



# Wrexham – Bidston December 2021

## Technical Note

Future Services Integration Team – System Operator

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## Overview

### What we did

- Options for a two trains per hour (tph) passenger service between Wrexham Central and Bidston were examined

### What we found

- A regular, clockface two tph service consisting of alternating 'all stations' and 'semi-fast' services is feasible in periods of the day when paths for freight services are not required
- It is not possible for a regular two tph passenger service to operate in conjunction with freight paths on the route
- It was possible to flex passenger services to accommodate freight services shown as running on a Wednesday in the May 2020 timetable, as these are in the early morning and early evening, outside the two tph passenger service operating period
- Infrastructure interventions such as the addition of Intermediate Block Signals, a southern entrance to Penyffordd or line speed enhancements for freight services would be necessary in order to accommodate freight paths without disruption to the regular two tph passenger timetable
- Connectional opportunities at Shotton to and from North Wales Coast line services were found to be sub-optimal in some cases, owing to constraints in the timing of Wrexham trains at the Bidston end of the route

### What were the assumptions?

- Version 3.0 of the Western & Wales 2021 Timetable Planning Rules was used during validation
- Running times for new Class 230 stock were assumed to be as per modelled data provided by Transport for Wales (TfW)

### What are the risks?

- Any freight paths running at different times on other days of the week have not been incorporated into this analysis, and may require more flexing or even removal of passenger services
- If modelled running times prove to be unachievable in practice the conclusions of this analysis would be invalidated.

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001	Western & Wales 2021 Timetable Planning Rules	v3.0	27/03/20
002	Arcadis Deeside Parkway Timetable Study	v1.0	15/05/20

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Abbreviations	
Acronym	Meaning
AB	Absolute Block
ESG	Event Steering Group
FOC	Freight Operating Company
IBS	Intermediate Block Signal
SRT	Sectional Running Time
TfW	Transport for Wales
tph	trains per hour
TPR	Timetable Planning Rules
WTT	Working TimeTable

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## Part A: Executive Summary

Options were examined to meet stakeholder requirements for a two trains per hour (tph) service between Wrexham Central and Bidston, which is expected to be introduced with effect from the December 2021 timetable change.

A clockface two tph service, consisting of alternating 'all stations' and 'semi-fast services, was shown to be possible at times when paths for freight services are not required. However, freight paths cannot be accommodated within the two tph timetable structure because of the capacity constraints caused by:

- long Absolute Block (AB) signalling sections on the route
- low running speeds of freight services, particularly for heavy steel coil trains to Dee Marsh

It proved necessary to substantially flex the timings of some passenger services around the times the freight services are required to run. However, the majority of this flexing was required for early morning and early evening services, allowing a clockface two tph passenger service to operate for the bulk of the day.

Infrastructure interventions in the form of Intermediate Block Sections (IBS) or improved line speeds for heavy freight services were shown to be necessary if such services are required to run alongside the two tph passenger service.

Connectional opportunities to and from North Wales Coast services at Shotton were illustrated, though connection times are sub-optimal in some cases as a result of constraints in the timing of services at the Bidston end of the route.

A full Passenger TimeTable for the line is provided in **Appendix A**, with a Working TimeTable (WTT) shown in **Appendix B**.

## Part B: Introduction

### B.01 Background

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As part of a package of service improvements to be introduced during the lifespan of the current Welsh franchise which commenced in 2018, there is a proposal to enhance the frequency of services on the Wrexham to Bidston line to two trains per hour (tph).

The most significant timetable change across the franchise is expected to occur in December 2022, and an Event Steering Group (ESG) was formed to smooth the delivery of this change.

The Wrexham to Bidston line improvements are anticipated to be delivered with effect from December 2021, however. Stakeholders expressed a desire for the proposed new timetable on this route to be analysed as part of the ESG process, given the potential interaction of freight services in particular with other routes covered by the franchise.

