Local Model Validation Report – Level Crossing Study

MG0172 Level Crossing study

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APPENDICES

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1 INTRODUCTION

1.1 Introduction

1.1.1 Modelling Group, in partnership with Tracsis Traffic Data Ltd have been appointed by Network Rail to analyse traffic and congestion implications of upgrading 7 level crossings to MCB-OD2 / MCB-CCTV type operation, with a view to understanding the impacts the upgrades will have on the local communities and the wider transport network.

1.2 Study Extents

1.2.1 The modelling study involves the assessment of 7 level crossings within Cambridgeshire and Norfolk. These include:

- Milton Fen, Fen Road, CB24 6AF. Ordinance Survey grid reference TL 484 623.
- Waterbeach, Clayhithe Road, CB25 9HS. Ordinance Survey grid reference TL 500 649
- Dimmocks Cote, Newmarket Road, CB6 3LJ. Ordinance Survey grid reference TL 526 730
- Croxton, A1075, IP24 2RQ. Ordinance Survey grid reference TL 902 867
- Six Mile Bottom, London Road, CB8 0UJ, Ordinance Survey grid reference TL 576 567
- Dullingham, Station Road, CB8 9UT. Ordinance Survey grid reference TL 618 585
- Meldreth, Meldreth Road, SG8 6XA. Ordinance Survey grid reference TL 388 477

1.3 Model setup

1.3.1 A microsimulation model for each of these level crossings has been developed using VISSIM 2021 SP09.

1.3.2 The following vehicle compositions have been used for all models:

- Lights (Cars + Light Goods Vehicles (LGVs))
- Heavies (Medium Class Vehicles (MGVs) + Heavy Goods Vehicles (HGVs))
- Cyclists (PCLs)

1.3.3 The model has been calibrated against manual classified count (MCCs) data and validated against automatic traffic count (ATC) data collected in 2021, using the GEH statistic criteria.

1.4 Model guidelines

1.4.1 The model has been developed to meet the following VISSIM modelling guidelines:

- DfT's TAG Unit 3.1 Guidelines – Highway Assignment Modelling
- TfL, Traffic Modelling Guidelines – TfL Traffic Manager and Network Performance Best Practice, Version 3.0

2 MILTON FEN VISSIM MODEL

2.1 Model Extents & Survey Locations

2.1.1 The model extents for the Milton Fen VISSIM model are shown in Figure 2.1.

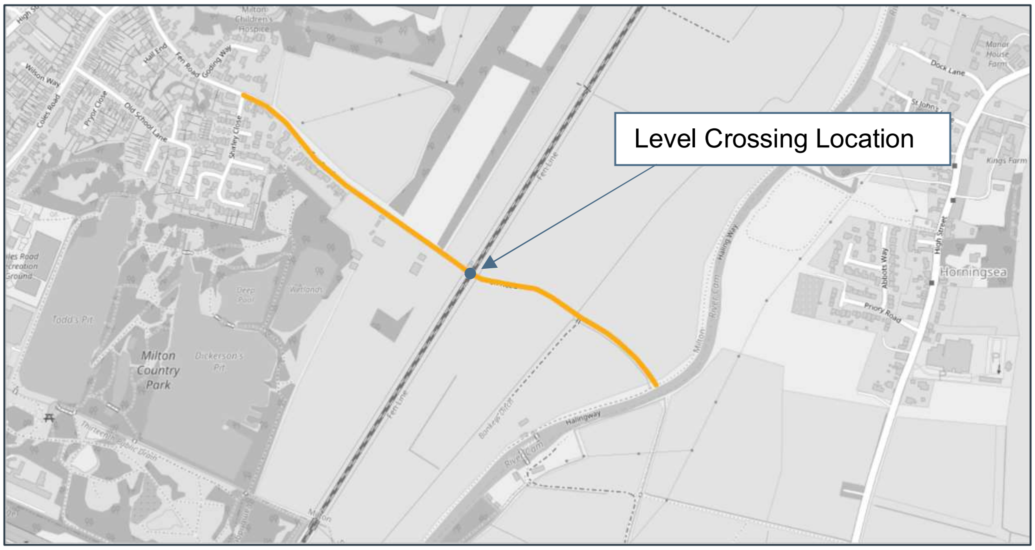


FIGURE 2.1: MODEL EXTENTS – MILTON FEN

2.1.2 The traffic survey data that has been captured is shown in Figure 2.2.

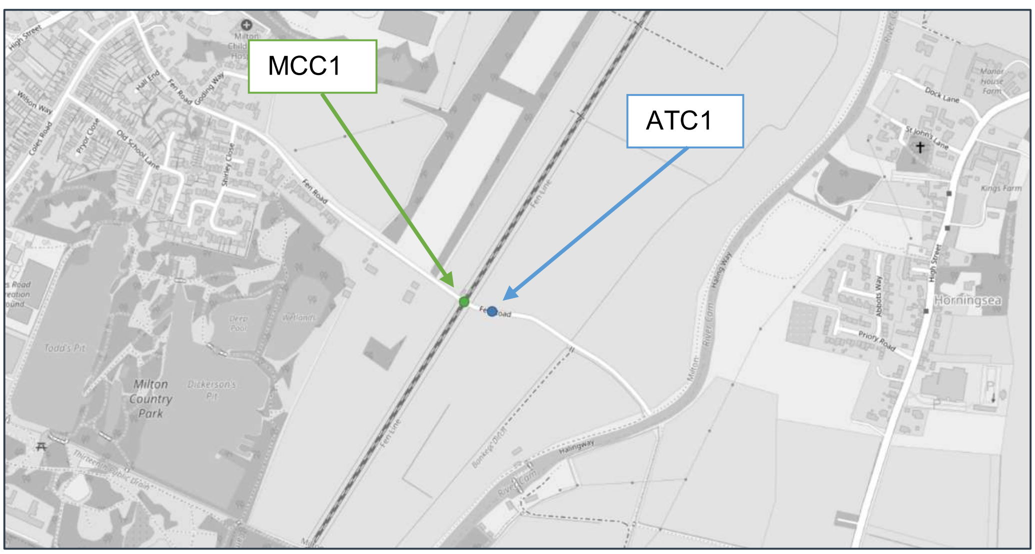


FIGURE 2.2: PROPOSED SURVEY LOCATIONS – MILTON FEN

2.2 Model Time Periods & Demands

2.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Milton Fen model:

- AM Peak - 1115-1215hrs
- PM Peak – 1630-1730hrs

2.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

Census data has been captured on Tuesday 6th of July 2021 and is summarised in Table 2.1 and Table 2.2.

