Stantec AllanRail
PRA – Operations Planning Ltd

Clitheroe to Hellifield
Strategic Outline Business Case

Rail Option Development and Rail Planning

On behalf of **Ribble Valley Borough Council**

Ribble Valley Borough Council
www.ribblevalley.gov.uk

Project Ref: 330610089 | Date: April 2021

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Document Control Sheet

Project Name: **Clitheroe to Hellifield Strategic Outline Business Case**

Project Ref: **330610089**

Report Title: **Rail Option Development and Rail Planning**

Date: **19th April 2021**

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For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved
1	14/04/21	Revised	David Prescott	Emily Seaman	Emily Seaman
2	19/04/21	Revised	David Prescott	Emily Seaman	Emily Seaman

Contents

Tables

Appendices

1 Introduction

1.1 Overview

1.1.1 This technical note sets out the background to the rail option development. It is intended to take the options included in the Ribble Valley Borough Council (RVBC) tender document for their *Restoring Your Railway* Ideas Fund Strategic Outline Business Case (SOBC) and test what is possible based on the current (i.e. 2019 pre-COVID) timetable.

1.1.2 As noted in our proposal, the analysis set out in this note is intended to establish 'proof of concept' and further option development will thus be required at Outline Business Case (OBC) stage.

1.1.3 A glossary of key terms is provided in Appendix A.

1.2 Methodology

1.2.1 The COVID-19 pandemic has resulted in substantially altered railway timetables due to the significant fall in patronage. It was therefore agreed with the client group that the December 2019 timetable would be used as a base, as this was the last timetable to be produced and implemented before the pandemic struck.

1.2.2 The Working Timetable (WTT) and public timetables for Manchester–Clitheroe, Preston–Colne and the Leeds–Settle–Carlisle and Leeds-Lancaster/Morecambe routes were provided in MS Excel form by Pilkington Rail Associates. Sectional Running Times (SRTs) for the relevant multiple unit trains were also provided.

1.2.3 Relevant Train Planning Rules (TPRs) were taken from the Network Rail website - where they are open data - and a copy of the Sectional Appendix entry for the Daisyfield Junction to Hellifield Route (LOR - NW7013, ELD - DJH) was also obtained.

1.2.4 From the three WTTs, a composite timetable was created as a base working document covering four hours across the middle of the day as a representative period. This included the following routes in full WTT detail:

- Blackburn – Hellifield
- Preston – Blackburn

1.2.5 And the following routes in simplified form:

- Manchester Victoria – Blackburn
- Blackburn – Colne
- Skipton – Lancaster/Carlisle

1.2.6 The two core routes shown in full WTT detail are the two route sections on which the options listed in the study brief would operate, as follows:

- Option 1A: Extending some or all of the Rochdale to Clitheroe services to Hellifield*
- Option 1B: Extending the Blackburn terminating services to Clitheroe and Hellifield*
- Option 2: Introduce a new service between Preston – Blackburn – Clitheroe and Hellifield

**For the purpose of this study, the Rochdale to Blackburn and Clitheroe services will be referred to as Manchester Victoria to Blackburn and Clitheroe service, as the Rochdale extension is not material to this study and another destination could be substituted.*

1.2.7 On these routes, detailed timetabling was required to test how the options performed and if there were any potential trade-offs required and / or investment opportunities to realise operational savings.

1.2.8 The three part routes are shown in less detail to reduce the 'clutter' in the core working timetable, allowing for greater focus on the core issues. These routes were divided into two groups:

- Manchester Victoria – Blackburn / Blackburn – Colne, which were treated in the same manner; and
- Skipton – Lancaster/Carlisle.

1.2.9 The following points in relation to the analysis should be noted:

- It was considered that any significant re-timings are not a realistic option at this initial SOBC stage on complex corridors like Bolton – Manchester. Furthermore, the single line between Bolton – Blackburn resulted in a timetable which fixed the time relationship between the services running in opposite directions due to the need to cross in the relatively short loops. Blackburn to Colne was left, in a simplified form, as there are possible additional connection opportunities and for completeness of this network, which is operated as a 'cross'.
- Skipton – Hellifield - Settle – Carlisle and Lancaster was included in largely summary format, mainly to identify connectional opportunities which might arise. The section between Skipton – Hellifield and Settle Jn. was considered in greater detail to highlight the operating impacts of additional connections at Hellifield, whilst the Hellifield area itself was subject to detailed scrutiny given potential interactions in the shared platforms.
- A separate timetable was prepared for Option 3 (Extensions of Services along the Settle-Carlisle line) as this would be a development of Options 1A, 1B & 2.
- Notes on the timetabling issues are included in the report, with a simplified commentary and 'standard hour' timetable for the options. In line with rail industry practise the standard hour would apply through the bulk of the day, Mondays to Saturdays, with reduced services at the start and end. It is proposed that Sunday services would use a similar standard hour but starting later in the day and taking cognisance of the DalesRail services.
- The initial assumption is that all extra trains running between Blackburn and Clitheroe will call at the three intermediate stations (Ramsgreave and Wilpshire, Langho and Whalley). This may be subject to later sensitivity testing.
- As far as possible, the services have been planned using existing infrastructure. All resourcing is based on one unit per train and no account has been taken of the need for peak strengthening of services.
- In the first stages of this work, no account has been taken of the freight services, as these are not generally on a regular timetable and so do not fit into the context of a "standard hour".
- Freight services have not been assessed in detail but are noted where there are risks of adverse interaction, which then feeds through to possible infrastructure interventions. This is consistent with the 'proof of concept' approach in this SOBC but may require further analysis at Outline Business Case (OBC) stage.

1.3 Summary Table

1.3.1 As the analysis which follows is detailed and complex, there is benefit in setting out the main highlights in an up-front summary table.

Table 1.1: Options description and requirements

Option Costs - Infrastructure and Operational (with optimism bias applied at 66% to capital infrastructure costs)							
		Resource / Operational Requirements		Essential Infrastructure requirements		Additional Desirable Infrastructure	
Option	Description	Additional Units Required	Costs per annum	Infrastructure	Cost	Infrastructure	Cost
1a	Extend all current Clitheroe terminating services to **Hellifield**	1 x 3 car 150	£1.5m	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m	Hellifield turnback signals (two different options, which could be combined)	£0.8m - £3.3m
1b	Extend alternative current Clitheroe terminating services – all stations to **Garsdale**	1 x 3 car 150	£1.7m	Nil	Nil	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
						Hellifield turnback signals	£0.8m
						Blea Moor acceptance solution (only one intermediate block required)	£1.7m
1c	Extend alternative current Clitheroe terminating services – all stations to **Skipton**	1x 3 car 150	£1.4m	Hellifield reversing capability	£3.3m	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
				Possible Skipton reversing capability	£16.6m-£24.9m***	Intermediate Block signals Hellifield - Gargrave	£3.3m
2	**Two trains per hour to Clitheroe**	1 x 3 car 150	£1.4m	Nil	Nil	Nil	Nil
2a	**Two trains** per hour to Clitheroe. One train every two hours to **Garsdale**	1 x 3 car 150	£1.7m**	Nil	Nil	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
						Hellifield turnback signals	£0.8m
						Blea Moor acceptance solution	£1.7m
2b	**Two trains** per hour to Clitheroe. One train every two hours to **Ribblehead**	1 x 3 car 150	£1.5m**	Nil	Nil	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
						Hellifield turnback signals	£0.8m
2c	**Two trains** per hour to Clitheroe. One train per hour to **Settle Jn**	1 x 3 car 150	£1.7m**	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m	Hellifield turnback signals (two different options, which could also be combined)	£0.8m - £3.3m

Option Costs - Infrastructure and Operational (with optimism bias applied at 66% to capital infrastructure costs)							
		Resource / Operational Requirements		Essential Infrastructure requirements		Additional Desirable Infrastructure	
Option	Description	Additional Units Required	Costs per annum	Infrastructure	Cost	Infrastructure	Cost
2d	**Two trains** per hour to Clitheroe. One train per hour to **Skipton**	1 x 3 car 150	£1.9m**	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m	Intermediate Block signals Hellifield – Gargrave	£3.3m
				Hellifield reversing capability	£5.0m		
				Possible Skipton reversing capability	£16.6m-£24.9m***		
2e	**Two trains** per hour to Clitheroe. One train every two hours to **Skipton**	1 x 3 car 150	£1.4m**	Hellifield reversing capability	£5.0m	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
				Possible Skipton reversing capability	£16.6m-£24.9m***	Hellifield turnback signals	£0.8m
3	**One Preston* to Clitheroe service every hour**	3 x 2 car 156	£3.2m	Nil	Nil	Nil	Nil
3a	**One Preston*** train every **two** hours to **Garsdale**	1 x 2 car 156	£1.4m	Nil	Nil*	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
						Hellifield turnback signals (two different options, which could also be combined)	£0.8m - £3.3m
3b	One **Preston*** train every **two** hours extends to **Skipton**	1 x 2 car 156	£1.2m	Hellifield reversing capability	£3.3m	Intermediate Block signals Horrocksford Jn – Hellifield	£3.3m
				Possible Skipton reversing capability	£16.6m-£24.9m***	Intermediate Block signals Hellifield – Gargrave	£3.3m
4a	One Clitheroe train every **two** hours extends to **Carlisle**	4 x 3 car 150	£5.4m	Nil	Nil	Nil	Nil

Option Costs - Infrastructure and Operational (with optimism bias applied at 66% to capital infrastructure costs)							
		Resource / Operational Requirements		Essential Infrastructure requirements		Additional Desirable Infrastructure	
Option	Description	Additional Units Required	Costs per annum	Infrastructure	Cost	Infrastructure	Cost
4b	One Clitheroe train every **four** hours extends to **Carlisle**	1 x 3 car 150	£1.7m	Nil	Nil	Nil	Nil
6	DalesRail Fri, Sat , Sun Only	2 x 2 car 156	£0.8m	Nil	Nil	Nil	Nil

2 Options

2.1 Overview

2.1.1 This section summarises the option development process, building on and extending the options in the brief.

It is important to note that this paper was prepared as the basis of the option development and is thus an early technical paper. It follows the option nomenclature set out in the study brief, which allowed options to be iteratively built-up. However, for presentational purposes, a slightly different option nomenclature was used in the final report (see summary table 1.1). To this end, for each option subsequently developed in this paper, a cross reference is made to its option number in the final report.

2.2 Option 1A: Extending some or all of the Rochdale to Clitheroe services to Hellifield

Option in final report: 1a,1b and 1c depending on destination.

2.2.1 The current Class 150 running time from Clitheroe to Hellifield is 20½ minutes and from Hellifield to Clitheroe 19½ minutes. The two minutes [2] engineering time was removed from the approach to Clitheroe in the down direction and applied to the approach to Hellifield. Whilst the Train Planning Rules require a two-minute allowance on the approach to Clitheroe on the Up line, this has not been included as it is felt that it is only applicable to trains running much longer distances from north of Hellifield as happens when the Settle to Carlisle line is used for WCML diversions or charter train operation.

2.2.2 The outcome is that each hourly Manchester Victoria to Clitheroe service can be extended to Hellifield to provide an hourly service, with the same applying in the reverse direction. The rolling stock and crew will effectively step back an hour to take up the Clitheroe to Manchester Victoria service, which will require one additional unit and train crew to be injected into the service throughout the day.

2.2.3 The turnaround time available at Hellifield is generally xx 18 to x1:03 (this timetable nomenclature is used to show what happens in repeating hourly cycles, for example this could be 10:18 to 11:03), a total of 45 minutes. This is sufficient time to shunt the train from the down arrival platform to the up-departure platform. The absolute minimum turnaround time at Hellifield station is assessed as 14 minutes, comprising:

- 4 minutes standing in the down platform changing ends
- 1 minute run to and through a trailing crossover (either on the Clitheroe or Skipton lines)
- 4 minutes to change ends
- 1 minute to run into the Up platform and 4 minutes to change ends ready to depart

2.2.4 In practice, up to 20 minutes is desirable to provide a degree of resilience, so there may be sufficient time for a train crew break. However, as the study has developed, it has become clear that it is not currently possible to restart a train at Hellifield, so this option has not been developed further at this stage but has been used to inform possible signalling enhancements to enable it to happen.

2.2.5 The following simplified timetables show the key points of this option should the signalling enhancement take place – additional trains shown in red

Table 2.1: Option 1A(i) with hourly Hellifield service

Option 1A(i)				
Manchester Victoria	Dep	10 41	11 41	12 41
Blackburn	Dep	11 33	12 33	13 34
Clitheroe	Dep	11 55	12 55	13 56
Hellifield	Arr	12 18	13 18	14 19
Hellifield	Dep	13.01	14 03	15 03
Clitheroe	Dep	13.23	14 25	15 25
Blackburn	Arr	13.45	14 47	15 47
Manchester Victoria	Arr	14.41	15 40	16 41

2.2.6 This train service does not offer attractive connections at Hellifield with services on the Leeds – Skipton – Settle – Carlisle / Lancaster line due to extended waiting times. There are however no apparent clashes with through trains during the times that platforms are required for trains to / from Clitheroe.

2.2.7 A variant of this option would be to operate on a two-hourly frequency to Hellifield. However, this would require the same number of units and crew as the one train per hour option, as the train terminating at Hellifield would need to sit there for an 1h 45m, with the train an hour behind it making a standard turnround at Clitheroe – this is highlighted in the timetable below. The marginal time available on a two-hour headway may offer opportunities to extend the service beyond Hellifield, which will be explored in the consideration of Option 3.

Table 2.2: Option 1A(ii) with two hourly Hellifield services

Option 1A(ii)							
Manchester Vic.	Dep	10 41	11 41		12 41	13 41	
Blackburn	Dep	11 33	12 33		13 34	14 34	
Clitheroe	Dep	11 55	12 55#		13 56	14 56##	
Hellifield	Arr	12 18*			14 19**		
Hellifield	Dep	12 03		14 03*			16 03**
Clitheroe	Dep	12 25	13.23#	14 25		15 25##	16 25
Blackburn	Arr	12 47	13.45	14 47		15 47	16 47
Manchester Vic.	Arr	13 41	14.41	15 40		16 41	17 41

*Note that linked trains marked with * and #. For example, the 12:18 arrival at Hellifield would form the 14:03 departure from Hellifield.*

2.3 Option 1B: Extending the Blackburn terminating service to Clitheroe and Hellifield

Option in final report: 2a, 2b, 2c, 2d and 2e depending on destination.

Clitheroe

2.3.1 This option would involve extending the hourly Manchester Victoria – Blackburn service to Clitheroe and Hellifield. The Blackburn to Clitheroe extension is a long-term aspiration of Transport for the North (TfN) and has been the subject of several studies. Without the extension to Hellifield (or beyond), it would double the frequency on the Clitheroe branch, offering a half hourly service to Manchester Victoria (with extensions to Rochdale).

2.3.2 The first feasibility test of this option is to simply extend the existing Manchester Victoria – Blackburn service through to Clitheroe to provide a half-hourly service all the way from Manchester Victoria to Clitheroe and the same in the reverse direction. This will be a test in its own right, but also forms the base for options to extend to Hellifield and potentially beyond.

2.3.3 The rolling stock and crew will effectively replicate the current Manchester Victoria – Clitheroe service. However, as the extra running to Clitheroe will prevent the train that arrived at Blackburn forming the next train back to Manchester Victoria (current trains arrive xx 07 depart 9 minutes later at xx 16), the trains will step back an hour to take up the next Blackburn to Manchester Victoria service. This will require one additional unit and train crew to be injected into the service throughout the day.

