

Harborough District - Potential Development Options

Strategic Traffic Assessment

September 2015



Revision Schedule

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1. Introduction

1.1 BACKGROUND

- 1.1.1 AECOM (AECOM Infrastructure and Environment Ltd) was appointed by Harborough District Council (HDC) to carry out a Strategic Transport Assessment (STA) to help the Council compile a sound evidence base from which to develop the strategy for locating future housing and other significant development, including any strategic allocations, within the new Local Plan. The preparation of a new Local Plan for Harborough is currently underway and it is intended that the Plan will comprise a review of Core Strategy policies, ensuring compliance with the National Planning Policy Framework, combined with strategic development allocations.
- 1.1.2 The objective of the assessment is to inform the process by testing reasonable alternatives for distributing development across the District. The STA will also help to inform more detailed forward planning work by Leicestershire County Council (LCC) in its role as the local highway authority.
- 1.1.3 The STA will form part of the evidence base for the new Local Plan, which will cover the period 2011-2031. At a high level, it will enable the Strategic Planning Team to give initial consideration to the impacts of deliverable options for housing and employment growth and help point to the option(s) that can best be accommodated in transport terms. A parallel assessment is currently underway, led by the County Council, to look at housing growth to 2031 across the Housing Market Area (HMA). This is considering more strategic issues and will help inform whether the HMA-wide authorities can accommodate their projected development growth within their boundaries.
- 1.1.4 The assessment used ODYSSEUS, a software program developed by AECOM to estimate the generation and distribution of traffic associated with, in this case, the Harborough District existing Core Strategy and tabled Preferred Options. ODYSSEUS applies a 'gravity modelling' approach that distributes generated trips from development according to the size of and travel time to, surrounding attractors - for example, employment centres that may attract commuting trips from new residential development etc.
- 1.1.5 A fundamental principle of ODYSSEUS is that it is a strategic level process that provides an early and cost effective overview of the broad traffic impacts associated with development. It offers a consistent and informed insight on where to invest further effort and more detailed analysis and in this respect it functions as an unbiased 'initial sifting tool' to help inform the decision making process when considering multiple development options; it is not intended to be a substitute for more comprehensive assignment or junction modelling.
- 1.1.6 For this study, ODYSSEUS was used to help HBC understand the cumulative impacts of a number of potential future housing development allocations across the District. As and when decisions are made on the most suitable pattern for development, more local impacts will be considered in greater detail with LCC as part of the strategy delivery and development control process.
- 1.1.7 Further information on ODYSSEUS and the assumptions made are provided in Chapter Two.

1.2 SCOPE OF ASSESSMENT

- 1.2.1 It was agreed at an inception meeting held on 6 February 2015 with Officers of HDC, that an initial assessment would focus on the existing Core Strategy housing Scenario that would be compared with four other emerging housing development scenarios. It was also agreed that to follow this initial assessment, further refinement and the prospect of new options for testing could be necessary to keep pace with the emerging strategy.
- 1.2.2 The scope therefore covers the findings from initial ODYSSEUS runs of the original four options set against the Core Strategy option; which were originally reported to HDC in April 2015. This initial work was followed by six additional allocation options identified by HDC as potential alternative housing development scenarios, augmented by an element of new commercial development. It was confirmed by HDC in an email dated 21 August 2015 that AECOM should supplement the original work by testing these alternatives. The output from this additional exercise now expands on the earlier ODYSSEUS scenario tests.

1.3 LAYOUT OF REPORT

1.3.1 To follow this introduction:

- Chapter Two provides details of the assumptions used in the ODYSSEUS modelling and the approach to the study;
- Chapter Three presents the results of the assessment for the earlier four housing and original Core Strategy Scenario;
- Chapter Four supplements the earlier work and presents the results of the assessment for six other housing development scenarios to include an element for commercial development at Magna Park; and.
- Finally Chapter Five presents Conclusions.

2. Site Details and Assumptions

2.1 GENERAL APPROACH

- 2.1.1 To determine the potential impact of the various development scenarios the study has included all information received from stakeholders and produced by AECOM to facilitate analysis of likely impacts arising from the Options.
- 2.1.2 Source information included:
- Spatial planning options provided by HDC by e-mail dated 12 February 2015;
 - Residual dwelling number from committed development as of 30 September 2014 - received from HDC by e-mail dated 13 February 2015;
 - TEMPRO growth factors; and
 - 2014 Reference traffic flows received from Leicestershire County Council by e-mail on 20 February 2015, with additional motorway flows sourced from the Highways England TRADS database.
- 2.1.3 A four stage approach was applied to produce output:
1. Project 2014 Reference flows to 2031 Reference flows using TEMPRO growth factors;
 2. Run ODYSSEUS for the various Options to produce the development flows and distribution;
 3. Overlay the development flows and distribution on the 2031 Reference flows; and
 4. Apply road capacity information based on *TA79/ 99 Traffic Capacity of Urban Roads* and *TA46/ 97 Traffic Flow Ranges For Use In The Assessment Of New Rural Roads* to calculate a link Congestion Reference Flow (CRF).
- 2.1.4 In the event that the RFC is below 1.00 then the link is likely to operate within capacity and little or no delay will be experienced. To allow for a performance margin, a value of 0.85 is more typically considered to represent the desirable maximum value.

2.2 ODYSSEUS ASSUMPTIONS

- 2.2.1 As noted in the introduction the AECOM ODYSSEUS software package was used to evaluate the potential network impacts associated with potential development scenarios. The software estimates how trips generated by development are distributed spatially via a 'gravity' function, using ward-based residential and employment data from the 2001 census.
- 2.2.2 The area over which the program considers trip generators and attractors is user-defined; in this case a maximum travel time isochrone of 50 minutes was used to represent a reasonable limit for a commute by car.
- 2.2.3 It is important to establish that the routes estimated between these generators and attractors are based on fixed-link travel times that are empirically-derived attributes of the underlying network database.
- 2.2.4 ODYSSEUS is not an iterative congested assignment model like SATURN, which simulates and reacts to changes in travel times; and was never intended to be. Rather, it produces 'demand' routes, i.e. the routes drivers would be most likely to take on the basis of the selected criteria (Peak Travel Time, Free-Flow Travel Time or Distance) although otherwise irrespective of effective supply capacity or whether the increased flows due to proposed development would cause new or increased congestion at particular locations that resulted in further journey time delays.
- 2.2.5 For this application, it should be noted that ODYSSEUS was designed to use measured Peak Travel Times supplied from a commercially available national dataset. The network therefore includes a delay element that reflects current congestion on the estimated routes, which is considered the most appropriate time criterion for the morning peak period in question.

- 2.2.6 The advantage of this general approach is that it helps to show where the most likely pressure points would be and their scale, rather than trying to predict how drivers might try to avoid them in practice; sometimes by using routes that are not appropriate for that purpose. The additional demand flow estimates can then be superimposed on existing flow and capacity data to establish where future network issues could be most likely. Ultimately ODYSSEUS is a strategic tool that is used as a first sift of potential impacts to guide decisions on the need for more detailed modelling and assessment.

2.3 SITE DETAILS

Initial Development Scenarios

- 2.3.1 The Initial Development Scenario (IDS) locations are illustrated in **Appendix A - Figure A1**. Development option information was compiled and provided by HDC and is presented in **Appendix B - Table B1** with Site Reference and Definition columns added by AECOM; the former column provides a unique identification number for analysis while the latter was used to inform trip rate assumptions.
- 2.3.2 A total of five options were assessed based on this information, to include the existing Core Strategy scenario as a benchmark.

Additional Development Scenarios

- 2.3.3 The Additional Development Scenario (ADS) locations are illustrated in **Appendix A - Figure A2**. Development option information was compiled and provided by HDC and is presented in **Appendix B - Table B2**. Once again Site Reference and Definition columns have been added by AECOM for reference purposes.
- 2.3.4 A total of Six options were assessed based on this information, to include an allocation for commercial development at Magna Park that was excluded from the earlier IDS testing.

2.4 RESIDUAL DWELLINGS

- 2.4.1 For the IDS testing HDC provided a summary of residual dwellings throughout the District totalling 3,160 outstanding units as of 30 September 2014. This information was used to inform an adjustment of TEMPRO traffic growth factors to avoid double counting.

2.5 2014 REFERENCE FLOWS (BASELINE TRAFFIC DATA)

- 2.5.1 Baseline traffic data for 2014 were originally sourced from Leicestershire County Council (LCC) by HDC. These data covered 35 automatic traffic count sites, found at strategic locations across the district, which were considered likely to attract and reflect the traffic impact of development traffic generated on the network. Output from each site related to data collated from either June or September 2014; while these are not usually considered 'Neutral Months', they were considered likely to provide traffic flows for some of the busiest periods of the year and as a consequence would offer a robust base case situation for the assessment.
- 2.5.2 The 2014 Reference flows for those sites compatible with the ODYSSEUS model network are provided as **Appendix B - Table B3** and illustrated in **Appendix A - Figure A3** (excluding some M1 sites on the figure). An additional site was used for the Additional Development Scenarios on Lubenham Hill east of Market Harborough, which is can be seen in context in **Appendix A - Figure A4**.
- 2.5.3 AECOM subsequently supplemented these data sites with others secured from the Highways England TRADS database to provide traffic flow information associated with the M1 Motorway. AECOM has identified a particularly low traffic flow at Data Site 24393 (Map ID 4) and it should be noted that this may underestimate the impact on link capacity with development overlaid on 2031 Reference flows.

2.6 GROWTH FACTORS

- 2.6.1 TEMPRO v6.2 dataset v6.2 was interrogated to generate traffic growth factors from 2014 to 2031. In agreement with HDC the planning assumptions were adjusted to include growth arising from residual dwellings only (see Section 2.4 above).
- 2.6.2 A comparison of the planning assumptions is shown in Table 2.1. The Adjusted Planning Assumptions in both cases indicated very little change when compared with the Unadjusted Assumptions. This suggests that TEMPRO could be out of date when compared with current HDC planning policy.

