

APPENDIX O: LOCAL MODEL VALIDATION REPORT FEB 2017 - VISSIM

TECHNICAL NOTE



WEST MIDLANDS INTERCHANGE WEST MIDLANDS INTERCHANGE

BASE YEAR 2015/16 LOCAL MODEL VALIDATION

IDENTIFICATION TABLE

Client/Project owner	WSP Parsons Brinckerhoff
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1.1 Introduction

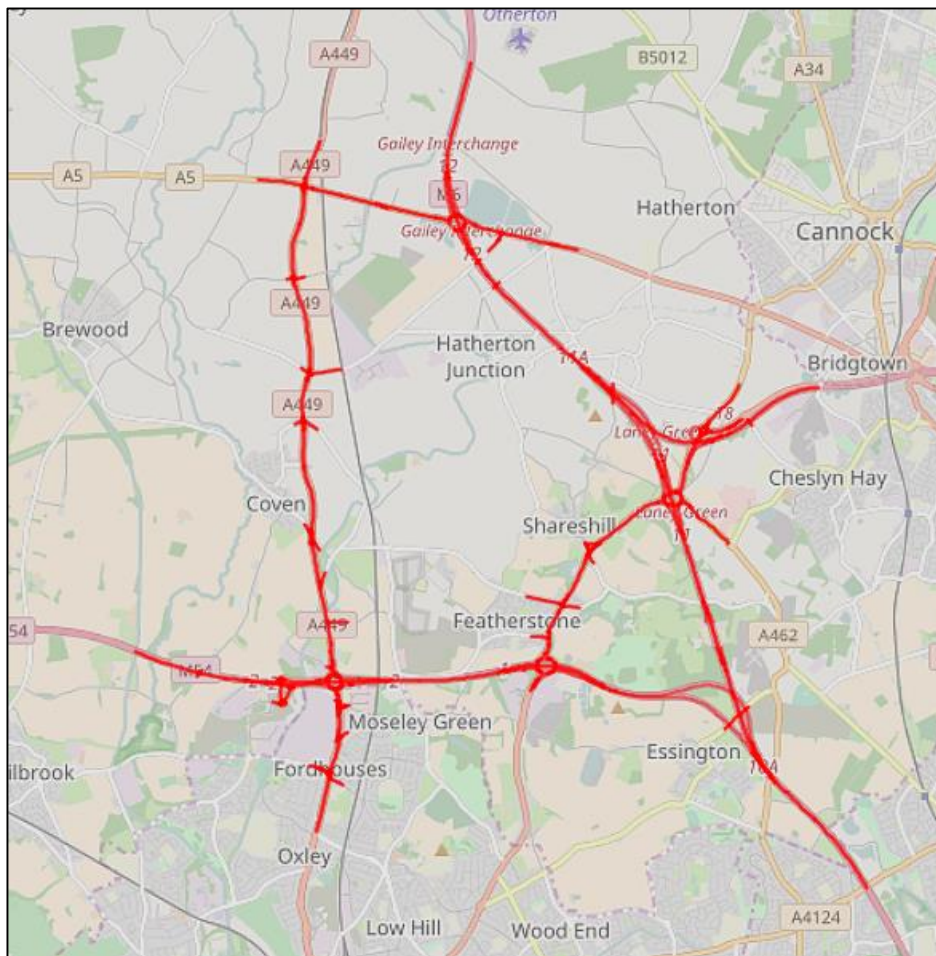
1.1.1 SYSTRA Ltd has been commissioned by WSP Parsons Brinckerhoff (WSP PB) to assess the impact of the proposed West Midlands Interchange development using the 2015 Base Year South Staffordshire VISSIM Model.

1.1.2 The South Staffordshire VISSIM model was calibrated and validated using both 2013 and 2015 data. WSP PB has supplied 2016 data including turning counts and queue counts for four local junctions, relating to accesses to the West Midlands Interchange. The four junctions are:

- A5 Watling Street/Vicarage Road;
- Vicarage Road/Straight Mile;
- A449 Stafford Road/Four Ashes Road/Station Drive; and
- A449 Stafford Road/A449 Wolverhampton Road/B5012 Wolgarston Way/Bungham Lane.