2.3.4 The turn round time available at Clitheroe and Hellifield is generally around xx 30 to xx 54 - a total of 24 minutes - which is sufficient time to shunt the train from the down arrival platform to the up departure platform via Horrocksford Junction and is a little less than the existing service but well within the permitted allowance of 12 minutes. This gives a slightly longer buffer in the turnaround than the current operation, terminating at Blackburn, so is unlikely to result in any performance worsening.

2.3.5 It should be noted that, whilst the Clitheroe – Manchester Victoria services are at close to a 30 minute frequency, those arriving from Manchester Victoria do not quite work on this basis. This is a consequence of the Manchester Victoria – Blackburn service having additional time added to follow a Blackpool North to York service at Blackburn. This is not a sufficient delay to impact on the turnaround at Clitheroe.

2.3.6 The following simplified timetables show the key points of this option – additional trains shown in red

Table 2.3: Option 1B(i) hourly extension of Manchester Victoria to Blackburn service Clitheroe

Option 1B(i)								
Manchester Vic.	Dep	10 41	11 08	11 41	12 08	12 41	13 07	13 41
Blackburn	Dep	11 33	12 07	12 33	13 07	13 34	14 06	14 33
Clitheroe	Arr	11 56	12 30	12 56	13 31	13 57	14 29	14 56
Hellifield	Arr							
Hellifield	Dep							
Clitheroe	Dep	12.25	12.54	13.23	13.54	14 25	14.55	15 25
Blackburn	Arr	12.47	13.16	13.45	14.16	14 47	15.17	15 47
Manchester Vic.	Arr	13.41	14.07	14.41	15.07	15 40	16.07	16 41

The structure of the timetable means that trains in opposite directions cross close to Clitheroe so do not conflict on the single track section of the lead Daisyfield Junction.

Hellifield

2.3.7 Option 1A showed the extension of the hourly Clitheroe service to Hellifield and illustrates the options available. With Option 1B, there are twice as many potential services to Hellifield (because there are twice as many services to Clitheroe) as illustrated by the timetable below. (Additional trains shown in red)

Table 2.4: Option 1b(ii) hourly extension of Manchester Victoria to Blackburn service to Clitheroe and all trains extended to Hellifield

Option 1B(ii)								
Manchester Vic.	Dep	10 41	11 08	11 41	12 08	12 41	13 07	13 41
Blackburn	Dep	11 33	12 07	12 33	13 07	13 34	14 06	14 33
Clitheroe	Dep	11 55	12 29	12 55	13 30	13 56	14 28	14 55
Hellifield	Arr	12 18	12 54	13 18	13 55	14 19	14 53	15 18
Hellifield	Dep	12 03	12 32	13 01	13 32	13.59	14 33	14 59
Clitheroe	Dep	12.25	12.54	13.23	13.54	14 25	14.55	15 25
Blackburn	Arr	12.47	13.16	13.45	14.16	14 47	15.17	15 47
Manchester Vic.	Arr	13.41	14.07	14.41	15.07	15 40	16.07	16 41

2.3.8 The operation of a two trains per hour service through to Hellifield would require an additional two units and crews in addition to the extension from Blackburn to Clitheroe, making a total of three additional units compared with the current services. This frequency of service would also result in two units being at Hellifield at the same time for some parts of each hour, which would potentially result in a loss of capacity on the Leeds to Settle – Carlisle and Lancaster line.

2.3.9 It is therefore not suggested that a two trains per hour service should operate through to Hellifield and Option 1 Bii has been discounted, but it does demonstrate the more probable one train per hour options to Hellifield – possible permutations are shown in the timetables below:

Table 2.5: Option 1B(iiia) : Hourly extension of Manchester Victoria to Blackburn service to Hellifield (Note * and ** show the link between arriving and departing trains)

Option 1B(iiia)								
Manchester Vic.	Dep	10 41	11 08	11 41	12 08	12 41	13 07	13 41
Blackburn	Dep	11 33	12 07	12 33	13 07	13 34	14 06	14 33
Clitheroe	Dep	11 55	12 29	12 55	13 30	13 56	14 28	14 55
Hellifield	Arr		12 54*		13 53**		14 51	
Hellifield	Dep		12 32		13 32*		14 33**	
Clitheroe	Dep	12.25	12.54	13.23	13.54	14 25	14.55	15 25
Blackburn	Arr	12.47	13.16	13.45	14.16	14 47	15.17	15 47
Manchester Vic.	Arr	13.41	14.07	14.41	15.07	15 40	16.07	16 41

Table 2.6: Option 1B(iiib): Hourly extension of Manchester Victoria – Blackburn service to Clitheroe and Manchester Victoria – Clitheroe to Hellifield

Option 1B(iiib)								
Manchester Vic.	Dep	10 41	11 08	11 41	12 08	12 41	13 07	13 41
Blackburn	Dep	11 33	12 07	12 33	13 07	13 34	14 06	14 33
Clitheroe	Dep	11 55	12 29	12 55	13 30	13 56	14 28	14 55
Hellifield	Arr	12 18*		13 18**		14 19		15 18
Hellifield	Dep	12 03		13 01*		13.59**		14 59
Clitheroe	Dep	12.25	12.54	13.23	13.54	14 25	14.55	15 25
Blackburn	Arr	12.47	13.16	13.45	14.16	14 47	15.17	15 47
Manchester Vic.	Arr	13.41	14.07	14.41	15.07	15 40	16.07	16 41

2.3.10 In either case, the turnround in Clitheroe will be broadly as it is now and the turnround at Hellifield will be around 40 minutes, which is 25 minutes longer than the minimum time required. This will require two additional units and crews, one for the Blackburn – Clitheroe extension and one for the Clitheroe – Hellifield extension.

2.3.11 A further option is to move to the second version of Option 1A – a two hourly service to Hellifield.

Table 2.7: Option 1B(iv): Hourly extension of Manchester Victoria – Blackburn service to Clitheroe and Manchester Victoria – Clitheroe to Hellifield every two hours

Option 1B(iv)								
Manchester Vic.	Dep	10 41	11 08	11 41	12 08	12 41	13 07	13 41
Blackburn	Dep	11 33	12 07	12 33	13 07	13 34	14 06	14 33
Clitheroe	Dep	11 55	12 29	12 55	13 30	13 56	14 28	14 55
Hellifield	Arr	12 18*				14 19		
Hellifield	Dep	11 59				13.59*		
Clitheroe	Dep	12.25	12.54	13.23	13.54	14 25	14.55	15 25
Blackburn	Arr	12.47	13.16	13.45	14.16	14 47	15.17	15 47
Manchester Vic.	Arr	13.41	14.07	14.41	15.07	15 40	16.07	16 41

2.3.12 This pattern could work on any of the arrivals at Clitheroe as long as the return train falls into the time slot two hours later. The excessive time at Hellifield xx 18 to x1 59, gives 1 hr 40 minutes of spare time which could be used to extend services, which will be considered in Option 3.

2.3.13 The choice of which pairs of trains to extend to Hellifield is likely to be dictated by the times of trains through Hellifield and the desire to make connections, or conversely the requirement to avoid blocking the Leeds to Settle Junction route.

2.3.14 This is developed in the assessment of Option 3 'Extensions of services along the Settle & Carlisle Line, where the interactions between Options 1 and 2 and the Settle & Carlisle line are explored.

2.4 Option 2: Introduce a new service between Preston – Blackburn – Clitheroe and Hellifield

Option in final report: 3a and 3b depending on destination.

2.4.1 This option is more complex than Option 1 as it requires a wholly new service from Preston to Blackburn, as well as the additional service to Clitheroe and Hellifield. The service specification, as far as pathing constraints permit, should be on the opposite half hour to the existing Preston to Colne service. The implication is that it should serve all or at least some of the intermediate stations between Preston and Blackburn (Lostock Hall, Bamber Bridge, Pleasington, Cherry Tree and Mill Hill), and it is presumed that this is an alternative option to extending the Manchester Victoria – Blackburn services to Clitheroe and Hellifield (i.e. they are mutually exclusive options).

Table 2.8: Option 2: New hourly Preston to Clitheroe and Hellifield service – down direction

Option 2: Down Direction								
Manchester Vic.	Dep		10 41			11 08		11 41
Preston	Dep	10 57		11 27	11 46		11 57	
Blackburn	Dep	11 24	11 33	11 54	12 03	1206	12 24	12 32
Colne	Arr	12 07					13 07	

Clitheroe	Arr		11 56	12 15				12 56
Hellifield	Arr			12 39				

2.4.2 The positioning of the additional Preston to Blackburn service exactly half an hour between the existing hourly xx 57 Preston to Colne services results in the Clitheroe extension from Blackburn, which arrives in Clitheroe at xx 15, reasonably evenly spaced between the existing xx 56 arrivals at Clitheroe from Manchester. This gives a 19/31 minute interval service between Blackburn and Clitheroe.

2.4.3 For Preston – Blackburn, this gives Preston departures at xx 27, xx 46 and xx 57, intervals of 19, 13 and 30 minutes with Blackburn arrivals at xx 03, xx 24 and xx 54, intervals of 21, 30 and 9 minutes.

2.4.4 As the number of passengers on the Clitheroe branch (548,550 in 2019/20) is more than double the number at the intermediate stations between Preston and Blackburn (250,802 in 2019/20), it is suggested that the better option would be to get closer to an even 30-minute service interval on the Clitheroe line. However, to achieve this would require the new train from Preston to run later and still further reduce the gap between it and the following Blackpool North to York train at Preston (it could run up to 5 minutes later and give arrival intervals at Blackburn of 26, 30 and 4 minutes). This would however reduce the commercial value of the service and increase the performance risks of reactionary delay on the Blackpool North to York service which, given its operation through the dense West Yorkshire network including Leeds, is undesirable.

2.4.5 The option of changing which Manchester Victoria to Blackburn service runs through to Clitheroe is also theoretically available, but this results in the two services running even closer together on the Blackburn to Clitheroe route. This option has therefore not been considered further because it offers no obvious advantages.

2.4.6 Consequently, for this SOBC it is proposed to keep to the original specification specified in the brief, noting that this can be adapted.

2.4.7 Note that, with this service, there is no additional Manchester Victoria – Clitheroe journey opportunity with a connection out of the Manchester Victoria to Blackburn service.

2.4.8 Conversely there is an additional Preston – Clitheroe travel opportunity in Option 1B, if the Manchester Victoria – Blackburn service is extended to Clitheroe as there is a connection out of the Blackpool North to York service at Blackburn.

Table 2.9: Option 2: New hourly Preston to Clitheroe and Hellifield service, up-direction (Version 1)

Option 2: Up-Direction (Version 1)						
Hellifield	Dep			11.38		
Clitheroe	Dep			12.02	12.25	
Colne	Dep					12.11
Blackburn	Dep	12.18	12.21	12.25	12.48	12.54
Preston	Arr		12.38	12.52		13.21
Manchester Vic.	Arr	13.07			13.41	

2.4.9 This first option (Version 1) is based on the reverse of the down direction, a 30-minute interval service for stations between Blackburn and Preston. However, between Blackburn and Preston themselves, there is little benefit with service intervals departing Blackburn of 4, 29 and 27 minutes and arrivals in Preston at 17, 14 and 29 minute intervals.

2.4.10 For the Clitheroe to Blackburn route, section the service interval is 23 and 37 minutes, which is somewhat off the ideal 30/30 split but there is no connection to Manchester at Blackburn.

Table 2.10: Option 2: New hourly Preston to Clitheroe and Hellifield service, up-direction (Version 2)

Option 2: Up-Direction (Version 2)							
Hellifield	Dep		11.27				
Clitheroe	Dep		11.50			12.25	
Colne	Dep	11 11					12.11
Blackburn	Dep	11 54	12.12	12.18	12.21	12.48	12.54
Preston	Arr	12 21	12.40		12.38		13.21
Manchester Vic.	Arr			13.07		13.41	

2.4.11 This version was tested to provide a better service interval on the Clitheroe to Blackburn section and a connection from Hellifield and Clitheroe into the xx18 departure from Blackburn to Manchester Victoria, which is desirable. However, the following York to Blackpool North train catches this train up on the approaches to Preston, so has had to be adapted as shown in Version 3:

Table 2.11: Option 2: New hourly Preston to Clitheroe and Hellifield service, up-direction (Version 3)

Option 2: Up-Direction (Version 3)							
Hellifield	Dep		11.20				
Clitheroe	Dep		11.44			12.25	
Colne	Dep	11 11					12.11
Blackburn	Dep	11 54	12.07	12.18	12.21	12.48	12.54
Preston	Arr	12 21	12.34		12.38		13.21
Manchester Vic.	Arr			13.07		13.41	

2.4.12 With version 3, the Hellifield – Clitheroe – Preston train has been timed to arrive in Preston at xx 34, the minimum 4 minutes in front of the following York to Blackpool North train (xx 38) and the timings created back from that. This results in a departure from Clitheroe at xx 44, creating a 19, 41 minute interval service from Clitheroe to Blackburn, which is not ideal, but it does provide a connection for Manchester Victoria at Blackburn.

2.4.13 The interval for the stations between Blackburn and Preston is 13, 47 minutes which does not meet the requirements. This also adds little to the Blackburn to Preston journey opportunities with departure from Blackburn at 13, 11 and 36 minute intervals and arrivals in Preston at 13, 04 and 43 minute intervals, with two trains running very close together rather than spread through the hour.

2.4.14 The conclusion of these tests is that Version 1 is the option that provides closest to the requirements as it provides the half hourly frequency for the stations between Preston and Blackburn and a reasonable spread of services between Blackburn and Clitheroe.

Table 2.12: Full standard hour timetable showing Preston – Hellifield hourly service

Manchester Vic.	Dep		10 41			11 08	
Preston	Dep	10 57		11 27	11 46		11 57

Blackburn	Dep	11 24	11 33	11 54	12 03	12Arr06	12 24
Colne		12 07					13 07
Clitheroe	Arr		11 56	12 15			
Hellifield	Arr			12 39			
Hellifield	Dep			13.38			
Clitheroe	Dep			14.02	14.25		
Colne						14.11	
Blackburn	Dep	14.18	14.21	14.25	14.48	14.54	
Preston	Arr		14.38	14.52		15.21	
Manchester Vic.	Arr	14.07			15.41		

2.4.15 The big inefficiency with this timetable is the time at Hellifield - 59 minutes - which might be enough time to be of value on the Settle & Carlisle line. This is be tested in Option 3.

2.4.16 This service would require a total of four extra units and train crews.

2.4.17 Compared with options 1 and 2, this option appears to be rather resource heavy. Two options were assessed to examine the possibilities on the Preston to Blackburn section to test whether a free-standing local service would offer a more cost-effective operation.

2.4.18 A simple free-standing operation to run at the opposite half hours to the current Preston – Colne service requires two units as the services in opposite directions do not match, as follows:

Table 2.13: Standard hour timetable with additional hourly Preston to Blackburn local service half hourly service interval

		Existing Colne	York – Blackpool	Extra	Blackpool - York	Existing Colne
Preston	dep	XX 57		X1 27	X1 46	X1 57
Blackburn	arr	XX 23		X1 53	X1 03	X1 23
Blackburn	dep	XX 54	X1 21	X1 24		X1 54
Preston		XX 21	X1 38	X1 51		X1 21

2.4.19 To deliver a resource led timetable with only one unit would result in the only options being:

Table 2.14:Additional hourly Preston to Blackburn local service with one unit offering best service spread from Preston

		Existing Colne	York – Blackpool	Extra	Blackpool - York	Existing Colne
Preston	dep	XX 57		X1 32	X1 46	X1 57
Blackburn	arr	XX 23		X1 58	X1 03	X1 23
Blackburn	dep	XX 54	X1 21	X1 02		X1 54
Preston		XX 21	X1 38	X1 29		X1 21

Table 2.15: Additional hourly Preston to Blackburn local service with one unit offering best hourly spread from Blackburn

		Existing Colne	York – Blackpool	extra	Blackpool - York	Existing Colne
Preston	dep	XX 57		X1 02	X1 46	X1 57
Blackburn	arr	XX 23		X1 28	X1 03	X1 23
Blackburn	dep	XX 54	X1 21	X1 32		X1 54
Preston		XX 21	X1 38	X1 59		X1 21

2.4.20 The running times with an 'all stations' service does not provide compliant 4-minute turnarounds at both ends, which can be solved by not calling at Pleasington (annual user ORR 2019/20 10,844), which will save about a minute in each direction off the schedule. In any case, it is a request stop, so unlikely to be scheduled with station dwell time, which also reduces the variability in running times for these local trains.