Table 2.1: TEMPRO Planning Assumptions

TEMPRO	2014 Households	2031 Households	Percentage Change
Unadjusted	36,053	39,722	10%
Adjusted - IDS		39,213	9%

- 2.6.3 The TEMPRO growth factors based upon the planning assumptions in Table 2.1 for the AM peak. There is little difference between the Unadjusted and Adjusted factors, which reflects the relatively small change in the number of households assumed in each.

Table 2.2: TEMPRO Growth Factors 2014 - 2031

TEMPRO	AM Peak
Unadjusted	1.0931
Adjusted	1.0900

2.7 TRIP RATES

- 2.7.1 It was agreed with HDC that ODYSSEUS default trip rates would be used as no local trip rates were available. ODYSSEUS default rates were derived from TRICS 2007b. The relevant trip rates per dwelling are provided as Table 2.3, while Table 2.4 reveals those for B8 'edge of town' development associated with the employment land identified at Magna Park.

Table 2.3: ODYSSEUS AM Peak Trip Rates per Dwelling

Location	Inbound	Outbound
Town Centre	0.12	0.28
Suburban	0.14	0.49
Edge of Town	0.17	0.64

Table 2.4: ODYSSEUS AM Peak B8 Trip Rates per 100 Sq.m

Location	Inbound	Outbound
B8 – Edge of Town	1.51	0.28

2.8 IMPACT ASSESSMENT TOOL

- 2.8.1 Impacts associated with the various development proposals were determined by an Impact Assessment Tool (IAT). The tool is an MS Excel spreadsheet that presents the inputs and outputs from this study to enable analysis of impacts. Details are provided in **Appendix C**.
- 2.8.2 Two versions of the Tool were issued to cover the IDS and ADS cases.

2.9 LINK ASSESSMENT METHODOLOGY

- 2.9.1 The traffic impact of the development scenarios were considered firstly in absolute terms as increases across the local road network. It was assumed that development size and the associated vehicle trip rates would remain constant over time and as a consequence the development generated traffic demand would not vary; irrespective of whether 2011 (Base Year) or 2031 (Future Year) network scenarios were examined.
- 2.9.2 These additional traffic flows were then considered in addition to:
- Existing 2011 (Base Year) traffic counts;
 - Forecast 2031 (Future Year) traffic flows - adjusting TEMPRO factors applied to the traffic counts to remove committed local development growth already accounted for by ODYSSEUS and leave 'background' growth only, e.g. through trips.
- 2.9.3 The Forecast 2031 (Future Year) provided a Future Year Reference Baseline Case, initially as a comparator and then as the framework on which to overlay the development trips associated with the various development scenarios
- 2.9.4 The network was also analysed to determine the particular road type associated with the link under scrutiny with Table 2.5 providing a summary of the various categories that were applied as appropriate to the circumstances.

Table 2.5: Road Type Label Description¹

Road Type	Label	Description
Rural Single Carriageway	RS	Single Lane
Rural Dual Carriageway	RD2	Two Lane
Urban All-purpose 9m Wide	UAP2 9.0m	Good standard single/dual carriageway road with frontage and more than two side roads per km. 9.0m wide.
Urban All-purpose 7.3m Wide	D UAP2 7.3m	Good standard single/dual carriageway road with frontage and more than two side roads per km. 7.3m wide.
Urban All-purpose 7.3m Wide	UAP3 7.3m	Variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings.

- 2.9.5 By estimating approximate road capacities at selected locations, these figures were used to assess where capacity issues could be expected when total traffic was considered. The various flow outputs for the selected links were assessed in terms of the Ratio of Flow to Capacity (RFC). Capacity thresholds were established on the basis of road type drawn from Table 2.5 and an associated values taken from TA79/99.
- 2.9.6 If the RFC is below 1.00 then the link is operating within capacity and little or no queuing will result. To allow for a performance margin, a value of 0.85 is more typically considered to represent the desirable maximum value.

¹ Design Manual for Roads and Bridges. Volume 5 Section 1 Part 3 TA 79/99 Amendment No 1. DfT.

3. Impacts – Initial Development Scenarios

3.1 INTRODUCTION

3.1.1 From the original phase of the commission the Initial Development Scenario options under test were defined as:

- **Scenario 1** - Core Strategy Distribution;
- **Scenario 2** - Urban Focus;
- **Scenario 3** - Rural Focus;
- **Scenario 4** - Misterton (Urban Focus); and
- **Scenario 5** - Kibworth (Rural Focus).

3.1.2 This assessment considered the main traffic increases that could be generated from delivery of these HDC housing development options through distribution of these trips on the network.

3.2 FUTURE 2031 REFERENCE CASE

3.2.1 As a comparator, output from the reference case, shown in **Appendix A - Figure A5** was also analysed. The result of this exercise indicated that sufficient capacity should exist on the current network to accommodate background traffic growth through to a forecast year of 2031.

3.3 SCENARIO RESULTS

3.3.1 Overall the ODYSSEUS output indicated that in some cases the future impacts could be relatively substantial, with several local roads experiencing increases of between 500 and 1,000 vehicles per hour in the morning peak. Across all scenarios, there were at least 500 to 1,000 additional vehicles per hour likely to be attracted to the A6 route between Market Harborough and Leicester, with between 251 and 500 vehicles per hour drawn towards the A427 linking Market Harborough with Corby.

3.3.2 The increased dwelling numbers associated with Scenarios 4 and 5 raised some significant local impacts:

- **Scenario 4:** In addition to the assignment to the A6 and A427, there were some 500 vehicles per hour predicted to use the M1 between Lutterworth and Leicester and 1,100 vehicles per hour along the A426 between Lutterworth and Rugby.
- **Scenario 5:** the difference forecast for the A6 is more than twice that of the other scenarios, with a projection of over 2,000 additional vehicles per hour.

3.3.3 The output indicated that there is often a strong directional bias. In the AM peak much of the traffic is likely to travel from Harborough towards major local attractors, such as Leicester, Corby and Rugby. It can be anticipated that the reverse would be the case in the PM peak in response to daily commuting patterns.

3.3.4 The application of the appropriate trip rates from Table 2.3 to the various development scenarios resulted in the vehicle trip generation provided in Table 3.1.

Table 3.1: AM Peak Vehicle Trips by Scenario

SCENARIO	DWELLINGS	DEVELOPMENT VEHICLE TRIPS		
		Outbound	Inbound	TOTAL TRIPS
S1 - Core	6,131	3,596	1,642	5,236
S2 - Urban	6,131	3,610	1,656	5,264
S3 - Rural	6,129	3,590	1,637	5,225
S4 - Misterton	8,631	5,110	2,431	7,539
S5 - Kibworth	8,129	4,790	2,257	7,045

3.3.5 Broadly some 68 per cent of the development traffic is travelling outbound during the AM peak with the remainder travelling inbound.

3.4 SCENARIO 1: CORE STRATEGY DISTRIBUTION

3.4.1 Scenario 1 represents HDCs Core Strategy distribution and includes 24 developments. totalling 6,131 dwellings.

3.4.2 No link capacity issues were identified in response to Scenario 1.

3.5 SCENARIO 2: URBAN FOCUS

3.5.1 Scenario 2 represents an Urban Focus with distribution formed by the HDC Core Strategy dispersal with a proportion of development reallocated from rural centres to the urban centres of Scraftoft, Thurnby & Bushby and Market Harborough, while also excluding developments in Billesdon, Great Glen and Kibworth. The Scenario includes 21 developments, totalling 6,131 dwellings.

3.5.2 In common with Scenario 1 no link capacity issues were identified associated with Scenario 2.

3.6 SCENARIO 3: RURAL FOCUS

3.6.1 Scenario 3 represents a Rural Focus distribution comprised of the HDC Core Strategy distribution with a proportion of development reallocated from Scraftoft, Thurnby & Bushby and Market Harborough Town Centres to rural centres. It includes 24 developments, totalling 6,129 dwellings.

3.6.2 The greatest impact from Scenario 3 appears to be on routes along the A6 eastbound at Great Glen Bypass; South of Station Road in Great Glen (see **Appendix A - Figure A8**).

3.6.3 Table 3.2 shows that of the development generated traffic flows, those using the Great Glen Bypass influence an RFC calculated at 0.867; slightly above the 0.85 operational benchmark. On this basis the link could, on occasions, experience some minor signs of stress during the Peak hours that result in a slight reduction in travel times.

Table 3.2: Issues Arising From Scenario 3

Location	Direction	Road Type	Capacity (vph)	85th Percentile (vph)	Dev. Flow Impact (vph)	Diff (vph)
Great Glen Bypass	Eastbound	RD2	1,268	1,078	1,100	+23

3.6.4 The capacity issue highlighted at Great Glen Bypass was sensitive to traffic flows generated by 12 of the developments that form Scenario 3.

3.6.5 Table 3.3 shows the five developments that, should any single one be excluded from Scenario 3, could reduce the overall development impact on Great Glen Bypass to below the 85th percentile

threshold. These five developments account for 81% of the overall 305 vehicles per hour attributable to the development traffic under Scenario 3 conditions.

- 3.6.6 The above information could inform development phasing and contributions towards potential highways improvements.

