

# **Magor and Undy Walkway Station**

GRIP Stage 3 - Option Selection

20 July 2018



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# Executive summary

This report presents options for the construction of a new walkway station at Magor and Undy, Monmouthshire. Following GRIP 1 and 2 studies in 2016, the project is being progressed to GRIP 3 to identify a single option for outline design.

The proposed scheme is to comprise two new platforms serving the Up Relief and Down Relief lines on the South Wales Main Line. Potential solutions have been evaluated to determine the most suitable options for station arrangements and access.

The primary options considered are:

- Platform construction
  1. Traditional front wall platform
  2. Cross-wall platform (Types 1 and 2)
  3. Modular steel platform
  4. Modular FRP (fibre-reinforced polymer) platform
  5. Modular EPS (expanded polystyrene) platform
- Platform access
  1. Undy Halt footbridge
  2. Deck replacement of West End subway
  3. Lowering of West End subway
  4. Replacement of West End subway
  5. Do minimum

'Do minimum', was identified as the preferred access solution. Fibre-reinforced polymer (FRP) platforms are recommended for the station platforms. In addition, the location of a new disabled drop-off point is recommended to be to the east of the West End subway. Recommended further actions to aid with progressing the project are included in Section 24.

# 1 Introduction

In June 2016, Mott MacDonald carried out a Governance for Railway Investment Projects (GRIP) 1 and 2 study on behalf of Magor Action Group on Rail (MAGOR) for a potential station site at Magor and Undy. The requirement was to consider only a walkway station (a station that can be accessed via walking/cycling by the majority of the local population) at their preferred site; therefore, the options were focussed on one location and considered different platform layouts, and the impact of the introduction of a new station on the existing infrastructure.

For further details of the history and work undertaken to date refer to the MAGOR website:

<http://magorstation.co.uk/>

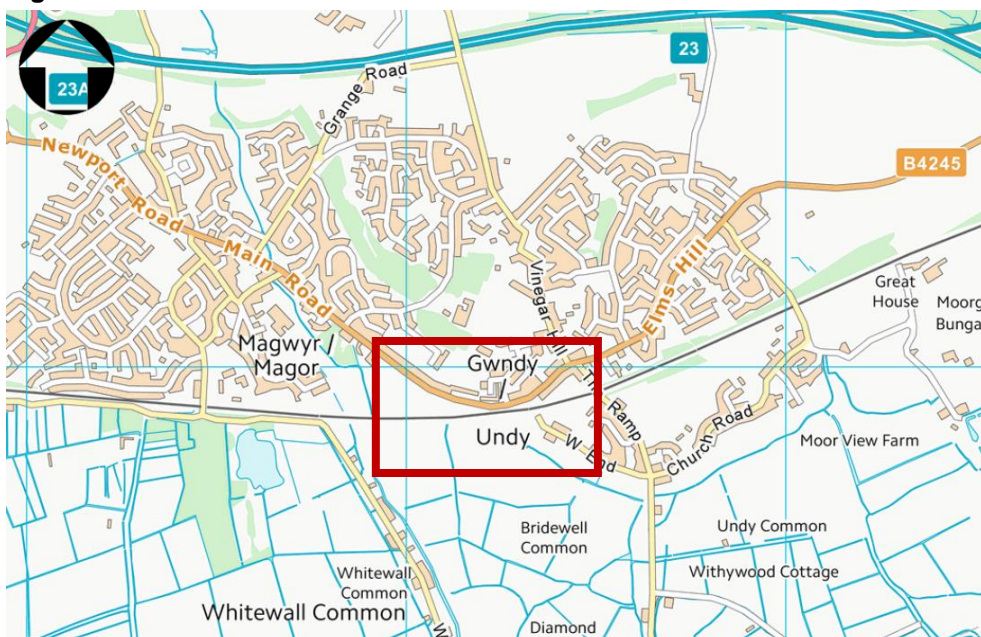
A possible station at Magor is in the National Transport Finance Plan, referenced in Network Rail's draft Wales Route Study, recognised in the Monmouthshire County Council (MCC) Local Transport Plan and is in the current Metro Phase 2 list of potential schemes.

This GRIP 3 Option Selection Report considers potential solutions for the walkway station outlined in the GRIP 2 report. Particular areas of focus include platform construction, provisions of safe access between platforms and the interface with the existing track and surrounding area.

## 1.1 Site Location

The Magor and Undy walkway station is to be located where the B4245 adjoins the rail corridor as this is a centralised location that can serve both villages. Figure 1 shows the site bisected by the South Wales Main Line and the B4245 (marked as Main Road), which runs immediately to the north of the proposed station location.

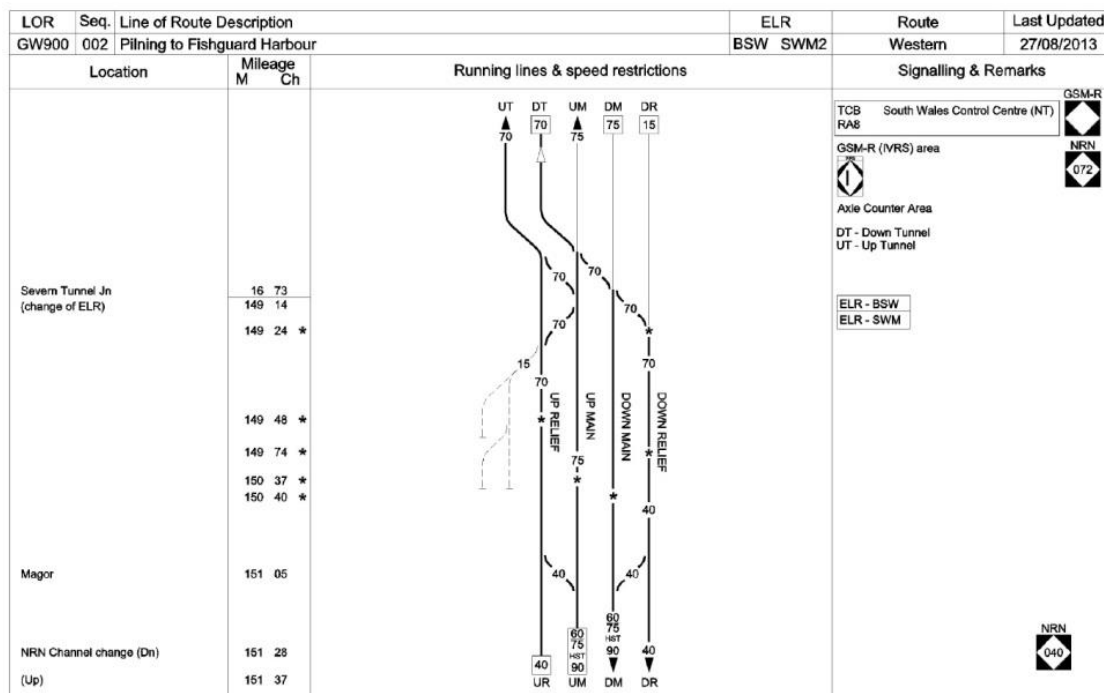
**Figure 1: General Location**



Source: Contains OS data © Crown copyright and database right (2018)

Magor and Undy have a combined estimated population of over 6100, with the nearest available train station is Severn Tunnel Junction, which is approximately 2.5 miles to the east. The track in this area comprises four lines: Up Main and Down Main lines as the inner lines and Up Relief and Down Relief lines as the outer lines, as shown in Figure 2.

**Figure 2: Track Section Diagram**



Source: Western Route Sectional Appendix Module WR1, Network Rail

There are three pedestrian crossing points in the area of the proposed station that can provide pedestrian access across the tracks. These are the Undy Halt footbridge towards the east which was reconstructed in 2015, the West End subway just to the west of this footbridge and Whitewall Footbridge further west. The subway provides step-free access but the existing ramp gradients down to subway level are non-compliant with accessibility standards.

The closest signalling infrastructure for all four tracks is the signal gantry to the west of the West End subway.

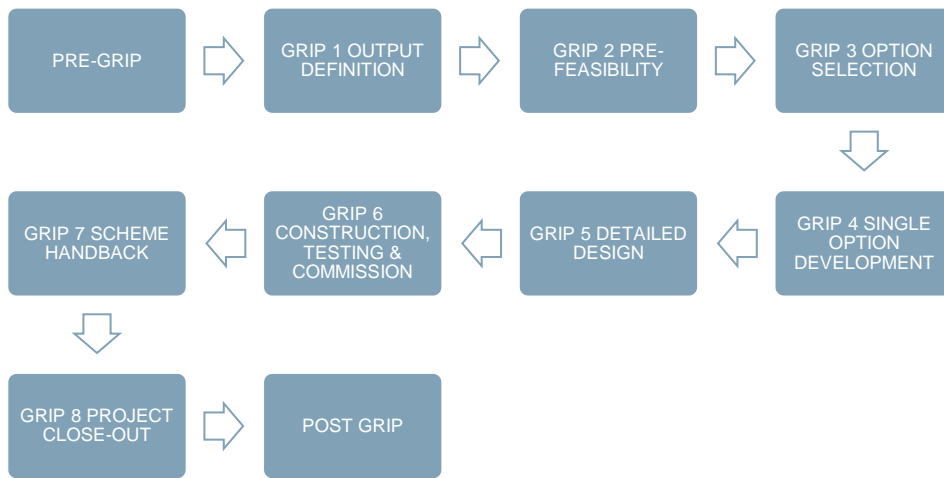
## 1.2 GRIP Study

The GRIP process is Network Rail's management and control process for delivering projects that enhance or renew the national rail network. The GRIP process is an eight-stage process as illustrated in Figure 3 below.

The GRIP 1 and 2 stages outlined the feasibility for providing a new station at Magor and Undy, the impact on the existing infrastructure and concluded that the stopping of trains at a new station at Magor and Undy appears to be technically viable.

This GRIP 3 report will build on these previous studies by looking in more detail at potential options for the proposed walkway station including the arrangement and construction of platforms, access to the station, whether it is operationally viable and local highway modifications.

**Figure 3: The GRIP Process**



Source: Network Rail



## 2 Project Objectives

A summary of policy plans relevant to this scheme is included within the GRIP 2 report, including the Wales Transport Strategy, National Transport Finance Plan, Monmouthshire Local Transport Plan and Cardiff Capital Region Metro.

The Magor Action Group on Rail (MAGOR) is a local community action group based in Magor and Undy. Their constitution was presented in June 2013 and the aims of the group are as follows:

1. To work towards the provision of a station and rail services to serve the residents and those that travel to the Magor and Undy area
2. To represent the interests of users and potential users of rail (including light rail or tram) services in the area and minimise the impact of people that may be adversely affected
3. To raise awareness, encourage and promote the use of rail travel for residents, visitors, business users and tourists, including supporting tourism/leisure, community development projects and local businesses, therefore enabling local communities to increase their economic, social, and environmental welfare
4. To foster and encourage sustainable transport and work towards maximising transport integration with the rail services for the Magor and Undy area
5. To seek to build and maintain good working relationships with the rail industry companies, the Welsh Government, the South East Wales Transport Consortium, local and county councils and other stakeholders as necessary
6. To liaise, work with, or form partnerships with organisations and other user groups where potential benefits could be gained to other group aims
7. To increase community involvement with the railway by bringing together a range of local people and organisations that share the above aims

### 3 Study Scope and Requirements

The purpose of this option selection study is to identify, evaluate and compare options for the new walkway station. Each option has been outlined with pros and cons to aid decision making and provide further detail for potential station funding applications. In addition, brief descriptions of discarded options have been included where appropriate.

This report includes considerations from the following areas:

- Civil and structural design – review of the arrangement and construction of platforms as well as the provision of compliant access routes for the station
- Rail operations – review of potential operational solutions and identification of areas of uncertainty that required further investigation
- Permanent way – review of track alignment, stepping and gauging for proposed platforms
- Signalling – review of the impact of new platforms on existing signalling assets and operations
- Telecommunications – development of telecommunications requirements for different options
- Drainage and flooding studies – high level review of local area flood risk and outline drainage strategy for the station
- Highways – review of impact of options on the highways arrangement and overview of proposed modifications
- Environmental and ecology – detailed review of ecology affected by proposed options and identification of key issues and constraints
- Geotechnical and contamination – desk study to review existing geotechnical information to inform and determine requirements of any proposed Ground Investigation. This includes a preliminary contaminated land risk assessment to review any potential contamination and ground water risks that may be present on site
- Electrical and power – review of anticipated electrical load demand required for the new station and contact DNO (Distribution Network Operator) suppliers to determine requirements for the new station and access routes
- Planning and consents
- Interface with other projects
- Form of construction and construction access

## 4 Background Information

The following background information has been received and used as the basis of this report.

**Table 1: Background information**

Title	Doc Reference	Originator	Date
Undy Halt Footbridge As-Built register	QF915 145137	Network Rail	19 <sup>th</sup> December 2017
Topographical Survey	W1008D-BNU-DRG-ECV-002001	Network Rail	1 <sup>st</sup> June 2015
Existing General Arrangement	W1008D-BNU-DRG-ECV-002002	Network Rail	26 <sup>th</sup> February 2015
Undy Halt Footbridge As-Built (various)	W1008D-BNU-DRG-ECV-002100 to 2114	Network Rail	May 2015 – May 2017
Undy Halt Ecological Appraisal	142199/2-1	Carillion	October 2014
Undy Halt Footbridge Topographical Survey Report	11020 SWM2 150-51 Undy Halt FBR	Atkins	14 <sup>th</sup> October 2011
Undy Halt Health and Safety file register	W1008D-NPT-INS-PDC-100000	Network Rail	None
Magor and Undy Walkway Station GRIP Stage 1 – Output Definition	364017-BNI-WTD-001-B	Mott MacDonald	15 <sup>th</sup> March 2016
Magor and Undy Walkway Station GRIP Stage 2 – Technical Feasibility	364017-BNI-WTD-002-B	Mott MacDonald	20 <sup>th</sup> April 2016
5 Mile Plan	31111006 SWM-13 to 15	Waterman	Various
Monmouthshire County Council Adopted Local Development Plan 2011-2021	None	Monmouthshire County Council	27 <sup>th</sup> February 2014
Ground Investigation Report (Confidential)	W1008F-TTS-REP-EGE-220001 A04	ABC	March 2016
Magor Station What If	None	MAGOR	11 <sup>th</sup> July 2013
Severn Tunnel Junction Interchange Study	CG/5263	Capita Symonds	21 <sup>st</sup> April 2011
Sewta Rail Strategy Study (Confidential)	JC25016	Jacobs	October 2005
Signalling Location Area Plan	S1224-27-1_AD3	Network Rail	20 <sup>th</sup> July 2011
Valley Line Passenger Numbers	Various	Unknown	None

## 5 Existing and Future Rail Operation

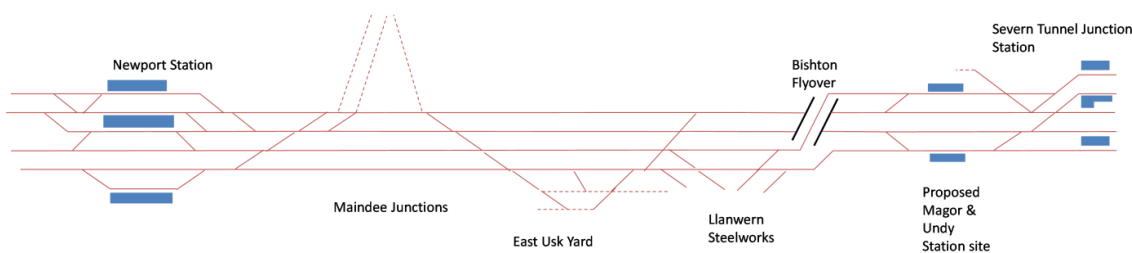
### 5.1 Track Arrangement

The proposed location of Magor and Undy station is approximately at 150 miles 60 chains from London, with a platform on the Down Relief line and another platform on the Up Relief line of the South Wales Main Line (NESA : GW900 seq. 002). This is 1 mile 46 chains west of Severn Tunnel Junction, and 50 chains east of the Bishton Flyover, as shown in Figure 4.

The line between Severn Tunnel Junction and Newport consists of four tracks, with the opportunity to cross between the Main line and Relief lines at the junction west of Severn Tunnel Junction 149 miles 24 chains and at Magor Junction 151 mains 05 chains. The Main line currently operates at 75mph and the Relief lines at 40mph.

The line is currently undergoing modifications to install Overhead Line Equipment (OLE) to enable running of electric trains as part of the Great Western Route Modernisation Project being undertaken by Network Rail.

**Figure 4: Existing Track Arrangement**



Source: Mott MacDonald

### 5.2 Current Train Services

The assessment later in this report is based upon train services that operate in the December 2017 to May 2018 Timetable. A typical hour comprises the following services:

- 1 train from Taunton/Exeter St. Davids/Weston-super-Mare to Cardiff and return via Bristol Temple Meads (Main line) calling at Severn Tunnel Junction (Great Western Railway - GWR)
- 1 train from London Paddington to Cardiff and return via Bristol Parkway (Main line) (GWR)
- 1 train from London Paddington to Swansea and return via Bristol Parkway (Main line) (GWR)
- 1 train from Portsmouth to Cardiff and return via Bristol Temple Meads (Main line) (GWR)
- 1 train from Nottingham to Cardiff and return via Chepstow (Main line) Cross Country
- 1 train every two hours from Cheltenham Spa to Maesteg and return via Chepstow (Main line) calling at Severn Tunnel Junction (Arriva Trains Wales - ATW)
- Two freight paths per hour and return (on the Relief lines between Severn Tunnel Junction, Newport and Cardiff)

## 6 Potential Rail Services

### 6.1 Line Speeds

Line speeds for the Main lines are 75 miles per hour (mph) with a higher differential speed of 90 mph for HST reducing to 40 mph in the Maindee Junction and Newport areas. The Relief lines are predominately 40 mph with some stretches of 70 mph in the Severn Tunnel Junction area.

### 6.2 Sectional Running Times

Technical Running Times (TRTs) are used to calculate the details for Sectional Running Times (SRTs). TRTs are the actual transit times in minutes and seconds between locations. These are prepared for each type of rolling stock operating trains.

The TRTs for Magor and Undy station calls were calculated by using a desktop time and distance analysis with the following parameters taken into consideration:

- Line speed
- Gradients
- Distance
- Stopping locations
- Stations

Various rolling stock parameters were also taken into consideration:

- Maximum Speed
- Acceleration rate
- Rolling stock weight
- Rolling stock length
- Braking rate

The Speed Profile graphs display the line speed between Severn Tunnel Junction and Newport for the route the trains will travel over in purple. The changes to the train speed when starting and stopping and reaching the line speed are similarly represented in black. See Figure 5 and Figure 6.

The TRTs were rounded cumulatively over the section of route of the new station, to make sure of minimal variance between SRT values and the TRTs at the timing points.

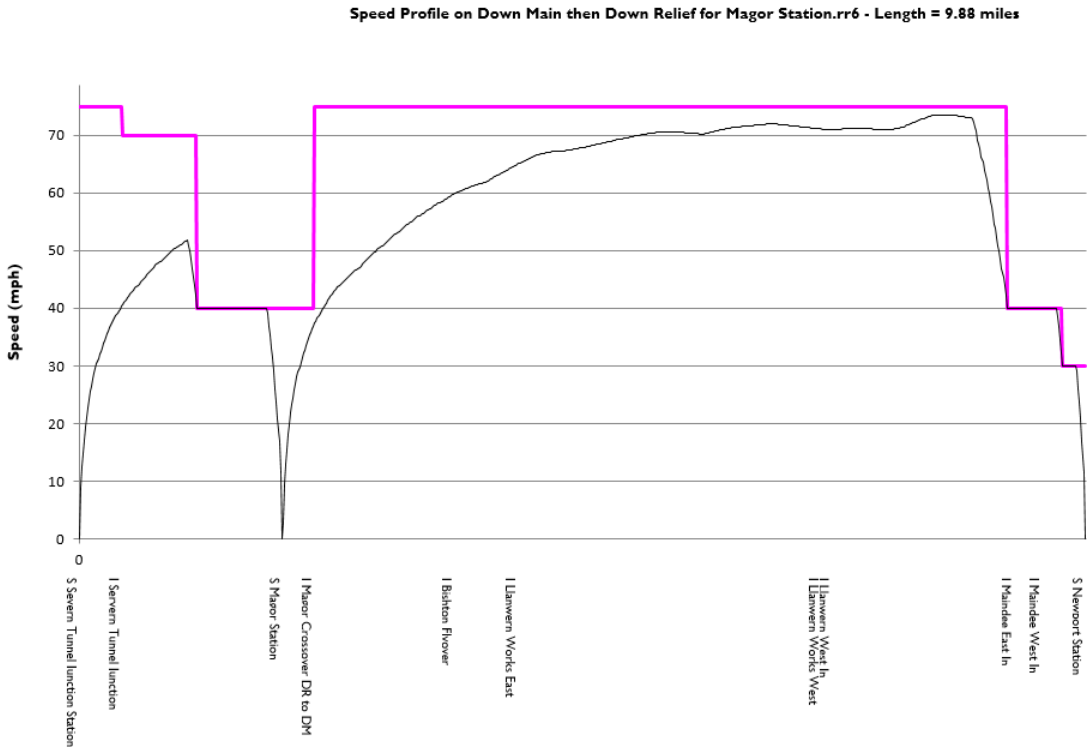
SRTs are compiled individually by:

- Direction of travel
- Each track on multiple lines

SRTs are split by type into 4 different timing links:

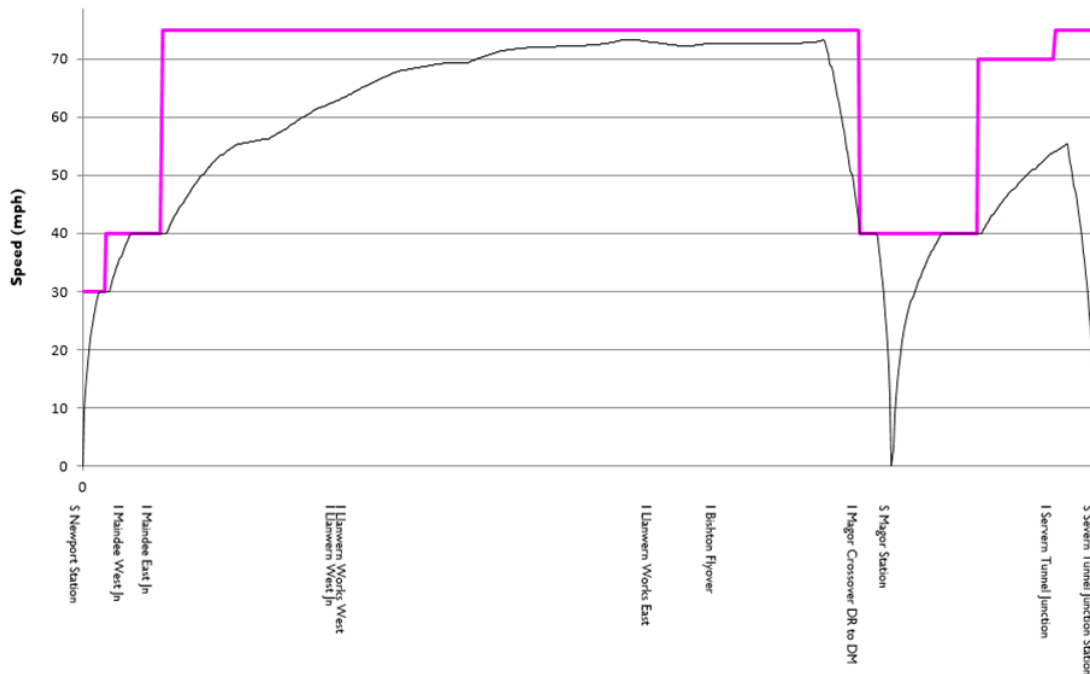
- Start to Pass – wheels stationary to front of train passing the second location
- Pass to Pass – front of the train passing the first timing point and passing the second timing point assuming maximum speed possible for line and rolling stock
- Pass to Stop – the front of train passing a timing point to wheels stop
- Start to Stop – wheels stationary to wheels stationary

Figure 5: Speed Profile - Westbound with station stop



Source: Mott MacDonald

**Speed Profile on Down Main then Down Relief for Magor Station Reversed.rr6 - Length = 9.88 miles**



SRTs allow sufficient time between each timing point to permit reasonable variations in operational train performance, without having an adverse impact on performance, safety and capacity or to be too tight as not able to react to day to day variations.

SRTs were calculated for Class 150 Diesel Multiple Unit (DMU) rolling stock, which is the rolling stock currently operating the Taunton – Cardiff Central service, as the base for calculation. Table 2 shows the baseline calculation excluding the proposed Magor and Undy Station.

Alternatively, trains can continue on the Relief lines between Magor crossovers and Newport, but, because the Relief lines have lower permissible speeds than the Main lines, the outcome is an increased time penalty. These have been presented in Table 6 and Table 7.

**Table 2: Sectional Running Times without station, using Main line throughout - Westbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Severn Tunnel Jn to Magor and Undy station stop	3	12	3	12	3	3
Magor and Undy station start to Magor Crossover pass	0	28	3	40	½	3½
Magor Crossover pass to Maindee Jn pass	6	53	10	33	7	10½

Source: Mott MacDonald

**Table 3: Sectional Running Times without station, using Main line throughout - Eastbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Maindee West Jn pass to Magor Crossover pass	6	48	6	48	7	7
Magor Crossover pass to Magor and Undy station stop	0	27	8	19	½	7½
Magor and Undy station start to Severn Tunnel Jn stop	2	57	11	16	3	10½

Source: Mott MacDonald

**Table 4: Sectional Running Times with stop at station, when crossing immediately back to the Main line - Westbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Severn Tunnel Jn to Magor and Undy station stop	3	21	3	21	3½	3½
Magor and Undy station start to Magor Crossover pass	0	47	4	08	½	4
Magor Crossover pass to Maindee Jn pass	6	55	11	03	7	11

Source: Mott MacDonald

**Table 5: Sectional Running Times with stop at station, when using Main lines as far as Magor - Eastbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Maindee West Jn pass to Magor Crossover pass	6	49	6	49	7	7
Magor Crossover pass to Magor and Undy station stop	0	41	7	30	½	7½
Magor and Undy station start to Severn Tunnel Jn stop	3	26	10	56	3½	11

Source: Mott MacDonald



**Table 6: Sectional Running Times with stop at station, remaining on Relief lines from/to Newport - Westbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Severn Tunnel Jn to Magor and Undy station stop	3	21	3	21	3½	3½
Magor and Undy station start to Magor Crossover pass	0	47	4	08	½	4
Magor Crossover pass to Maindee Jn pass	10	15	14	23	10½	14½

Source: Mott MacDonald

**Table 7: Sectional Running Times with stop at station, remaining on Relief lines from/to Newport - Eastbound**

Location	Technical Running Time values		Cumulative TRTs		Sectional Running Time Values	Cumulative SRTs
	Mins	Secs	Mins	Secs	Mins	Mins
Maindee West Jn pass to Magor Crossover pass	10	42	10	42	11	11
Magor Crossover pass to Magor and Undy station stop	0	41	11	23	½	11½
Magor and Undy station start to Severn Tunnel Jn stop	3	26	14	49	3½	15

Source: Mott MacDonald

### 6.3.1 Overall Impact Including Station Dwell Time

Network Rail's Timetable Planning Rules (for the planning of train services) indicate that a 30 second dwell time for services calling at similar-sized stations is appropriate for Magor and Undy station.

Overall the impact of the station call can be seen, by comparison with the without-station running times for existing services (Table 2 and Table 3), and including the 30 second dwell time, to be an extension of the journey time between Severn Tunnel Junction and Newport by one minute (in either direction)<sup>1</sup> or by five minutes (i.e., at maximum, a further four minutes) if remaining on the Relief lines between the Magor crossovers and Newport.

## 6.4 Timetable Analysis

### 6.4.1 Enhancement to GRIP 2 Study

This analysis has re-examined the timetabling implications of stopping suitable existing services at Magor and Undy station, using the December 2017 timetable as the base (the most up-to-date timetable available), recognising the possibility of knock-on effects to other train services.

