7 Cost-Benefit of Development Options

7.1 Introduction

7.1.1 This section details both the costs of each mitigation package, as well as a cost-benefit analysis of the wider benefit provided to the town through the mitigation package for each development option.

7.2 Costs of Mitigation

Capital Costs

7.2.1 Using the park and ride models used previously within the forecasting, we have determined the likely number of spaces likely to be required as part of the scheme from surveys of accumulation at other P&R sites across the East Midlands. Table 7.1 shows the number of spaces required at each of the two linked park and ride locations proposed for each development option.

Table 7.1 Daily Parking Requirements for Park and Ride

Options	Location of P&R Options				Total
	East (A60)	South (A6)	West (A512)	North (A6)	
Cotes	123	406	0	0	**529**
Cotes Large	152	412	0	0	**569**
SSW	0	412	126	0	**538**
West	0	406	126	0	**532**

7.2.2 The estimated cost of providing park and ride options around Loughborough has been provided based on existing assumptions. Each development option has been tested with two park and ride options and the costs below are the combined totals. In order to reach these totals the following assumptions have been made;

- Capital Cost £7,500 per space;
- At this stage no revenue has been assumed.

7.3 Cost of Highway Schemes

7.3.1 Table 7.2 shows the indicative costs for the highway mitigations assessed within this study. These figures are estimates based on available data and show the contribution which would need to be funded above the infrastructure cost of the development and any developer contribution to schemes.

7.3.2 Schemes as part of the previously identified masterplan areas are assumed to be fully provided by the developer. This includes 30% of the area and therefore of the cost of the western distributor road in order to access the western development options from it, as well as the full cost of Cotes enhancements and upgrades onto Meadow Lane associated with the Eastern options.

Table 7.2 Predicted Cost of Highway Schemes

Scheme	Additional Offsite Cost (£m)	Required for Options
Eastern Distributor Package (partial inner route, single lane)	42	Cotes
Eastern Distributor Package (full inner route single lane)	65	Cotes
Meadow Lane, A60 enhancements, and further junction upgrades required (excluding site masterplan area)	8	Cotes, Cotes Large
Eastern Distributor Package (full outer route, part dualled A6 South to A60)	87	Cotes
Eastern Distributor Package (full outer route, dualled to Dishley Industrial Estate)	110	Cotes Large
North Western Distributor Road (excluding site masterplan area) plus Epinal Way package enhancements	11	West, SSWW
South Western Distributor Road (excluding site masterplan area) plus Epinal Way package enhancements	20	SSW, SSWW
A6 and A512 Dualling and Dishley/ A6 Roundabout Enhancements	5	West, SSWW
M1 Junction Improvements	2.5	West, SSW, SSWW
Junction Upgrades At A6/ South West Distributor and A512/ West Distributor	3	West, SSW, SSWW
Single lane link West of Nanpantan from Woodthorpe Lane to A512, or dualling of Snell's Nook Lane plus Nanpantan 'bypass'	5	West, SSWW
Hathern Bypass	6	Cotes and Cotes Large with Full EDR, SSWW and Full WDR

7.3.3 The capital cost for the mitigation of each option tested is shown in Table 7.3. This includes both highway and park and ride capital costs along with a total capital cost per option and a cost per household based on the number of dwellings the new development option will provide. This analysis shows that due to the high costs associated with routeing the road through floodplain (and lack of developer contribution), the Eastern Bypass Option 9 would be far more expensive that the alternative options.

7.3.4 Optimism bias at prevailing rates should also be applied to these costs if taken for further appraisal or consideration within a business case context. Further, CPO costs are also not included within the above cost estimates for the schemes.