2.4.21 The possible alternative method of providing an additional service to the intermediate stations between Blackburn and Preston would be to extend the existing Wigan Wallgate – Manchester Victoria - Rochdale – Blackburn service to Preston calling at all stations. In the Up direction, this train arrives in Blackburn at xx 10, only 9 minutes in front of the York – Blackpool North service, so has insufficient time to reach Preston in front of the following Blackpool North bound service, as happens in Version 2 – tested above.

2.4.22 In the opposite direction, the train for Wigan Wallgate via Rochdale leaves Blackburn at xx 19 only 4 minutes before the following Preston – Colne all stations train (arrives Blackburn xx 23), so the two local services would be duplicating each other, with the Blackpool North – York service running only 16 minutes earlier.

2.4.23 There is therefore no advantage in trying to use this service to provide an additional local service between Preston and Blackburn.

2.5 Option 3: Extensions of Services along the Settle & Carlisle Line

Option in final report: All options.

2.5.1 The development of Options 1A, 1B and 2 has indicated that there is surplus time at Hellifield in some of these options, and that if two hourly services rather than hourly are provided to Hellifield, there can be considerable marginal time available which may be useable to extend the service beyond Hellifield.

2.5.2 The first stage of this analysis has been carried out on the assumption that there are no timetable conflicts and is designed to show the possible options

2.5.3 So Option 3 base cases are derived from Options 1&2 (and respective sub-options) with the arrival to departure times at Hellifield, which gives the marginal time available:

Table 2.16: Option 3 Base Cases – Arrival to departure times at Hellifield

Option	Frequency	Arrival tp Departure	Marginal Time
Option 1A(i)	Hourly	xx 18 to xx 03	45 minutes
Option 1A(ii)	Two hourly	xx 18 to x1 03	1 hour 45 minutes
Option 1B(iii)	Hourly	xx 54 to x1 32	38 minutes
Option 1B(III)	Hourly	xx 18 to xx 01	43 minutes
Option 1B(iv)	Two hourly	xx 18 to x1 59	1 hour 41 minutes
Option 2	Hourly	xx 49 to x1 37	48 minutes

Option 2	Two hourly	xx 49 to x2 37	1 hour 48 minutes

2.5.4 From these running times, it is possible to generate minimum times from arrival at Hellifield to departure from Hellifield to points at which trains have be terminated and restarted (includes stopping at all stations, except Long Preston where the train terminates at Settle Jn and Settle):

Table 2.17: Options for extending services from Hellifield

	Running time each direction (min) All stations except Long Preston (different times shown for each direction	Turn round (min)	Total minimum time Hellifield arrive to Hellifield depart
Settle Jn	5 non-stop each way (6 with a Long Preston) call	Allow 5	15 or 19 (calling at Long Preston)
Settle	10 + 10	(No current turnaround at the station). Allow 5	25
Ribblehead	31 + 29	10 via Blea Moor	70
Garsdale	43 + 40	8	91
Kirkby Stephen	56 + 53	12	121
Appleby	69 + 67	12	148
Carlisle	109 +110	Allow 10	229
Skipton	16 + 14 (No direct access from Hellifield)	Min 5 plus 4 reverse at Hellifield each way	43

2.5.5 Table 2.18 below shows the marginal time available at Hellifield in each option and whether it is possible to reach a range of potential destinations on the Settle to Carlisle line in that time. In effect extra connectivity but only incurrs the mileage running costs.

Table 2.18: Marginal time at Hellifield and range of potential destinations

Option	Frequency	Available Time	Settle Jn 15 min	Settle 25 min*	Ribblehead 70 min	Garsdale 91 min	Kirkby Stephen 121 min	Appleby 148 min	Carlisle 229 min	Skipton 43 min*
1Ai	Hourly	45 mins	Yes	Yes						Yes
1Aii	2 hourly	105 mins	Yes	Yes	Yes	Yes				Yes
1Biiia	Hourly	38 mins	Yes	Yes						
1Biiib	Hourly	43 mins	Yes	Yes						Yes
1Biv	2 hourly	101 mins	Yes	Yes	Yes	Yes				Yes
2	Hourly	48 mins	Yes	Yes						Yes

2	2 hourly	108 mins	Yes	Yes	Yes	Yes				Yes

**For Settle and Skipton infrastructure work would be required.*

2.5.6 This demonstrates that within a repeating pattern and at no additional resource costs other than train mileage in all options, it is possible to run services beyond Hellifield onto the Settle & Carlisle line, in all cases reaching as far as Settle (although a turn-back facility would be required to enable trains to turn back at Settle).

2.5.7 It would also be possible to run to Skipton in all but one case, but infrastructure work would be required at Hellifield to enable the required reversal of the trains and possibly Skipton.

2.5.8 Clearly, within the repeating pattern, it is possible to go further by adding additional units and crews above those shown in the summary table into the working. This is illustrated in Table 2.19:

Table 2.19: Number of additional units required in addition those required for Clitheroe - Hellifield

Option	Frequency	Available Time	Settle Jn 15 min	Settle 25 min*	Ribblehead 70 min	Garsdale 91 min	Kirkby Stephen 121 min	Appleby 148 min	Carlisle 229 min	Skipton 43 min*
1Ai	Hourly	45 mins	0	0	1	1	2	2	4~	0
1Aii	2 hourly	105 mins	0	0	0	0	1	1	2~	0
1Biiia	Hourly	38 mins	0	0	1	1	2	2	4	1
1Biiib	Hourly	43 mins	0	0	1	1	2	2	4~	0
1Biv	2 hourly	101 mins	0	0	0	0	1	1	2~	0
2	Hourly	48 mins	0	0	1	1	2	2	4~	0
2	2 hourly	108 mins	0	0	0	0	1	1	2~	0

Number of additional units required to operate the extended service.

**For Settle and Skipton - infrastructure work would be required.*
~ For Carlisle the timings only just force an additional unit. It may be that slight reductions in calling patterns, line speed improvements or a slight reduction in the station dwells (conservative at 1 minute) would reduce the unit requirement by one. Costing based on 3 units, not 4.

2.5.9 As the existing Leeds – Settle – Carlisle service already provides a broadly two hourly frequency service, it is unlikely to be a viable option to consider operating to Carlisle on an hourly basis on these extended services, requiring potentially an additional four units and crews, but it is shown for completeness.

2.5.10 However, there are several potential service extension options if one or two extra units and crews are added into the resource base, over that required to reach Hellifield in Options 1 or 2. These would significantly increase the connectivity of the Yorkshire Dales into Manchester and the North-West.

Connections at Hellifield

2.5.11 The following two tables show the potential for connections at Hellifield between trains running on the Leeds to Carlisle and Lancaster routes and the possible options for different train service between Clitheroe and Hellifield. Table 2.20 shows potential connections arriving at Hellifield from the Clitheroe direction. Table 2.21 shows possible connections from trains on the Leeds to Carlisle and Lancaster lines into services departing Hellifield for Clitheroe

Table 2.20: Train departures from Hellifield on the Leeds – Carlisle/Lancaster route

December 2019 T/t	To Carlisle	To Lancaster	To Skipton/Leeds
		05 37	
	06 14		07 37
		08 15	07 46
	08 40		
		09 10	
	10 13		10 10
		11 11	10 37
	11 44		11 41
		13 15	13 40
	14 09		
		15 13	15 43
	16 13		16 37
	17 41		18 05
		18 24	18 42
	19 09		20 11
		20 14	21 26
	20 42 (Ribblehead)		22 08
			22 28 (Skipton)
Generic Times			
Hellifield arrival from			
Clitheroe			
1A, 1Bii/iv XX 18	XX 09 - XX 14 (5 times)	XX 10 – XX 15 (XX 24)	XX 05 – XX 11 (4 times)
2 XX 49	XX 40 - XX 44 (4 times)	XX 24 (once)	XX 37 -XX 46 (8 times)
1Biii XX 54			XX 26 – XX 28 (2 times)

Table 2.21: Train arrivals into Hellifield on the Leeds – Carlisle/Lancaster route

December 2019 T/t	From Carlisle	From Lancaster	From Skipton/Leeds
			05 36 (Skipton)
			06 14
	07 37	07 43	08 13

December 2019 T/t	From Carlisle	From Lancaster	From Skipton/Leeds
			08 40
			09 10
		10 33	10 12
			11 11
	12/40 Non-stop	11 38	11 41
		13 37	13 12
	15/14 Non-stop		14 09
		15 40	15 12
	16 34		16 12
			17 44
	18 02		18 23
		18 39	19 08
	20 08		20 14
		21 23	20 41
	22 05 (Ribblehead)		
		22 26	
Generic Times			
Hellifield departure for			
Clitheroe			
1A, 1Biii XX 01 - XX 03	XX 02 - XX 08 (3 times)	XX 33 – XX 43 (6 times)	XX 08 – XX 14 (12 times)
2, 1Biii/iv XX 32 – XX 37	XX 34 - XX 37 (2 times)	XX 23 – XX 26 (Twice)	XX 40 -XX 44 (4 times)
			XX 23 (Once)

2.5.12 These simplified Hellifield station working tables demonstrate that the interactions between the new services coming up from Clitheroe do not generally deliver good passenger connections. In some circumstances, particularly in the Up direction, there are potential clashes, with trains on the two routes potentially occupying the same platforms at the same time.

3 Analysis

3.1 Summary Table

3.1.1 Table 3.1 summarises the services that can be offered with the additional incremental units and crews (but no infrastructure expenditure) with the base case being the December 2019 timetable and resource plan. It gives an indication of the benefits for each cost increment.

Table 3.1: Summary Table

Number of Units required	Base Option	SOBC Report OPtions	Clitheroe	Hellifield	Settle – Carlisle (Only using marginal time)	Skipton (Only using marginal time)	Blackburn - Preston	Clitheroe to Manchester Direct Link
One	1Ai	1a	No change	One train/hour	Connect only	Yes	No change	No change 1 tph
One	1Aii	1b	No change	One train/2 hours	Garsdale	Yes	No change	No change 1 tph
One	1Bi	2	Two trains/hour	nil	N/A	nil	No change	Two train/hour
Two	1Biii	2b	Two trains/hour	One train/hour	Settle*	Yes	No change	Two trains/hour
Two	1Biv	2a	Two trains/hour	One train/2 hours	Garsdale	Yes	No Change	Two trains/hour
Three	1Bii	2c	Two trains/hour	Two trains/hour	No through trains	No through trains	No change	Two trains/hour
Four	2	3a	Two trains/hour	One train/hour	Garsdale	Yes	½ hourly local	No change 1 tph

*NB * Settle requires additional points and signalling.*

3.2 Settle and Carlisle Termination Point Analysis

3.2.1 This section details the practical issues around terminating, stabling and restarting passenger trains at points along the Settle & Carlisle Line. The brief and supporting information suggests that this is a substantial problem and not possible at Hellifield at present. Consequently, understanding this detailed operational point is important at this SOBC stage as it has the potential to drive operating solutions and potential capital costs. The five potential locations listed and discussed in this section are:

- Hellifield
- Settle Junction
- Ribblehead / Blea Moor
- Garsdale
- Skipton

Hellifield

3.2.2 Clearly, the operation of a train service to Hellifield requires the capability to terminate and restart at Hellifield or another location on the Settle – Carlisle line. The brief suggested that it was not possible terminate trains at Hellifield and other solutions, including running to Settle Junction to reverse, were proposed.

3.2.3 At first glance, Hellifield has all the physical infrastructure in place to enable trains to terminate and restart there. However, this is not the case. An extract of Hellifield signalling plan is included in Appendix B to aid understanding of the following section.

3.2.4 Network Rail's Capacity Analysis suggests arriving and departing only using platform 2 – the down platform. This is not possible with the current arrangements at Hellifield as the departure route is not signalled to passenger standards with only disc shunt signals (27 & 37) and the points which become facing (47 & 49A) are not fitted with facing point locks. This route is, however, available for an empty passenger train. Creating this passenger departure capability is one of the potential infrastructure interventions at Hellifield. Equally, however, it was agreed that prolonged occupation on Hellifield down platform was not a good use of capacity and there are alternative methods of holding an empty train at Hellifield, but some infrastructure work will be required.

3.2.5 As Hellifield is a very traditional railway operating layout, the traditional approach to terminating and restarting would be by moving the arrived train from platform 2 across to platform 1 which is signalled for departing a passenger train towards to Clitheroe.

3.2.6 Unfortunately, due to the nature of the signalling – specifically the lack of a wrong direction signal to take an ECS (Empty Coaching Stock) train from the Clitheroe or Skipton direction into the Up Platform (No 1) from which it can start as a passenger train - there is no means of re-positioning a terminating train to restart at Hellifield.

3.2.7 There are places to hold the empty train at Hellifield, most notably the currently out of use cripple sidings, which avoids blocking any running lines, but also potentially the two goods loops and possibly on the Up Clitheroe line, given the number of trains currently planned to run on that line.

3.2.8 The Cripple siding can be accessed by the empty stock of an arriving train, once passengers have disembarked, running via either 47 and 49 points (27 & 37 signals) to the up Clitheroe line or 47 and 28 points (53 signal) on the up Leeds line then setting back into the cripple siding through 49, 16 & 2 points (56 & 11 signals) from the Clitheroe line or 28, 16 & 2 points (44 & 11signals) from the Leeds line. The empty train could also stand on the up goods loop in which case 12 signal applies, not 11.

3.2.9 However, somewhat surprisingly, whilst there are the two routes to move from the 11 & 12 signals through 16 points into the cripple siding and the up goods loop respectively, there is no signal to allow a movement back into the up platform (No1).

3.2.10 There is also not a signalled route out of the west end of the up goods loop through 14 points, in the wrong direction, to stand on the Up Leeds line and enter platform 1 using 21 signal. This would require 'blocking back' into the Settle Jn to Hellifield section, thus preventing a train approaching Hellifield from Settle Junction.

3.2.11 In practice, there is no current issue with potential lengthy dwells at Hellifield because it is impossible to restart a terminating train there. If a means of restarting trains at Hellifield is made available, there is enough infrastructure for it to be reasonable to anticipate being able to stable trains between inbound and outbound services, so it is not considered that long dwells will prohibit trains terminating and starting at Hellifield.

3.2.12 By the same token, there are no signalled routes to enable passenger trains to operate between Clitheroe and Skipton in either direction.

Settle Junction

3.2.13 Network Rail's Capacity Analysis suggested it was not possible to turn trains at Settle Junction. There is a clear option to hold trains at Settle Junction for a length of time **if** this time is not in conflict with Leeds to Lancaster/Morecambe trains (in that direction).

3.2.14 The method of working would be to run from Hellifield to Settle Junction and onto the down branch (Bentham Line) stopping just inside ground disc signal 25, before reaching signal 16, the starter signal permitting access into the block section to Carnforth Station Junction. The train would then be clear of all trains in both directions on the Leeds – Settle – Carlisle route and any trains coming from the Lancaster/Morecambe to Leeds. This was discussed with the Capacity Analyst and agreed as a possibility but reflecting that it did use a lot of capacity.