The analysis has expanded the GRIP 2 work by also looking explicitly at freight trains and other non-passenger trains on the line, such as stock maintenance moves and infrastructure servicing

<sup>1</sup> i.e., westbound: 11 minutes (Table 4 cumulative SRT) minus 10½ minutes (Table 2 cumulative SRT), plus half minute dwell time; and similarly for eastbound.

trains, and examining the extent of likely interaction between any retiming of trains to serve Magor and Undy and the operation of such freight services. The findings are reported in Section 6.5.

It will be possible, when details of future timetables and possible additional services are known, to further examine whether it would be operationally practical for such services to call at Magor and Undy station (instead of a portion of the calls examined here) with the intention of achieving a better spread of calls within each hour than can be attained by stopping the current services. In particular, future consideration should include the impact of the GWRM electrification completion and the possibility of additional Bristol-Cardiff local services as an outcome of regional strategic duties.

The GRIP 2 study outlined a number of strategies that could be used to mitigate any operational impacts, should such impacts prove to be substantial. Further study has demonstrated that impacts will be minimal and as such the mitigations have not been further explored at this stage.

#### 6.4.2 Timetable Interactions

The location of the station on the Relief lines requires trains in the down direction, which are to call at Magor and Undy station, to cross from the Down Main line at Severn Tunnel Junction to the Down Relief line and call at the proposed station before crossing back to the Main line. Trains in the up direction will travel on the Up Main line from Newport, crossing to the Up Relief line before the station at Magor and Undy. Following the station, call trains will continue on the Relief line to Severn Tunnel Junction where they will be routed to the Severn Tunnel or Chepstow lines as appropriate, the latter involving crossing westbound services from the Severn Tunnel route. The core station call as described above, inclusive of a 30-second dwell time allowance, results in an increase in journey time of one minute. This is outlined in more detail below.

Train services in the December 2017 weekday timetable<sup>2</sup> that call at Severn Tunnel Junction station remain the most appropriate ones to also call at the new station, recognising markets served, pattern of stops, and rolling-stock allocation:

- 1 train per hour from Taunton (or beyond) to Cardiff Central and return, via Bristol Temple Meads
- 1 train every two hours from Cheltenham Spa to Cardiff/Maesteg and return via Chepstow

The geographical scope of the timetable analysis covers trains originating from Gloucester and Patchway in the east and Cardiff Central in the west. The Timetable Planning Rules indicate that:

- A four minute headway is required between trains in the timetable area
- A two minute station stop is generally required at Newport stations, with a three minute re-occupation time for same-direction use of platforms
- Where train paths cross on the level at Severn Tunnel Junction, a margin of (typically) three minutes<sup>3</sup> is required between conflicting moves

These values have been applied to our analysis.

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<sup>2</sup> Mondays-Fridays, known in railway planning as 'Saturdays Excepted' (SX) services.

<sup>3</sup> The values vary reflecting the impact on occupancy of the speeds of the trains involved. The value quoted above covers the majority of potential situations at this location – however, for those situations where a slower-moving freight train is the first of a pair of conflicting moves, the value is increased. This has been accommodated in the small number of such situations requiring resolution, noted in the findings.

The interactions between trains that are to include a station call at Magor and Undy with other trains in the timetable have been assessed. The tables below summarise, on a train by train basis, the effect of an increase in journey time for each service.

Table 8 (showing westbound trains) indicates that the vast majority of trains arrive in Cardiff either as planned or no more than a minute later, with two arriving three minutes later than planned. In most cases any onward workings will continue as currently booked.

Table 9 (showing eastbound trains) indicates that for almost all trains the maximum impact within the area examined will be a lateness of one minute compared with current timings, with no knock-on impacts on other trains within the area examined. There is one conflicting movement at Severn Tunnel Junction such that the train will arrive at its destination (Gloucester) three minutes later than currently but this is a conflict that is already present within the existing timetable (see the 19.50 ATW CDF to GCR in Table 9).

**Table 8: Passenger train impacts - Westbound**

Train Title	Magor and Undy Depart	Remarks
05.37 ATW CNM to MST	06.33½	NPT arrives one minute late, forward as planned.
05.12 GWR TAU to CDF	06.51½	CDF arrives one minute late.
05.37 XC BHM to CDF	07.44½	CDF arrives one minute late.
06.02 GWR TAU to CDF	07.59	CDF arrives one minute late.
07.46 ATW CNM to MST	08.42½	NPT arrives one minute late, forward as planned.
07.37 GWR WSM to CDF	08.52½	CDF arrives one minute late.
08.46 ATW CNM to MST	09.44½	CDF arrives as planned.
08.41 GWR WSM to CDF	09.50	CDF arrives one minute late.
09.16 GWR TAU to CDF	10.51	CDF arrives one minute late.
10.45 ATW CNM to MST	11.43	CDF arrives one minute late, forward as planned.
09.25 GWR SJP to CDF	11.51½	CDF arrives three minutes late.
11.46 ATW CNM to MST	12.42½	CDF arrives one minute late.
11.04 GWR TAU to CDF	12.50½	CDF arrives one minute late, 1215 PAD-CDF arrives 1minute late.
12.04 GWR TAU to CDF	13.49½	CDF arrives one minute late.
13.45 ATW CNM to MST	14.42½	CDF arrives as planned.
13.08 GWR TAU to CDF	14.52	NPT arrives one minute late, forward as planned. 1315 PAD-CDF arrives two minutes late.
14.46 ATW GCR to FGH	15.31½	CDF arrives one minute late, forward as planned.
12.53 GWR PGN to CDF	15.49½	CDF arrives one minute late. 1415 PAD-CDF 1 minute late into NPT, but arrives at CDF on time.
14.57 GWR TAU to CDF	16.51	NPT arrives one minute late, forward as planned.
16.46 ATW CNM to MST	17.43½	CDF arrives one minute late, remains one minute late to MST.

Train Title	Magor and Undy Depart	Remarks
16.07 GWR TAU to CDF	17.47½	CDF arrives one minute late,
17.45 ATW CNM to MST	18.43½	CDF arrives one minute late, remains one minute late to MST.
17.06 GWR TAU to CDF	18.54½	CDF arrives one minute late, 17.15 PAD to CMN retimed arrives at CDF one minute late, then as booked.
18.45 ATW CNM to MST	19.44	CDF arrives one minute late, remains one minute late to MST.
18.08 GWR TAU to CDF	19.50½	CDF arrives one minute late. 18.15 PAD to SWA retimed arrives at CDF one minute late, then forward as booked.
19.45 ATW CNM to MST	20.44	CDF arrives one minute late, remains one minute late to MST
21.21 GWR BRI to CDF	21.50½*	CDF arrives one minute late. 20.15 PAD to SWA retimed arrives at CDF one minute late, and throughout to SWA.
19.23 GWR PMH to CDF	22. 21½*	CDF arrives one minute late. 1930 MAN to CMN retimed arrives at CDF one minute late, and throughout to CMN.
20.23 GWR PMH to CDF	23.22*	CDF arrives one minute late.
23.00 ATW CNM to CDF	23.59*	CDF arrives one minute late.

Source: Mott MacDonald – Abbreviations are as follow: Birmingham New Street (BHM), Bristol Temple Meads (BRI), Cardiff Central (CDF), Carmarthen (CNM), Cheltenham Spa (CNM), Exeter St Davids (EXD), Fishguard Harbour (FGH), Gloucester (GCR), Manchester Piccadilly (MAN), Maesteg (MST), Nottingham (NOT), London Paddington (PAD), Paignton (PGN), Plymouth (PLY), Penzance (PNZ), Portsmouth Harbour (PMH), Patchway (PWY), St James Park (Exeter) (SJP), Swansea (SWA), Taunton (TAU), Westbury (WSB), Weston-super-Mare (WSM) Severn Tunnel Junction (STJ).

**Table 9: Passenger train impacts - Eastbound**

Train Title	Magor and Undy Depart	Remarks
06.12 ATW CDF to CNM	06.36½	GCR arrives one minute late.
06.30 GWR CDF to PMH	06.52½	PWY arrives one minute late.
07.00 XC CDF to MAN	07.22½	PWY arrives one minute late.
07.05 ATW CDF to CNM	07.35	GCR arrives one minute late.
08.00 GWR CDF to PGN	08.24	PWY arrives one minute late.
09.00 GWR CDF to PNZ	09.24	PWY arrives one minute late.
09.12 ATW CDF to CNM	09.37	GCR arrives one minute late.
10.00 GWR CDF to TAU	10.25	PWY arrives two and a half minutes late.
09.16 ATW MST to CNM	10.35½	GCR arrives one minute late.
11.00 GWR CDF to TAU	11.23½	PWY arrives one minute late.
12.00 GWR CDF to TAU	12.23½	PWY arrives one minute late.
11.15 ATW MST to CNM	12.37	GCR arrives one minute late.
13.00 GWR CDF to EXD	13.24½	PWY arrives one minute late.
12.17 ATW MST to GCR	13.38	GCR arrives one minute late.
14.00 GWR CDF to TAU	14.23½	PWY arrives one minute late
15.00 GWR CDF to TAU	15.24	PWY arrives one minute late
14.15 ATW MST to CNM	15.37	GCR arrives one minute late.
16.00 GWR CDF to TAU	16.24	PWY arrives one minute late.
15.17 ATW MST to CNM	16.35½	GCR arrives one minute late.
17.00 GWR CDF to TAU	17.24	PWY arrives one minute late.
16.15 ATW MST to CNM	17.36½	GCR arrives one minute late.
18.00 GWR CDF to TAU	18.24½	PWY arrives one minute late.
17.15 ATW MST to CNM	18.32½	GCR arrives one minute late.
19.00 GWR CDF to TAU	19.24	PWY arrives one minute late.
19.50 ATW CDF to GCR	20.08	GCR arrives four minutes early. Train is retimed to start five minutes earlier, at 19.45, to mitigate interaction at STJ.
20.00 GWR CDF to TAU	20.24½	PWY arrives one minute late.
21.00 GWR CDF to WSB	21.24	PWY arrives one minute late.

Train Title	Magor and Undy Depart	Remarks
06.12 ATW CDF to CNM	06.36½	GCR arrives one minute late.
06.30 GWR CDF to PMH	06.52½	PWY arrives one minute late.
07.00 XC CDF to MAN	07.22½	PWY arrives one minute late.
07.05 ATW CDF to CNM	07.35	GCR arrives one minute late.

Source: Mott MacDonald – Abbreviations are as follow: Birmingham New Street (BHM), Bristol Temple Meads (BRI), Cardiff Central (CDF), Carmarthen (CNM), Cheltenham Spa (CNM), Exeter St Davids (EXD), Fishguard Harbour (FGH), Gloucester (GCR), Manchester Piccadilly (MAN), Maesteg (MST), Nottingham (NOT), London Paddington (PAD), Paignton (PGN), Plymouth (PLY), Penzance (PNZ), Portsmouth Harbour (PMH), Patchway (PWY), St James Park (Exeter) (SJP), Swansea (SWA), Taunton (TAU), Westbury (WSB), Weston-super-Mare (WSM), Severn Tunnel Junction (STJ).

\*see Engineering Access Statement comments.

Full details of the complete timetable of trains can be found in Appendix E.

In Appendix E, trains which call at Magor and Undy are shaded in yellow. Other trains that have been retimed are reflected in orange.

## 6.5 Freight Impact

The assessment has been carried out under the premise that the trains stopping at Magor and Undy would join the Relief lines for a short section between Severn Tunnel Junction and Newport to provide access to the station. As such, and as no situations have been found requiring more extensive use of the Relief lines, no substantial issues have been found regarding freight services.

The revised timetable has only been checked against Working Timetable (WTT) freight paths and against the further paths actually used on a sample day during March 2018. Although many WTT freight paths are not used, and many additional paths are added to the route on individual days, the quantum of freight services remains (particularly during the daytime period) at a similar level to that shown in the WTT as checked for conflicts during this exercise.

Table 10 indicates the potential impact of the scheme on non-passenger trains<sup>6</sup>. On the basis of freight trains featured in the WTT, there is one impact from Magor and Undy calls in westbound passenger trains and two from calls in eastbound passenger trains<sup>7</sup>.

<sup>6</sup> The analysis has been undertaken on the basis of services scheduled to run on two or more days per week.

<sup>7</sup> A further eastbound interaction occurs where a passenger train has needed to be retimed by one minute to follow a freight train through the Relief line at Magor at 10.24, as can be seen in the eastbound train listing in Appendix E.

**Table 10: Non-passenger train impacts**

Train Title	Severn Tunnel Junction (STJ) passing time	Remarks
6V13 0338 Acton - Margam <sup>8</sup>	06:41:00	Retimed by one minute to 06:42:00, allowing it to take the STJ crossover after the eastbound 2G50.
4V44 1047 Daventry-Wentloog	14:48:00	Delayed by 5min to 14:53:00, to allow 2U18 to precede it westbound.
6B33 (Q) 1300 Theale - Robeston	16:41:00	Retimed by one minute to 16:42:00, allowing it to take the STJ crossover after the eastbound 2G64.

The flexibility enshrined in the contracts between the freight operator and Network Rail permits a reasonable degree of flexing in the planned path. Therefore we anticipate that the minor adjustments identified above can be accommodated during the usual industry timetable planning process.

The analysis reported above identifies interactions with existing passenger services on the two routes which would call at Magor and Undy. There are aspirations to enhance the Cheltenham - Cardiff – Maesteg service, which is currently two-hourly, to hourly and it has been assumed in the economic analysis that this has been done. This would require the infilling of four westbound and five eastbound passenger services per day, with the likely need for adjustments to freight services which are currently making use of the vacant route capacity at these times<sup>10</sup>. The further step to call any new passenger services at a Magor and Undy station is not expected to have significantly different implications than the calling of the current services reported in Section 6.4.2.

## 6.6 Engineering Access Implications

As part of the maintenance of the route in this area, Network Rail publish the times when opportunities are available to take possessions on the Main or Relief lines in their Engineering Access Statement. The latest rules have been summarised below .

The commencement time of these possession opportunities in the evening could restrict station calls from 2150 onward. These rules will need to be renegotiated with Network Rail if access is to be provided for trains to call at Magor and Undy station, however any impacts are likely to be manageable and will certainly fall outside the periods of core impact on the market for the new station.

<sup>8</sup> The train does not feature in Appendix E, the westbound train listing, as it did not run on the day of the example train extract.

<sup>10</sup> Appendix E lists the five freight services in the current Working Timetable (or actually running on the sample day in March 2018) for Mondays-Fridays which would need to be adjusted to bring in the hourly stopping passenger service between Cardiff and Cheltenham.

**Figure 7: Engineering Access Statement, 2019 timetables**

Network Rail  
National Access Planning Team  
Wales Route

Engineering Access Statement 2019  
Final Rules  
Section 4 – Standard Possession Opportunities

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**GW900 PILNING TO FISHGUARD HARBOUR - continued**

SECTION		Periods A and B 09.12.2018 to 10.02.2019	Period C 11.02.2019 to 24.03.2019	Period D 25.03.2019 to 18.05.2019	Periods E to G 19.05.2019 to 08.09.2019	Periods H and J 09.09.2019 to 07.12.2019	REMARKS
Severn Tunnel Jn to Maindee East Jn  900.2	WEEK END	2150 Sat – 1000 Sun Mains or Reliefs BLOCKED -and- 0010 Sun – 0750 Sun All BLOCKED		2150 Sat – 0900 Sun Mains or Reliefs BLOCKED -and- 0010 Sun – 0750 Sun All BLOCKED		<b>Period H</b> 2150 Sat – 0900 Sun Mains or Reliefs BLOCKED -and- 0010 Sun – 0750 Sun All BLOCKED <b>Period J</b> 2150 Sat – 1000 Sun Mains or Reliefs BLOCKED -and- 0010 Sun – 0750 Sun All BLOCKED	Access to Llanwrn Steel works must be available for 6V02 at the east end. Access from Llanwrn Steel works must be available for 6B66 at the west end.
	SUN/ MON	0001 Mon – 0500 Mon Mains BLOCKED					Trains to be timed over the RLs with RL SRTs when MLs blocked.
	MID WEEK	2215 Mon-Thu – 0605 Tue-Fri Mains BLOCKED or 2150 Mon-Thu – 0600 Tue-Fri Reliefs BLOCKED (Specific Weeks / Sections / Lines as shown in Section 5)					RLs can be blocked for same times if declared and agreed in DPPP / CPPP.
							ML side patrolling required until 1000 Sun during GMT. Trains to / from Marches Line not affected unless specified in Section 7.

Source: Engineering Access Statement 2019, Network Rail.

## 6.7 Impact of Potential Future Train Services

The forthcoming introduction of new specifications for the Wales and Borders rail services and the current Great Western Railway (GWR) franchise, and the full introduction of electrified services under the Great Western Route Modernisation (GWRM) will change the timings of train services along the route that have been used in the timetable analysis, and possibly also the number of services operating.

As a result of the electrification programme, a cascade of rolling stock will take place from other areas that have been electrified. Consequently differing rolling stock types may be operating the Taunton – Cardiff and the Cheltenham Spa – Maesteg service, with the possibility of slightly improved overall journey times which might allow the time penalty of the station stop to be recouped. For example, a saving of two minutes between Cardiff and Severn Tunnel Junction stations alone is indicated by timing exercises<sup>11</sup>, however until the internal cascades for GWR are enabled by the final deliveries of new rolling stock, we cannot specifically state that these trains will be available.

Similarly whilst there are likely to be electric trains available, it would not be possible to apply electric timings to our assessment until it could be clarified that the entire route for relevant services was to be electrified. Whilst there are also bi-mode trains being developed, at present only franchises that have already started the procurement process will have these units available.

## 6.8 Rail Services Conclusion

The operations assessment shows that when services call at Magor and Undy there is a core time penalty of one minute to the services. In some instances this impacts upon trains following behind, although in most cases the additional time is fairly minimal as shown in Table 8 and Table 9.

- When heading towards Cardiff the combined impact can be up to three minutes but in most cases will not affect the next train working

<sup>11</sup> Indicative exercises conducted using train planning software TPS, informed by Network Rail data from B-Plan, for cascade of existing regional DMU classes.



- In the eastbound direction the impact is typically one minute at Patchway and Gloucester, with two examples of being up to three minutes late (both necessitated by accommodating current freight paths). While these could affect the continuation of their onward journey (and other services outside of the scope of this review could also be affected by this) the overall scale of the impact is small

A small number of impacts to freight services have been identified, which are small in scale (two impacts of one minute and one of five minutes).

Overall the timetable impacts are assessed to be minor and capable of being resolved within the usual industry timetable planning process. There is a further possibility that a cascade of rolling stock associated with the forthcoming new Wales and Border service (and completion of electrification of the Great Western Main Line) could bring more modern, higher-performance rolling stock capable of compensating for the time penalty of the station stop, in both directions (subject to intermediate timing constraints).

Beyond any May 2018 timetable changes, further changes will be due for December 2019, when it is expected that the renewed GWR fleet will be in squadron service and operating under electric traction throughout. The impacts of any such timetable changes are currently unknown and we suggest that this component of the study is further updated when the details of these schemes are known. This will coincide with other analysis (such as punctuality impact modelling) required to complete the GRIP 3 assessment. This will also provide an opportunity to quantify the impacts, in the context of any adjustments to other services arising from the potential filling of gaps in the Cheltenham service, to provide an hourly service of stopping trains throughout the day.

## 7 Station Arrangement

### 7.1 Existing Infrastructure

The existing railway is supported on an embankment and runs adjacent to Main Road that provides the main access through the villages of Magor and Undy. The Undy Halt footbridge and West End subway provide means of crossing the railway line at the site of the proposed station.

Undy Halt footbridge was constructed in 2015 to replace an existing footbridge structure in order to increase the height of the structure to accommodate the Great Western Route Modernisation Project. From review of the latest inspection report, no defects have been reported in any past visual or detailed inspections up to September 2017.

The West End subway was expanded in 1941 to accommodate quadrupling of the South Wales Main Line and now comprises 3 separate decks each supporting the Up Relief line, the Up and Down Main line and the Down Relief line. No additional defects were recorded in the latest visual inspection of the West End subway from May 2016. The last detailed inspection, carried out in June 2017, found the structure to be in a fair condition with a few minor defects. These included the following:

- Deteriorating paintwork throughout the trough deck and areas of minor corrosion
- Open fractures to the low mileage wingwall with minor fractures to the copings of the low mileage wingwall and both abutments
- Areas of isolated corrosion across the trough floor and ballast plates
- Efflorescence throughout wingwalls, abutments and high mileage cill indicating a failure/lack of waterproofing to the deck

Mott MacDonald carried out a site visit which was carried out in March 2018 which also identified the areas of fracturing and efflorescence to the abutments described in the previous inspection reports. The report for this site visit can be found in Appendix H. Additional observations from this site visit were :

- Development of dampness and vegetation along the abutment walls beneath the central twin deck and in the open areas to either side of this deck
- Corrosion of the troughs for the twin Main line deck, rivets of the deck for the Down Relief line and bearings of the deck for the Up Relief line
- Low headroom beneath the Up Relief line
- Areas of masonry spalling to abutments beneath the Main line deck at a low level
- Build-up of vegetation and debris around the high mileage wingwall at the southern entrance to the subway
- Weepholes were identified beneath the troughs of the deck supporting the Main line and along the wall running parallel to the footpath on Main Road

### 7.2 Options Study Overview

An option study has been carried out to compare options and determine the most effective solution for the overall station layout. The previous GRIP 2 report reviewed the platform arrangements and, as such, this report will focus on potential solutions for platform construction, access for persons with reduced mobility and highways modifications required to accommodate

the station access. A brief description of the discarded options has been included in Section 7.6.5 to illustrate the full design process undertaken.

### 7.3 Platform Locations

The GRIP 2 stage considered several options for the location of platforms on the Up and Down Relief lines at the proposed station. Figure 8 below identifies the options considered.

**Figure 8: Platform Location Options**



Source: Contains OS data © Crown copyright and database right (2018)

For the Up Relief (eastbound) platform the main considerations were as follows:

- Option 1 – This platform would be located near to potential car parking and drop-off areas. However, it is furthest from the subway and footbridge. This location would benefit from being west of the existing signal gantry, minimising potential costly changes to the signalling infrastructure
- Option 2 – This platform would be located directly above the subway and provide close access to the B4245, potential car parking and drop-off areas. However, this option would reduce the width of the road as well as the width of the adjacent pavement, particularly if ramp access is provided
- Option 3 – In this option the walking distance from potential car parking is considerably further than for Options 1 and 2. In addition, a signal gantry is located between Option 1 and 2, and it is not good practice to introduce a platform immediately after a major piece of signalling infrastructure as station duties can be a distraction, potentially causing a driver to forget what the signal was displaying. These signals could potentially be moved, although these would significantly increase the project cost and potential risk of a signal overrun

For the Down Relief (westbound) platform the choice of option was primarily due to access from the car park and drop-off areas as well as proximity to the Up Relief platform. Neither of the suggested locations were significantly impacted by the location of signalling infrastructure as with the eastbound platform.

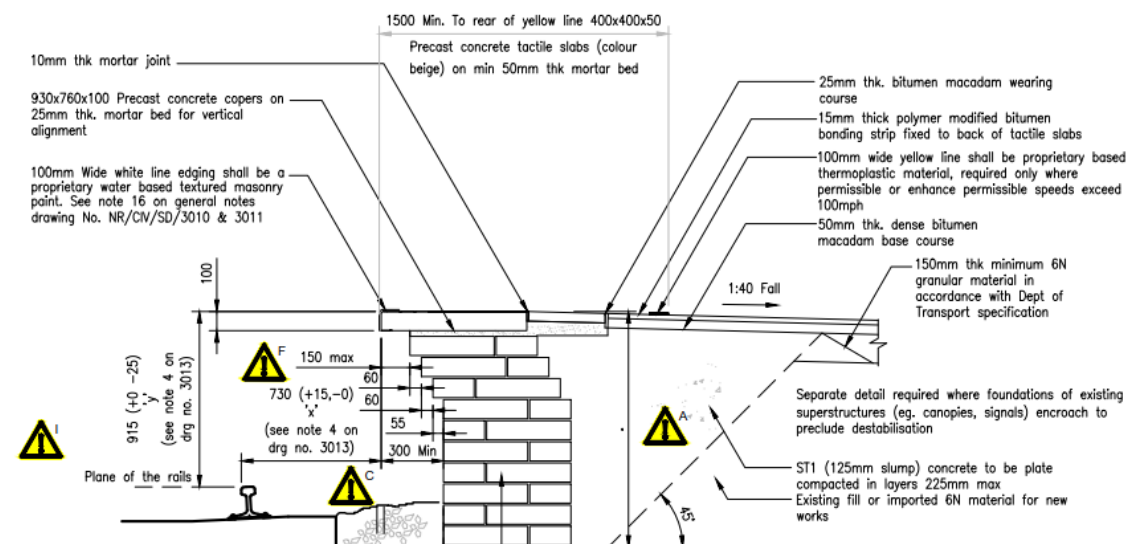
## 7.4 Platform Construction

The options considered are:

- Option 1 – Traditional front wall platform
- Option 2 – Cross-wall platform (Type 1 or 2)
- Option 3 – Modular steel platform
- Option 4 – Modular fibre-reinforced polymer (FRP) platform
- Option 5 – Modular expanded polystyrene (EPS) platform

#### 7.4.1 Option 1 – Traditional Front Wall Platform

**Figure 9: Typical cross-section of the traditional front wall platform**



Source: NR/CIV/SD/3012. Network Rail

Figure 10 and Figure 11 show two types of cross fall platform system that are available and utilise a 600mm thick reinforced concrete T-shaped strip foundation with 440mm thick blockwork walls on top. Type 1 includes steel beams that cantilever from the wall and precast concrete planks are then placed on top along with surfacing.

1500 Min to rear of yellow line

15mm thick polymer modified bitumen bonding strip fixed to back of tactile slabs

25mm Thk. bitumen macadam wearing course

400x400x50 Precast concrete tactile slabs (colour - beige) on min. 50mm thk. mortar bed

10mm thk. mortar joint

50mm Thk. dense bitumen macadam base course

Precast C40 beam 440 wide x 210 deep on 10mm mortar. Length to suit platform width. 20x20 Chamfers to external corners

100mm wide yellow line shall be proprietary based thermoplastic material, required only where permissible or enhanced permissible speeds exceed 100mph

Bitumen tack coat to be applied

Slope 1:40

450min

1550

800/1000

560

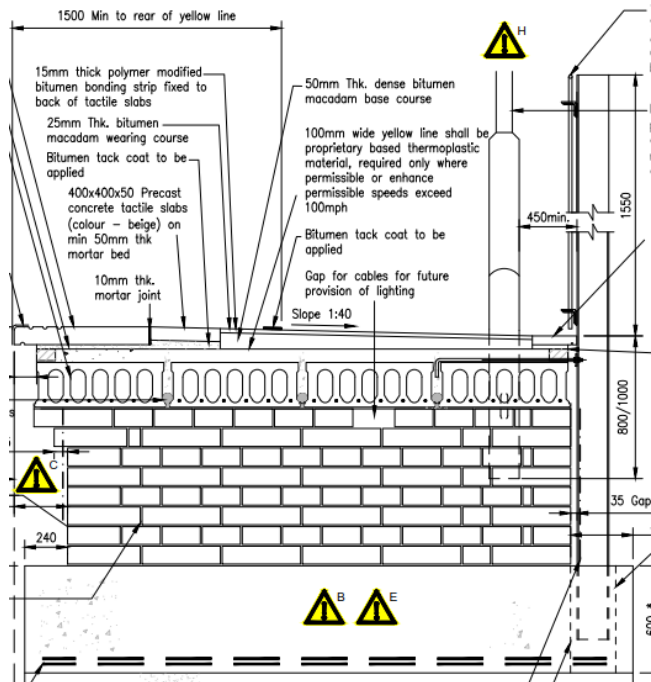
100

35 Gap

Warning signs: A (Yellow diamond with black border and exclamation mark), B (Yellow diamond with black border and exclamation mark), C (Yellow diamond with black border and exclamation mark), E (Yellow diamond with black border and exclamation mark), H (Yellow diamond with black border and exclamation mark)

For Type 2, no cantilever beams are used and the blockwork walls are instead built closer to the track with precast planks placed directly onto the walls. Due to the reduced distance between the walls and track, it is not possible to install troughing adjacent to the tracks.

