TRACSIS RAIL CONSULTANCY REPORT – KENILWORTH FURTHER PERFORMANCE MODELLING ADDENDUM

VERSION 2.0

30 March 2017

Document Control	
File name	Tracsis Rail Consultancy Report - Kenilworth Further Performance Modelling Addendum v2.0 20170330
Version number	2.0
Version date	30/03/2017
Authors	Yen-Han Chou
Reviewed By	David MacQuarrie, Alastair Morrison

Issue History		
1.0	27/03/2017	Draft report
2.0	30/03/2017	Final report

Any questions or queries regarding the content of this report should be directed to:

Tracsis Plc: Operations and Planning Systems Division

33 Brunel Parkway

Pride Park

Derby

DE24 8HR

T 01332 226 860

E info@tracsis.com

i. Contents

1. Introduction

It is uncertain whether the infrastructure works at Kenilworth Loop will be completed in time for the planned commencement of the passenger service to the new station in Kenilworth.

As such, in order to understand the implications and to inform further decisions about the train service, should that become necessary, the following additional modelling work is required:

- Establish whether the proposed shuttle service can work in theory and highlight any issues or conflicts with other passenger and freight trains
- Re-run the Railsys performance model, changing the infrastructure to remove the Kenilworth loop modifications.

The objective of this study is to assess the likely performance impacts on the proposed May 2016 + Shuttle timetable if the infrastructure changes around Kenilworth Loop (i.e. improved signalling with shorter overlaps) are not commissioned in time for the commencement of operation of the new service.

Tracsis plc has been commissioned by SLC Rail to undertake this work using RailSys. This addendum follows on from the previous timetable and performance modelling work on Kenilworth that was undertaken by Tracsis plc.

2. Modelling Setup and Assumptions

2.1 RailSys Version

This round of modelling work has been undertaken using RailSys Version 10.3.215. This is different to the version (8.9.104) used in the previous round of work. The move to version 10 was undertaken due this being the latest version of the software and the only version now being used by Network Rail. This version also incorporates improved dispatching, which is particularly relevant to the modelling of the Kenilworth single line. All models presented in this report were re-run in version 10.

2.2 RailSys Models

The RailSys SX May 2016 Base and Option models (including the infrastructure, timetable, delay data and traction data) used in the previous round of work were taken and used for comparative purposes in this latest round of work.

A copy of the May2016 + Shuttle variant timetable model was taken, with the Option infrastructure modified so that the overlaps on signals at Kenilworth Loop were reverted to as they were in the base. Table 1 below summarises the models compared in this latest round of work.

Models	Infrastructure	Timetable
Base	Base infrastructure	May 2016
Option	Option infrastructure	May 2016 + Kenilworth shuttle
Option + Extended OL	Option infrastructure with the overlaps at Kenilworth Loop everted to as per base infrastructure	May 2016 + Kenilworth shuttle

Table 1 RailSys models

This study focuses on the comparison between the "Option" (May 2016 + Kenilworth shuttle on Option infrastructure) and the "Option + Extended OL" (May 2016 + Kenilworth shuttle on Option infrastructure that has reverted overlaps). The "Base" (May 2016 timetable with base infrastructure) is included for reference but without detailed explanations.

2.3 Option Infrastructure Amendments

Compared to the previous work undertaken only a few minor changes to the Option infrastructure were needed for this study, with no changes made to the timetable. The only changes required in the "Option + Extended OL" model were to revert the overlaps on the signals at Kenilworth Loop back to as they were in the base model:

- Signal LC6511 – overlap lengthened back to 350m (was 226m in Option) so that it extends across the overlap of LC6510
- Signal LC6513 – overlap lengthened back to 350m (was 226m in Option) so that it extends across the overlap of LC6510
- Signal LC6505 – overlap lengthened back to 400m (was 299m in Option) so that it extends across the overlap of LC6502/LC6504

All other option infrastructure was retained. This included the new Kenilworth station platforms, upgrade of the Up-Down crossover on the branch near Leamington Spa to 40mph and the ability to set routes into/out of Platform 4 at Leamington Spa to and from the branch line.

3. Static Conflict Identification

The first task required as part of this work was to establish whether the proposed shuttle service could work in theory and highlight any issues or static conflicts with other passenger and freight trains.

As shown in Table 2, only five "additional" static conflicts were recorded in RailSys when reverting the overlaps back to as per the base infrastructure (i.e. "Option + Extended OL" vs "Option").

Additional static conflict detected by RailSys			
Time	Conflict trains	Conflict location	Delay
06:40:12	2H66 COVNTRY-LMNGTNS	4M95 SOTOMCT-TRFDFLT	Kenilworth Loop	00:01:23
15:04:39	2C84 LMNGTNS-COVNTRY	6O42 HALWJAG-SOTDED	Kenilworth Loop	00:03:09
11:18:30	1M34 BOMO-MNCRPIC	4O49 CREWBHM-SOTOMCT	Kenilworth Loop	00:00:28
12:18:43	1M38 BOMO-MNCRPIC	4O21 TRFDEUT-SOTD107	Kenilworth Loop	00:00:22
17:18:30	1M58 BOMO-MNCRPIC	4O17 LWLYSFT-SOTOMCT	Kenilworth Loop	00:00:58

Table 2 Additional static conflicts due to the longer overlaps (Option + Extended OL vs Option)

Two of these additional conflicts were caused by London Midland shuttle services (2C84 and 2H66) conflicting freight, while the other three additional conflicts were between CrossCountry services (1M58, 1M34, 1M38) and crossing freight paths. Further details regarding these additional conflicts are shown below.

3.1 2H66 vs 4M95

London Midland 2H66 Coventry-Leamington Spa is scheduled to arrive Kenilworth Loop at 06:41:30, while 4M95 Southampton M.C.T-Trafford Park F.L.T. is scheduled to pass through Kenilworth Loop at 06:43:30. This conflict is mainly because in the base infrastructure the overlaps from signals LC6502 and LC6505 overlap each other. Therefore, the overlap will be triggered when the shuttle 2H66 is moving towards Kenilworth Loop. This is illustrated in Figure 1 below.
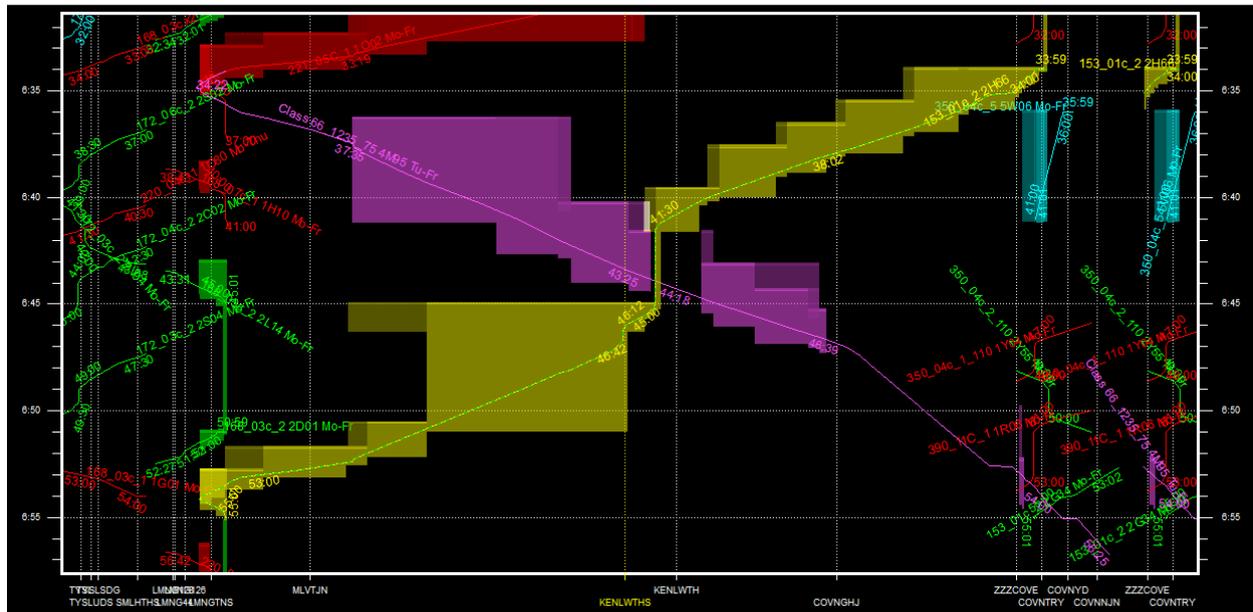
Figure 1 RailSys static conflicts between 2H66 and 4M95

3.2 2C84 vs 6O42

London Midland 2C84 Leamington Spa-Coventry is scheduled to depart from Kenilworth station at 15:08:00, while 6O42 Halewood (Jaguar Cars)-Southampton Eastern Docks is scheduled to arrive Kenilworth Loop at 15:07:30. As explained in the previous case, the overlap from signal LC6502 will be triggered as 6O42 is approaching.
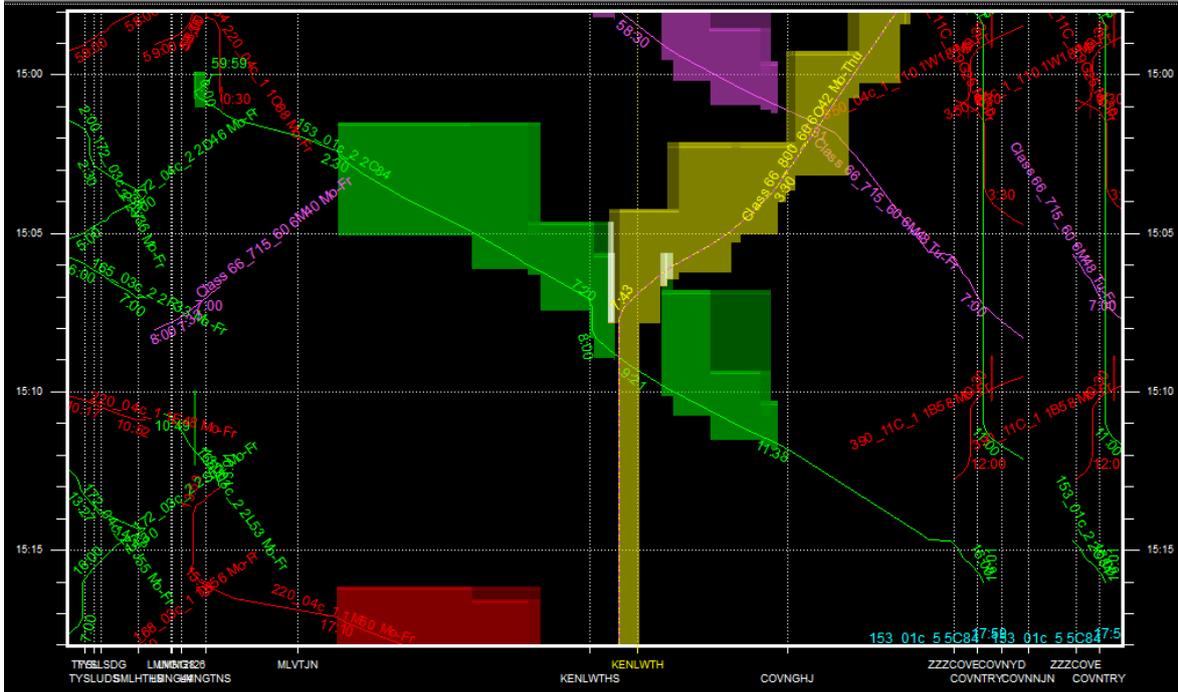
Figure 2 Static conflicts between 2C84 and 6O42

3.3 1M34 vs 4O49

CrossCountry 1M34 Bournemouth-Manchester Piccadilly is scheduled to pass through Kenilworth Loop at 11:20:30, while 4O49 Crewe Basford Hall S.S.M. – Southampton M.C.T. is scheduled to arrive Kenilworth Loop at 11:17:30. The overlap from signal LC6502 will be triggered as 4O49 is approaching.
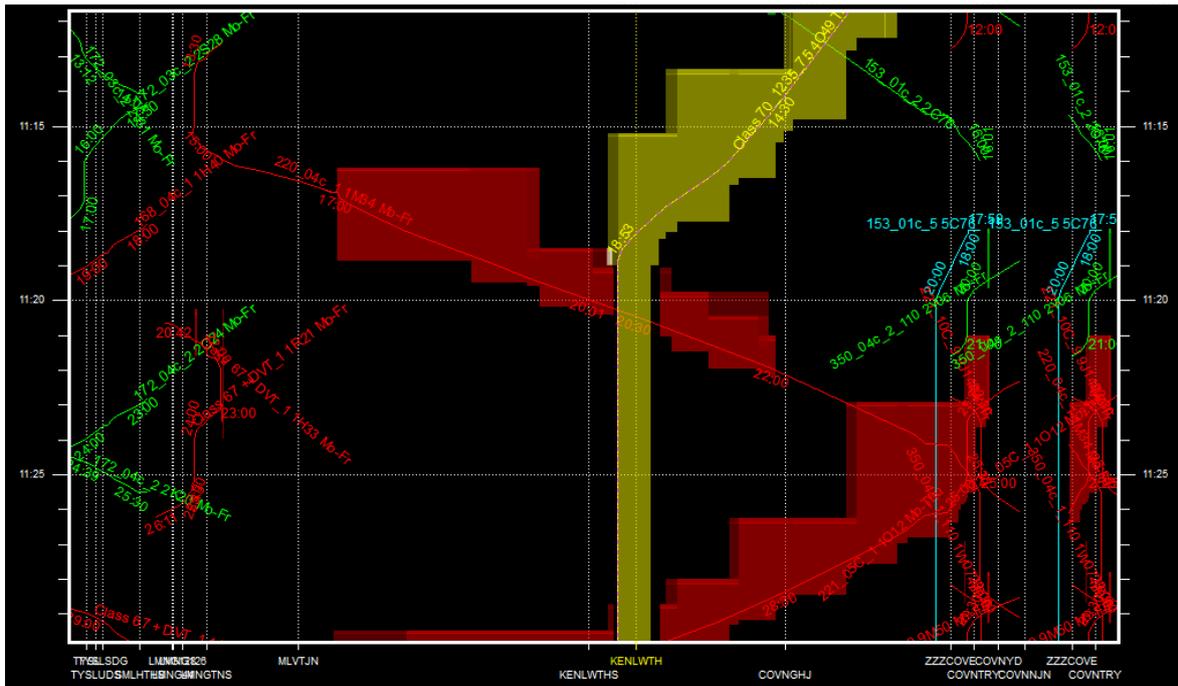
Figure 3 Static conflicts between 1M34 and 4O49

