Lincoln Eastern Bypass

Final Funding Bid
Value of Time Note

January 2016

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1 Introduction

1.1 Background

Lincoln Eastern Bypass (LEB) is a proposed 7.5km single carriageway road linking the existing Lincoln Northern Relief Road with the A15 to the south. The route runs through the villages of Canwick and Bracebridge Heath and an area of predominantly arable farmland to the east of the city, and the outlying villages of North Greetwell, Cherry Willingham, Washingborough and Branston to the west.

The road is a key element of the Lincoln Integrated Transport Strategy (LITS), designed to provide much needed relief to the congested historic core of Lincoln and to permit a range of complementary policies, also identified in LITS, on traffic management and slow modes to be introduced to the city, thereby improving traffic and environmental conditions for a wide range of road users.

In 2011, Mouchel was commissioned under the Lincolnshire County Council Technical Services Partnership to undertake traffic forecasting and scheme appraisal work in support of the Best and Final Bid (BaFB) Business Case for LEB. This followed earlier studies prepared by another consultancy to support the original Major Scheme Business Case (MSBC) submission for the scheme in 2009. The scheme was successful in obtaining Programme Entry status in 2011.

1.2 Purpose of this Report

Following the recent Public Inquiries, the DfT has requested that the scheme forecast and economics be updated to reflect latest modelling guidance as a component of the Final Funding Bid.

This paper considers the impact of WebTAG consultations in relation to value of time on the scheme. It considers the potential impact on the assignment model and whether the changes proposed (and the new methodology) should be included in the base and future models prior to input to the VfM assessment.

This paper is limited to the Highway Assignment model elements of the project. Variable Demand elements will be considered at a subsequent stage of analysis.

1.3 Structure of this Report

This report is structured as follows:

- Section 2 – Current Model Parameters: provides an understanding of what is in the current model and the sources of these parameters.
- Section 3 – 2015 Parameter Updates: describes the latest DfT parameters and sets out alternative methodologies for implementation in the model.
- Section 4 – Updated Model Results: demonstrates the impact of applying these changes; and
- Section 5 – concludes on the exercise.

2 Existing Model Parameters and Model Results

2.1 Base Model Parameters and Performance

The tabulation below demonstrates the VoT and resultant generalised cost weighting parameters used in the current model.

Table 2-1 Greater Lincoln Transport Model – Assignment Model 2006 Parameters (2010 prices)

User Class	Time Period	Monetary Values		Generalised Cost	
		Time (pence per minute)	Distance (pence per kilometre)	Time	Distance
Car Commute	AM IP PM	13.34	6.68	1.00	0.50
Car Other	AM IP PM	18.28	6.68	1.00	0.37
Car Employed Business	AM IP PM	45.03	13.17	1.00	0.29
LGV	AM IP PM	20.52	13.70	1.00	0.67
HGV	AM IP PM	20.80	42.62	1.00	2.05

Source: WebTAG 3.5.6 (Updated November 2014)

The model has been calibrated and validated using these parameters, and screenline performance was compared with WebTAG highway model validation criteria. Details will be provided in a full Local Model Calibration and Validation Report to be issued as part of the LEB Final Funding Bid.

In summary Table 2.2 presents the current (2015) WebTAG validation criteria for link flow validation.

Table 2-2 Web TAG Link Validation Criteria and Acceptability Guidelines

Criteria and Measure	Acceptability Guidelines	
1. Assigned Model Hourly Flows compared with Observed Flows		
i. Observed Flows < 700 vph	Modelled flow within ± 100	> 85% of links
ii. Observed Flows between 700 – 2,700 vph	Modelled flow within ± 15%	> 85% of links
iii. Observed Flows > 2,700 vph	Modelled flow within ± 400	> 85% of links
iv. Screenline Flow Totals (normally > 5 links)	Modelled flow within ± 5%	All (or nearly all) screenlines
2. GEH Statistic		
i. Individual Flows	GEH < 5	> 85% of links
ii. Screenines	GEH < 4	All (or nearly all) screenlines

The screenlines defined for this study are shown on Figure 2.1. A validation summary is included in Tables 2.3-2.5.

Figure 2-1: Screenline locations

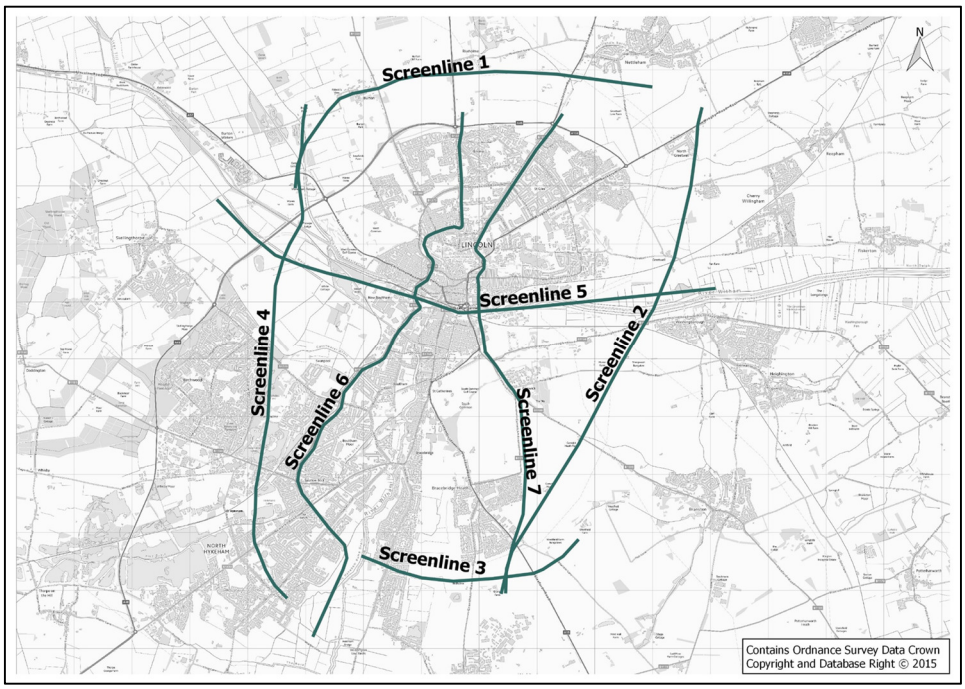


Table 2-3 Greater Lincoln Transport Model Validation Summary AM Peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	1,767	1,679	-88	-5%	2.1	✓	✓
	SB	3,356	3,107	-249	-7%	4.4	✓	×
Screenline 2	EB	1,895	1,833	-62	-3%	1.4	✓	✓
	WB	3,723	3,538	-185	-5%	3.1	✓	✓
Screenline 3	NB	1,371	1,280	-91	-7%	2.5	✓	✓
	SB	1,538	1,444	-95	-6%	2.4	✓	✓
Screenline 4	EB	5,344	5,123	-221	-4%	3.1	✓	✓
	WB	3,965	3,935	-30	-1%	0.5	✓	✓
Screenline 5	NB	5,272	5,445	174	3%	2.4	✓	✓
	SB	4,212	4,348	136	3%	2.1	✓	✓
Screenline 6	EB	7,206	7,283	77	1%	0.9	✓	✓
	WB	6,051	5,833	-219	-4%	2.8	✓	✓
Screenline 7	EB	5,555	5,569	14	0%	0.2	✓	✓
	WB	6,128	6,165	37	1%	0.5	✓	✓
Number of Screenlines passing Criteria							**14 / 14**	**13 / 14**
Percentage of Screenlines passing Criteria							**100%**	**93%**