**Figure 11: Type 2 Cross-wall Platform**

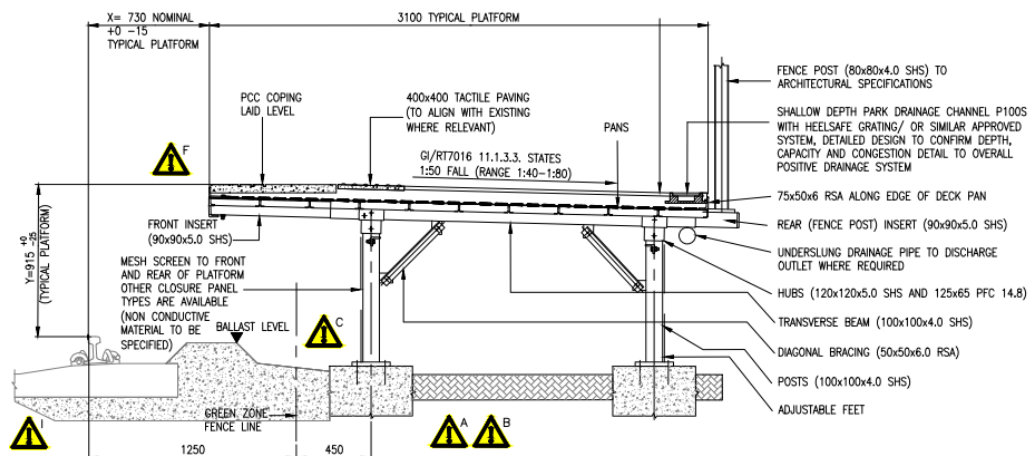


Source: NR/CIV/SD/3037, Network Rail

### 7.4.3 Option 3 – Modular Steel Platform

The Network Rail standard modular steel platform system can be mounted on either concrete pad or pile foundations and supports are typically provided at 1.22m intervals across the length of the platform. The void below the platform can be utilised for duct work to provide service routes along the platforms.

**Figure 12: Typical cross-section of steel modular platform system**



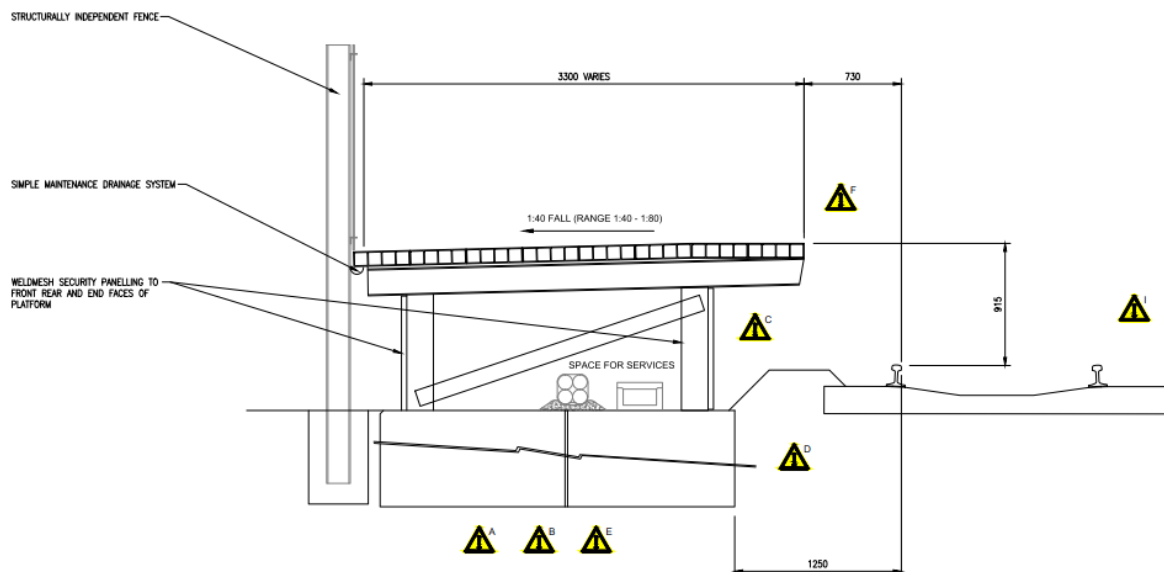
Source: NR/CIV/DWG/3900, Network Rail

#### 7.4.4 Option 4 – Modular FRP Platform

The modular Fibre Reinforced Platform (FRP) system that is provided by Network Rail can be founded on either precast or in-situ foundations. The construction sequence is very similar to its steel counterpart, although the support intervals are typically at 4m. Space for services can also be provided below the platform.

The FRP system is modular, light-weight and can be prefabricated to include integral lines, lighting and anti-slip surfaces. They are also non-conductive meaning they do not have the same earthing and bonding requirements as steel platforms have when located adjacent to electrified railway lines.

**Figure 13: Typical cross-section of FRP modular platform system**

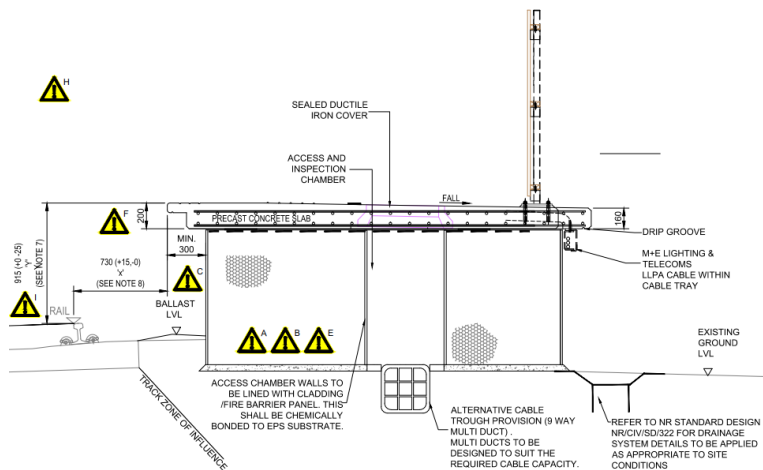


Source: NR/CIV/DWG/3910, Network Rail

#### 7.4.5 Option 5 – Modular EPS Platform

Expanded polystyrene is provided within the core of this third modular platform option and was recently used as part of station upgrades at Peterborough and Bath Spa stations. The EPS block core is founded on a thin layer of sand and coated in a cementitious mortar to provide fire resistance. Once the EPS blocks are lowered into place onto the layer of sand, a packer filler is applied for further protection before a precast slab is placed on top of the blocks to form the platform surface. With this platform arrangement, troughing can be provided either buried below the EPS blocks or to the rear of the platform.

**Figure 14: Typical cross-section of EPS modular platform system**



Source: NR/CIV/DWG/3920, Network Rail

#### 7.4.6 Platform Recommendations

Table 7 summarises the advantages and disadvantages of each option considered for platform construction.

For this station, it is recommended that a modular platform construction is adopted. The traditional front wall platform and cross fall platform (Types 1 and 2) would require significantly longer construction time and subsequent higher costs for possessions in comparison to the following three modular systems. It is recommended that the choice of platform construction should be discussed and agreed with Network Rail.



**Table 7: Comparison of Options for Platform Construction**

	Traditional front wall platform	Cross wall platform – Types 1 and 2	Modular steel platform	Modular FRP platform	Modular EPS platform
Advantages	<ul style="list-style-type: none"> <li>Simple to construct</li> <li>No crane required to lift parts in place</li> <li>Appearance can be designed to preference</li> <li>Low material use which reduces capital cost</li> <li>Low maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Platform supported on structure with no reliance on fill</li> <li>Foundation has low impact on track influence zone.</li> <li>Will not form barrier to water during high return period flood event</li> </ul>	<ul style="list-style-type: none"> <li>Quick construction due to provision of pre-fabricated sections</li> <li>Low temporary works requirements for construction of foundations</li> <li>Able to be constructed in smaller sections that can be assembled on site</li> <li>Platform can be altered easily if track alignment changes in the future</li> <li>Void can be utilised for service routes</li> <li>Will not form barrier to water during high return period flood event</li> </ul>	<ul style="list-style-type: none"> <li>Quick construction due to modular sections</li> <li>Lightweight sections prefabricated and assembled on site with smaller plant</li> <li>Smaller foundations required due to reduced loading</li> <li>Low temporary works required for construction of foundations</li> <li>Platform can be altered easily if track alignment changes in the future</li> <li>Lower maintenance cost than steel or traditional/cross-wall construction</li> <li>Void can be utilised for service routes</li> <li>Will not form barrier to water during high return period flood event</li> <li>Non conductive</li> </ul>	<ul style="list-style-type: none"> <li>Quick construction time due to modular sections</li> <li>Lightweight elements that can be prefabricated and assembled on site with smaller plant</li> <li>Reduced excavation as minimal foundations required</li> <li>Sustainable solution – EPS can be recycled if platform is eventually demolished</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Temporary works required to install foundation within track influence zone</li> <li>Large amount of infill required due to existing ground profile</li> <li>Brickwork construction is slow and would require possession and increased manual handling</li> <li>Pre-planned duct routes required</li> <li>Could act as barrier to water during flood event</li> </ul>	<ul style="list-style-type: none"> <li>Difficulty in lifting precast concrete units and steel members</li> <li>Cranes maybe required for construction</li> <li>Excavation required for foundations</li> <li>Large variation in construction materials will increase cost</li> <li>High maintenance requirements due to multiple elements requiring inspection and large voids located beneath platform</li> </ul>	<ul style="list-style-type: none"> <li>Cranes maybe required to lift larger units which would require possession of at least adjacent lines</li> <li>Higher maintenance demand than traditional forms of platform construction</li> </ul>	<ul style="list-style-type: none"> <li>Higher capital cost than steel counterpart</li> </ul>	<ul style="list-style-type: none"> <li>Higher material costs</li> <li>Pre-planned duct routes required</li> <li>Off-site preparation preferred</li> <li>Flood event could cause uplift of platform</li> </ul>

## 7.5 Platform Widths

It is anticipated that platform widths will be 2.5-3m and that all platforms will be compliant with the Infrastructure Technical Specifications for Interoperability (INF TSI) and Design Standards for Accessible Railway Stations, including provision of tactile paving, unobstructed progress and signage. As station footfall is expected to be low, the platform widths are likely to be governed by the widths required for boarding ramps, platform furniture and emergency evacuation requirements. It is recommended that a pedestrian flow study, considering emergency evacuation scenarios, is carried out at the next stage of design to confirm the required platform widths. This should be considered in consultation with the train operating companies.

Yellow lines are required where the permissible speed on the adjacent line exceeds 100mph. As the line speeds adjacent to the platforms are less than 100mph, a yellow line is not mandatory at this station. However, there may be a desire to include a yellow line behind the tactile pavers as a visual aid, this should be decided in collaboration with Network Rail and the Train Operating Company during the next design stage.

## 7.6 Platform Access

Platform access routes are to be provided from the nearby B4245 and proposed drop-off points. As this is a new station, access to all platforms should be in accordance with the INF TSI and the Department for Transport's Design Standards for Accessible Railway Station, including provision of step-free access routes to all platforms.

The northern platform shall be accessed through the provision of a footpath from the nearby drop-off point. Access to the southern platform from the drop-off point will require a track crossing. The following options have been considered for access to the southern platform across the station.

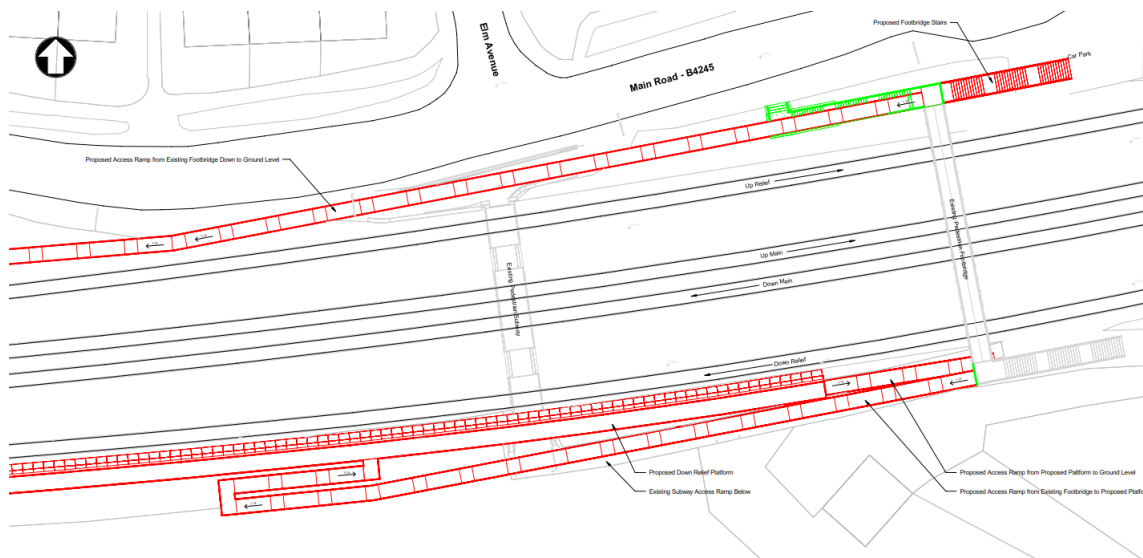
### 7.6.1 Option 1 – Undy Halt Footbridge

This option considers use of the existing Undy Halt footbridge to the east of the site to provide access over the railway tracks. This has recently been reconstructed by Network Rail as part of the electrification of the South Wales Main Line and is a Right of Way. However, this footbridge only currently provides stepped access, therefore modifications are required for this route to become step-free.

One option to provide step-free access across the footbridge is to install ramps to each end. For the purpose of this study, the ramp gradient for these footbridge modifications is assumed to be 1 in 20, which represents the lowest gradient compliant with the Design Standards for Accessible Railway Stations. For ramps of this nature, the optimum compliant gradient to reduce the total ramp length is 1 in 14. It is recommended that the most suitable gradient should be confirmed at the outline design stage, including dialogue with local user groups.

The main span of the footbridge is approximately 5.12m vertically above the existing highway to the north. At the northern end of the footbridge, this would require a ramp with a horizontal length of approximately 140m to join with the existing footpath adjacent to Main Road, assuming ramp gradients of 1 in 14. To accommodate this ramp the stairs could be relocated to the east. For the southern side of the footbridge, the existing stairs running east from the footbridge towards West End could be retained and a ramp provided running west towards the proposed platform. The required horizontal length of ramp required here is approximately 110m for a gradient of 1 in 14 to meet the southern platform. Details of these proposed ramp arrangements are shown in drawing 373743-WTD-BTL-DRG-ECV-101, an extract of which is shown below in Figure 15.

**Figure 15: Option 1 showing ramps required to existing footbridge**



A disadvantage of using this form of access are the long stretches of ramp required to reach the main span of the footbridge, presenting a long travel distance that may make access difficult for wheelchair users.

It is anticipated that the ramps would be constructed from a steel frame with piled foundations, similar to the structural arrangement of the existing steel footbridge. The ramps would be located adjacent to the existing railway infrastructure and would therefore require additional land take to construct.

### 7.6.2 Options 2-4 – West End Subway

This option considers use of the existing West End subway which connects Main Road (B4245) and West End to provide access between the two platforms. The subway comprises three separate decks with continuous masonry walls. Between each deck is an open air section. The total length of the subway is 25m, it is 2.4m wide and the headroom varies across its length, with the lowest headroom being just under 1.9m at the northern end. There are two main standards which have been considered for applicability to this subway:

- DMRB Volume 6: Section 3 TD36/93 Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions.
- Design Standards for Accessible Railway Stations, incorporating relevant clauses from the PRM TSI (Persons of Reduced Mobility Technical Specification for Interoperability) and BS 8300:2009 (Design of buildings and their approaches to meet the needs of disabled people)

TD36/93 requires the subway height and width to be at least 2.3m to provide suitable access for pedestrians. However, should the subway be deemed to form part of the station then the Design Standards for Accessible Railway Stations would be applied. Code of Practice guidance within this standard recommends a minimum of 3m clear headroom to be provided. The recommended subway width is 4.8m although the minimum requirement for subway width is 1.6m. These key dimensions are summarised in the table below.

**Table 11: Summary of subway dimensions**

	Current subway dimensions	TD36/93	Design Standards for Accessible Railway Stations
<b>Width</b>	2.4m	1.6m minimum	4.8m recommended for subways within a station
<b>Headroom</b>	1.9m minimum	2.3m minimum	3m recommended for subways within a station

Due to the nature of the subway, and as it will remain a public right of way it is not considered to be part of the station, therefore the height of 2.3m shall be provided in line with the TD36/93 standard. The existing subway width shall be maintained since this currently meets these requirements.

Options 2-4 consider three different solutions for increasing the headroom to meet the requirements of TD36/93.

Current access from the north of the subway is via two steep ramps sloping down from the existing road level. We have considered options for re-grading these access ramps to provide a compliant gradient, but this approach should be discussed and agreed with Network Rail and Monmouthshire County Council and documented in the Common Safety Method (CSM) hazard logs.

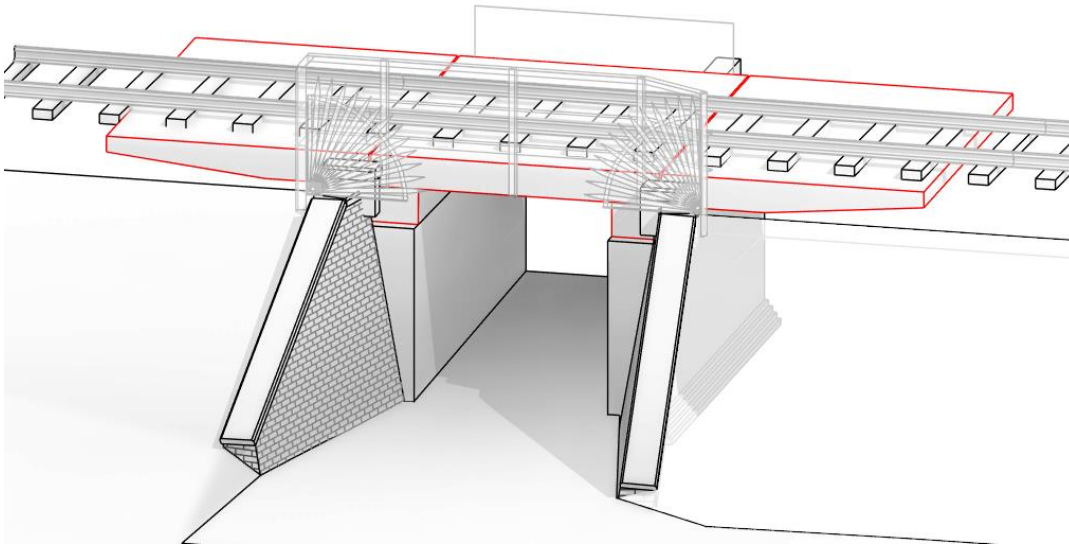
#### 7.6.2.1 Option 2 – Deck Replacement of West End Subway

The first option for increasing headroom in the subway is to remove the three existing trough decks that form the subway and replace these with thinner precast decks. Installation of direct fixed track would be required to retain the current track level and would allow for creation of additional headroom through removal of the depth of ballast currently in place. Removal of these elements of the railway track, along with replacing the existing troughs with a more efficient steel structure, could achieve a compliant headroom without any requirement for excavation of the subway base.

It is anticipated that the deck replacement works would be carried during possessions. Due to the existing track and subway layout it is possible to carry out the replacement works one deck at a time to reduce overall impact to the operational railway. The B4245 road to the north of the proposed station, along with adjacent footpaths, are likely to require some temporary closure during the deck replacement to allow for provision of cranes to safely install new precast deck units into place. For the Down Relief track on the southern side of the station, the most suitable access for cranes is likely to be to the south of the proposed station. However, this land is privately owned and access would require negotiation with land owners.

The advantages provided by using precast units include an upgraded deck to replace the deteriorating existing trough deck and increased speed of construction which therefore reduces possession demands. Reducing the time spent on site also causes reduces of exposure to other site hazards, such as risks of falling from height and vehicle collision on nearby roads.

**Figure 16: Proposed replacement deck to subway**

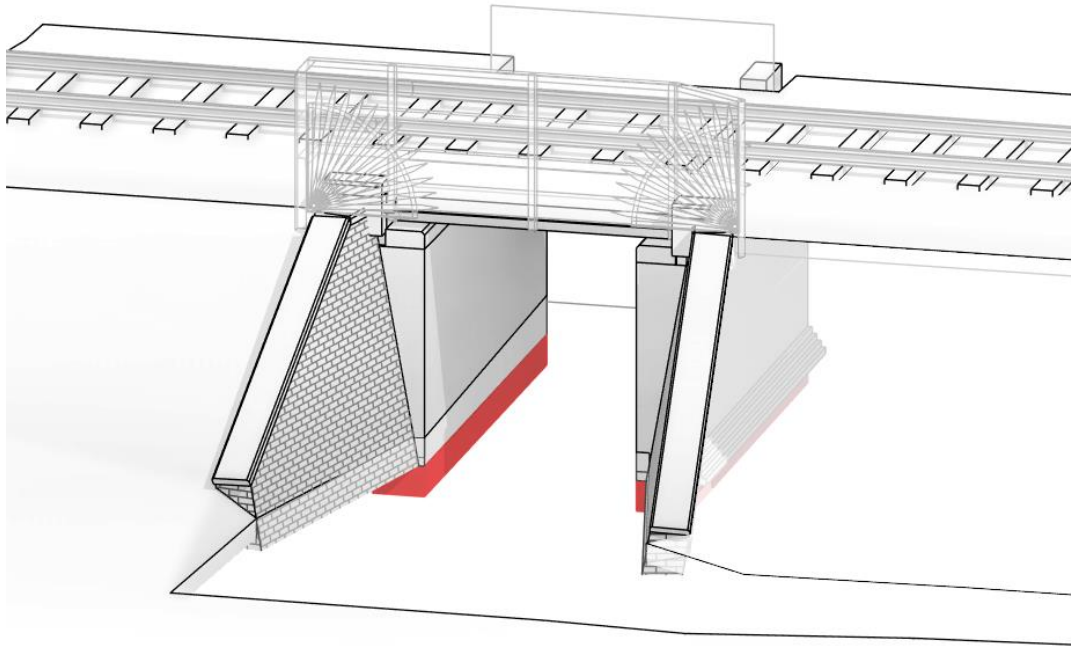


#### 7.6.2.2 Option 3 – Lowering of West End Subway

An alternative way of providing sufficient headroom across the length of the subway is to lower the existing ground level of the subway. This could be completed by excavating the base of the subway in a hit and miss sequence, excavating and underpinning the foundations in stages along the length of the walls. Props and waler beams will be required to temporarily support the abutments either side of the subway during constriction. It is anticipated that excavation will be required to provide new foundation, base and blinding layers to the new subway floor. These layers should be expected to account for an additional 0.5m depth of excavation beneath the new proposed level of the subway base.

It may be possible to carry out the construction works with the lines above in operation under a temporary speed restriction. Alternatively, single line possessions could be used to allow staged excavation across the length of the subway. This option does not require cranes as all work can be completed with small plant. However, due to the reduced headroom and work required within the subway, completing a full excavation of the base of the subway would be labour intensive.

**Figure 17: Proposed lowering of subway floor**



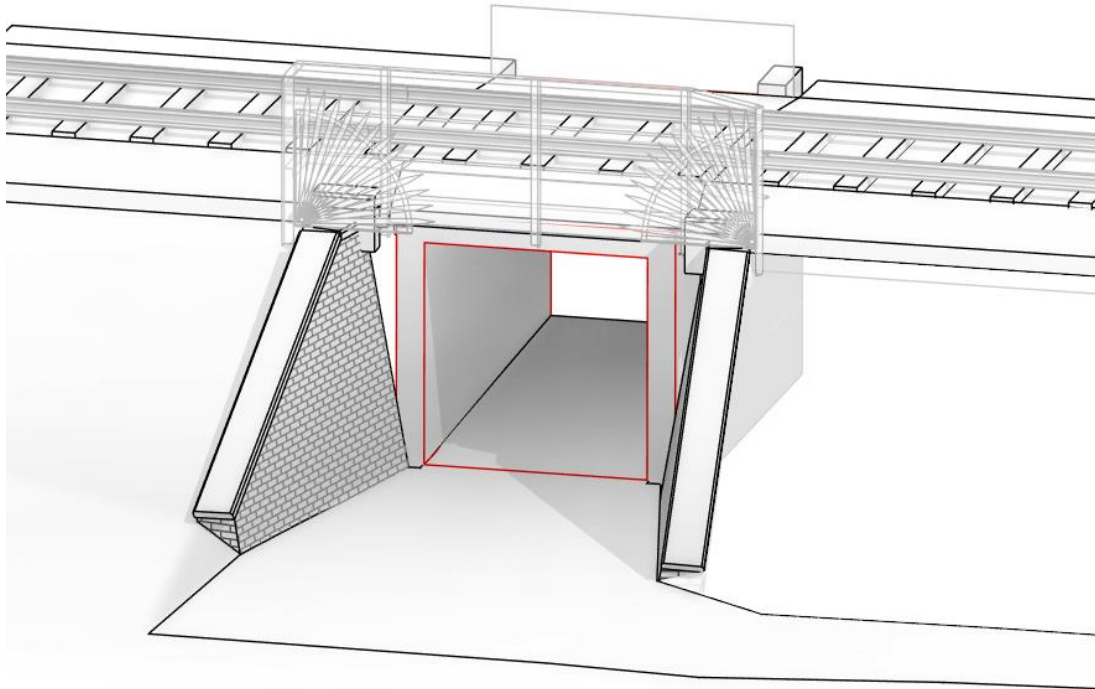
#### 7.6.2.3 Option 4 – Replacement of West End Subway

Another method of modification of the West End subway that has been considered is to remove the entire existing subway structure and install new precast concrete box culverts of suitable dimensions. Three culverts could be provided to replace the existing deck elements along the length of the subway to fulfil the headroom requirements beneath railway tracks. The precast reinforced concrete box culverts can be designed to accommodate the required width and headroom for full compliance with TD36/93.

This form of construction would require possession of the lines, but this could be undertaken one deck at a time to reduce overall impact on the operational railway. Some excavation of the embankment would also be required following removal of the subway structure to enable to installation of the replacement concrete culverts. This would then need to be back filled before replacing the ballast and track. Cranes would be required to manoeuvre the box culverts into place during abnormal possessions. Similar considerations for the provision of cranes on site will be required as for Option 2 to safely install box culverts into their correct locations, with similar advantages associated with the use of precast units.



**Figure 18: Proposed replacement subway**



### 7.6.3 Option 5 – Do Minimum

The final option considered for platform access to the station is to use the existing Undy Halt footbridge to provide stepped access to both platforms and for the existing subway to offer step-free access with non-compliant headroom. Potential mitigation options for the non-compliant headroom include installing warning signs or black/yellow reflective strips.

For this option, works would be limited to:

- Regrading/reconstruction of subway north access ramps to provide compliant gradient to subway
- Installation of compliant lighting
- Installation of CCTV
- Removal of overgrown vegetation and debris

As the Project Hazard Log presented in Appendix D shows, there are significant hazards from options that involve adapting the West End subway to achieve compliant access to the station. The key hazards that could be avoided (by not undertaking works to the subway and footbridge) are risks associated with working near roads and railway lines that may affect construction workers and members of the public. In particular, the stability of the existing subway masonry walls poses a significant risk for any works to the subway as the current condition of the structure is unknown. Works to the footbridge pose risks associated with working at height during the construction stage. In addition any ramps installed may be deemed to be excessively long for the difference in level of over 5m to from the adjacent footpaths.

## 7.6.4 Comparison of Options for Platform Access

Table 12 summarises the advantages and disadvantages of each option considered for step-free access to the platforms.

Each consideration has been given a score from 1 to 5, with 1 being least desirable and 5 being most.

