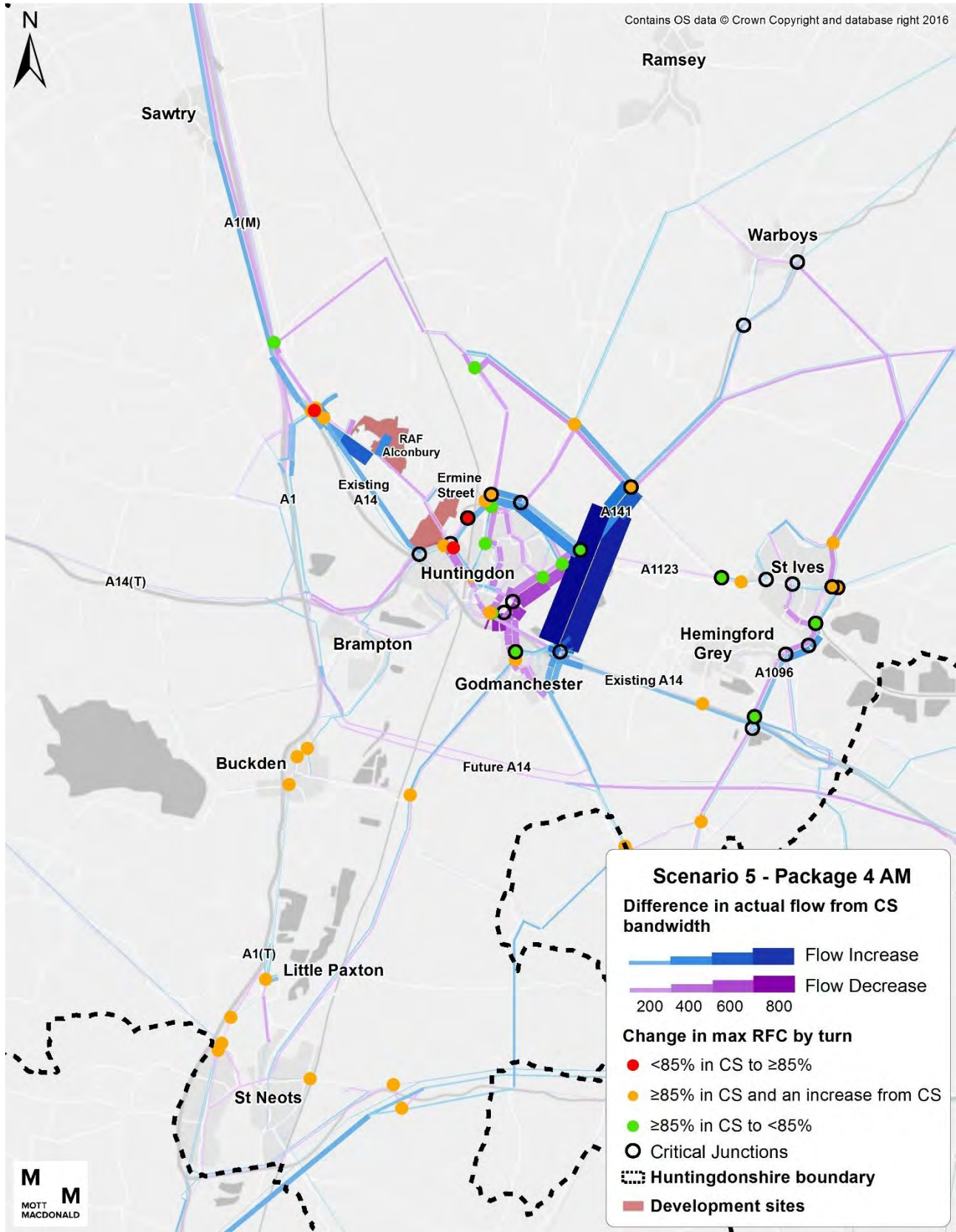
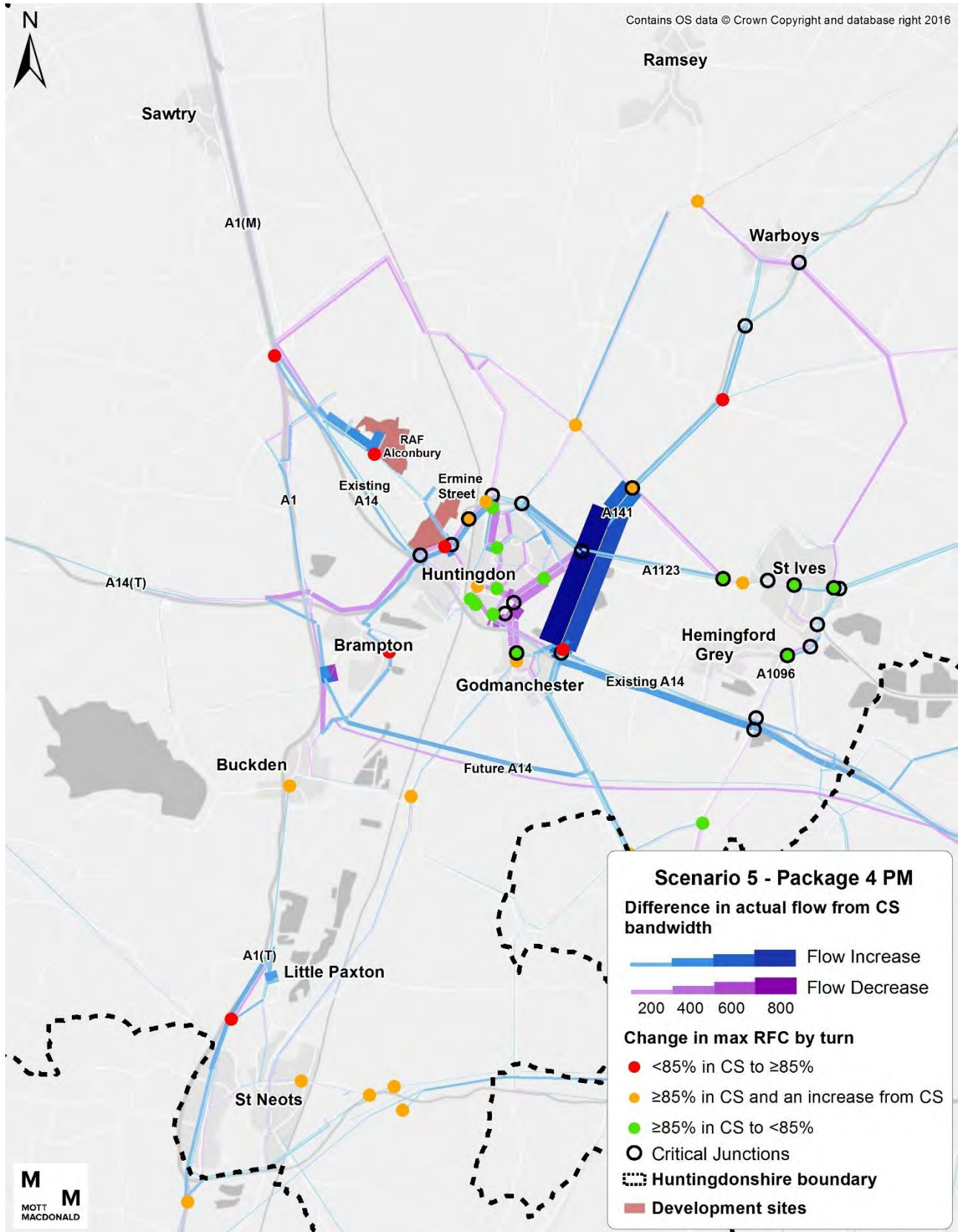