Table 2-4 Greater Lincoln Transport Model Validation Summary Inter-peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	1,814	1,868	54	3%	1.2	✓	✓
	SB	1,840	1,735	-105	-6%	2.5	✓	✓
Screenline 2	EB	1,928	2,042	114	6%	2.6	✓	✓
	WB	1,843	1,866	23	1%	0.5	✓	✓
Screenline 3	NB	855	866	10	1%	0.4	✓	✓
	SB	1,021	1,081	60	6%	1.8	✓	✓
Screenline 4	EB	3,512	3,737	226	6%	3.8	✓	✓
	WB	3,617	3,758	141	4%	2.3	✓	✓
Screenline 5	NB	3,510	3,700	190	5%	3.2	✓	✓
	SB	3,904	4,164	260	7%	4.1	✓	×
Screenline 6	EB	5,593	5,364	-229	-4%	3.1	✓	✓
	WB	5,471	5,315	-156	-3%	2.1	✓	✓
Screenline 7	EB	4,804	4,700	-104	-2%	1.5	✓	✓
	WB	5,318	5,079	-240	-5%	3.3	✓	✓
Number of Screenlines passing Criteria							**14/14**	**13/14**
Percentage of Screenlines passing Criteria							**100%**	**93%**

Table 2-5 Greater Lincoln Transport Model Validation Summary PM Peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	3,264	3,342	78	2%	1.4	✓	✓
	SB	2,302	2,467	166	7%	3.4	✓	✓
Screenline 2	EB	3,385	3,425	41	1%	0.7	✓	✓
	WB	1,875	1,986	111	6%	2.5	✓	✓
Screenline 3	NB	1,396	1,477	80	6%	2.1	✓	✓
	SB	1,492	1,365	-127	-9%	3.4	✓	✓
Screenline 4	EB	4,687	4,572	-115	-2%	1.7	✓	✓
	WB	4,963	4,895	-68	-1%	1.0	✓	✓
Screenline 5	NB	4,358	4,306	-52	-1%	0.8	✓	✓
	SB	5,269	5,506	237	5%	3.2	✓	✓
Screenline 6	EB	6,843	6,472	-371	-5%	4.6	✓	×
	WB	6,474	6,779	306	5%	3.8	✓	✓
	EB	6,276	6,046	-230	-4%	2.9	✓	✓

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 7	WB	6,299	5,912	-387	-6%	5.0	✓	×
Number of Screenlines passing Criteria							**14/14**	**12/14**
Percentage of Screenlines passing Criteria							**100%**	**86%**

The performance of the model exceeds >85% of screenlines meeting the specified criteria. LEB travel patterns dictate that screenlines 2, 5 and 7 are the most important. In general these screenlines perform well.

Table 2.6 presents the journey time validation criterion and the acceptability guideline as defined in WebTAG Unit M3.1.

Table 2-6: WebTAG Journey Time Validation criterion and Acceptability Guideline

Journey Time Validation Criterion and Acceptability Guideline	
Criteria	**Acceptability Guideline**
Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

Figure 2.2 shows the defined journey time routes. Table 2.7 presents the journey time validation summary, which is also considered to be compliant in 2 of the 3 time periods. The PM peak period falls slightly outside of the criteria but an examination of potential remedial measures has concluded that this would worsen other aspects of the model.

Figure 2-2: Journey time routes

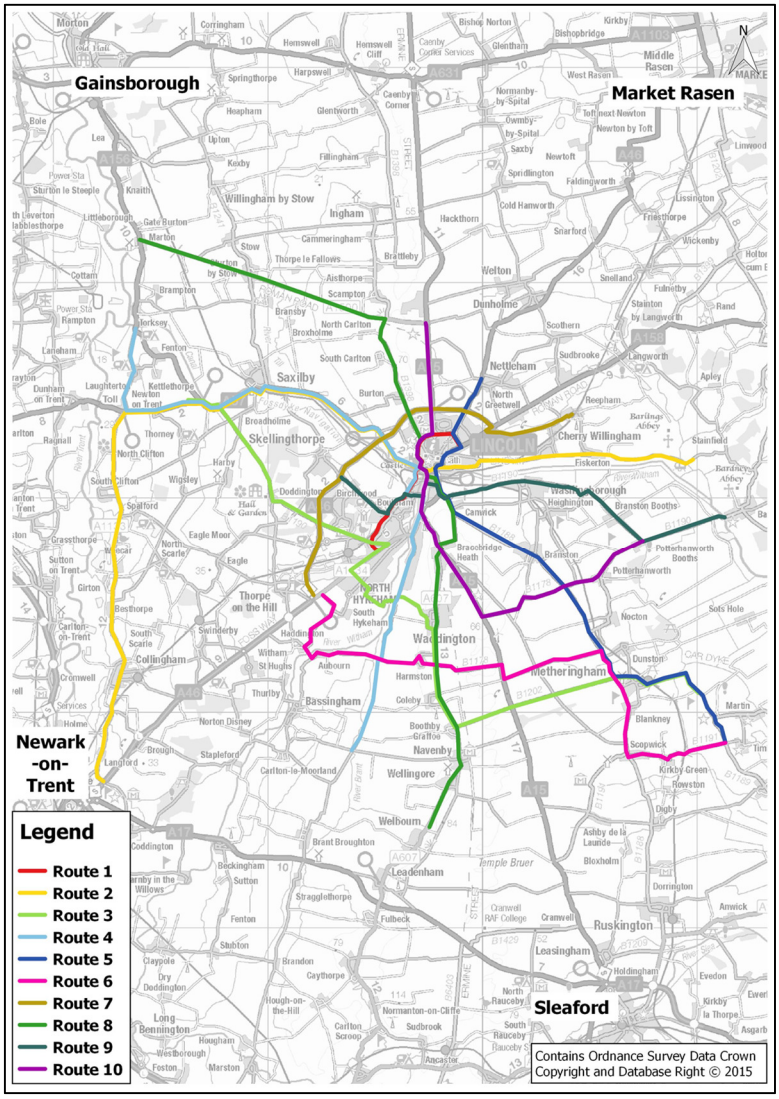


Table 2-7 Journey Time Validation - Summary.