**Table 12: Options Matrix for platform access**

	Option 1 – Undy Halt footbridge		Option 2 – Deck replacement of West End subway		Option 3 – Lowering of West End subway		Option 4 – Replacement of West End subway		Option 5 – Do minimum	
Impact on operational railway (indicative possession and access requirements)	Short possessions may be required to outer Relief lines for construction of ramps to footbridge. Utilisation of Rules of Route possessions to be considered. Low risk of crane or piling rig impacting railway line operation	4	Three separate possessions will be required to replace the three decks along subway: 1) Up relief 2) Up main/Down main 3) Down relief  Assumed 48 hour possession per deck	3	Subway lowering will impact rail operations, although it will be possible to carry out some works while the rail is operational. Network Rail may accept temporary speed restriction. Alternatively, single line possessions may be required for major work activities.	1	Possessions will be required to replace the existing subway with pre-cast concrete subways. Potential to separate into three separate possessions (as with Option 2) to minimise disruption. Assumed 72 hour possession per deck	3	None	5
Risk to existing Network Rail infrastructure	Existing footbridge to be closed during works. Construction of new ramps to be separate from the railway with minimal risk to track or adjacent land  Potential for damage to existing footbridge during modification/construction.	5	Fixed track due to reduced depth of new deck, could present differential settlement issues and provide greater maintenance requirement.  Lateral resistance of existing abutments could be reduced and impact stability of existing structure.	1	Lateral resistance of existing abutments could be reduced and impact stability of existing structure during construction.	1	Risk of over-running possessions impacting rail operations.	3	Deterioration of existing asset under increased use.	5
Accessibility and Diversity Impact Assessment	Compliant ramp gradients, but greatest length to provide accessible route across the station.  Existing subway to be retained with non-compliant headroom,	2	Installation of shallower deck to increase headroom to minimum of 2.3m.  North – ramp gradients to be modified and made compliant	5	Excavation of subway base to increase headroom to minimum of 2.3m.  North – ramp gradients to be modified and made compliant	5	New pre-cast subways to provide minimum headroom of 2.3m.  North – ramp gradients to be modified and made compliant  South – compliant access route to be provided to platform	5	Non-compliant headroom, ramp gradients and lighting. Headroom clearance can be mitigated through signage, but others are difficult to mitigate.	1



	Option 1 – Undy Halt footbridge		Option 2 – Deck replacement of West End subway		Option 3 – Lowering of West End subway		Option 4 – Replacement of West End subway		Option 5 – Do minimum	
	ramp gradients and lighting		South – compliant access route to be provided to platform Subway could be considered less preferable route at night for some users		South – compliant access route to be provided to platform Subway could be considered less preferable route at night for some users		Subway could be considered less preferable route at night for some users			
Derogation or non-compliances with Railways Standards	Full compliance achievable but excessive travel distance. Guidance recommends that the solution that presents the least travel distance practicable is adopted	2	Full compliance achievable	5	Full compliance achievable	5	Full compliance achievable	5	Non-compliance or derogations for ramps and subway geometries required	1
Impact on adjacent highway	Subway to remain open to provide public right of way. Temporary closure of Main Road and adjacent footpaths may be required to accommodate plant movement. Footpath diversion and traffic management maybe required particularly during critical delivery periods.	4	Footbridge to remain open to provide public right of way. Temporary closure of Main Road and adjacent footpaths may be required to accommodate plant movement. Footpath diversion and traffic management maybe required particularly during critical delivery periods.	3	Footbridge to remain open to provide public right of way. Temporary closure of Main Road and adjacent footpaths may be required to accommodate plant movement. Footpath diversion and traffic management maybe required particularly during critical delivery periods.	3	Footbridge to remain open to provide public right of way. Temporary closure of Main Road and adjacent footpaths may be required to accommodate plant movement. Footpath diversion and traffic management maybe required particularly during critical delivery periods.	3	Temporary subway closure for minor modifications.	5
Risks associated with ground conditions	Variable ground conditions, low strength soft compressible ground, contaminated land, differential settlement and the presence of existing services. Foundations for ramp expected to be similar to existing footbridge (piled).	3	No change to existing subway foundation loading. Potential for differential settlement of track due to different track construction.	4	Excavation of existing subway base may undermine existing foundations and provide exposure to contaminants (asbestos, tarmacadam, etc) Existing foundation arrangement unknown	1	Excavation of existing subway base may undermine existing foundations and provide exposure to contaminants (asbestos, tarmacadam, etc). Differential settlement between new and old foundations.	2	None	5

	Option 1 – Undy Halt footbridge	Option 2 – Deck replacement of West End subway	Option 3 – Lowering of West End subway	Option 4 – Replacement of West End subway	Option 5 – Do minimum
Key construction risks	<p>Possession availability 4</p> <p>Completion of works within possession</p> <p>Transportation and lifting of steel ramp units into position adjacent to operational line</p> <p>Crane operations</p>	<p>Possession availability 2</p> <p>Completion of works within possession</p> <p>Transportation and lifting of precast deck units into position adjacent to operational line</p> <p>Crane operations</p> <p>Precast units allow better control over construction risks</p>	<p>Stability of existing subway walls with potential for collapse 2</p> <p>Possession availability</p> <p>Completion of works within possession.</p> <p>Location of subway wall footings unknown</p> <p>Open excavations</p> <p>Location of buried services unknown</p> <p>Small plant/manual handling required</p>	<p>Possession availability and completion of works within possession 3</p> <p>Transportation and lifting of precast units into position adjacent to operational line</p> <p>Crane activities</p> <p>Precast units allow better control over construction risks</p>	<p>Working at height to install lighting and CCTV 5</p>
Maintenance and inspection access	<p>New elements of modified footbridge to be included in existing footbridge inspection/maintenance regime along with additional telecommunications and lighting features. 1</p>	<p>Steel ramps will require periodic inspection and re-painting 3</p> <p>Existing inspection/maintenance regime to be maintained for subway abutments. Telecommunications and lighting features to be added to regime along with recommended requirements for precast deck and deck bearings. Precast deck can be provided with waterproof coating prior to being manoeuvred into position. Waterproofing will require renewing during lifetime of structure.</p>	<p>Existing inspection/ maintenance regime to be maintained for subway with telecommunications and lighting features to be added. 3</p> <p>Waterproof coating to be applied which will require renewing during lifetime of structure.</p>	<p>Telecommunications and lighting features to be added to inspection/maintenance regime along with recommended requirements for precast culverts. Precast culverts can be provided with waterproof coating prior to being manoeuvred into position. Waterproofing will require renewing during lifetime of structure. 5</p>	<p>Maintain existing regime. Additional telecoms and lighting to be included in inspection/maintenance regime 2</p>
Sustainability and environmental impacts	<p>Embodied carbon in steel 2</p> <p>Bolted steel structure can be dismantled and recycled at end of life</p> <p>Medium volumes of spoil from excavation for foundations.</p>	<p>Large volumes of spoil requiring removal from demolition of existing deck. 3</p> <p>Embodied carbon in concrete</p>	<p>Smaller amounts of spoil requiring removal from excavation of base of subway. 3</p> <p>Embodied carbon in steel waler beams and concrete foundations</p>	<p>Large volumes of spoil requiring removal from demolition of existing deck and abutments. 1</p> <p>Embodied carbon in concrete (larger than Options 2 and 3)</p>	<p>Minimal construction materials 5</p>

	Option 1 – Undy Halt footbridge	Option 2 – Deck replacement of West End subway	Option 3 – Lowering of West End subway	Option 4 – Replacement of West End subway	Option 5 – Do minimum
	Larger construction zone within new area of embankment.	Ballast removed can be recycled Limited opportunities for re-use of concrete deck ant end of life	Limited opportunities for re-use of concrete at end of life	Limited opportunities for re-use of concrete at end of life	
Aesthetics	Ramps to the footbridge will be long and visually intrusive. Standard Network Rail construction detail allows for integration with existing footbridge Steps to be provided as alternative means of access to footbridge	Minimal changes to existing aesthetics. One existing ramp at northern end of subway to be replaced with steps to offer an alternative means of access	Minimal changes to existing aesthetics. One existing ramp at northern end of subway to be replaced with steps to offer an alternative means of access	Concrete subway face instead of masonry One existing ramp at northern end of subway to be replaced with steps to offer an alternative means of access	Minimal changes to existing aesthetics. Minor maintenance works maybe required in the future to make route look more desirable to station users. Varying headroom along subway
Cost (High/Medium/Low)	Low - Medium	Medium - High	Medium - High	High	Minimal
<b>Total Score</b>	<b>32</b>	<b>36</b>	<b>30</b>	<b>35</b>	<b>41</b>

### 7.6.5 Options Discarded

The following options have been discarded:

- Installation of lifts to the existing footbridge. These have not been considered at this stage as the station will be unmanned and installation/maintenance of lifts is likely to have greater cost implications during operation. An upgrade to the existing DNO supply to the vicinity may also be required to accommodate the lifts which would have an impact on the construction cost
- Installation of a new, dedicated station footbridge in addition to the existing footbridge. This option has been discarded as the existing infrastructure is considered suitable for modification and use for the new station, and cost impact is likely to reduce the Benefit Cost Ratio (BCR) for the scheme
- Construction of a new subway located between the proposed platforms. This option has been discounted as the costs are likely reduce the BCR for the scheme and the existing subway/footbridge are considered suitable for modification

## 8 Telecommunications

The new walkway station will require new telecommunications equipment typically associated with platforms and access routes. While there is no significant option selection at this stage, a summary of the anticipated equipment is outlined below:

- Eight CCTV cameras for platforms plus additional ones to cover access routes, two Help Points, two Customer Information Systems (CIS) and two ticket vending machines
- Ticket vending machines (TVM's) will be included in the station since it will not be staffed. Arriva Trains Wales has recommended that two TVM's be placed at the station, one per platform. This could be reduced to one if all passengers access the station through a single point of entry
- The use of the subway as part of the station access arrangements is possible. Third party infrastructure has been used in new station construction at nearby stations in Risca and Pontymister. This third-party access route could have CCTV provision included within the station system
- Three lineside equipment cabinets are affected by the position of the platform and which will need to be relocated. In addition, any lineside cabling will need to be moved and corresponding UTX's extended

In preparing these estimates, the following assumptions have been made:

- PA system to be provided for platforms, footbridge, subway and shelters, including allowance for columns
- One customer help point to each platform
- One Customer Information System per platform and at each station entrance
- CCTV system to be provided to platforms, footbridge, subway and car park, including allowance for columns
- All systems networked back to the control centre
- Allowance included for station telephony

## 9 Electrical and Power

The new station will also require new electrical and power equipment typically associated with platforms and access routes. A summary of the anticipated equipment is outlined below:

- Lighting columns to platforms and access ramps
- Soffit mounted lighting to existing subway
- Low voltage power to telecommunications equipment outlined in Section 8 above
- Provision of new DNO cabinet or substation for station power supply
- Earthing and bonding

# 10 Highway Modifications

To accommodate the proposed modifications to the subway access or footbridge ramps, some modifications will be required to the local highway. A disabled drop-off point is also required to serve the station.

## 10.1 Existing Highway Arrangement

There are currently no designated crossing points in the vicinity of the proposed station. The highways design incorporates a proposed crossing point (toucan) to the east of the subway and the Undy Halt footbridge to facilitate safe Non Motorised User (NMU) movements in this area. Refer to drawings 373743-WTD-BTL-DRG-HWY-101 to 104 in Appendix A for details.

The existing footway is narrow and ramps to the subway are steep. A narrowing of the carriageway by widening the footway on the southern side would provide better access for pedestrian and persons with reduced mobility accessing the subway and those traveling in an east-west direction along the southern side of Main Road. This would result in the carriageway being reduced to 6.2m and may have the added benefit of reducing traffic speeds through this section of highway and on approach to the proposed traffic signal crossing.

**Figure 19: Proposed crossing point**



**Figure 20: Ramps to subway**



A disabled parking and drop-off zone are required to serve the station. The highways design has considered providing this within a small triangular parcel of land to the west of the site extents or within the existing parking to the east of the footbridge as shown in Figure 21 below.

The area to the east of the footbridge is currently being used as long stay parking. Under the design proposal this area would be signed and allocated for disabled drivers and dropping off and picking up foot passengers.

**Figure 21: Proposed disabled parking**



**Figure 22: Proposed long-stay car park**



## 10.2 Proposed Options

The highways options have been outlined below. The applicable standards for highways design are the Monmouthshire County Council Highway Design standards, which default to the Design Manual for Road and Bridges (DMRB). The options consider modifications to make the pathways compliant, with associated re-alignment of Main Road. For the purpose of these options, it is assumed that the subway is the main route for pedestrians crossing the track.

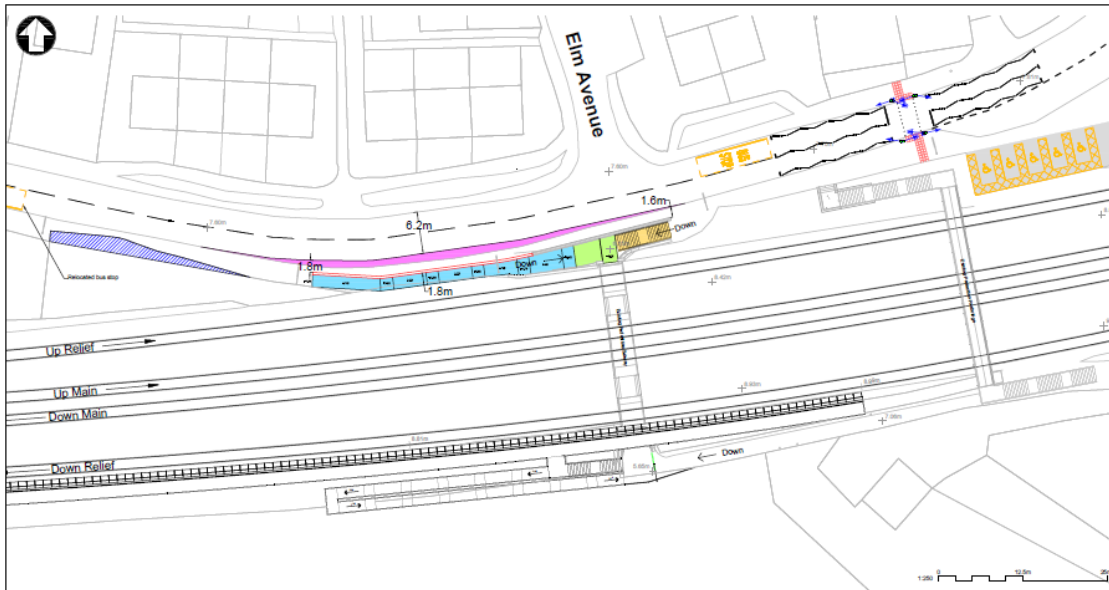
### 10.2.1 Option 1a – Parking to East

This option proposes:

- Widening of the footway on the south side of Main Road
- Land take to the west of the subway to widen the footway to suitable highway standards
- Re-grading of the ramp on the western approach to the subway as per Options 2-5 discussed in Section 7
- Inclusion of compliant steps
- A toucan crossing to the east to provide safer pedestrian access to the walkway station
- Parking provision for Disabled Drivers and drop-off



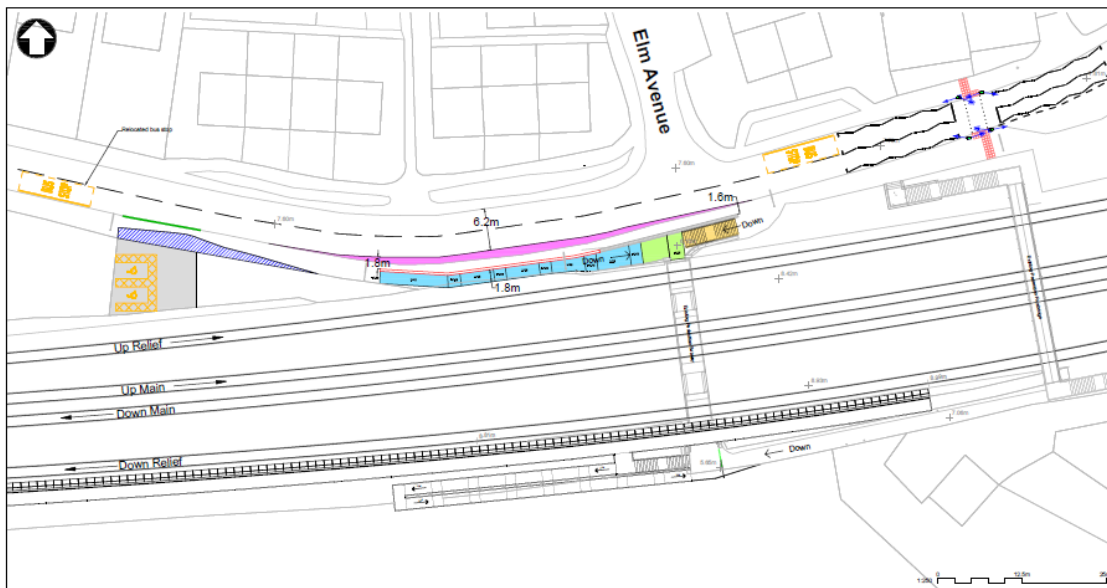
**Figure 23: Option 1a - Parking to East**



### 10.2.2 Option 1b – Parking to West

This option is as proposed in Option 1a above, with additional land take the west of the scheme extent for provision of a parking/drop-off zone.

**Figure 24: Option 1b - Parking to West**



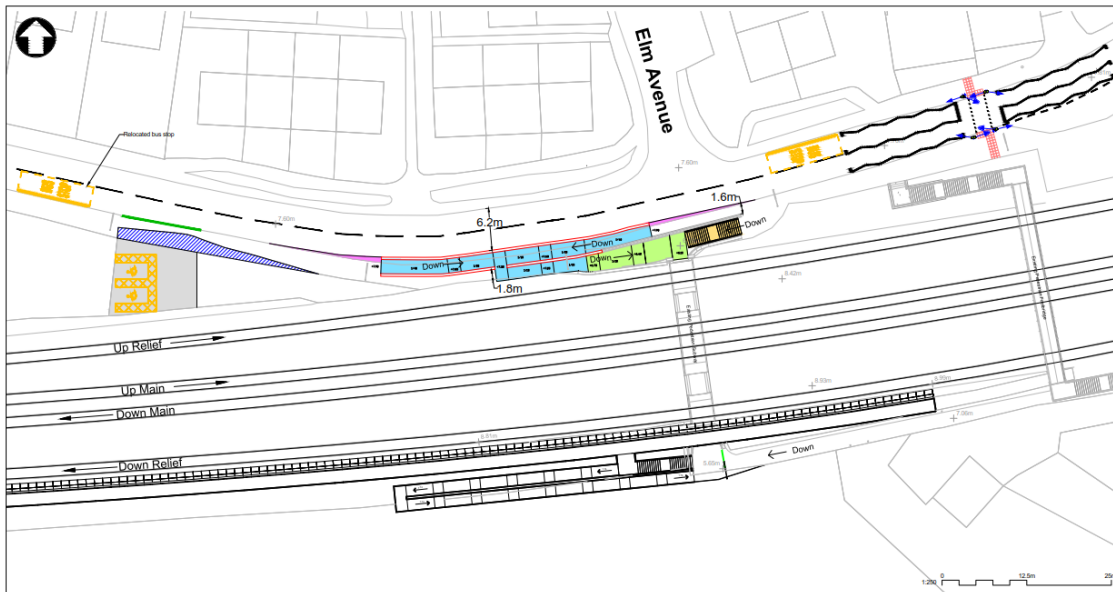
### 10.2.3 Option 2a – Parking to East

This option proposes:

- Widening of the footway on the south side of Main Road
- Land take to the west of the subway to widen the footway to suitable highway standards

- Dropping down of the footway on the southern side of Main Road to accommodate a two-phase ramped approach to the underpass from the west side as and alternative ramping arrangement to that considered in Options 2-5 in Section 7
- Inclusion of compliant steps
- A toucan crossing to the east
- Parking provision for Disabled Drivers and drop-off

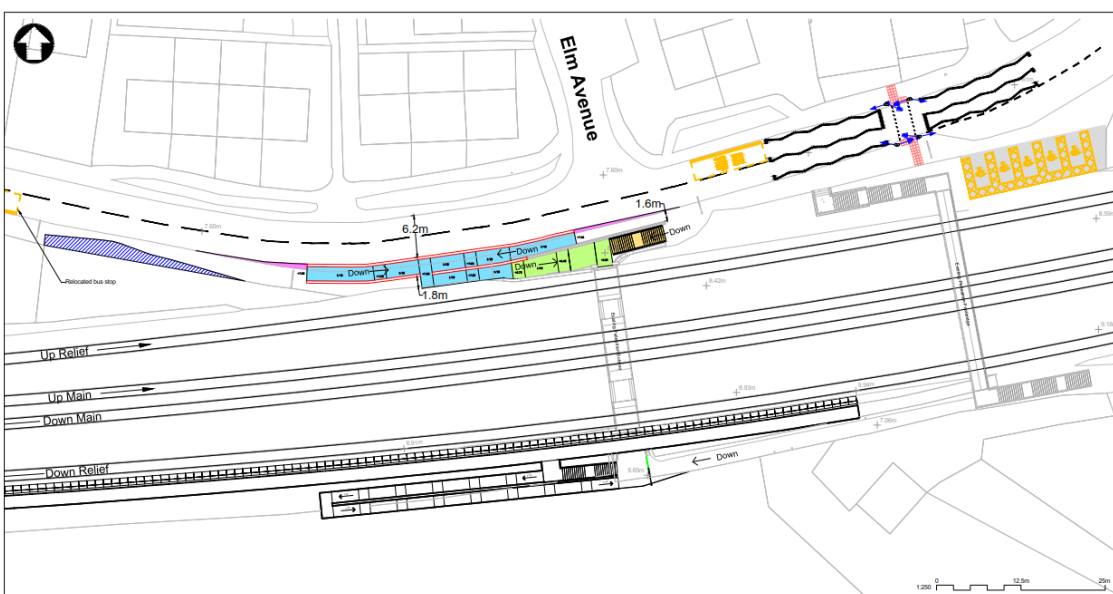
**Figure 25: Option 2a - Parking to East**



#### 10.2.4 Option 2b – Parking to West

This option is as proposed in Option 2a above, with additional land take the west of the scheme extent for provision of parking/drop-off zone.

**Figure 26: Option 2b - Parking to West**



These options should be reviewed and agreed with Monmouthshire County Council as the local highway authority. The final design should be developed in co-ordination with the other proposed options for subway or footbridge modifications covered in Section 7.

# 11 Signalling

The proposed platform arrangement is the most economical and disruptive way for signalling to deliver a new station at Magor and Undy. Locating the Down Platform before signal NT 1235 means that no changes will be required to signal NT1235 (refer to the signalling drawing provided in Appendix A). The train stopping position will need to be 25 metres before the signalling gantry to ensure the driver has a clear view of the signal upon departure from the station. This should result in no signal sighting issues with signal NT1235. In the Up direction the same principles apply. Placing the platform before signal NT1232 means that no changes to the signal will be required. Again, a 25m separation between the gantry and train stopping position will need to be maintained.

There will be a change required to South Wales Control Centre (NT Workstation) to display the new station on the signallers Visual Display Unit (VDU) screen. It is proposed that this minor screen amendment can be undertaken as part of a wider upgrade of the VDU system at a later date.

A draft signalling sketch is included in Appendix A outlining this arrangement.

## 12 Permanent Way

From a review of previously available information on the existing permanent way alignment, a smoothing alignment design for the Down Relief may be appropriate to support the platform design, unless maintenance tamping to address this is carried out ahead of/in anticipation of this scheme. This would require minor modification to the existing track alignment before construction of the proposed station platforms.

Further information on the existing track alignment was not available to inform this report so this should be reviewed once the latest topographical information for the track alignment is provided, either from Network Rail or through further topographical survey. Any modifications required to the track alignment will require a Form A design to be carried out to agree proposals with Network Rail.

## 13 Construction Access Strategy

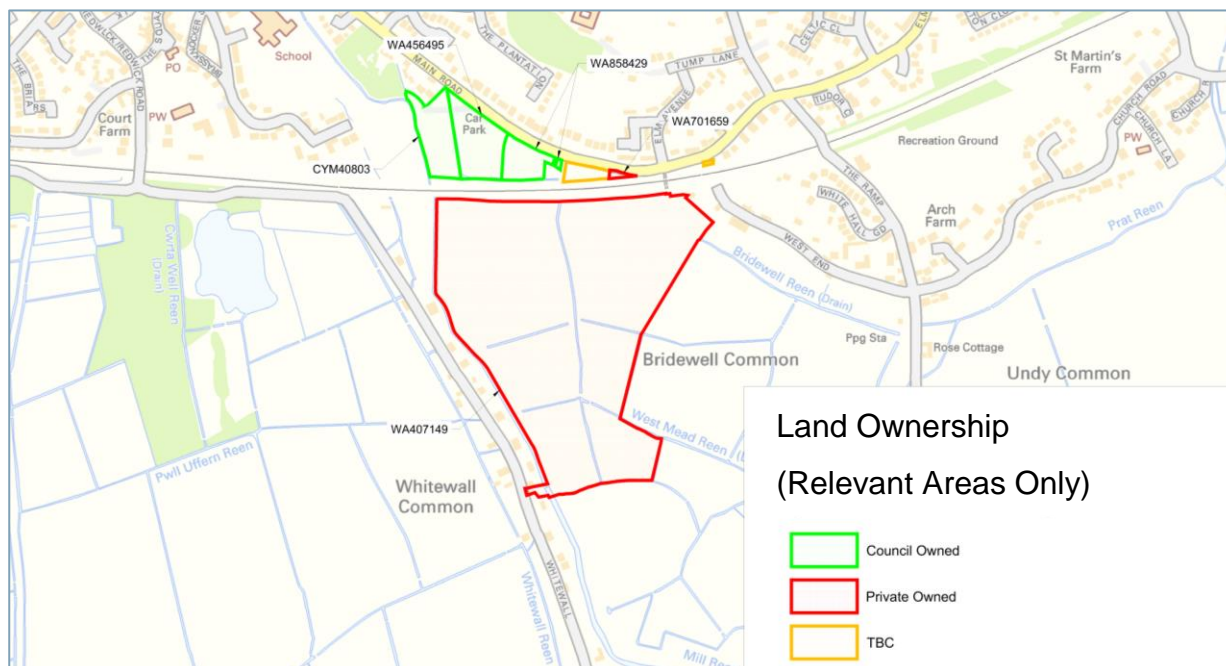
It is anticipated that the construction of the new structures or modifications to existing structures adjacent to the railway line will require some possessions of the lines. There is some opportunity to make use of existing night time possessions to carry out some of the construction works, however it is anticipated that some abnormal possessions (those outside of the planned possessions) will also be required to complete the scheme. The extent of these possessions depends on the preferred option chosen, as summarised in Section 7.6.4.

Modular platforms systems have been proposed to increase the speed of construction and therefore reduce possession demands during construction.

### 13.1 Site Compound Location

The most suitable area to provide a site compound for construction works is on the Three Fields site, located directly north of the proposed northern platform. This area is adjacent to the B4245 road that can be easily accessed from the M4 motorway and a community car park is provided just to the west of this area, which is also proposed to support a new community centre. Figure 27 following shows the land plots identified to be relevant to the footprints of the proposed platform positions.

**Figure 27: Land ownership of relevant nearby areas**



Source: Mott MacDonald

Monmouthshire County Council owns the four land plots to the west on the figure above, which are CYM40803, WA456495 (the two middle plots having the same title number) and WA858429. Located next to the four plots, there is a plot where ownership is not registered on the Land Registry database. The same applies to a small plot next to the footbridge (the furthest

plot to the east). The plot in Figure 27 numbered WA701659 belongs to a private individual having been sold by the British Rail Board in 1992.

The four plots owned by Monmouthshire County Council contain the car park in the Three Fields' site that is proposed to support a new community centre and a medieval orchard. The car park and immediately adjacent area between the car park and track provide close access to the northern platform proposed for the station and would provide a suitable construction compound for provision of welfare facilities and prefabrication area. Use of this land would need to be agreed with the Council. When working over or adjacent to the southern railway line is required, negotiation of privately-owned land located south of the railway track will likely be required for construction of the south platform and access ramps.