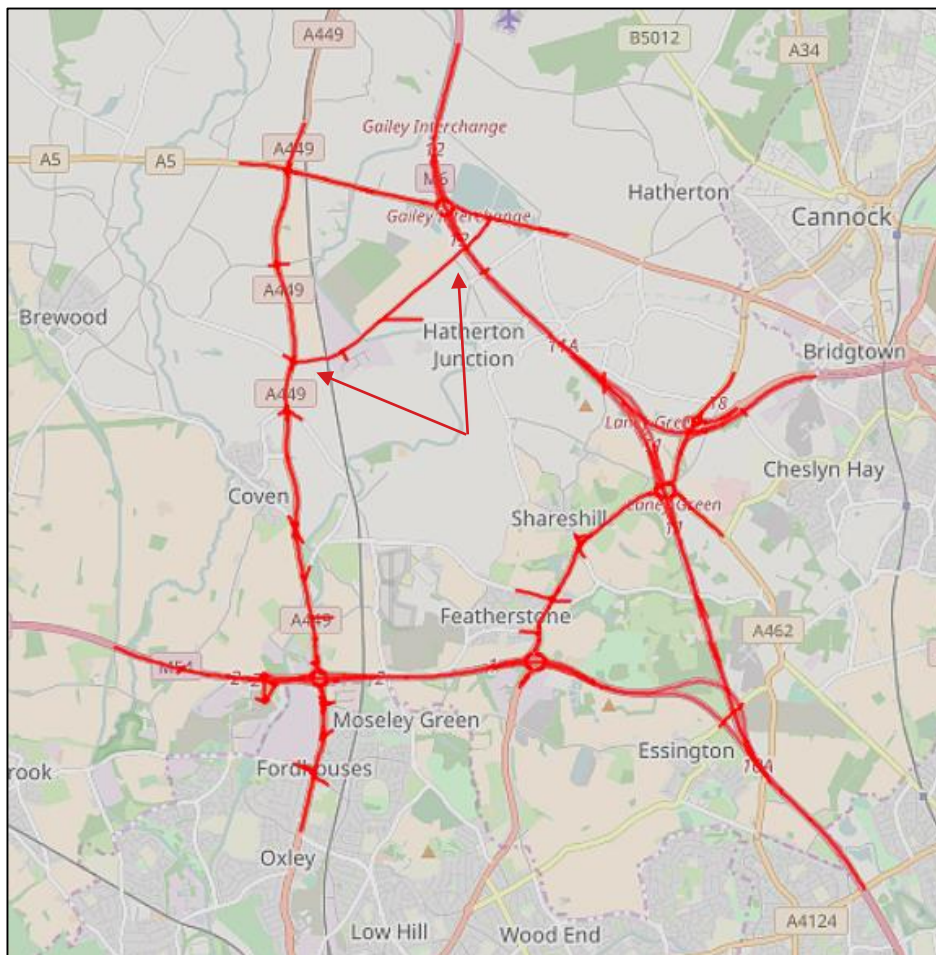
1.1.3 The 2015 South Staffordshire VISSIM model extent is shown in Figure 1, and indicates that the model does not extend as far north as the A449/B5012 junction. The 2015 model extent also does not include Vicarage Road/Station Drive in its entirety, cutting off Vicarage Road north of the M6 and Station Drive east of the A449/Four Ashes Road/Station Drive junction.

Figure 1. 2015 South Staffordshire VISSIM Model Extent



1.1.4 In order to assess the impact of the West Midlands Interchange, it was agreed with WSP PB that Vicarage Road/Station Drive would be included in its entirety within an updated South Staffordshire Model, alongside the Vicarage Road/Straight Mile junction, as shown in Figure 2.