There are significant capacity constraints to consider when planning timetables for the Wrexham to Bidston Line:

- the route has Absolute Block (AB) signalling with block sections up to 13 miles long
- there are restricted time windows between Merseyrail services at Bidston within which Wrexham services must be accommodated
- there are regular freight services to and from Dee Marsh and Penyffordd, some of which consist of heavy axle weight formations subject to severe speed restrictions on the route
- the line between Wrexham Exchange Jn and Wrexham Central is single track

It is also necessary to take into account stakeholder desires to:

- provide connectional opportunities at Shotton High level to and from services on the North Wales Coast line via Shotton Low Level
- allow for a proposed new station at Deeside Parkway in any new timetable structure
- offer customers a clockface, even interval timetable at the northern end of the route in particular

During collaborative working sessions with Transport for Wales, different timetable structure options were explored and issues discussed. A pattern of alternating 'all stations' and 'semi-fast' services was determined to best meet stakeholders' aspirations; this note describes the issues affecting the implementation of such a structure.



## B.02 Aims and Objectives

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This analysis sought to develop a timetable structure for the Wrexham to Bidston line which best meets stakeholders' aspirations. The capacity constraints described in Section B.01 were expected to result in the need for compromises in the timetable pattern because of the need to accommodate freight traffic to and from terminals on the route.

The aim of this exercise was to summarise the issues arising and suggest potential mitigations to allow stakeholders to make informed decisions on how to proceed.

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## Part C: Methodology & Assumptions

### C.01 Methodology

A database was created in the ATTune timetable planning software, and validation carried out using a timetable graph of the Wrexham to Bidston route

### C.02 Geographic Scope

The geographical scope of the analysis was limited to the Wrexham to Bidston line as shown in Figure C.1 below, though high level analysis of freight paths was undertaken further afield to assess the viability of any flexing deemed necessary:

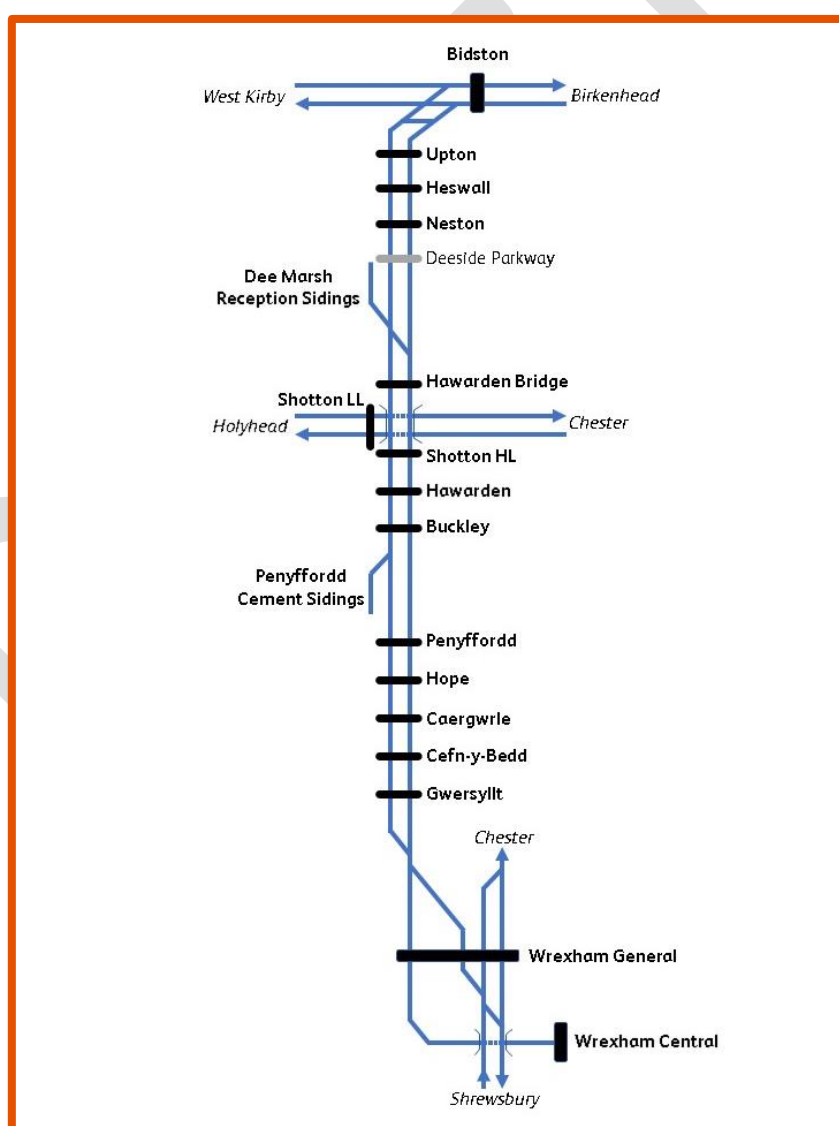


Figure C.1: Geographical scope

### C.03 Timetable Scope

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A 24 hour period for a Wednesday was analysed.

### C.04 Timetable Planning Rules

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The 2021 Western & Wales Timetable Planning Rules version 3.0 have been used in this study (Ref:Error! Reference source not found.).

#### C.04.01 Exceptions to the TPRs

Any margins assumed which are not prescribed by TPRs are mentioned in the body of the report

### C.05 Timing Load Assumptions

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Existing Sectional Running Times (SRT) were assumed to be as contained within the December 2020 BPlan database.

#### C.05.01 New Sectional Running Times

New Class 230 rolling stock is expected to be introduced on the route ahead of the December 2021 timetable change.

No formally agreed SRTs for the new stock were available at the time of this analysis, and indicative values modelled for TfW were used (Ref:002). These included running times associated with calls at the proposed new Deeside Parkway station.

No verification of these assumed running times has been undertaken in this analysis, and any increase in overall journey times may invalidate the conclusions reached

### C.06 Source Timetable

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Electronic files supplied by TfW were used as the base timetable, overlain with other operators' services from the May 2020 production timetable. The latter were extracted from the relevant Production Timetable TPS database.

## Part D: Findings

### D.01 The basic timetable pattern

Prior to consideration of freight paths, a basic timetable structure consisting of the proposed alternating mix of ‘all stations’ and ‘semi-fast’ services was found to be viable within the constraints identified (Section B.01).

The standard hourly pattern is demonstrated in Table D.1 below:

<b>Bidston</b>	dep	xx:01	xx:31	<b>Wrexham Central</b>	dep	xx:04	xx:38
Upton	dep	xx:05	xx:35	<b>Wrexham General</b>	arr	xx:06	xx:40
Heswall	dep	xx:11	xx:41		dep	xx:06	xx:40
Neston	dep	xx:15	xx:45	Gwersyllt	dep	xx:10	xx:45
Deeside Parkway	dep	xx:21	xx:51	Cefn-y-Bedd	dep	xx:14	-
Hawarden Bridge	dep	-	-	Caergwrle	dep	xx:16	-
Shotton High Level	dep	xx:25	xx:55	Hope (Clwyd)	dep	xx:18	-
Hawarden	dep	-	xx:59	Penyffordd	dep	xx:22	-
Buckley	dep	xx:32	xx:03	Buckley	dep	xx:25	xx:56
Penyffordd	dep	-	xx:06	Hawarden	dep	xx:29	-
Hope (Clwyd)	dep	-	xx:10	Shotton High Level	dep	xx:33	xx:03
Caergwrle	dep	-	xx:12	Hawarden Bridge	dep	-	-
Cefn-y-Bedd	dep	-	xx:14	Deeside Parkway	dep	xx:38	xx:08
Gwersyllt	dep	xx:43	xx:18	Neston	dep	xx:44	xx:14
<b>Wrexham General</b>	arr	xx:48	xx:23	Heswall	dep	xx:48	xx:18
	dep	xx:48	xx:23	Upton	dep	xx:54	xx:24
<b>Wrexham Central</b>	arr	xx:52	xx:27	<b>Bidston</b>	arr	xx:00	xx:30

Table D-1: Standard hourly pattern

Times shown are public versions, which as per current practice on the route have a two minute differential added at destination stations compared to those in the Working Timetable (WTT). Turnround times at Bidston in the WTT are 3 minutes for both services in each hour, whereas a more generous 13 or 14 minutes are allowed at Wrexham Central.