Monitoring and re-tamping of the track may be required as part of the works which may require short possessions or use of rules of route working windows. Existing footpaths in the construction area will require temporary diversion during the works and some traffic management maybe required to Main Road and West End to control traffic flow in the area during key construction activities.

## 14 Geotechnical Considerations

At this stage a geotechnical desk study has been undertaken using readily available information, presented in Appendix B. The purpose of this study was to:

- Outline the likely ground conditions under the site
- Establish the principal geotechnical risks for the site and the areas with additional risks to historical contamination
- Define the geotechnical constraints
- Develop a preliminary conceptual site model and guidance on geotechnical ground investigation
- Provide options for possible foundation solutions and provides recommendations for any further works required to assist in the design of the proposed development

A site reconnaissance walkover was undertaken on March 29, 2018. Key observations from the visit included signs of potential settlement of the existing rail embankment with soft ground conditions surrounding the rail line with the presence of hydrophilic plants and areas of standing water. Drainage reens are located north and south of the site with Mill Reen flowing north to south culverted beneath the site at its western extent.

The site is underlain by variable ground conditions comprising Made Ground materials, soft compressible natural Tidal Flat Deposits associated with the River Severn, Head Deposits and a potentially variably weathered bedrock profile of mudstones and limestones. Previously undertaken ground investigations by others largely confirm the published geology ground profile. Though areas of the proposed station location have no ground investigation data available. The site is bordered by predominantly agricultural land use to the south with a mixed use to the north including agricultural and residential.

Geotechnical engineering risks are associated with variable ground conditions, low strength soft compressible ground, differential settlement and the presence of existing services. It may be possible to found platform structures on strip footings though raft footings, screw piles or potential lightweight structures may also be suitable. This is reflected in the platform options discussed in Section 7.4 and it is therefore recommended that the platforms are constructed from modular EPS platforms to reduce the overall weight.

Further ground investigation is essential to confirm ground profiles, groundwater conditions and undertake both geotechnical and geo-environmental testing across the site and should be carried out prior to further design development to ensure appropriate foundation solutions are defined.



# 15 Environmental Considerations

An ecological/environmental site walkover was undertaken on 5th April 2018. This was used to inform and complete the Environmental Appraisal presented in Appendix C.

The key ecological/environmental considerations identified include:

- Liaison with Network Rail should be undertaken at the next stage of design to understand the condition of the existing embankment and any known environmental constraints
- Habitats suitable for a number of species were identified during the site walkover and therefore a full Phase One habitat survey should be carried out at later design stage. Following this, further surveys may be necessary to determine the absence/presence of protected species
- Consultation with the Magor Action Group On Rail should be continued throughout the design and construction period to maintain community relationships and promote social benefits of scheme

A Preliminary Assessment of Flooding Consequences was also carried out and is presented in Appendix I. The findings of this study identified that the proposed station and alterations to the West End subway at Magor and Undy is at risk of flooding from rivers and/or the sea, surface water and potentially from ground water. To better understand the implications of this flood risk and further develop the scheme to mitigate, the study includes the following recommendations:

- Carrying out consultation with Natural Resources Wales to obtain all existing readily available flood risk information and seek their view on the acceptability of the development
- Carrying out consultation with the Lead Local Flood Authority and Internal Drainage District
- Investigating the ground water levels on the site to better understand the risks and consequences of ground water flooding and effect of ground water on local drainage

## 16 Interfaces with Other Projects

This project will interface with other developments in the surrounding area. The projects that we are aware of being relevant to the scheme are:

- Great Western Route Modernisation – introducing Overhead Line Equipment (OLE) gantries throughout the South Wales Main Line as part of Network Rai's Electrification programme
- New Station Schemes along South Wales Main Line – proposals for two new station schemes, Cardiff Parkway and Llanwern Station are also in development and would impact the train services for a proposed station at Magor and Undy
- Procurement of new Wales and Borders franchise – will see the roles and responsibilities of the Wales Route and the lead Train Operating Company (TOC) change which may impact the train services, station operation and station assets provided at Magor and Undy
- M4 Relief Road – a 14-mile road is planned to be built south of Newport to deal with severe traffic congestion issues on the M4 motorway around the Brynglas tunnels. This diversion is to begin at Magor before following the A4180 and joining back to the existing motorway at Castleton. Connections between the M4, M48 and B4245 are to be improved between Undy and Rogiet as part of the scheme, which will reduce demand to the proposed station of passengers driving in nearby towns, providing easier access to Severn Tunnel Junction from the M48 and M4
- Local Development Plan Site – a large area between the M4 and villages of Magor and Undy has been safeguarded by Monmouthshire County Council for housing and mixed development. This comprises of Rockfield Farm and Vinegar Hill sites, approximately 800~1000m from the proposed station so is on the limit of expected walking distances for passengers. Some might prefer to drive to Severn Tunnel Junction where parking is available than walk to the Magor and Undy station, therefore providing a bus route from the new development to the new station would provide clear benefits
- B4245 Magor and Undy By-pass – for the LDP site, the council has safeguarded space for a possible diversion of the B4245, depending on the M4 proposal. The by-pass would turn North West before Rockfield Grove, going north of all of the existing housing, and re-join the B4245 just outside of Magor. The new route would provide relief to the existing Main Road/Newport Road and access to the new housing developments
- Community Centre on Three Fields Site – this is located to the north west of the station, along the B4245 and there are plans for developing a community centre built near the existing car park

## 17 CDM Information

This project is considered notifiable under CDM 2015 and as such the CDM arrangements for this project are as follows:

Client: Monmouthshire County Council

Client's Representative: TBA

Principal Designer: TBA

Principal Designer Representative: TBA

Designer: TBA

Person acting on behalf of the Designer: TBA

Principal Contractor: TBA

Client appointed Contractors: TBA

A summary of client duties under CDM 2015 has been included in Appendix F.

## 18 Safety Verification Recommendations

Information with regards to the applicability of ROGS (Railway and Other Guided Transport Systems (Safety) Regulations) is to be provided by Network Rail.

## 19 Common Safety Method

The Common Safety Method for risk evaluation and assessment (CSM RA) will apply to this scheme. The person/organisation making the change (known as 'the proposer') is expected to be Monmouthshire County Council at this stage, although this is subject to confirmation as the project progresses. The proposer is responsible for determining whether the impact on safety is significant or not by using the criteria in the CSM RA. If the change is significant the proposer must apply the risk management process. If the change is not significant, the proposer must keep a record of how it arrived at its decision. It is recommended by the Rail Safety and Standards Board (RSSB) that, even if the change is not significant, the risk management process of CSM RA should be applied to avoid a duplicate risk assessment process.

Following the risk assessment, an assessment body will carry out an independent assessment of the risk management process and the results obtained. The proposer is responsible for appointing the assessment body.

A copy of the Project Hazard Log is included in Appendix D.

## 20 Planning and Consents Strategy

The proposed development falls wholly within the administrative boundary of Monmouthshire County Council. A planning policy review can be found in Appendix G.

Key areas noted include:

- The constraints map confirms that the site is located within an area subject to potential Flood Risk, on the edge of an Area of Archaeological Sensitivity towards the north of the site and a Site of Specific Scientific Interest (SSSI) is located towards the south
- The Proposals Map confirms the site is located within a Mineral Safeguarding Area (for Limestone) and sits on the edge of the Development Boundary north of the site

Appropriate consents for the land take necessary for the construction and permanent works will be required. For details of the existing land ownership refer to Figure 27 in Section 13 of this report. The station platform construction will fall within the Network Rail owned embankment, however the approach ramps to the platforms and subway will require additional land take. Modifications to the wider highway network are also proposed and will need acceptance from the local authority.

Consents will be required to temporarily close the existing footway below the subway to enable construction of the new access ramps. Temporary traffic management will also be required to enable construction works and highway modifications.

Appropriate possessions will be required for construction of the platforms and will need to be obtained from Network Rail and the Train Operating Companies (TOC).

## 21 Maintenance Strategy

Following the introduction of a new station, maintenance requirements will increase for the TOC. In addition, Network Rail would be the owner of new assets and would likely include the station as part of its inspection and maintenance schedule/programme.

Following conversations with Arriva, the assumption is that Magor and Undy would be a DfT category F (small unmanned) station. As such, there would be no staff to operate the station. This will need to be confirmed during later stages of the design in agreement with the future Wales and Borders Service operator.

Maintenance considerations associated with the different construction options are included within Section 7.6.4, Table 12 for ease of comparison.

The choice of platform construction will affect maintenance requirements over the life of the asset. While traditional and cross-wall platforms would require minimal maintenance, the construction implications are likely to be prohibitive. Modular steel platforms will require inspection and periodic re-painting working near the line. FRP and expanded polystyrene platforms will also require inspection but are unlikely to require significant maintenance works unless damaged.

If ramps are installed to the existing footbridge, or down to the existing subway, it is unclear whether Network Rail or the train operating company would be responsible for maintenance of these assets. This is to be discussed with Network Rail at the next stage of design. Currently Network Rail are responsible for maintenance of the existing footbridge and subway, and it is anticipated that the additional ramps or modified structures would be included in the current maintenance and inspection regime for the structure.

It is assumed that station facilities and general access routes, including the disabled drop-off point would be included within the station lease boundary, thus the train operating company would be responsible for maintenance. This would also include maintenance of the station lighting, CCTV and telecoms.

It is anticipated that vehicle access (such as MEWPs) should be provided to both platforms to enable future maintenance of lighting, CCTV and other platform furniture.

## 22 Engineering Outputs and Surveys

To develop this scheme, the design should be progressed in accordance with the Network Rail GRIP processes. The following technical deliverables are anticipated during the next stage of design:

- GRIP 3 Approval in Principle
  - Civil Engineering Form 001
  - Mechanical and Electrical Form 001
  - Permanent Way AiP
  - Signalling AiP
  - Telecommunications AiP
  - Transport Appraisal
  - Rail Operations Timetable and Performance study
- Strategic Outline Business Case
- Common Safety Method (CSM) documentation

In addition, the following surveys and studies are recommended to inform the detail design development of the scheme ahead of GRIP 4:

- Topographical survey
- Buried services search
- Ground investigation
- Potential intrusive surveys to confirm subway construction
- Phase One Habitat Survey



## 23 Project Risks

The following key project risks have been identified at option selection stage:

**Table 13: Project Risks**

Risk Title	Description	Mitigation
Approvals	GRIP 3 design not approved by Network Rail	Monmouthshire County Council and MAGOR Group to discuss approvals process with Network Rail. Engagement with Network Rail prior to completion of Form 001/AIPs is recommended to aid with acceptance of the proposed solution.
Available information	Information provided by Network Rail and other parties not suitable for development of design.	Review has been undertaken of information received, but some outstanding information has not yet been received (e.g. detailed examination reports, track model, as-built drawings, railway infrastructure). Further surveys may be required.
Electrification	Changes to planned electrification works resulting in alterations to options/design	Liaison with Network Rail's GWRM project team.
Unforeseen conditions	Buried services, ground conditions not identified during desk study.	During GRIP 3, a desk study and review of Network Rail available information will be undertaken. Recommendations for further investigation to facilitate design validation and approvals
Funding/Business Case	Proposal for new station not economically viable	Hold points have been noted in the programme, where decision to proceed is to be instructed by the client. This will control expenditure on the project for the client. Network Rail engagement and acceptance of the scheme will be necessary to improve project viability.
Condition of existing subway	Condition of the existing subway may impact choice of access solution and cost to modify	As-built and record drawings to be used to determine extents of existing structure. Full structural inspection and assessment is recommended to confirm condition of existing structure prior to developing detailed design.
Protected Species	Presence of protected species impacting proposed design, construction methods or construction programme.	Carry out Phase One Habitat survey and identify critical further ecology surveys required to enable presence of protected species to be accommodate in design and construction programme.

## 24 Conclusions and Recommendations

The recommended solution for the provision of step free access to the station is to implement Option 5. This approach retains the existing subway with minor modifications only and provides compliant gradient ramps to access platforms. This option will provide step free access to the station, with compliant ramps to access the subway and platforms, whilst reducing the extent of construction and cost associated with modifying the subway to provide compliant headroom. This option should be further discussed with Network Rail to obtain acceptance and agree an approach for mitigating risks presented by the non-compliant subway. A derogation from the PRM TSI and TD36/93 may be required and advice should be sought from the Rail Safety and Standards Board (RSSB) to confirm.

FRP platforms are recommended for the station platform construction as the loading on foundations will be lighter, they allow for flood water to pass through and can be constructed in a modular, pre-fabricated manner to reduce the impact on the operational railway.

The highways modifications have considered two locations for the disabled drop off point. The location to the east of West End subway would provide the shortest travel distance to each platform for users with reduced mobility and therefore is the preferable solution. However, this option would require additional land to be purchased. If this is not possible, locating the drop-off point to the west of the station would be a viable alternative.

It is recommended that the following activities should be carried out in later GRIP stages and to complete GRIP 3:

- Engagement with Network Rail Sponsor, Route Asset Managers (RAMs) and Designated Project Engineer (DPE) to obtain acceptance of preferred solution
- Engagement with local disabled user groups on proposed solutions
- For the Rail Operations, additional performance related tasks are required to fully understand the operations of the stations. This will require further engagement with Network Rail and will be more informed once the Intercity Express Programme (IEP) timetable is known
- Consider targeted ground investigation, including contamination testing, to inform development of the detailed design and construction method
- Obtain more accurate topographical and services information including level, location and type of existing buried and overhead services, particularly at track level and on the approaches to the existing subway

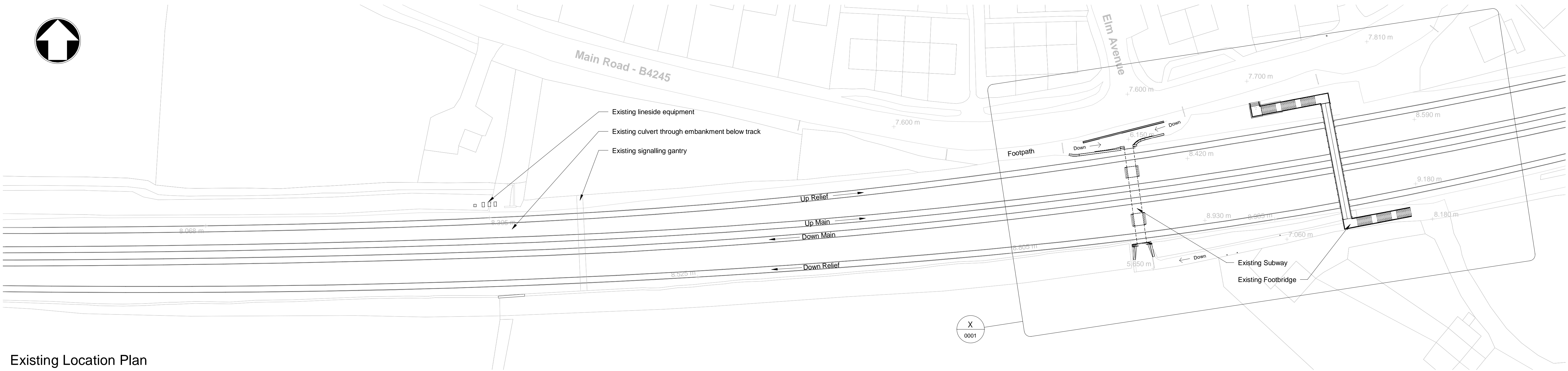
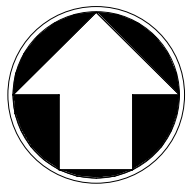
# 25 Formal Acceptance of Selected Option by Client, Funders and Stakeholders

<b>Client:</b>	
<b>Comments:</b>	

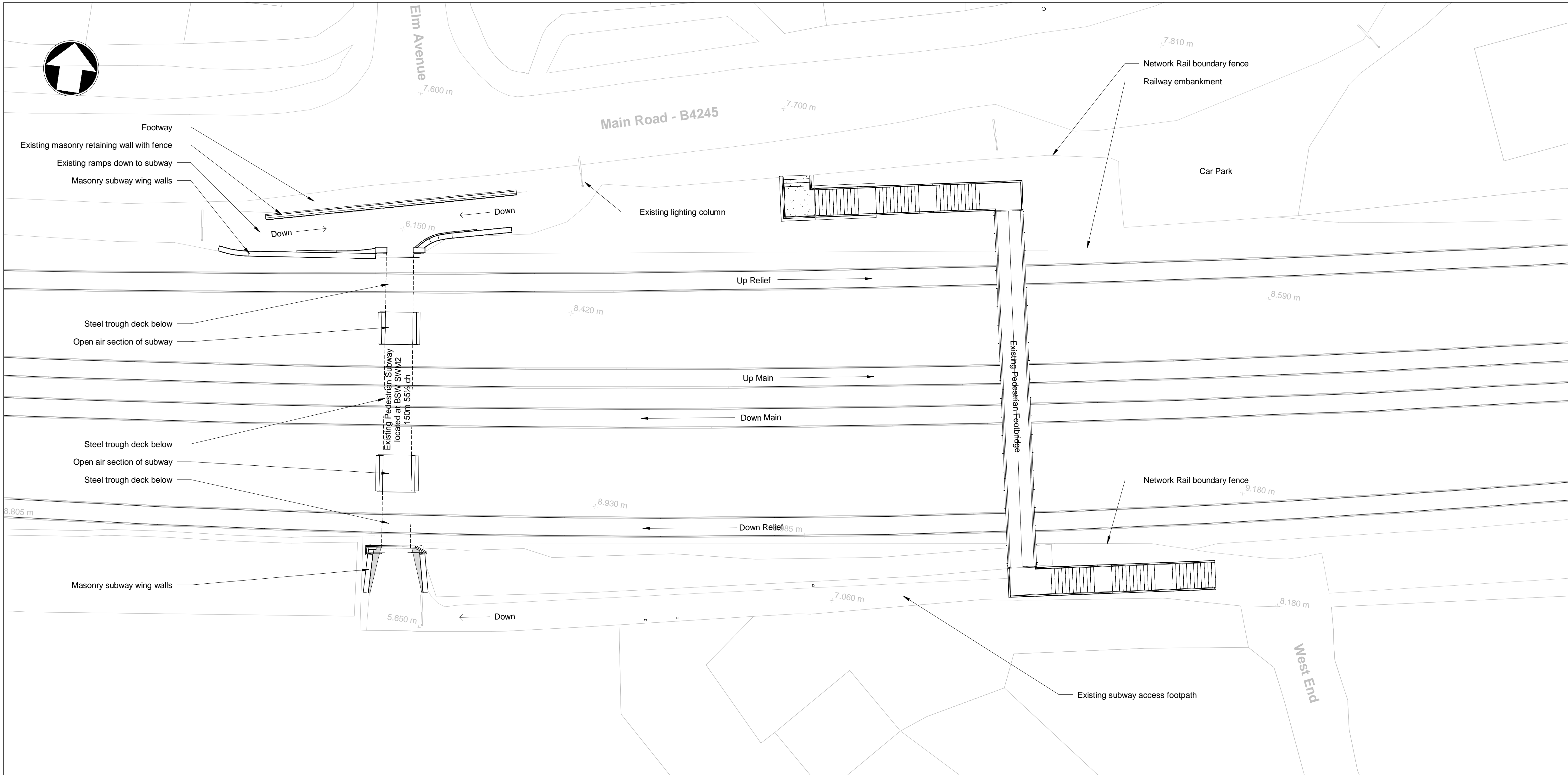
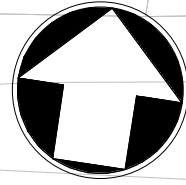
# Appendices

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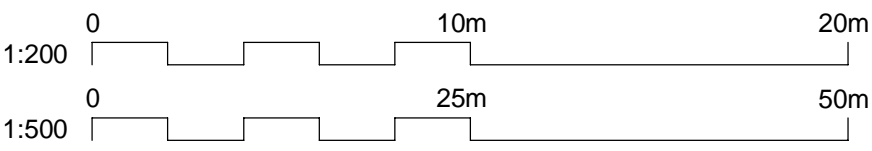
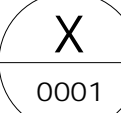
## A. Drawings



Existing Location Plan  
1 : 500



Detail  
1 : 200




Notes

1. All dimensions are shown in millimetres unless states otherwise
2. All levels are shown in metres unless stated otherwise
3. Do not scale from this drawing
4. Drawings are based on W1008D-BNU-DRG-ECV-002001(Z01) to 002002(Z01), W1008D-BNU-DRG-ECV-002100(Z01) to 002106(Z01), W1008D-BNU-DRG-ECV-002110(Z01) to 002114(Z01), 11020-SWM2-150-51-P-1 and photogrammetry survey carried out on 09/03/18 and are for the purpose of this options study only. Detailed surveys will be required for further design.
5. The drawings should be read in conjunction with the Option Selection report 373743-WTD-BTL-OSR-0001

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Rev	Date	Drawn	Description	Ch'k'd	App'd

Status	Preliminary
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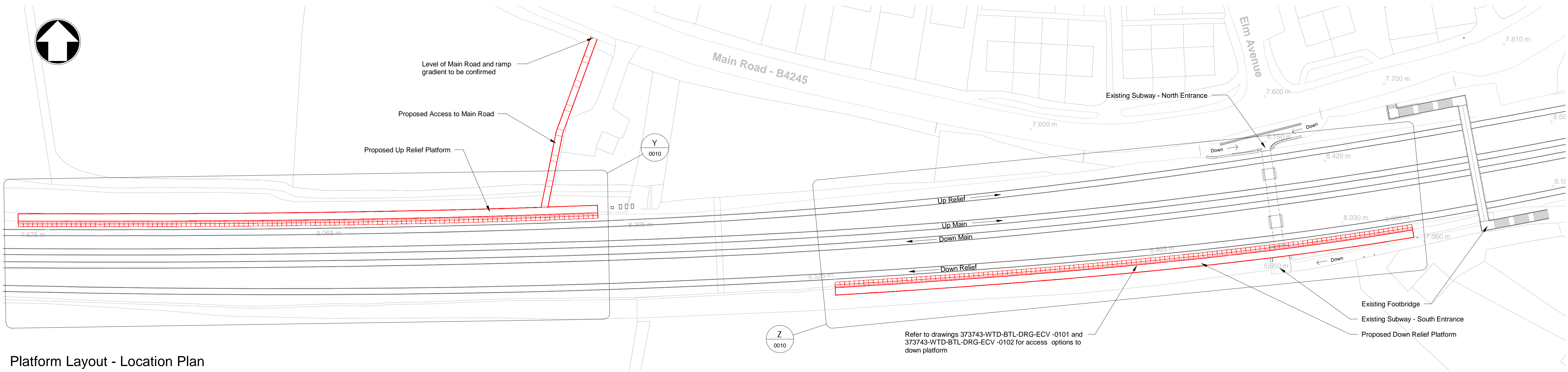
<b>M</b> <b>MOTT</b> <b>MACDONALD</b>	10 Temple Back Bristol BS1 6FL United Kingdom  T +44 (0)117 906 9500  W mottmac.com
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Client	Monmouthshire County Council County Hall The Rhadyr Usk NP15 1GA	 monmouthshire sir fynwy
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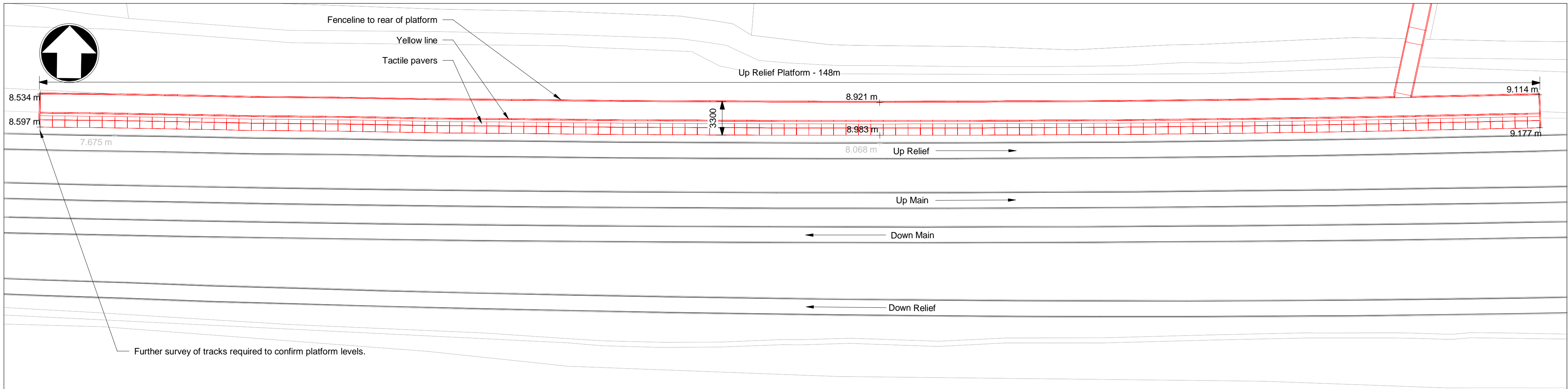
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Dwg.check.	S Symmons	SS	Approved	C B Bishop	CB
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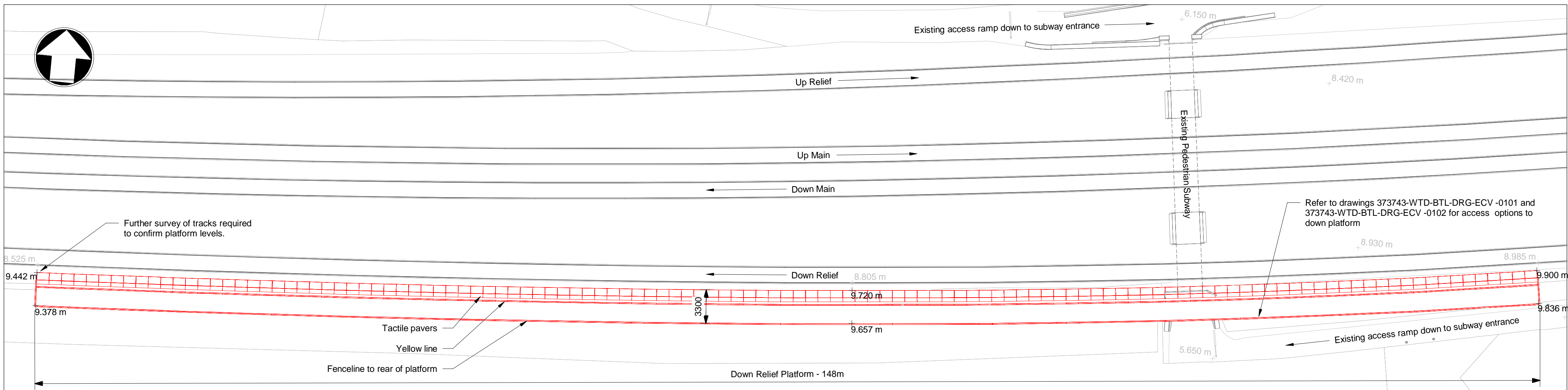




Platform Layout - Location Plan  
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Detail  
1 : 250  
Y  
0010



Detail  
1 : 250  
Z  
0010

- Notes
- All dimensions are shown in millimetres unless states otherwise
  - All levels are shown in metres unless stated otherwise. Further surveys required to confirm all levels.
  - Do not scale from this drawing
  - Drawings are based on W1008D-BNU-DRG-ECV-002001(Z01) to 002002(Z01), W1008D-BNU-DRG-ECV-002100(Z01) to 002106(Z01), W1008D-BNU-DRG-ECV-002110(Z01) to 002114(Z01), 11020-SWM2-150-51-P-1 and photogrammetry survey carried out on 09/03/18 and are for the purpose of this options study only. Detailed surveys will be required for further design.
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Key					
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	Proposed				
	Removed				
	Proposed Spot Level in metres- (Approximate)				
	Existing Spot Level in metres - (Approximate)				