3.4 1M38 vs 4O21

CrossCountry 1M38 Bournemouth-Manchester Picc. is scheduled to pass through Kenilworth Loop at 12:20:30, while 4O21 Trafford Park Euro Term-Southampton W Docks Shed 107 is scheduled to arrive Kenilworth Loop at 12:19:00. The overlap from signal LC6502 will be triggered as 4O21 approaches.
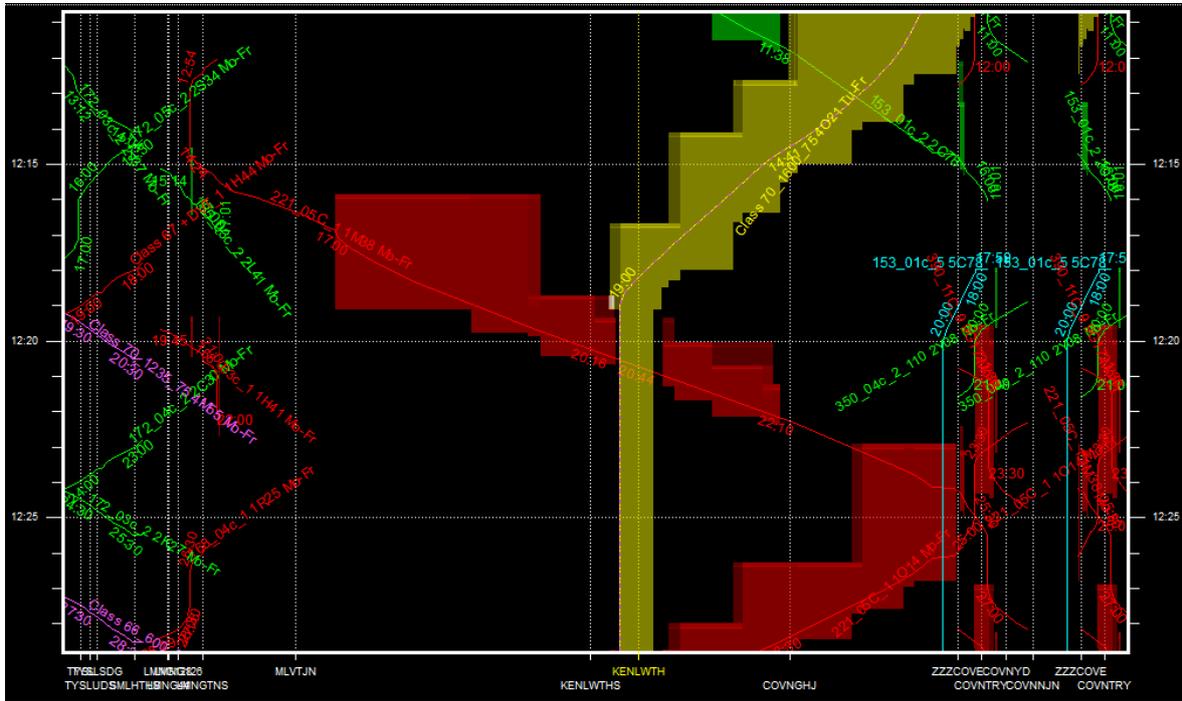
Figure 4 Static conflicts between 1M38 and 4O21

3.5 1M58 vs 4O17

CrossCountry 1M58 Bournemouth-Manchester Piccadilly is scheduled to pass through Kenilworth Loop at 17:20:30, while 4O17 Lawley Street F.L.T.-Southampton M.C.T. is scheduled to arrive Kenilworth Loop at 17:17:30. The overlap from signal LC6502 will be triggered as 4O21 is approaching.
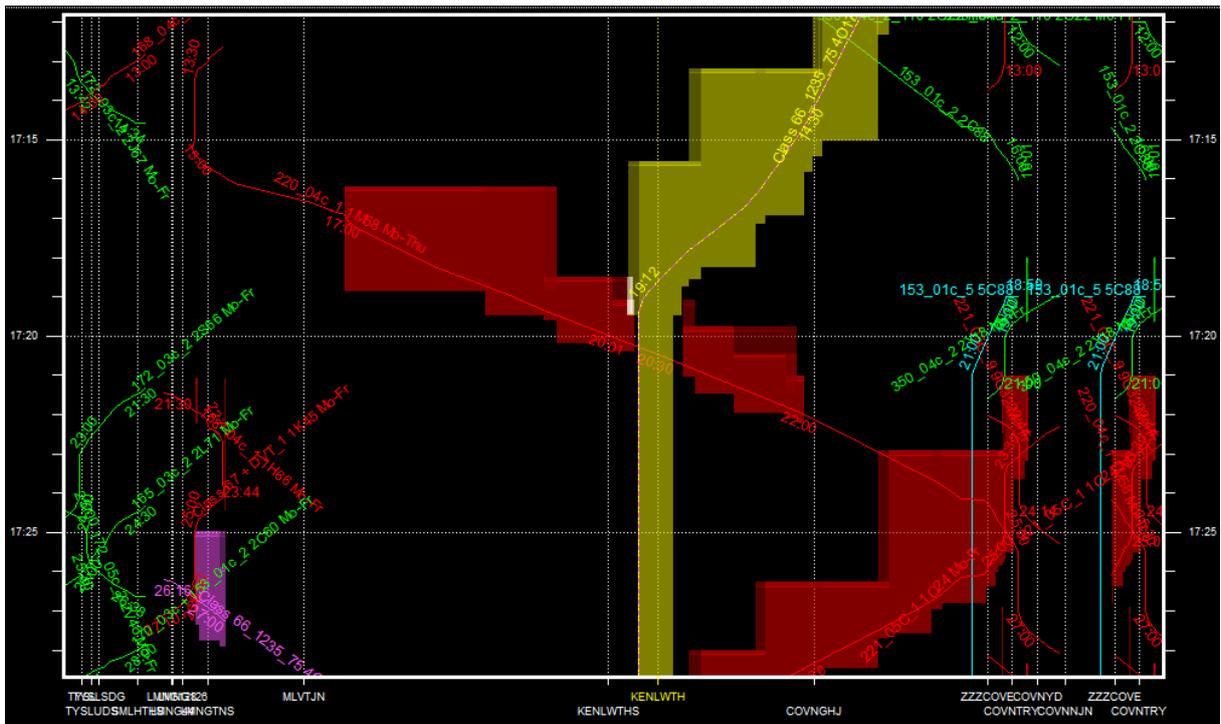
Figure 5 Static conflicts between 1M58 and 4O17

4. Nominal Simulation Results

4.1 Delay Minutes Overview by TOC

TOC	Class	May 2016 Total delay time (hh:mm:ss)	May 2016 Total train kilometres (Km)	May 2016 Delay sec. per Km	May 2016 No. of trains	May 2016 Shuttle Total delay time (hh:mm:ss)	May 2016 Shuttle Total train kilometres (Km)	May 2016 Shuttle Delay sec. per Km	May 2016 Shuttle No. of trains	May 2016 Shuttle+extended OL Total delay time (hh:mm:ss)	May 2016 Shuttle+extended OL Total train kilometres (Km)	May 2016 Shuttle+extended OL Delay sec. per Km	May 2016 Shuttle+extended OL No. of trains	May 2016 vs May 2016 Shuttle Total Delay increase (hh:mm:ss)	May 2016 vs May 2016 Shuttle Delay sec. per Km increased (%)	May 2016 vs May 2016 Shuttle Change in train kilometres (%)	May 2016 Shuttle vs May 2016 Shuttle+Extended OL Total Delay increase (hh:mm:ss)	May 2016 Shuttle vs May 2016 Shuttle+Extended OL Delay sec. per Km increased (%)	May 2016 Shuttle vs May 2016 Shuttle+Extended OL Change in train kilometres (%)
Arriva Trains Wales	1	00:01:45	391	0.27	30	00:01:45	391	0.27	30	00:01:45	391	0.27	30	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
Chiltern Railways	1	00:09:23	5,586	0.10	94	00:12:17	5,586	0.13	94	00:12:17	5,586	0.13	94	+00:02:54	30.91	0.00	+00:00:00	0.00	0.00
Chiltern Railways	2	00:01:43	1,087	0.09	32	00:01:43	1,087	0.09	32	00:01:43	1,087	0.09	32	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
Chiltern Railways	5	00:00:33	199	0.17	25	00:00:51	199	0.26	25	00:00:51	199	0.26	25	+00:00:18	54.55	0.00	+00:00:00	0.00	0.00
Great Western	1	00:00:00	37	0.00	4	00:00:00	37	0.00	4	00:00:00	37	0.00	4	+00:00:00	-	0.00	+00:00:00	-	0.00
Great Western	2	00:01:18	184	0.42	20	00:01:18	184	0.42	20	00:01:18	184	0.42	20	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
Great Western	5	00:00:00	10	0.00	7	00:00:00	10	0.00	7	00:00:00	10	0.00	7	+00:00:00	-	0.00	+00:00:00	-	0.00
London Midland	1	00:08:34	2,828	0.18	57	00:08:19	2,828	0.18	57	00:08:19	2,828	0.18	57	-00:00:15	-2.92	0.00	-00:00:00	0.00	0.00
London Midland	2	00:15:21	7,019	0.13	291	00:21:49	7,555	0.17	325	00:24:20	7,555	0.19	325	+00:06:28	32.05	7.64	+00:02:31	11.54	0.00
London Midland	5	00:02:38	487	0.32	27	00:02:38	504	0.31	43	00:02:38	504	0.31	43	+00:00:00	-3.32	3.43	+00:00:00	0.00	0.00
Virgin Trains	1	00:19:11	1,833	0.63	36	00:19:24	1,833	0.64	36	00:19:24	1,833	0.64	36	+00:00:13	1.13	0.00	+00:00:00	0.00	0.00
Virgin Trains	5	00:00:01	103	0.01	3	00:00:01	103	0.01	3	00:00:01	103	0.01	3	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
Virgin Trains	9	00:06:03	3,105	0.12	61	00:05:55	3,105	0.11	61	00:05:55	3,105	0.11	61	-00:00:08	-2.20	0.00	+00:00:00	0.00	0.00
CrossCountry Trains	1	00:14:12	5,170	0.16	64	00:14:45	5,170	0.17	64	00:16:00	5,170	0.19	64	+00:00:33	3.87	0.00	+00:01:15	8.47	0.00
CrossCountry Trains	5	00:05:29	128	2.57	3	00:05:29	128	2.57	3	00:05:29	128	2.57	3	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
Long term Freight	4	00:08:29	2,656	0.19	37	00:10:13	2,656	0.23	37	00:10:13	2,656	0.23	37	+00:01:44	20.43	0.00	-00:00:00	0.00	0.00
Long term Freight	6	00:04:35	1,428	0.19	22	00:05:51	1,428	0.25	22	00:05:51	1,428	0.25	22	+00:01:16	27.64	0.00	-00:00:00	0.00	0.00
Long term Freight	7	00:02:07	75	1.70	1	00:02:07	75	1.70	1	00:02:07	75	1.70	1	+00:00:00	0.00	0.00	+00:00:00	0.00	0.00
TOTAL		**01:41:22**	**32,328**	**0.19**	**814**	**01:54:25**	**32,881**	**0.21**	**864**	**01:58:11**	**32,881**	**0.22**	**864**	**+00:13:03**	**10.98**	**1.71**	**+00:03:46**	**3.29**	**0.00**

Table 3 Nominal Simulation Delay by TOC

Nominal simulation shows the likely effect of a given timetable without any additional input delay. It can demonstrate the reactionary delay due to timetable conflicts. As can be seen in Table 3, an additional delay of 3 minutes 46 seconds was recorded in the nominal simulation in the May 2016 Shuttle + Extended OL model compared to the May 2016 Shuttle model. This is attributable to the Class 2 London Midland shuttle services and Class 1 CrossCountry services that run through the line section between Coventry and Leamington Spa.