Figure 160: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 4, PM



Source: CSRM

Figure 161: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 5, AM

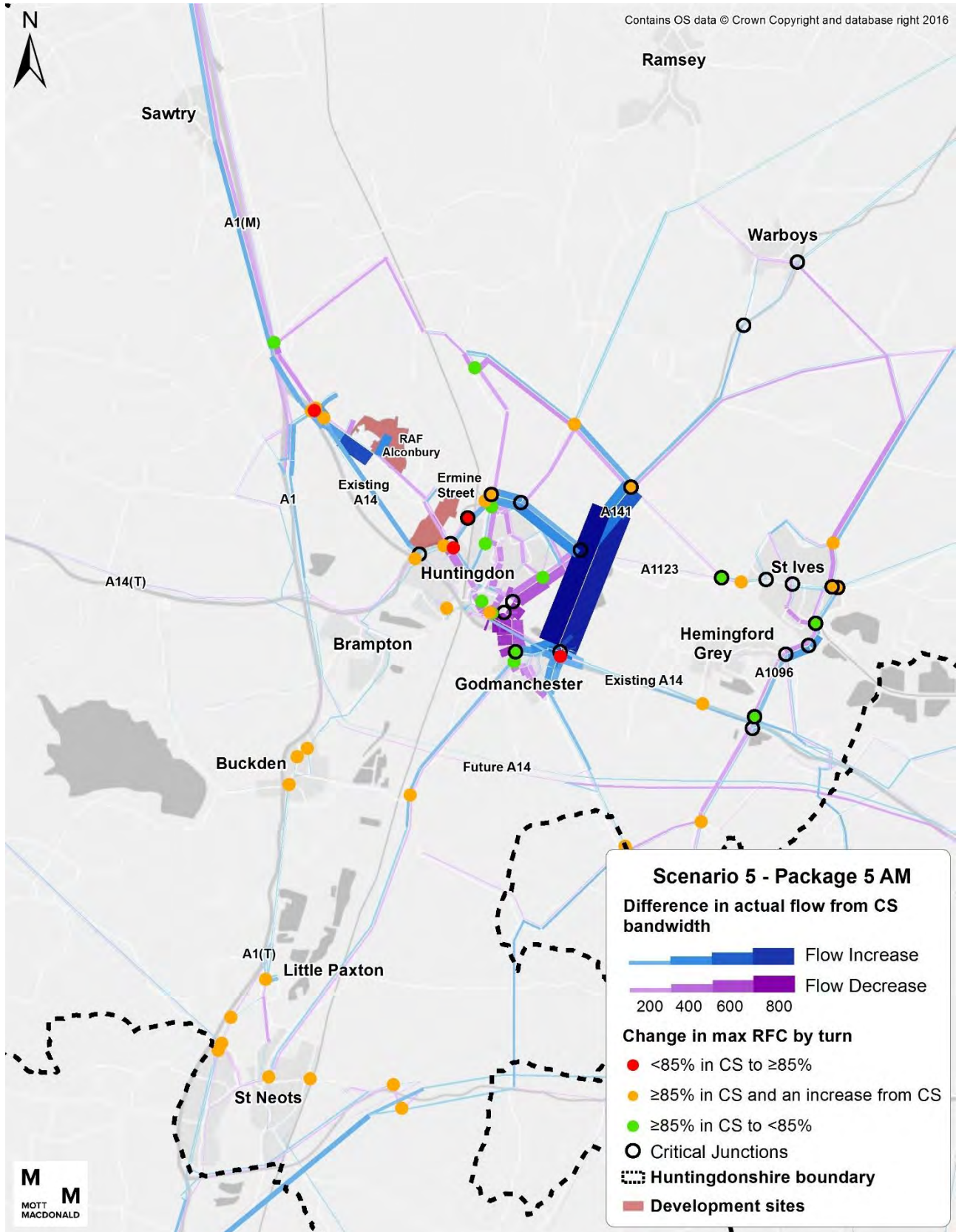
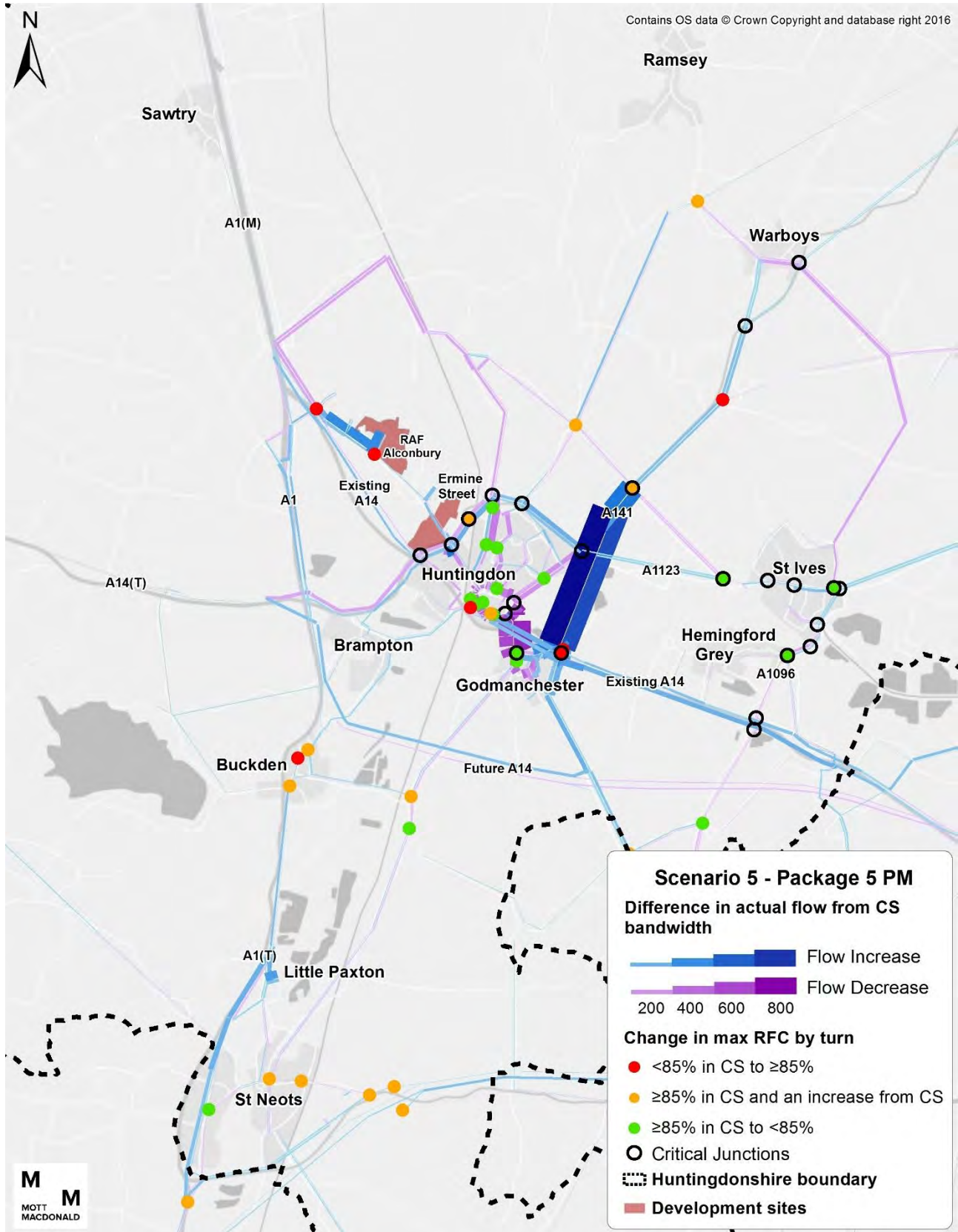