P1	31/05/18	NMB	First Issue	GB	CB
Rev	Date	Drawn	Description	Ch'k'd	App'd

Status  
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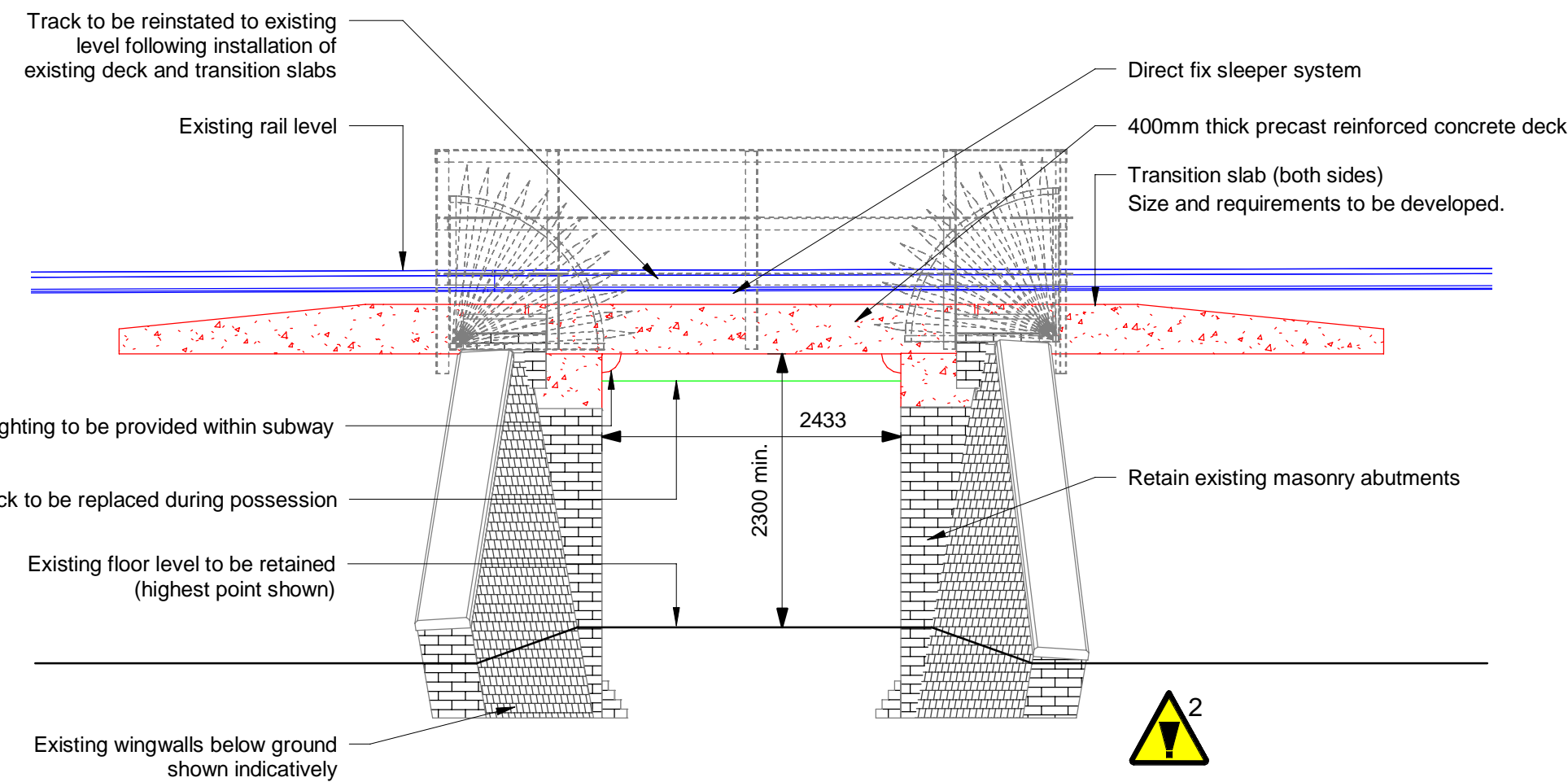
Client

Monmouthshire County Council  
County Hall  
The Rhadyr  
Usk  
NP15 1GA

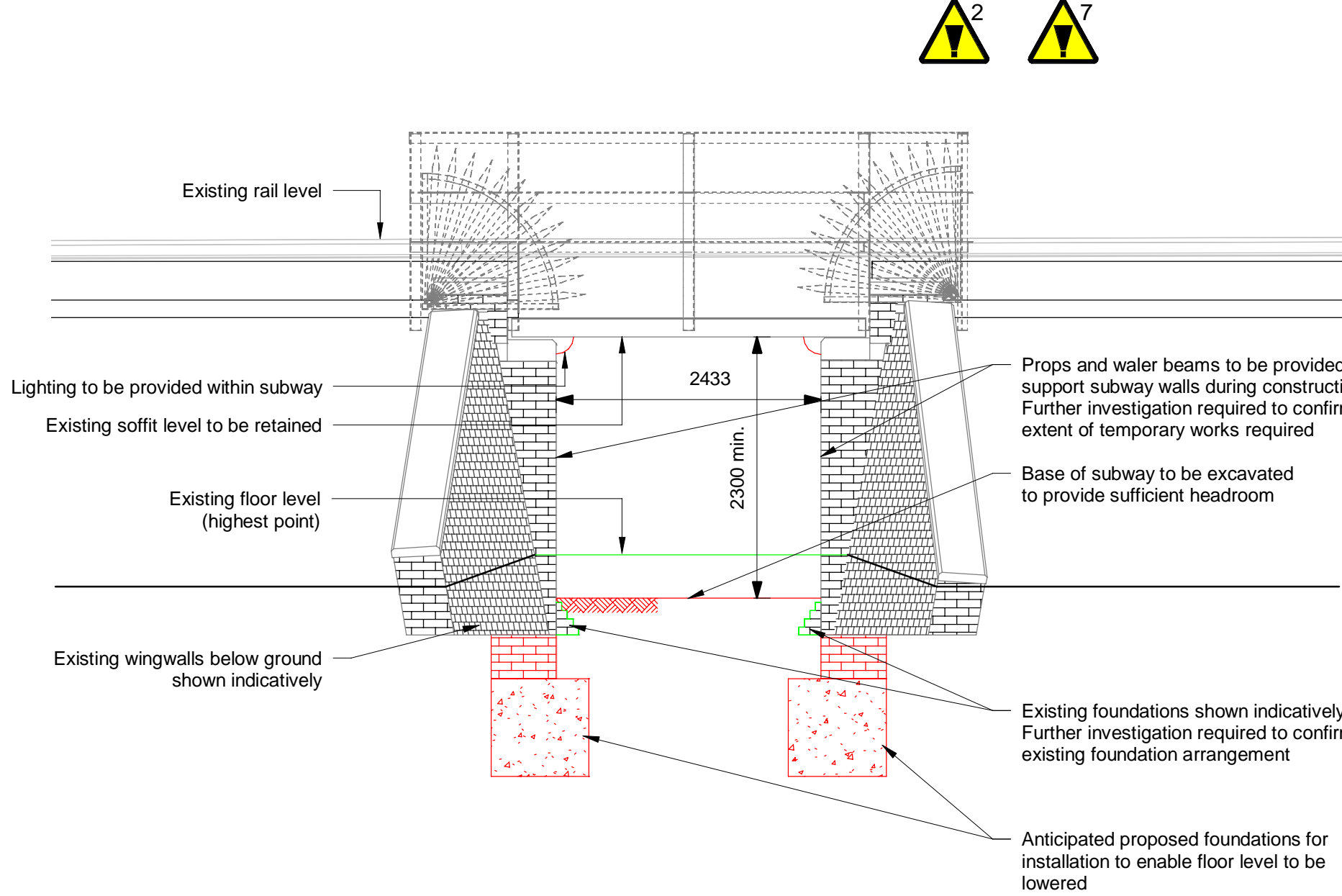
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Proposed Platforms Layout**

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Dwg.check.	S Symmons	SDS	Approved	C B Bishop	CB
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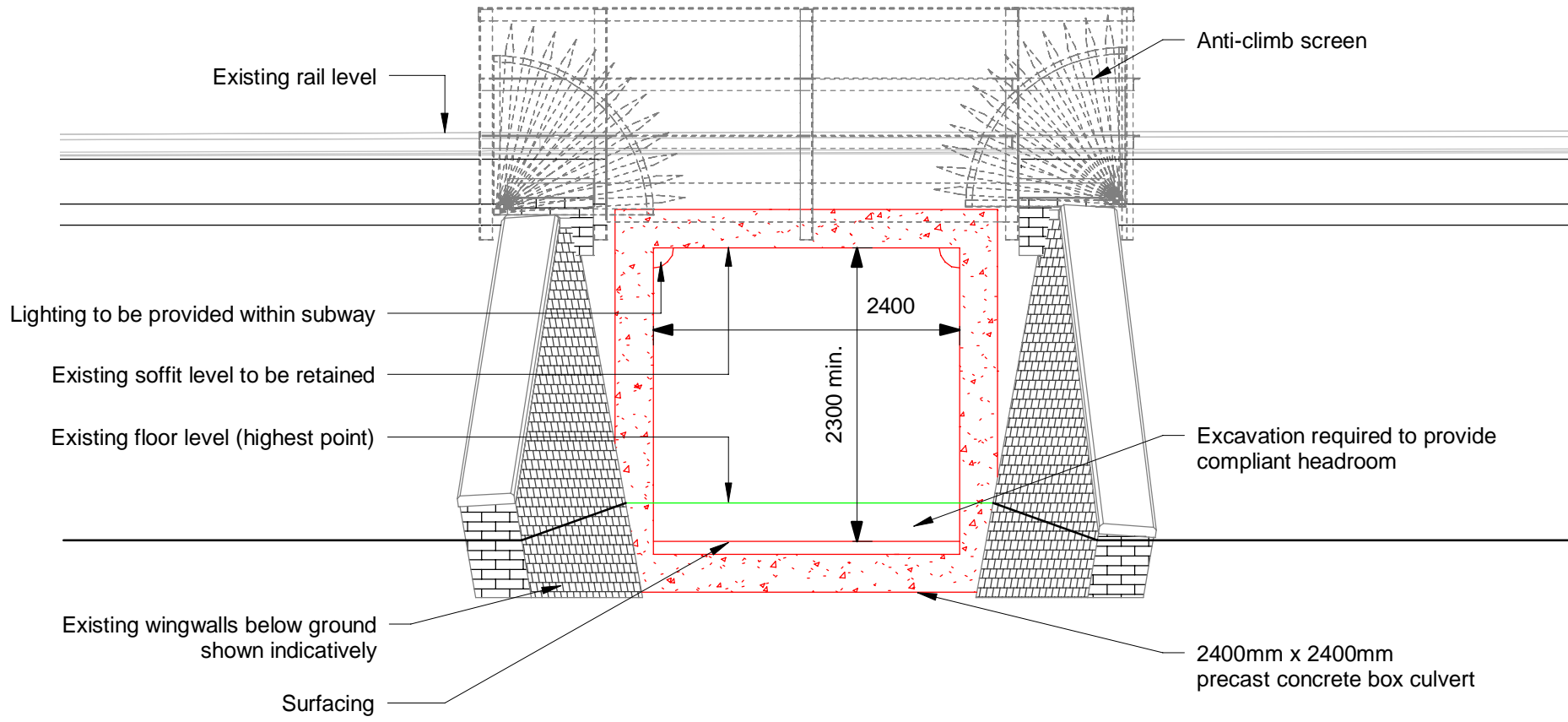




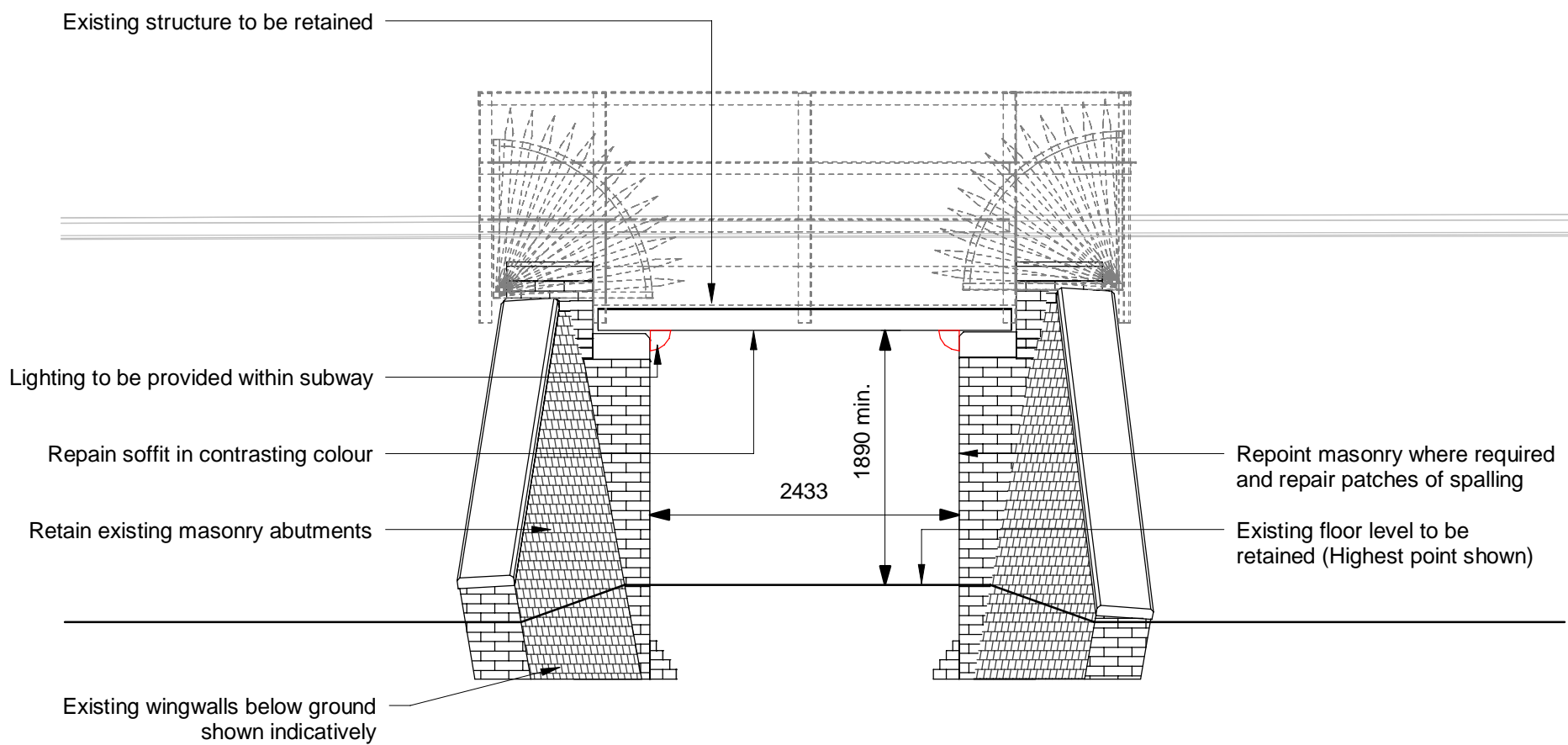
Option 2 - Deck Replacement  
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Option 3 - Lower Subway Floor  
1 : 50



Option 4 - Box Culvert Replacement  
1 : 50



Option 5 - Retain Existing Subway  
1 : 50

- Notes
- All dimensions are shown in millimetres unless states otherwise
  - All levels are shown in metres unless stated otherwise
  - Do not scale from this drawing
  - Drawings are based on W1008D-BNU-DRG-ECV-002001(Z01) to 002002(Z01), W1008D-BNU-DRG-ECV-002100(Z01) to 002106(Z01), W1008D-BNU-DRG-ECV-002110(Z01) to 002114(Z01), 110020-SWM2-150-51-P-1 and photogrammetry survey carried out on 09/03/18 and are for the purpose of this options study only. Detailed surveys will be required for further design.
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Key

Existing	Existing
Modified	Modified
Proposed	Proposed
Removed	Removed
Proposed Spot Level in metres- (Approximate)	Proposed Spot Level in metres- (Approximate)
Existing Spot Level in metres - (Approximate)	Existing Spot Level in metres - (Approximate)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

THE FOLLOWING NOTES HIGHLIGHT SIGNIFICANT RESIDUAL HAZARDS IDENTIFIED BY THE DESIGNER. TYPICAL HAZARDS THAT SHOULD BE IDENTIFIED BY A COMPETENT CONTRACTOR ARE NOT INCLUDED. THE CONTRACTOR SHALL CARRY OUT THE WORKS USING AN APPROVED SAFE SYSTEM OF WORK.

FOR FULL DETAILS OF IDENTIFIED HAZARDS REFER TO THE PROJECT HAZARD LOG 373743-WTD-BTL-GSM-0006

REF.	HAZARD	STAGE	MITIGATING MEASURE
2	Instability of existing masonry abutments	C	Carry out further investigation to confirm existing structure arrangement and undertake assessment of existing condition
7	Manual handling	C	Insufficient space for plant to lower subway floor. Detailed design to develop use of lightweight and modular construction to specify lightweight materials where possible to reduce extent of manual handling

Ket to Stages:  
C = Construction  
M = Maintenance  
U = Use  
D = Demolition

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Rev	Date	Drawn	Description	Ch'k'd	App'd

Status

Preliminary

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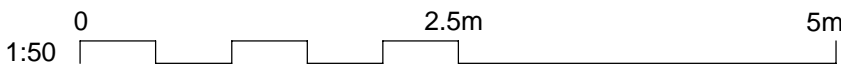
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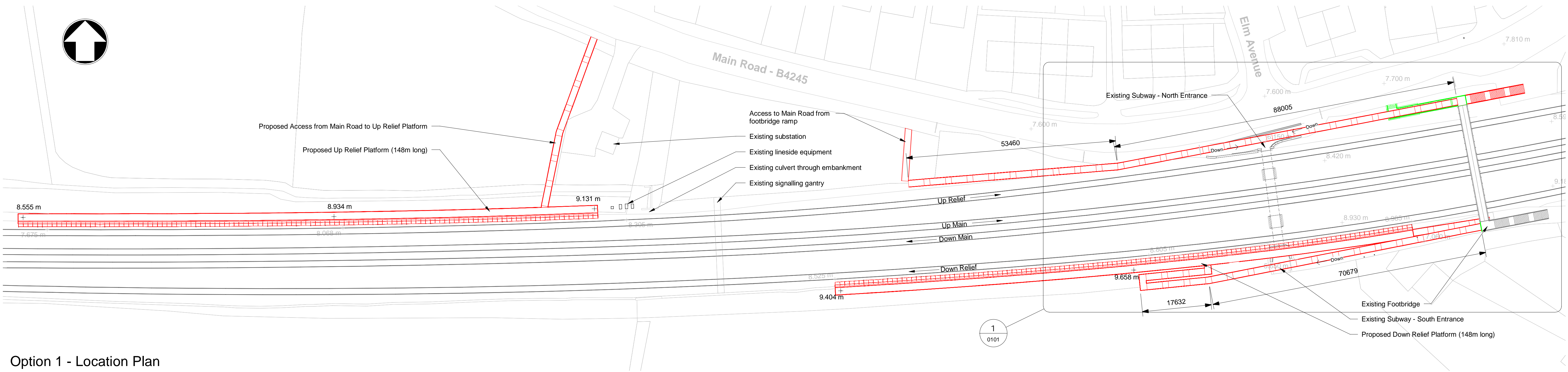
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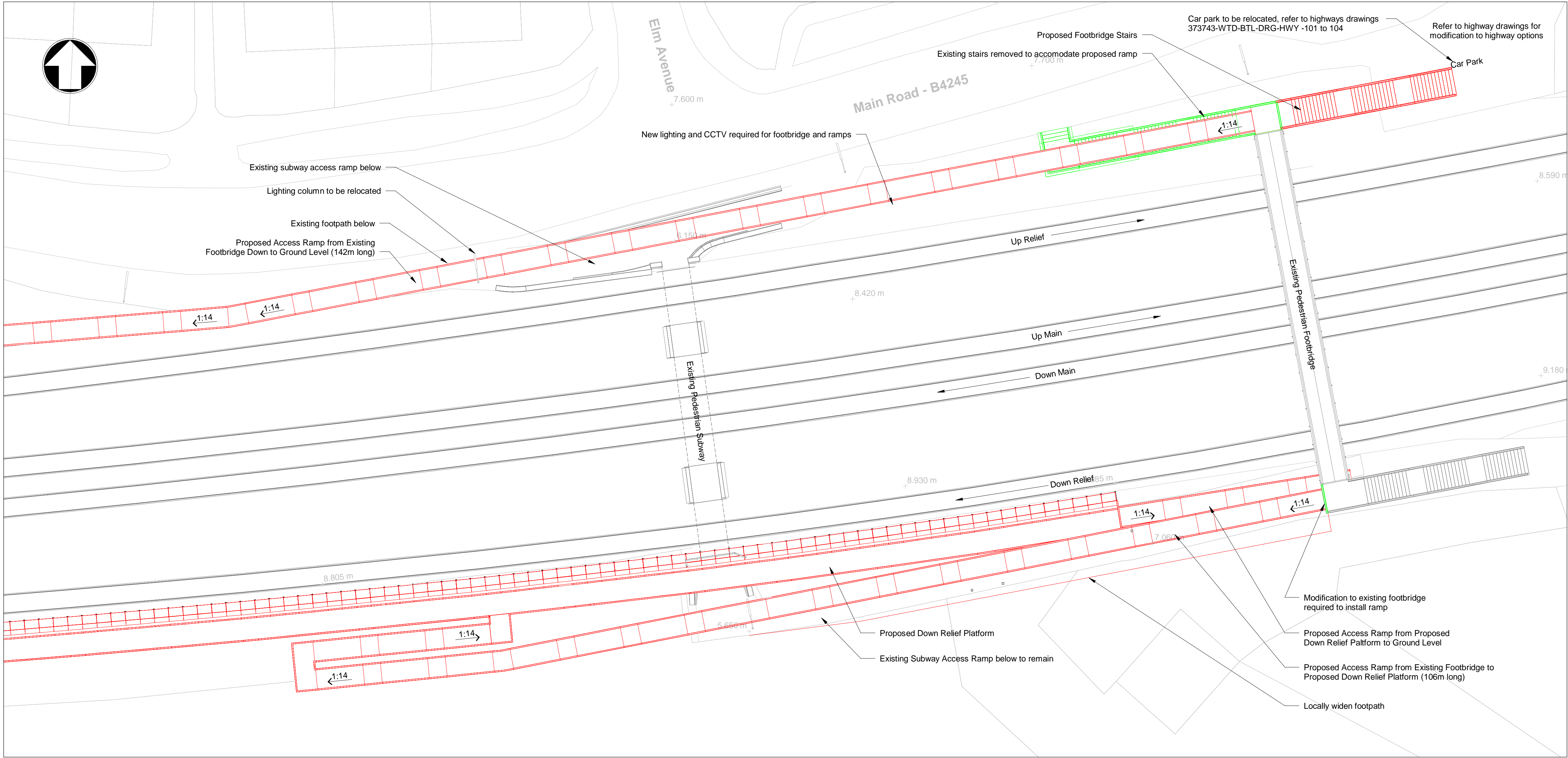
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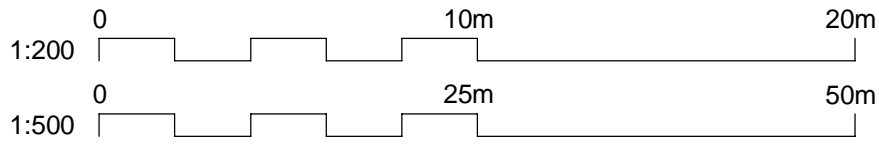




Option 1 - Location Plan  
1 : 500



Option 1  
1 : 200



- Notes
1. All dimensions are shown in millimetres unless states otherwise
  2. All levels are shown in metres unless stated otherwise
  3. Do not scale from this drawing
  4. Drawings are based on W1008D-BNU-DRG-ECV-002001(Z01) to 002002(Z01), W1008D-BNU-DRG-ECV-002100(Z01) to 002106(Z01), W1008D-BNU-DRG-ECV-002110(Z01) to 002114(Z01), 11020-SVM2-150-51-P-1 and photogrammetry survey carried out on 09/03/18 and are for the purpose of this options study only. Detailed surveys will be required for further design
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	Modified
	Proposed
	Removed
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	Existing Spot Level in metres - (Approximate)

P1	31/05/18	NMB	First Issue	GB	CB
Rev	Date	Drawn	Description	Ch'k'd	App'd

Status

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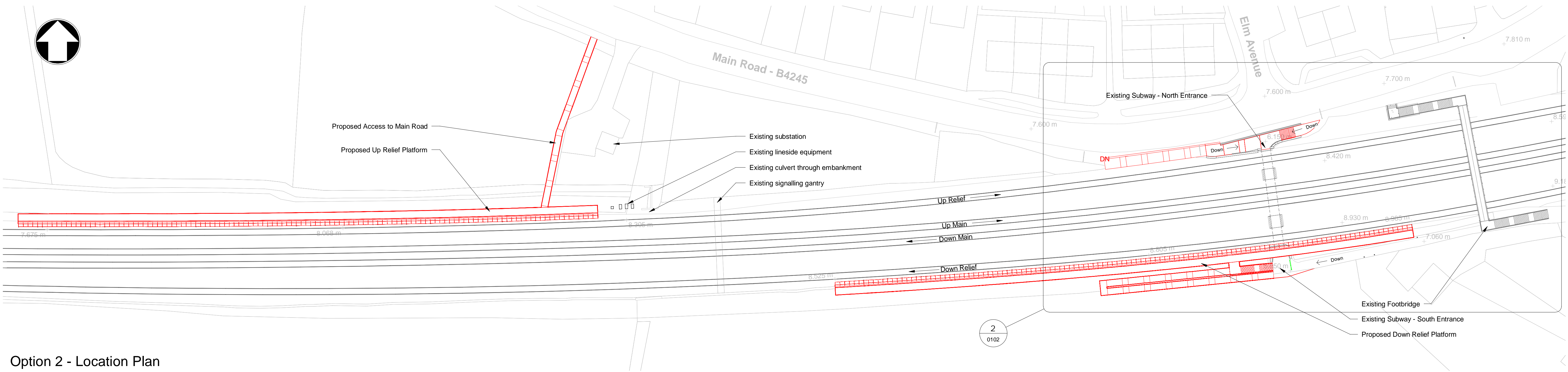
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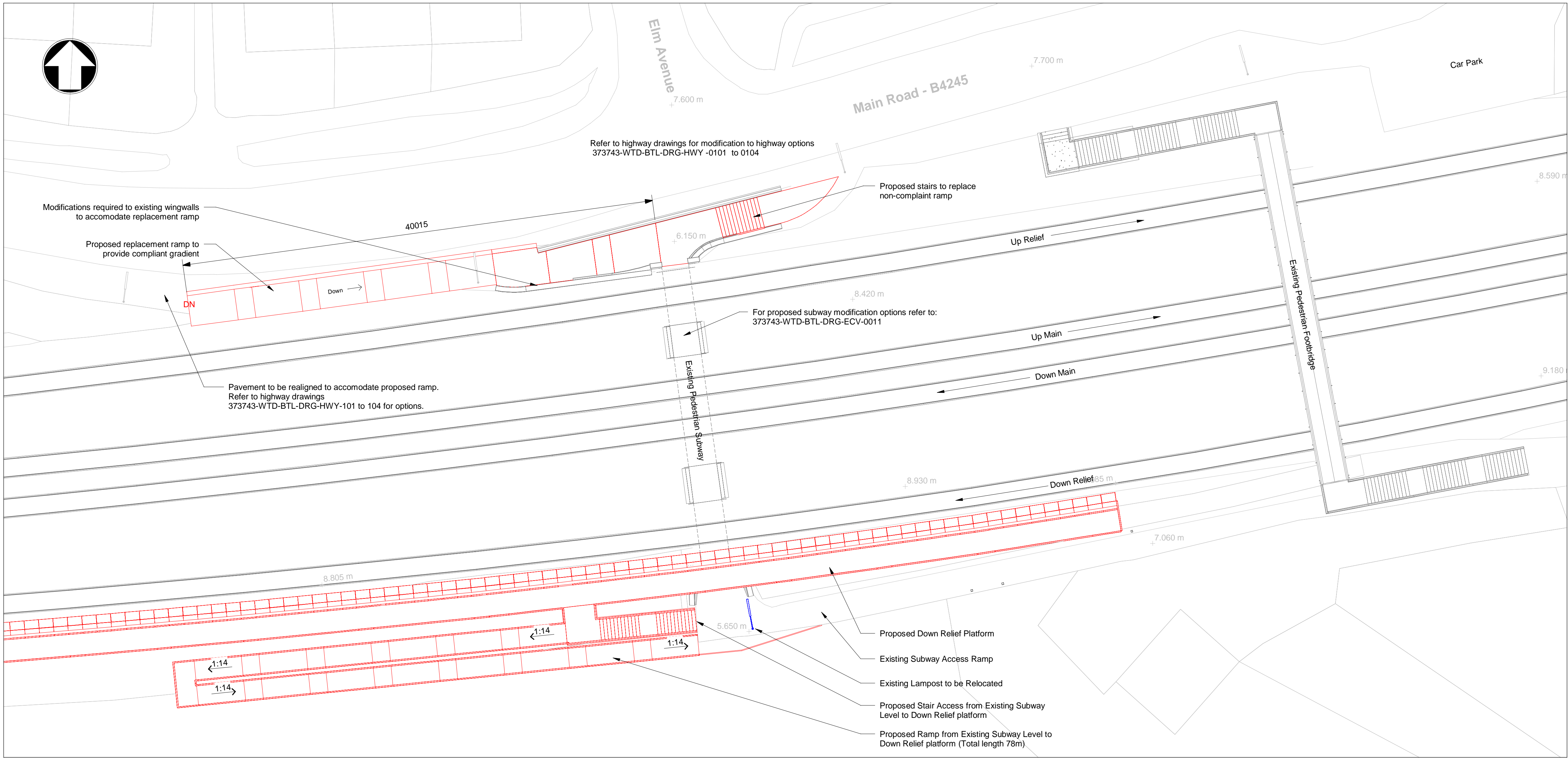
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**Undy Halt Footbridge Ramps**