3.2.15 This report is clear that there is an ability to reverse a train at Settle Junction, but it will depend on the timetable that emerges for the Clitheroe service and in particular its relationship to the Leeds to Lancaster/Morecambe trains.

Ribblehead/Blea Moor

3.2.16 There was no signalling plan available for Blea Moor signal box, which includes Ribblehead. A passenger train is routinely terminated at Ribblehead and reversed at Blea Moor - the 18:18 Leeds to Ribblehead terminates at 21:14 and returns to Skipton at 21:30. The train crosses the viaduct to Blea Moor and runs into Blea Moor Up goods loop for the driver to change ends and return over the viaduct.

3.2.17 Discussion with the Network Rail Capacity Analysis team suggested that there were no major issues about turning at Ribblehead. Any train plan that turned trains at Ribblehead would be expected to arrive at Hellifield at a time close to that required to depart for Clitheroe to pick up the required path onward to Blackburn and Manchester, so avoid prolonged platform occupation at Hellifield. To achieve this it would need to stand in Blea Moor up goods loop.

3.2.18 The long block sections are more challenging, but it is expected that there will be solutions as the timetabling moves forward in more detail on the selected option(s), but it is agreed that the number of freight trains operating as far as Blea Moor adds to the challenges of finding compliant paths.

3.2.19 Moreover, the prolonged occupation of the up goods loop at Blea Moor would remove an important freight facility from use at certain times.

Garsdale

3.2.20 There is a trailing crossover north of Garsdale station with signalled moves, which is available to transfer a terminating a train from the south and restarting back to the south. Several local stakeholders have suggested reversing a train at Garsdale and this appears to be a viable option.

3.2.21 The time required to physically reverse a train is 9 minutes:

- 2 minutes allow passengers to alight and for the train to be checked that no-one is left on board
- 1 minute to run forward to the crossover
- 4 minutes to change ends
- 1 minute to run into the up platform and 1 minute for passengers to board before departure
- To that should be added some recovery time to avoid delays arising on the terminating journey being carried over into the following departing train as reactionary delay, with a minimum of 5 minutes suggested.

3.2.22 Using Garsdale removes the occupation of Blea Moor up goods loop but, due to the signalling design at Blea Moor, once a train sets off from Garsdale, it restricts the operation of freight trains at Blea Moor. There are relatively low-cost solutions adding either an up line outer home signal at Blea Moor or an intermediate block signal closer to Dent.

Skipton

3.2.23 Skipton has already been investigated in respect of understanding the capability to terminate, hold and restart a train on the possible re-opened line to Colne. The possible options included in this SOBC are generally for short turnarounds at Skipton, because they use marginal time running from Hellifield. Some are only suggested to operate on a 2-hourly cycle.

3.2.24 Consequently, this may enable these services, especially those on a two-hourly frequency, to operate without adding more infrastructure at Skipton, but it may require retiming to freight trains to and from Rylstone Quarry which use the down Skipton slow line, platform 4 and platform 3 to run around the train in each direction, as it reverses direction at Skipton on and off the branch line.

3.2.25 However, there is a significant risk that additional infrastructure is required at the west end of Skipton station to enable Clitheroe trains to terminate and restart there.

3.3 Summary

Hellifield

3.3.1 It is not possible to restart a passenger train at Hellifield after it has terminated. There are potential enhancements to the signalling to enable this to happen.

3.3.2 Although the track is there to permit it, the operation of passenger trains in either direction between Clitheroe and Skipton is not possible with the current signalling. Further signalling and facing point enhancements would be required to enable this to happen.

Settle Junction

3.3.3 It is possible to terminate hold and restart an empty passenger train at Settle Junction by using the down Bentham Line. However, this blocks the route for other trains and can only happen in the opposite hours to the passage of the Leeds to Lancaster/Morecambe services

Ribblehead / Blea Moor

3.3.4 Terminating and restarting passenger trains is possible and it happens every night. Trains run across the Ribblehead Viaduct into Blea Moor up goods loop and restart from there. If this was required during the day, the long occupation of the up goods loop may have a detrimental impact on freight operations from the quarry sidings at Ribblehead and Arcow, and potentially a new quarry connection at Horton-in-Ribblesdale.

Garsdale

3.3.5 Termination and restarting trains at Garsdale is possible. The only significant issue is the constraint on freight run round moves at Blea Moor whilst a train is running from Garsdale to Blea Moor. There are potential signalling solutions to this issue.

Skipton

3.3.6 It may be possible to terminate trains from Hellifield at Skipton, particularly a two hourly Hellifield service with short turn rounds, which may give sufficient time windows for the train to arrive and depart without occupying platforms for excessive periods so creating difficulties with other operations.

3.3.7 An hourly frequency service could be considerably more restrictive on the Skipton station workings, as would an extended dwell time.

3.4 Network Rail Capacity Analysis – Summary

3.4.1 This Capacity Analysis is a high-level study based around a fixed two-hour period, between 08:00 and 10:00, which may be representative of the wider day, but there is no timetable available to confirm that.

3.4.2 Following the issuing of the report a Stantec/Network Rail discussion took place with the Capacity Analysts present.

3.4.3 The report appears to suggest a number of options are not possible, but in dialogue with the Capacity Analysists there was a much closer understanding reached, recognising that the Capacity Analysis Report was commissioned to a different brief.

3.4.4 The Capacity Analysis report included as an equal requirement the addition of an hourly Class 6 freight paths. These were confirmed by the Network Rail Route Freight Manager as long-term strategic possibilities, notably in connection with High Speed 2 services operating north of Preston, but not a requirement for immediate use.

3.4.5 This analysis is useful in understanding the implications of operating more freight paths over the Clitheroe – Hellifield and Settle – Carlisle corridor. If the passenger service is to be introduced in a relatively short time, the freight project would be developed separately when the demand for additional paths is known, including the quantum and when they are required. The high-level implications of any Clitheroe – Hellifield service introduction and the potential requirements for infrastructure changes for freight could be considered at OBC stage.

3.4.6 One of the differences in approaches was around the planning of ‘shunting’ type moves where different options may be required at different times which, whilst physically possible, is not the norm, with Network Rail’s preference being the same process every time.

3.5 Other Passenger Rail Modes

3.5.1 At the SOBC stage it is expected that all possible options should be considered. This report is concerned with the potential to reintroduce regular passenger services on an extant railway that is already capable of being used by passenger trains (as it is currently by DalesRail).

3.5.2 A TramTrain is a tram type vehicle which is permitted to operate on heavy rail tracks. As they are essentially trams, they do not have the crashworthiness of heavy rail trains so even greater signalling protection is required to ensure the separation of vehicles on the network to avoid potential collision.. This requires changes to signalling over the whole network over which the TramTrain would operate. No track alterations are required as no street running is proposed and the TramTrains would use standard Network Rail profile wheels, avoiding any need to install raised check rails at pointwork. Realistically, whilst it would be physically possible to operate a TramTrain on this heavy rail infrastructure, it would need to be restricted to only a relatively short section otherwise the signalling infrastructure costs will become excessive. In this case it is suggested that Blackburn to Hellifield would be the limits of operation. There are no obvious benefits from doing this, and a number of disbenefits, including the signalling changes. There would also be an increase in the level of passenger interchange and the operation of a small fleet of physically different vehicles in a relatively remote location.

3.5.3 For these reasons, no further analysis was carried out on the potential of other rail modes.

3.6 Freight

3.6.1 There are two different route sections where aspects of freight operation need to be taken into account when planning an increased passenger service:

- Daisyfield Junction - Horrocksford Junction (Castle Cement) – Hellifield; and
- Skipton - Hellifield - Ribblehead/Blea Moor – New Biggin and beyond.

3.6.2 There is some interaction between the two operations with some freight operating from Daisyfield Junction through to Hellifield and on towards Carlisle.

Daisyfield Junction to Horrocksford Junction (Castle Cement) and to Hellifield

3.6.3 The core traffic is the cement from Castle Cement at Horrocksford Junction, with one set working three times a week to Avonmouth and another set working three times a week to Mossend near Glasgow.

3.6.4 With this number of trains, it should be possible to find a timetable that will be able to accommodate them. South to Daisyfield Junction, with the intermediate block signals which were put in for coal trains from Scotland to Fiddlers Ferry and Rugeley Power Stations, there is reasonable capacity available, as confirmed during freight industry consultation.

3.6.5 North to Hellifield, the section length is long at 13 miles but with a permanent speed limit of 30 mph for freight trains, the running time for a loaded train is 34 minutes. There are some steep (for railways) gradients of around 1-in-100, which will slow a heavily loaded cement train. In the opposite direction, the empty train takes under 30 minutes.

3.6.6 There are also a small number of through freight trains, which take this route to avoid the West Coast Main Line via Lancaster and Penrith, where the frequent and fast passenger services during the day will impede the progress of slow heavy Class 6 trains (Class 6 trains are limited to 60mph).

3.6.7 These include a daily loaded timber train from Carlisle to Chirk and a weekly train of china clay from Antwerp via the Channel Tunnel to Irvine in west Scotland. Other through trains include

Network Rail materials trains between Mountsorrel Quarry and Crewe in the south and the engineering base at Carlisle.

Skipton – Hellifield – Ribblehead/Blea Moor – Newbiggin - Carlisle

3.6.8 There are two main freight flows over the Settle & Carlisle Line:

- through flows both off the Daisyfield Junction route and from Leeds to Newbiggin at the north end of the route; and
- aggregates traffic from Arcow and Ribblehead Quarries (and potentially from Horton-in-Ribblesdale Quarry) which all goes east to Leeds

3.6.9 Aggregates trains arrive from the south and reverse into the quarry sidings. On departure, they require to go north over Ribblehead Viaduct into Blea Moor up goods loop where the engine runs round the train using the up main line and then departs back across Ribblehead Viaduct to go south. This takes a considerable amount of capacity for every train, with a slow climb up Blea Moor including a 20mph speed restriction over the viaduct, the occupation of the up main line for the run round move and then the return journey across the single track viaduct.

3.6.10 The rail freight industry is concerned about the addition of extra passenger trains on the route potentially restricting freight operation. In environmental and road maintenance and safety terms, it is important to move as much stone out of the National Park by rail as is possible to avoid lorry traffic on relatively narrow roads and through communities such as Horton-in-Ribblesdale and Settle.

Horton area Quarry Trains

3.6.11 Concern has been expressed about additional passenger train restricting the operation of freight trains from the Horton area quarries. The WTT records the running time from departing Arcow quarry (the furthest south) to arriving at Blea Moor up goods loop as variously 27 to 30 minutes. The running time for a passenger train to Garsdale and back to approaching Blea Moor is 40 minutes. This provides sufficient time for a freight train to depart the quarry and be in the up goods loop at Blea Moor, with time to secure the train and uncouple the locomotive to use the up mainline to run round immediately the passenger has passed Blea Moor.

3.6.12 Running round, coupling up, taking off the hand brakes and carrying out a brake test will mean that the passenger train is well clear, and that the freight train will have a clear run to Hellifield.

3.6.13 Whilst this is more restrictive than having no passenger trains, there are reasonable windows in which to run these quarry trains.

3.6.14 The ability to run round the freight train whilst the passenger train is between Garsdale and Blea Moor will add greater flexibility to the operation and enable the freight train to follow the southbound passenger train more closely.

4 Bringing the Options Together

4.1 Overview

4.1.1 Armed with the understanding of the implications of the differing options and their interactions, particularly Options 1 and 2 with Option 3, selected all-day timetables have been drawn up. These do not seek to cover all the potential options but to illustrate the implications of combining differing options and to assist with future option selection. The passenger service timetables are presented in Appendix C and the freight timetables in Appendix D.

Option 1A

4.1.2 Option 1A, extending the existing Clitheroe terminating services, is based on the 1A(ii) version. It offers a two-hourly service beyond Clitheroe to Hellifield and all-stations to Garsdale. Interactions with other train services on the Settle & Carlisle Line are not significant with some retiming required in the hour chosen, but the alternative hour has more clashes.

4.1.3 There are some potential clashes with freight trains, but with a two hourly timetable and turning at Garsdale rather than Blea Moor up goods loop, it is anticipated that the services will be able to be accommodated.

4.1.4 One additional unit (or unit combination) is required to deliver this Option

Option 1B

4.1.5 Option 1B, extending the Manchester Victoria – Blackburn terminating services through to Clitheroe and on to Hellifield, is based on the 1Biv version. This option cannot reliably run to Garsdale as there is insufficient turnround time to give any buffer against out-of-course running. This could be partly rectified by removing calls at selected intermediate stations, which may be preferable to terminating at Ribblehead and reversing in Blea Moor up goods loop, where the loop occupation is likely to have a more significant impact on freight services.

4.1.6 Two additional units are required to operate this option, but this is not an even comparison with Option 1A(ii) above as the additional Blackburn – Clitheroe services are built into this option. To provide a fair comparison, Option 1Aii needs to be supplemented by additional Blackburn – Clitheroe extensions of the Manchester Victoria – Blackburn services and the resource requirement is then the same.

Option 2

4.1.7 Option 2, which is the Preston-based service, uses times closer to Option 1A(ii) as these give a clearer operation onto the Settle & Carlisle Line to turn at Settle Junction. An hourly Preston to Hellifield service requires three units, but as it is not possible (with the current layout) to turn a train at Hellifield a fourth unit is required to run to Settle Junction (or further) to enable the train to turn round. An hourly Preston – Clitheroe service would also require three units, with an excessively long layover at Clitheroe. The investment in a turn back capability in the down platform (No 2) at Hellifield would reduce the rolling stock and associated train crew requirement by one unit.

4.1.8 Resourcing would permit an hourly service to Hellifield, but that would result in more difficulty in finding paths between Hellifield and Settle Junction to hold and restart the return service. Additionally, it would use a lot of the available capacity on the Clitheroe – Hellifield, line making the operation of freight trains challenging as they also need to fit into the constraints on the wider network.

4.1.9 In summary, the operation of a two-hourly extension of the existing Manchester Victoria – Clitheroe service to Hellifield and on to Garsdale appears to offer the most cost-effective solution to running to Hellifield and linking into the Settle & Carlisle Line, with the separate option of doubling the current Blackburn – Clitheroe service, taking it from hourly to half-hourly.

4.2 Operating Costs

4.2.1 The operating costs are composed of broadly three components: rolling stock leasing, rolling stock mileage driven running costs and train crew costs.

4.2.2 Commercial confidentiality presents a challenge to finding costs and the raw cost information has to be redacted. Consequently, in this report, the costs are quoted at a total level for each option to single decimal point millions, to reflect the accuracy level.

4.2.3 Rolling stock leasing costs which include time based heavy maintenance have been secured from various sources and reflect the types of unit available to lease. There costs are routinely quoted to the train operators on a per vehicle per month basis.

4.2.4 Mileage based costs include rolling stock maintenance, fuel and variable track access charges paid to Network Rail.

4.2.5 Train crew costs are taken from a unit rate with the number of staff required being a multiple of the number of extra diagrammed units in service then grossed up to provide the additional staff for 6-day working week operation and to cover for holidays, sickness etc.(Sundays are covered on overtime).

4.2.6 It is noted that the impacts of the COVID pandemic on driver training programmes and other uncertainties mean likely longer lead in times for driver and other staff training. It is recognised that there is a **major cost associated with the level of training** which would need to take place for both Northern's drivers and conductors. At present, the DalesRail service is covered entirely by a Blackpool based train crew, whilst all Rochdale-Blackburn/Clitheroe services are covered by Blackburn and Manchester based train crews. None of these currently sign north of Horrocksford Junction. Northern is still affected by the pause to training last year due to the pandemic and the continuing situation with COVID (re-training/training new starters etc) and this would place an element of risk to the programme of delivery.