Figure 162: Flow and junction RFC difference from Core Scenario – Scenario 5, Package 5, PM

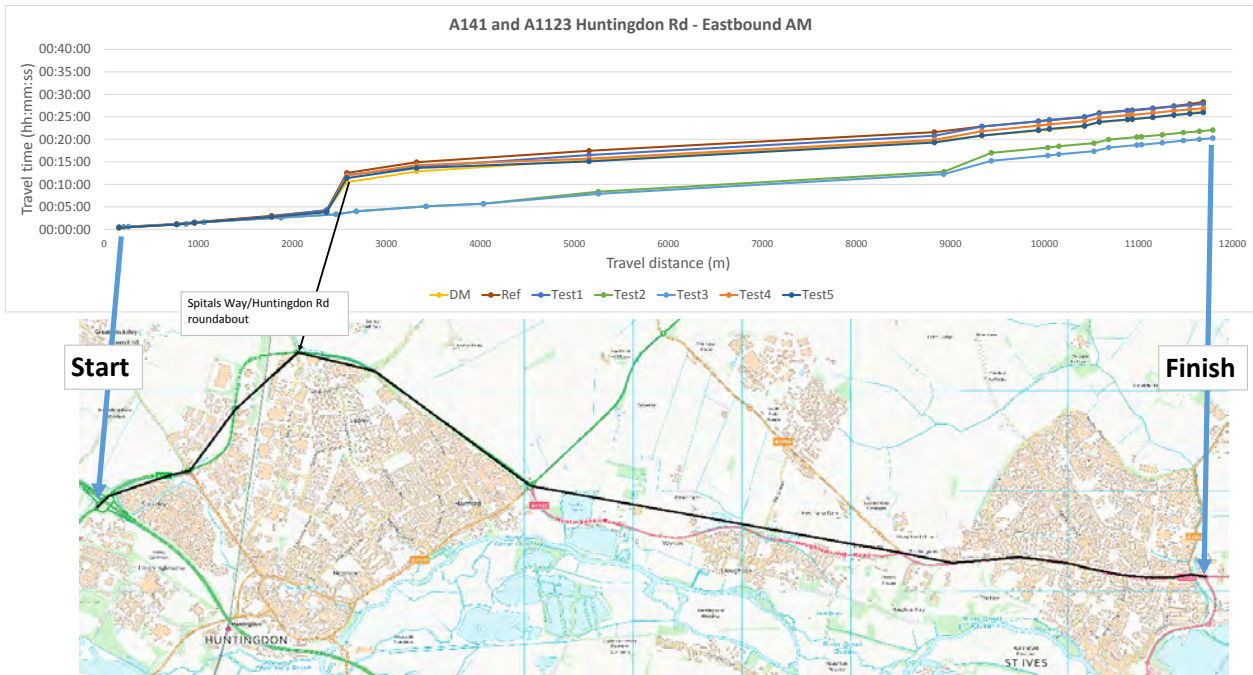


F.3 Scenario 5 Journey Time Plots

The following figures show modelled journey times for selected routes in the AM peak hour for the:

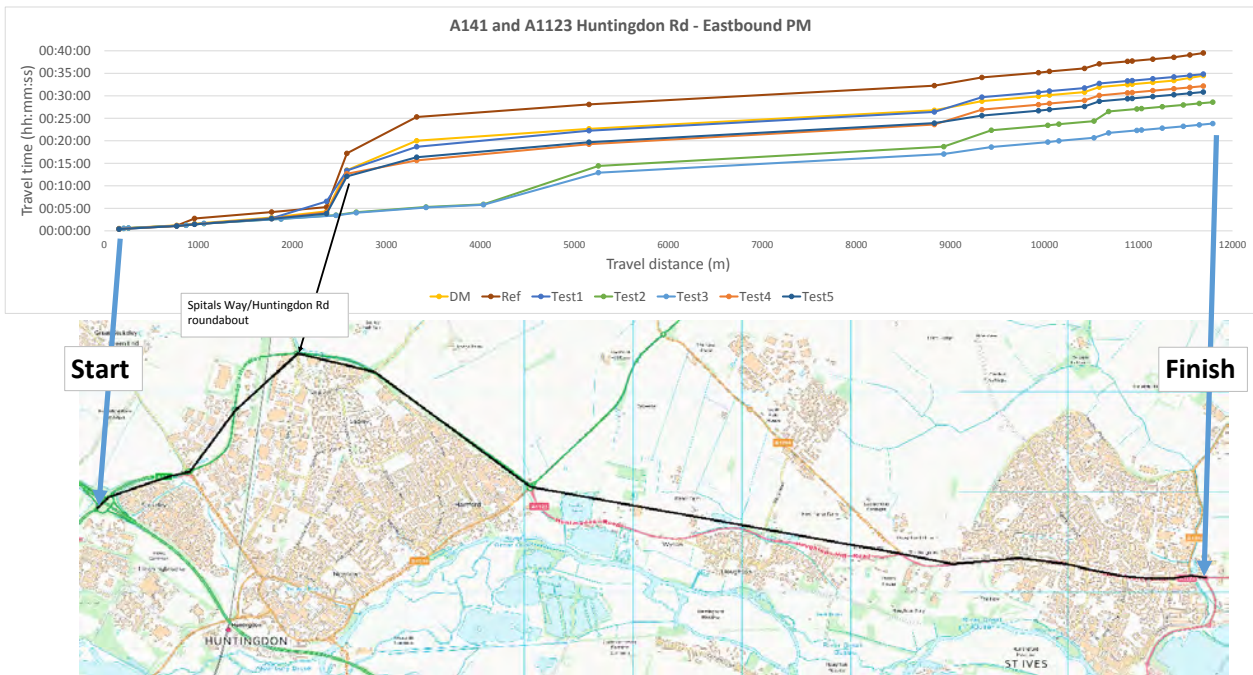
- The Core Scenario (labelled as DM)
- The pre-mitigation Development Scenario 5 (Ref)
- Development Scenario 5 with mitigation packages 1 to 5 applied (Test X)