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Dwg.check.	S Symmons	SDS	Approved	C B Bishop	C
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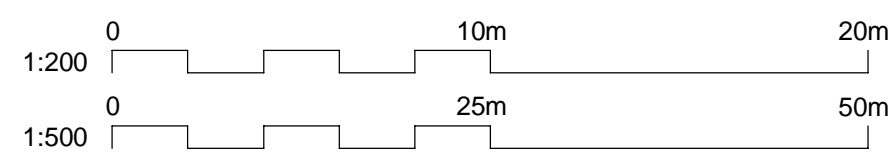




Option 2 - Location Plan  
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Detail  
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2  
0102



- Notes
1. All dimensions are shown in millimetres unless states otherwise
  2. All levels are shown in metres unless stated otherwise
  3. Do not scale from this drawing
  4. Drawings are based on W1008D-BNU-DRG-ECV-002001(Z01) to 002002(Z01), W1008D-BNU-DRG-ECV-002100(Z01) to 002106(Z01), W1008D-BNU-DRG-ECV-002110(Z01) to 002114(Z01), 11020-SWM2-150-51-P-1 and photogrammetry survey carried out on 09/03/18 and are for the purpose of this options study only. Detailed surveys will be required for further design.
  5. The drawings should be read in conjunction with the Option Selection report 373743-WTD-BTL-OSR-0001

Key					
	Existing				
	Modified				
	Proposed				
	Removed				
	Proposed Spot Level in metres- (Approximate)				
	Existing Spot Level in metres - (Approximate)				

P1	31/05/18	NMB	First Issue	GB	CB
Rev	Date	Drawn	Description	Ch'k'd	App'd

Status

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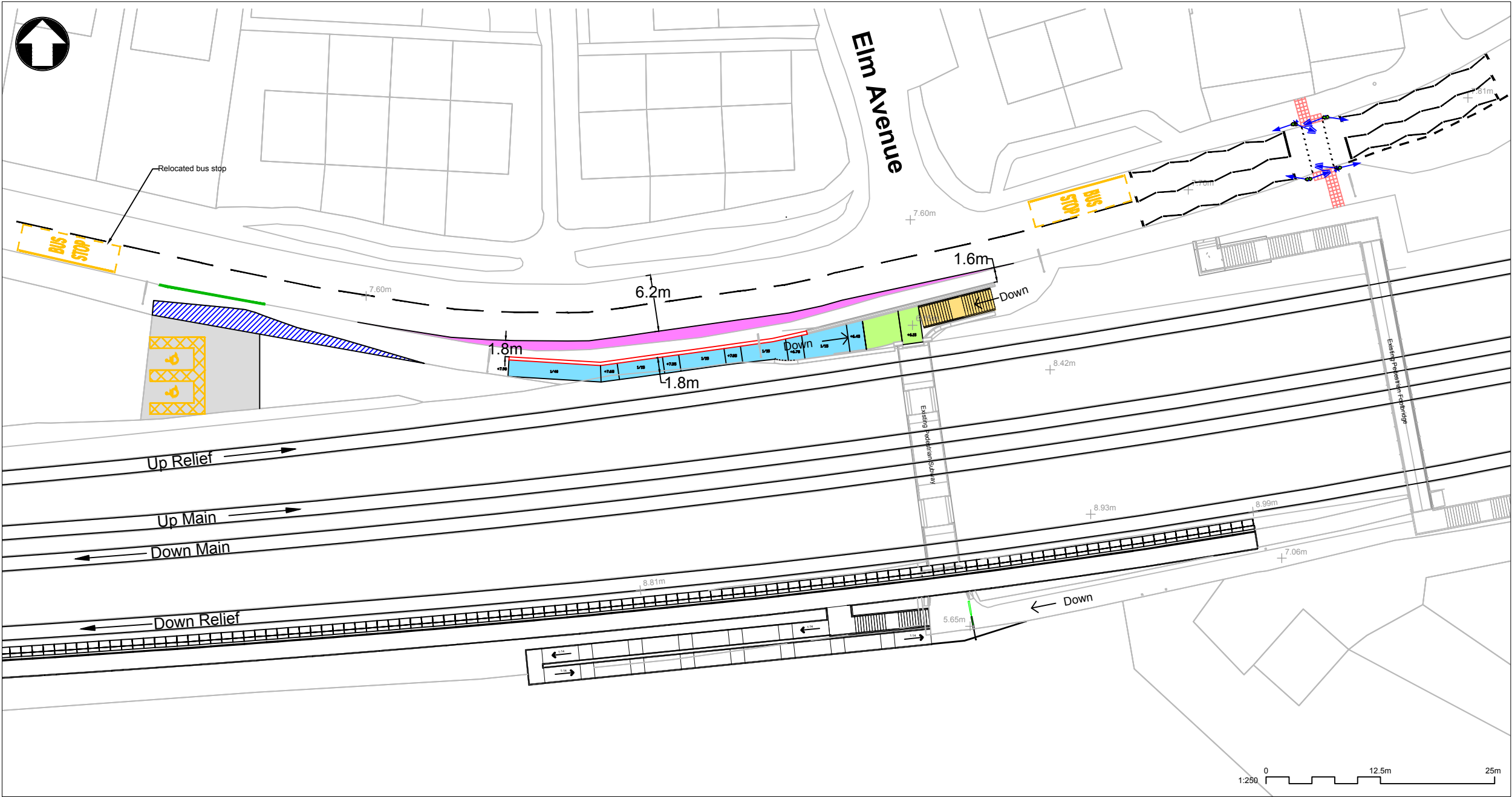
monmouthshire  
sir fynwy

Title

Magor and Undy Walkway Station

Option 2, 3, 4 and 5  
Ramp Arrangement

Designed	A Mason	ACM	Eng.check.	G Berry	GB
Drawn	N M Burrows	NMB	Coordination	G Berry	GB
Dwg.check.	S Symmons	SDS	Approved	C B Bishop	CB
MMD project Number		Scale at A1			Security
373743		As indicated			STD
Suitability Description					Suit. Code
Suitable for Information					S2
Drawing Number					Rev
373743-WTD-BTL-DRG-ECV-0102					P1



- Notes
1. Subject to design with topographic survey.
  2. Subject to consultation with highways authority.
  3. Subject to road safety audit.
- Key
- Underpass levels to be re-graded
  - Main Road realignment and footway extension
  - Compliant access ramp
  - Steps
  - Structural retaining wall
  - Footway widening into 3rd party land
  - Dropped kerb
  - Proposed new hardstanding
  - Primary traffic signal
  - Secondary traffic signal
  - Pedestrian push button unit

P1	03/05/2018	RB	Preliminary design	CC	GT
Rev	Date	Drawn	Description	Ch'k'd	App'd

Status	Work In Progress
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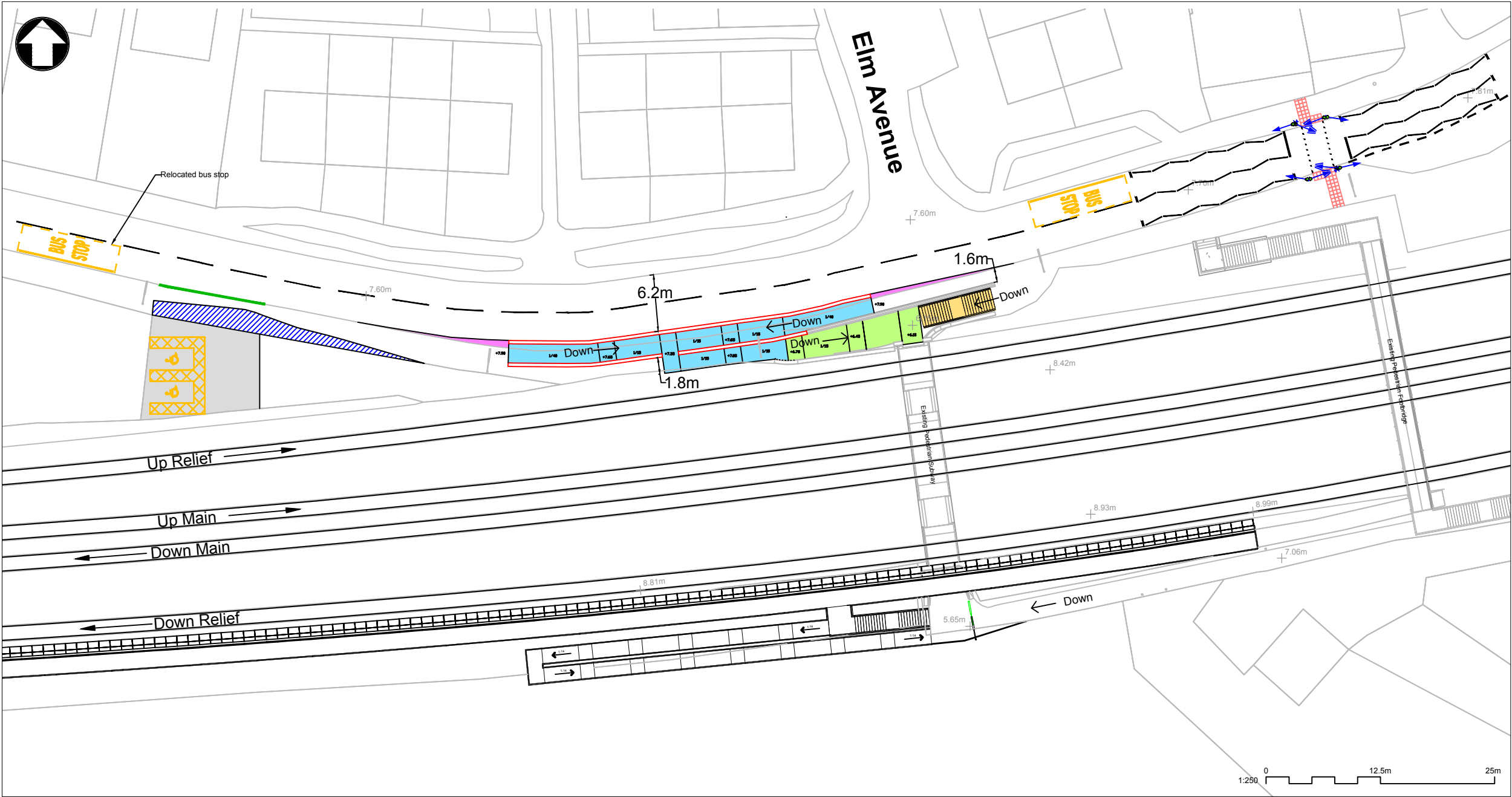
Client	Monmouthshire Couny Council
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Title	Magor and Undy Walkway Station  Option 1a
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Designed	G Tregillis	GT	Eng.check.	G Tregillis	GT
Drawn	R Barwell	RB	Coordination	G Berry	GB
Dwg.check.	C Cole	CC	Approved	G Tregillis	GT
MMD project Number	373743	Scale at A1	1:250	Security	STD
Suitability Description	Work In Progress	Suit. Code	S0	Rev	P1
Drawing Number	373743-WTD-BTL-DRG-HWY-101				







Notes

1. Subject to design with topographic survey.
2. Subject to consultation with highways authority.
3. Subject to road safety audit.

Key

- Underpass levels to be re-graded
- Main Road realignment and footway extension
- Compliant access ramp
- Steps
- Structural retaining wall
- Footway widening into 3rd party land
- Dropped kerb
- Proposed new hardstanding
- Primary traffic signal
- Secondary traffic signal
- Pedestrian push button unit

P1	03/05/2018	RB	Preliminary design	CC	GT
Rev	Date	Drawn	Description	Ch'k'd	App'd

Status

**Work In Progress**

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**Magor and Undy Walkway Station**

**Option 2a**

Designed	G Tregillis	GT	Eng.check.	G Tregillis	GT
Drawn	R Barwell	RB	Coordination	G Berry	GB
Dwg.check.	C Cole	CC	Approved	G Tregillis	GT
MMD project Number		Scale at A1			Security
373743		1:250			STD
Suitability Description					Suit. Code
Work In Progress					S0
Drawing Number					Rev
373743-WTD-BTL-DRG-HWY-103					P1



## **B. Geotechnical Desk Study**



# **Magor and Undy Railway Station**

Geotechnical Desk Study

04 May 2018





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# **Magor and Undy Railway Station**

## **Geotechnical Desk Study**

04 May 2018



# Issue and Revision Record

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**Document reference:** 373743-WTD-CE-0001

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# Executive summary

Monmouth County Council has commissioned Mott MacDonald Ltd. to undertake a geotechnical and geo-environmental desk study for a proposed new railway station at Magor and Undy. The Site is located on the existing South Wales Main line railway at Undy, Monmouthshire, south-east Wales. The Site has an approximate National Grid Reference of ST 431868 (Easting: 343180, Northing: 186871)

The designed structure comprises of two 150m long, 3.3m wide railway platforms with two rail waiting shelters, at the northern and southern side of the site. An existing underpass beneath the South Wales Main line is planned to be lowered to provide necessary headroom. A parking area is proposed to the northern side of the embankment of the railway.

The scope of this report is to determine the likely ground conditions under the site, establish the principal geotechnical risks for the site and the areas with additional risks to historical contamination, define the geotechnical constraints, develop a preliminary conceptual site model and guidance on geotechnical ground investigation. It also provides options for possible foundation solutions and provides recommendations for any further works required to assist in the design of the proposed development.

A site reconnaissance walkover was undertaken on March 29, 2018. Key observations from the visit included signs of potential settlement of the existing rail embankment with soft ground conditions exhibited surrounding the rail line with the presence of hydrophilic plants, areas of standing water and the presence of a Welsh Water sewage pumping station. Drainage reens are located north and south of the site with Mill Reen flowing north to south culverted beneath the site at its western extent.

The site is underlain by variable ground conditions comprising Made Ground materials, soft compressible natural Tidal Flat Deposits associated with the River Severn, Head Deposits and a potentially variably weathered bedrock profile of mudstones and limestones. Previously undertaken ground investigations largely confirm the published geology ground profile. Though areas of the site have no ground investigation data available. The site is bordered by predominantly agricultural land use to the south with a mixed use to the north including agricultural and residential.

A preliminary contaminated land risk assessment anticipates sources of contamination to be associated with railway land use and from potential fly tipping. There is a low risk from Unexploded Ordnance (UXO) and no risk from previous mining activities.

Geotechnical engineering risks are associated with variable ground conditions, low strength soft compressible ground, differential settlement and the presence of existing services. It may be possible to found platform structures on strip footings though raft footings, screw piles or potential lightweight structures may be also be suitable.

Further ground investigation is recommended to confirm ground profiles, groundwater conditions and undertake both geotechnical and geo-environmental testing across the site.

# 1 Introduction

## 1.1 Background

Mott MacDonald Limited have been appointed by Monmouth County Council to provide an options study and Approval in Principle (AIP) for the proposed new railway station at Magor and Undy. In April 2016, Mott MacDonald Limited produced a Grip Stage 2 – Technical Feasibility study which concluded that further information is required to determine the ground conditions and assist the construction methodology.

## 1.2 Development proposals

A new railway station is proposed on the South Wales Mainline at Undy, which includes two staggered platforms with associated parking and access routes. However, the final development proposals may be subject to change as the scheme develops.

## 1.3 Scope and objective of the report

The objectives of this report are to:

- Determine the likely ground conditions beneath the site;
- Establish the principal geotechnical risks for the site, relating to slope stability, UXO and subsidence;
- Establish areas with additional risks due to historical contamination;
- Develop a preliminary conceptual site model (CSM) and identify potential pollutant linkages which could be present during and following construction;
- Define geotechnical constraints that can be used to develop feasibility and outline design of foundations; and,
- Develop guidance on ground investigation requirements for the site, including an outline ground investigation plan.

## 1.4 Methodology

This report has been completed in cognisance of best practice methodology detailed in the following documents:

- BS EN 1997 - 1:2007, 'Eurocode 7 – Geotechnical Design – Part 1: General Rules' (Ref. 1);
- BS EN 1997 - 2:2007, 'Eurocode 7 – Geotechnical Design – Part 2: Ground Investigation and Testing'. (Ref. 2);
- BS10175:2011(+A1:2013), 'Investigation of Potentially Contaminated Sites', (Ref. 3);
- CLR 11, 'Model Procedures for the Management of Land Contamination' (2004) (Ref. 4);
- Construction and Industry Research and Information Associated (2001) Contaminated Land Risk Assessment – A Guide to Good Practice CIRIA Report C552 (Ref. 5)

## 1.5 Sources of information

The following sources of information have been consulted to compile this report:

- British Geological Survey (BGS) Geology of Britain Online Viewer (Ref. 6);
- BGS GeoIndex Online Viewer (Ref. 7);



- Coal Authority Online Viewer (Ref. 8);
- Coal Authority, Coal Mining Report (Ref. 9);
- Natural Resources Wales (Ref. 10);
- UXO Online Map Viewer, Zetica (Ref. 11);
- Network Rail Earthworks Database (Ref. 12);
- Network Rail – Western Route Sectional Appendix module WRI (Supplement No.37-02 December 2017) (Ref 16); and
- Waterman Autorail™ 5-mile diagrams (Ref. 17).

## 1.6 Limitations

Mott MacDonald Limited is not insured for, and therefore will not undertake, surveys to identify asbestos or provide guidance on the treatment of asbestos. Should the presence of asbestos be suspected during development, Mott MacDonald Limited would recommend the appointment of a specialist contractor to address the issue and would not provide advice on any risk or remedial measures required. This report is based on the development proposals outlined in Section 1.2. Should the development proposals change during design development, the recommendations and conclusions of this report should be reviewed and if necessary, revised.

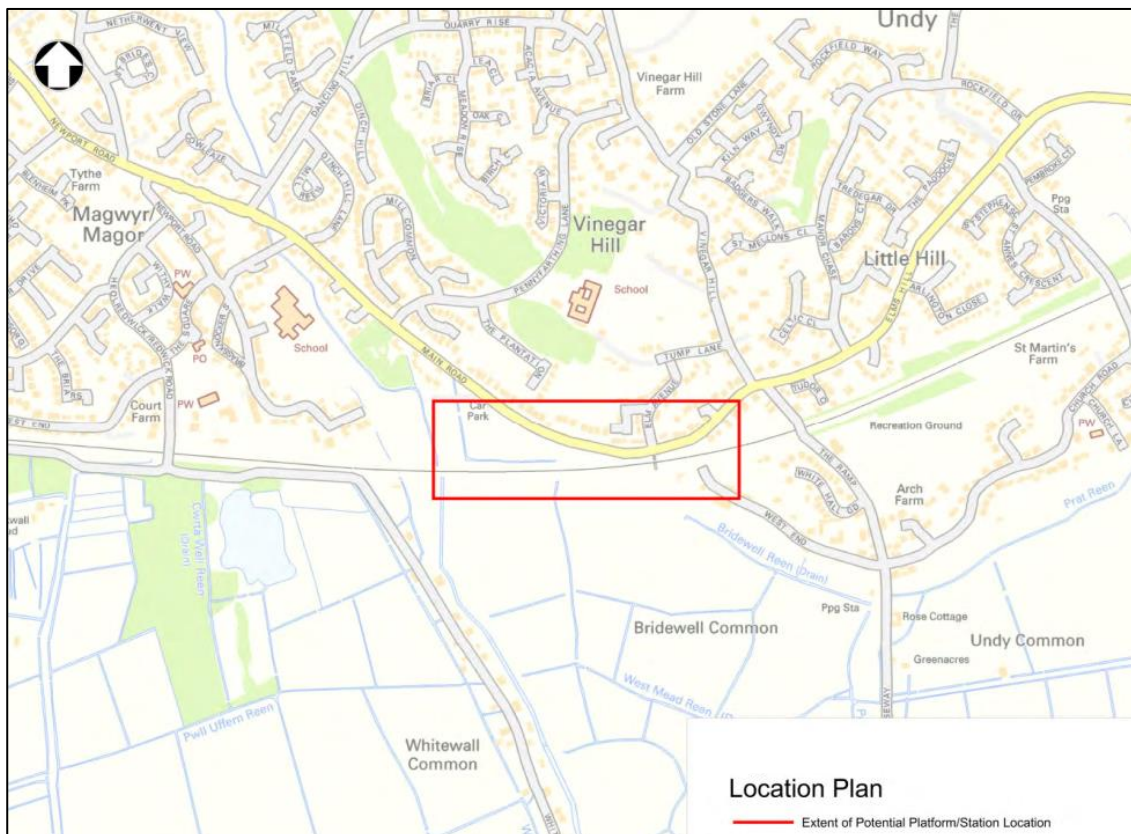
## 2 Site location and description

### 2.1 Site location

The Site is located on the South Wales Main Line Railway at Undy, Monmouthshire, south-east Wales. The Site has an approximate National Grid Reference of ST 431868 (Easting: 343180, Northing: 186871)

The railway line connects the Severn Tunnel to the east (low mileage) with Newport to the west (high mileage). The Site is situated along the Engineers Line Reference (ELR) of SWM2 between approximate track mileages 150M 1029Y and 150M 1600Y. A site location plan is presented as Figure 1: Site location plan.

**Figure 1: Site location plan**



### 2.2 Site description

#### 2.2.1 General

The site is situated within the village of Undy in Monmouthshire, south-east Wales, adjoining the village of Magor with which it forms the community and parish of “Magor and Undy”. The site includes four railway tracks which have a general orientation of east-west with line speeds varying between 40 miles per hour (mph) and 75mph on the Up and Down main line. The site also includes Undy Halt footbridge (at 150M 1096Y) and an underpass (at 150M 1210Y).

### 2.2.2 Topography

The Site is located on sidelong ground, south of Vinegar Hill and has an average elevation of 8m AOD. The site has a slight incline from approximately 6mAOD west to 11mAOD at the eastern extents. South of the site the surrounding area is generally flat, gently sloping south towards the Severn Estuary.

Aerial photography of the site suggests that the southern area is low lying and crossed by a complex reën system. Additional evidence of the low-lying nature of the land is supported by a number of road names suggesting that the roads in the area have been built up and include names such as 'The Causeway' and 'The Ramp' which crosses the rail line approximately 200m to the east of the site.

### 2.2.3 Surrounding Area

The site is bounded to the north by Main Road (B4245) which meanders around the foot of Vinegar Hill and fields. Further north of the site the area is filled with residential buildings. An area of hardstanding which is indicated to be used as a car park is located approximately 67m north of the western extents of the site (150M 1600Y).

To the south, the site is bounded by Gwent Levels of Magor and Undy, which is a Site of Special Scientific Interest (SSSI) West End Farm which is located on Bridewell Common. The area south of the site has several reens, which are located around the field boundaries

Magor Marsh Nature Reserve, is indicated to be approximately 150m south west of the site and includes damp meadows, sedge fen, reedbeds, scrub and wet woodland.

## 2.3 Site reconnaissance

A site walkover was undertaken on the afternoon of 28 March 2018 during overcast conditions with occasional heavy rain showers. Periods of heavy rain in the preceding morning and days prior to the site visit would have contributed to wetter than average surface water conditions.

The site comprised a set of four operational rail lines with the South Wales Mainline occupying the two centre tracks with the Up direction to London on the northern most of the two lines. The Up-relief line is the northernmost of the 4 lines and Down-relief is the southernmost. The outer relief lines had survey monitoring targets attached to the rails shown on Figure 7. These targets indicate monitoring of the lines has been undertaken possibly as a result of subsidence of the embankment. No access to Network Rail land was possible during the walkover and all observations were made from boundary fences, the public highway and overline structures.

At the eastern extent of the site there is a stepped, metal construction, overline footbridge. It appeared to be of recent construction and comprised a single span, crossing the rail line. A redundant concrete pad footing with H profile steel beams, cut flush to ground level, was located in an area of gravelled car parking, adjacent to a Network Rail authorised access point as shown on Figure 6. Overhead high voltage electricity was encountered on the northern edge of the site and extended on wooden poles above the B4245 Road in an approximate north south direction.

At the southern side of the railway, to the east of the footbridge, a short dead-end path of approximately 20-30m is located parallel and on the border of the Network Rail boundary fence. Thick brambles were identified between the rail line and the path as shown in Figure 8, the embankment supporting the railway was approximately 1.0 – 1.5m above the surrounding ground level at this point. The footpath also extended to the western side of the footbridge, allowing public access to the underpass. The footpath was approximately 2-3m wide and 40-

50m long. The embankment next to the footpath on the northern side, comprised clinker, ash and coal fragments that had been excavated by small burrowing animals such as rodents and or rabbits.

Hydrophilic plants, such as bull rush, were encountered bordering the southern side of the footpath. This area is also believed to be the location of a spring as identified on historic mapping discussed in section 6.1. Older construction concrete fence posts were identified at the southern edge of the footpath. The concrete posts appeared to be leaning to the south and away from the railway as shown on Figure 9 and indicated potential progress movement. The area along the southern side of the embankment to the west of the underpass was not visited as there were no public access to this area.

The underpass connecting the southern footpath to the pavement on the northern side of the railway line on the B4245 (Newport Road), was located at 150m 55½ch as shown on Figure 10. The central part of the underpass is a masonry construction, whilst the northern and southern ends supporting the relief lines are of brick construction, as shown on Figure 11. As shown on historical maps it is believed that the central section of the railway was constructed at an earlier date with the underpass extended on construction of the relief lines. Some calcite material was noted on the surface of both brick and masonry, as shown on Figure 14. This calcite build-up indicates ground water behind the wall is potentially high, and drainage may not be operating effectively. In addition, no weep holes were identified in the underpass. Near vertical cracking of the masonry and brick walls were also noted, which suggests possible movement of the wall, as shown on Figure 12 and Figure 13.

A 1.6m high brick retaining wall was located at the northern end of the underpass and supports the B4245 highway. Weep holes located within the wing walls at the northern end of the underpass, appeared to be dry, and calcite was encountered just above these weeps as shown on Figure 16. At the northern end of the underpass manholes that appear to be part of the existing highway drainage system were encountered with an apparent flow direction from the pavement and possibly beneath the underpass (see Figure 17). A BT service manhole was encountered 10-15m to the east of the entry of the underpass, within the pavement, as shown in Figure 18.