4.2 Delay Minutes Overview by Line Sections

Line Code	Line Section	May 2016	May 2016 Shuttle	May 2016 Shuttle+ extended OL	May 2016 Shuttle vs May 2016	May 2016 Shuttle vs May 2016 Shuttle+ extended OL
MD401	Tyseley to Hatton	00:05:19	00:06:02	00:06:02	+00:00:43	-00:00:00
	Hatton to Leamington Spa	00:02:38	00:05:13	00:05:13	+00:02:35	+00:00:00
	Leamington Spa to Aynho Jn	00:12:34	00:13:44	00:13:44	+00:01:10	+00:00:00
	Aynho Jn to Leamington Spa	00:04:25	00:04:56	00:04:56	+00:00:31	+00:00:00
	Leamington Spa to Hatton	00:01:46	00:01:52	00:01:52	+00:00:06	+00:00:00
	Hatton to Tyseley	00:09:03	00:08:53	00:08:53	-00:00:10	+00:00:00
MD425	Tyseley to Shirley	00:00:01	00:00:01	00:00:01	+00:00:00	+00:00:00
	Shirley to Tyseley	00:00:11	00:00:11	00:00:11	+00:00:00	-00:00:00
MD415	Hatton to Bearley Jn	00:00:06	00:00:06	00:00:06	+00:00:00	+00:00:00
	Bearley Jn to Hatton	00:00:02	00:00:02	00:00:02	+00:00:00	+00:00:00
MD420	Hatton North Junction to Hatton West Junction	00:00:00	00:00:00	00:00:00	+00:00:00	+00:00:00
	Hatton West Junction to Hatton North Junction	00:00:00	00:00:00	00:00:00	+00:00:00	+00:00:00
MD301	Proof House Jn to Stetchford	00:01:49	00:01:49	00:01:49	+00:00:00	-00:00:00
	Stetchford to Coventry	00:33:03	00:33:09	00:33:09	+00:00:06	+00:00:00
	Coventry to Hillmorton Jn	00:00:24	00:01:19	00:01:19	+00:00:55	-00:00:00
	Hillmorton Jn to Coventry	00:11:28	00:11:24	00:11:24	-00:00:04	+00:00:00
	Coventry to Stetchford	00:10:32	00:10:41	00:10:38	+00:00:09	-00:00:03
	Stetchford to Proof House Jn	00:00:07	00:00:07	00:00:07	+00:00:00	-00:00:00
MD410	Coventry to Nuneaton	00:00:04	00:00:06	00:00:06	+00:00:02	-00:00:00
	Nuneaton to Coventry	00:01:57	00:02:02	00:02:02	+00:00:05	+00:00:00
MD405	Coventry to Gibbet Hill Jn	00:00:01	00:00:01	00:00:01	+00:00:00	+00:00:00
	Gibbet Hill Jn to Kenilworth	00:00:00	00:00:17	00:00:17	+00:00:17	-00:00:00
	Kenilworth to Milverton Jn	00:00:02	00:02:39	00:02:39	+00:02:37	+00:00:00
	Milverton Jn to Leamington Spa	00:00:06	00:02:22	00:02:22	+00:02:16	+00:00:00
	Leamington Spa to Milverton Jn	00:00:01	00:01:02	00:01:02	+00:01:01	-00:00:00
	Milverton Jn to Kenilworth	00:00:30	00:00:01	00:03:50	-00:00:29	+00:03:49
	Kenilworth to Gibbet Hill Jn	00:00:00	00:00:04	00:00:04	+00:00:04	-00:00:00
	Gibbet Hill Jn to Coventry	00:00:34	00:01:49	00:01:49	+00:01:15	+00:00:00
	Other (mainline)	00:03:05	00:02:59	00:02:59	-00:00:06	+00:00:00
	Other (sidings)	00:01:34	00:01:34	00:01:34	+00:00:00	-00:00:00
Grand Total		**01:41:22**	**01:54:25**	**01:58:11**	**+00:13:03**	**+00:03:46**

Table 4 Nominal Simulation Delay by Line Section

As expected, Table 4 shows that the additional delay minutes in the May 2016 Shuttle + Extended OL model, compared to the May 2016 Shuttle model, were mainly recorded on the line section between Coventry and Leamington Spa. In particular, it was incurred between Milverton Jn – Kenilworth.

4.2.1 Milverton Jn-Kenilworth

As shown in Figure 6, a delay of 2 minute 31 seconds was recorded in the nominal simulation for London Midland 2C84 Leamington Spa-Coventry. As explained previously this is mainly because the

overlap from signal LC6502 has been triggered as 6O42 is approaching Kenilworth Loop. Therefore, 2C84 will be delayed by stopping at LC6503 due to the RED aspect, as shown in Figure 7.
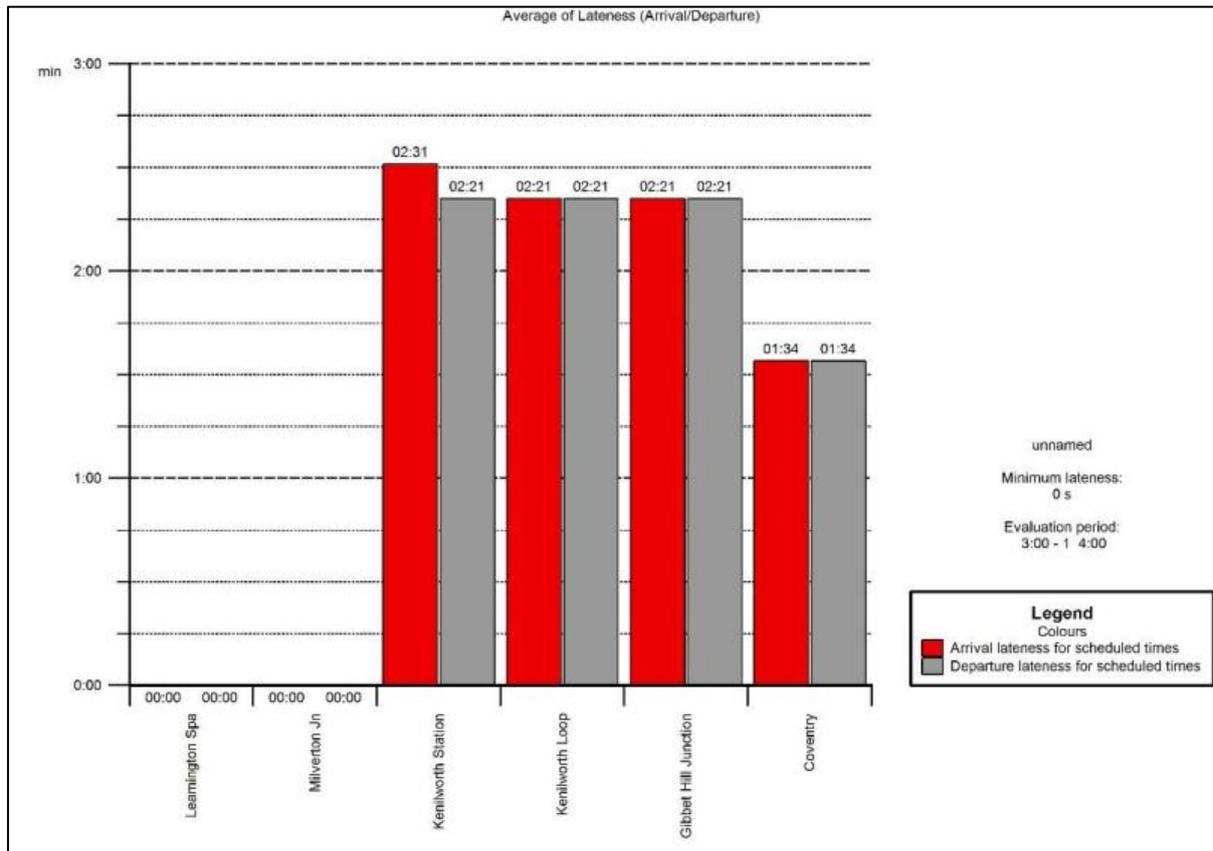
Figure 6 Nominal Simulation Delay minutes incurred by London Midland 2C84 approaching Kenilworth
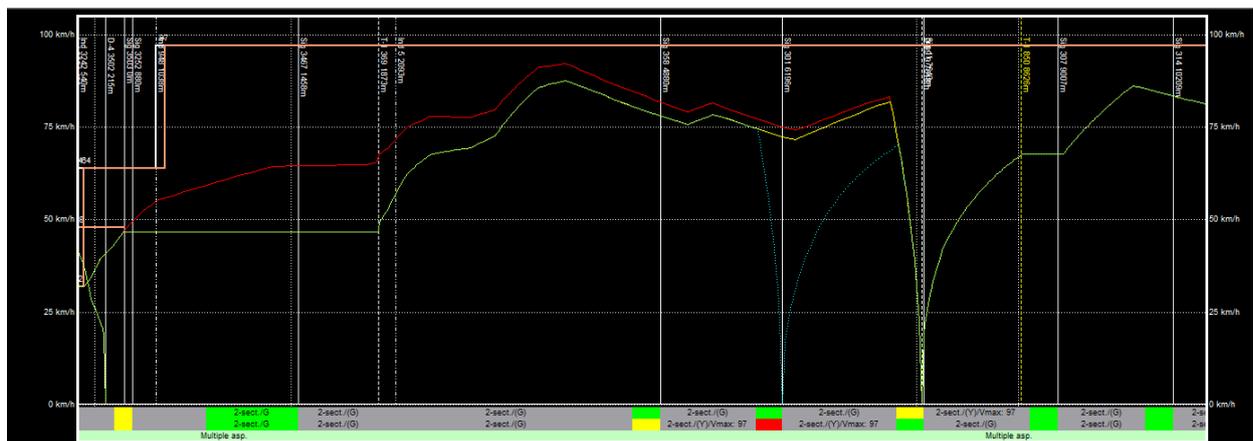
Figure 7 Actual speed graph from nominal simulation shows 2C84 was stopped by a RED aspect