Route	Description	Pass Criteria		
		AM	IP	PM
Route 1	B1182 Ruskin Ave/A15 Wragby Rd and A1434 Newark Rd/B1003 Tritton Rd	✓	✓	×
		✓	✓	✓
Route 2	Ferry Rd/Short Ferry Rd and A1133/A46	✓	✓	✓
		✓	✓	✓
Route 3	B1189 Moor Ln and A57 Gainsborough Rd/B1190 Tom Otters Ln	✓	✓	✓
		✓	✓	✓
Route 4	Hopyard Ln/Navenby Ln and A1133 Newark Rd/A156	✓	✓	×
		✓	✓	×
Route 5	B1189/B1191 Main St/Station Rd and A46 Lincoln Rd/Washdyke Ln	✓	✓	✓
		✓	✓	✓
Route 6	B1191 Main St/B1189/Station Rd and A1434 Newark Rd/Boundary Ln	×	✓	✓
		✓	✓	✓
Route 7	A46/A1434 Newark Rd and Moor Ln/Fiskerton Rd	✓	×	✓
		✓	×	×

Route	Description	Pass Criteria		
		AM	IP	PM
Route 8	A607 Cliff Rd/Skinnand Ln and A1500 Stow Park Rd/High St	✓	✓	✓
		✓	✓	✓
Route 9	B1190 Branston Causway at river and B1378 Skellingthorpe Rd/Lincoln Rd	✓	✓	✓
		✓	✓	✓
Route 10	B1190 Branston Causeway at river and A1500 Horncastle Ln/A15	✓	✓	✓
		✓	✓	✓
Number of routes passing criteria		**19 / 20**	**18 / 20**	**16 / 20**
Percentage of routes passing criteria		**95%**	**90%**	**80%**

2.2 Future Year Model Scheme Forecasts

Figure 2.3 shows the sections of the LEB that have been defined to assist in the analysis of the model outputs. Table 2.6 and 2.7 present the hourly 2-way pcu flows on the specified sections for the opening and design year respectively. The heaviest flows are observed on Section 2 (River Witham Crossing).

Figure 2-3 – LEB Sections

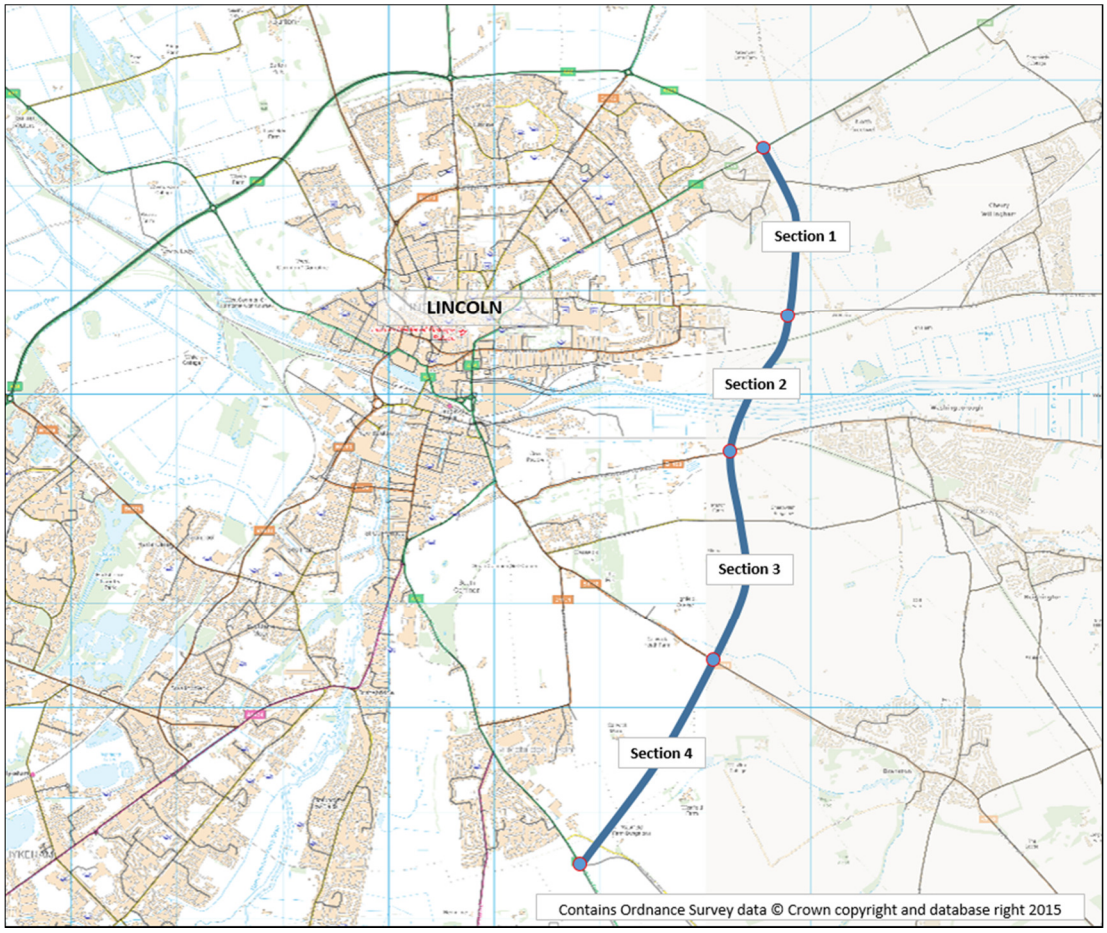


Table 2-8 Hourly Flows on Scheme Links – Opening Year -2-way PCUs

	From	To	AM	IP	PM
Section 1	A158	B1308	1,628	1,174	1,711
Section 2	B1308	B1190	1,805	1,454	2,053
Section 3	B1190	B1188	1,349	976	1,571
Section 4	B1188	A15	1,475	1,011	1,707

Table 2-9 Hourly Flows on Scheme Links – Design Year – 2 way PCUs

	From	To	AM	IP	PM
Section 1	A158	B1308	1,777	1,467	1,943
Section 2	B1308	B1190	2,319	2,056	2,593
Section 3	B1190	B1188	1,843	1,574	2,215
Section 4	B1188	A15	1,644	1,529	2,075

3 2015 Assignment Parameter Updates

3.1 Introduction

In 2013 the DfT made a commitment to undertake new primary research on individuals's and businesses' willingness-to-pay for journey time reductions and a range of other journey improvements. That research is now complete, and represents a major development in the evidence base on valuing journey improvements. The update incorporates extended surveys to cover a more representative set of modes of transport; applies new methods to estimate values of time for business travel, which avoid the need to rely on theoretical assumptions about how people use their travel time, and has jointly estimated values for other journey characteristics. The key results are presented in the document titled "*Understanding and valuing impacts of transport investment – Values of travel time savings*" (DfT, October 2015). This document is currently under consultation and will be reviewed in Spring 2016. A December 2015 databook has been issued in the interim, although the parameters included in this databook in respect of values of time do not differ from those presented in the November 2014 values currently used.

3.2 Latest Updates

Table 3-1 presents a comparison of the current values of time against the updated values from the new research. The main observations are that for business travel the key factor affecting the value of time is the trip distance. Longer business trips are usually undertaken by senior staff and for more important purposes and therefore are likely to include costs such as overnight stay, subsistence etc. It can also be observed that the value of time for commuting is very similar to that of short-distance business trips.

Table 3-1 Extract: Revised VoT Assumptions (2010 prices)

Journey purpose/mode	Nov 2014 WebTAG values	Dec 2015 Research results	
Non-work travel			
Commute	£6.81	£10.01	
Other non-work	£6.04	£4.57	
Business travel		**Distance band**	
Car (driver/passenger)	£27.06/£20.52	0-50km	£10.08
		50-100km	£16.30
		100km+	£25.12
Rail passenger	£31.96	0-50km	£10.08
		50-100km	£16.30
		100km+	£36.19
Bus passenger	£16.63	0-50km	£10.08

Journey purpose/mode	Nov 2014 WebTAG values	Dec 2015 Research results	
		50-100km	£16.30
Other public transport passenger	£26.28	0-50km	£10.08
		50-100km	£16.30

Source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470998/Understanding_and_Valuing_Impacts_of_Transport_Investment.pdf

Table 3.2 presents a more detailed breakdown of the revised values of time which are included in Annex A of the guidance document "Understanding and valuing impacts of transport investment – Values of travel time savings". Behavioural (perceived) and market prices are included.