Table 3.3: Main Development Contributors to Impact on Great Glen Bypass

Site No.	Development Site	Dwellings	Impact on Great Glen Bypass (vph)
1	Market Harborough - Airfield Farm	1,350	65
3	Market Harborough - Overstone Park	800	63
16	Kibworth - Centre	344	60
4	Market Harborough - Town centre residual	547	32
14	Great Glen - Centre	276	28
TOTAL		3,317	248

3.7 SCENARIO 4: MISTERTON (URBAN FOCUS)

- 3.7.1 Scenario 4 represents the Urban Focus distribution plus a large development located at Lutterworth, east of the M1. It includes 22 developments, totalling 8,631 dwellings.
- 3.7.2 The greatest impact from Scenario 4 emerged on Rugby Road (see **Appendix A - Figure A9**).
- 3.7.3 Table 3.7 shows that as a result of the additional traffic flows Rugby Road, North of Shawell Lane in Cotesbach is forecast to exceed capacity with an RFC of 1.21 (i.e. 21 per cent over capacity), while those on Rugby Road, South of Riverside Road in Lutterworth are approaching 100 per cent capacity with an RFC of 0.984.

Table 3.4: Issues Arising From Scenario 4

Location	Direction	Road Type	Capacity (vph)	85th Percentile (vph)	Dev. Flow Impact (vph)	Diff (vph)
Rugby Road	Southbound	RS	1,268	1,077	1,533	-265
Rugby Road	Northbound	UAP3 7.3m	1,300	1,105	1,279	+76

- 3.7.4 Table 3.5 shows that the highway issues arising from Scenario 4 appear exclusively sensitive to an allocation of 2,500 dwellings at Lutterworth – East of the M1. Either removal or a reduced scale of development at this location could reduce the demand to a level that could manage the Rugby Road capacity issue to an appropriate level.

Table 3.5: Impact on Rugby Road

Site Number	Development Site	Dwellings	Impact on Rugby Road, Cotesbach (vph)	Impact on Rugby Road, Lutterwoth (vph)
10	Lutterworth - East of M1	2,500	665	213

- 3.7.5 The above information may be used to inform development scale, phasing and potential contributions towards necessary highways improvements.

3.8 SCENARIO 5: KIBWORTH (RURAL FOCUS)

- 3.8.1 Scenario 5 represents the Rural Focus distribution supplemented by a large development located at Kibworth. It includes 25 developments, totalling 8,129 dwellings.
- 3.8.2 The main impacts to emerge from Scenario 5 were found on the A6 between Leicester and Market Harborough, with the greatest indicated on the Great Glen and Harborough Bypasses.
- 3.8.3 As outlined in Table 3.6 the resulting additional traffic flows generated by Scenario 5 cause both the Great Glen Bypass, South of Station Road in Great Glen and Harborough Bypass, East of Gallow Lodge in Great Bowden, to exceed their respective link capacity, with RFCs of 1.17 and 1.07 respectively.
- 3.8.4 In addition, those on London Road in Oadby become close to capacity and exceed the 85th percentile of the capacity for the respective road type.

Table 3.6: Issues Arising From Scenario 5

Location	Direction	Road Type	Capacity (vph)	85th Percentile (vph)	Dev. Flow Impact (vph)	Diff (vph)
Great Glen Bypass	Eastbound	RD2	1,268	1,077	1,479	-211
Harborough Bypass	Eastbound	RS	1,268	1,077	1,356	-88
London Road, Oadby	Southbound	D UAP2 7.3m	1,988	1,689	1,699	289

- 3.8.5 While the highway issues arising from Scenario 5 are sensitive to a large number of its component developments, the links at the Great Glen Bypass and Harborough Bypass, which have emerged with capacity failings, are particularly sensitive to the 2,000 dwellings development at Kibworth – East of the A6 (See Table 3.7).
- 3.8.6 For instance, should these 2,000 dwellings be the sole development in Scenario 5 then, while the links at the Great Glen and Harborough Bypasses would no longer exceed the calculated link capacity. They would however, remain close to capacity; exceeding the 85th percentile of the capacities. Equally, should the development at Kibworth – East of the A6 be excluded from Scenario 5 then the only remaining issue would be along the Great Glen Bypass, which would approach capacity and exceed the 85th percentile metric.

Table 3.7: Impact on Harborough Bypass and Great Glen Bypass

Site Number	Development Site	Dwellings	Impact on Harborough Bypass, Great Bowden (vph)	Impact on Great Glen Bypass (vph)
17	Kibworth - East of A6	2,000	307	379

- 3.8.7 Independent of the two issues outlined above, London Road in Oadby is particularly sensitive to seven developments within Scenario 5. See Table 3.6 above. Should any single development from the choice of Airfield Farm, Overstone Park, Market Harborough Town Centre residual, Great Glen Centre, Kibworth Centre, Great Bowden Centre or Kibworth – East of A6 be excluded from Scenario 5, then the link capacity issue at London Road could be resolved.
- 3.8.8 The above information may be used to inform development phasing, and contributions towards necessary highways improvements.

4. Impacts – Additional Development Scenarios

4.1 INTRODUCTION

4.1.1 The additional development options for assessment were defined in terms of six new scenarios:

- **Scenario 6** - Core Strategy Distribution plus Magna Park;
- **Scenario 7** - Urban Focus plus Magna Park ;
- **Scenario 8** - Rural Focus plus Magna Park;
- **Scenario 9** - Misterton (Urban Focus) plus Magna Park;
- **Scenario 10** - Kibworth (Rual Focus) plus Magna Park; and
- **Scenario 11** - PUA (Urban Focus) plus Magna Park.

4.1.2 In common with the Initial Assessment, this part of the process considered the main traffic increases that could be generated from delivery of these HDC housing development options through distribution of these trips on the network.

4.2 FUTURE 2031 REFERENCE CASE

4.2.1 The output and conclusions on the reference case reported earlier in paragraph 3.2 above remain valid.

4.3 SCENARIO RESULTS

4.3.1 Overall the ODYSSEUS output indicated that while proposed development will add a significant numbers of trips to the network in some places (for example immediately adjacent to large development sites) the highway network will continue to operate within capacity.

4.3.2 There is only one instance where the traffic flow approaches link capacity. This is in Scenario 9 on Rugby Road, North of Shawell Lane in Cotesbach. This arises because of an increase in traffic of 416 vehicles from development East of M1 Junction 20. In addition to this traffic demand is approaching effective link capacity on Rugby Road, South of Riverside Road in Lutterworth in Scenario 9 and Thurnby Hill, West of Grange Ln, Thurnby in Scenario 11.

4.3.3 The strong directional bias observed in the IDS testing still largely remains with the ADS testing. In the AM peak traffic demand tends to be focused towards dominant local attractors, such as Leicester, Corby and Rugby. Magna Park also generate a significant amount of traffic , attracting trips along the A5 and also on east-west routes. It can be anticipated that the reverse would be the case in the PM peak in response to daily commuting patterns.

4.3.4 The application of the appropriate trip rates from Table 2.3 and Table 2.4 to the various development scenarios resulted in the vehicle trip generation provided in Table 4.1. While the number of dwellings changes with each scenario the commercial development is identical throughout them all with the result that the number of trips to and from Magna Park remains constant.

Table 4.1: ADS AM Peak Vehicle Trips by Scenario

SCENARIO	DWELLINGS	B8 COMMERCIAL SQ M	DEVELOPMENT VEHICLE TRIPS		
			Outbound	Inbound	TOTAL TRIPS
S6 - Core	4,874	380,000	3,183	6,416	9,599
S7 - Urban	5,030	380,000	3,253	6,437	9,690
S8 - Rural	4,761	380,000	3,129	6,400	9,529
S9 - Misterton	5,131	380,000	3,494	6,470	9,964
S10 - Kibworth	4,932	380,000	3,417	6,444	9,861
S11 - PUA	4,918	380,000	3,377	6,439	9,815

4.3.5 Broadly some 34 per cent of the development traffic is travelling outbound during the AM peak with the remainder travelling inbound. This is in stark contrast to the trip generation arising from the IDS scenarios and is a result of the B8 commercial development. This will capture, as its own inbound trips, outbound trips from the dwellings comprising the ADS scenarios (i.e. an interaction between the differing land use types within the tested scenarios) and also generate inbound trips from existing dwellings. As a result of the ODYSSEUS gravity function the degree of interaction between the residential and commercial development will vary by scenario according to the scale and spatial distribution of residential development.

4.4 SCENARIO 6: CORE STRATEGY PLUS MAGNA PARK

4.4.1 Scenario 6 would bring forward 4,874 dwellings across 22 residential sites.

4.4.2 No link capacity issues were identified to arise from Scenario 6.

4.5 SCENARIO 7: URBAN FOCUS PLUS MAGNA PARK

4.5.1 Scenario 2 represents an Urban Focus with distribution formed by the HDC Core Strategy dispersal with a proportion of development reallocated from rural centres to the urban centres of Scraftoft, Thurnby & Bushby and Market Harborough. In addition developments at Billesdon, Great Glen and Kibworth are excluded. The Scenario includes 18 developments, totalling 5,030 dwellings.

4.5.2 In common with Scenario 6 no link capacity issues were identified associated with Scenario 7.

4.6 SCENARIO 8: RURAL FOCUS PLUS MAGNA PARK

4.6.1 Scenario 8 represents a Rural Focus distribution comprised of the HDC Core Strategy distribution with a proportion of development reallocated from Scraftoft, Thurnby & Bushby and Market Harborough Town Centres to rural centres such as Kibworth, Great Bowden and Houghton on the Hill. It includes 22 developments, totalling 4,761 dwellings, the smallest number of any scenario.

4.6.2 As with previous scenarios there are no link capacity issues arising from Scenario 8.

4.7 SCENARIO 9: MISTERTON (URBAN FOCUS) PLUS MAGNA PARK

4.7.1 Scenario 9 represents the Urban Focus distribution plus a large development located at Lutterworth, east of the M1. It includes 5,131 dwellings across 20 developments. Although this is not the largest number of dwellings within any scenario it does represent the greatest number of dwellings tested.

4.7.2 This is the only scenario that indicates a marked impact on the highway network, which occurs on Rugby Road (see **Appendix A – Figure A14**).