4.2.7 At OBC stage, these costs can be considerably refined as it is likely that Northern Trains would become the delivery vehicle and they have complete knowledge of their rolling stock and staff costs.

4.3 Potential Infrastructure Upgrades

4.3.1 This project does not appear to require any significant infrastructure expenditure, but there are some potential relatively minor infrastructure changes that would be essential for some options and desirable in others to improve reliability and maintain capacity for freight and charter operators. The essential infrastructure is that required to permit the proposed service to operate. Desired infrastructure is not essential for the proposed service to operate, but may offer benefits in resilience, performance or timetable flexibility. Some of the desired infrastructure may prove essential when the detailed timetabling is complete, or possibly when other services are introduced onto this network at some point in the future. The costs are based on carrying out the work during the planned life extension works in the signal boxes, but as this is now unlikely to be an option they will need to be completed immediately afterwards with potential cost increases.

Horrocksford Junction layout

4.3.2 As an observation, when point work renewal is required, there would be benefit in replacing the very old-fashioned layout with a standard crossover and a facing connection onto the branch with

a limit of shunt signal on the down line towards Clitheroe. This would eliminate some of the complex shunting move required to access and egress the cement works, reduce the network capacity required, reduce journey times and reduce the number of propelling moves required, so improving safety.

4.3.3 This is not required by any passenger train operations, so no costs are proposed.

Horrocksford Junction – Hellifield

4.3.4 Line speed improvement to 60mph for all traffic and ideally to 75mph for passenger trains is desirable. This would both reduce journey times and increase the capacity of the section, by permitting trains to pass through more quickly, noting that much higher freight speeds may not be possible climbing in the Horrocksford Junction to Hellifield direction.

4.3.5 Improving the line speed for freight trains may significantly reduce the time to run over this route section, which will effectively increase the capacity.

4.3.6 Transport for the North has already initiated a comprehensive study into line speed improvement opportunities which is being carried out by Network Rail and assessment of this route section could form a natural part of this work bank as all the processes are in place. The value of Network Rail carrying out this work is that they can rapidly move forward to deliver on the 'quick wins' that may already be available at little or no cost and so bring early benefits.

4.3.7 A notional cost of £1m has been included to cover small scale expenditure, but this will not cover major structures, earthworks, or track issues, such as fastenings, rails or sleepers.

4.3.8 Intermediate Block Signals could be provided to break up the long signal sections, increasing capacity and improving the flexibility in operation and performance. Intermediate Block signals have been priced at £1m in each direction, using the same technology as has been used all along the Settle & Carlisle Line.

Hellifield

4.3.9 The signalling could be upgraded to enable passenger trains to turnback and/or re-start from Hellifield, including in the Skipton direction. For the simplest upgrade, the additional signal to permit ECS trains to set back into Platform 1 - the up platform - is suggested as £0.5m.

4.3.10 To start a terminated train in Platform 2 - the down platform - back to Clitheroe requires facing point locks (probably motorised points) on the Clitheroe line trailing crossover at Hellifield as well as replacing shunt signals with running signals.

4.3.11 For Clitheroe – Hellifield – Skipton services, facing point locks (probably motorised points) would also be required on the Skipton line trailing crossover at Hellifield as well as more replacement of shunt signals with running signals.

4.3.12 Each one of these two alterations is priced at £1.5m, so for a Clitheroe to Skipton service, £3m of infrastructure investment would be required.

4.3.13 Both the Network Rail Capacity Analysis Report and Project Brief refer to the possibility of re-instating the former east end bay platform at Hellifield. Whilst this would be an elegant answer, it would also be expensive. The advantage of creating a new bay platform is that the interaction with other trains is limited to crossing the down Settle & Carlisle Line to access and exit the new platform. This would ease the timetable integration task for the two routes (Preston/Manchester Victoria – Clitheroe – Hellifield and Leeds – Lancaster/Carlisle) and reduce the interactive performance risks. Additionally, it would provide for a short turn round time, matching that possible (with suitable infrastructure) in Platform 2.

4.3.14 The costs would be considerable, both in creating a new platform, to modern standards, on the site of the former bay platform (a rail locked site), with the risks that a complete rebuild of all platforms may emerge due to potential level differences. Additionally, new point work, track and signalling would be required: new points to access the new bay platform and most probably a new facing crossover on the Clitheroe lines approaching Hellifield. Although there may be other solutions, all are likely to be broadly the same complexity and cost. It is possible that some of the old mechanical interlocking remains from the time when the bay platform was operational, but it would need to be refurbished.

4.3.15 This is a major infrastructure change and is likely to cost in the region of £10m - £15m and would be well beyond the scope of the currently planned life extension works. It would therefore need to follow them or delay the life extension to incorporate that into the major works.

4.3.16 Use of the bay platform to reverse trains as part of a Clitheroe – Hellifield – Skipton service may be possible, but it would require significant additional point work and signalling in the Skipton direction as well. The facing crossover on the Clitheroe line would be an option for a Clitheroe – Hellifield – Skipton service, reversing the train to Skipton in the up platform. This would give more operational flexibility but at a significant cost.

Garsdale - Blea Moor

4.3.17 It would be beneficial to break the section between Blea Moor and Garsdale to enable engine run round moves to take place whilst a train is in the up line section between Garsdale and Blea Moor. This could be done either through a new intermediate block signal or the provision of a new outer home signal at Blea Moor to create sufficient overlap to allow trains to be accepted from Garsdale whilst a locomotive is running round its train stood in the up loop. This is estimated as £1m, the same as an IB signal

Arcow Quarry

4.3.18 If freight traffic is going to grow on this site, then the provision of an internal run-round facility and a new main-to-main trailing crossover would enable freight trains to avoid the run to Blea Moor to run round. This would reduce the capacity required to operate freight trains, especially two occupations of the single track across Ribblehead viaduct as well as saving well over an hour in running time for freights departing Arcow.

4.3.19 This could also be used by trains serving a reconnected Horton-in-Ribblesdale Quarry.

4.3.20 No costs are proposed for these possible works.

Hellifield to Skipton

4.3.21 If services are run to Skipton there may be a need to provide Intermediate block signals between Hellifield and Gargrave where the first York controlled signals are located.

4.3.22 Additionally, there may be costs required at Skipton which may be relatively small, such as an additional crossover, or quite considerable if a north facing bay platform is required. A figure of £10m - £15m is suggested (£16.6m - £24.9m with 66% optimism bias applied), with the wide cost range a consequence of what is required.

Level Crossings

4.3.23 There may be minor works that emerge from some level crossings as a consequence of the increase in the number of trains. These may include adding ‘whistle boards’, moving existing whistle boards further out and potentially improvements to sight to cater for higher speeds. Network Rail has been made aware of all the possible options and an initial assessment of Cowgill footpath level crossing between Horrocksford Junction and Hellifield, which will have the biggest

percentage increase in trains passing, which supports this initial assessment. There is reasonable confidence that substantial costs are unlikely to be incurred.

4.3.24 The three station crossings at Settle, Horton-in-Ribblesdale and Ribblehead may require the provision of more equipment. The station crossing at Horton-in-Ribblesdale is already being assessed in the context of potential new freight trains from the quarry if it is re-opened.

4.3.25 A notional figure of £0.5m has been suggested to cover possible enhancements and changes that may be required. A notional figure of £0.5m for each of the three station "barrow" crossings at Settle, Horton-in-Ribblesdale and Ribblehead should be considered for possible risk mitigation. This would not cover the costs of a replacement accessible footbridge. Note that these costs have not been included in the costs for the relevant options.

Station Facilities

4.3.26 There are no new stations required, but all of the stations will require to be reassessed to ensure that they have adequate facilities, particularly waiting shelters on the down platforms on the Ribble Valley Line where there have traditionally been fewer passengers travelling north.

4.3.27 Hellifield will require more detailed assessment to cater for any increased interchange, especially customer information and adequate waiting facilities.

4.3.28 A notional figure of £0.5m has been suggested to cover possible enhancements that may be required once a service options is finalised. Note that this cost has not been included in the costs for the relevant options.

4.4 Conclusions

4.4.1 This analysis has covered a number of possible permutations as set out in the Brief, with a wider consideration of the possibilities on the Settle & Carlisle Line.

4.4.2 The first point is that the decision on extending the Manchester Victoria to Blackburn trains on to Clitheroe is one that can be made independently of any extension beyond Clitheroe to Hellifield and possibly beyond. Service extensions beyond Clitheroe are not dependent on the operation of an extra Blackburn - Clitheroe service, although it would permit a wider range of timetabling options.

4.4.3 For an extension to Hellifield, the key issues are the potential end destination of the train: Hellifield, Skipton or stations on the Settle & Carlisle Line, where depending on the frequency of the service, different destinations can be reached.

4.4.4 There is a trade-off between hourly and two hourly operation to Hellifield, with the two hourly option permitting through running to Settle, Ribblehead and potentially Garsdale. Running hourly restricts the destination to Hellifield (or Settle Junction), Skipton or, if the necessary infrastructure was put in place to reverse the train, Settle.

4.4.5 It is not currently possible to restart a passenger train from Hellifield or to operate a Clitheroe to Skipton service, as the signalling does not permit these moves at Hellifield.

4.4.6 Operation into Skipton may be challenging because as well as the terminating electric trains from Leeds and Bradford and through trains to/from Lancaster and Carlisle, there are also trains to and from Rylstone Quarry which change direction in Skipton station. This requires two platforms (3 & 4) for the engine run-round.

4.4.7 With a two hourly service it is possible to run as far as Garsdale without requiring an additional unit, so only incurring marginal mileage running costs. Reversal is possible at Ribblehead/Blea

Moor, which may restrict the availability for freight use of the up goods loop at Blea Moor, and Garsdale, which does also slightly impinge on engine run round capability at Blea Moor.

4.4.8 Projecting the Hellifield services south of Clitheroe provides potentially two options: Manchester or Preston. Preston is operationally challenging with limited capability to terminate local trains at Preston, especially on the west side of the station, which is where they ideally should operate from. The additional operation between Preston and Blackburn adds significantly to the mileage and staff costs but rolling stock costs are lower because of the use of 2 coach Class 156 units on all the other Preston centred local services (Blackpool South, Colne, Ormskirk) compared with 3 coach Class 150 units as used on Rochdale – Manchester Victoria – Blackburn – Clitheroe services.

4.4.9 The Preston option also provides improved services for the intermediate stations between Preston and Blackburn, which reduces the net cost with some additional revenue. It would also reduce crowding on other services on the same corridor (if there is any) and provide wider social and economic benefits. These would be assessed in any future Outline Business Case (OBC) should the Preston option be progressed.

4.4.10 Class 150 units are not ideal for longer distance, rural and predominately leisure travel with less spacious 2 + 3 seating and poor seat/window alignment.

Appendix A Glossary of Key Terms

Working Timetable (WTT)

The rail industries detailed timetable, containing all trains, freight and passenger, based on ½ minutes and including times at key points such as junctions and intermediate points at which trains do not stop.

Train Planning Rules (TPRs)

One of the building blocks of the WTT – showing the times required between conflicting trains at junctions, the permitted headways, accepted reversal times, platform lengths and all general details required to develop a robust timetable.

Sectional Running Times (SRTs)

The rail industries agreed train running times between two timetabling points on the network, which can vary according to the type of roiling sock and where trains stop, start or pass the timing point,

Running line nomenclature

Running lines on the rail network are designated Up and Down to provide a clear reference for staff working on the railway, train crew, signallers, engineering staff. As a rule of thumb, Up is to London, but the Midland used Up as to Derby, their Headquarters. The definition for each route is included in the Sectional Appendix which is a schematic view of the railway with all key locations and running lines noted and available to all operating staff.

Facing and Trailing connections

Points, the devices which enable trains to change from one line to another, are basically of one design. However, the higher the speed, the longer the radius of the turnout line curve so the longer the length the points become. For operating purposes, points are in two configurations, facing and trailing to the direction of travel of the train over them.

Facing points enable trains to diverge from a route, trailing points result in convergence. There is a risk of derailment with facing points as trains can potentially go in both directions, although only for a very short distance before they become derailed. The consequences can be catastrophic and so there is a requirement to fit ‘facing point locks’ to ensure that the points are locked in the required direction before the signals are cleared. Modern point motors perform this function.

Trailing points do not carry the same risk, so no not require to be locked, although in most modern signalling installations they will be because of being fitted with point motors.

A crossover is a pair of normally interworked points to allow trains to move between parallel lines from one line, typically on double track railways between the up and down lines.

Signal Nomenclature

Signal nomenclature in traditionally signalled absolute block areas such as this report covers is structured to ensure consistency and avoid misunderstanding. The signal at a signal box which permits access into the ‘block’ or ‘signal section’ is known as the starting signal. The ‘block’ or ‘signal section’ is the section of railway, often several miles long, between signal boxes into which, under normal circumstances, only one train is permitted at any one time in one direction on double track railways (clearly only one train on single track railways).

By definition, every signal box will have one, but only one, starting signal for each line it controls. If there are points at the signal box, there is a signal to protect them, marking the end of the block section from

the preceding signal box which is called the home signal. Depending on the complexity and length of the track in the area around the signal box, there may be more than one home signal with the usual description being inner and outer home signals with the outer one being further away.

For trains to be permitted to approach a signal box through the block section, there must be a safe space beyond the outer most home signal (as approached by the train), known as the overlap, in case the train runs past the signal. In absolute block areas this is normally 440 yards.

Starter and home signals are stop signals, which can only be passed in the 'off' position is at green. Each outermost home signal is preceded by a distant signal which is at a considerable distance out from the home signal, to give train divers time to slow and stop their train if the home signal is at red. Distant signals are yellow not red and can be passed when in the 'on' position.

Intermediate Block signal (IB Signal)

An intermediate block signal is a single stop signal with an associated distant signal which is located in a block section, usually towards the middle, which breaks the block section into two, thus increasing the capacity of the route without requiring additional signal boxes.

Whistle boards

Whistle boards are used to tell the driver to use the train horn and are generally located on the approaches to footpath or farm level crossings to alert users of the approaching train.