Table 3-2: Revised Values of Time for use in sensitivity testing (2010 prices)

Journey purpose/mode/distance band	Resource cost	Perceived Cost	Market price
Commute	£8.41	£10.01	£10.01
Other non-work	£3.84	£4.57	£4.57
Business by mode			
Car (driver and passenger)	£14.95	£14.95	£17.79
Rail	£24.66	£24.66	£29.35
Bus and other public transport	£8.33	£8.33	£9.91
Business by distance			
0-50km (all modes)	£8.47	£8.47	£10.08
50-100km (all modes)	£13.70	£13.70	£16.30
100km+ (car)	£21.11	£21.11	£25.12
100km+ (rail)	£31.41	£31.41	£36.19

Source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470998/Understanding_and_Valuing_Impacts_of_Transport_Investment.pdf – Annex A

If values of time are updated in the model this would impact the scale of user/non-user benefits associated with the construction of the Lincoln Eastern Bypass. The latest BCR (which is based on fixed demand) is classified as "very high", at a ratio of approximately 9.4, so it remains unlikely that the viability of the scheme will be adversely affected by these changes.

Nevertheless there is a need to assess the impact of the changes on the assignment model and establish whether backcasting the value of time updates would require a revised validation, and whether forecasting the updates results in a significantly different usage of the proposed scheme.

3.3 Implementation Methods

The paper "Understanding and Valuing Impacts of Transport Investment, Values of Travel Time Savings" suggests sensitivity tests be undertaken on business cases.

The most obvious and straightforward approaches to implement this are as follows:

1) To use an average 'all distance band' value for assignment and appraisal; or
2) To add in additional demand segments whereby business trips are split into 3 distance bands for assignment and then undertake appraisal accordingly.

Option 1 represents the most straightforward assessment for traffic assignment. The introduction of additional demand segments (Option 2) in the assignment represents a more sophisticated method. However, it is predicted to increase the model run times by 40%, which becomes impractical for model development and application. This would also impact the demand model which would need to segment values of time according to distance. There may be impacts on time value by model iteration as the distribution function changes trip length in response to changed costs. Instability could result from trips switching between bands.

Forthcoming releases of TUBA will incorporate differential cell-by-cell valuation by distance banding such that the appraisal values are correctly valued according to journey length and mode, although discontinuity between behavioural (assignment values) and appraisal values is an inevitable outcome of these circumstances.

In the longer term to serve modelling needs there may be some benefit in introducing a continuous distance function which captures the effects of the banding. To facilitate this would require further information from the DfT. However, it is currently proposed to implement option 1 as a proportionate response to the needs of the project. The impacts on assignment are detailed in the subsequent chapter.

The revised values are indicated below in Table 3.3. Table 3.4 presents a comparison of the outturn generalised costs against the values used originally in the 2006 model. As it can be observed the ratio for commuting is reduced by 30% when compared to previous values. The cost for other purposes on the other hand increases by 30%. The biggest difference can be observed when looking at travel for business where there is a 55% increase in the generalised cost distance weight component. The cost for the LGV and HGV user classes remains relatively unchanged.

Table 3-3 Revised Assignment Model Parameters by Highway User Class – 2006 Values (2010 prices)

User Class	Time Period	Monetary Values		Generalised Cost	
		Time (pence per minute)	Distance (pence per kilometre)	Time	Distance
Car Commute	AM IP PM	19.70	6.82	1.00	0.35
Car Other	AM IP PM	14.10	6.82	1.00	0.48
Car Employed Business	AM IP PM	29.64	13.29	1.00	0.45
LGV	AM IP PM	20.52	13.84	1.00	0.67
HGV	AM IP PM	20.80	41.94	1.00	2.02

Table 3-4 General Cost (GC) Comparison

User Class	2006 Model		Revised VoT		GC Distance % Difference
	GC - Time	GC - Distance	GC - Time	GC - Distance	
Car Commute	1.00	0.50	1.00	0.35	-30%
Car Other	1.00	0.37	1.00	0.48	30%
Car Employed Business	1.00	0.29	1.00	0.45	55%
LGV	1.00	0.67	1.00	0.67	0%
HGV	1.00	2.05	1.00	2.02	-1%

Analysis has been undertaken to establish whether using an alternative methodology to the 'all distance band' would result in a significantly different value of time. The purpose split for the base year car matrix was derived as shown in Table 3.5. These are compared to the corresponding values from the National Travel Survey 2010, presented in Table 3.6. It can be seen that the proportions of the base year matrix corresponds closely to those recorded as national average back in 2006.

Table 3-5 Model Matrices – Percentage Split by Purpose for Car category

Time Period	Work	Commute	Other
AM	0.11	0.54	0.35
IP	0.11	0.15	0.74
PM	0.11	0.44	0.44
W. Average	**0.11**	**0.32**	**0.57**

Table 3-6 NTS 2014 - Percentage Split by Purpose for Car category (England, National Travel Survey 2010)

Year	Work	Commute	Other	Total
2006	0.11	0.32	0.56	1.00
2014	0.09	0.35	0.56	1.00

Subsequent analysis was undertaken to define a weighted average based on the modelled trip length distribution for the Employers Business trip matrix. The perceived cost was used to produce a distance-weighted VoT. The resultant average distance-weighted value of time for the Greater Lincoln Model was calculated as £12.93, slightly lower than the £14.95 value used in the sensitivity test. Both figures are significantly lower than the £45.03 per hour Employers Business VOT employed in the original model.

A lower value of time potentially implies less willingness to divert onto lengthier, but potentially faster routes to save time. The next chapter considers the impact of this in the case of the Lincoln model given the changes resultant from national VOT averages.

Table 3-7 Employers business AM Peak - 2006

Distance Bands	Demand	% of total Demand	VoT Perceived Cost*		Distance Weighted VoT
0-50	3,168	0.58	8.47	26,833	4.90
50-100	647	0.12	13.7	8,859	1.62
100+	1,665	0.30	21.11	35,157	6.42
Total	5,480	1.00	-	-	12.93

** Understanding and Valuing the Impacts of Transport Investment (October 2015) Annex A*

4 Revised Model Parameters and Model Results

4.1 Averaged Value of Time Assignments – Base Year

The results from the highway assignment process utilising the revised (average) values of time are presented in this section. Tables 4.1 to 4.3 present the revised link flow validation summary for the screenlines that have been defined for this study.

As per the earlier tables the pass criteria reflects the specified acceptability criteria.

The comparison of the revised flows at screenline locations reveals that for the AM the IP and the PM peak one additional screenline fails the flow validation criteria when compared to the results from the original model that have been reported in previous sections. This demonstrates that the overall performance of the model is not unduly impacted.