Table 7.3 Capital Cost of Mitigation

Option	Park and Ride (£m)	Highways (£m)	Total (£m)	Per Household (£)
Cotes- Full Outer EDR	3.9	101.0	104.9	**24,976**
Cotes- Partial Inner EDR	3.9	50.0	53.9	**12,833**
Cotes- Full Inner EDR	3.9	79.0	82.9	**19,738**
Cotes Large- Full Outer EDR	4.2	124.0	128.2	**16,025**
SSW- Partial WDR	4.0	23.5	27.5	**5,500**
West- Partial WDR	3.9	24.5	28.4	**8,114**
SSWW- Full WDR	4.0	51.5	55.5	**6,529**

7.4 Operating Costs by Option

7.4.1 Table 7.4 shows that overall the annual cost per household of the mitigation measures proposed is very similar between the development options. These figures include the following assumptions;

- The cost of a bus operating per annum is assumed to be £100,000;
- Bus requirements for park and ride would be 3 vehicles;
- Smarter Choices cost £38 per household;
- Park and Ride maintenance charges are levied at £400 per space per annum; and
- No inclusion has been made for any revenue gained on the extended bus routes and /or Park and Ride.

Table 7.4 Mitigation Operating Costs (per Annum)

Option	Park and Ride (£m)	Bus Improvements (£m)	Smarter Choices (£m)	Total (£m)	Per Household (£)
Cotes	0.21	0.7	0.16	1.07	**254**
Cotes Large	0.23	0.7	0.30	1.23	**154**
SSW	0.21	0.7	0.19	1.10	**220**
West	0.22	0.7	0.13	1.05	**300**
SSWW	0.22	1.4	0.32	1.94	**228**

7.5 Overall Cost Effectiveness

7.5.1 Table 7.5 shows the overall capital and operating cost per house of implementing the proposed mitigation packages. This is based on five year duration of support for bus and smarter choices measures, prior to these becoming self-sustaining. The percentage mitigation level achieved for each site is also presented as a comparative indicator, by which to assess cost-effectiveness.

7.5.2 It can be seen that the West of Loughborough and the SSW options are more cost-effective as compared with Cotes and Cotes Large Options. The SSW and SSWW Options incur the lowest mitigation costs per dwelling. The size of the cost difference is substantial, and costs would have to be three times as much than forecast within this report, for the eastern side to become more cost effective in transport mitigation terms.

7.5.3 Lower cost alternatives to the outer EDR fail to mitigate the development to a satisfactory level, whilst also not providing any wider net benefit to the town. Further enhancements to these schemes, as potentially indicated in Table 6.6 have not been costed within this analysis, and therefore the cost per dwelling of the partial and full inner EDR routes would rise accordingly.

7.5.4 As the Cotes Large and the SSWW Options are almost equal in size (in terms of number of dwellings) and as the level of mitigation achieved through the best performing highway packages is greater for the SSWW Option, the overall cost per dwelling is also significantly lower for the SSWW option.

7.5.5 The standardised mitigation cost of the SSWW Option is forecast to be £7,670 compared with £16,800 for Cotes Large Option in order to achieve a lower level of mitigation and less benefit for the town in net terms.

Table 7.5 Overall Mitigation Cost Effectiveness

Option	Total Cost (£m)	Total Cost per Household £ (exc. developer funding)	% Mitigation Achieved
Cotes- Full Outer EDR	110.3	26,261	130%
Cotes- Partial Inner EDR	59.3	14,119	41%
Cotes- Full Inner EDR	88.3	21,023	56%
Cotes Large- Full Outer EDR	134.4	16,800	87%
SSW- Partial WDR	33.0	6,600	80%
West- Partial WDR	33.7	9,628	126%
SSWW- Full WDR	65.2	7,670	114%

7.6 Wider Economic and User Benefits for Loughborough

7.6.1 Although the Cotes development with a full outer EDR is forecast to be fully mitigated, whilst also providing a significant wider benefit to the town, the capital costs associated with this package are high. An indicative cost benefit analysis has been conducted in the following section of this report to detail a further and clearer insight into the cost-effectiveness of each option.

7.6.2 TUBA cost-benefit calculations have been run for each of the mitigation packages, which broadly speaking tend to mirror travel time and distance benefits for all users across the model. We have included risk and optimism bias at 44% in terms of the cost estimates, and the wider user benefits (expressed in Present Value of Benefits), per year have been developed as shown in Table 7.6.