There are limited windows available at Bidston in which Wrexham services can arrive on platform 2 (via the crossover outside the station) and depart again in between the regular 15 minute frequency Merseyrail services on the West Kirby line. The four available slots are between xx:13 and xx:21, xx:28 and xx:36, xx:43 and xx:51 and xx:58 and xx:06.

At the request of stakeholders, clockface, regular interval times have been prioritised at the northern end of the route, to provide a customer-friendly timetable for stations between Bidston and Shotton High Level inclusive. The mix of alternating ‘all stations’ and ‘semi-fast’ services at the southern end of the route means that exact even intervals are not possible, though times

repeat on an hourly basis. The times chosen in Table D-1 are an attempt to maximise connectional opportunities at Shotton with North Wales Coast line services, as described in Section D.05.

## D.02 Provision for freight paths

The biggest obstacle to the development of a clockface repeating timetable throughout the main part of the day is the need to make provision for the line's freight traffic. There is a regular flow of steel coil between Margam Yard and Dee Marsh Shotton Works, and the Padeswood Hall Cement Works at Penyffordd also has traffic from Avonmouth.

The former flow has a trailing weight of 2200 tonnes in the northbound (loaded) direction and is subject to Heavy Axle Weight restrictions. The maximum permitted speed on the route for these services is 25 mph, and there are further restrictions to 15 and 20 mph in places. As a result, the running time for the block section between Wrexham Exchange Jn and Penyffordd is 20 minutes, and the section between Penyffordd and Dee Marsh Jn takes 23 minutes.

This makes it impossible to path such a service alongside the regular two tph passenger pattern. On the sample day of the week analysed (a Wednesday), both of the northbound Dee Marsh paths in the base timetable are timed outside the period when the standard two tph pattern would be required, giving more scope for flexing passenger services to accommodate them.

The amendments required to accommodate both freight and passenger services are described in Table D-2 below.

Amendments required to accommodate freight paths						
TID	Dep	From	To	Arr	Amendment to freight path	Amendments to passenger services
6M76	00:34	Margam TC	Dee Marsh	07:58	Retimed 00:20 from Dee Marsh and earlier throughout, arriving Dee Marsh 07:28	2F50 06:36 Wrexham General to Bidston is retimed to 06:26, arriving Bidston 07:16. If a Rail Head Treatment Train 3506 cannot be retimed an extended dwell would be necessary at Neston (or Deeside Parkway when open) to delay arrival at Bidston until 07:28. 2F22 06:12 from Wrexham Central to Bidston must be retimed to 05:53 to keep ahead of 2F50 as Penyffordd box is switched out until 06:30. An earlier first southbound departure of around 06:56 would be possible if stakeholders prefer.
6V75	09:30	Dee Marsh	Margam TC	17:07	Retimed 09:36 and repathed, now looped at Craven Arms with only a 2 minute 'C' stop at Hereford. Llanwern Exchange arrival unchanged	2J03 09:31 Bidston to Wrexham Central is retimed off-pattern to 09:36, and has extended dwell of 3 minutes at Neston (or at Deeside Parkway when open) waiting for clearance of 6V75 from Dee Marsh Jn -Penyffordd block section. 2J03 arrival at Wrexham Central is 10:33 rather than the pattern 10:25
6M86	10:29	Margam TC	Dee Marsh	18:49	Retimed later from Llanwern Exchange and repathed throughout with stops at Panteg and Sutton Bridge Jn. Arrives Dee Marsh 3 minutes earlier 18:46	Northbound departures 2F20 and 2F72 are maintained almost on pattern at 17:03 (provision for Hawarden Bridge call) and 17:38. Corresponding return workings 2J71 and 2J79 are also on pattern at 18:01 and 18:31 respectively. Next northbound service 2F24 is retimed to 18:22 to follow 6M86, and return 2J21 is retimed to 19:20. To allow a margin at Wrexham Exchange Jn with 2F24, 2J81 17:31 from Bidston is retimed later off pattern at 17:36
6M42	09:20	Avonmouth	Penyffordd	19:24	Held at Shrewsbury for 25 mins with subsequent pathing removed, arrives Penyffordd 19:35, 11 mins later	No further retimings required
0F42	20:25	Penyffordd	Tuebrook Sdg	23:19	Minor repathing	2F74 Wrexham Central - Bidston is retimed from 19:48 to 19:59 to reduce turnaround time at Bidston to 3 minutes (earlier arrival would conflict with a Merseyrail service)
6V80	20:38	Dee Marsh	Margam TC	04:02	Retimed 20:30 from Dee Marsh and repathed through to Shrewsbury, then as before	No retimings required