Figure 163: A141 and A1123 Huntingdon Rd – Eastbound AM



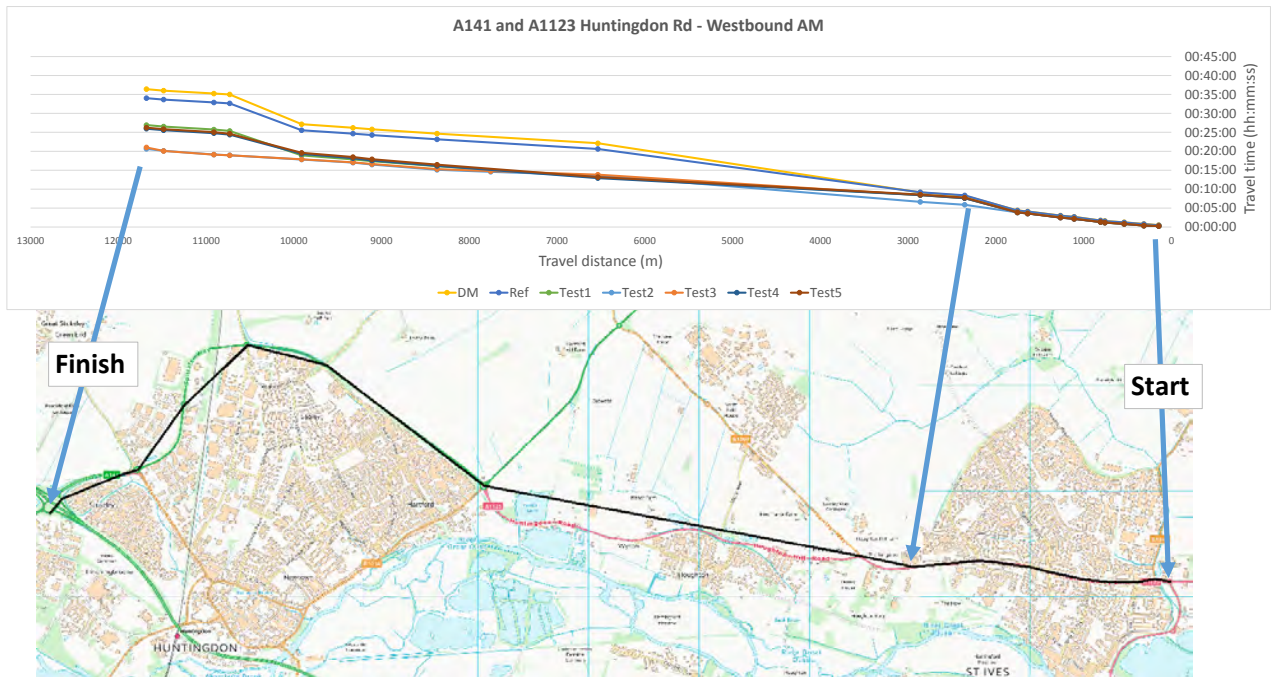
Source: CSRM

Figure 164: A141 and A1123 Huntingdon Rd – Eastbound PM



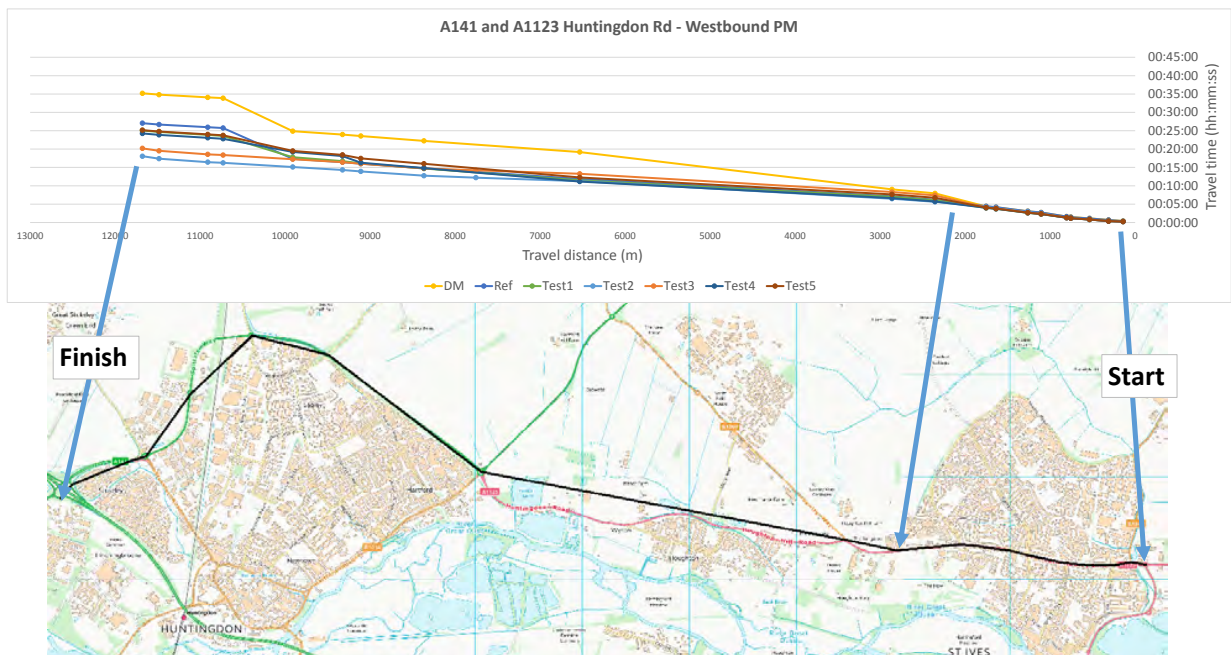
Source: CSRM