4.7.3 Table 4.2 shows that as a result of additional traffic flows on Rugby Road, North of Shawell Lane in Cotesbach is forecast to exceed effective capacity with an RFC of 0.94. Those on Rugby Road, South of Riverside Road in Lutterworth are close to effective capacity (with an RFC of 0.84).

4.7.4 A comparison with Scenario 4 in paragraph 3.7, which most closely reflects Scenario 9 from the IDS scenarios, is favourable as the link does not exceed actual capacity. The traffic flows presented in Table 4.2 do however suggest that there may be limited capacity for further traffic growth on Rugby Road southbound, particularly if further development is located in close proximity to it.

Table 4.2: Issues Arising From Scenario 9

Location	Direction	Road Type	Capacity (vph)	85th Percentile (vph)	Dev. Flow Impact (vph)	Diff (vph)
Rugby Road	Southbound	RS	1,268	1,077	1,188	+80
Rugby Road	Northbound	UAP3 7.3m	1,300	1,105	1,091	+209

4.7.5 Analysis using the IAT indicates the capacity constraint on Rugby Road arises from 2,000 dwellings located at Lutterworth – East of M1 (Site 10), where it contributes 416 vehicles southbound in Cotesbach and 137 northbound in Lutterworth. In Cotesback this results in Site 10 using approximately 34% of southbound link capacity.

4.7.6 The above information may be used to inform development scale, phasing and potential contributions towards necessary highways improvements.

4.8 SCENARIO 10: KIBWORTH (RUAL FOCUS) PLUS MAGNA PARK

4.8.1 Scenario 10 is comparable to the Rural Focus distribution in Scenario 7, supplemented by a large development located at Kibworth. It includes 22 developments, totalling 4,932 dwellings.

4.8.2 There are no link capacity issues arising from Scenario 10.

4.9 SCENARIO 11: PUA (URBAN FOCUS) PLUS MAGNA PARK

4.9.1 Scenario 11 is a variation on the Rural Focus with two sites at Scruptoft, Thurnby & Bushby located on the edge of Leicester. It also features the removal of the site at Kibworth town centre. In total there are 4,918 dwellings spread across 23 Sites.

4.9.2 Although there are no immediate link capacity issues arising from Scenario 11 Thurnby Hill, West of Grange Lane, Thurnby has an RFC of 0.84 indicating that it is operating close to effective capacity and may have limited capability to accommodate further traffic growth.

5. Conclusions

- 5.1.1 Two sets of scenarios were tested, the five Initial Development Scenarios (IDS) provided an earlier analysis of the Core Strategy housing Scenario with four other emerging housing development scenarios. At the time of this assessment it was agreed with HDC that further refinement and the prospect of new options for testing could be necessary to keep pace with the emerging strategy. As a consequence of this the six Additional Development Scenarios (ADS) provided updated analysis to also include significant commercial development at Magna Park.
- 5.1.2 Generally the ODYSSEUS output has highlighted a strong directional bias in terms of traffic movement, with much of the traffic travelling from Harborough towards major local attractors, such as Leicester, Corby and Rugby in the AM peak, followed by a potential reversal in the PM peak in response to daily commuting patterns.
- 5.1.3 ODYSSEUS has also indicated that in some cases the impacts could be substantial, with several local roads experiencing increases in excess of 500 vehicles per hour in the morning peak. Across all scenarios, there are at least 500 to 1,000 additional vehicles per hour attracted to the A6 route between Market Harborough and Leicester. In the IDS there were between 251 and 500 vehicles per hour drawn towards the A427 linking Market Harborough with Corby. In response to the reduction in dwellings but with increased in trips as a consequence of development at Magna Park the A5 west of Lutterworth, and the A4303 between Lutterworth and the A5, also experience an increase in excess of 600 vehicles per hour.
- 5.1.4 With testing of the IDS the analysis makes it is clear that while each of HDCs development options will have a significant impact on the existing highway network, it is only Scenarios 3 – 5 that raise potential impacts along certain key links on the network that could affect the effective operational of the highway network.
- 5.1.5 The impacts associated with Scenarios 4 and 5 have emerged as those that could influence the most significant local impacts:
- **Scenario 4:** In addition to adding a significant number of trips to the A6 and A427, the development mix is forecast to add some 500 vehicles per hour to the M1 between Lutterworth and Leicester and 1,100 vehicles per hour to the A426 between Lutterworth and Rugby.
 - **Scenario 5:** Likely to add more than twice the number of vehicles to the A6 when compared with all other scenarios, with a forecast of over 2,000 additional vehicles per hour.
- 5.1.6 With Scenario 5 there is a direct correlation between the addition of approximately 2,000 extra dwellings at Kibworth, east of the A6, which results in the Great Glen Bypass exceeding its stated capacity by some 22 per cent. While the impact of Scenario 4 on Rugby Road, Cotesbach is also directly correlated, although development at Lutterworth, East for the M1, results in the link at Cotesbach exceeding capacity by some 21%.
- 5.1.7 Situations where links have exceeded the 85th percentile of the stated link capacity, such as London Road, Oadby in Scenario 5 and the Great Glen Bypass in Scenario 3, there is the potential option to manage the scale and/ or combination of multiple developments to lessen potential link capacity issues.
- 5.1.8 Analysis of the ADS testing indicates that the impact on the highway network is less significant than the IDS across all scenarios. There are no instances where a link flow exceeds capacity in any scenarios. There is, however one instance where the link flow exceeds an RFC of 0.85, which occurs in Scenario 9 on Rugby Road, North of Shawell Lane in Cotesbach. Here the one-way link flow increases from 708 vehicles in the 2031 Reference Case to 1,188 vehicles with development, within 6% of one-way link capacity. This would suggest limited capability to accommodate further traffic growth without mitigation to the highway network. A review of the ODYSSEUS outputs using the Impact Assessment Tool indicates that the relatively poor performance of this link is caused by Site 10 Lutterworth - East of M1.
- 5.1.9 In addition to traffic pressures on Rugby Road, North of Shawell Lane there are also instances where links are within 16% of capacity. This occurs on Rugby Road, South of Riverside Road in

Lutterworth in Scenario 9 and Thurnby Hill, West of Grange Lane, Thurnby in Scenario 11. Whilst these locations do not experience the same level of development pressure as Rugby Road, North of Shawell Lane the analysis suggests that these locations may be particularly sensitive to additional development in close proximity.

5.1.10 In each instance information provided by ODYSSEUS may be used to inform development phasing, and contributions towards necessary highways improvements. For ease of reference the main link issues associated with the various development scenarios are provided in Table 5.1.

Table 5.1: Link Issue Summary by Scenario

SCENARIO	DWELLINGS	LINK ISSUE	COMMENTS
Initial Development Scenarios			
S1 - Core	6,131	None	None
S2 - Urban	6,131	None	None
S3 - Rural	6,129	None	None
S4 - Misterton	8,631	Rugby Road N. of Shawell Lane, Cotesbach. Rugby Road S. of Riverside Road, Lutterworth.	Could be managed by either removal or reduced scale of development at Lutterworth.
S5 - Kibworth	8,129	Great Glen Bypass Harborough Bypass	Could be managed by either removal or reduced scale of development at Kibworth.
		London Road, Oadby	Particularly sensitive to seven developments within Scenario 5. Removal of traffic demand from any one of these likely to resolve link capacity issue.
Additional Development Scenarios (incorporating Magna Park)			
S6 - Core	4,874	None	None
S7 - Urban	5,030	None	None
S8 - Rural	4,761	None	None
S9 - Misterton	5,131	Rugby Road N. of Shawell Lane, Cotesbach.	Could be managed by either removal or reduced scale of development at Lutterworth, particularly at Site 10 east of the M1. In addition Rugby Road, South of Riverside Road is close to effective capacity and indicates that this road may have limited capability to accommodate further growth.
S10 - Kibworth	4,932	None	None
S11 - PUA	4,918	None	Thurnby Hill, West of Grange Ln, Thurnby is close to effective capacity and indicates that this road may have limited capability to accommodate further growth.