Surveyed				
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	8	0	2	10
Eastbound	3	0	3	6

TABLE 2.1: AM PEAK FLOW – MILTON FEN

Surveyed				
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	3	0	2	5
Eastbound	8	0	1	9

TABLE 2.2: PM PEAK FLOW – MILTON FEN

2.2.3 A total of 21 and 10 pedestrians were observed crossing the level crossing during the AM and PM peak periods respectively.

2.3 Model Calibration – Flows

2.3.1 The model has been calibrated against the turning count as shown in Table 2.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 2.3: FLOW CALIBRATION – AM AND PM PEAK – MILTON FEN

2.4 Model Validation – Flows

2.4.1 The model has been validated against the ATC data as shown in Table 2.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%

Validation	
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 2.4: FLOW VALIDATION – AM AND PM PEAK – MILTON FEN

2.4.2 Flow consistency checks have also been undertaken between the observed and modelled values for the crossing within the study area for light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

2.5 Model Validation – Barrier Down Time

2.5.1 The barrier down time was also captured as part of this study and was used to set up the model as shown in Table 2.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
6	6	0	7	7	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
38	38	0	22	22	0
21	21	0	27	27	0
33	33	0	25	25	0
24	24	0	21	21	0
20	20	0	24	24	0
29	29	0	31	31	0
-	-	-	26	28	2

TABLE 2.5: BARRIER DOWN TIME – MILTON FEN

2.5.2 From the results above, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

2.6 Model Validation – Queue Lengths

2.6.1 The queue lengths in the model have also been compared with the observed data as shown in Table 2.6 and Table 2.7.

Max Queue Length (Vehicle) AM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
Avg	0	0	0	0	0	0

TABLE 2.6: QUEUE LENGTHS – AM PEAK – MILTON FEN

Max Queue Length (Vehicle) PM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
Avg	0	0	0	0	0	0

TABLE 2.7: QUEUE LENGTHS – PM PEAK – MILTON FEN

2.6.2 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

3 WATERBEACH VISSIM MODEL

3.1 Model Extents & Survey Locations

3.1.1 The model extents for the Waterbeach VISSIM model are shown in Figure 3.1.

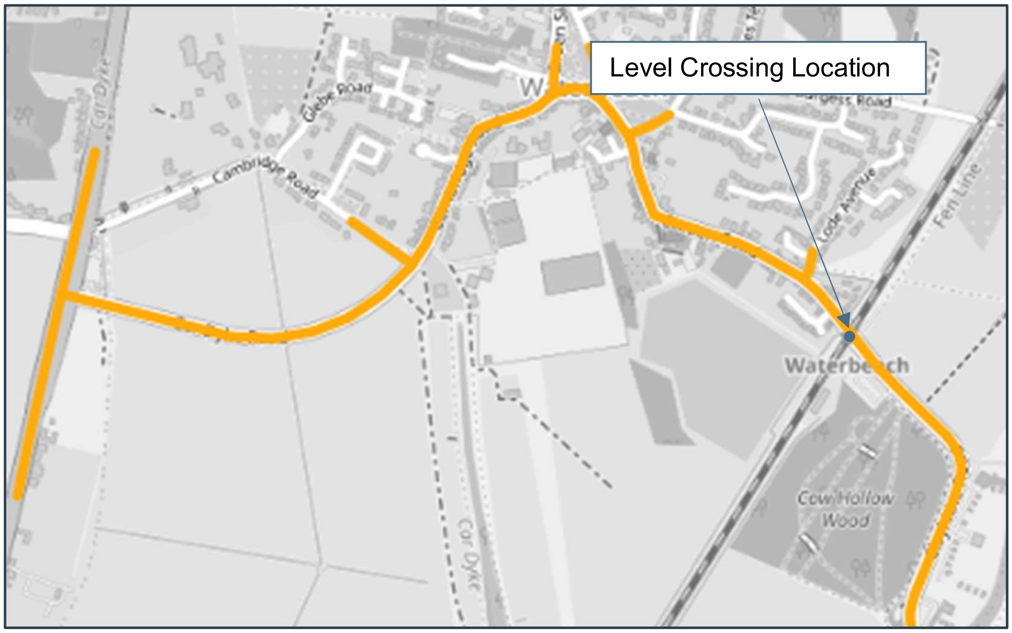


FIGURE 3.1: MODEL EXTENTS – WATERBEACH

3.1.2 The traffic survey data that has been captured is shown in Figure 3.2.

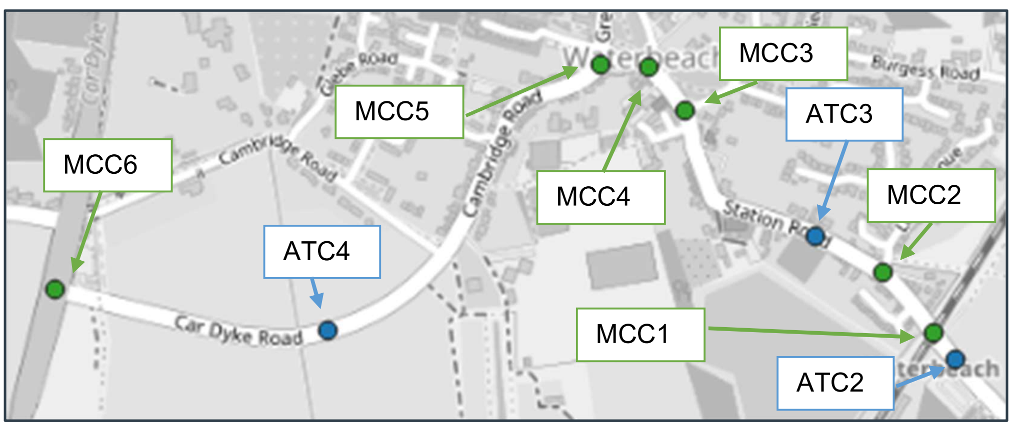


FIGURE 3.2: PROPOSED SURVEY LOCATIONS – WATERBEACH

3.2 Model Time Periods & Demands

3.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Waterbeach model:

- AM Peak – 0800-0900hrs
- PM Peak – 1630-1730hrs

3.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

3.2.3 Census data has been captured on Tuesday 29th of March 2022 and is summarised in Table 3.1 and Table 3.2.

	225	2	227

TABLE 3.1: AM PEAK FLOW – WATERBEACH

	118	2	120

TABLE 3.2: PM PEAK FLOW – WATERBEACH

3.2.4 A total of 43 and 26 pedestrians uses the level crossing during the AM and PM peak period. This is mainly due to the access of the platforms which are located on each side of the level crossing.