Figure 2. Updated South Staffordshire VISSIM Model Extent



1.1.5 With the inclusion of Vicarage Road/Station Drive in its entirety, the updated South Staffordshire VISSIM model includes 3 of the 4 junctions with 2016 data:

- A5 Watling Street/Vicarage Road;
- Vicarage Road/Straight Mile; and
- A449 Stafford Road/Four Ashes Road/Station Drive.

1.1.6 The A5 Watling Street/Vicarage Road junction and the A449 Stafford Road/Four Ashes Road/Station Drive junction are currently calibrated using 2013 data, and so therefore need re-calibrating using the new 2016 traffic count data. The Vicarage Road/Straight Mile junction has also been calibrated using the 2016 count data.

1.1.7 This Technical Note outlines the calibration of these three junctions, alongside a comparison of overall calibration and validation statistics of the original 2015 South Staffordshire Model against the updated model.



1.2 Local Junction Turn Calibration

1.2.1 Tables 1 and 2 present the turn calibration results for the two local junctions included within the original 2015 South Staffordshire VISSIM AM and PM models respectively, and indicate that in both time periods the junctions calibrate to a high standard, with 94% of turns having a GEH less than 5.

Table 1. AM Local Turn Calibration Results, Original 2015 South Staffordshire Model

Counts	18					PASS	FAIL	Criteria	%	Flow Test						
	Site	From Arm	From	To Arm	To	Survey	Model	Diff (S-M)	% Diff	GEH	Flow Test Criteria	17				
17												1	% GEH <4	94%	% PASS	17
17												1	% GEH <5	94%		
	J8_13	A	A449 (N)	B	Station Rd	34	34	0	0%	0.0	100	PASS				
	J8_13	A	A449 (N)	C	A449 (S)	901	931	-30	-3%	1.0	135	PASS				
	J8_13	A	A449 (N)	D	Four Ashes Rd	9	6	3	50%	1.1	100	PASS				
	J8_13	B	Station Rd	A	A449 (N)	11	26	-15	-58%	3.5	100	PASS				
	J8_13	B	Station Rd	C	A449 (S)	463	424	39	9%	1.9	100	PASS				
	J8_13	B	Station Rd	D	Four Ashes Rd	64	65	-1	-2%	0.1	100	PASS				
	J8_13	C	A449 (S)	A	A449 (N)	771	791	-20	-3%	0.7	116	PASS				
	J8_13	C	A449 (S)	B	Station Rd	314	211	103	49%	6.4	100	FAIL				
	J8_13	C	A449 (S)	D	Four Ashes Rd	10	20	-10	-50%	2.6	100	PASS				
	J8_13	D	Four Ashes Rd	A	A449 (N)	68	69	-1	-1%	0.1	100	PASS				
	J8_13	D	Four Ashes Rd	B	Station Rd	111	116	-5	-4%	0.5	100	PASS				
	J8_13	D	Four Ashes Rd	C	A449 (S)	54	55	-1	-2%	0.1	100	PASS				
	J12_13	A	A5 (E)	B	Vicarage Road	287	284	3	1%	0.2	100	PASS				
	J12_13	A	A5 (E)	C	A5 (W)	636	665	-29	-4%	1.1	100	PASS				
	J12_13	B	Vicarage Road	A	A5 (E)	245	244	1	0%	0.1	100	PASS				
	J12_13	B	Vicarage Road	C	A5 (W)	56	70	-14	-20%	1.8	100	PASS				
	J12_13	C	A5 (W)	A	A5 (E)	744	693	51	7%	1.9	112	PASS				
	J12_13	C	A5 (W)	B	Vicarage Road	115	105	10	10%	1.0	100	PASS				
	Total					4,893	4,809	84	2%	1.3						

Table 2. PM Local Turn Calibration Results, Original 2015 South Staffordshire Model