Appendix B Hellifield South Junction Signalling Diagram

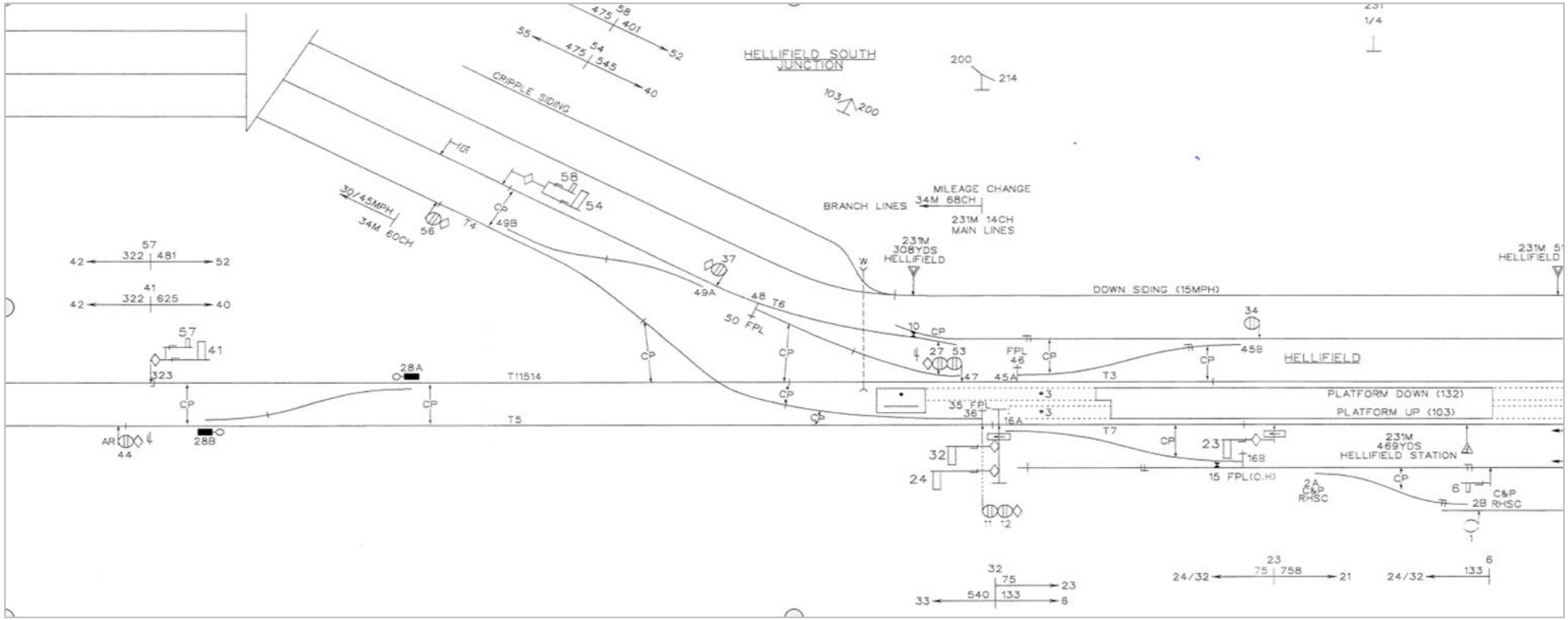

Figure A:1: Hellifield South Junction Signalling

Appendix C Composite timetables showing some possible option integration options

Composite Timetables

Composite timetable Option 1Aii and Option 3 (Down)

		2H29YB	2H10FY		2H03YB	2H12FY	2H05YB		1M53MG	2H06YB		2H86FY	2H16YB		2H90FY	2H17YB		2H92FY		2H94FY	2H21YB	2H96FY		2H27YB	2H29GW
To							MORCAME			MORCAME			MORCAME			MORCAME						MORCAME				
							10:27			12:24			14:24			16:32						19:51				
		150	150		150	150	150		150	150		150	150		150	150		150		150	150	150		150	150
		SX	SX		SX	SX	SX		SX	SX		SX	SX		SX	SX		SX		SX	SX	SX		SX	SX
		??	??		??	??	??		??	??		??	??		??	??		??		??	??	??		??	??
		21869000	21151900		21869000	21151900	21869000		21151900	21869000		21151900	21869000		21151900	21869000		21151900		21151900	21869000	21151900		21869000	21151900
Leeds	Dep	..	05:17		07:20	07:48	08:18		09:19	10:18		10:49	12:18		13:18	14:18		15:18		16:48	17:26	18:18		19:18	19:49
Skipton	Dep	05:22	06:02		07:59	08:26	08:56		09:59	10:57		11:27	12:58		13:57	14:58		16:00		17:27	18:10	18:56		20:00	20:27
Gargrave	Dep	05:28	..		08:05	08:32	09:02		10:04	11:03		11:33	13:04		..	15:04		..		17:32	18:15	..		20:06	20:33
Manchester	Dep			05:37				07 41			09 41			11 41			13 41		15 41				17 41		
Blackburn	Dep			06 33				08 33			10 33			12 33			14 33		16 33				18 33		
Clitheroe	Dep			06 55				08 55			10 55			12 55			14 55		16 55				18 55		
Hellifield	Arr	05:36	06:14	07 20	08:13	08:40	09:10	09 18	10:12	11:11	11 18	11:41	13:12	13 18	14:09	15:12	15 18	16:12	17 18	17:40	18:23	19:08	19 18	20:14	20:41
	Dep	05:37	06:14	07 21	08:15	08:40	09:10	09 19	10:13	11:11	11 19	11:41	13:12	13 19	14:09	15:13	15 19	16:13	17 19	17:41	18:24	19:09	19 19	20:14	20:42
Long Preston	Dep	05:40	..	..	08:18	..	09:13	09 22	10:15	11:14	11 22	11:44	13:15	13 22	..	15:15	15 22	..	17 22	17:43	18:26	19:11	19 22	20:17	20:44
Settle Jn		*05/43*	*06/18*	*07/26*	*08/22*	*08/45*	*09/16*	*09/26*	*10/18*	*11/18*	*11/26*	*11/46*	*13/19*	*13/26*	*14/13*	*15/19*	*15/26*	*16/17*	*17/26*	*17/46*	*18/30*	*19/14*	*19/26*	*20/21*	*20/47*
Giggleswick	Dep	05:48	..		08:27	..	09:21		..	11:22		..	13:23		..	15:23		..		..	18:34	..		20:25	..
Clapham (North Yorkshire)	Dep	05:56	..		08:35	..	09:29		..	11:30		..	13:31		..	15:31		..		..	18:43	..		20:34	..
Bentham	Dep	06:03	..		08:42	..	09:35		..	11:36		..	13:37		..	15:38		..		..	18:49	..		20:40	..
Wennington	Dep	06:08	..		08:48	..	09:40		..	11:42		..	13:43		..	15:43		..		..	18:55	..		20:46	..
Camforth	Arr	06:22	..		09:04	..	09:57		..	11:58		..	13:59		..	15:59		..		..	19:11	..		21:02	..
Lancaster	Arr	06:31	..		09:13	..	10:06		..	12:10		..	14:09		..	16:08		..		..	19:24	..		21:14	..
Settle	Dep	..	06:22	07 30	..	08:50	..	09 30	10:22	..	11 30	11:51	..	13 30	14:17	..	15 30	16:20	17 30	17:49	..	19:17	19 30	..	20:50
Horton In Ribblesdale	Dep	..	06:30	07 39	..	08:58	..	09 39	10:31	..	11 39	11:59	..	13 39	14:25	..	15 39	16:29	17 39	17:58	..	19:26	19 39	..	20:59
Ribblehead	Arr	..	06:38	07 46	..	09:06	..	09 46	10:38	..	11 46	12:07	..	13 46	14:33	..	15 46	16:36	17 46	18:05	..	19:33	19 46	..	21:08
	Dep	..	06:38	07 47	..	09:06	..	09 50	10:39	..	11 47	12:07	..	13 47	14:33	..	15 47	16:37	17 47	18:06	..	19:33	19 47	..	---
Blea Moor			*06/41*	*07/50*		*09/09*		*09/53*	*10/42*		*11/50*	*12/10*		*13/50*	*14/36*		*15/50*	*16/40*	*17/50*	*18/09*		*19/36*	*19/50*		
Dent	Dep	..	06:48	07 57	..	09:16	..	10 00	10:48	..	11 57	12:17	..	13 57	14:43	..	15 57	16:46	17 57	18:15	..	19:43	19 57	..	..
Garsdale	Dep	..	06:53	08 03	..	09:21	..	10 06	10:54	..	12 03	12:22	..	14 03	14:48	..	16 03	16:52	18 03	18:21	..	19:48	20 03	..	..
Kirkby Stephen	Dep	..	07:06		..	09:34	..		11:06	..		12:35	..		15:01	..		17:04		18:33	..	20:01		..	..
Appleby	Dep	..	07:18		..	09:48	..		11:19	..		12:48	..		15:14	..		17:17		18:46	..	20:13		..	..
Langwathby	Dep	..	07:32		..	10:01	..		11:32	..		13:02	..		15:28	..		17:31		19:00	..	20:27		..	..
Lazonby & Kirkoswald	Dep	..	07:38		..	10:07	..		11:38	..		13:08	..		15:33	..		17:36		19:05	..	20:33		..	..
Armathwaite	Dep	..	07:46		..	10:15	..		11:46	..		13:16	..		15:41	..		17:44		19:13	..	20:40		..	..
Carlisle	Arr	..	08:03		..	10:31	..		12:01	..		13:31	..		16:01	..		18:00		19:28	..	20:55		..	..

C.1.1 Option 1A offers the lowest cost method of securing a link between Manchester Victoria, Hellifield and the Settle & Carlisle Line. It extends the existing (Rochdale) - Manchester Victoria – Clitheroe service through to Hellifield every two hours. The hours presented here also include extension beyond Hellifield through Settle and Ribblehead to Garsdale and provide at least 17 minutes for a reversal at Garsdale, of which only 9 minutes is required for the activity, leaving a minimum 8-minute recovery time. These hours would also permit an operation turning at Settle Junction or Ribblehead.

C.1.2 Operation in the alternative two hours is also potentially possible, but there are more clashes with trains running through Hellifield on the Leeds Lancaster/Carlisle routes. Clashes at Ribblehead have been managed by small re-timing of service, but not impacting on the basic structure.

Composite timetable Option 1Aii and Option 3 (Up)

C.1.3 Option 1A running at two hourly intervals and running onto the Settle & Carlisle Line to Garsdale and back requires one additional unit. Total turn round time at Clitheroe is 30 minutes so the 17 to 20 minutes turnaround at Garsdale represents an increase in utilisation, whilst still providing adequate time for performance recovery and avoiding excessive time standing on the main line.

Composite timetable Option 1Aii and Option 3 (Up)

		2H81GZ	2H54NL			2H85GZ	2Y58NL		2Y60NL	2H89GY		2Y62NL		1E65GZ	2Y01NL	2H93GZ		2H95GZ	2H02NL		2H97GA		2Y03NL	2H04CA	2H88NL
									10:33			12:32			14:32				17:31				20:07		
From									MORCAME			MORCAME			MORCAME				MORCAME				MORCAME		
		150	150			150	142		150	150		150		150	150	150		150	150		150		150	142	150
		SX	SX			SX	SX		SX	SX		SX		SX	SX	SX		SX	SX		SX		SX	SX	SX
		??	??			??	??		??	??		??		??	??	??		??	??		??		??	??	??
		21151900	21869000			21151900	21869000		21869000	21151900		21869000		21151900	21869000	21151900		21151900	21869000		21151900		21869000	21151900	21869000
Carlisle	Dep	05:51	..			08:24	..		..	10:49		..		13:40	..	14:50		16:18	..		18:24		..	..	..
Armathwaite	Dep	06:05	..			08:38	..		..	11:04		..		..	..	15:04		16:32	..		18:38		..	..	..
Lazonby & Kirkoswald	Dep	06:12	..			08:45	..		..	11:12		..		..	..	15:11		16:39	..		18:45		..	..	..
Langwathby	Dep	06:19	..			08:52	..		..	11:18		..		..	..	15:18		16:46	..		18:52		..	..	..
Appleby	Dep	06:33	..			09:06	..		..	11:33		..		14:17	..	15:32		17:00	..		19:06		..	..	..
Kirkby Stephen	Dep	06:46	..			09:20	..		..	11:46		..		14:31	..	15:46		17:14	..		19:20		..	..	..
Garsdale	Dep	07:00	..		08 23	09:33	..	10 23	..	12:05	12 23	..	14 20	..	..	15:59	16 23	17:27	..	18 23	19:33	20 23	..	..	..
Dent	Dep	07:05	..		08 28	09:38	..	10 28	..	12:10	12 28	..	14 25	..	..	16:04	16 28	17:32	..	18 28	19:38	20 28	..	..	..
Blea Moor		*07/10*			*08/33*	*09/44*		*10/33*		*12/15*	*12/33*		*14/30*			*16/09*	*16/33*	*17/37*		*18/33*	*19/43*	*20/33*			
Ribblehead	Arr	07:14	..		08 37	09:47	..	10 37	..	12:19	12 37	..	14 37	..	..	16:13	16 37	17:41	..	18 37	19:47	20 37	..	---	..
	Dep	07:14	..		08 38	09:48	..	10 38	..	12:19	12 38	..	14 38	..	..	16:14	16 38	17:42	..	1838	19:48	20 38	..	21:45	..
Horton In Ribblesdale	Dep	07:21	..		08 44	09:54	..	10 44	..	12:26	12 44	..	14 44	..	..	16:20	16 44	17:48	..	18 44	19:54	20 44	..	21:51	..
Settle	Dep	07:29	..		08 52	10:02	..	10 52	..	12:34	12 52	..	14 52	15:07	..	16:28	16 52	17:56	..	18 52	20:02	20 52	..	21:59	..
Lancaster	Dep	..	06:48			..	09:41		10:46	..		12:45		..	14:48	..		..	17:45		..		20:30	..	21:30
Carnforth	Dep	..	06:59			..	09:50		10:55	..		12:55		..	14:57	..		..	17:55		..		20:40	..	21:43
Wennington	Dep	..	07:13			..	10:04		11:09	..		13:08		..	15:11	..		..	18:09		..		20:54	..	21:57
Bentham	Dep	..	07:19			..	10:10		11:15	..		13:14		..	15:17	..		..	18:15		..		21:00	..	22:02
Clapham (North Yorkshire)	Dep	..	07:26			..	10:16		11:21	..		13:20		..	15:23	..		..	18:21		..		21:06	..	22:09
Giggleswick	Dep	..	07:35			..	10:27		11:32	..		13:31		..	15:34	..		..	18:32		..		21:17	..	22:19
Settle Jn		*07/31*	*07/39*	*07/55*	*08/55*	*10/05*	*10/30*	*10/55*	*11/35*	*12/36*	*12/55*	*13/34*	*14/55*	*15/10*	*15/37*	*16/31*	*16/55*	*17/59*	*18/35*	*18/55*	*20/05*	*20/55*	*21/20*	*22/02*	*22/22*
Long Preston	Dep	07:34	07:43	07 59	08 59	..	10:33	10 59	11:38	..	12 58	13:37	14 58	..	15:40	16:34	16 58	18:02	18:39	18 58	20:08	20 58	21:23	22:05	22:26
Hellifield	Arr	07:37	07:46	08 02	09 02	10:09	10:36	11 02	11:41	..	13 02	13:40	15 02	..	15:42	16:36	17 02	18:04	18:41	19 02	20:10	21 02	21:25	22:08	22:28
	Dep	07:37	07:46	08 03	09 03	10:10	10:37	11 03	11:41	..	13 03	13:40	15 03	..	15:43	16:37	17 03	18:05	18:42	19 03	20:11	21 03	21:26	22:08	22:28
Clitheroe	Arr			08 25	09 25			11 25			13 23		15 25				17 25			19 25		21 25			
Blackburn	Arr			08 47	09 47			11 47			13 45		15 47				17 47			19 47		21 47			
Manchester	Arr			09 41	10 41			12 41			14 41		16 41				18 41			20 41					
Gargrave	Dep	07:45	07:55			..	10:45		11:50	..		13:49		..	15:51	16:45		18:13	18:50		20:19		21:34	22:16	22:37
Skipton	Arr	07:53	08:03			10:24	10:53		11:57	12:54		13:56		15:27	15:58	16:54		18:21	18:58		20:27		21:41	22:25	22:44
Leeds	Arr	08:33	08:41			11:08	11:38		12:38	13:38		14:37		16:04	16:39	17:39		19:08	19:38		21:06		22:22	23:12	..
				Possibe additional am peak																19 25 from Clitheroe is 19 10 running 15 min later						

Composite timetable Option 1Biv and Option 3 (Down)