Table D-2: Flexing required to incorporate freight paths

In summary the first two northbound passenger services are retimed significantly with the second, train 2F50, departing Wrexham General at 06:26 rather than 06:36, arriving at Bidston 07:16. The return service from Bidston does not depart until 07:31. Whilst this does not conflict with Merseyrail services it would be necessary to explore a retiming of a Rail Head Treatment Train which is booked to pass through platform 2 during that period. If that proves impossible then an extended dwell would be necessary at a station north of Dee Marsh Jn to delay the Bidston arrival until 07:28.

The first northbound service from Wrexham Central 2F22 would need to be retimed from 06:12 to as early as 05:53 because Penyffordd signal box is switched out until 06:30 and the block section therefore becomes Wrexham Exchange Jn to Dee Marsh Jn. Bidston arrival is at 06:50. The return from Bidston departs at 07:04, but stakeholders may wish to offer an off-pattern slightly earlier first service for southbound passengers

The nominal 09:31 southbound departure from Bidston must also be retimed out of pattern five minutes later with a slightly extended journey time to accommodate train 6V75, the morning return empty steel coil service from Dee Marsh.

The early evening loaded steel coil arrival at Dee Marsh requires the usual two tph passenger service to be 'opened out' earlier than would be desirable, with an interval of 44 minutes between 17:38 and 18:22 departures from Wrexham.

Thereafter the passenger service drops to one unit operation on a basically two hourly frequency, allowing a Penyffordd Cement working and the second return Dee Marsh empties to be pathed with less difficulty.

### D.03 Other freight paths

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Only those freight paths booked to run on a Wednesday in the May 2020 timetable have been examined in this exercise. Further disruption would be necessary to the standard two tph passenger service pattern to accommodate any freight services running in different times on other days

A particular concern would be train 6V41, the 17:08 TThFO Penyffordd Cement to Avonmouth service as this must travel northwards to Dee Marsh Exchange Sidings to run round before continuing southwards towards Wrexham. As TPRs state it is not possible to time a train to depart Wrexham whilst the move between Penyffordd and Dee Marsh takes place there would be no suitable path within the two tph passenger train structure.

Without infrastructure interventions (see Section D.04) the only option to include the freight path would be to remove a northbound passenger service and its return from Bidston in the middle of the evening peak, which is likely to prove unpalatable to stakeholders.

It is recommended therefore that, in collaboration with the Freight Operating Company (FOC), efforts should be concentrated on exploring a later departure from Penyffordd whilst maintaining the current arrival time at Avonmouth

## D.04 Potential Infrastructure Interventions

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The long block sections between Wrexham Exchange Jn and Penyffordd and Penyffordd and Dee Marsh Jn, combined with the speed restrictions imposed on Heavy Axle Weight freight services makes the inclusion of such services within a regular two tph passenger service impossible.