Figure 165: A141 and A1123 Huntingdon Rd – Westbound AM



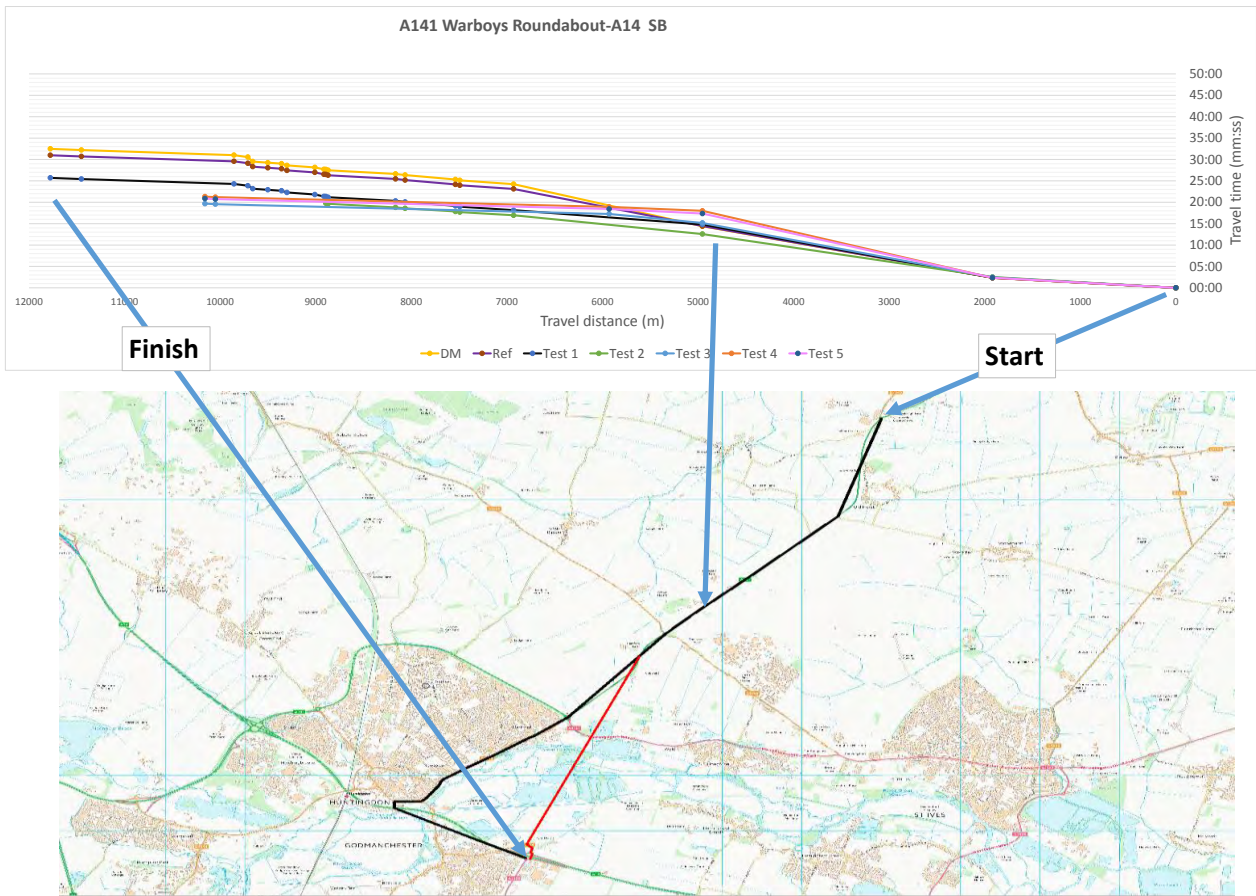
Source: CSR

Figure 166: A141 and A1123 Huntingdon Rd – Westbound PM



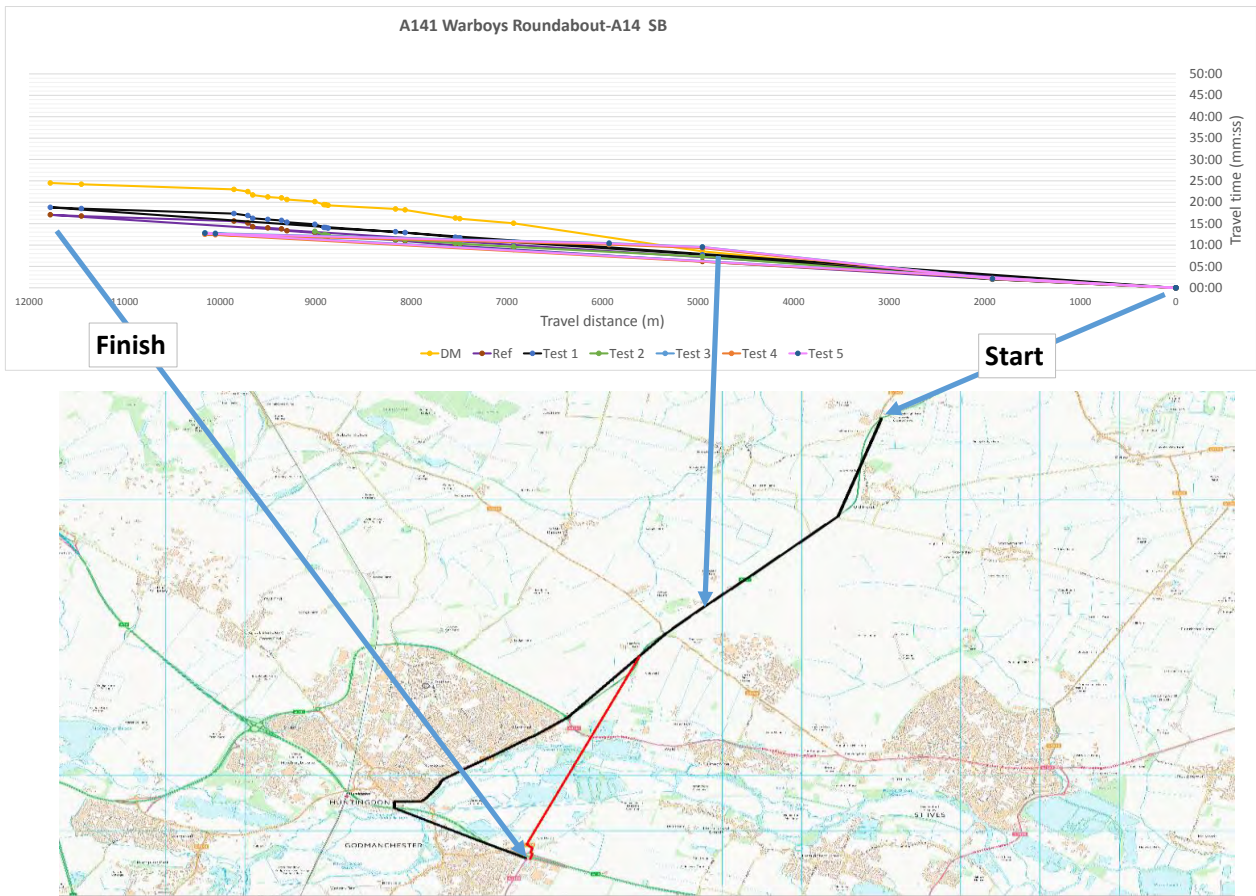
Source: CSR

Figure 167: A141 Warboys Roundabout Southbound AM