3.3 Model Specifics & Site Observations

3.3.1 On street parking was observed on Station Road, with the sections highlighted in Figure 3.3 showing the main locations.

FIGURE 3.3: ON STREET PARKING LOCATION

3.3.2 These sections have been modelled in VISSIM using invisible signals and a demand dependent signal logic profile, to provide an accurate representation of the give way behaviour. The model has also been setup to hold traffic where double yellow line sections are located as highlighted in Figure **3.4**.

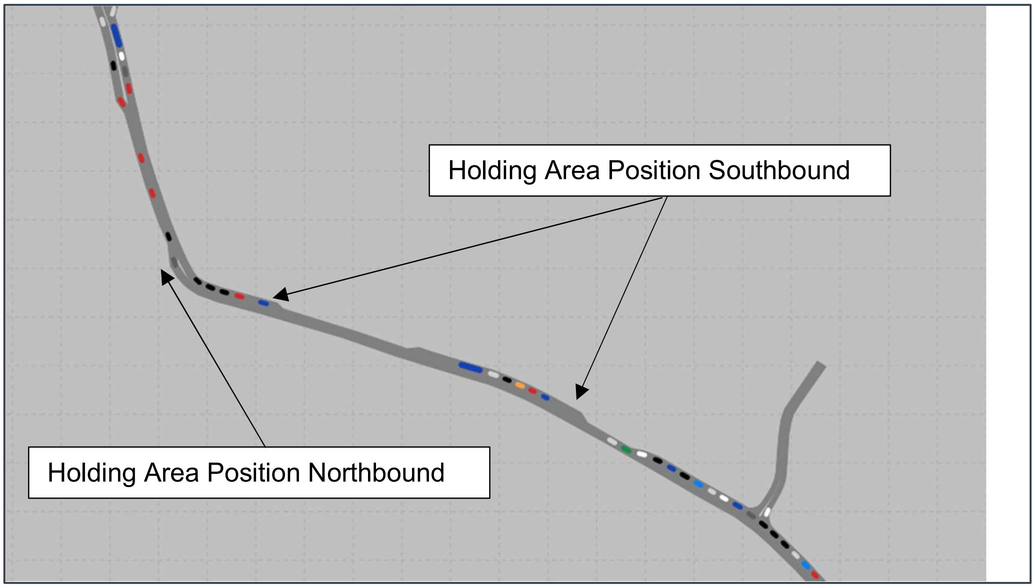


FIGURE 3.4: **TRAFFIC HOLDING POSITION MAP**

3.4 Model Calibration – Flows

3.4.1 The model has been calibrated against the turning count as shown in Table 3.3.

Calibration	
Total number of counts considered	42
VISSIM model counts with GEH <3	41
% of VISSIM counts with GEH <3	97.62%
VISSIM model counts with GEH <5	42
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	42
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	42
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 3.3: FLOW CALIBRATION – AM AND PM PEAK – WATERBEACH

3.5 Model Validation – Flows

3.5.1 The model has been validated against the ATC data as shown in Table 3.4.

Validation	
Total number of counts considered	42
VISSIM model counts with GEH <3	42
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	42
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	42
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	42
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 3.4: FLOW VALIDATION – AM AND PM PEAK – WATERBEACH

3.5.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

3.6 Model Validation – Barrier Down Time

3.6.1 The barrier down time was also captured as part of this study and was used to set up the model as shown in Table 3.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
8	8	0	8	8	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
77	77	0	78	78	0
9	9	0	36	36	0
44	44	0	8	8	0
53	53	0	54	54	0
23	23	0	41	41	0
76	76	0	26	26	0
56	56	0	49	49	0
41	41	0	49	49	0

TABLE 3.5: BARRIER DOWN TIME - WATERBEACH

3.6.2 From the results above, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

3.7 Model Validation – Queue Lengths

3.7.1 The queue lengths in the model have also been compared with the observed data as shown in Table 2.6 and Table 3.7.

Max Queue Length (Vehicle) AM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	0	1	1	15	5	-10
2	0	0	0	2	0	-2
3	0	1	1	24	5	-19
4	1	0	-1	12	0	-12
5	2	6	4	2	14	12
6	13	0	-13	18	0	-18
7	12	2	-10	6	7	1
8	16	0	-16	8	0	-8
Avg	6	1	-4	11	4	-7

TABLE 3.6: QUEUE LENGTHS – AM PEAK – WATERBEACH

Max Queue Length (Vehicle) PM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	7	4	-3	0	2	2
2	11	0	-11	8	0	-8
3	14	13	-1	8	6	-2
4	3	0	-3	2	0	-2
5	1	11	10	2	6	4
6	13	0	-13	10	0	-10
7	11	4	-7	11	4	-7
Avg	9	5	-4	6	3	-3