Services to Penyffordd from the south have to reverse on the Down Main Line to access the Cement Works, a process which takes 30 minutes

If heavy freight paths are required to be provided during the period when the two tph passenger service operates then infrastructure interventions would be necessary. These could take the form of:

- removal of the current onerous speed restrictions imposed on Heavy Axle Weight trains to enable their speed profile to match stopping passenger services. This would require an average speed of just over 30 mph to be maintained between Wrexham Exchange Jn and Dee Marsh Jn
- the addition of two Intermediate Block Signals (IBS) in the Down direction, located at approximately Milepost 4 in the Cefn-y-Bedd area, and at Milepost 12 approaching Shotton High Level station. The reduction in block length would allow Heavy Axle Weight paths with current speed restrictions to be accommodated alongside the regular passenger services. In the Up direction it is anticipated that only one IBS would be required, at approximately Milepost 12
- provision of a southern entrance to the Penyffordd facility, along with a crossover to allow direct access to the Up Main line for southbound services

## D.05 Connectional Opportunities at Shotton

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There is a clear desire from stakeholders for improved connections to be offered between Wrexham – Bidston line stations and those on the North Wales Coast line between Chester and Holyhead, making use of the interchange possible between Shotton High Level and Low Level stations.

The most important connections were deemed to be between stations north of Shotton High Level and Chester and vice versa, but other connections were also considered.

This analysis has drawn on work done to date on the enhanced service specification for the December 2022 timetable on the North Wales Coast route. This provides hourly TFW services between Manchester Airport and Bangor, Liverpool and Llandudno and Birmingham International / Cardiff Central and Holyhead, in addition to occasional Avanti West Coast services between London Euston and Llandudno / Holyhead.

Shotton Low Level calls are provided in the Manchester Airport to Bangor and Liverpool to Llandudno services. Each of these service groups operates at clockface times in most hours of the day, but the timings of the two service groups result in uneven intervals in Shotton Low Level



calls. Westbound departures are provided at xx:03 and xx:48, whilst eastbound calls are at xx:29 and xx:42.

It proved impossible to provide optimum connectional opportunities in all directions because of the constraints of the timings of Wrexham to Bidston line services at the northern end of the route. No connection time is specified between the two Shotton stations in the TPRs, which means the default value of 5 minutes is assumed.

The best combination of connections was found to be delivered by the timings shown in Table D-1. However, in the case of connections from stations between Bidston and Neston to Chester the addition of time in the schedule for the proposed Deeside Parkway station frustrated efforts to provide a good connectional opportunity. The xx:01 departure from Bidston reaches Shotton High Level at xx:25, narrowly missing a valid connection time into the xx:29 departure from Low Level towards Chester. The latter cannot be retimed any later without compromising its onward path to Liverpool, bearing in mind the need to attach to a portion from Cardiff / Shrewsbury at Chester. The xx:01 departure from Bidston is dictated by the earliest possible arrival of the inbound service from Wrexham at xx:58. The connection that would be advertised in journey planners is therefore into the xx:42 departure, giving a waiting time of 17 minutes.

For connections between Chester and stations north of Shotton, the best is out of the Liverpool to Llandudno service which arrives at Shotton Low Level at xx:47, resulting in a 16 minute wait for the xx:03 service from High Level to Bidston. Attempts to move the Wrexham – Bidston line services around the clockface by 15 minutes afforded no improvement to the connection times possible.

For stations south of Shotton the connection times are better with an 9 minute waiting time between the xx:33 arrival from Wrexham and the xx:42 departure to Chester. In the opposite direction the Liverpool to Llandudno service allows an 8 minute connection into the xx:55 departure from Shotton High level towards Wrexham. These connections are most useful for customers at stations between Penyffordd and Hawarden, with faster journeys via Wrexham possible for stations further south.