Table 7.6 Wider Economic and User Benefits- TUBA PVB

Option	Present Value of Benefits per year (£)
Cotes- Full Outer EDR	9,704,000
Cotes- Partial Inner EDR	479,000
Cotes- Full Inner EDR	2,811,000
Cotes Large- Full Outer EDR	12,993,000
SSW- Part WDR	5,798,000
West- Part WDR	7,207,000
SSWW- Full WDR	12,560,000

7.6.3 A number of caveats need to be placed around the cost-benefit analysis undertaken, which relate to the facts that the results have been derived from a single model forecast year (rather than the ideal of three forecast years), and also that annualisation has been derived from the AM and PM peak models only. In other words, inter-peak benefit has been inferred, rather than specifically modelled, and may well be slightly exaggerated in overall terms.

7.6.4 Nevertheless, the cost-benefit results do provide a consistent value for money basis for appraising the various transport mitigation packages developed for each option.

7.6.5 The results show that the full outer, dualled EDR to Dishley with the Cotes Large Option produces, in aggregate terms, the largest level of benefit. Cotes at 4,200 dwellings, with a full EDR, dualled between the A6 South to A60 also performs highly. However, this is only with a full outer, and partially dualled EDR route.

7.6.6 The Cotes Option with a partial inner EDR, even with improvements along the A60, and Meadow Lane produces the lowest level of user benefits. This is due to the high number of over-capacity junctions which result from the scheme without the further, and substantial, increases in capacity along Belton Road, Meadow Lane, Stanford, Belton Road West and the A6, as detailed in the previous section.

7.6.7 The SSWW Option has a very similar level of benefits compared to the Cotes Large and full EDR mitigation package. However, when costs are also factored into the calculations, the difference between the development options becomes greater. These results, which show the transport benefit-cost ratios for the mitigation packages are shown in Table 7.7.

Table 7.7 Benefit Cost Ratios (BCR) for the Development Options

Option	Benefit Cost ratio (BCR)	BCR (with 30% increase in cost for West, SSW and SSWW options if no developer contribution)
Cotes- Full Outer EDR	2.54	-
Cotes- Partial EDR	0.23	-
Cotes- Full Inner EDR	0.92	
Cotes Large- Full Outer EDR	2.59	-
SSW- Part WDR	4.96	3.81
West- Part WDR	6.18	4.75
SSWW- Full WDR	7.09	5.44

7.6.8 The cost-benefit results show that the partial EDR without substantial further improvements is forecast to have a BCR of 0.27, which in DfT terms represents poor value for money. The same is true for a full inner EDR, with a BCR of 0.92.

7.6.9 The full outer EDR has a BCR of greater than 2.5 (which in DfT terms represents very good value for money), whilst the full and partial Western Distributor Roads have a BCR of close to, or greater than 5 (which also represents very good value for money in DfT terms).

7.6.10 The western site has the highest BCR as a single development option, which is reinforced, in cost-benefit terms, through the longer term provision of a full WDR.

7.6.11 The difference in cost is partly due to the fact that 30% of the route on the western site is integral to the site masterplans, and which can therefore be directly provided by it, but also there are two fewer railway crossings and substantially less cost associated with building through floodplain. Although improvements to the A60 and Meadow Lane/ Stanford can be attributed to the masterplan on the eastern site, the remainder of an EDR cannot be implemented as part of the masterplan area in terms of the development.

7.6.12 However, in order to ensure parity, benefit-cost ratios have also been calculated for the West, SSW and SSWW with a 30% increase in capital cost of mitigation for these development options. This has been done to assess the value for money for these developments with no developer-funding associated with schemes within the masterplan area. The results show that, even without any developer contribution towards the Western Distributor Road, the Western, the South Western and the combined options thereof, are still are forecast to provide a greater benefit-cost ratio than the best-performing eastern mitigation packages.

7.7 M1 and HA Trunk Road Impacts

7.7.1 Wider benefits and disbenefits of each of the development options and associated mitigation packages on the M1 J23 have also been assessed using the model. Although the M1 junction is itself not explicitly simulated, the change in flows approaching the junction to and from the A512 towards Loughborough can be derived, which proxy the likely impact and required capacity upgrade for the junction more generally.

7.7.2 These flow changes are detailed for each scenario in Table 7.8. The percentage change when compared to the 2026 Reference Case is also highlighted.