Counts	18					PASS	FAIL	Criteria	%	Flow Test						
	Site	From Arm	From	To Arm	To	Survey	Model	Diff (S-M)	% Diff	GEH	Flow Test Criteria	18				
17												1	% GEH <4	94%	% PASS	18
17												1	% GEH <5	94%		
	J8_13	A	A449 (N)	B	Station Rd	14	28	-14	-50%	3.1	100	PASS				
	J8_13	A	A449 (N)	C	A449 (S)	659	708	-49	-7%	1.9	100	PASS				
	J8_13	A	A449 (N)	D	Four Ashes Rd	5	7	-2	-29%	0.8	100	PASS				
	J8_13	B	Station Rd	A	A449 (N)	32	38	-6	-16%	1.0	100	PASS				
	J8_13	B	Station Rd	C	A449 (S)	390	356	34	10%	1.8	100	PASS				
	J8_13	B	Station Rd	D	Four Ashes Rd	90	87	3	3%	0.3	100	PASS				
	J8_13	C	A449 (S)	A	A449 (N)	866	869	-3	0%	0.1	130	PASS				
	J8_13	C	A449 (S)	B	Station Rd	317	223	94	42%	5.7	100	PASS				
	J8_13	C	A449 (S)	D	Four Ashes Rd	21	17	4	24%	0.9	100	PASS				
	J8_13	D	Four Ashes Rd	A	A449 (N)	15	19	-4	-21%	1.0	100	PASS				
	J8_13	D	Four Ashes Rd	B	Station Rd	42	43	-1	-2%	0.2	100	PASS				
	J8_13	D	Four Ashes Rd	C	A449 (S)	7	10	-3	-30%	1.0	100	PASS				
	J12_13	A	A5 (E)	B	Vicarage Road	216	206	10	5%	0.7	100	PASS				
	J12_13	A	A5 (E)	C	A5 (W)	625	630	-5	-1%	0.2	100	PASS				
	J12_13	B	Vicarage Road	A	A5 (E)	364	369	-5	-1%	0.3	100	PASS				
	J12_13	B	Vicarage Road	C	A5 (W)	88	71	17	24%	1.9	100	PASS				
	J12_13	C	A5 (W)	A	A5 (E)	708	636	72	11%	2.8	106	PASS				
	J12_13	C	A5 (W)	B	Vicarage Road	69	89	-20	-22%	2.3	100	PASS				
	Total					4,528	4,406	122	3%	1.4						

1.2.2 Comparison of the 2013 turn data for the two junctions within the original 2015 South Staffordshire VISSIM model against the 2016 data indicated that the traffic volumes at both junctions is fairly consistent between the two datasets. However, as the updated South Staffordshire VISSIM model includes the Vicarage Road/Straight Mile junction and the Vicarage Road/Station Drive through road, it was necessary to recalibrate the model at these locations through matrix manipulation to establish the through traffic along Vicarage Road.

1.2.3 Tables 3 and 4 present the turn calibration results for the updated South Staffordshire Model for the AM and PM peak periods respectively, and indicate that in both time periods 100% of turns at the three local junctions calibrate to a GEH of less than 5.