Source: CSRM

Figure 168: A141 Warboys Roundabout Southbound PM



Source: CSRM

Figure 169: A141 Warboys Roundabout Northbound AM

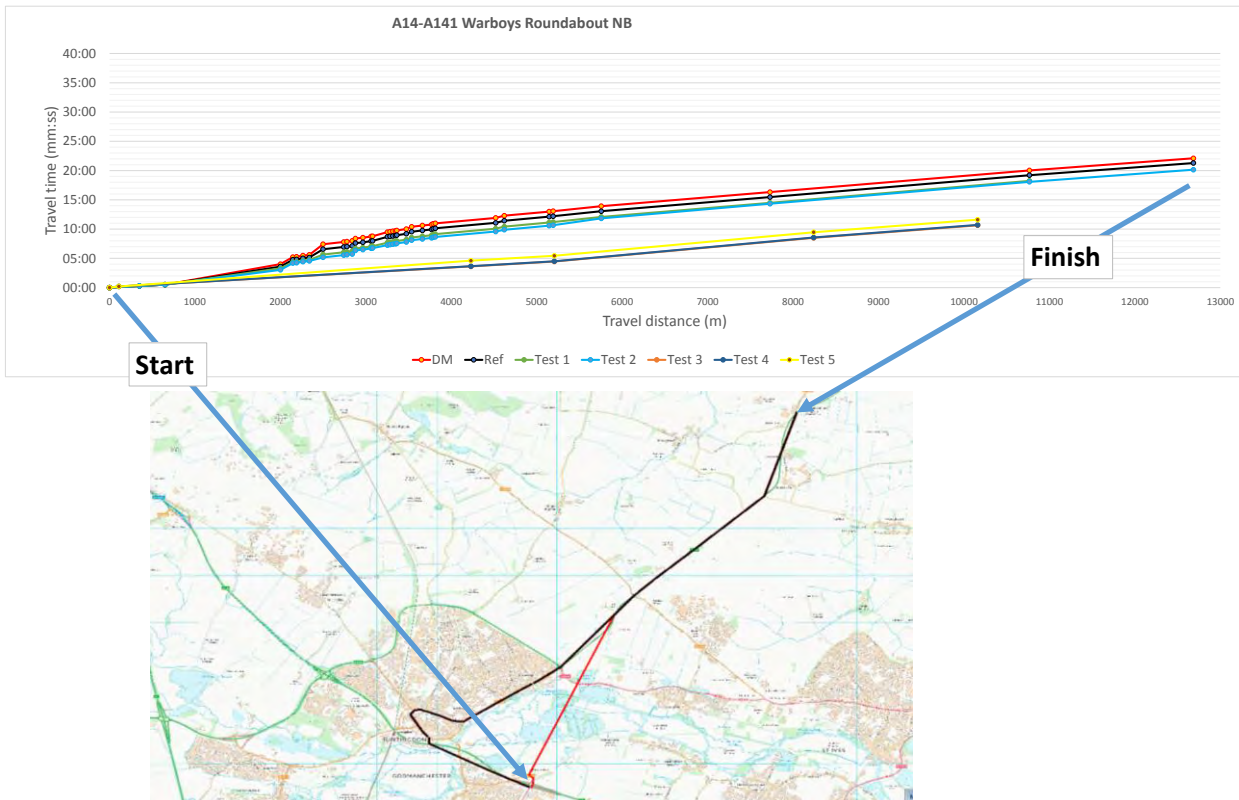
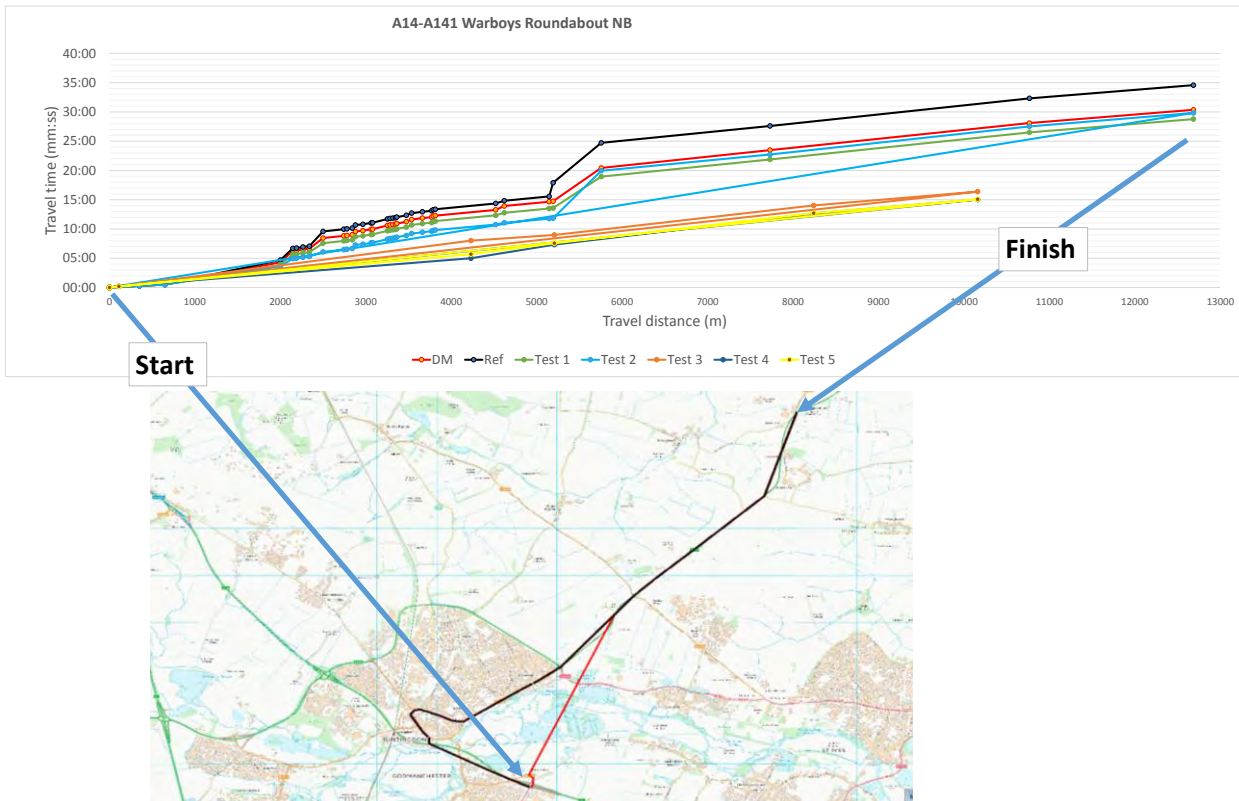
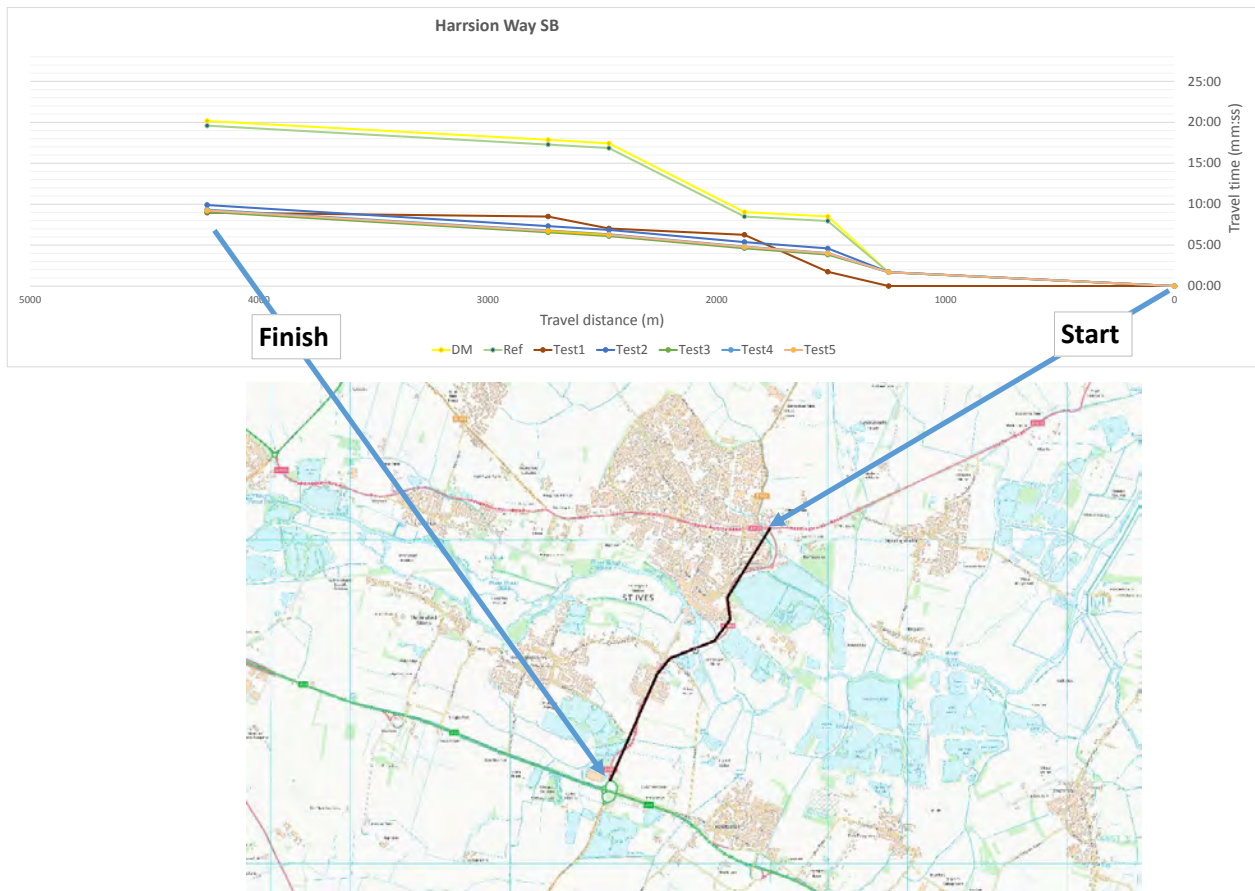