7.7.3 It may be seen that the Cotes development options, when mitigated by a full outer EDDR package produce limited impact in the vicinity of the M1 junction. Indeed, flows are forecast to fall by approximately 10%, as a result of the full EDDR scheme in place, as a result of traffic reassignment.

7.7.4 When mitigated by an inner route, any benefit of the previous mitigation package at the M1 junction is negated, and the eastern development options leads to a typical 5-10% flow increase on approaches to the M1 junction. This rises to over 20% outbound along the A512 in the PM peak, and may require further mitigation not costed within this report.

7.7.5 However, flow increases are greatest at the M1 junction with the Western Development options in place, with typical flow increases of 15-20% for the West and SSW Developments when mitigated by a partial WDR.

7.7.6 With 8,500 dwellings under the SSWW Scenario, plus the full WDR route, flow increases at the M1 junction approach 30%. This is the result of development trip generations and reassigned traffic as part of the WDR. However, this level of development is substantially greater than land use requirements for the LDF 2026, and this level of growth and subsequent requirements for mitigation at the M1 junction, therefore needs to be set into context with requirements over the period to 2026.

7.7.7 The costs of mitigation at the M1 junction for the Western options have been determined by this percentage flow change over and above the 2026 Reference Case as the Reference Case includes development such as the Science Park, which utilise existing levels of spare capacity at the junction. No costs have been assumed for development options to the East of Loughborough within this report.

7.7.8 In terms of other trunk road impacts, the model shows that there are not forecast to be any significant flow differences between the development scenarios at the A6/A46 junction, once the size of development is controlled for. An eastern or western routing enhances flow levels due to traffic reassignment by a similar magnitude of 2-5%.

Table 7.8 Vehicular Flow Impact on M1 J23 with each Development and Mitigation Package

			Full Outer EDR		Full Inner EDR		Partial WDR		Full WDR	
		2026 Ref Case	Cotes	Cotes Large Longer Term Growth	Cotes	Cotes Large	West	SSW	SSW	SSWW Longer Term Growth
AM	To M1 along A512	1194	1075	1086	1172	1262	1377	1402	1386	1502
			-10%	-9%	-2%	6%	15%	17%	16%	26%
	From M1 along A512	1927	1918	1919	2026	2110	2311	1929	1983	2311
			0%	0%	5%	9%	20%	0%	3%	20%
PM	To M1 along A512	1536	1666	1695	1884	1891	1927	1769	1846	1976
			8%	10%	23%	23%	25%	15%	20%	29%
	From M1 along A512	1362	1144	1163	1365	1429	1644	1612	1641	1821
			-16%	-15%	0%	5%	21%	18%	20%	34%

7.8 Longer Term Growth Potential

7.8.1 MVA Consultancy has also undertaken a number of further runs of the Loughborough Model in order to investigate the longer term growth potential of both the Eastern and Western Distributor Road multi-modal mitigation packages, over and above the core requirements for 3,500 dwellings as part of the 2026 LDF.

7.8.2 As a result, the scenarios detailed within this section do not directly represent scenarios being actively considered for the Charnwood 2026 LDF. However, the results are inherently linked to the LDF decision making process, as the longer term growth potential of each of the mitigation packages forms an important part of the overall strategy for growth in Loughborough, whilst also preventing a myopic view of individual developments or mitigation packages in isolation.