Table 3. AM Local Turn Calibration Results, Updated South Staffordshire Model

Counts	24					PASS	FAIL	Criteria	%	Flow Test	
						23	1	% GEH <4	96%	% PASS	24
						24	0	% GEH <5	100%		100%
					24	0	% GEH <10	100%			
Site	From Arm	From	To Arm	To	Survey	Model	Diff (S-M)	% Diff	GEH	Flow Test Criteria	Flow Test PASS/FAIL
A_16	A	Watling Street E	B	Vicarage Road	280	265	15	6%	0.9	100	PASS
A_16	A	Watling Street E	C	Watling Street W	708	764	-56	-7%	2.1	106	PASS
A_16	B	Vicarage Road	A	Watling Street E	280	209	71	34%	4.5	100	PASS
A_16	B	Vicarage Road	C	Watling Street W	77	89	-12	-13%	1.3	100	PASS
A_16	C	Watling Street W	A	Watling Street E	678	777	-99	-13%	3.7	100	PASS
A_16	C	Watling Street W	B	Vicarage Road	161	158	3	2%	0.2	100	PASS
C_16	A	Stafford Road N	B	Station Drive	40	28	12	43%	2.1	100	PASS
C_16	A	Stafford Road N	C	Stafford Road S	877	966	-89	-9%	2.9	132	PASS
C_16	A	Stafford Road N	D	Four Ashes Road	1	5	-4	-80%	2.3	100	PASS
C_16	B	Station Drive	A	Stafford Road N	23	17	6	35%	1.3	100	PASS
C_16	B	Station Drive	C	Stafford Road S	449	531	-82	-15%	3.7	100	PASS
C_16	B	Station Drive	D	Four Ashes Road	66	47	19	40%	2.5	100	PASS
C_16	C	Stafford Road S	A	Stafford Road N	810	788	22	3%	0.8	122	PASS
C_16	C	Stafford Road S	B	Station Drive	354	342	12	4%	0.6	100	PASS
C_16	C	Stafford Road S	D	Four Ashes Road	9	20	-11	-55%	2.9	100	PASS
C_16	D	Four Ashes Road	A	Stafford Road N	58	70	-12	-17%	1.5	100	PASS
C_16	D	Four Ashes Road	B	Station Drive	139	127	12	9%	1.0	100	PASS
C_16	D	Four Ashes Road	C	Stafford Road S	38	52	-14	-27%	2.1	100	PASS
B_16	A	Vicarage Road E	B	Straight Mile	1	1	0	0%	0.0	100	PASS
B_16	A	Vicarage Road E	C	Vicarage Road W	445	414	31	7%	1.5	100	PASS
B_16	B	Straight Mile	A	Vicarage Road E	2	5	-3	-60%	1.6	100	PASS
B_16	B	Straight Mile	C	Vicarage Road W	140	108	32	30%	2.9	100	PASS
B_16	C	Vicarage Road W	A	Vicarage Road E	330	289	41	14%	2.3	100	PASS
B_16	C	Vicarage Road W	B	Straight Mile	36	40	-4	-10%	0.6	100	PASS
Total					6,002	6,112	-110	-2%	1.9		



Table 4. PM Local Turn Calibration Results, Updated South Staffordshire Model

Counts	24					PASS	FAIL	Criteria	%	Flow Test	
						22	2	% GEH <4	92%	% PASS	24
						24	0	% GEH <5	100%		100%
					24	0	% GEH <10	100%			
Site	From Arm	From	To Arm	To	Survey	Model	Diff (S-M)	% Diff	GEH	Flow Test Criteria	Flow Test PASS/FAIL
A_16	A	Watling Street E	B	Vicarage Road	209	164	-45	27%	3.3	100	PASS
A_16	A	Watling Street E	C	Watling Street W	611	676	-65	-10%	2.6	100	PASS
A_16	B	Vicarage Road	A	Watling Street E	388	320	68	21%	3.6	100	PASS
A_16	B	Vicarage Road	C	Watling Street W	77	43	34	79%	4.4	100	PASS
A_16	C	Watling Street W	A	Watling Street E	670	726	-56	-8%	2.1	100	PASS
A_16	C	Watling Street W	B	Vicarage Road	77	87	-10	-11%	1.1	100	PASS
C_16	A	Stafford Road N	B	Station Drive	18	22	-4	-18%	0.9	100	PASS
C_16	A	Stafford Road N	C	Stafford Road S	658	680	-22	-3%	0.9	100	PASS
C_16	A	Stafford Road N	D	Four Ashes Road	3	6	-3	-50%	1.4	100	PASS
C_16	B	Station Drive	A	Stafford Road N	44	47	-3	-6%	0.4	100	PASS
C_16	B	Station Drive	C	Stafford Road S	387	419	-32	-8%	1.6	100	PASS
C_16	B	Station Drive	D	Four Ashes Road	102	81	21	26%	2.2	100	PASS
C_16	C	Stafford Road S	A	Stafford Road N	989	946	43	5%	1.4	148	PASS
C_16	C	Stafford Road S	B	Station Drive	364	344	20	6%	1.1	100	PASS
C_16	C	Stafford Road S	D	Four Ashes Road	26	19	7	37%	1.5	100	PASS
C_16	D	Four Ashes Road	A	Stafford Road N	16	19	-3	-16%	0.7	100	PASS
C_16	D	Four Ashes Road	B	Station Drive	49	54	-5	-9%	0.7	100	PASS
C_16	D	Four Ashes Road	C	Stafford Road S	11	9	2	22%	0.6	100	PASS
B_16	A	Vicarage Road E	B	Straight Mile	5	7	-2	-29%	0.8	100	PASS
B_16	A	Vicarage Road E	C	Vicarage Road W	279	236	43	18%	2.7	100	PASS
B_16	B	Straight Mile	A	Vicarage Road E	5	9	-4	-44%	1.5	100	PASS
B_16	B	Straight Mile	C	Vicarage Road W	76	79	-3	-4%	0.3	100	PASS
B_16	C	Vicarage Road W	A	Vicarage Road E	447	348	99	28%	5.0	100	PASS
B_16	C	Vicarage Road W	B	Straight Mile	67	73	-6	-8%	0.7	100	PASS
Total					5,578	5,414	164	3%	1.7		