Figure 170: A141 Warboys Roundabout Northbound PM



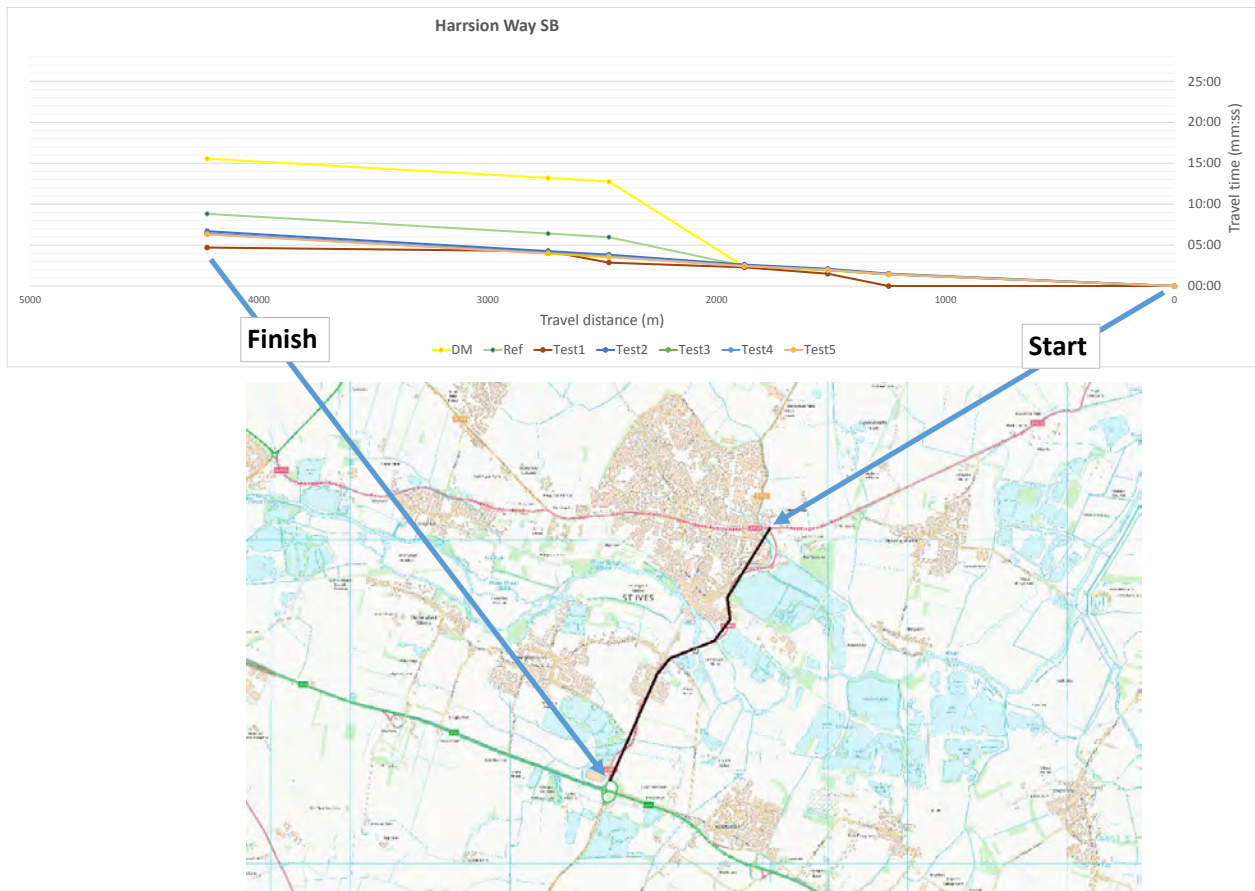
Source: CSRM

Figure 171: Harrison Way Southbound AM



Source: CSRM

Figure 172: Harrison Way Southbound PM



Source: CSRM

Figure 173: Harrison Way Northbound AM

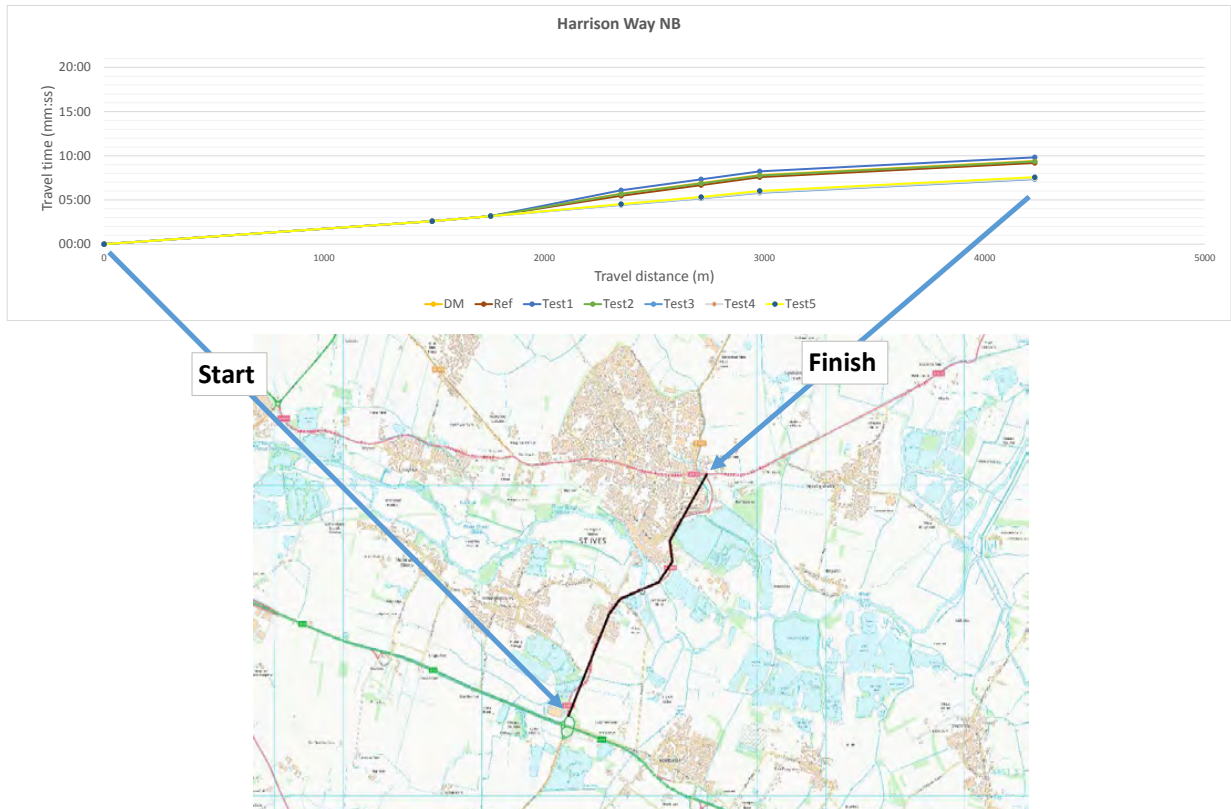


Figure 174: Harrison Way Northbound PM



Source: CSRM