TABLE 3.7: QUEUE LENGTHS – PM PEAK – WATERBEACH

3.7.2 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

3.8 Model Validation – Journey Times

3.8.1 The journey times in the model have also been compared, using the journey time section as shown in Figure 3.5.

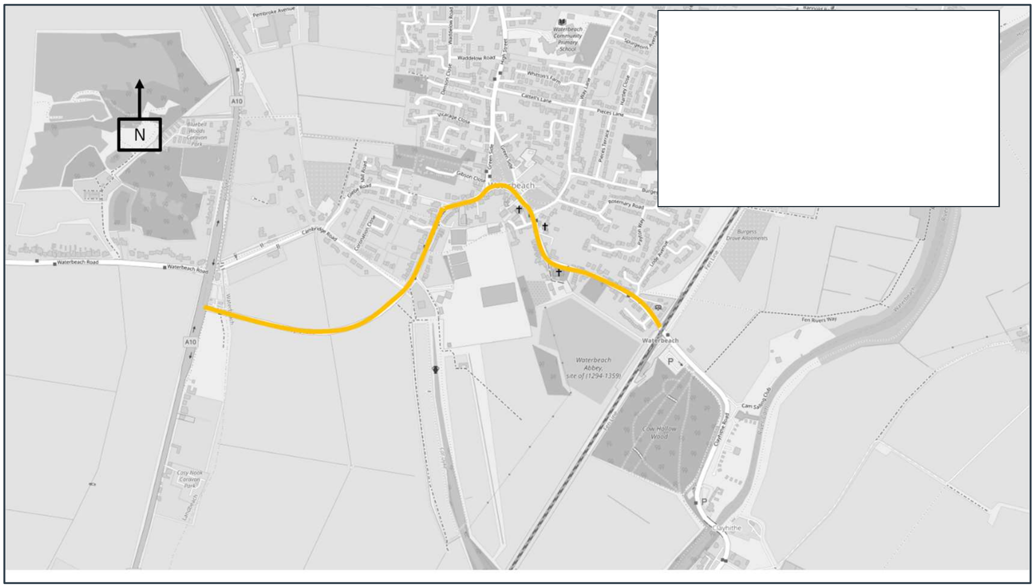


FIGURE 3.5: JOURNEY TIME MAP – WATERBEACH

	AM JT(s)				PM JT(s)			
Section	Observed	Modelled	Diff.	% Diff.	Observed	Modelled	Diff.	% Diff.
EB Section	147	125	-21	-15%	146	130	-15	-10%
WB Section	154	132	-21	-14%	128	132	3	3%

TABLE 3.8: JOURNEY TIMES – AM AND PM PEAK – WATERBEACH

3.8.2 From the results above, it can be seen that the modelled journey times are not within 15% of the observed times However, they are within 60s and are considered representative against DfT’s TAG Unit 3.1 guidance.

4 DIMMOCKS COTE VISSIM MODEL

4.1 Model Extents & Survey Locations

4.1.1 The model extents for the Dimmocks Cote VISSIM model are shown in Figure 4.1.

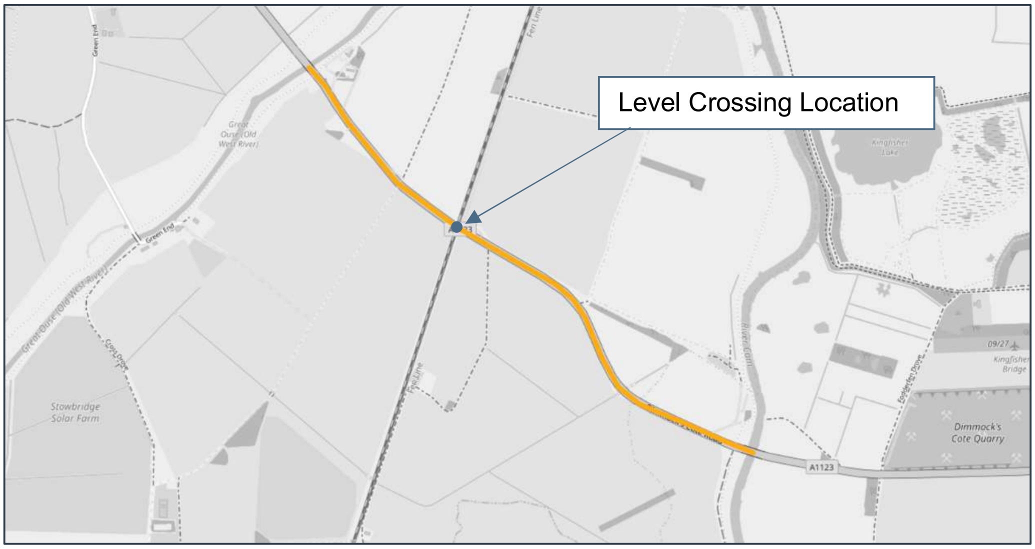


FIGURE 4.1: MODEL EXTENTS – DIMMOCKS COTE

4.1.2 The traffic survey data that has been captured is shown in Figure 4.2.

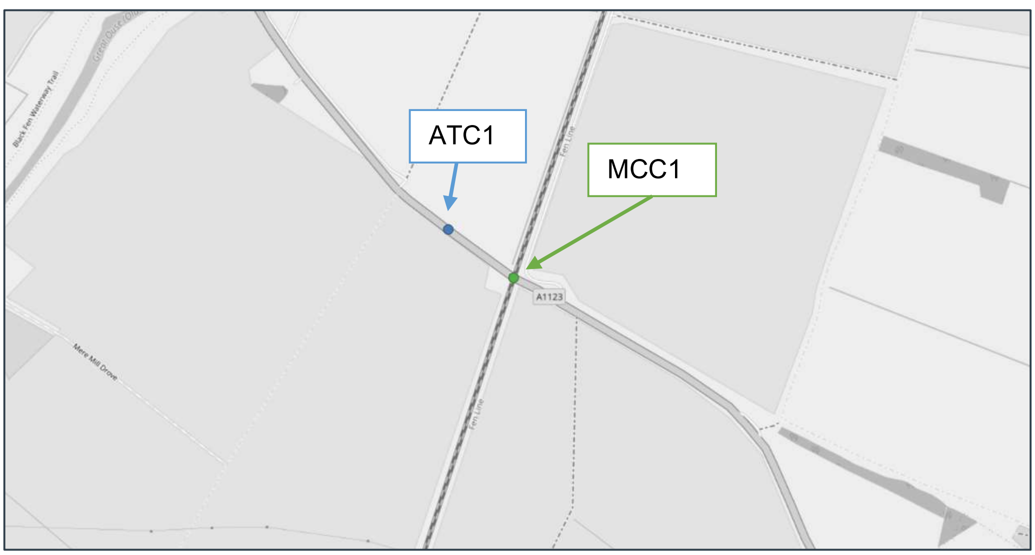


FIGURE 4.2: PROPOSED SURVEY LOCATIONS – DIMMOCKS COTE

4.2 Model Time Periods & Demands

4.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Dimmocks Cote model:

- AM Peak - 0715-0815hrs
- PM Peak – 1630-1730hrs

4.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

4.2.3 Census data have been captured on Tuesday 6th of July 2021 and have been summarised in Table 4.1 and Table 4.2.

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	210	11	0	221
Eastbound	167	15	0	182

TABLE 4.1: AM PEAK FLOW – WATERBEACH

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	197	6	1	204
Eastbound	160	4	1	165

TABLE 4.2: PM PEAK FLOW - WATERBEACH

4.2.4 No pedestrian was observed using the level crossing during both peak periods.

4.3 Model Calibration – Flows

4.3.1 The model has been calibrated against the turning count as shown in Table 4.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 4.3: FLOW CALIBRATION - AM AND PM PEAK – DIMMOCKS COTE

4.4 Model Validation – Flows

4.4.1 The model has been validated against the ATC data as shown in Table 4.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 4.4: FLOW VALIDATION – AM AND PM PEAK – DIMMOCKS COTE

4.4.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for the light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

4.5 Model Validation – Barrier Down Time

4.5.1 The barrier down time was also captured as part of this study and was used to set up the model as shown in Table 4.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
8	8	0	7	7	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
31	31	0	47	47	0
24	24	0	23	23	0
31	31	0	33	33	0
22	22	0	24	24	0
23	23	0	29	29	0
20	20	0	33	33	0
33	33	0	23	23	0
22	22	0	-	-	-

TABLE 4.5: BARRIER DOWN TIME – DIMMOCKS COTE

4.5.2 From the results above, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

4.6 Model Validation – Queue Lengths

4.6.1 The queue lengths in the model have also been compared with the observed data as shown in Table 4.6 and Table 4.7.

Max Queue Length (Vehicle) AM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	3	3	0	1	1	0
2	2	3	1	1	1	0
3	0	2	2	2	1	-1
4	2	2	0	0	1	1
5	2	3	1	2	2	0
6	7	2	-5	1	2	1
7	1	1	0	3	2	-1
8	2	2	0	2	2	0
Avg	0	2	2	4	3	-1

TABLE 4.6: QUEUE LENGTHS – AM PEAK – DIMMOCKS COTE

Max Queue Length (Vehicle) PM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	2	2	0	4	4	0
2	0	2	2	6	2	-4
3	4	2	-2	7	3	-4
4	2	2	0	3	2	-1
5	0	3	3	9	3	-6
6	1	3	2	5	3	-2
7	4	3	-1	2	2	0
Avg	2	2	1	5	3	-2

TABLE 4.7: QUEUE LENGTHS – PM PEAK – DIMMOCKS COTE

4.6.2 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

5 CROXTON VISSIM MODEL

5.1 Model Extents & Survey Locations

5.1.1 The model extents for the Croxton VISSIM model are shown in Figure 5.1.

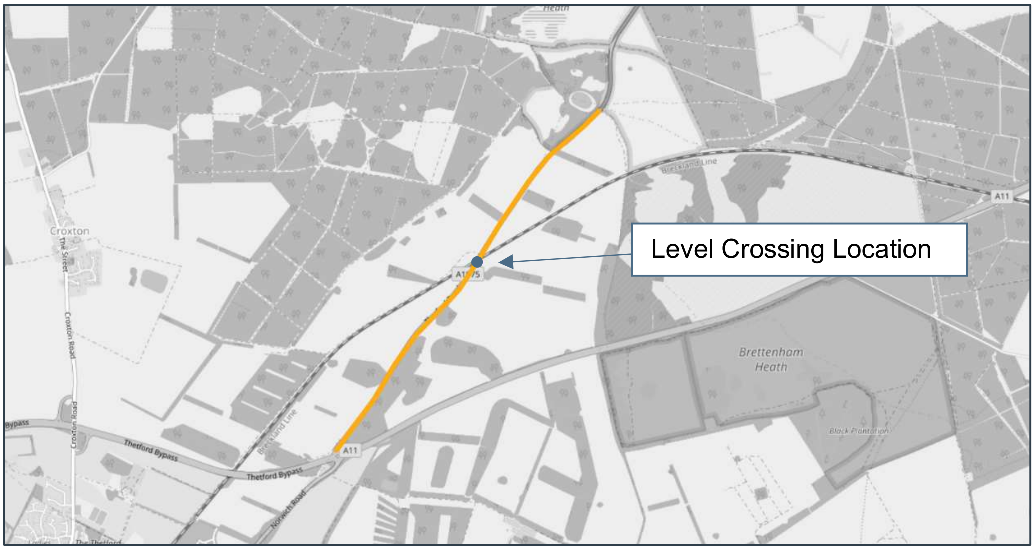


FIGURE 5.1: MODEL EXTENTS – CROXTON

5.1.2 The traffic survey data that has been captured is shown in Figure 5.2.

FIGURE 5.2: PROPOSED SURVEY LOCATIONS – CROXTON

5.2 Model Time Periods & Demands

5.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Croxton model:

- AM Peak - 0715-0815hrs
- PM Peak – 1645-1745hrs

5.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

5.2.3 Census data have been captured on Tuesday 6th of July 2021 and have been summarised in Table 5.1 and Table 5.2.

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	317	10	0	327
Eastbound	182	13	0	195

TABLE 5.1: AM PEAK FLOW – CROXTON

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	279	9	8	296
Eastbound	181	2	2	185

TABLE 5.2: PM PEAK FLOW - CROXTON

5.2.4 No pedestrian was observed using the level crossing during both peak periods.

5.3 Model Calibration – Flows

5.3.1 The model has been calibrated against the turning count as shown in Table 5.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 5.3: FLOW CALIBRATION – AM AND PM PEAK – CROXTON

5.4 Model Validation – Flows

5.4.1 The model has been validated against the ATC data as shown in Table 5.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 5.4: FLOW VALIDATION – AM AND PM PEAK – CROXTON

5.4.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

5.5 Model Validation – Barrier Down Time

5.5.1 The barrier down time was also captured as part of this study and was used to setup the model as shown in Table 5.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
3	3	0	2	2	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
96	96	0	45	45	0
42	42	0	36	36	0
48	48	0	-	-	-