APPENDIX A: Figures

Figure A1 - Residential Development Sites – Initial Development Scenario

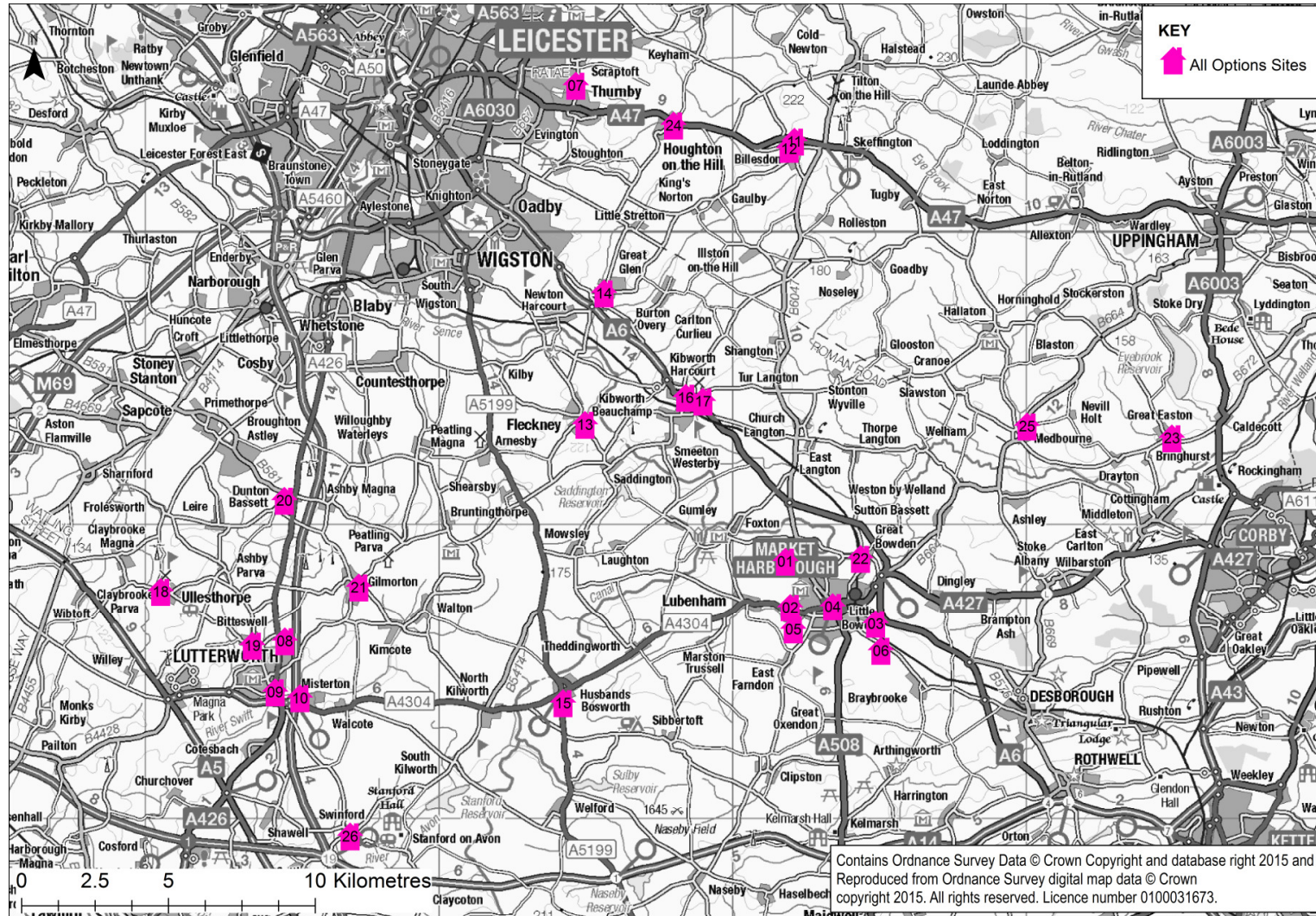


Figure A2: All Development – Sites Additional Development Scenarios

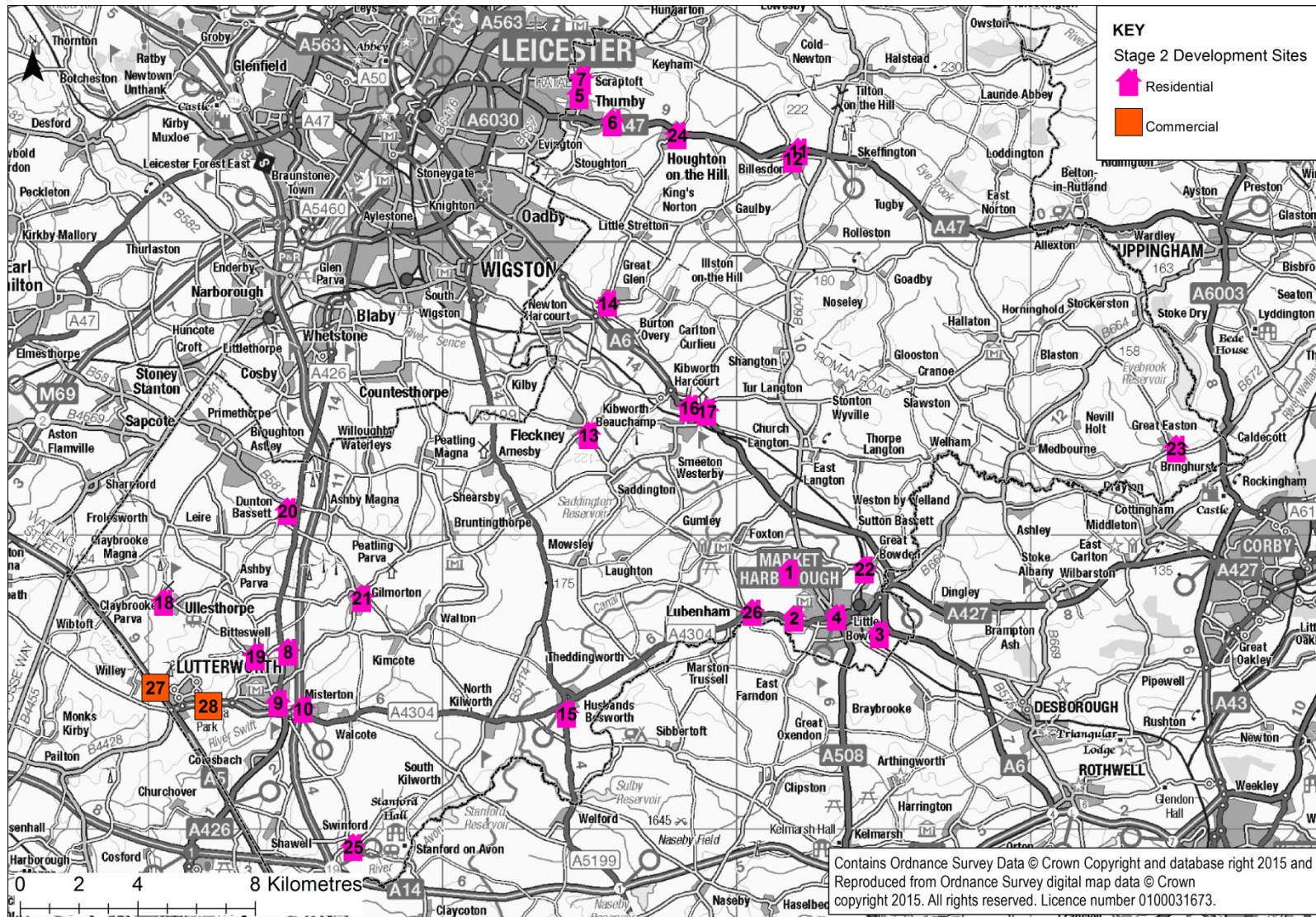


Figure A3 - Traffic Data Sites – Initial Development Scenario



Figure A4: Traffic Data Sites - Additional Development Scenarios

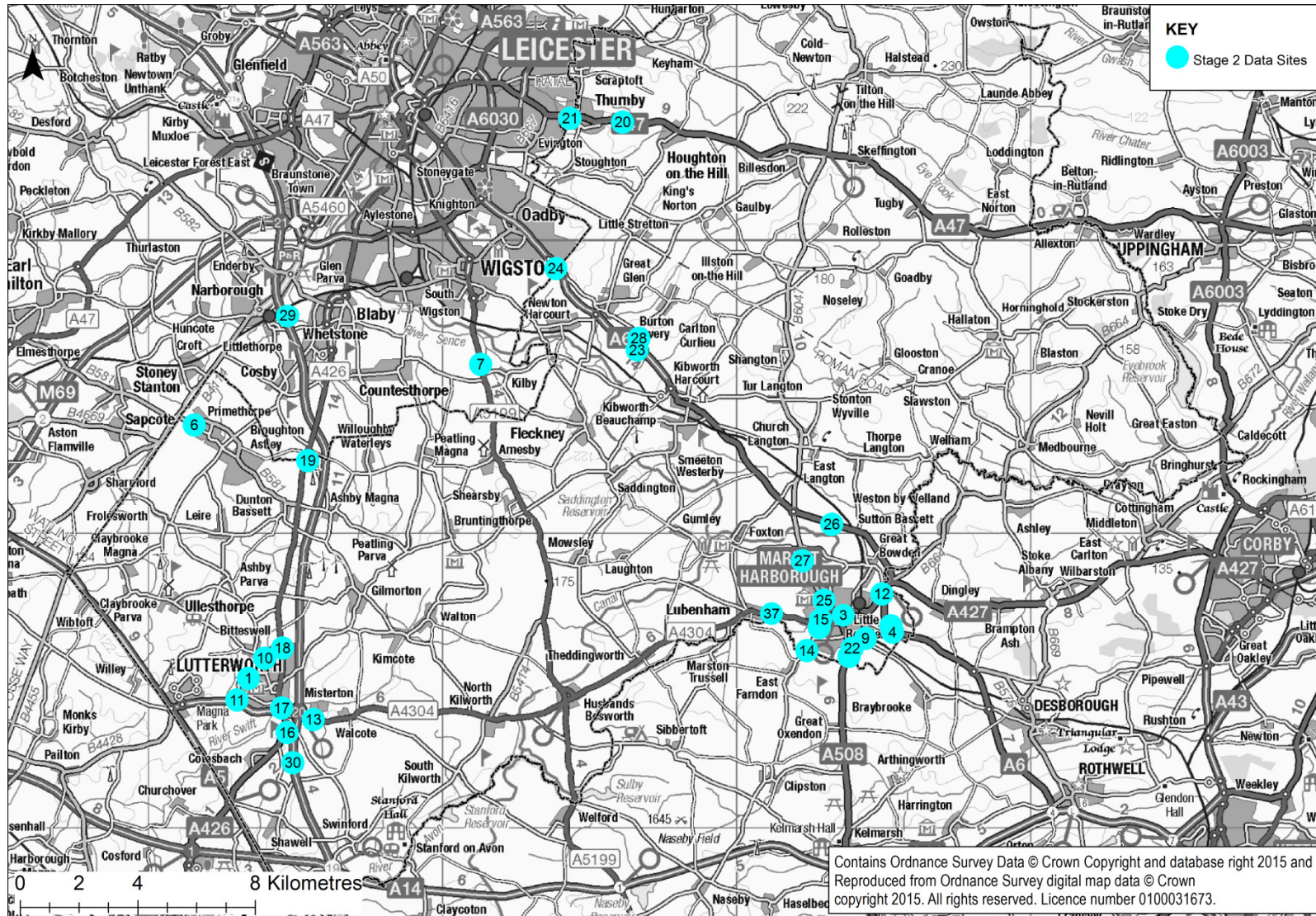


Figure A5 - 2031 Reference RFC

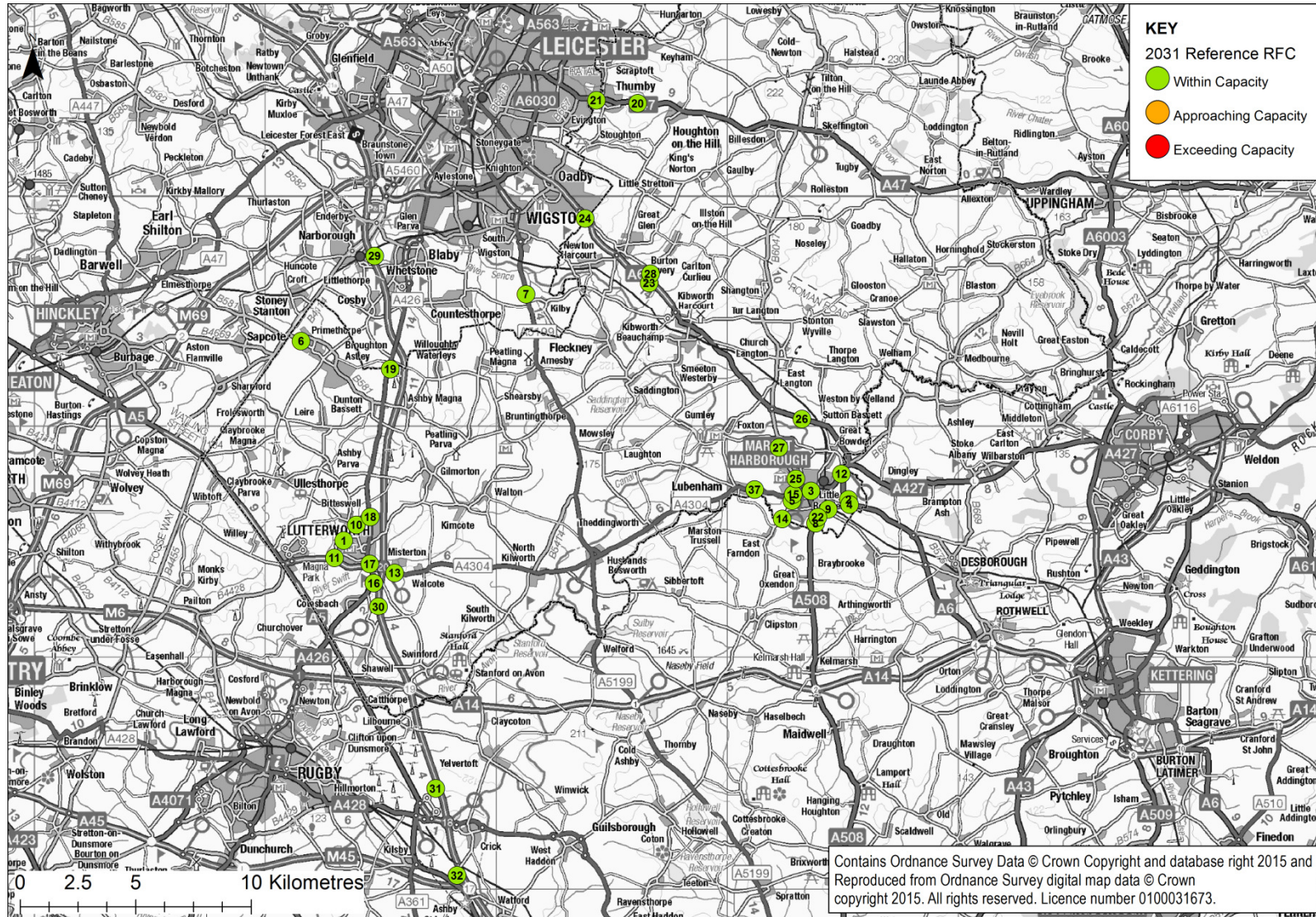


Figure A6 - Option 1 Impacts With Development RFC



Figure A7 - Option 2 Impacts With Development RFC



Figure A8 - Option 3 Impacts With Development RFC



Figure A9 - Option 4 Impacts With Development RFC



Figure A10 - Option 5 Impacts With Development RFC



Figure A11: Option 6 Impacts With Development RFC



Figure A12: Option 7 Impacts With Development RFC



Figure A13: Option 8 Impacts With Development RFC

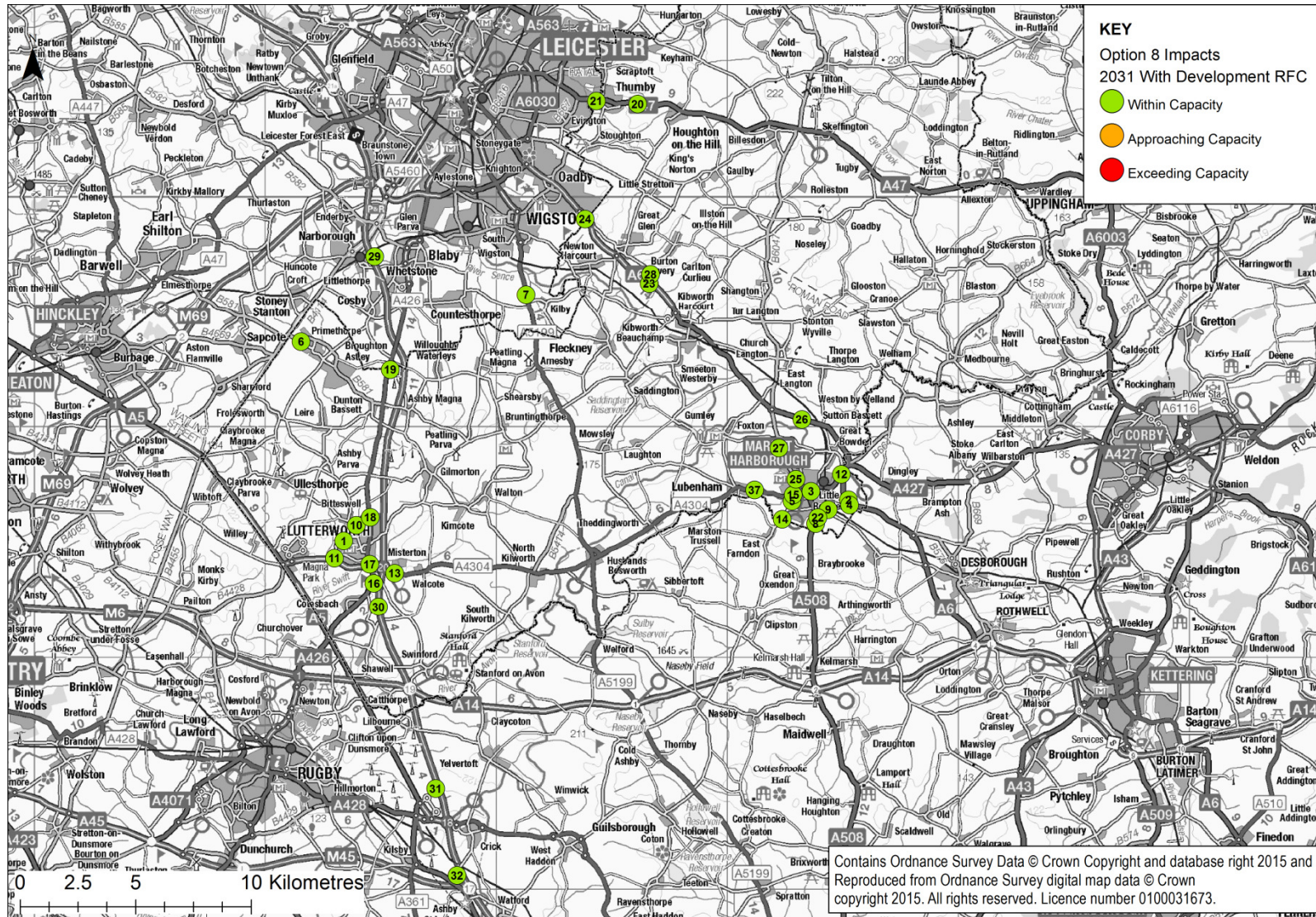


Figure A14: Option 9 Impacts With Development RFC



Figure A15: Option 10 Impacts With Development RFC

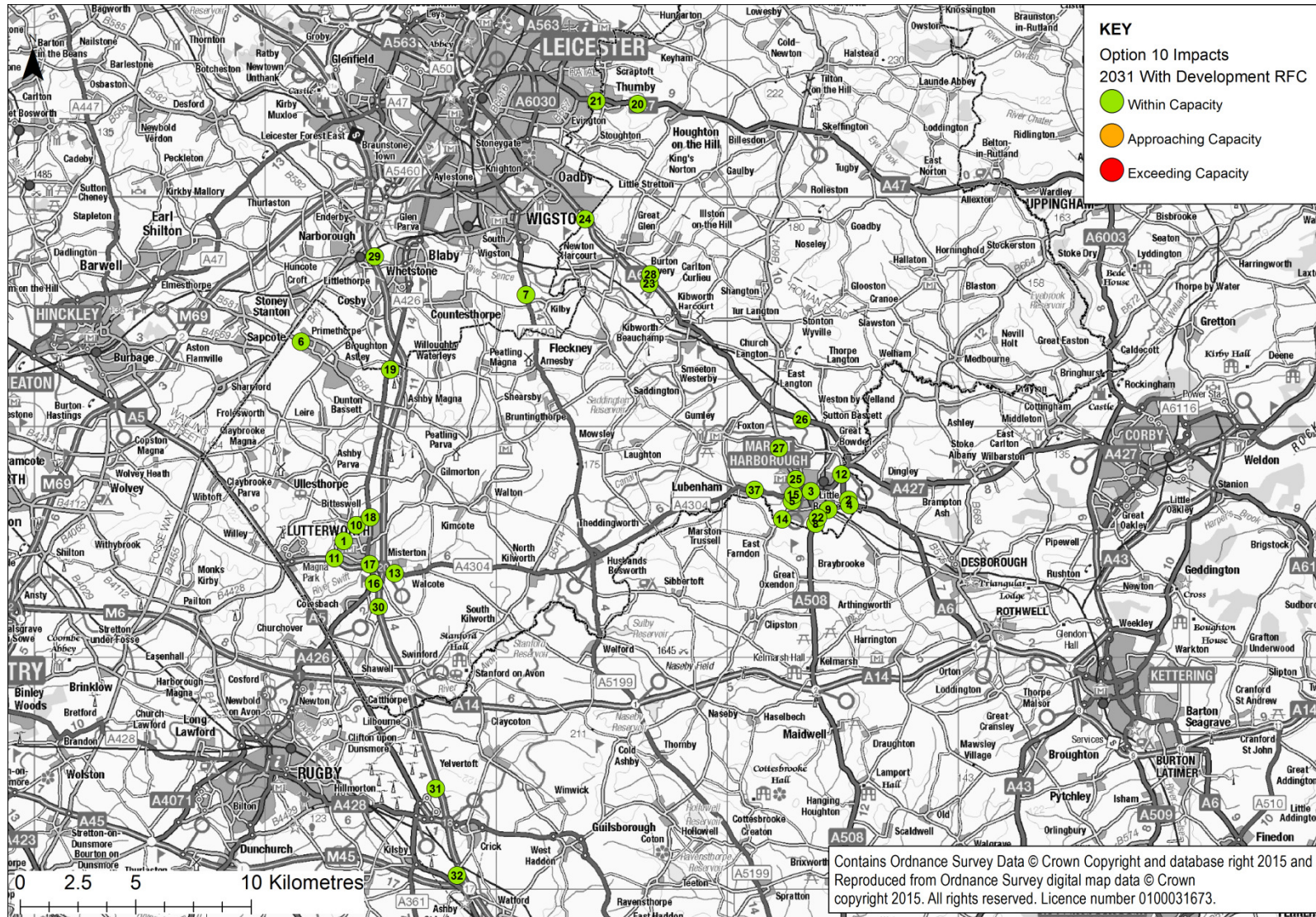
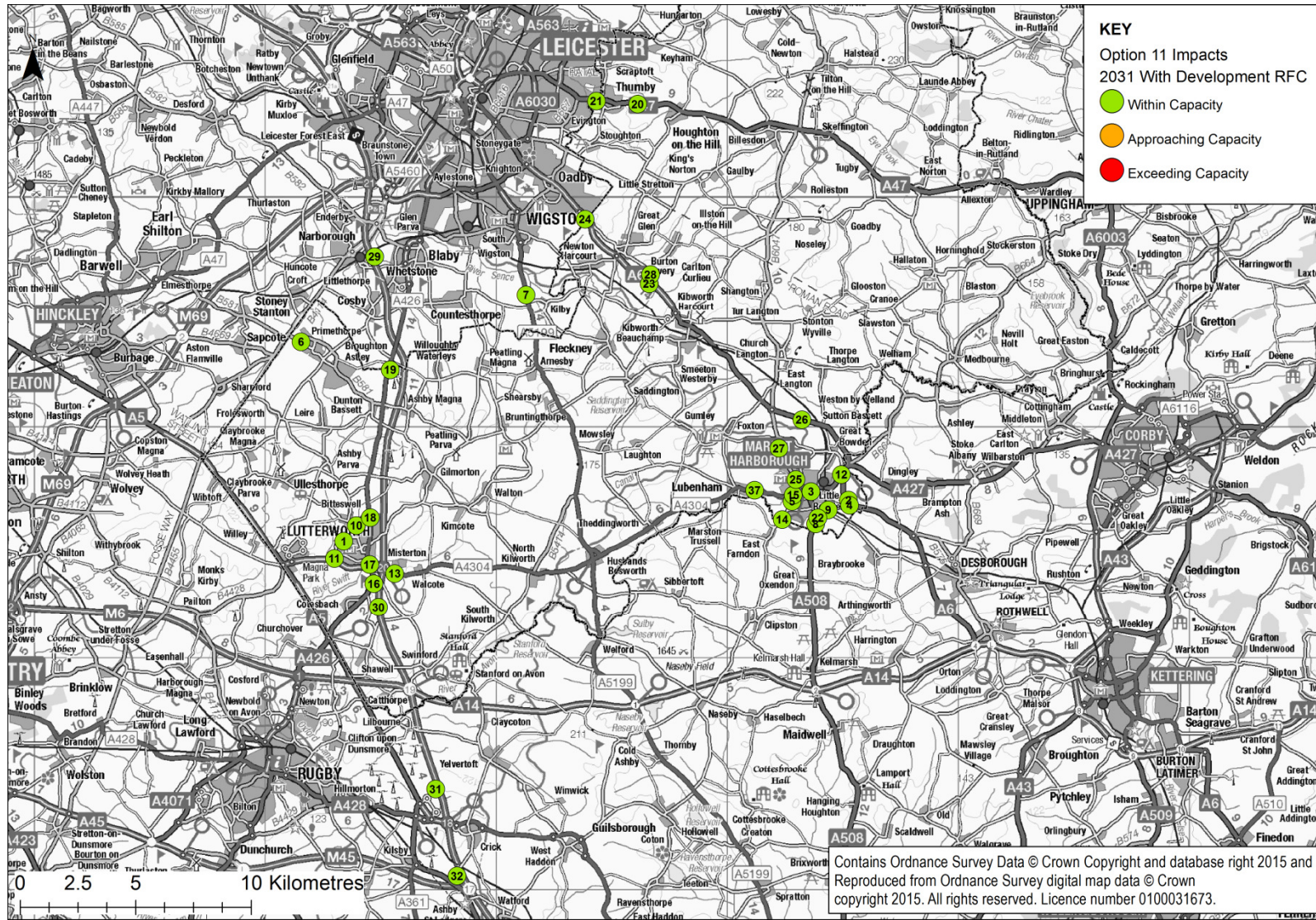