1.3 Local Junction Queue Validation

1.3.1 The principle requirement of queue validation is to ensure that the model does not generate excessive queued vehicles which varies from those observed, or inversely underestimates the scale of congestion in the network. In the absence of defined DfT TAG queue length criteria, study specific criteria have been defined, using the 85% of observation criteria:

- Total of all junction approaches maximum queue length within 30 vehicles; and
- Individual junction approaches maximum queue length within 15 vehicles.

1.3.2 2016 queue length observations have been collected for the three local junctions, whilst queue length observations were not available for these junctions previously, and so therefore no comparison can be made.

1.3.3 Tables 5 and 6 present the queue length observations for the individual junction approaches for the AM and PM peak periods respectively, and show that in the AM peak 90% of individual approaches are within the 15 vehicle criteria, whilst in the PM peak 100% of individual approaches are within the 15 vehicle criteria.



Table 5. AM Local Queue Validation Results, Updated South Staffordshire Model

					Queue Validation	% PASS	90%	
					Average Vehicle Length (m)		5.75	
Individual Approach Maximum Queue Length Count Validation					Criteria <Veh			15
					Vehicles			PASS / FAIL
Queue Counter	Site	Arm	Description	Lanes	Survey Queue	Model Queue	Diff (M-S)	
					Max Q (Veh)	Max Q (Veh)	Max Q (Veh)	<15 Veh
29	Site A	Arm A	A5 Watling St. E	2	20	16	-4	PASS
30	Site A	Arm B	Vicarage Road	2	13	15	2	PASS
31	Site A	Arm C	A5 Watling St. W	2	9	20	11	PASS
32	Site C	Arm A	Stafford Road N	2	23	17	-6	PASS
33	Site C	Arm A	Stafford Road N Right Turn Flare	1	1	1	0	PASS
34	Site C	Arm B	Station Road	1	26	42	16	FAIL
35	Site C	Arm C	Stafford Road S	2	20	18	-2	PASS
36	Site C	Arm C	Stafford Road S Right Turn Flare	1	21	19	-2	PASS
37	Site C	Arm D	Four Ashes Road	1	11	9	-2	PASS
38	Site B	Arm A	Straight Mile	1	4	0	-4	PASS
Total					148	157	9	

Table 6. PM Local Queue Validation Results, Updated South Staffordshire Model

					Queue Validation	% PASS	100%	
					Average Vehicle Length (m)		5.75	
Individual Approach Maximum Queue Length Count Validation					Criteria <Veh			15
					Vehicles			PASS / FAIL
Queue Counter	Site	Arm	Description	Lanes	Survey Queue	Model Queue	Diff (M-S)	
					Max Q (Veh)	Max Q (Veh)	Max Q (Veh)	<15 Veh
29	Site A	Arm A	A5 Watling St. E	2	15	17	2	PASS
30	Site A	Arm B	Vicarage Road	2	14	21	7	PASS
31	Site A	Arm C	A5 Watling St. W	2	13	21	8	PASS
32	Site C	Arm A	Stafford Road N	2	16	11	-5	PASS
33	Site C	Arm A	Stafford Road N Right Turn Flare	1	1	1	0	PASS
34	Site C	Arm B	Station Road	1	25	34	9	PASS
35	Site C	Arm C	Stafford Road S	2	24	15	-9	PASS
36	Site C	Arm C	Stafford Road S Right Turn Flare	1	22	15	-7	PASS
37	Site C	Arm D	Four Ashes Road	1	5	5	0	PASS
38	Site B	Arm A	Straight Mile	1	3	0	-3	PASS
Total					138	139	1	