Similar effects can be seen in Figures 8, 9 and 10 where additional delay minutes were recorded for CrossCountry 1M34, 1M58 and 1M38 respectively. RailSys nominal simulation shows that 1M34, 1M58 and 1M38 will slow down prior to Kenilworth station due to the YELLOW aspect, thus causing delay.
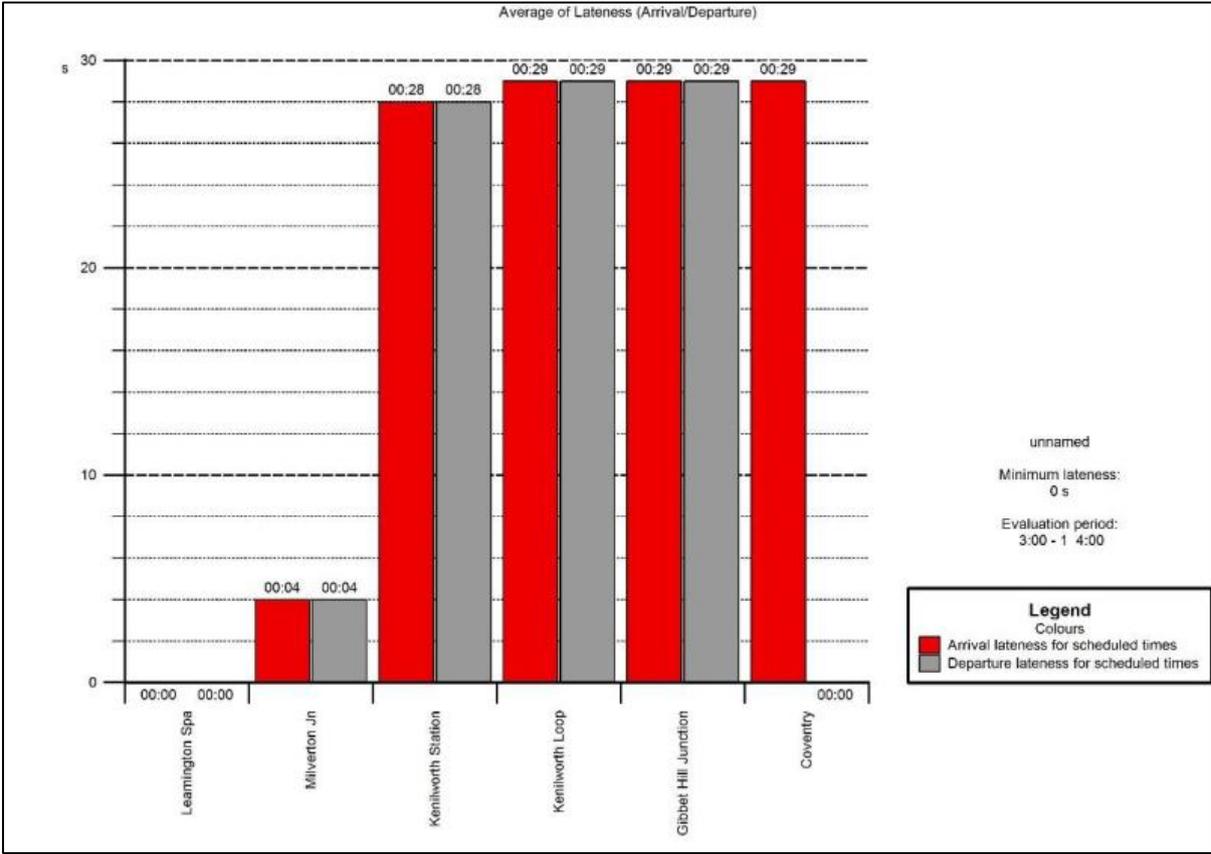
Figure 8 Nominal Simulation Delay minutes incurred by CrossCountry 1M34 approaching Kenilworth
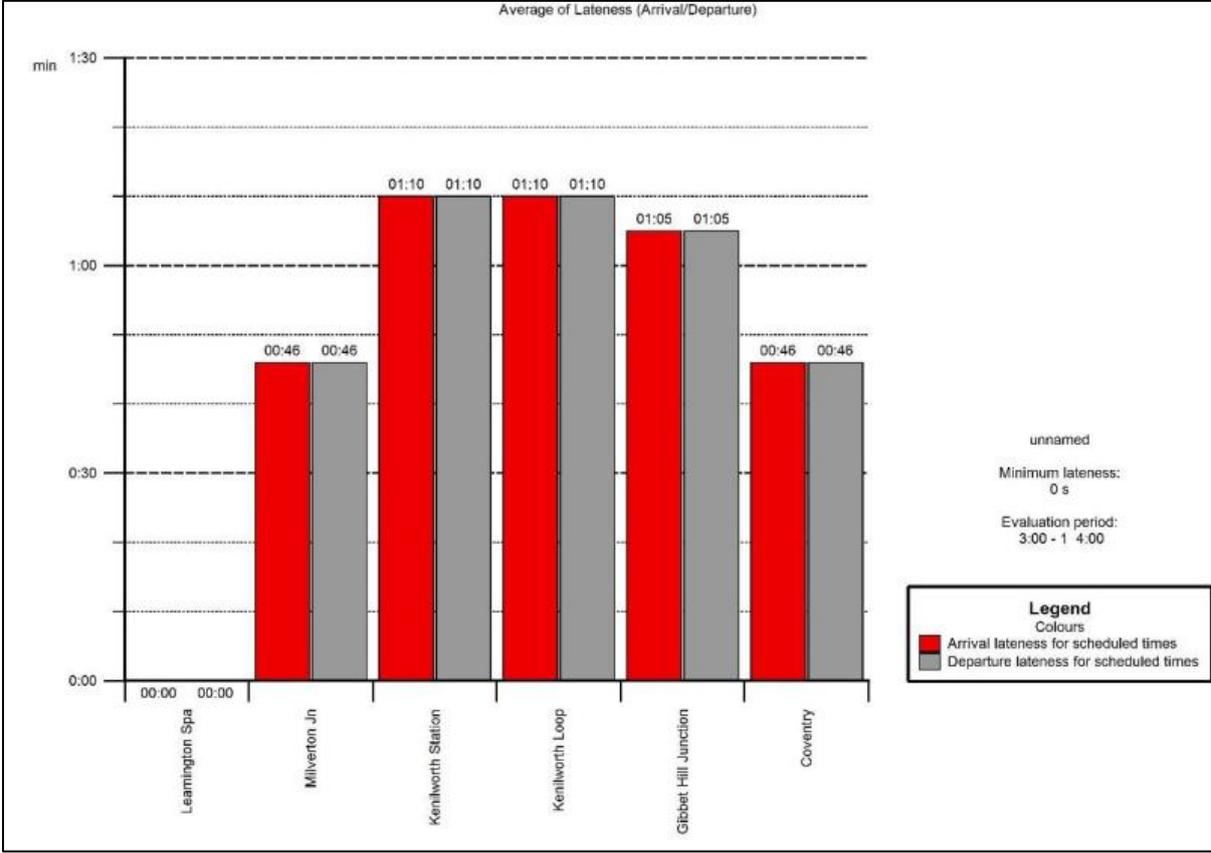
Figure 9 Nominal Simulation Delay minutes incurred by CrossCountry 1M58 approaching Kenilworth
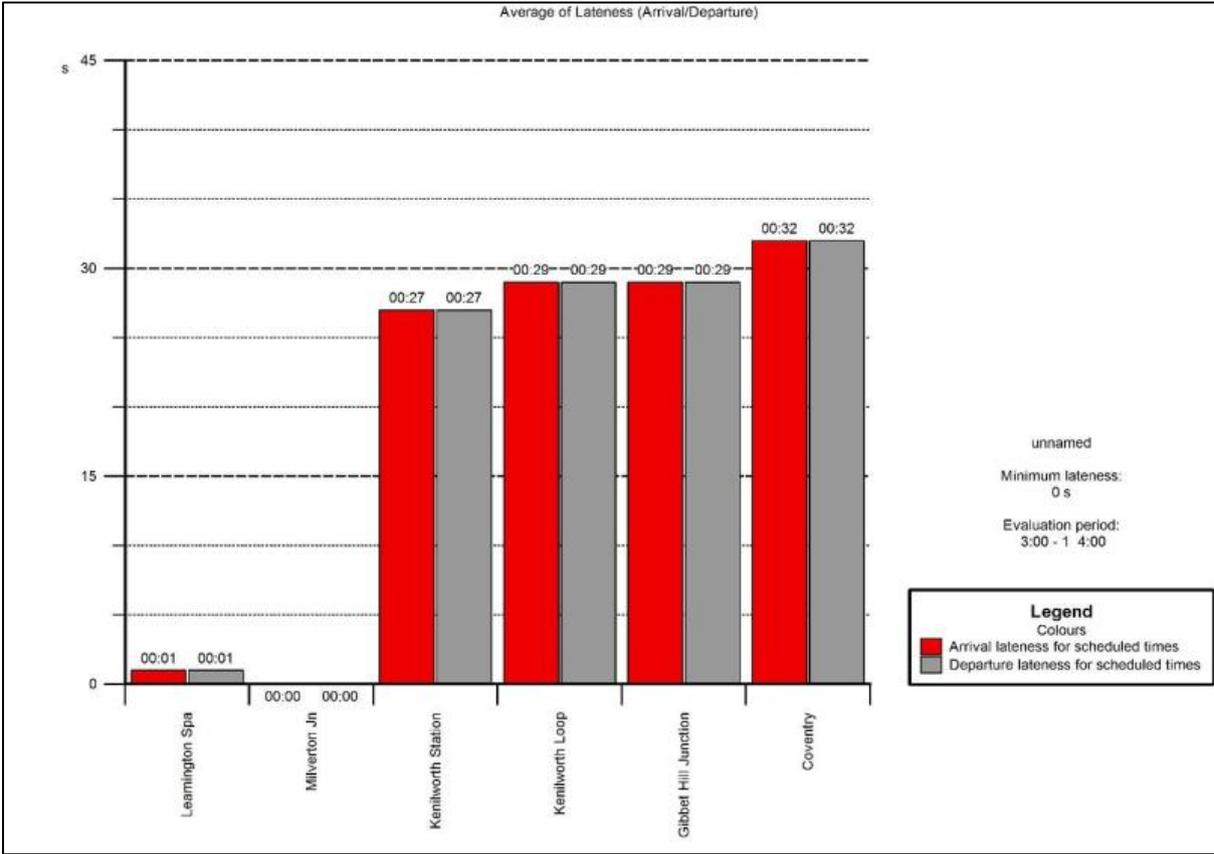
Figure 10 Nominal Simulation Delay minutes incurred by CrossCountry 1M38 approaching Kenilworth

5. Perturbed Simulation Results

5.1 Delay Minutes Overview by TOC

TOC	Class	May 2016				May 2016 Shuttle				May 2016 Shuttle+extended OL				May 2016 vs May 2016 Shuttle			May 2016 Shuttle vs May 2016 Shuttle+extended OL		
		Total delay time (hh:mm:ss)	Total train kilometres (Km)	Delay sec. per Km	No. of trains	Total delay time (hh:mm:ss)	Total train kilometres (Km)	Delay sec. per Km	No. of trains	Total delay time (hh:mm:ss)	Total train kilometres (Km)	Delay sec. per Km	No. of trains	Total Delay increase (hh:mm:ss)	Delay sec. per Km increased (%)	Change in train kilometres (%)	Total Delay increase (hh:mm:ss)	Delay sec. per Km increased (%)	Change in train kilometres (%)
Arriva Trains Wales	1	00:44:40	391	6.85	30	00:43:49	391	6.72	30	00:43:52	391	6.73	30	-00:00:51	-1.90	0.00	+00:00:03	0.11	0.00
Chiltern Railways	1	03:02:53	5,586	1.96	94	03:10:10	5,586	2.04	94	03:10:22	5,586	2.04	94	+00:07:17	3.98	0.00	+00:00:12	0.11	0.00
Chiltern Railways	2	00:42:04	1,087	2.32	32	00:44:20	1,087	2.45	32	00:44:20	1,087	2.45	32	+00:02:16	5.39	0.00	-00:00:00	0.00	0.00
Chiltern Railways	5	00:15:22	199	4.63	25	00:15:51	199	4.78	25	00:15:53	199	4.79	25	+00:00:29	3.15	0.00	+00:00:02	0.21	0.00
Great Western	1	00:01:52	37	3.04	4	00:01:54	37	3.10	4	00:01:54	37	3.10	4	+00:00:02	1.79	0.00	+00:00:00	0.00	0.00
Great Western	2	00:11:46	184	3.83	20	00:12:13	184	3.98	20	00:12:12	184	3.97	20	+00:00:27	3.82	0.00	-00:00:01	-0.14	0.00
Great Western	5	00:03:31	10	21.61	7	00:04:10	10	25.60	7	00:04:11	10	25.70	7	+00:00:39	18.48	0.00	+00:00:01	0.40	0.00
London Midland	1	02:50:57	2,828	3.63	57	02:47:10	2,828	3.55	57	02:46:57	2,828	3.54	57	-00:03:47	-2.21	0.00	-00:00:13	-0.13	0.00
London Midland	2	05:11:13	7,019	2.66	291	05:43:29	7,555	2.73	325	05:45:29	7,555	2.74	325	+00:32:16	2.54	7.64	+00:02:00	0.58	0.00
London Midland	5	00:30:57	487	3.81	27	00:49:39	504	5.91	43	00:49:50	504	5.93	43	+00:18:42	55.09	3.43	+00:00:11	0.37	0.00
Virgin Trains	1	01:41:36	1,833	3.33	36	01:42:27	1,833	3.35	36	01:42:24	1,833	3.35	36	+00:00:51	0.84	0.00	-00:00:03	-0.05	0.00
Virgin Trains	5	00:02:05	103	1.21	3	00:01:57	103	1.14	3	00:01:57	103	1.14	3	-00:00:08	-6.40	0.00	+00:00:00	0.00	0.00
Virgin Trains	9	02:42:05	3,105	3.13	61	02:37:29	3,105	3.04	61	02:37:27	3,105	3.04	61	-00:04:36	-2.84	0.00	-00:00:02	-0.02	0.00
CrossCountry Trains	1	04:40:52	5,170	3.26	64	04:48:41	5,170	3.35	64	04:50:14	5,170	3.37	64	+00:07:49	2.78	0.00	+00:01:33	0.54	0.00
CrossCountry Trains	5	00:08:31	128	3.99	3	00:08:32	128	4.00	3	00:08:28	128	3.97	3	+00:00:01	0.20	0.00	-00:00:04	-0.78	0.00
Long term Freight	4	02:22:08	2,656	3.21	37	02:34:58	2,656	3.50	37	02:35:47	2,656	3.52	37	+00:12:50	9.03	0.00	+00:00:49	0.53	0.00
Long term Freight	6	00:47:51	1,428	2.01	22	00:56:17	1,428	2.36	22	00:56:36	1,428	2.38	22	+00:08:26	17.62	0.00	+00:00:19	0.56	0.00
Long term Freight	7	00:03:40	75	2.94	1	00:03:46	75	3.02	1	00:03:47	75	3.03	1	+00:00:06	2.73	0.00	+00:00:01	0.44	0.00
TOTAL		**26:04:03**	**32,328**	**2.90**	**814**	**27:26:52**	**32,881**	**3.01**	**864**	**27:31:40**	**32,881**	**3.01**	**864**	**+01:22:49**	**3.53**	**1.71**	**+00:04:48**	**0.29**	**0.00**

Table 5 Perturbed Simulation Delay by TOC

Perturbed simulation shows the likely performance impacts of a given timetable with additional input delay based on the historical data. As can be seen in Table 5, an additional delay of 4 minutes 48 seconds was recorded in the perturbed simulation for the Option + extended OL model compared with the Option model. The additional delay is mainly due to the interactions between the London Midland shuttle, freight trains and CrossCountry services that run through the line section between Coventry and Leamington Spa.