TABLE 5.5: BARRIER DOWN TIME - CROXTON

5.5.2 From the results, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

5.6 Model Validation – Queue Lengths

5.6.1 The queue lengths in the model have also been compared with the observed data as shown in Table 5.6 and Table 5.7.

Max Queue Length (Vehicle) AM Peak						
	NB			SB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	7	13	6	9	7	-2
2	1	6	5	3	1	-2
3	1	6	5	3	1	-2
Avg	3	8	5	5	3	-2

TABLE 5.6: QUEUE LENGTHS – AM PEAK – CROXTON

Max Queue Length (Vehicle) PM Peak						
	NB			SB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	4	3	-1	2	5	3
2	1	3	2	7	4	-3
Avg	3	3	1	5	5	0

TABLE 5.7: QUEUE LENGTHS – PM PEAK – CROXTON

5.6.2 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

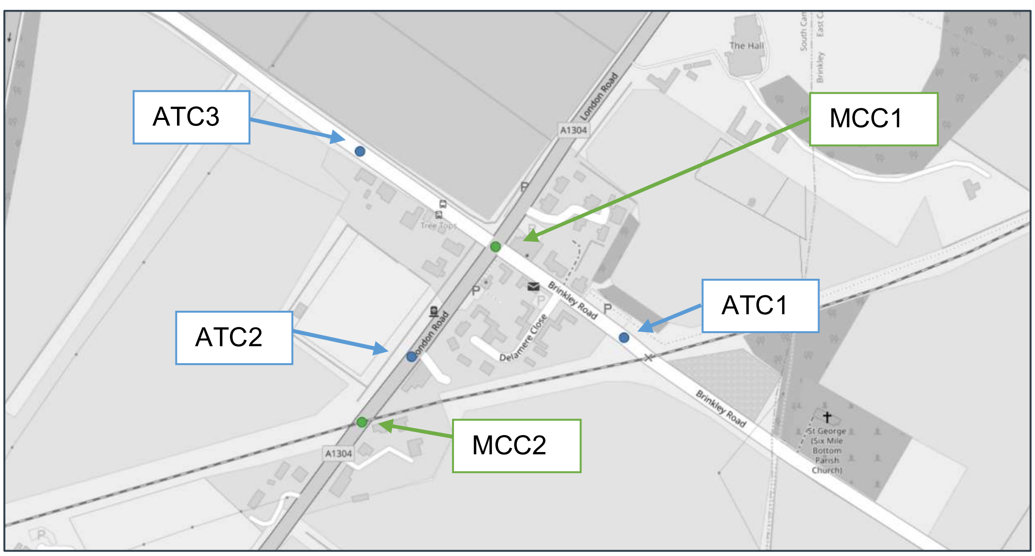
6 SIX MILE BOTTOM VISSIM MODEL

6.1 Model Extents & Survey Locations

6.1.1 The model extents for the Six Mile Bottom VISSIM model are shown in Figure 6.1.

FIGURE 6.1: MODEL EXTENTS – SIX MILE BOTTOM

6.1.2 The traffic survey data that has been captured is shown in Figure 6.2.



6.1.3

FIGURE 6.2: PROPOSED SURVEY LOCATIONS – SIX MILE BOTTOM

6.2 Model Time Periods & Demands

6.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Six Mile Bottom model:

- AM Peak - 0745-0845hrs
- PM Peak – 1530-1630hrs

6.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

6.2.3 Census data have been captured on Tuesday 6th of July 2021 and have been summarised in Table 6.1 and Table 6.2.

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	355	11	1	367
Eastbound	731	10	1	742

TABLE 6.1: AM PEAK FLOW – SIX MILE BOTTOM

	Surveyed			
Mvt #	**Lights**	**Heavies**	**Cyclists**	**Total**
Westbound	761	31	3	795
Eastbound	262	3	0	265

TABLE 6.2: PM PEAK FLOW – SIX MILE BOTTOM

6.2.4 3 pedestrians were observed to cross the level crossing during the AM peak only.

6.3 Model Calibration – Flows

6.3.1 The model has been calibrated against the turning count as shown in Table 6.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 6.3: FLOW CALIBRATION – AM AND PM PEAK – SIX MILE BOTTOM

6.4 Model Validation – Flows

6.4.1 The model has been validated against the ATC data as shown in Table 6.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 6.4: FLOW VALIDATION – AM AND PM PEAK – SIX MILE BOTTOM

6.4.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for the light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

6.5 Model Validation – Barrier Down Time

6.5.1 The barrier down time was also captured as part of this study and was used to set up the model as shown in Table 6.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
2	2	0	1	1	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
39	39	0	38	38	0
42	42	0	-	-	-

TABLE 6.5: BARRIER DOWN TIME - SIX MILE BOTTOM

6.5.2 From the results above, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

6.5.3 The timings associated with the level crossing on Brinkley Road are identical to those used at the Six Mile Bottom crossing, due the same crossing type and close proximity.

6.6 Model Validation – Queue Lengths

6.6.1 The queue lengths in the model have also been compared with the observed data as shown in Table 6.6 and Table 6.7.

Max Queue Length (Vehicle) AM Peak						
	NB			SB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	2	5	3	16	16	0
2	4	6	2	22	18	-4
Avg	3	6	3	19	17	-2

TABLE 6.6: QUEUE LENGTHS– AM PEAK – SIX MILE BOTTOM

Max Queue Length (Vehicle) PM Peak						
	NB			SB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	22	18	-4	6	4	-2
Avg	22	18	-4	6	4	-2