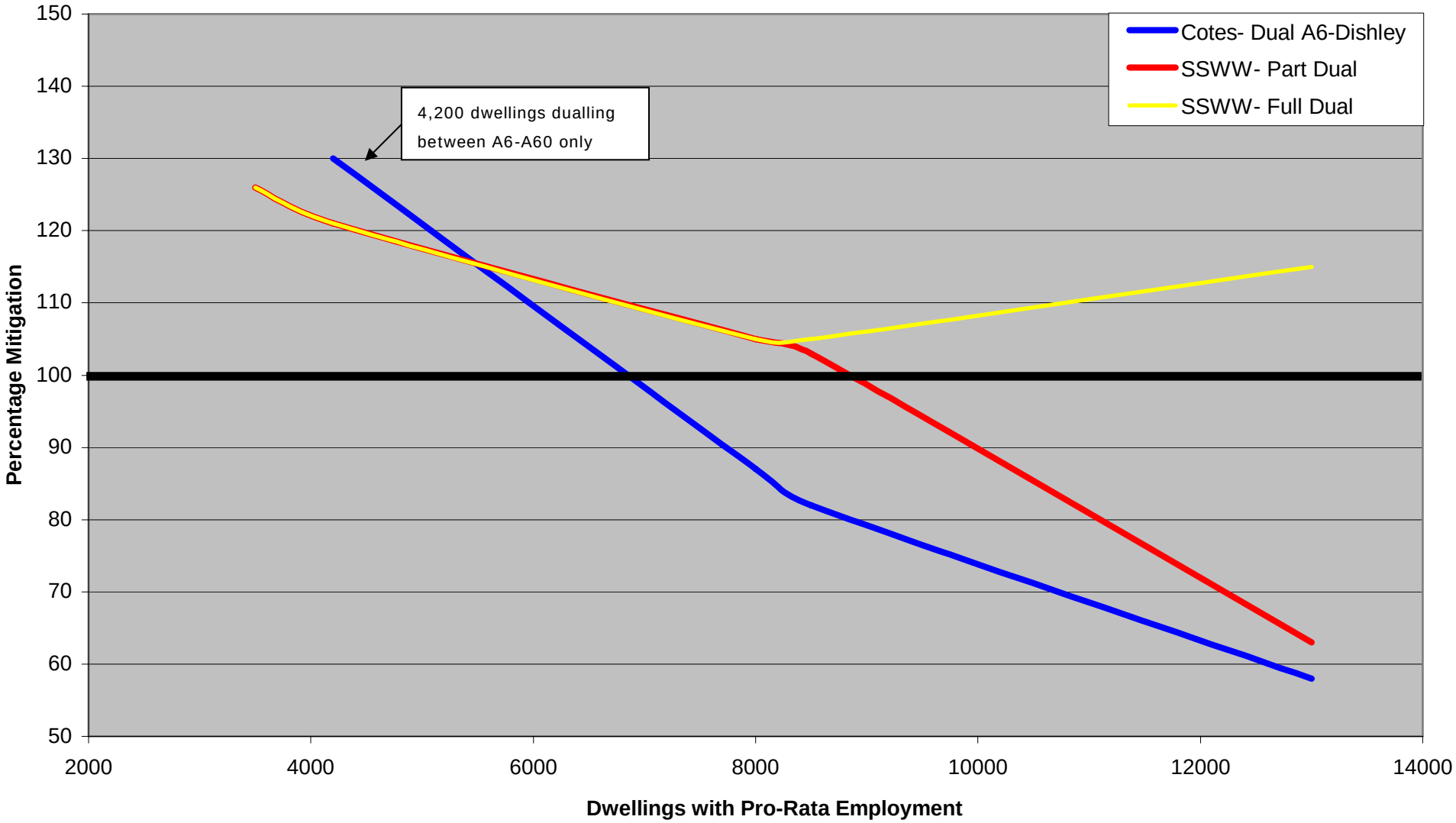
7.8.3 The modelled scenarios tested, with each respective mitigation package include:

- Cotes- 8,000 dwellings, 25ha Employment;
- Cotes- 8,500 Dwellings, 40ha Employment;
- Cotes- 13,000 Dwellings 50ha Employment;
- South, South-West and West (SSWW)- 8,500 dwellings, 40 ha Employment; and,
- South, South-West and West (SSWW)- 13,000 dwellings, 50 ha Employment.

7.8.4 These have also been reported separately within a supporting technical Note TN01 "Longer Term Growth Potential," 17th August 2009.

7.8.5 However, the percentage mitigation results for each of these scenarios are summarised overleaf in Figure 7.9, which shows how the level of mitigation achieved for each option varies as a function of development size.