Table 4-1 Greater Lincoln Transport Model Validation Summary AM Peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	1,767	1,686	-81	-5%	1.9	✓	✓
	SB	3,356	3,056	-300	-9%	5.3	✓	×
Screenline 2	EB	1,895	1,828	-67	-4%	1.5	✓	✓
	WB	3,723	3,531	-192	-5%	3.2	✓	✓
Screenline 3	NB	1,371	1,293	-78	-6%	2.1	✓	✓
	SB	1,538	1,438	-100	-7%	2.6	✓	✓
Screenline 4	EB	5,344	5,080	-264	-5%	3.7	✓	✓
	WB	3,965	3,941	-24	-1%	0.4	✓	✓
Screenline 5	NB	5,272	5,451	179	3%	2.4	✓	✓
	SB	4,212	4,323	111	3%	1.7	✓	✓
Screenline 6	EB	7,206	7,218	12	0%	0.1	✓	✓
	WB	6,051	5,858	-193	-3%	2.5	✓	✓
Screenline 7	EB	5,555	5,534	-21	0%	0.3	✓	✓
	WB	6,128	6,139	11	0%	0.1	✓	✓
Number of Screenlines passing Criteria							**14 / 14**	**13 / 14**
Percentage of Screenlines passing Criteria							**100%**	**93%**

Table 4-2 Greater Lincoln Transport Model Validation Summary Inter-peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	1,814	1,867	53	3%	1.2	✓	✓
	SB	1,840	1,723	-117	-6%	2.8	✓	✓
Screenline 2	EB	1,928	2,054	126	7%	2.8	✓	✓
	WB	1,843	1,854	11	1%	0.3	✓	✓
Screenline 3	NB	855	875	20	2%	0.7	✓	✓
	SB	1,021	1,076	55	5%	1.7	✓	✓
Screenline 4	EB	3,512	3,693	181	5%	3.0	✓	✓
	WB	3,617	3,729	112	3%	1.9	✓	✓
Screenline 5	NB	3,510	3,718	208	6%	3.5	✓	✓
	SB	3,904	4,155	251	6%	3.9	✓	✓
Screenline 6	EB	5,593	5,384	-209	-4%	2.8	✓	✓
	WB	5,471	5,349	-122	-2%	1.7	✓	✓
Screenline 7	EB	4,804	4,688	-116	-2%	1.7	✓	✓
	WB	5,318	5,049	-269	-5%	3.7	✓	✓
Number of Screenlines passing Criteria							**14 / 14**	**14 / 14**
Percentage of Screenlines passing Criteria							**100%**	**100%**

Table 4-3 Greater Lincoln Transport Model Validation Summary PM Peak – Detailed Quantification.

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
Screenline 1	NB	3,264	3,350	86	3%	1.5	✓	✓
	SB	2,302	2,491	189	8%	3.9	✓	✓
Screenline 2	EB	3,385	3,445	60	2%	1.0	✓	✓
	WB	1,875	1,970	95	5%	2.2	✓	✓
Screenline 3	NB	1,396	1,492	96	7%	2.5	✓	✓
	SB	1,492	1,399	-93	-6%	2.4	✓	✓
Screenline 4	EB	4,687	4,546	-141	-3%	2.1	✓	✓
	WB	4,963	4,880	-83	-2%	1.2	✓	✓
Screenline 5	NB	4,358	4,343	-15	0%	0.2	✓	✓
	SB	5,269	5,596	327	6%	4.4	✓	×
Screenline 6	EB	6,843	6,436	-407	-6%	5.0	×	×
	WB	6,474	6,772	298	5%	3.7	✓	✓
Screenline 7	EB	6,276	6,033	-243	-4%	3.1	✓	✓
	WB	6,299	5,909	-390	-6%	5.0	✓	×

Screenline	Direction	Observed (pcu)	Modelled (pcu)	Abs Diff (pcu)	% Diff	Average GEH	Pass TAG Flow	Pass DMRB GEH
						Number of Screenlines passing Criteria	**13 / 14**	**11 / 14**
						Percentage of Screenlines passing Criteria	**93%**	**79%**

Table 4.4 presents the journey time validation statistics following the updating of the assignment parameters. When compared to the statistics presented in Table 2.5 it can be observed that there is no material change to the overall validation statistics.

Table 4-4 Greater Lincoln Transport Model Journey Time Validation Summary.

Route	Description	Pass Criteria		
		AM	IP	PM
Route 1	B1182 Ruskin Ave/A15 Wragby Rd and A1434 Newark Rd/B1003 Tritton Rd	✓	✓	×
		✓	✓	✓
Route 2	Ferry Rd/Short Ferry Rd and A1133/A46	✓	✓	✓
		✓	✓	✓
Route 3	B1189 Moor Ln and A57 Gainsborough Rd/B1190 Tom Otters Ln	✓	✓	✓
		✓	✓	✓
Route 4	Hopyard Ln/Navenby Ln and A1133 Newark Rd/A156	✓	✓	×
		✓	✓	×
Route 5	B1189/B1191 Main St/Station Rd and A46 Lincoln Rd/Washdyke Ln	✓	✓	✓
		✓	✓	✓
Route 6	B1191 Main St/B1189/Station Rd and A1434 Newark Rd/Boundary Ln	×	✓	✓
		✓	✓	✓
Route 7	A46/A1434 Newark Rd and Moor Ln/Fiskerton Rd	✓	×	✓
		✓	×	×
Route 8	A607 Cliff Rd/Skinnand Ln and A1500 Stow Park Rd/High St	✓	✓	✓
		✓	✓	✓
Route 9	B1190 Branston Causway at river and B1378 Skellingthorpe Rd/Lincoln Rd	✓	✓	✓
		✓	✓	✓
Route 10	B1190 Branston Causeway at river and A1500 Horncastle Ln/A15	✓	✓	✓
		✓	✓	✓
Number of routes passing criteria		**19 / 20**	**18 / 20**	**16 / 20**
Percentage of routes passing criteria		**95%**	**90%**	**80%**

4.2 Averaged Value of Time Assignments – Forecast Years

Tables 4.5 and 4.6 summarise the assignment parameters employed in the forecast models based on the revised values of time for the scheme's opening and design year respectively.

Table 4-5 Revised Assignment Model Parameters - 2018 (2010 prices)

User Class	Time Period	Monetary Values		Generalised Cost	
		Time (pence per minute)	Distance (pence per kilometre)	Time	Distance
Car Commute	AM IP PM	21.32	6.00	1.00	0.28
Car Other	AM IP PM	15.26	6.00	1.00	0.39
Car Employed Business	AM IP PM	32.08	12.46	1.00	0.39
LGV	AM IP PM	22.21	13.15	1.00	0.59
HGV	AM IP PM	22.51	44.20	1.00	1.96

Table 4-6 Revised Assignment Model Parameters – 2033 (2010 prices)

User Class	Time Period	Monetary Values		Generalised Cost	
		Time (pence per minute)	Distance (pence per kilometre)	Time	Distance
Car Commute	AM IP PM	28.47	5.43	1.00	0.19
Car Other	AM IP PM	20.38	5.43	1.00	0.27
Car Employed Business	AM IP PM	42.85	11.82	1.00	0.28
LGV	AM IP PM	29.66	13.26	1.00	0.45
HGV	AM IP PM	30.07	50.18	1.00	1.67

Tables 4.7 and 4.8 present the resultant forecast flows on the bypass sections for the opening and design year respectively. Table 4.8 presents a comparison of the flows on the scheme resulting from the application of the original and revised VoT for the opening and design year. It can be seen that in the majority of the cases the difference is within +/-1%.