		2H29YB		2H10FY		2H03YB	2H12FY	2H05YB		1M53MG		2H06YB	2H86FY		2H16YB	2H90FY		2H17YB	2H92FY		2H94FY	2H21YB		2H96FY	2H27YB		2H29GW
To								MORCAME				MORCAME			MORCAME			MORCAME				MORCAME					
								10:27				12:24			14:24			16:32				19:51					
		150		150		150	150	150		150		150	150		150	150		150	150		150	150		150	150		150
		SX		SX		SX	SX	SX		SX		SX	SX		SX	SX		SX	SX		SX	SX		SX	SX		SX
		??		??		??	??	??		??		??	??		??	??		??	??		??	??		??	??		??
		21869000		21151900		21869000	21151900	21869000		21151900		21869000	21151900		21869000	21151900		21869000	21151900		21151900	21869000		21151900	21869000		21151900
Leeds	Dep	..		05:17		07:20	07:48	08:18		09:19		10:18	10:49		12:18	13:18		14:18	15:18		16:48	17:26		18:18	19:18		19:49
Skipton	Dep	05:22		06:02		07:59	08:26	08:56		09:59		10:57	11:27		12:58	13:57		14:58	16:00		17:27	18:10		18:56	20:00		20:27
Gargrave	Dep	05:28		..		08:05	08:32	09:02		10:04		11:03	11:33		13:04	..		15:04	..		17:32	18:15		..	20:06		20:33
Manchester	Dep								07 03		09 03			11 03			13 03			15 03			17 03			19 03	
Blackburn	Dep				06 11				08 09		10 09			12 09			14 09			16 09			18 09			20 09	
Clitheroe	Dep				06 35				08 32		10 32			12 32			14 32			16 32			18 32			20 32	
Hellifield	Arr	05:36		06:14	06 58	08:13	08:40	09:10	08 55	10:12	10 55	11:11	11:41	12 55	13:12	14:09	14 55	15:12	16:12	16 55	17:40	18:23	18 55	19:08	20:14	20 55	20:41
	Dep	05:37		06:14	06 59	08:15	08:40	09:10	08 56	10:13	10 56	11:11	11:41	12 56	13:12	14:09	14 56	15:13	16:13	16 56	17:41	18:24	18 56	19:09	20:14	20 56	20:42
Long Preston	Dep	05:40		..	..	08:18	..	09:13	08 59	10:15	10 59	11:14	11:44	12 59	13:15	..	14 59	15:15	..	16 59	17:43	18:26	18 59	19:11	20:17	20 59	20:44
Settle Jn		*05/43*		*06/18*	*07/06*	*08/22*	*08/45*	*09/16*	*09/03*	*10/18*	*11/03*	*11/18*	*11/46*	*13/03*	*13/19*	*14/13*	*15/03*	*15/19*	*16/17*	*17/03*	*17/46*	*18/30*	*19/03*	*19/14*	*20/21*	*21/03*	*20/47*
Giggleswick	Dep	05:48		..		08:27	..	09:21		..		11:22	..		13:23	..		15:23	..		..	18:34		..	20:25		..
Clapham (North Yorkshire)	Dep	05:56		..		08:35	..	09:29		..		11:30	..		13:31	..		15:31	..		..	18:43		..	20:34		..
Bentham	Dep	06:03		..		08:42	..	09:35		..		11:36	..		13:37	..		15:38	..		..	18:49		..	20:40		..
Wennington	Dep	06:08		..		08:48	..	09:40		..		11:42	..		13:43	..		15:43	..		..	18:55		..	20:46		..
Carnforth	Arr	06:22		..		09:04	..	09:57		..		11:58	..		13:59	..		15:59	..		..	19:11		..	21:02		..
Lancaster	Arr	06:31		..		09:13	..	10:06		..		12:10	..		14:09	..		16:08	..		..	19:24		..	21:14		..
Settle	Dep			06:22	07 10	..	08:50	..	09 07	10:22	11 07	..	11:51	13 07	..	14:17	15 07	..	16:20	17 07	17:49	..	19 07	19:17	..	21 07	20:50
Horton In Ribblesdale	Dep			06:30	07 19	..	08:58	..	09 16	10:31	11 16	..	11:59	13 16	..	14:25	15 16	..	16:29	17 16	17:58	..	19 16	19:26	..	21 16	20:59
Ribblehead	Arr			06:38	07 26	..	09:06	..	09 23	10:38	11 23	..	12:07	13 23	..	14:33	15 23	..	16:36	17 23	18:05	..	19 23	19:33	..	21 23	21:08
	Dep			06:38	07 27	..	09:06	..	09 27	10:39	11 24	..	12:07	13 24	..	14:33	15 24	..	16:37	17 24	18:06	..	19 24	19:33	..	21 24	----
Blea Moor			*06/41*	*07/30*		*09/09*		*09/30*	*10/42*	*11/27*		*12/10*	*13/27*		*14/36*	*15/27*		*16/40*	*17/27*	*18/09*		*19/27*	*19/36*		*21/27*	
Dent	Dep			06:48	07 37	..	09:16	..	09 37	10:48	11 34	..	12:17	13 34	..	14:43	15 34	..	16:46	17 34	18:15	..	19 34	19:43	..	21 34	
Garsdale	Dep		..	06:53	07 43	..	09:21	..	09 43	10:54	11 40	..	12:22	13 40	..	14:48	15 40	..	16:52	17 40	18:21	..	19 40	19:48	..	21 40	
Kirkby Stephen	Dep		..	07:06		..	09:34	..		11:06		..	12:35		..	15:01		..	17:04		18:33	..		20:01	..	..	
Appleby	Dep		..	07:18		..	09:48	..		11:19		..	12:48		..	15:14		..	17:17		18:46	..		20:13	..	..	
Langwathby	Dep		..	07:32		..	10:01	..		11:32		..	13:02		..	15:28		..	17:31		19:00	..		20:27	..	..	
Lazonby & Kirkoswald	Dep		..	07:38		..	10:07	..		11:38		..	13:08		..	15:33		..	17:36		19:05	..		20:33	..	..	
Armathwaite	Dep		..	07:46		..	10:15	..		11:46		..	13:16		..	15:41		..	17:44		19:13	..		20:40	..	..	
Carlisle	Arr		..	08:03		..	10:31	..		12:01		..	13:31		..	16:01		..	18:00		19:28	..		20:55	..	..	

C.1.4 Option 1B adds in the additional Blackburn to Clitheroe service, to move to a broadly half hourly service Manchester Victoria - Clitheroe and, in this case, the Hellifield extension shown is a projection of one of the services extended to Clitheroe to demonstrate this effect of this option. The key structural issue here is that the turn round time at Garsdale, whilst technically feasible does not include a significant performance recovery component. This might be created by reducing calls, at some of the intermediate stations. This difference compared with Option 1A is because the Manchester Victoria – Blackburn service is held back on its arrival into Blackburn to allow the Blackpool North – York service to pass in front at Blackburn Bolton Junction, so is 35 minutes after the previous Manchester Victoria – Clitheroe service on departure from Blackburn, and all the way potentially to Garsdale.

C.1.5 Option 1B could as easily use the Option 1A services to project to Hellifield and beyond to give the same quantum of services. An operational timetable would probably use that method of delivering the Hellifield and beyond service as well as the Clitheroe half hourly service. This would be a decision to be made during the preparation of more detailed timetables, especially taking into account the timetable operating on the Leeds – Lancaster/Carlisle route at that time.

C.1.6 This Option 1B requires two units, one to double the service frequency to Clitheroe and one to operate beyond Clitheroe to Hellifield and beyond.

Composite timetable Option 1Biv and Option 3 (Up)

		2H81GZ	2H54NL		2H85GZ		2Y58NL	2Y60NL		2H89GY	2Y62NL		1E65GZ	2Y01NL		2H93GZ		2H95GZ	2H02NL	2H97GA	2Y03NL		2H04CA	2H88NL	
								10:33			12:32			14:32					17:31		20:07				
From								MORCAME			MORCAME			MORCAME					MORCAME		MORCAME				
		150	150		150		142	150		150	150		150	150		150	150		150	150	150		142	150	
		SX	SX		SX		SX	SX		SX	SX		SX	SX		SX	SX		SX	SX	SX		SX	SX	
		??	??		??		??	??		??	??		??	??		??	??		??	??	??		??	??	
		21151900	21869000		21151900		21869000	21869000		21151900	21869000		21151900	21869000		21151900	21151900		21869000	21151900	21869000		21151900	21869000	
Carlisle	Dep	05:51	..		08:24		..	..		10:49	..		13:40	..		14:50	16:18		..	18:24	..		..	..	
Armathwaite	Dep	06:05	..		08:38		..	..		11:04	..		..	..		15:04	16:32		..	18:38	..		..	..	
Lazonby & Kirkoswald	Dep	06:12	..		08:45		..	..		11:12	..		..	..		15:11	16:39		..	18:45	..		..	..	
Langwathby	Dep	06:19	..		08:52		..	..		11:18	..		..	..		15:18	16:46		..	18:52	..		..	..	
Appleby	Dep	06:33	..		09:06		..	..		11:33	..		14:17	..		15:32	17:00		..	19:06	..		..	..	
Kirkby Stephen	Dep	06:46	..		09:20		..	..		11:46	..		14:31	..		15:46	17:14		..	19:20	..		..	..	
Garsdale	Dep	07:00	..	07 43	09:33	09 43	..	..	11 57	12:05	..	13 57	..	..	15 32	15:59	17:27	17 32	..	19:33	..	19 43	..	..	21 57
Dent	Dep	07:05	..	07 58	09:38	09:57	..	..	11:57	12:10	..	13:57	..	..	15 57	16:04	17:32	17 57	..	19:38	..	19 57	..	..	21 57
Blea Moor		*07/10*		*08/03*	*09/44*	*10/02*			*12/02*	*12/15*		*14/02*			*16/02*	*16/09*	*17/37*	*18/02*		*19/43*		*20/02*			*22/02*
Ribblehead	Arr	07:14	..	08 07	09:47	10 06	..	..	12 06	12:19	..	14 06	..	..	16 06	16:13	17:41	18 06	..	19:47	..	20 06	----	..	22 06
	Dep	07:14	..	08 08	09:48	10 07	..	..	12 07	12:19	..	14 07	..	..	16 07	16:14	17:42	18 07	..	19:48	..	20 07	21:45	..	22 07
Horton In Ribblesdale	Dep	07:21	..	08 14	09:54	10 13	..	..	12 13	12:26	..	14 13	..	..	16 13	16:20	17:48	18 13	..	19:54	..	20 13	21:51	..	22 13
Settle	Dep	07:29	..	08 22	10:02	10 21	..	..	12 21	12:34	..	14 21	15:07	..	16 21	16:28	17:56	18 21	..	20:02	..	20 21	21:59	..	22 21
Lancaster	Dep	..	06:48		..		09:41	10:46		..	12:45		..	14:48		..	..		17:45	..	20:30		..	21:30	
Carnforth	Dep	..	06:59		..		09:50	10:55		..	12:55		..	14:57		..	..		17:55	..	20:40		..	21:43	
Wennington	Dep	..	07:13		..		10:04	11:09		..	13:08		..	15:11		..	..		18:09	..	20:54		..	21:57	
Bentham	Dep	..	07:19		..		10:10	11:15		..	13:14		..	15:17		..	..		18:15	..	21:00		..	22:02	
Clapham (North Yorkshire)	Dep	..	07:26		..		10:16	11:21		..	13:20		..	15:23		..	..		18:21	..	21:06		..	22:09	
Giggleswick	Dep	..	07:35		..		10:27	11:32		..	13:31		..	15:34		..	..		18:32	..	21:17		..	22:19	
Settle Jn		*07/31*	*07/39*	*08/25*	*10/05*	*10/24*	*10/30*	*11/35*	*12/24*	*12/36*	*13/34*	*14/24*	*15/10*	*15/37*	*16/24*	*16/31*	*17/59*	*18/24*	*18/35*	*20/05*	*21/20*	*20/24*	*22/02*	*22/22*	*22/24*
Long Preston	Dep	07:34	07:43	08 29	..	10 28	10:33	11:38	12 28	..	13:37	14 28	..	15:40	16 58	16:34	18:02	18 58	18:39	20:08	21:23	20 58	22:05	22:26	22 58
Hellifield	Arr	07:37	07:46	08 32	10:09	10 31	10:36	11:41	12 31	..	13:40	14 31	..	15:42	14 31	16:36	18:04	19 31	18:41	20:10	21:25	21 31	22:08	22:28	22 31
	Dep	07:37	07:46	08 33	10:10	10 32	10:37	11:41	12 32	..	13:40	14 32	..	15:43	14 32	16:37	18:05	19 32	18:42	20:11	21:26	21 32	22:08	22:28	22 32
Clitheroe	Arr			08 55		10:54			12:54			14:54			16 54			19 54				21 54			22 54
Blackburn	Arr			09 17		11:16			13:16			15:16			15 16			20 16				22 16			23 16
Manchester	Arr			10 09		12 09			14 09			16 09			18 09										00 05
Gargrave	Dep	07:45	07:55		..		10:45	11:50		..	13:49		..	15:51		16:45	18:13		18:50	20:19	21:34		22:16	22:37	
Skipton	Arr	07:53	08:03		10:24		10:53	11:57		12:54	13:56		15:27	15:58		16:54	18:21		18:58	20:27	21:41		22:25	22:44	
Leeds	Arr	08:33	08:41		11:08		11:38	12:38		13:38	14:37		16:04	16:39		17:39	19:08		19:38	21:06	22:22		23:12	..	