Figure A16: Option 11 Impacts With Development RFC



APPENDIX B: Development Components

Table B1: Harborough District Council Development Options – Initial Development Scenarios

Status	Site Ref	Settlement Name	Notes	Definition	Easting	Northing	DWELLING OPTION No.				
							1	2	3	4	5
SRC	01	Market Harborough	Airfield Farm	Edge of town	471,798	288,752	1,350	1,350	1,350	1,350	1,350
	02		Linden	Suburban	471,962	287,177	120	120	120	120	120
	03		Overstone Park	Suburban	474,870	286,614	800	800	800	800	800
	04		Town centre residual	Town Centre	473,410	287,211	994	1,042	547	1,042	547
	05		Farndon Road	Suburban	472,065	286,422	140	140	140	140	140
	06		Northampton Road	Suburban	475,050	285,693	120	120	120	120	120
PUA	07	Scraptoft, Thurnby & Bushby	Station Lane	Suburban	464,658	304,970	598	1,086	462	1,086	462
KC	08	Lutterworth	Leics Road	Suburban	454,747	286,021	150	150	150	150	150
	09		Town centre residual	Town Centre	454,412	284,288	432	432	432	432	432
	10		East of M1		455,260	284,084	0	0	0	2,500	0
RC	11	Billesdon	NP commitment	Suburban	472,108	303,065	35	35	35	35	35
	12		Centre	Town Centre	471,920	302,820	50	0	95	0	95