Table 4-7 Hourly Flows on Scheme Links – 2018

	From	To	AM	IP	PM
Section 1	A158	B1308	1,627	1,120	1,733
Section 2	B1308	B1190	1,818	1,470	2,061
Section 3	B1190	B1188	1,347	992	1,613
Section 4	B1188	A15	1,477	1,035	1,723

Table 4-8 Hourly Flows on Scheme Links – 2033

	From	To	AM	IP	PM
Section 1	A158	B1308	1,792	1,474	1,972

	From	To	AM	IP	PM
Section 2	B1308	B1190	2,315	2,050	2,607
Section 3	B1190	B1188	1,846	1,565	2,223
Section 4	B1188	A15	1,638	1,524	2,083

Table 4-9 Scheme Flow Comparison – Original and revised VoT

	Year	Section	Section 1	Section 2	Section 3	Section 4
		From	A158	B1308	B1190	B1188
		To	B1308	B1190	B1188	A15
Original VoT	2018	AM	1,628	1,805	1,349	1,475
		IP	1,174	1,454	976	1,011
		PM	1,711	2,053	1,571	1,707
	2033	AM	1,777	2,319	1,843	1,644
		IP	1,467	2,056	1,574	1,529
		PM	1,943	2,593	2,215	2,075
Revised VoT	2018	AM	1,627	1,818	1,347	1,477
		IP	1,120	1,470	992	1,035
		PM	1,733	2,061	1,613	1,723
	2033	AM	1,792	2,315	1,846	1,638
		IP	1,474	2,050	1,565	1,524
		PM	1,972	2,607	2,223	2,083
% Flow Difference	2018	AM	0%	1%	0%	0%
		IP	-5%	1%	2%	2%
		PM	1%	0%	3%	1%
	2033	AM	1%	0%	0%	0%
		IP	0%	0%	-1%	0%
		PM	1%	1%	0%	0%

4.3 Assignment Impacts

Figures 4.1 to 4.3 present the flow differences resulting from the application of the revised values of time when compared to the forecast flows for the opening year as reported in the "Forecast and Economic Evaluation Update Note" document which has been issued in June 2015. The red links indicate a difference of over 5 GEH. As it can be observed there are very few locations where this is the case. This indicates the forecasts flows are very close to the reported ones and that there was no significant changes as a result of the revised values of time.

Figures 4.4 to 4.6 present the results for the design year where again it can be observed that the number of links with difference greater than 5 GEH is very small.