Figure 7.9 Percentage Mitigation Results- Cotes and SSWW Options



7.8.6 On the eastern side of Loughborough the results show that:

- Development at Cotes which includes 4,200 dwellings and 12 ha employment land is fully mitigated by a full outer EDR multi-modal mitigation package, which is dualled between the A6 South and A60. Indeed a wider net benefit is provided to the town, particularly on its eastern side.
- However, this wider benefit to the town is eroded in net terms when development at Cotes reaches approximately 6,500 dwellings plus associated employment land.
- Additional employment at Cotes, up to a total of 40ha, has proportionately less congestion impact than additional dwellings over and above this threshold, due to the different directions of movement associated with the employment land uses.
- However, any development size above 6,500 dwellings at Cotes is no longer fully mitigated in congestion terms, even when dualled between the A6 South and the present Dishley industrial Estate.
- Above 6,500 dwellings mitigation is not achieved because it is increasingly difficult to accommodate additional development at Cotes with only two access points onto the EDR. Either additional routes would need to be provided, or one or more of the A60 and Meadow Lane would require significant capacity enhancements to and from the EDR itself.
- When development approaches 13,000 dwellings and associated employment, congestion is forecast along the majority of the dual EDR to such an extent that relief to the town centre and eastern side of Loughborough is no longer readily apparent. This negates the principal benefit of a bypass for Loughborough itself. As a consequence, congestion of the Western side of the town is also significantly worse than the situation prior to the development being in place.

7.8.7 On the western side:

- A partial, single lane WDR between the A6 North and Nanpantan Road provides access to, and fully mitigates, a 3,500 dwelling, 20ha development, whilst also providing a net benefit to the town, particularly on its western side.
- A full WDR, dualled between the A512 and Nanpantan Road, is also able to fully mitigate an 8,500 dwelling SSWW option, with development spread along its route. Because an EDR at the same scale of development, by comparison requires dualling of longer stretches of the route, there is a significant cost differential between the Cotes and SSWW options of a similar size. This is approximately 2.6 to 1 in favour of the SSWW option.
- As the WDR is required to access, as well as mitigate the developments on the western side, the likelihood of developer contributions towards the route are greater, enhancing overall deliverability of the route. However additional schemes that induce greater parity of benefits across Loughborough as a whole would also be desirable elements of any package taken forward. This is also true, but in reverse, for a similar sized Cotes Option on the eastern side of Loughborough.
- At development levels greater than 8,500 dwellings and associated employment, there is a significant drop in the level of mitigation provided by the full WDR route, which is part dualled between the A512 and Nanpantan Road. This is due to congestion along the route itself, which limits relief provided to the town as well, particularly along Epinal Way and through Thorpe Acre.

- A fully dualled route is shown to be sufficient to fully mitigate a greater level of development up to 13,000 dwellings on the western side, whilst also providing additional benefit to the western side of Loughborough. However, such a scenario is unlikely to happen because of the limitations in terms of land availability of delivering more than 8,500 dwellings on the western side. Therefore dualling is not required for substantial sections of the WDR route if development cannot feasibly rise above this threshold.
- Further growth on the Western side over and above 8,500 dwellings (whether at Shepshed, or elsewhere) is likely to lead to flow increases on the A512 approaches of M1 J23 of greater than 30%, and the Highway Agency is likely to require more detailed modelling work, to ensure that, beyond the 2026 LDF, additional longer term growth up to 2040- 2050, as analysed within this note, may be accommodated through enhancements and mitigation proposals at the junction itself.

7.8.8 This analysis shows that either of the currently devised mitigation packages, whether on the eastern of western sides of the town, is limited in terms of the level of growth that may be accommodated in congestion terms. On the eastern side, mitigation falls below 100% with approximately 6,500- 7,000 dwellings and associated employment, whilst on the western side approximately 8,500- 9,000 dwellings and associated employment may be accommodated prior to full congestion mitigation no longer being provided.

7.8.9 However, beyond these thresholds, both the eastern and western packages have substantial costs increases associated with them. In the case of the eastern package, this represents dualling of the routes to and from the outer EDR itself, or provision of a third route to it, whilst on the Western side, full dualling of a WDR route as well as M1 J23 improvements would be required.

7.8.10 As a result, and at this time, other development locations may become more cost-effective in transport mitigation terms than further expansion at a single eastern location, or further expansion along the WDR, if land availability considerations meant that further development could be accommodated along it.