RC	13	Fleckney	Centre	Town Centre	464,972	293,406	468	413	468	413	468
RC	14	Great Glen	Centre	Town Centre	465,621	297,902	116	0	276	0	276
RC	15	Husbands Bosworth	Grid to Welford Road	Suburban	464,224	283,916	51	45	51	45	51
RC	16	Kibworth	Centre	Town Centre	468,402	294,325	104	0	344	0	344
	17		East of A6 (add link road)	Suburban	468,990	294,202	0	0	0	0	2,000
RC	18	Ullesthorpe	Centre	Town Centre	450,516	287,724	44	7	86	7	86
SRV	19	Bitteswell	Centre	Town Centre	453,638	285,866	63	36	84	36	84
SRV	20	Dunton Bassett	Centre	Town Centre	454,725	290,824	59	59	59	59	59
SRV	21	Gilmorton	Centre	Town Centre	457,265	287,872	69	51	69	51	69
SRV	22	Great Bowden	Centre	Town Centre	474,358	288,848	134	71	180	71	180
SRV	23	Great Easton	Centre	Town Centre	484,962	292,948	50	11	78	11	78

Status	Site Ref	Settlement Name	Notes	Definition	Easting	Northing	DWELLING OPTION No.				
							1	2	3	4	5
SRV	24	Houghton on the Hill	Centre	Town Centre	467,986	303,613	77	77	77	77	77
SRV	25	Medbourne	Centre	Town Centre	480,030	293,352	57	36	56	36	56
SRV	26	Swinford	Centre	Town Centre	456,966	279,394	50	50	50	50	50

Table B1: Harborough District Council Development Options – Additional Development Scenarios