Composite timetable Option 2 and Option 3 (Down)

		2H29YB	2H10FY		2H03YB	2H12FY	2H05YB		1M53MG	2H06YB		2H86FY	2H16YB		2H90FY	2H17YB		2H92FY	2H94FY		2H21YB	2H96FY		2H27YB	2H29GW
To							MORCAME			MORCAME			MORCAME			MORCAME					MORCAME				
							10:27			12:24			14:24			16:32					19:51				
		150	150		150	150	150		150	150		150	150		150	150		150	150		150	150		150	150
		SX	SX		SX	SX	SX		SX	SX		SX	SX		SX	SX		SX	SX		SX	SX		SX	SX
		??	??		??	??	??		??	??		??	??		??	??		??	??		??	??		??	??
		21869000	21151900		21869000	21151900	21869000		21151900	21869000		21151900	21869000		21151900	21869000		21151900	21151900		21869000	21151900		21869000	21151900
Leeds	Dep	..	05:17		07:20	07:48	08:18		09:19	10:18		10:49	12:18		13:18	14:18		15:18	16:48		17:26	18:18		19:18	19:49
Skipton	Dep	05:22	06:02		07:59	08:26	08:56		09:59	10:57		11:27	12:58		13:57	14:58		16:00	17:27		18:10	18:56		20:00	20:27
Gargrave	Dep	05:28	..		08:05	08:32	09:02		10:04	11:03		11:33	13:04		..	15:04		..	17:32		18:15	..		20:06	20:33
Preston	Dep			06 27				08 27			10 19			12 27			14 27			16 27			18 27		
Blackburn	Dep			06 54				08 54			10 46			12 54			14 54			16 54			18 54		
Clitheroe	Dep			07 15				09 15			11 07			13 15			15 15			17 15			19 15		
Hellifield	Arr	05:36	06:14	07 39	08:13	08:40	09:10	09 39	10:12	11:11	11 31	11:41	13:12	13 39	14:09	15:12	15 39	16:12	17:40	17 42	18:23	19:08	19 39	20:14	20:41
	Dep	05:37	06:14	07 40	08:15	08:40	09:10	09 40	10:13	11:11	11 32	11:41	13:12	13 40	14:09	15:13	15 40	16:13	17:41	17 47	18:24	19:09	19 40	20:14	20:42
Long Preston	Dep	05:40	..	07 43	08:18	..	09:13	09 43	10:15	11:14	11 35	11:44	13:15	13 43	..	15:15	15 43	..	17:43	17 50	18:26	19:11	19 43	20:17	20:44
Settle Jn		*05/43*	*06/18*	*07/46*	*08/22*	*08/45*	*09/16*	*09/46*	*10/18*	*11/18*	*11/38*	*11/46*	*13/19*	*13/46*	*14/13*	*15/19*	*15/46*	*16/17*	*17/46*	*17/53*	*18/30*	*19/14*	*19/46*	*20/21*	*20/47*
Giggleswick	Dep	05:48	..		08:27	..	09:21		..	11:22		..	13:23		..	15:23		..	..		18:34	..		20:25	..
Clapham (North Yorkshire)	Dep	05:56	..		08:35	..	09:29		..	11:30		..	13:31		..	15:31		..	..		18:43	..		20:34	..
Bentham	Dep	06:03	..		08:42	..	09:35		..	11:36		..	13:37		..	15:38		..	..		18:49	..		20:40	..
Wennington	Dep	06:08	..		08:48	..	09:40		..	11:42		..	13:43		..	15:43		..	..		18:55	..		20:46	..
Carnforth	Arr	06:22	..		09:04	..	09:57		..	11:58		..	13:59		..	15:59		..	..		19:11	..		21:02	..
Lancaster	Arr	06:31	..		09:13	..	10:06		..	12:10		..	14:09		..	16:08		..	..		19:24	..		21:14	..
Settle	Dep	..	06:22	07 50	..	08:50	..		10:22	..		11:51	..		14:17	..		16:20	17:49		..	19:17		..	20:50
Horton In Ribblesdale	Dep	..	06:30	07 59	..	08:58	..		10:31	..		11:59	..		14:25	..		16:29	17:58		..	19:26		..	20:59
Ribblehead	Arr	..	06:38	08 06	..	09:06	..		10:38	..		12:07	..		14:33	..		16:36	18:05		..	19:33		..	21:08
	Dep	..	06:38	08 07	..	09:06	..		10:39	..		12:07	..		14:33	..		16:37	18:06		..	19:33		..	----
Blea Moor			*06/41*	*08/10*		*09/09*			*10/42*			*12/10*			*14/36*			*16/40*	*18/09*			*19/36*			
Dent	Dep	..	06:48	08 17	..	09:16	..		10:48	..		12:17	..		14:43	..		16:46	18:15		..	19:43		..	..
Garsdale	Dep	..	06:53	08 23	..	09:21	..		10:54	..		12:22	..		14:48	..		16:52	18:21		..	19:48		..	..
Kirkby Stephen	Dep	..	07:06		..	09:34	..		11:06	..		12:35	..		15:01	..		17:04	18:33		..	20:01		..	..
Appleby	Dep	..	07:18		..	09:48	..		11:19	..		12:48	..		15:14	..		17:17	18:46		..	20:13		..	..
Langwathby	Dep	..	07:32		..	10:01	..		11:32	..		13:02	..		15:28	..		17:31	19:00		..	20:27		..	..
Lazonby & Kirkoswald	Dep	..	07:38		..	10:07	..		11:38	..		13:08	..		15:33	..		17:36	19:05		..	20:33		..	..
Armathwaite	Dep	..	07:46		..	10:15	..		11:46	..		13:16	..		15:41	..		17:44	19:13		..	20:40		..	..
Carlisle	Arr	..	08:03		..	10:31	..		12:01	..		13:31	..		16:01	..		18:00	19:28		..	20:55		..	..

C.1.7 The Option 2 times shown here are the closest to providing a half hourly local service between Preston and Blackburn whilst still offering a meaningful doubling of service between Blackburn and Clitheroe. In this case, the Preston service is specified to be extended to Hellifield every two hours and, for clarity, the Preston – Clitheroe short workings are not shown in the timetables here.

C.1.8 This service cannot project beyond Settle Junction as it cannot reliably get to Ribblehead and Blea Moor before it needs to start its return journey - see extensions of first trains to illustrate the problem.

C.1.9 This connection illustrates the challenge of bringing together three discrete service patterns, Preston – Blackburn, Manchester Victoria – Clitheroe and Leeds – Lancaster/Carlisle. At this stage, no attempt was made to complete the timetable into Preston which is itself a constrained location. Network Rail did not include Preston in their Capacity Analysis study.

Composite timetable Option 2 and Option 3 (Up)

		2H81GZ	2H54NL		2H85GZ		2Y58NL		2Y60NL	2H89GY		2Y62NL		1E65GZ	2Y01NL	2H93GZ		2H95GZ	2H02NL		2H97GA	
									10:33			12:32			14:32				17:31			
From									MORCAME			MORCAME			MORCAME				MORCAME			
		150	150		150		142		150	150		150		150	150	150		150	150		150	
		SX	SX		SX		SX		SX	SX		SX		SX	SX	SX		SX	SX		SX	
		??	??		??		??		??	??		??		??	??	??		??	??		??	
		21151900	21869000		21151900		21869000		21869000	21151900		21869000		21151900	21869000	21151900		21151900	21869000		21151900	
Carlisle	Dep	05:51	..		08:24		..		..	10:49		..		13:40	..	14:50		16:18	..		18:24	
Armathwaite	Dep	06:05	..		08:38		..		..	11:04		..		..	..	15:04		16:32	..		18:38	
Lazonby & Kirkoswald	Dep	06:12	..		08:45		..		..	11:12		..		..	..	15:11		16:39	..		18:45	
Langwathby	Dep	06:19	..		08:52		..		..	11:18		..		..	..	15:18		16:46	..		18:52	
Appleby	Dep	06:33	..		09:06		..		..	11:33		..		14:17	..	15:32		17:00	..		19:06	
Kirkby Stephen	Dep	06:46	..		09:20		..		..	11:46		..		14:31	..	15:46		17:14	..		19:20	
Garsdale	Dep	07:00	..	07 58	09:33		..		..	12:05		..		..	..	15:59		17:27	..		19:33	
Dent	Dep	07:05	..	08 03	09:38		..		..	12:10		..		..	..	16:04		17:32	..		19:38	
Blea Moor		*07/10*		*08/08*	*09/44*					*12/15*						*16/09*		*17/37*			*19/43*	
Ribblehead	Arr	07:14	..	08 12	09:47		..		..	12:19		..		..	..	16:13		17:41	..		19:47	
	Dep	07:14	..	08 13	09:48		..		..	12:19		..		..	..	16:14		17:42	..		19:48	
Horton In Ribblesdale	Dep	07:21	..	08 19	09:54		..		..	12:26		..		..	..	16:20		17:48	..		19:54	
Settle	Dep	07:29	..	08 27	10:02		..		..	12:34		..		15:07	..	16:28		17:56	..		20:02	
Lancaster	Dep	..	06:48		..		09:41		10:46	..		12:45		..	14:48	..		..	17:45		..	
Carnforth	Dep	..	06:59		..		09:50		10:55	..		12:55		..	14:57	..		..	17:55		..	
Wennington	Dep	..	07:13		..		10:04		11:09	..		13:08		..	15:11	..		..	18:09		..	
Bentham	Dep	..	07:19		..		10:10		11:15	..		13:14		..	15:17	..		..	18:15		..	
Clapham (North Yorkshire)	Dep	..	07:26		..		10:16		11:21	..		13:20		..	15:23	..		..	18:21		..	
Giggleswick	Dep	..	07:35		..		10:27		11:32	..		13:31		..	15:34	..		..	18:32		..	
Settle Jn		*07/31*	*07/39*	*08/30*	*10/05*		*10/30*	*10/40*	*11/35*	*12/36*	*12/41*	*13/34*	*14/41*	*15/10*	*15/37*	*16/31*	*16/41*	*17/59*	*18/35*	*18/43*	*20/05*	*20/11*
Long Preston	Dep	07:34	07:43	08 34	..		10:33	10 44	11:38	..	12 45	13:37	14 45	..	15:40	16:34	16 45	18:02	18:39	18 47	20:08	20 14
Hellifield	Arr	07:37	07:46	08 37	10:09		10:36	10 47	11:41	..	12 48	13:40	14 48	..	15:42	16:36	16 48	18:04	18:41	18 50	20:10	20 16
	Dep	07:37	07:46	08 38	10:10		10:37	10 48	11:41	12/40	12 49	13:40	14 49	..	15:43	16:37	16 49	18:05	18:42	18 51	20:11	20 17
Clitheroe	Arr			09 02				11 12			13 13		15 13				17 13			19 15		20 41
Blackburn	Arr			09 25				11 35			13 36		15 36				17 36			10 38		21 04
Preston	Arr			09 52				12 02			14 03		16 03				18 03			20 05		21 31
Gargrave	Dep	07:45	07:55		..		10:45		11:50	..		13:49		..	15:51	16:45		18:13	18:50		20:19	
Skipton	Arr	07:53	08:03		10:24		10:53		11:57	12:54		13:56		15:27	15:58	16:54		18:21	18:58		20:27	
Leeds	Arr	08:33	08:41		11:08		11:38		12:38	13:38		14:37		16:04	16:39	17:39		19:08	19:38		21:06	

C.1.10 Option 2 is more challenging operationally than the Option 1 variants and with the known capacity issues at Preston, it would need to have a strong commercial and market justification to counter the operational challenges.

Appendix D Freight timetable

Freight Timetables around Hellifield

Freight Services on the Settle to Carlisle line Down Direction										
To										Mossend
From		Hunslet			Hunslet	Hull		Wellingborough	Dewsbury	
Castle Cement										19 30
Horrocksford Jn										19 40
										19 42
Clitheroe										19 46
										19 48
Horrocksford Jn										
Leeds	pass	04 48			10 32	13 35		16 03	19 54	
Skipton	arr	06 47								
	dep	07 02			11 55	14 25			20 54	
Hellifield	arr					14 38		16 55		
	pass	07 13			12 08	15 01		17 06	21 23	20 23
Settle Jn	pass	07 17			12 13	15 06		17 10	21 27	20 32
Helwith Bridge	pass	07 25			12 20	15 14		17 18	21 35	20 39
Arcow Quarry	arr	07 40			12 36	15 28		17 32	21 50	
	dep		11 25	12 12			16 43			
Ribblehead			11 45	12 35			17 03			20 52
Blea Moor	arr		11 52	14 42			17 10			
	dep		12 33	13 25			17 50			20 55
Garsdale	pass									21 07
Newbiggin										
Carlisle										22 16

To			Lancashire			Chirk	
From			Arcow		Mossend	Carlisle	
Carlisle	pass				11 36	12 58	
Newbiggin							
Garsdale		10 14			12 39	14 29	
Blea Moor	arr		11 52	12 42		14 41	17 10
	dep	10 23	12 33	13 25	12 49	15 09	17 50
Ribblehead	pass	10 26	12 37	13 29	12 51	15 13	17 54
Helwith Bridge	pass		12 44	13 38	12 58	15 20	18 01
Settle Jn	pass	10 39	12 53	13 44	13 02	15 28	18 08
Hellifield	arr			13 50			18 14
	dep	10 45	13 01	13 52	13 10	15 35	18 19
Skipton	arr			14 11			
	dep		13 23	14 24			18 36
Leeds	pass		14 12	15 13			19 19
Horrocksford Jn	arr	11 14					
	dep	11 29			13 41	16 04	
Clitheroe	arr	11 32			13 45	16 05	
	dep	11 36			13 50		
Horrocksford Jn	pass	11 38			13 52		
Castle Cement	arr	11 48			14 02		

Appendix E Data Sources

Planning Rules

Headways:

East Lancashire Line	4 minutes
Daisyfield Jn – Langho	AB
Langho – Horrocksford Jn	AB
Horrocksford Jn – Hellifield	AB
Hellifield – Horrocksford Jn	AB
Horrocksford Jn – Whalley	AB
Whalley – Daisyfield Jn	AB

Allowances

Attach a unit	6 minutes
Detach a unit	5 minutes
Standard station dwell	½ minute – This is a very short time unless there are only a few passengers
Hellifield station dwell	1 minute
Minimum Turnround DMU	4 minutes, but no more than 3 successive 4 minutes
Clitheroe Turnround	12 minutes for service shunting from arrival platform and different departure platform (via Horrocksford Jn)
Reversal DMU	4 minutes
Crew change	2 minutes
Engineering Allowance	Down 2 minutes approaching Clitheroe or Hellifield Up 2 minutes approaching Clitheroe (This is probably for longer distance trains and is anticipated only to apply to trains starting on the S&C line.)

Standard public connectional allowance is 5 minutes at Blackburn and Hellifield

Freight Stopping and Propelling 2 minutes

Junction Margins

Daisyfield Jn	3 minutes - pass from Up Hellifield then Up or Down East Lancs 4 minutes – pass from Up Hellifield then Pass from Blackburn

Sectional Running times minutes (150 units) (not available from the Working Time Tables)

Clitheroe – Clitheroe North Jn (Start to Pass)	1½
Clitheroe North Jn – Hellifield (Pass to Stop)	19
Hellifield – Clitheroe North Jn (Start to Pass)	19½
Clitheroe North Jn – Clitheroe (Pass to Stop)	1½

Which gives:

Clitheroe – Hellifield (Start to Stop)	21½ (plus [2] allowance transferred from the approach to Clitheroe)
Hellifield – Clitheroe (Start to Stop)	21

Platform Lengths (metres)

	Down	Up
Ramsgreave and Wilpshire	60	60
Langho	75	75
Whalley	75	75
Clitheroe	76	76
Hellifield	133	104
Lostock Hall	84	84
Bamber Bridge	80	75
Pleasington	78	73
Cherry Tree	73	74
Mill Hill (Lancs.)	92	92
Bolton Line stations	92 – 99	

Mileages (Miles) (Sources National Rail Timetable Table 94 & 97)

Manchester Victoria – Blackburn	24½
Manchester Victoria – Clitheroe	34¼
Preston – Blackburn	12
Blackburn – Clitheroe	9¾
(Sectional Appendix)	
Clitheroe – Hellifield	13¾

Historic Passenger Demand

Historic Passenger Demand (Source ORR Estimates of Station Usage)

	2019-20	2018-19	2017-18	2016-17
Clitheroe	305,258	263,656	271,350	284,362
Whalley	86,134	76,684	78,720	83,182
Langho	45,706	37,850	37,526	43,996
Ramsgreave & Wilpshire	111,452	94,584	96,980	113,542
Blackburn	1,323,216	1,200,186	1,258,172	1,277,930
Mill Hill (Lancs.)	72,962	56,492	69,456	73,470
Cherry Tree	41,128	29,634	38,012	40,136
Pleasington	10,844	6,974	9,362	9,570
Bamber Bridge	87,266	68,764	88,718	89,676
Lostock Hall	38,602	31,138	44,550	39,788
Hellifield	32,234	24,490	26,238	26,916
Gargrave	33,820	30,462	29,898	27,856
Skipton	1,212,320	1,217,432	1,206,474	1,137,700
Long Preston	13,624	11,670	11,830	13,070
Settle	148,852	139,442	141,342	120,190
Horton in Ribblesdale	19,648	18,968	16,720	16,112
Ribblehead	23,102	19,260	21,396	17,734
Dent	8,126	7,894	7,988	7,248
Garsdale	15,800	15,572	15,974	12,520
Kirkby Stephen	30,912	27,654	30,146	19,962
Appleby	60,310	57,526	60,254	61,446
Langwathby	22,002	18,630	18,162	4,132
Lazonby & Kirkoswald	13,452	10,774	11.218	4,150
Armathwaite	9,510	7,616	7,100	2,190

Demand on Clitheroe branch (2019/20) – 548,550
Demand intermediate stations Preston – Blackburn (2019/20) – 250,802