5.2 Delay Minutes Overview by Line Sections

Line Code	Line Section	May 2016	May 2016 Shuttle	May 2016 Shuttle+ extended OL	May 2016 Shuttle vs May 2016	May 2016 Shuttle vs May 2016 Shuttle+ extended OL
MD401	Tyseley to Hatton	01:17:47	01:18:49	01:18:49	+00:01:02	+00:00:00
	Hatton to Leamington Spa	00:42:30	00:51:03	00:51:32	+00:08:33	+00:00:29
	Leamington Spa to Aynho Jn	02:18:10	02:21:18	02:21:21	+00:03:08	+00:00:03
	Aynho Jn to Leamington Spa	03:30:02	03:35:10	03:35:08	+00:05:08	-00:00:02
	Leamington Spa to Hatton	00:36:56	00:37:37	00:37:43	+00:00:41	+00:00:06
	Hatton to Tyseley	01:32:40	01:36:24	01:36:27	+00:03:44	+00:00:03
MD425	Tyseley to Shirley	00:04:11	00:04:12	00:04:12	+00:00:01	-00:00:00
	Shirley to Tyseley	00:01:23	00:01:35	00:01:35	+00:00:12	+00:00:00
MD415	Hatton to Bearley Jn	00:01:21	00:01:35	00:01:35	+00:00:14	+00:00:00
	Bearley Jn to Hatton	00:00:03	00:00:03	00:00:03	+00:00:00	-00:00:00
MD420	Hatton North Junction to Hatton West Junction	00:00:07	00:00:11	00:00:11	+00:00:04	+00:00:00
	Hatton West Junction to Hatton North Junction	00:00:04	00:00:05	00:00:05	+00:00:01	-00:00:00
MD301	Proof House Jn to Stetchford	00:23:02	00:23:02	00:23:02	+00:00:00	-00:00:00
	Stetchford to Coventry	04:32:33	04:35:01	04:34:55	+00:02:28	-00:00:06
	Coventry to Hillmorton Jn	01:12:00	01:08:42	01:08:37	-00:03:18	-00:00:05
	Hillmorton Jn to Coventry	01:22:29	01:17:32	01:17:35	-00:04:57	+00:00:03
	Coventry to Stetchford	05:45:10	05:33:11	05:32:55	-00:11:59	-00:00:16
	Stetchford to Proof House Jn	00:11:52	00:11:57	00:11:56	+00:00:05	-00:00:01
MD410	Coventry to Nuneaton	00:13:40	00:08:24	00:08:29	-00:05:16	+00:00:05
	Nuneaton to Coventry	00:24:17	00:25:49	00:25:43	+00:01:32	-00:00:06
MD405	Coventry to Gibbet Hill Jn	00:05:30	00:13:42	00:13:44	+00:08:12	+00:00:02
	Gibbet Hill Jn to Kenilworth	00:08:24	00:13:44	00:15:10	+00:05:20	+00:01:26
	Kenilworth to Milverton Jn	00:08:01	00:28:08	00:28:21	+00:20:07	+00:00:13
	Milverton Jn to Leamington Spa	00:03:19	00:06:52	00:06:53	+00:03:33	+00:00:01
	Leamington Spa to Milverton Jn	00:09:24	00:17:53	00:17:56	+00:08:29	+00:00:03
	Milverton Jn to Kenilworth	00:10:37	00:13:35	00:16:20	+00:02:58	+00:02:45
	Kenilworth to Gibbet Hill Jn	00:02:33	00:04:35	00:04:53	+00:02:02	+00:00:18
	Gibbet Hill Jn to Coventry	00:07:07	00:18:45	00:18:21	+00:11:38	-00:00:24
	Other (mainline)	00:51:25	00:51:45	00:51:46	+00:00:20	+00:00:01
	Other (sidings)	00:07:26	00:26:13	00:26:23	+00:18:47	+00:00:10
Grand Total		**26:04:03**	**27:26:52**	**27:31:40**	**+01:22:49**	**+00:04:48**

Table 6 Perturbed Simulation Delay by Line Section

Table 6 shows that the additional delay minutes in the May 2016 Shuttle + Extended OL model, compared to the May 2016 Shuttle model, were mainly recorded in the two sections approaching Kenilworth from each direction – Milverton Jn-Kenilworth Loop *and* Gibbet Hill Jn-Kenilworth.

Unlike the nominal simulation, in the perturbed simulation the southbound train may be the one to incur delay (in the section Gibbet Hill Jn – Kenilworth Loop) if it is the northbound train that actually approaches the loop and thus triggers the intersecting overlaps first on a particular simulation day.

5.3 Time-to (Punctuality)

The table below shows the average time-to figures for time-to 1, 3, 5 and 10 minutes spilt by operator. This shows the percentage of trains arriving at destination or model boundary under the threshold. For example time-to 1 includes all trains up to and including 59 seconds, this is similar to TRUST which truncates lateness data to 1 minute accuracy. It should be noted that the values only relate to trains that run within the model area and do not represent the change in punctuality for all services operated by a TOC. The total performance is presented as a weighted figure, taking into account the number of trains in each group. These figures also cannot be equated to PPM.

Data	TOC Full Name	May 2016	May 2016 Shuttle	May 2016 Shuttle+ extended OL	May 2016 Shuttle vs May 2016	May 2016 Shuttle vs May 2016 Shuttle+ extended OL
Overall T-1	Cross Country	50.1%	49.2%	49.0%	-0.9%	-0.3%
	First Great Western	56.0%	55.5%	55.5%	-0.5%	0.0%
	London Midland	76.9%	76.7%	76.6%	-0.2%	-0.2%
	Chiltern Railways	73.8%	73.5%	73.4%	-0.3%	0.0%
	Arriva Trains Wales	62.8%	63.3%	63.2%	0.5%	-0.1%
	Virgin Trains	50.0%	50.1%	50.1%	0.1%	0.0%
Overall T-3	Cross Country	62.8%	62.2%	62.1%	-0.6%	-0.2%
	First Great Western	74.0%	73.7%	73.7%	-0.3%	0.0%
	London Midland	85.2%	85.3%	85.2%	0.1%	0.0%
	Chiltern Railways	84.7%	84.4%	84.4%	-0.3%	0.0%
	Arriva Trains Wales	73.3%	73.8%	73.8%	0.5%	0.0%
	Virgin Trains	66.2%	66.3%	66.3%	0.1%	0.0%
Overall T-5	Cross Country	71.5%	71.0%	70.9%	-0.5%	-0.1%
	First Great Western	82.7%	82.5%	82.5%	-0.2%	0.0%
	London Midland	90.6%	90.7%	90.7%	0.2%	0.0%
	Chiltern Railways	90.2%	89.9%	89.9%	-0.3%	0.0%
	Arriva Trains Wales	78.4%	78.7%	78.6%	0.3%	-0.1%
	Virgin Trains	76.5%	76.6%	76.6%	0.1%	0.0%
Overall T-10	Cross Country	80.7%	80.8%	80.8%	0.1%	0.0%
	First Great Western	93.1%	92.9%	92.9%	-0.1%	0.0%
	London Midland	96.2%	96.3%	96.3%	0.1%	0.0%
	Chiltern Railways	95.7%	95.5%	95.5%	-0.2%	0.0%
	Arriva Trains Wales	93.4%	93.4%	93.4%	0.0%	0.0%
	Virgin Trains	89.2%	89.4%	89.5%	0.3%	0.0%
Total Overall T-1		68.7%	68.9%	68.8%	0.2%	-0.1%
Total Overall T-3		79.4%	79.7%	79.6%	0.2%	0.0%
Total Overall T-5		85.9%	86.2%	86.1%	0.2%	0.0%
Total Overall T-10		93.5%	93.6%	93.6%	0.2%	0.0%

Table 7 Punctuality by TOC

By reverting the overlaps on signals at Kenilworth Loop back to as they were in the base infrastructure, a 0.1% drop in total overall punctuality at Time-to 1 was recorded when compared to the Option model. Meanwhile overall Time-to 3, 5 and 10 showed no change.

5.4 Average Minute Lateness (AML)

In the following graphs the line graph represents the average lateness on route whilst the bar chart represents the average delay incurred between TIPLOCS on arrival at the second TIPLOC. The charts refer to passenger services only unless otherwise stated.

As alluded to previously, the focus of this addendum is on the comparison between May 2016 + Kenilworth shuttle on Option infrastructure and May 2016 + Kenilworth shuttle on Option infrastructure but with extended overlaps. Figures 11 to 24 demonstrate the AML graphs on each route within the model area.

With the exception of slightly higher lateness being recorded on the line section between Coventry and Leamington Spa, the AML graphs for the remainder of the line sections remain unchanged. Slightly higher lateness on the Coventry and Leamington Spa line is mainly due to the interactions between CrossCountry trains, shuttle services and freight trains with the extended overlaps.

5.4.1 Shuttle services
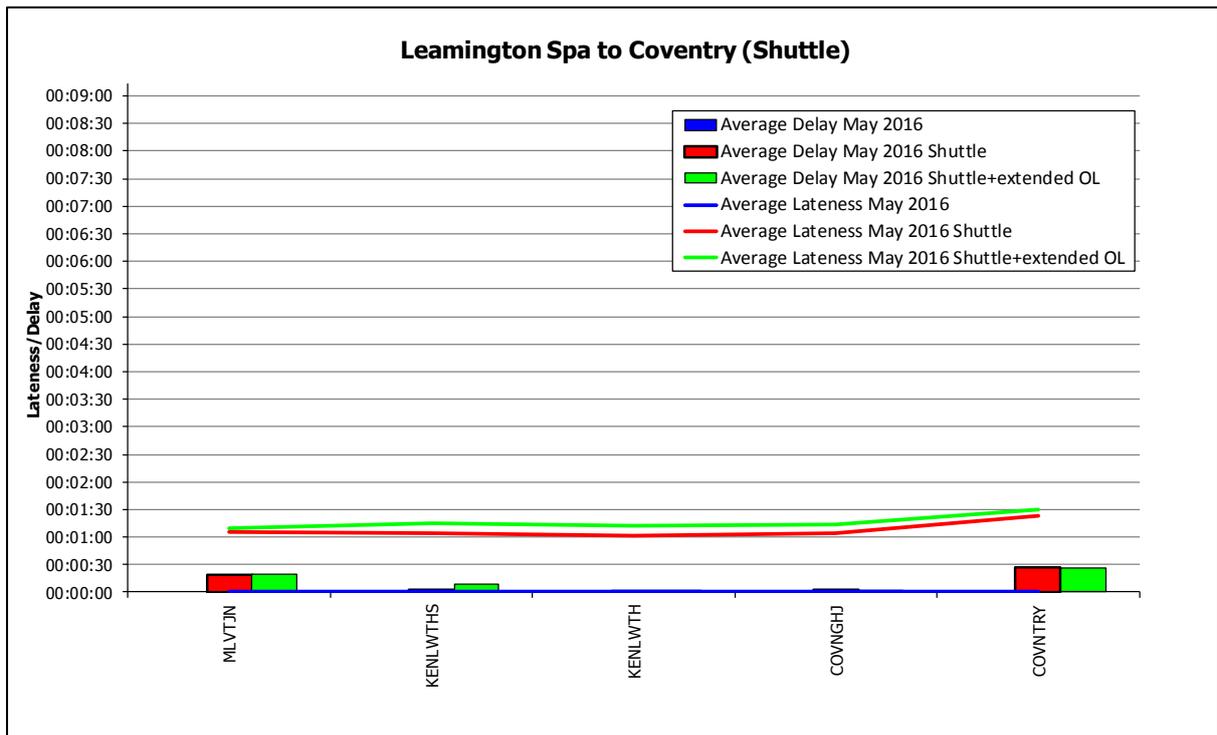
Figure 11 AML graph for Down shuttle services
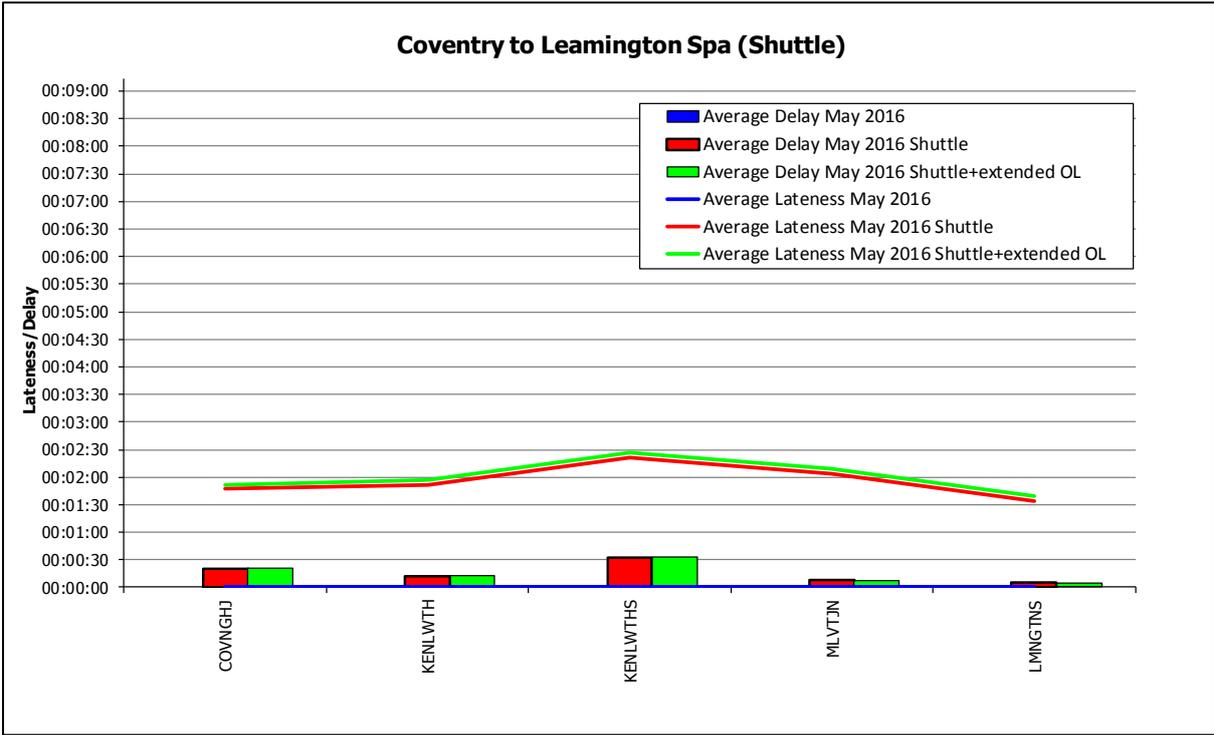
Figure 12 AML graph for Up shuttle services