1.4 Overall Calibration and Validation Statistics

- 1.4.1 Alongside the local calibration and validation of the three local junctions, Tables 7 and 8 provide the overall calibration and validation statistics for the original and updated South Staffordshire models respectively. These results show that the updated model calibrates to the required standard, exceeding the TAG criteria of turns and links with a GEH less than 5.
- 1.4.2 In relation to validation statistics, the updated model validates to the required 85% or more criteria for total traffic volumes in both the AM and PM peak periods. In both the original and updated PM peak models, journey time validation falls slightly below the required standard, with 10 of the 12 routes passing the required criteria. However, the journey time routes which fail in both time periods relate to the M6, where Trafficmaster data does not account for the junctions 10a-13 “Smart” Motorway Scheme, and so therefore based on the journey time results, the updated model is considered to be representative of the traffic conditions and travel times throughout the modelled network.

Table 7. Calibration and Validation Summary, Original South Staffordshire Model

MODEL CALIBRATION & VALIDATION	CRITERIA	COUNTS / RECORDS	MODELLED PEAK HOUR RESULTS	
			AM Peak Hr (08:00-09:00)	PM Peak Hr (17:00-18:00)
Calibration	Junction link count GEH <5	143	99%	97%
	Junction turn count GEH <5	189	98%	97%
Validation	ATC Total Traffic GEH <5	37	95%	89%
	Journey time routes within 15% of observed	12	92%	83%
	Junction total maximum queue length <30 vehicles of observed	8	71%	100%
	Junction approach maximum queue length <15 vehicles of observed	28	82%	93%

Table 8. Calibration and Validation Summary, Updated South Staffordshire Model

MODEL CALIBRATION & VALIDATION	CRITERIA	COUNTS / RECORDS	MODELLED PEAK HOUR RESULTS	
			AM Peak Hr (08:00-09:00)	PM Peak Hr (17:00-18:00)
Calibration	Junction link count GEH <5	143	97%	93%
	Junction turn count GEH <5	195	98%	97%
Validation	ATC Total Traffic GEH <5	37	95%	89%
	Journey time routes within 15% of observed	12	92%	83%
	Junction total maximum queue length <30 vehicles of observed	10	80%	90%
	Junction approach maximum queue length <15 vehicles of observed	38	84%	92%

1.5 Summary

- 1.5.1 SYSTRA Ltd has been commissioned to assess the impact of the proposed West Midlands Interchange development, using the 2015 Base Year South Staffordshire VISSIM Model. WSP Parsons Brinckerhoff supplied 2016 turning counts and queue length data for four local junctions, of which two were included in the VISSIM model network.
- 1.5.2 In order to assess the impact of the West Midlands Interchange, it was agreed that network modifications should be undertaken to include the Vicarage Road/Station Drive through road within the model, including the Vicarage Road/Straight Mile junction.
- 1.5.3 Therefore, the updated South Staffordshire VISSIM model includes three of the four local junctions with 2016 data, and as these junctions relate to accesses to the West Midlands Interchange, the updated model has been recalibrated against this data.
- 1.5.4 The results provided in this Technical Note indicate that the updated South Staffordshire VISSIM model is calibrated and validated to the required standards, and is representative of the observed network conditions, based on multiple criteria.



APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Mia-Jade Thornton	Senior Consultant	22/02/2017	
	Checked by	Adrian Hewitt	Principal Consultant	23/02/2017	
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