Site Ref	Settlement Name	Notes	Definition	Easting	Northing	DWELLING OPTION No.					
						6	7	8	9	10	11
01	Market Harborough	Airfield Farm	Edge of town	471,798	288,752	1,350	1,350	1,350	1,350	1,350	1,350
02		Linden	Suburban	471,962	287,177	120	120	120	120	120	120
03		Overstone Park	Suburban	474,870	286,614	600	600	600	0	600	600
04		Town centre residual	Town Centre	473,410	287,211	729	1,383	207	440	175	266
05	Scraptoft, Thurnby & Bushby	Station Lane	Suburban	464,658	304,970	303	478	166	73	158	182
06		PUA SDA	Suburban	465,781	304,048	0	0	0	0	0	500
07		PUA SDA	Suburban	464,728	305,519	0	0	0	0	0	500
08	Lutterworth	Leics Rd	Suburban	454,747	286,021	150	150	150	150	150	150
09		Town centre residual	Town Centre	454,412	284,288	356	495	238	238	225	248
10		East of M1	Suburban	455,260	284,084	0	0	0	2,000	0	0
11	Billesdon	NP commitment	Suburban	472,108	303,065	35	35	35	35	35	35
12		Centre	Town Centre	471,920	302,820	31	0	59	8	17	19
13	Fleckney	Centre	Town Centre	464,972	293,406	440	204	572	307	370	385
14	Great Glen	Centre	Town Centre	465,621	297,902	64	0	166	0	17	25
15	Husbands Bosworth	Grid to Welford Rd	Suburban	464,224	283,916	68	20	99	40	52	55
16	Kibworth	Centre	Town Centre	468,402	294,325	56	0	208	0	0	0
17		East of A6	Suburban	468,990	294,202	0	0	0	0	1,200	0
18	Ullesthorpe	Centre	Town Centre	450,516	287,724	27	0	54	7	15	17
19	Bitteswell	Centre	Town Centre	453,638	285,866	40	17	53	27	33	34
20	Dunton Bassett	Centre	Town Centre	454,725	290,824	72	33	94	50	61	62
21	Gilmorton	Centre	Town Centre	457,265	287,872	65	23	91	41	52	54

Site Ref	Settlement Name	Notes	Definition	Easting	Northing	DWELLING OPTION No.					
						6	7	8	9	10	11
22	Great Bowden	Centre	Town Centre	474,358	288,848	83	3	114	54	68	71
23	Great Easton	Centre	Town Centre	484,962	292,948	32	6	51	17	23	25
24	Houghton on the Hill	Centre	Town Centre	467,986	303,613	130	57	172	89	108	112
25	Swinford	Centre	Town Centre	456,966	279,394	51	24	67	36	43	45
26	Lubenham	Centre	Town Centre	470,536	287,379	72	32	95	49	60	63
27	Magna Park	Local need	Edge of town	450,232	284,805	101,000 sqm B8	101,000 sqm B8	101,000 sqm B8	101,000 sqm B8	101,000 sqm B8	101,000 sqm B8
28		Regional need	Edge of town	452,030	284,181	279,000 sqm B8	279,000 sqm B8	279,000 sqm B8	279,000 sqm B8	279,000 sqm B8	279,000 sqm B8

Table B3: 2014 Peak Hour Reference Traffic Flows by Site and Direction of Travel

Data Site	Description	Map ID	Direction		AM Peak Traffic by Direction			PM Peak Traffic by Direction		
			1	2	1	2	Both	1	2	Both
25136	Brookfield Way, W of Juniper Close, Lutterworth	1	NB	SB	186	327	514	283	213	495
24395	Market Harborough Bypass, N of Kettering Road (Pro)	2	NB	SB	481	450	930	510	498	1,007
24394	St Mary's Road, Market Harborough	3	EB	SB	33	26	59	37	21	58
24393	Kettering Road, W of A6 Market Harborough	4	EB	WB	218	178	397	197	217	414
24391	Welland Park Road, Market Harborough	5	EB	WB	361	182	543	344	225	569
23258	Coventry Road, E of B4114, Broughton Astley	6	EB	WB	473	747	1,220	763	629	1,392
22527	Welford Road, S of Kilby Bridge, Kilby	7	NB	SB	450	421	871	506	437	942
21752	Northampton Road, S of Sports Club Mkt Harb (pro)	8	NB	SB	319	301	620	404	323	728
21412	Braybrooke Road, Market Harborough	9	SEB	NWB	92	113	205	133	106	240
21408	Lutterworth Road, E of The Nook, Bitteswell (pro)	10	EB	WB	289	179	468	206	279	486
21407	Coventry Road, N of A4303, Lutterworth (pro)	11	NB	SB	234	570	805	552	291	843
21404	Rockingham Road, W of A6, Market Harborough (Pro)	12	EB	WB	546	797	1,343	940	704	1,644
21402	Lutterworth Road, E of M1, Misterton	13	EB	WB	372	661	1,034	707	437	1,144
21401	Farndon Road, S of Watson Av, Market Harborough	14	NB	SB	133	98	231	128	125	252
21378	Coventry Road, W of Logan St, Market Harborough	15	EB	WB	461	353	814	370	559	929
21230	Rugby Road, N of Shawell Lane, Cotesbach (pro)	16	NB	SB	570	649	1,219	716	597	1,314
21229	Rugby Road, S of Riverside Road, Lutterworth (pro)	17	NB	SB	826	718	1,544	897	711	1,608
21228	Leicester Road, N of Bill Crane, Lutterworth (pro)	18	NB	SB	426	721	1,147	845	417	1,262

Data Site	Description	Map ID	Direction		AM Peak Traffic by Direction			PM Peak Traffic by Direction		
			1	2	1	2	Both	1	2	Both
21227	Lutterworth Road, N of Dunton Bassett	19	NB	SB	373	462	835	569	379	948
20577	Uppingham Road, W of Bushby, Thurnby	20	EB	WB	478	555	1,033	516	480	995
20576	Thurnby Hill, W of Grange Ln, Thurnby	21	WB	EB	782	419	1,201	501	598	1,099
20299	Northampton Road, (nr Cem) Market Harborough (Pro)	22	NB	SB	381	482	863	620	487	1,106
20249	Great Glen Bypass, S of Station Road, Great Glen	23	EB	WB	730	560	1,290	759	611	1,370
20247	London Road, Oadby	24	SB	NB	900	1,091	1,991	992	947	1,939
20236	Leicester Road, S of Poplars Ct, Market Harborough	25	NB	SB	278	401	678	439	321	760
20235	Harborough Bypass, E of Gallow Lodge, Great Bowden	26	EB	WB	713	465	1,178	545	802	1,347
20233	Harborough Road, S of Gallowfield Road, Lubenham	27	NB	SB	456	538	994	525	479	1,003
20230	London Road, S of Mayns Lane, Great Glen	28	NB	SB	13	164	177	5	149	154
30024032	M1 Mainline Junction 20 to 21	29	NB	SB	2,644	3,155	5,799	3,466	2,978	6,444
30022443	M1 Mainline Junction 19 to 20	30	NB	SB	2,385	2,952	5,337	3,146	2,904	6,051
30023543	M1 Mainline Junction 18 to 19	31	NB	SB	2,353	2,412	4,765	3,025	2,770	5,795
30022448	M1 Mainline Junction 17 to 18	32	NB	SB	2,276	2,546	4,822	2,904	2,804	5,708
30023904	M1 Mainline Junction 16 to 17	33	NB	SB	2,793	2,944	5,736	3,153	3,063	6,216
30022449	M1 Mainline Junction 15A to 16	34	NB	SB	3,875	4,140	8,015	4,168	4,067	8,234
30020420	M1 Mainline Junction 15 to 15A	35	NB	SB	3,776	4,308	8,084	4,108	4,124	8,232
30025970	M1 Mainline Junction 14 to 15	36	NB	SB	3,567	4,365	7,932	4,348	3,827	8,175
21403	Lubenham Hill, E of Lubenham, Market Harborough	37	EB	WB	409	403	812	462	395	857

APPENDIX C – Impact Assessment Tool Guide

AECOM ODYSSEUS - IMPACT ASSESSMENT TOOL

The Impact Assessment Tool (IAT) is an MS Excel spreadsheet that presents the inputs and outputs from this project to provide analysis of impacts. Output is provided in the form of a series of worksheets, which are:

- **Menu:** Providing a brief introduction to the tool and a means of selecting the main information sheets, it also includes a plan of the development sites;
- **Options:** Presenting the options received from HDC;
- **Factors:** Containing the TEMPRO factors and supporting information. It also includes the trip rates used by ODYSSEUS for this project;
- **Key Links 2014:** Including all traffic data received from Leicestershire County Council and TRADS data. It should be noted that not all of these sites could be matched with the ODYSSEUS network;
- **Key Links 2031:** Forecast future year reference flows, i.e. excluding traffic generated by the HDC development options;
- **2031 Development:** Incorporating a drop down menu to select an option and presentation of the 2031 Reference and Development flows with capacity analysis; and
- **Data Site:** A map of the data sites matched with the ODYSSEUS network for cross referencing with the sites shown on the 2031 Development sheet.

The sheet that allows analysis of options is the 2031 Development sheet. Its key elements are:

- A drop down selection for the Options, this cell is highlighted in orange;
- A list of all sites and the number of dwellings for the selected option. If a site is not used in that option then the Dwellings column for that site is greyed out. A checkbox alongside each site to allow it to be turned on and off in the analysis is also included;
- A table of the matched Data Sites providing siteID from the source (either Leicestershire County Council or the Highways England) and a Map ID to correspond with the map shown in the Data Sites sheet. The table also shows road type, 2031 Reference flows, traffic generation from the selected sites for the selected option, and total link flows to combine the 2031 Reference and Selected Sites flows.
- The total flows change colour accordingly to indicate when one-way link flows are approaching capacity (between 85% and 99% of capacity) or exceeding capacity (equal to or greater than 100% of capacity); and
- Additional tables show the total development traffic for the selected option and the flow for each site included in the selected option.

ABOUT AECOM

In a complex and unpredictable world, where growing demands have to be met with finite resources, AECOM brings experience gained from improving quality of life in hundreds of places.

We bring together economists, planners, engineers, designers and project managers to work on projects at every scale. We engineer energy efficient buildings and we build new links between cities. We design new communities and regenerate existing ones. We are the first whole environments business, going beyond buildings and infrastructure.

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