5.4.2 CrossCountry services via Kenilworth
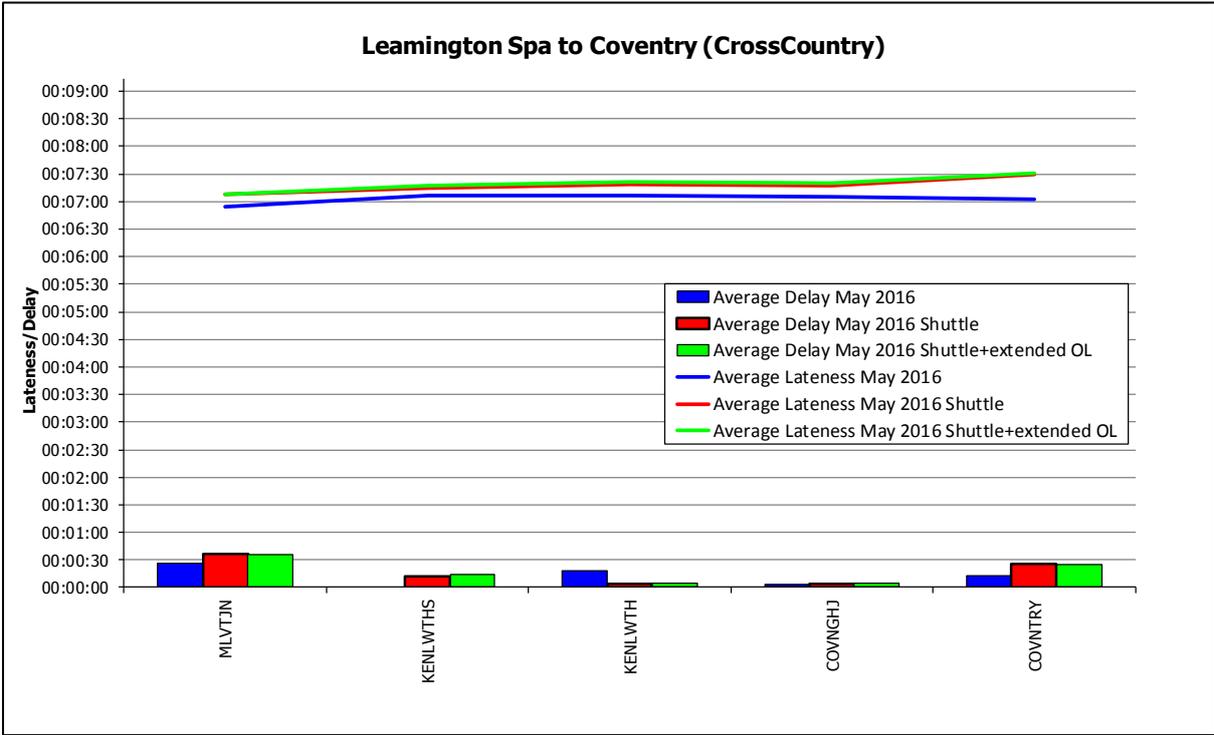
Figure 13 AML graph for Down CrossCountry services via Kenilworth
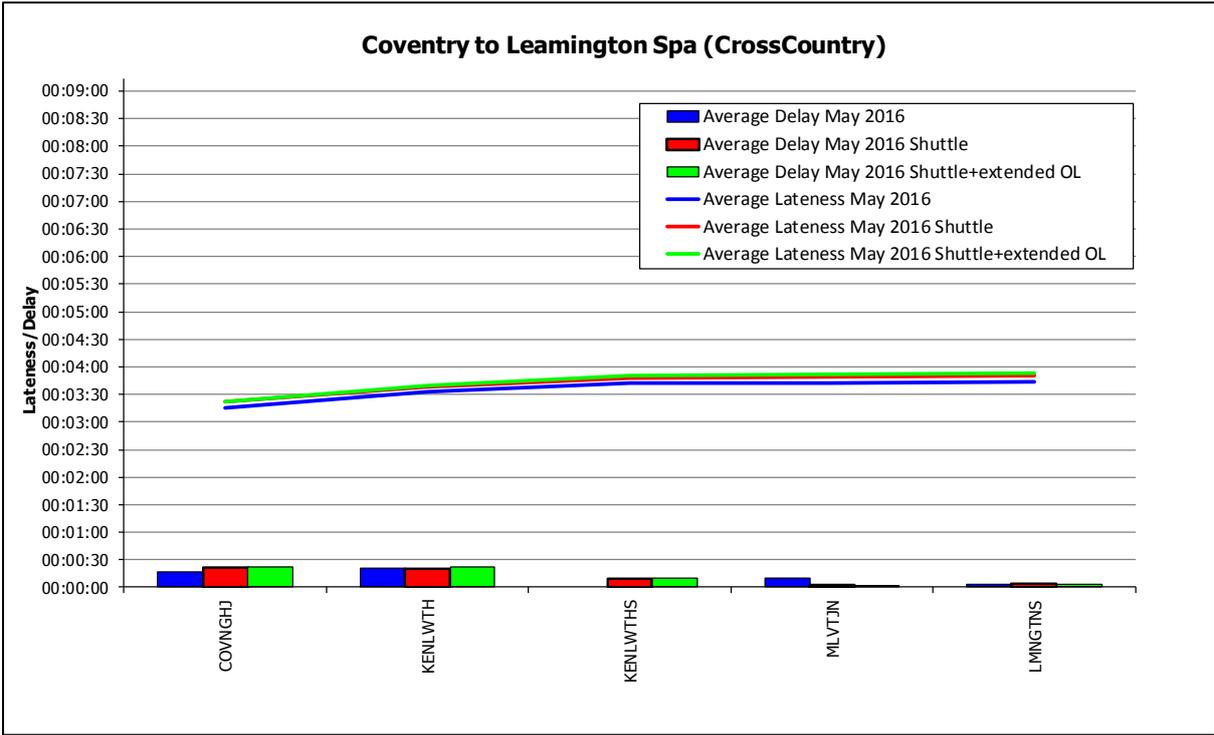
Figure 14 AML graph for Up CrossCountry services via Kenilworth
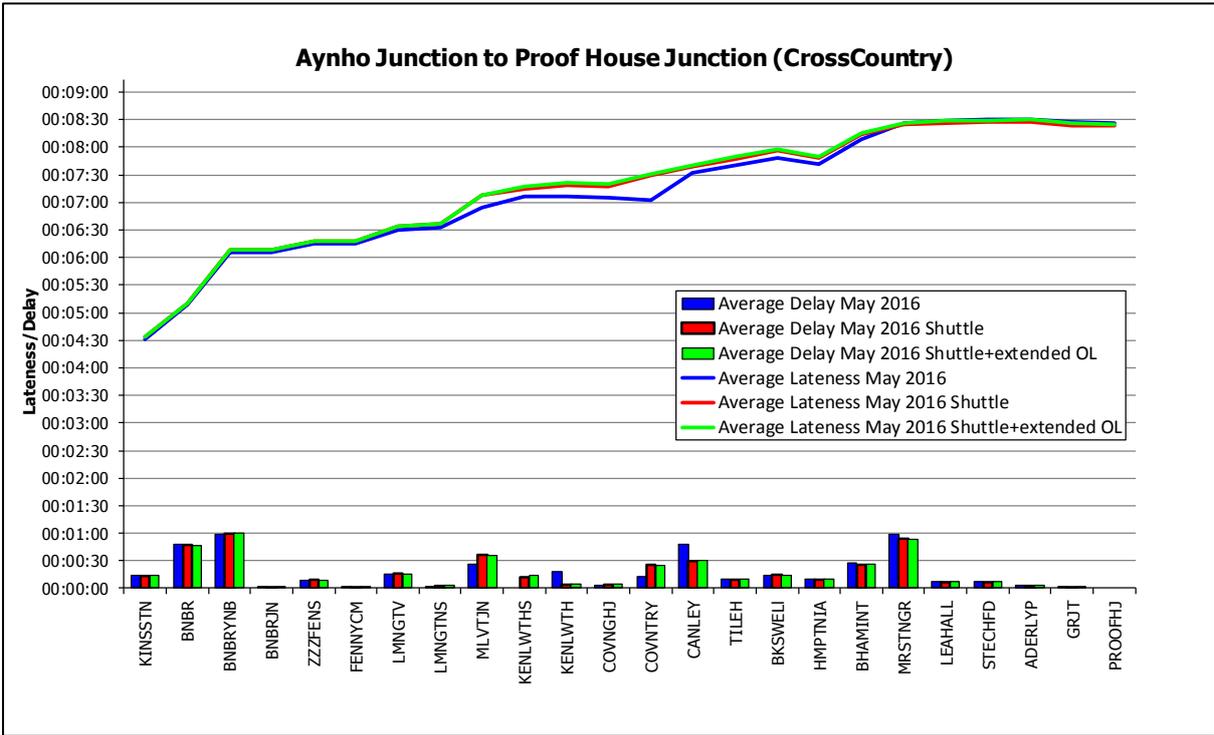
Figure 15 AML graph for Down CrossCountry services via Kenilworth (whole modelled route)
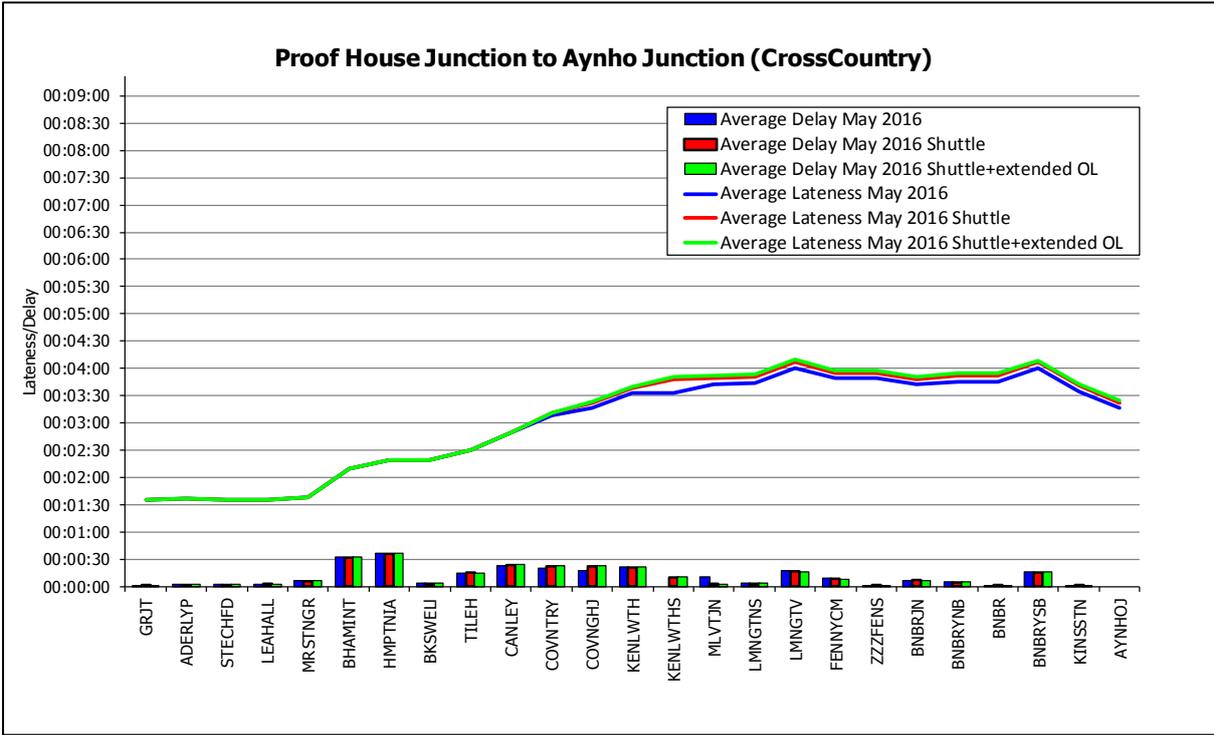
Figure 16 AML graph for Up CrossCountry services via Kenilworth (whole modelled route)