Figure 4-1: Flow difference plot – DS AM 2018

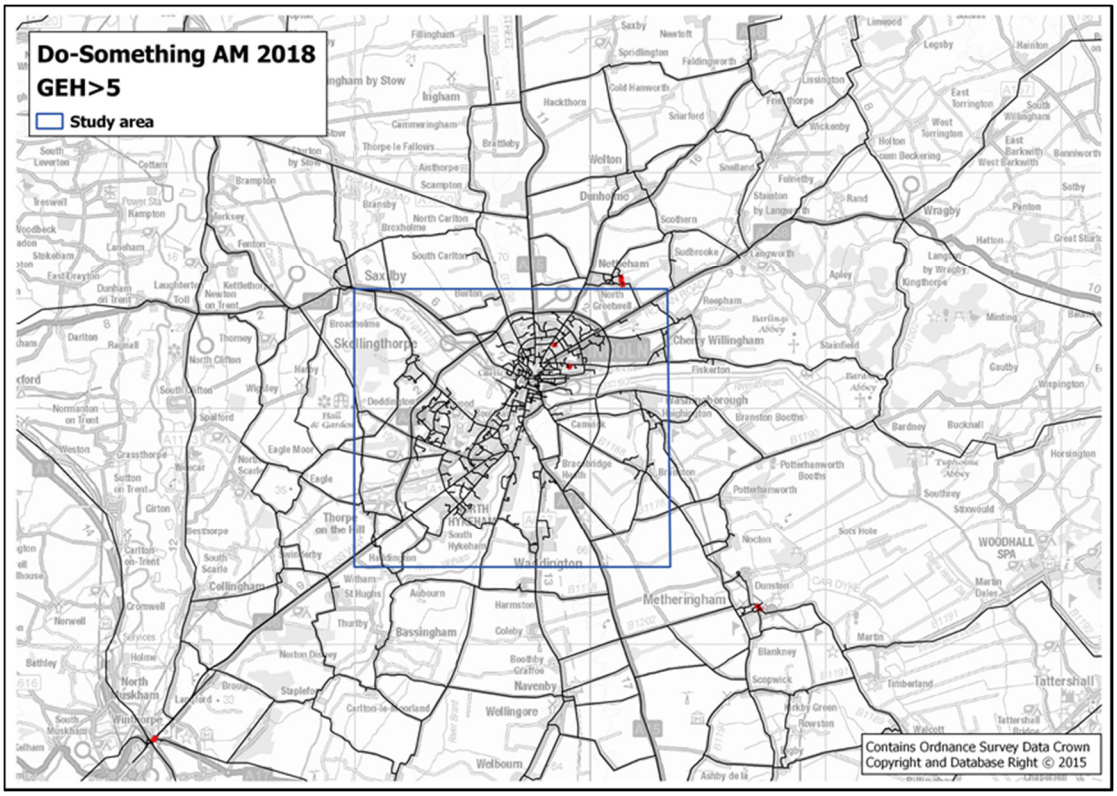


Figure 4-2: Flow difference plot – DS IP 2018

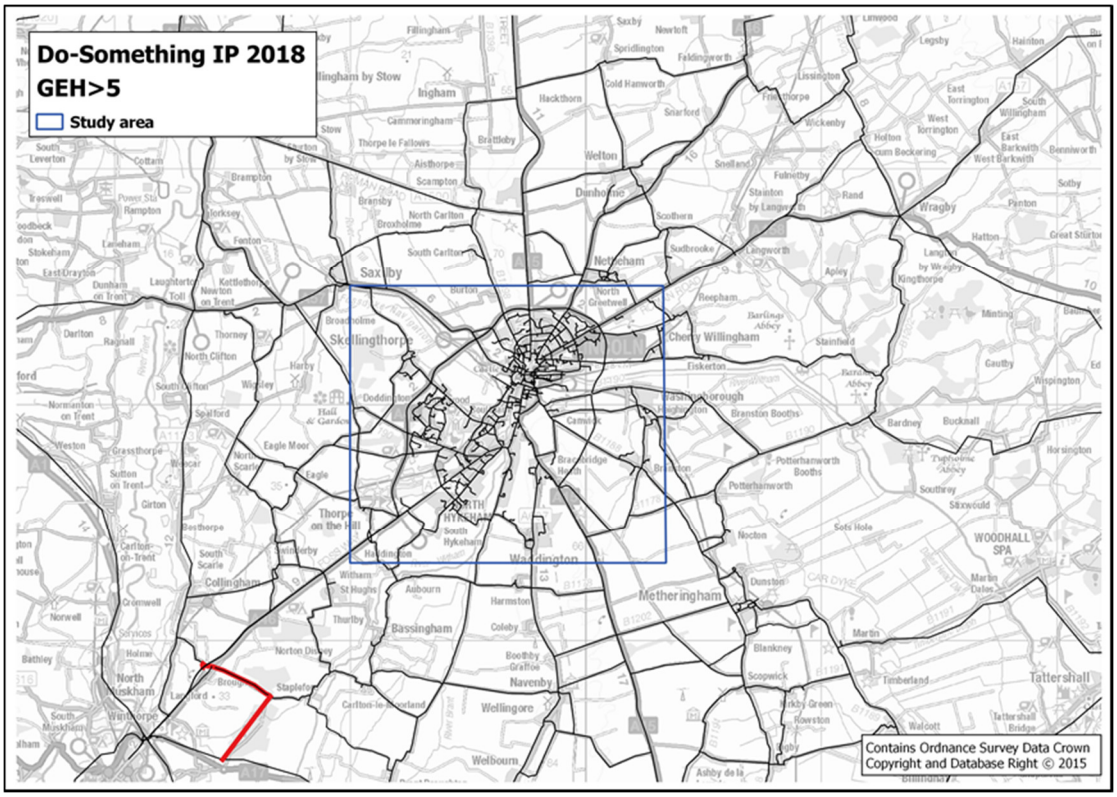


Figure 4-3: Flow difference plot – DS PM 2018

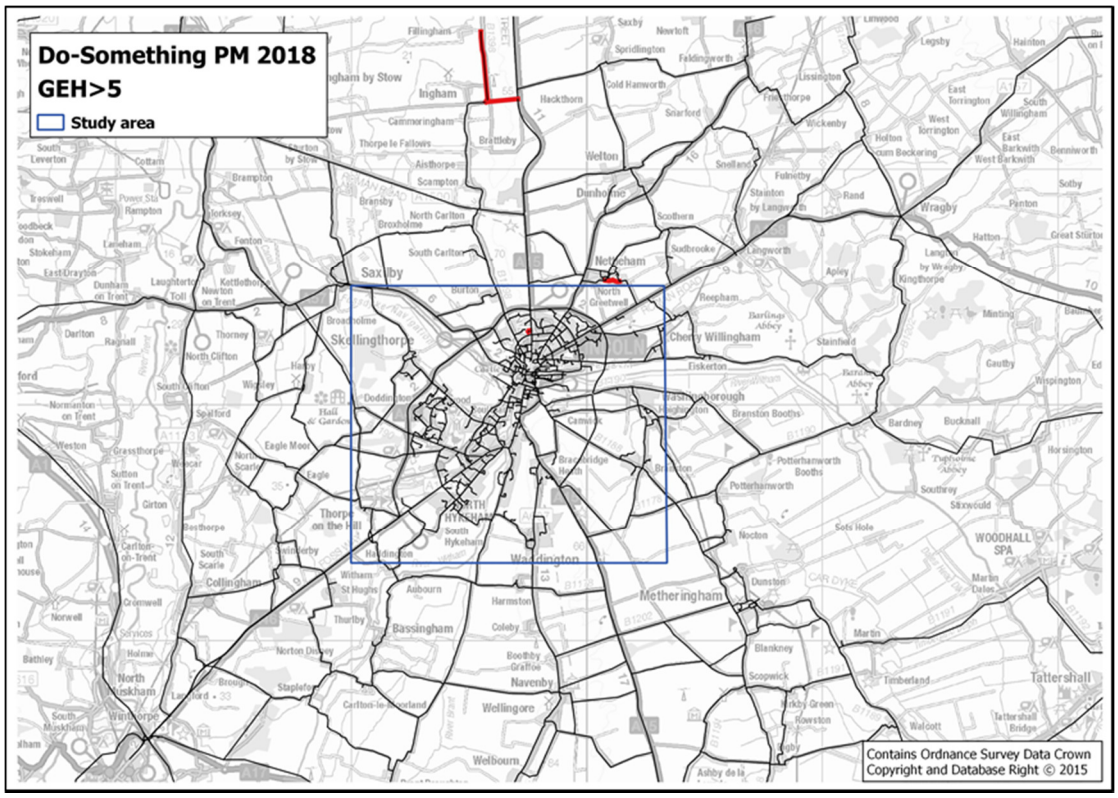


Figure 4-4: Flow difference plot – DS AM 2033

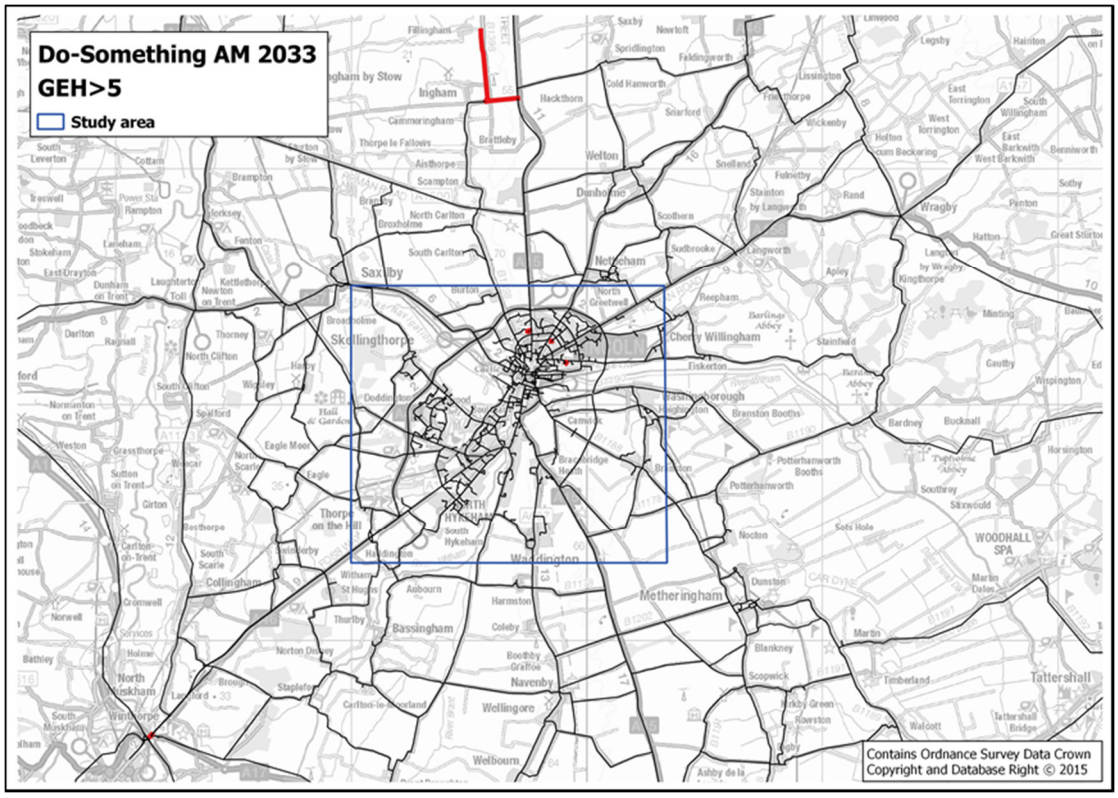


Figure 4-5: Flow difference plot – DS IP 2033

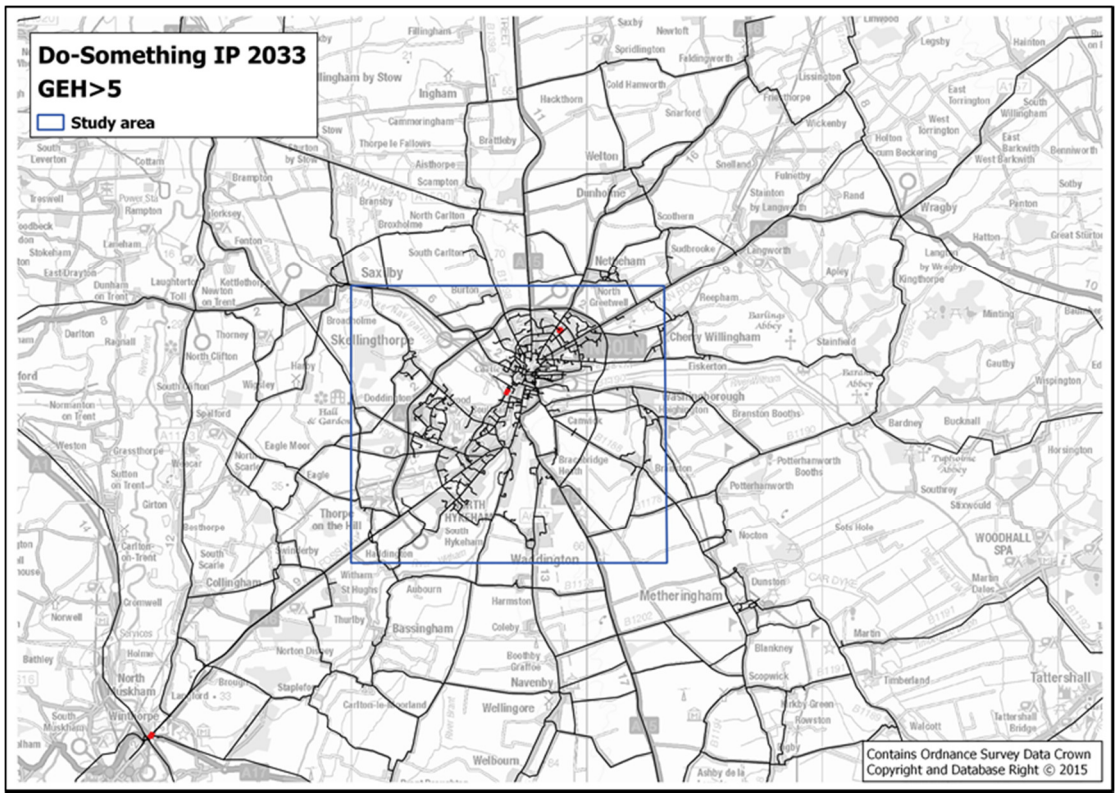
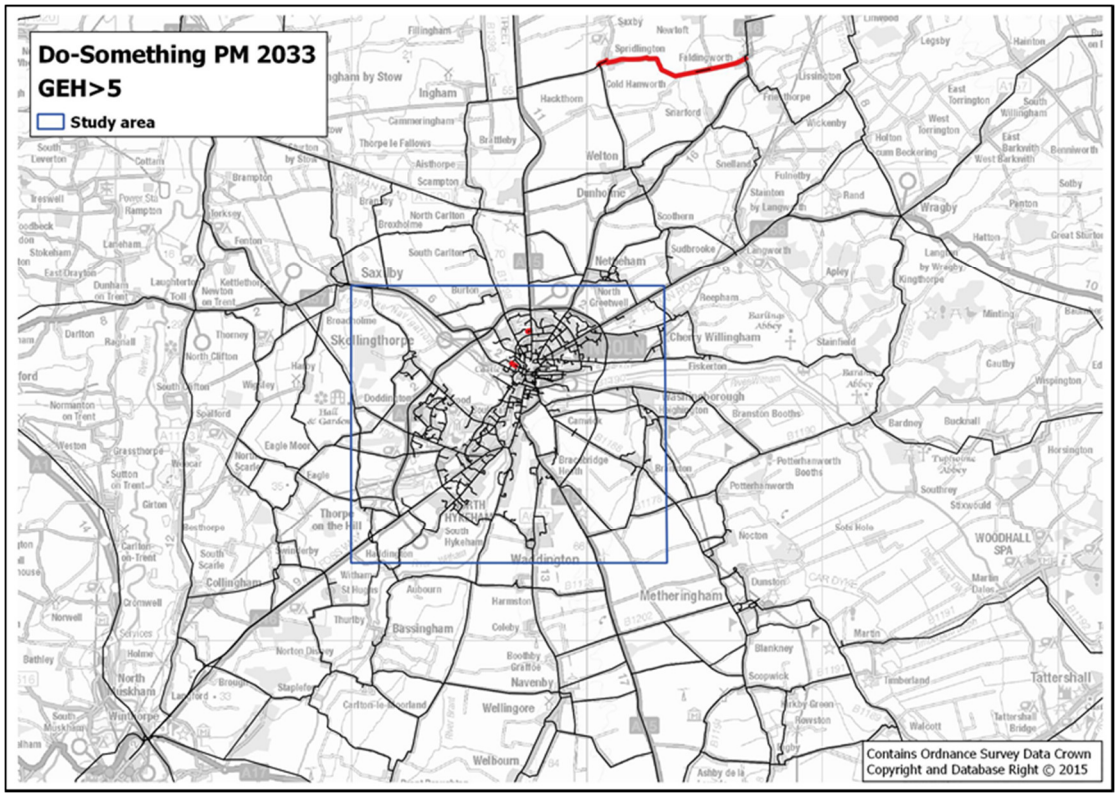


Figure 4-6: Flow difference plot – DS PM 2033



5 Summary and Conclusions

5.1 Summary

Following the recent Public Inquiry the DfT has requested that the scheme forecast and economics be updated to reflect latest modelling guidance as a component of the Final Funding Bid. This paper considers the impact of the proposed WebTAG updates in relation to value of time. The paper is limited to the Highway Assignment model elements of the project. Variable Demand elements will be considered at a subsequent stage of analysis.

The methodology that has been followed is in line with approach suggested by the DfT in the paper titled "*Understanding and valuing impacts of transport investment – Values of travel time savings*" and more specifically it uses an average 'all distance band' value for assignment.

The process consists of adopting the research values and converting them into generalised costs that are incorporated in the highway assignment of the base year (2006) and the scheme's opening (2018) and design year (2033). The results are then compared against the already published model results.

5.2 Conclusion

The conclusions of the exercise are as follows:

- The base year model flow validation is made slightly but not significantly worse by the introduction of the new values of time;
- The impact on journey time validation is negligible; and
- The future year scheme forecast flows are not unduly impacted by the new values of time.

The current analysis has not calculated the impact on the BCR, which is currently healthy at a ratio of 9.4. Given the limited flow changes there is every reason to believe that this would not result in a significant impact. A greater effect on the BCR will be the Variable Demand Model impact, to be investigated in a subsequent paper.

Following from these conclusions it is recommended that in line with principles of proportionate analysis the new values of time could be adopted in both base and forecast models without adverse effect on established relationships.

Notwithstanding the orderly release process and the current modelling timeframe the decision on whether to adopt this in the will need to be made in conjunction with DfT given the consultative nature of the updates.