Table D-3 shows the connectional opportunities to and from Chester for stations between Bidston and Penyffordd:



Bidston	dep	xx:01	<i>Chester</i>	dep	xx:39
Upton	dep	xx:05	<i>Shotton Low level</i>	arr	xx:47
Heswall	dep	xx:11	Shotton High Level	dep	xx:03
Neston	dep	xx:15	Deeside Parkway	arr	xx:08
Deeside Parkway	dep	xx:21	Neston	arr	xx:14
Shotton High Level	arr	xx:25	Heswall	arr	xx:18
<i>Shotton Low Level</i>	dep	xx:42	Upton	arr	xx:24
<i>Chester</i>	arr	xx:53	Bidston	arr	xx:30
Penyffordd	dep	xx:22	<i>Chester</i>	dep	xx:39
Buckley	dep	xx:25	<i>Shotton Low level</i>	arr	xx:47
Hawarden	dep	xx:29	Shotton High Level	dep	xx:55
Shotton High Level	arr	xx:33	Hawarden	arr	xx:59
<i>Shotton Low Level</i>	dep	xx:42	Buckley	arr	xx:03
<i>Chester</i>	arr	xx:53	Penyffordd	arr	xx:06

**Table D-3: Connectional opportunities at Shotton**

Options to make the narrowly missed connection between station north of Shotton valid were examined, but none would result in satisfactory solutions:

- move the one minute engineering allowance at Saltney Jn in the Llandudno to Liverpool services back to Shotton, resulting in a departure time of xx:30 and a five minute connection
- add a public arrival time differential of minus one minute at Shotton High Level in the xx:01 departure from Bidston. This would result in an advertised arrival time of xx:24 instead of xx:25, again resulting in a five minute connection time

The first solution would result in a technical non-compliance, whilst the second would result in a more 'risky' connection, particularly for less mobile customers, as in reality the time allowed would be only four minutes.

## Part E: Conclusions

A standard clockface two trains per hour(tph) passenger service between Wrexham Central and Bidston was shown to be possible at times when no paths for freight services are required. This consists of an alternating 'all stations' and 'semi-fast' pattern.

Provision was made for calls at the proposed new Deeside Parkway station. Times at stations between Bidston and Shotton High Level would be at exact half hour intervals for the bulk of the day.

Flexing of passenger services was required in order to accommodate the freight paths contained within the May 2020 Working Timetable (WTT) on a Wednesday, which was used as a base for this analysis. The heavy loaded steel coil trains to Dee Marsh proved the most difficult to include, though the two daily arrivals are fortunately timed outside the main two tph hours of operation.

If there is a need to accommodate such services alongside the standard two tph passenger service, infrastructure interventions were shown to be required, which could take the form of:

- Intermediate Block signals between Wrexham Exchange Jn and Penyffordd, and between Penyffordd and Dee Marsh Jn
- A southern entrance to the Penyffordd facility with crossover to the Up Main
- Line speed improvements for Heavy Axle Weight freight services

Connectional opportunities with North Wales Coast services at Shotton were highlighted, though in the case of stations north of Shotton these are sub-optimal. This is largely as a result of the limited windows available for Wrexham services to turnround at Bidston station in between the frequent Merseyrail services on the West Kirby line.



Appendix B: Working Timetable for proposed Wrexham – Bidston line services

Table with columns for Signal ID, Org. Dep. Time, Org. Loc. Name, Dest. Loc. Name, Trip Load, Operating Characteristics, TOC, Day of Operation, and Changes To Form. It lists various train services between Wrexham and Bidston, including Wrexham Central, Wrexham General, Gwersyllt, Cefn-y-Bedd, Camperley, Hope (Clwyd), Penyffordd, Penyffordd General Sdgs GP, Buckley, Newton, Shotton High Level, Hawarden Bridge, Dee Marsh Jn., Dee Marsh Rqcd. Sdgs, and Neston.

Table with columns for Signal ID, Org. Dep. Time, Org. Loc. Name, Dest. Loc. Name, Trip Load, Operating Characteristics, TOC, Day of Operation, and Changes To Form. It lists various train services between Bidston and Wrexham, including Bidston, Wrexham Central, Wrexham General, Gwersyllt, Cefn-y-Bedd, Camperley, Hope (Clwyd), Penyffordd, Penyffordd General Sdgs GP, Buckley, Newton, Shotton High Level, Hawarden Bridge, Dee Marsh Jn., Dee Marsh Rqcd. Sdgs, and Neston.