5.4.3 Coventry Corridor
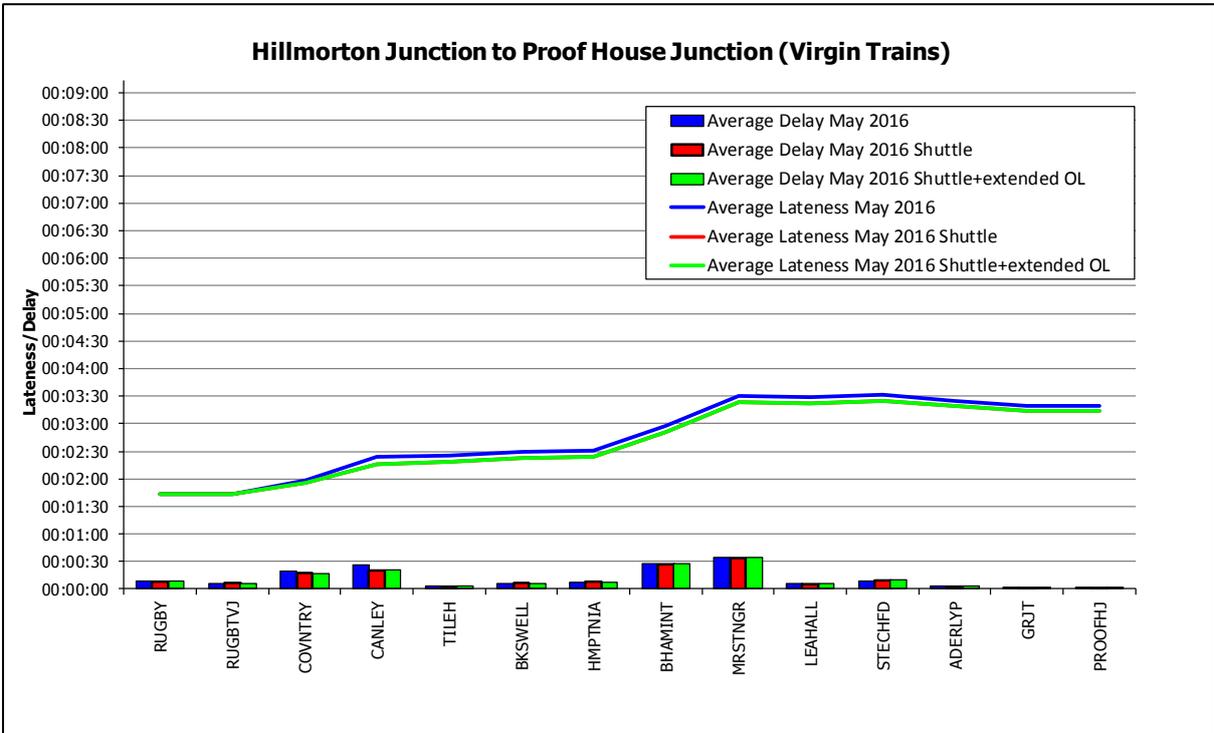
Figure 17 AML graph for Down Virgin Trains services
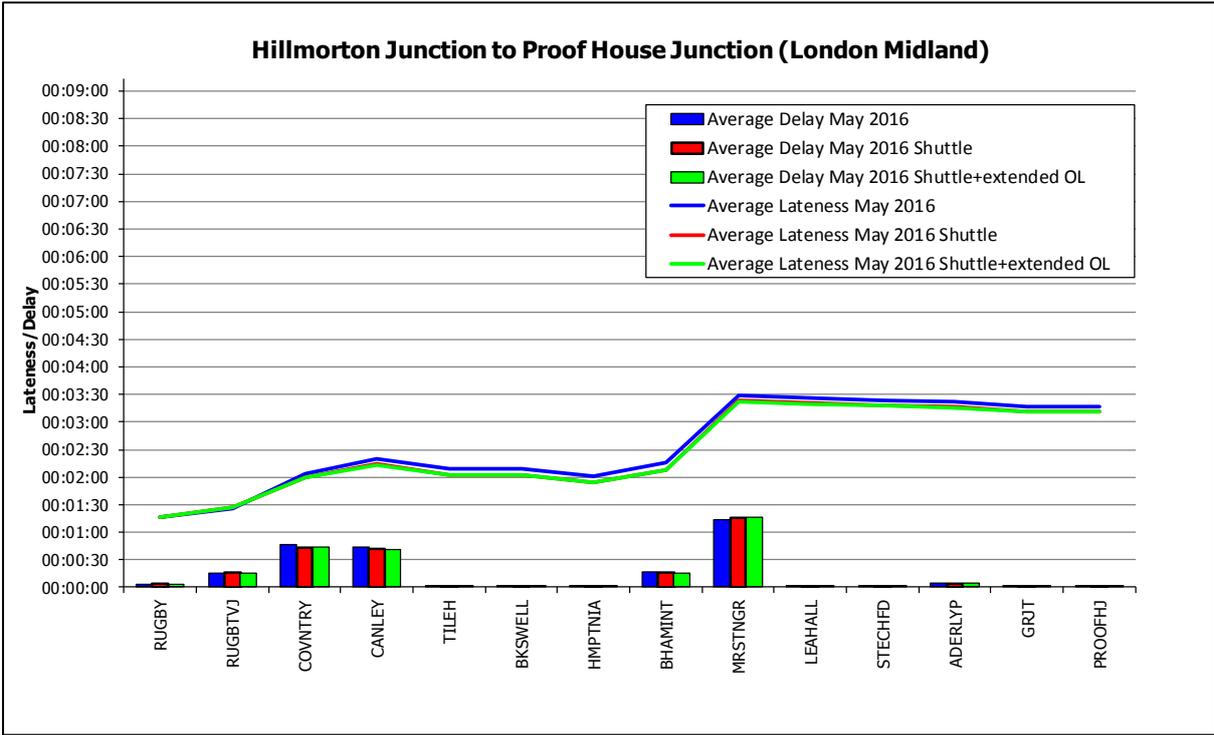
Figure 18 AML graph for Down London Midland Northampton/Euston-Birmingham services
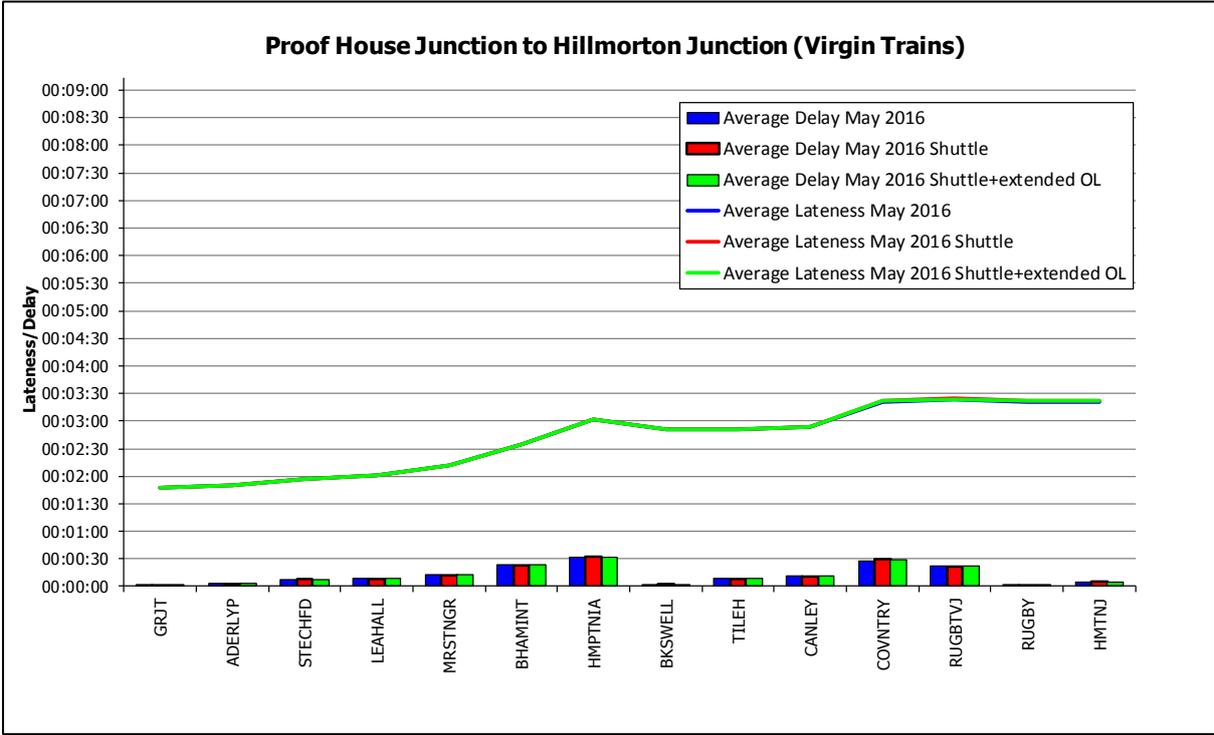
Figure 19 AML graph for Up Virgin Trains services
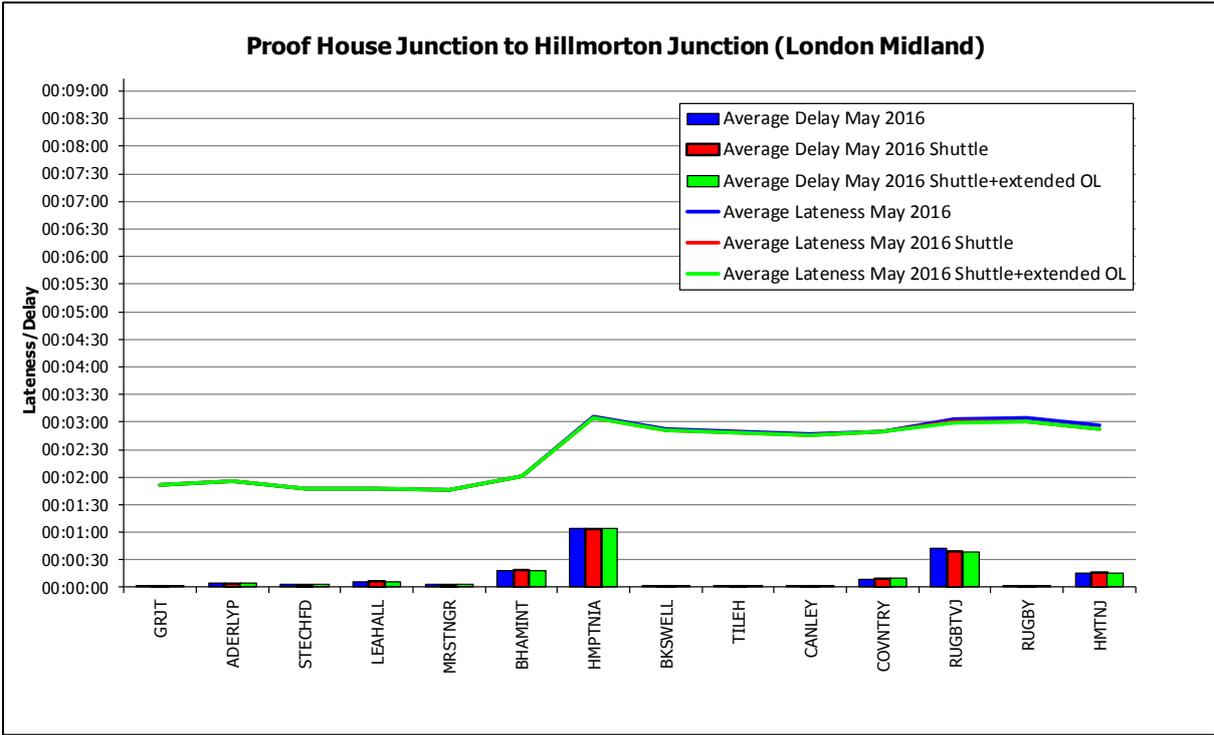
Figure 20 AML graph for Up London Midland Birmingham - Northampton/Euston services