TABLE 6.7: QUEUE LENGTHS– PM PEAK – SIX MILE BOTTOM

6.6.2 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

7 DULLINGHAM VISSIM MODEL

7.1 Model Extents & Survey Locations

7.1.1 The model extents for the Dullingham VISSIM model are shown in Figure 7.1.

FIGURE 7.1: MODEL EXTENTS – DULLINGHAM

7.1.2 The traffic survey data that has been captured is shown in Figure 7.2.

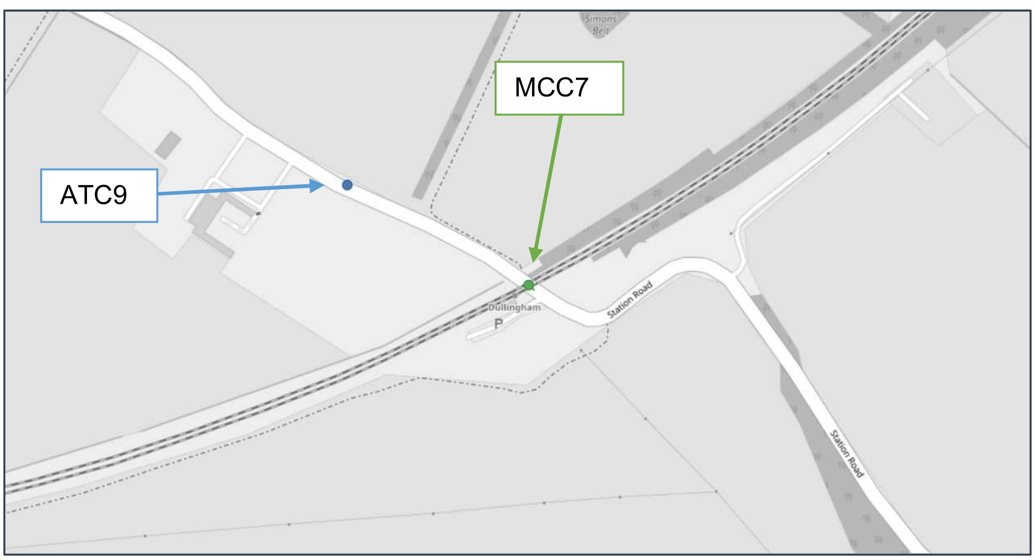


FIGURE 7.2: PROPOSED SURVEY LOCATIONS – DULLINGHAM

7.2 Model Time Periods & Demands

7.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Dullingham model:

- AM Peak - 0815-0915hrs
- PM Peak – 1600-1700hrs

7.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

7.2.3 Census data have been captured on Tuesday 6th of July 2021 and have been summarised in Table 7.1 and Table 7.2

	Surveyed			
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	29	3	0	32
Eastbound	20	1	0	21

TABLE 7.1: AM PEAK FLOW – DULLINGHAM

	Surveyed			
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	23	0	0	23
Eastbound	16	1	0	17

TABLE 7.2: PM PEAK FLOW – DULLINGHAM

7.2.4 A maximum of 4 pedestrians were observed to cross the level crossing during the AM peak period.

7.3 Model Calibration – Flows

7.3.1 The model has been calibrated against the turning count as shown in Table 7.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 7.3: FLOW CALIBRATION – AM AND PM PEAK – DULLINGHAM

7.4 Model Validation – Flows

7.4.1 The model has also been validated against the ATC data as shown in Table 7.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 7.4: FLOW VALIDATION – AM AND PM PEAK – DULLINGHAM

7.4.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for the Lights and Heavies vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

7.4.3 The barrier down time was also captured as part of this study and was used to setup the model as shown in Table 7.5.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	1	0	2	2	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
236	236	0	181	181	0
-	-	-	356	356	0

TABLE 7.5: BARRIER DOWN TIME - DULLINGHAM

7.4.4 Overall, the model validates well with the observed data in term of the barrier down time and number of activations.

Max Queue Length (Vehicle) AM Peak						
	NB			SB		
Call #	**Surveyed**	**Modelled**	**Diff.**	**Surveyed**	**Modelled**	**Diff.**
1	0	2	2	3	2	-1
Avg	0	2	2	3	2	-1

TABLE 7.6: QUEUE LENGTHS – AM PEAK – DULLINGHAM

Max Queue Length (Vehicle) PM Peak						
	NB			SB		
Call #	**Surveyed**	**Modelled**	**Diff.**	**Surveyed**	**Modelled**	**Diff.**
1	0	1	1	4	6	2
2	0	3	3	5	0	-5
Avg	0	2	2	5	3	-2

TABLE 7.7: QUEUE LENGTHS – PM PEAK – DULLINGHAM

7.4.5 From the results above, it can be seen that the queue lengths in the model are similar to those observed.

8 MELDRETH VISSIM MODEL

8.1 Model Extents & Survey Locations

8.1.1 The model extents for the Meldreth VISSIM model are shown in Figure 8.1.

FIGURE 8.1: MODEL EXTENTS - MELDRETH

8.1.2 The traffic survey data that has been captured is shown in Figure 8.2.

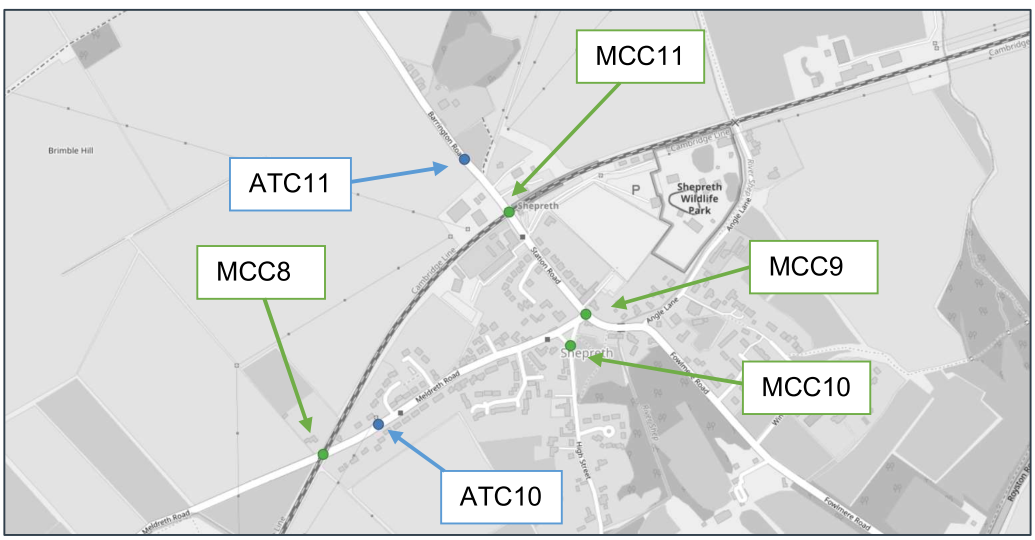


FIGURE 8.2: PROPOSED SURVEY LOCATIONS - MELDRETH

8.2 Model Time Periods & Demands

8.2.1 The peak periods have been calculated using the sum of all entry points based on the MCCs. The following peak periods have been identified for the Meldreth model:

- AM Peak - 0745-0845hrs
- PM Peak – 1645-1745hrs

8.2.2 A 15-minute warm-up and cool-down period has also been applied to the model.

8.2.3 Two pedestrians have been captured crossing the level crossing during the AM peak period.

8.2.4 Census data have been captured on Tuesday 6th of July 2021 and have been summarised in Table 8.1 and Table 8.2.

Surveyed				
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	52	0	1	53
Eastbound	57	0	0	57

TABLE 8.1: AM PEAK FLOW – MELDRETH

Surveyed				
Mvt #	Lights	Heavies	Cyclists	Total
Westbound	59	0	1	60
Eastbound	51	1	2	54

TABLE 8.2: PM PEAK FLOW – MELDRETH

8.2.5 A maximum of 4 pedestrians were observed to cross the level crossing during the AM peak period.

8.3 Model Calibration – Flows

8.3.1 The model has been calibrated against the turning count as shown in Table 8.3.

Calibration	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 8.3: FLOW CALIBRATION – AM AND PM PEAK – MELDRETH

8.4 Model Validation – Flows

8.4.1 The model has been validated against the ATC data as shown in Table 8.4.

Validation	
Total number of counts considered	2
VISSIM model counts with GEH <3	2
% of VISSIM counts with GEH <3	100%
VISSIM model counts with GEH <5	2
% of VISSIM counts with GEH <5	100%
VISSIM model counts with GEH <10	2
% of VISSIM counts with GEH <10	100%
VISSIM model counts meeting WebTAG Unit 3.1 criteria	2
% of VISSIM counts meeting WebTAG Unit 3.1 flow criteria	100%

TABLE 8.4: FLOW VALIDATION – AM AND PM PEAK – MELDRETH

8.4.2 Flow consistency has been checked between the observed and modelled values for the crossing within the study area for the light and heavy vehicles. The results show a GEH <3 for at least 85% of cases in all peaks, as recommended by the modelling guidelines.

8.5 Model Validation – Barrier Down Time

8.5.1 The barrier down time was also captured as part of this study and was used to setup the model as shown in Table 8.5 and Table 8.6.

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
10	10	0	9	9	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
43	43	0	77	77	0
36	36	0	41	41	0
36	36	0	43	43	0
54	54	0	40	40	0
102	102	0	65	65	0
51	51	0	41	41	0
40	40	0	37	37	0
41	41	0	43	43	0
36	36	0	62	62	0
60	60	0	-	-	-

TABLE 8.5: BARRIER DOWN TIME – MELDRETH

AM			PM		
Number of call			Number of call		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
6	6	0	7	7	0
Barrier down time (s)			Barrier down time (s)		
Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
248	248	0	123	123	0
209	209	0	218	218	0
409	409	0	252	252	0
152	152	0	110	110	0
257	257	0	144	144	0
322	322	0	155	155	0
-	-	-	111	111	0

TABLE 8.6: BARRIER DOWN TIME – SHEPRETH

8.5.2 From the results, it can be seen that the model validates well with the observed data in term of the barrier down time and number of activations.

8.6 Model Validation – Queue Lengths

8.6.1 The queue lengths in the model have also been compared with the observed data as shown in Table 8.7 and Table 8.8.

Max Queue Length (Vehicle) AM Peak						
	WB			EB		
Call #	Surveyed	Modelled	Diff.	Surveyed	Modelled	Diff.
1	1	0	-1	1	1	0
2	1	0	-1	2	0	-2
3	0	0	0	1	1	0
4	1	0	-1	0	0	0
5	2	1	-1	3	1	-2
6	2	0	-2	2	0	-2
7	1	0	-1	2	2	0
8	1	0	-1	1	0	-1
9	3	1	-2	0	4	4
10	0	0	0	1	0	-1
Avg	1	0	-1	1	1	0

TABLE 8.7: QUEUE LENGTHS – AM PEAK – MELDRETH

	2	1	-1	1	2	1
	2	1	-1	2	1	-1
	2	1	-1		1	1
		1	1	2	1	-1
	1	1	0		2	2

TABLE 8.8: QUEUE LENGTHS – PM PEAK – MELDRETH

8.6.2 From the results, it can be seen that the queue lengths in the model are similar to those observed.

8.7 Model Validation – Journey Times

8.7.1 The journey times in the model have also been compared, using the journey time section as shown in Figure 8.3.

FIGURE 8.3: JOURNEY TIME MAP – MELDRETH

	AM JT (s)				PM JT (s)			
Section	**Surveyed**	**Modelled**	**Diff.**	**% Diff.**	**Surveyed**	**Modelled**	**Diff.**	**% Diff.**
EB Section	47	46	0	-1%	55	46	-8	-15%
WB Section	44	44	0	-1%	40	43	4	9%

TABLE 8.9: JOURNEY TIMES – AM AND PM PEAK – MELDRETH

8.7.2 From the results above, it can be seen that the modelled journey times correlate well with the observed times and are within the 15% criteria required within the DfT's TAG Unit 3.1 guidance.

9 CONCLUSION

9.1.1 Modelling Group, in partnership with Tracsis Traffic Data Ltd have been appointed by Network Rail to analyse traffic and congestion implications of upgrading 7 level crossings to MCB-OD2 / MCB-CCTV type operation, with a view to understanding the impacts the upgrades will have on the local communities and the wider transport network.

9.1.2 This report has detailed the steps taken to develop base VISSIM models suitable for undertaking further testing at the following level crossing locations:

- Milton Fen, Fen Road, CB24 6AF. Ordinance Survey grid reference TL 484 623.
- Waterbeach, Clayhithe Road, CB25 9HS. Ordinance Survey grid reference TL 500 649
- Dimmocks Cote, Newmarket Road, CB6 3LJ. Ordinance Survey grid reference TL 526 730
- Croxton, A1075, IP24 2RQ. Ordinance Survey grid reference TL 902 867
- Six Mile Bottom, London Road, CB8 0UJ, Ordinance Survey grid reference TL 576 567
- Dullingham, Station Road, CB8 9UT. Ordinance Survey grid reference TL 618 585
- Meldreth, Meldreth Road, SG8 6XA. Ordinance Survey grid reference TL 388 477

9.1.3 In summary, the calibration and validation results for each crossing demonstrate a suitable fit between modelled and surveyed data.

9.1.4 As such, the base models are considered an appropriate starting point in which to undertake any further network testing.

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