5.4.4   Via Hatton and Solihull
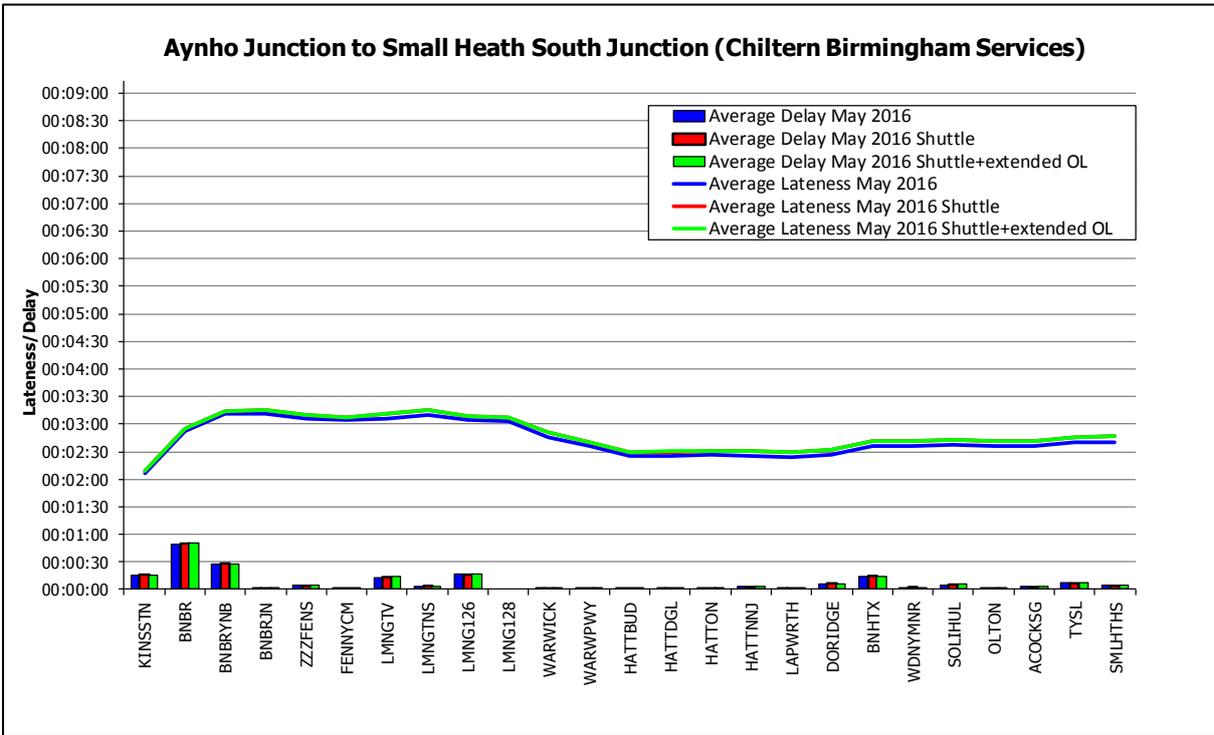
Figure 21 AML graph for Down Chiltern Birmingham services
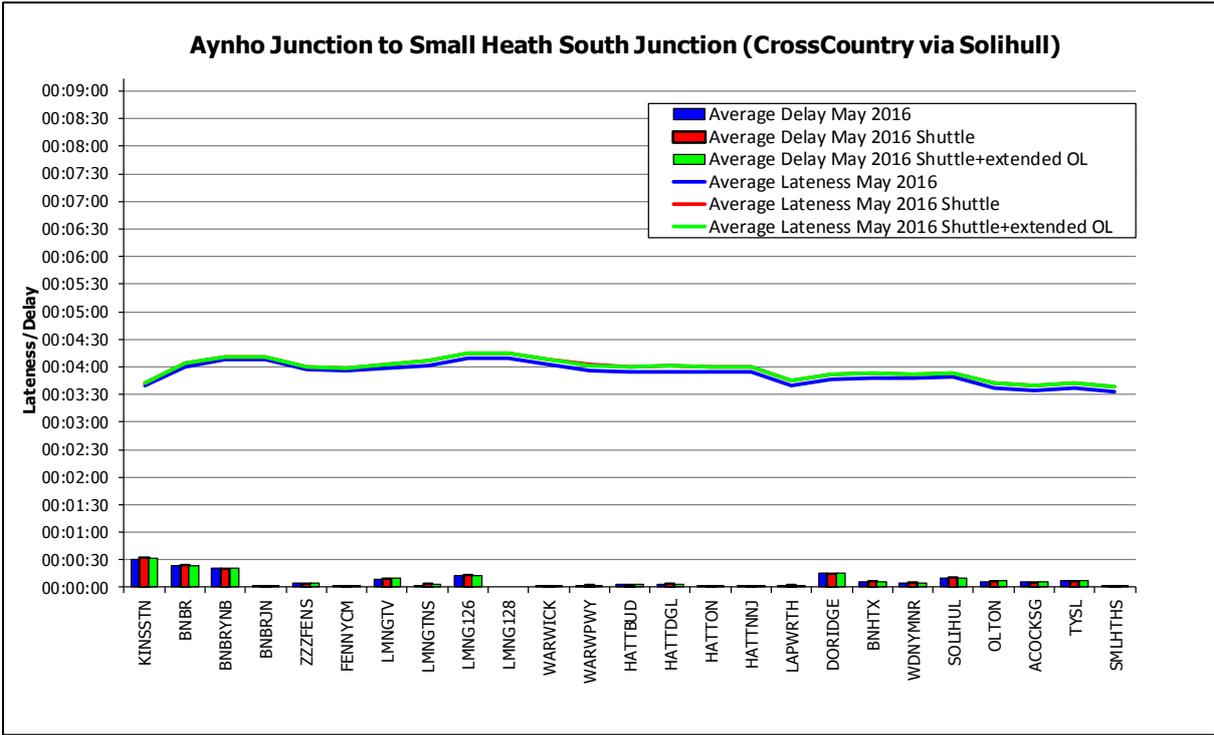
Figure 22 AML graph for Down CrossCountry services via Solihull
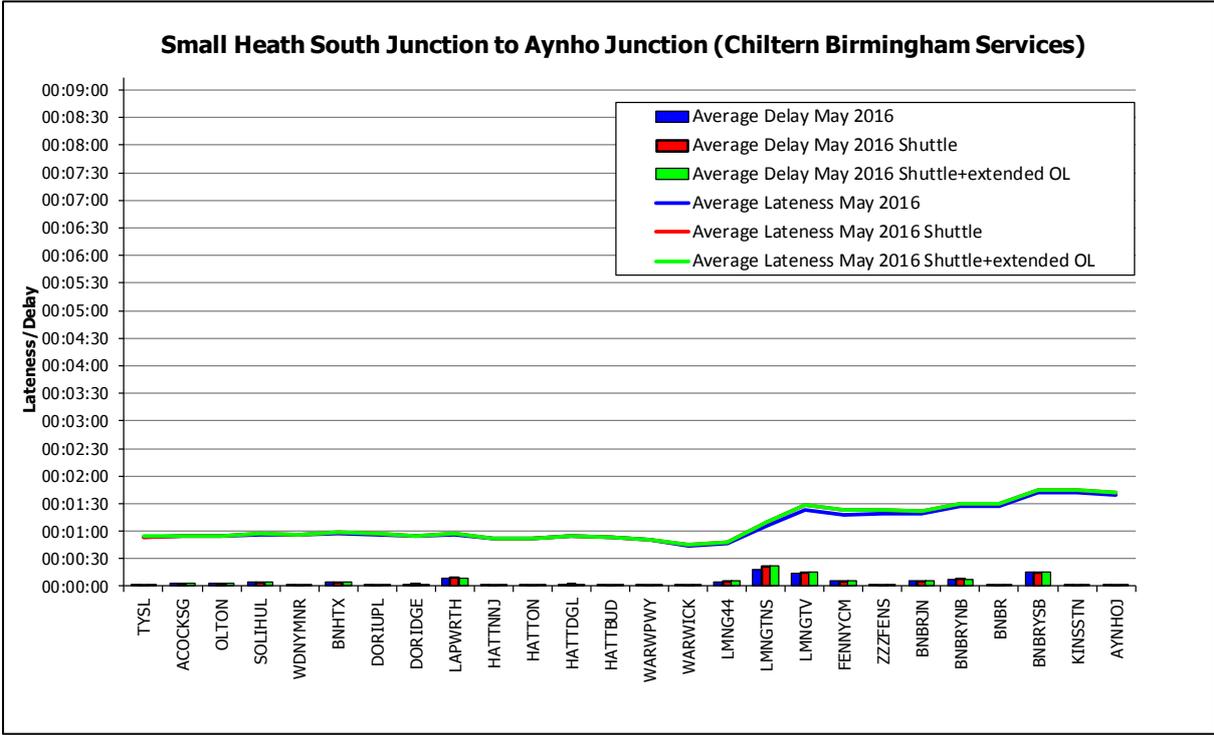
Figure 23 AML graph for Up Chiltern Birmingham services
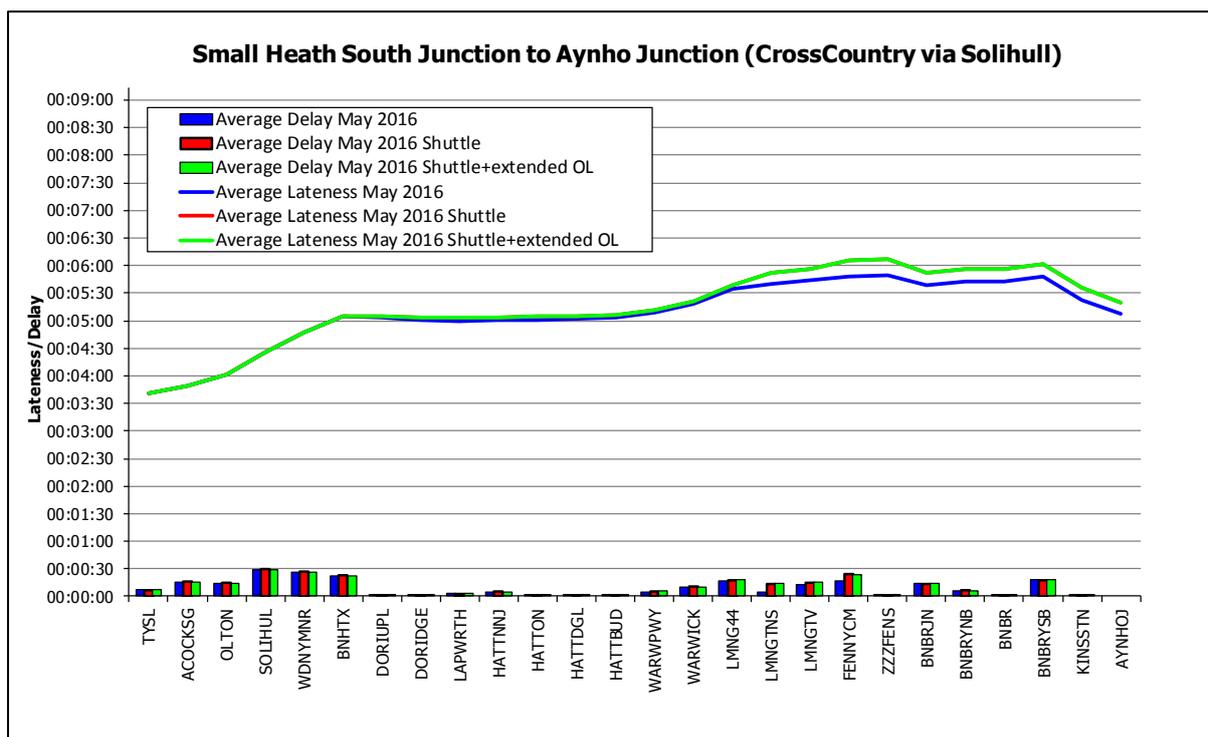
Figure 24 AML graph for Up CrossCountry services via Solihull

6. Summary and Recommendations

This addendum report focuses mainly on the comparisons between May 2016 + Kenilworth shuttle on Option infrastructure and May 2016 + Kenilworth shuttle on Option infrastructure but with extended overlaps at Kenilworth Loop.

The study highlights the trains (see Table 2) which may cause additional static conflicts if the proposed infrastructure improvements are not commissioned in time for the planned commencement of the passenger service to the new station in Kenilworth.

Nominal and perturbed simulations show that total delay minutes increased by 3 minutes 46 seconds and 4 minutes 48 seconds, respectively. This was mainly due to the interactions between CrossCountry trains, shuttle services and freight trains with the extended overlaps.

Moreover, a 0.1% drop in total overall punctuality at Time-to 1 was recorded when compared to the Option model. Meanwhile overall Time-to 3, 5 and 10 showed no change.

AML graphs remain unchanged on most of the routes except the line section between Coventry and Leamington Spa.

In conclusion, reverting the proposed overlaps at Kenilworth Loop back to as per the base infrastructure does cause some static conflicts and a minor performance impact. Retiming some of the trains in Table 2 could potentially resolve the timetable conflicts but this is not within the scope of this study.

Table 8 below suggests some possible solutions to resolve the static conflicts (within model area only). However it should be noted that any suggestions or retimings would need to be validated and permitted by TOC or FOC.

Conflict trains		Conflict location	Delay	Possible solutions
2H66	4M95	Kenilworth Loop	00:01:23	If possible, retiming 2H66 one minute earlier from Coventry to Kenilworth Loop
2C84	6O42	Kenilworth Loop	00:03:09	If possible, retiming 2C84 one or two minutes later from Leamington Spa to Coventry
1M34	4O49	Kenilworth Loop	00:00:28	In possible, retiming 4O49 thirty seconds or one minute earlier from model entry or utilise running time allowance
1M38	4O21	Kenilworth Loop	00:00:22	In possible, retiming 4O21 thirty seconds or one minute earlier from model entry or utilise running time allowance
1M58	4O17	Kenilworth Loop	00:00:58	In possible, retiming 4O17 one minute earlier from model entry or utilise running time allowance

Table 8 Possible solutions to resolve the static conflicts around Kenilworth Loop

Tracsis plc
Operations and Planning Systems

Tracsis is an innovative and forward-thinking business with unrivalled experience in the transportation sector. Our state of the art range of software solutions designed specifically for the transportation sector, are essential for the effective optimisation of valuable resources.

We are problem solvers and our clients are at the forefront of the services we provide. Our highly experienced technical specialists work in partnership with our clients, solving technical issues and increase efficiencies within the business infrastructure.

Leeds (Head Office & Software)
+44 (0)845 125 9162

Leeds (Traffic and Data Services)
+44 (0)1937 833 933

Boroughbridge (Event Traffic Management)
+44 (0)1423 326 622

Manchester (Datasys Software)
+44 (0)845 094 7656

Derby (Professional Services)
+44 (0)1332 226 860

Derby (Remote Condition Monitoring)
+44 (0)1332 363 979

Gateshead (IT Solutions)
+44 (0)191 477 4951

www.tracsis.com
www.tracsisops.com
info@tracsis.com

@Tracsis

Tracsis plc