The western extent of monitoring targets on the Up-relief rails were encountered just above the underpass as shown on Figure 19. Towards the western extent of the site, in the vicinity of the proposed parking area, an abandoned building was encountered (see Figure 20) which might have been part of the historic rail infrastructure, as it is shown on historical maps. The building comprised corrugated iron sheeting and was partly collapsed with vegetation growing in and around the structure. This area of the site had some fly tipped materials and was bordered by an intermittent fence with a maximum height of 1.6m. Ballast supporting the Up-relief rail line appeared to be retained by signal cable troughing and was spalling down the embankment slope. The thickness of ballast would indicate that topping up of the rail line has been undertaken periodically and may indicate subsidence of the rail earthwork embankment. Newly constructed pile foundations were encountered adjacent to the rail lines, possibly installed for overhead electrification gantries as part of the south Wales electrification, as shown on Figure 21.

Land surrounding the railway to the north appeared to be approximately 1.0m below the rail embankment and highway level. Located centrally and approximately 15m north of the rail line was a Welsh Water owned and operated sewage pumping station with a pole mounted transformer adjacent to the brick built structure (see Figure 22).

A single 205 litre steel drum was encountered at the western end of the proposed parking drop-off area. There is potential that the drum may contain potential contaminating materials (see Figure 23). Further overhead electricity cables were encountered at the western end of the pumping station.

Continuing westwards along the B4245 an orchard is located between the highway and rail line containing a mix of large older age apple trees and newly planted trees. A further electricity sub-station was encountered at the north-western edge of the orchard - see Figure 24. Towards to the western edge of the site an existing car parking area was located, which is surrounded by flat grassed area, with some marsh reed grass indicating saturated poorly drained land. Mill Reen is located towards the western extent of the site which is culverted beneath the rail way line in north-south flow direction. The culvert is believed to be located beneath the western end of the proposed northern platform.

Tennis courts and an outdoor play area are located on the western side of Mill Reen, which was also bordered by an open grassed area. Standing surface water and further marsh reed grass was also noted indicating potential saturated and soft ground conditions.

A further pedestrian footbridge is located approximately 100m west of Mill Reen (and off site). It was noted that further monitoring targets were installed on the rails again indicating earthwork embankment settlement issues

Site visit photos are shown as Figure 6 to 24 in Appendix C.

## 3 Published geology

### 3.1 Made Ground

No Made Ground is indicated on the available geological maps (Ref. 9 & 10) to be present on site or within its surroundings. However, Made Ground is likely to be present on site associated with the construction of the railway.

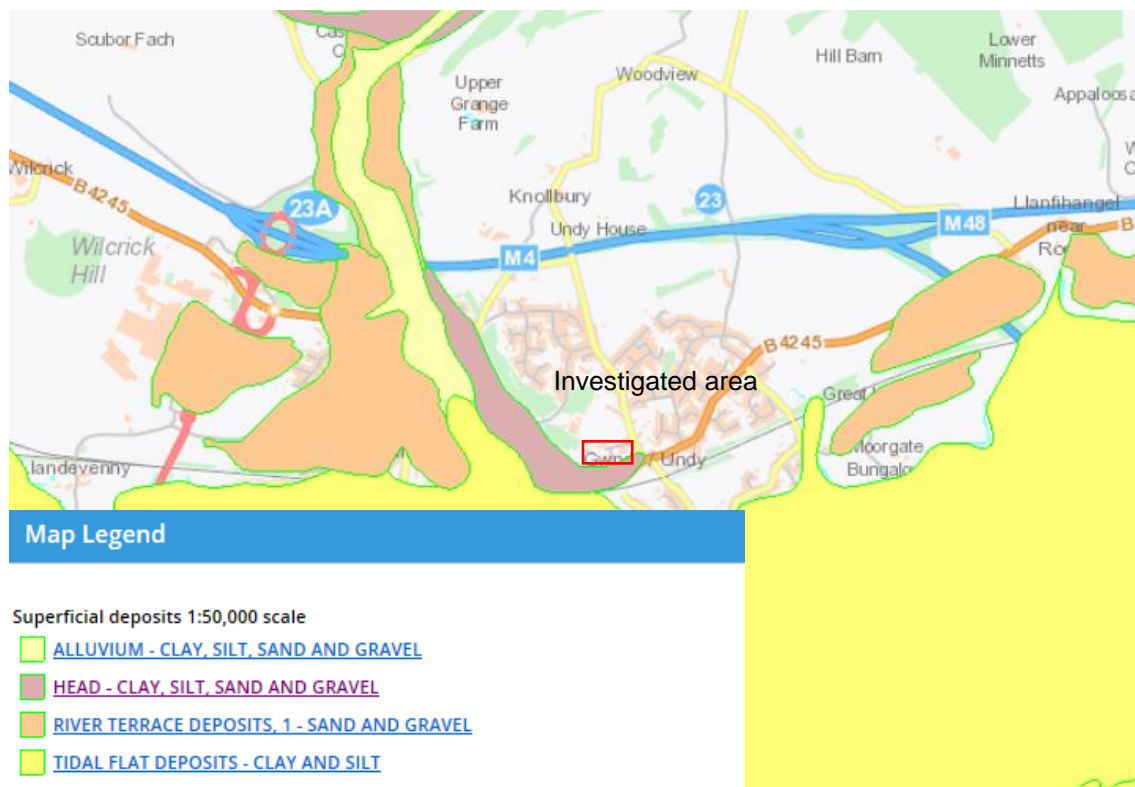
### 3.2 Superficial geology

The available published geological maps (Ref. 9 & 10) indicate that the superficial deposits comprise Tidal Flat deposits between 100m of the western extents of the site (high mileage) and 170m of the south of the site between approximate mileages 150M 1305Y to 150M 1490Y. This is described as predominantly soft clay and silt deposits containing possible peat layers associated with the Severn Estuary. These can often have a firm to stiff clay desiccated crust at the surface.

North of the railway line between 150M 1305Y to 15M 1490Y the superficial deposits comprises Head. This essentially comprises sand and gravel, locally lenses of silt, clay or peat and organic material. Formed from hill side slope movements and therefore content dependant on upslope source.

The eastern 125m (approximate mileage 150M 1029Y and 150M 1165Y) of the site is indicated not to be underlain by no superficial deposits. Shallow bedrock may be encountered within these areas and therefore a weathered bedrock profile may be present at the surface.

**Figure 2: Superficial Geology**



Reproduced using BGS online GeoIndex resource. (Ref: 10)

### 3.3 Bedrock geology

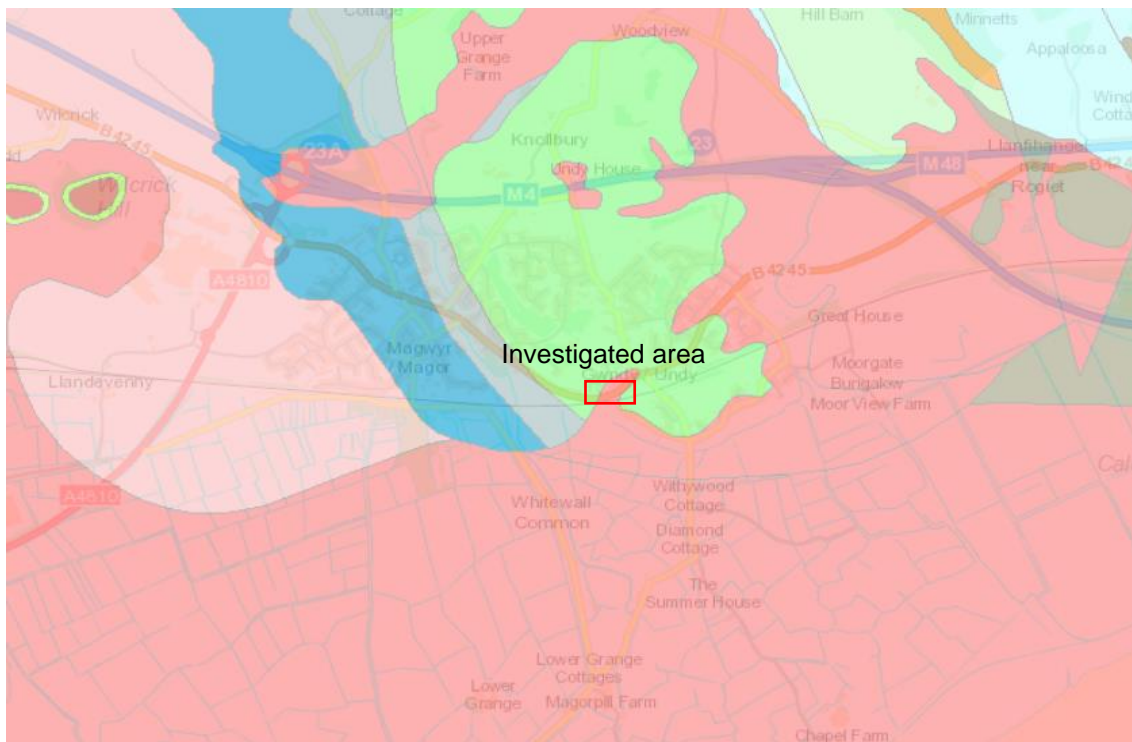
The underlying bedrock is indicated by published geological maps (Ref. 9 & 10) comprises Dolostone; a Black Rock Limestone subgroup between approximately 150M 1029Y and the Undy Halt Footbridge at 150M 1096Y and 150M 1230Y to 150M 1340Y. This is described by BGS as thin-to-thick-bedded, dark grey to black, foetid, fine – to coarse-grained skeletal packstones with subordinate thin beds of shaley argillaceous skeletal packstone and mudstone.

Conglomerate of the Mercia Mudstone Group (Marginal Facies) is also indicated to overlie the Carboniferous Limestone within the area of Undy Halt footbridge and the Underpass (approximately 150M 1096Y and 150M 1230Y). This comprises finer-grained rock fragments or, less commonly siltstone, sandstone or micritic limestone. Within this area both the matrix and limestone clasts are commonly dolomitized.

The eastern extent of the site between 150M 1230Y and 150M 1600Y, is underlain by Mudstone and Limestone, interbedded of the Avon Group. This is described by the BGS as Interbedded grey – mudstones and thin – to medium-bedded skeletal packstones of Carboniferous age. Contains one to several thick units of ooidal and skeletal grainstones (limestones). Thin units of calcite mudstone and mudstone may be locally present.



**Figure 3: Bedrock Geology**



### Map Legend

Bedrock geology 1:50,000 scale

- HUNTS BAY OOLITE SUBGROUP - LIMESTONE, OOIDAL
- AVON GROUP - LIMESTONE
- TINTERN SANDSTONE FORMATION - SANDSTONE
- LLANELLY FORMATION - LIMESTONE/CEMENTSTONE/CALCILUTITE, ARGILLACEOUS, MUDDY
- AVON GROUP - MUDSTONE AND LIMESTONE, INTERBEDDED
- QUARTZITIC SANDSTONE FORMATION - SANDSTONE
- MERCIA MUDSTONE GROUP - MUDSTONE
- MERCIA MUDSTONE GROUP - SANDSTONE
- BLACK ROCK LIMESTONE SUBGROUP - DOLOSTONE
- PENARTH GROUP - MUDSTONE
- BLUE ANCHOR FORMATION - MUDSTONE
- CROMHALL SANDSTONE FORMATION - SANDSTONE

Reproduced using BGS online GeoIndex resource. (Ref: 10)

### 3.4 Structural geology

From available information (Ref. 9 and 10), there are no indicated faults that cross the site. The closest fault to the site is indicated to be approximately 2.48 km north-east of the site with a north-west to south-east orientation. An inferred fault crosses the railway approximately 1.8km east of the site.



## 4 Mining and quarrying

### 4.1 Mining

No current or historic mining activities are indicated by the Coal Authority (Ref. 11) to be on site or within the surrounding area.

### 4.2 Quarrying

No quarries are indicated to be on site (Ref. 10).

## 5 Land mass movements

No land mass movements have been recorded on site or within the surrounding area.

## 6 Hydrology and hydrogeology

### 6.1 Hydrology

A review of OS maps and Natural Resources Wales' website (Ref. 17 and 18) identifies a complex reen system south of the site which form part of the Caldicot Levels. The closest reen is Mill Reen, which crosses the railway at the far western extent of the site. Bridewell Reen is orientated west to east parallel and adjacent to the northern side of the railway embankment, and crosses beneath the embankment in a culvert approximately 200-250m west of the site. The reen continues flowing to the east direction adjacent and parallel to the southern side of the embankment where it changes direction after approximately 100m, and flows to southeast. A spring was identified to the southern side of the site according to the historic maps.

The Severn Estuary is located approximately 1.5km south of the site, which enters the Bristol Channel to the west.

No chemical or biological data was available for review to determine the water quality of the water sources.

### 6.2 Flooding

Natural Resources Wales (Ref. 16) indicates that the entirety of the site is within an area of low-medium risk of flooding from Rivers and Sea.

The area of the proposed Down-line platform (southern) and car park is considered to be at a Medium risk of surface water flooding. A Medium risk means that each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%). The underpass at 150M 1210Y is indicated to be at a High risk of flooding from surface water. High risk means that each year, this area has a chance of flooding of greater than 1 in 30 (3.3%). The remainder of the site is indicated to not be at risk of surface water flooding.

The Site is not considered to be at risk of flooding due to Reservoirs.

### 6.3 Hydrogeology

The Tidal Flat deposits indicated to underlie the site are designated by Natural Resources Wales (Ref. 16) as being an Unproductive Aquifer. This is by definition of the Environment Agency (Ref. 17), drift deposits with low permeability that have negligible significance for water supply or river base flow.

The Head deposits which underlie the site north of the railway between 150M 1305Y and 15M 1490Y is classified by NRW as a Secondary Undifferentiated Aquifer. This is assigned in cases where it has not been possible to attribute either category A or B to the drift deposit.

Natural Resource Wales (Ref. 16) indicates that the Avon Group mudstone and limestone interbedded is a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The Conglomerate of the Marginal Facies and Black Rock limestone are both indicated to be Principal Aquifers. These are described to have layers of rock deposits with high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

## 7 Historical development & current land use

### 7.1 Historical development

As part of the assessment, historical plans dating from 1882 through to the early 2000's were reviewed.

The earliest available historical map of the site indicates a dual-track railway line to be present on a shallow embankment along a similar alignment as the present South Wales Mainline. The area surrounding the railway to the north and south is typically agricultural land with an orchard immediately to the north of the site and the surrounding field boundaries are clearly defined.

A road is shown to the immediate north of the railway line with a similar alignment to the current B4245. A further road is located to the immediate south east of the railway line on a similar alignment to the current West End Lane. This appears to have originally connected to the road to the north but has been bisected by the constructed railway line. Residential buildings are located to the north of the main road called West End. An orchard is identified immediately to the west of the site, and an Ash cottage is located to the north of the orchard. Another orchard is located to the northeast of the railway embankment, bordered by the road with the similar alignment to the current B4245 and the railway line. A spring is identified to the south of the railway embankment to the west of the existing underpass.

A sawpit is identified to the northwest of the orchard. Two quarries are identified, one, is located to the southeast of the railway embankment, next to the similar alignment to the current West End Lane, the other is located to the north of the railway embankment, possibly on the top of Vinegar Hill.

An underpass appears to be located beneath the railway at the approximate location of the existing underpass. A reen or drainage channel is shown to the north west of the railway line flowing in a southerly direction where it appears to pass below the railway line in a culvert. At the northern end of this culvert a further reen appears to discharge into the first. This flows in an east west direction along the norther side of the railway embankment. This reen appears to pass below the embankment in a culvert at the approximate location of the current Bridewell Brook. To the south of this culvert the reen flows in a north south direction. A further reen flows from the southern side of the culvert in an easterly direction parallel to embankment for approximately 100m at which point it flows to the south east. A spring is identified on the southern side of the railway embankment slightly to the east of the underpass.

The map from 1901 no longer indicates the presence of the spring, and a sluice has been built to the west of the site, where the Bridewell reen joins to Mill reen. Several posts have been built along the alignment of the railway lines. No other significant changes are identified.

The map dated 1921 shows that the orchard, which was located to the northeast of the railway embankment, developed into residential properties. No other significant changes are identified.

The map from 1968 shows that the railway to have been extended by two more lines and it is assumed that these are the relief lines. Extension of the underpass is also assumed. The posts and the sluice gates are no longer present. The reen which was located to the south of the embankment is also no longer present. Ash Cottage and the surrounding area has become residential area. A building has been built immediately to the north of the embankment and to

the west of the underpass. A footbridge has been built above the mainline to the north of West End Road formerly. The underpass is named as a subway,

From 1968 to 1986 historical maps are unavailable for the whole site area.

The 1986 map shows that a building has been built to the south of the railway embankment, between the subway and the footbridge. Other significant changes have not been identified.

From 1986 to 2000 historical maps are unavailable.

Satellite imagery from 2000 shows that the building which was located to the north of the embankment has been removed, and another building has been built 80 to 90m to the west of the above-mentioned removed building.

## 7.2 Current land use

The land is currently used for live railway operations and no train stations are located at the site. A footbridge passes over the lines at the eastern end of the site and an underpass is located central to the study area. Land which is located to the north of the railway, is a private and is not publicly accessible. The rail lines are currently active and used by several rail companies. The land to the south of the site appears to be of predominant agricultural land use with land to the north comprising a mix of orchard, grazing land and residential. A car parking area is located to the west of the site at a distance of approximately 300m. The proposed car parking drop off area is an overgrown triangular parcel of land with limited access.

**Figure 4: Current land use**



## 8 Historical ground information

Magor and Undy Halt Footbridge - Factual Report on Ground Investigation has been reviewed as part of the desk study (Ref. 18) also relevant sections from ground investigations undertaken as part of the South Wales Electrification programme (Ref 19).

The BGS website does not include any historical boreholes at the site or at the vicinity of the area.

### 8.1 On Site

A ground investigation was previously undertaken for the recently constructed footbridge at the eastern extent of site. It includes three boreholes and provides geological and geotechnical information.

Further information is contained within Associated reporting refers to the section between Severn Tunnel Junction to Llandavenny Road, where a further borehole relevant to the site is included.

The initial report refers to Magor and Undy Walkway Station investigation, where a borehole, two trial pits and two dynamic probe logs are included. The dynamic probe tests were carried out in hand dug trial pits. General details of these boreholes are provided in Table 1 below. Table 2 summarises geological features according to the boreholes. Water was encountered only in borehole (BH02), at 0.50m and remained static. The location and the elevation of the boreholes were not included within the report, so these information's are not available.

**Table 1: Borehole Information**

Borehole Ref.	Borehole ID.	Grid Reference	Total Depth bgl (m)
BH01	BH01	-	1.10
BH02	BH02	-	5.85
BH03	BH03	-	6.20
BH04	GWRM-F-BH09	343328.8E 186908.3N	10.00

To simplify the geological model, geological units have been simplified into the general groups below.

- Made Ground
- Clay
- Sand / Gravel
- Limestone

**Table 2: Geological summary of boreholes**

Geology	Depth and Thickness			Boreholes encountered stratum
	Depth to top (m)	Depth to base (m)	Thickness (m)	
Made Ground	0	1.10 – 2.70	1.10 – 2.70	BH01, BH02, BH03, BH04
Clay (probable alluvium)	1.10 – 2.70	2.50 – 3.00	1.30 – 1.65	BH01, BH03, BH04
Sand	2.50	2.85	0.35	BH02
Gravel	2.85	3.90	1.05	BH03
Limestone	2.85 – 3.90	5.85 – 10.00	2.30 – 7.00	BH02, BH03, BH04

Made Ground layer is described as dark brown, dark reddish sandy silt and sandy gravel. Sand is fine to coarse and gravel is angular to subangular.

The clay layer thought to represent alluvium deposits comprised slightly gravelly, slightly sandy clay with frequent dark brownish organic matter.

Sand layer is described as orangish, brown, slightly silty gravelly, fine to coarse.

Limestone layer is described as weak thinly laminated brown, with frequent shells and calcite veins.

## 8.2 Off Site

Further off site boreholes are referenced in the ABC electrification report (Ref: 19) however, they are considered too far away from the site to be of relevance.

## 9 Preliminary Contaminated Land Risk Assessment

### 9.1 Introduction

A key element in the risk assessment for land contamination is the development of a conceptual site model (CSM) which may be refined or revised as more information and understanding is obtained through the risk assessment process. The CSM is described in terms of the contaminant 'Sources', transport 'Pathways' and possible 'Receptors' that may be present. These are defined as:

- Sources (S) are potential or known contaminant sources e.g. arising from a former land use.
- Pathways (P) are environmental systems thorough which a contaminant could migrate e.g. air, groundwater or direct contact.
- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant e.g., site occupiers, groundwater resources.

Where a source, relevant pathway and receptor are present, a contaminant linkage is present which requires further investigation and risk assessment.

The conceptual model and qualitative risk assessment are presented in Table 3. The risk assessment process is described in Appendix B.



## 9.2 Risk Assessment

**Table 3: Conceptual Model**

Source	Receptor	Pathway	Risk	Comments
Potentially contaminated soil and ground water associated with: <u>On site</u> S1: Operation of the existing railway.	R1: Railway construction and maintenance workers	P1: Human uptake pathways; P1a: Soil and dust ingestion P1b: Inhalation of airborne dust P1c: Inhalation of chemical vapours P1d: Dermal absorption	Probability: Likely Consequence: Medium Overall risk: <b>Moderate</b>	The risk to railway construction and maintenance workers should be addressed by the CDM process with site specific health and safety measures implemented during construction and maintenance of the railway and associated infrastructure.  In addition, the contractor should undertake a screen of all imported and re-used earthworks materials against suitable acceptability criteria designed to protect railway construction and maintenance workers.
S2: Made ground and fill associated with the construction of the railway.				
S3: Abandoned 205l drum.	R2: Inhabitants and recreational users of adjacent land and properties	P1a: Soil and dust ingestion P1b: Inhalation of airborne dust P1d: Dermal absorption	Probability: Unlikely Consequence: Medium Overall risk: <b>Low</b>	Geo- environmental soil samples shall be collected and analysed for contaminants of concern to facilitate assessment of potential risk to users and inhabitants of adjacent land and properties during any future ground investigation. This will inform any potential mitigation/ remedial measures which may be required.  During construction, the contractor should take all reasonable and precautionary steps to minimise the generation of dust to minimise the risk to users and inhabitants of adjacent land and properties.
	R3: Sub- surface structures	P2: Direct contact with contaminated or corrosive soils	Probability: Low Consequence: Medium Overall Risk: <b>Low/moderate</b>	Aggressive ground conditions can result in erosion of buried concrete and shorten the life of buried foundations.  During any future ground investigation, soil and groundwater samples shall be taken to facilitate this selection.
	R4: Controlled waters R4a: Groundwater in the permeable layers of the superficial deposits. R4b: Groundwater in the bedrock R4c: Mill Reen and Bridewell Reen	P3: Contaminant leachate P4: Horizontal and vertical migration of contaminants through potentially permeable soils, variable permeable geological formations and damaged drainage systems.	Probability: Low likelihood Consequence: Medium Overall Risk: <b>Moderate/ low risk</b>	Remediation of potentially contaminated controlled waters is unlikely to be economic. To inform assessment of the risks posed to controlled waters from mobile contamination present in site soils and groundwater (if identified), a Generic (and detailed if necessary) Quantitative Risk Assessment should be

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undertaken in accordance with CLR11 (Ref 4) and the EA Groundwater Policy (Ref 19).

To minimise the risk of pollution of controlled waters during the construction phase the contractor should implement a Site Environmental Management Plan (SEMP) which sets out the reasonable and precautionary steps which should be taken to prevent pollution of controlled water.

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## 10 Unexploded Ordnance Risk

The Zetica Limited Online Map Viewer indicates that the site is located within a Low risk area of Unexploded Ordnance (UXO). Low risk areas are those with a bombing density of up to 100 bombs per 10000 acres, and therefore in general further action to mitigate risk is considered prudent, although not essential. Care should be taken when assessing the risk for the specific sites where the risk may be higher due to local wartime activity.

**Figure 5: Unexploded Ordnance Risk Map**



### LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

# 11 Geotechnical Risk Register

## 11.1 Geotechnical Risk Assessment

Potential geotechnical hazards identified in association with the construction of the scheme along this section of the railway are summarised in the risk register presented in Table 8. The risks are assessed by the interaction of an Impact Index and Likelihood Index, shown in Table 4 and Table 5 respectively. Table 6 is the Risk Matrix, which shows the actual risk level, rated from severe (maximum risk level) to negligible (minimum risk level). Table 7 details the designers' actions based on the risk level.

**Table 4: Impact Index**

Impact			Cost (C)	Time (T)	Health and Safety (H&S)	Environment (E)
1	Very low	Negligible	Negligible	Negligible effect on programme	Negligible	Negligible
2	Low	Significant	> 1% budget	> 5% effect on programme	Minor injury	Minor environmental incident
3	Medium	Serious	> 10% budget	> 12% effect on programme	Major injury	Environmental incident requiring management input
4	High	Threat to future work and client relations	> 20% budget	> 25% effect on programme	Fatality	Environmental incident leading to prosecution or protestor action
5	Very high	Threat to business survival and credibility	> 50% budget	> 50% effect on programme	Multiple fatalities	Major environmental incident with irreversible effects and threat to public health or protected natural resource

**Table 5: Likelihood Index**

Likelihood		Probability
1	Negligible/improbable	<1%
2	Unlikely/remote	>1%
3	Likely/possible	>10%
4	Probable	>50%
5	Very likely/almost certain	>90%

**Table 6: Risk Matrix**

		IMPACT				
		1	2	3	4	5
LIKELIHOOD	1	N	N	N	A	A
	2	N	A	A	H	H
	3	A	H	H	S	S
	4	H	H	S	S	S
	5	H	H	S	S	S

**Table 7: Designers` Action**

RISK LEVEL	DESCRIPTION		ACTION BY DESIGNER
N	Negligible	None	
A	Acceptable	Check that risks cannot be further reduced by simple design changes	
H	High	Amend design to reduce risk, or seek alternative option. Only accept option if justifiable on other grounds.	
S	Severe	Alternative design options should be explored to avoid severe risk.	

**Table 8: Preliminary Assessment of Geotechnical Hazards for the scheme**

No.	Hazard	Consequence	Impact	Likelihood	Current Risk	Risk Type*	Potential Control Measures	Impact	Likelihood	Residual Risk
1.	Unforeseen ground conditions.	Variable ground conditions may result in the need to changes to the proposed design during construction or ULS/SLS failure of the proposed structure.	3	4	Severe	H&S, C, T	Detailed ground investigation to allow the development of accurate understanding of the ground conditions across the site.	4	1	Acceptable
2.	Potential presence of low strength cohesive soil (Alluvium).	Low bearing capacity, and excessive total and differential settlements.	3	3	High	H&S, C, T	Detailed ground investigation to determine presence of material parameters of the alluvium and to enable the design of a suitable foundation solution.	3	2	Acceptable
3.	Variability of superficial soils	Excessive total and differential settlements, of foundations.	3	3	High	H&S, C, T	Detailed ground investigation, ground model and design parameters from GI used to undertake bearing capacity analysis.	3	2	Acceptable
4.	Differential settlements along the platform.	Failure of the structure, excessive differential settlements, cracks in the structure.	3	3	High	H&S, C, T	Detailed ground investigation, ground model and design values from ground investigation.	3	2	Acceptable
5.	Differential weathered zones in the bedrock layer (Mercia Mudstone).	Piles reliant on end bearing founded in this stratum may experience excessive settlement	3	3	High	H&S, C, T	Detailed ground investigation, in situ investigations. Ground model and design values from GI. Avoid the design of end bearing piles within the MMG.	3	2	Acceptable
6.	Shallow groundwater.	Difficulties in excavation of foundations due to flooding/ collapse. Shallow ground water will have negative impact on bearing capacity of any proposed foundations	3	3	High	H&S, C, T	Groundwater monitoring during GI to determine groundwater levels. Minimise requirement for excavations during design stage. Consider appropriate piling methods for shallow groundwater. If excavations unavoidable temporary shoring and pumping will be required.	3	1	Acceptable
7.	Aggressive ground conditions.	Serviceability issues related to long term degradation of buried concrete related to	3	2	Acceptable	H&S, C, T	Undertake BRE chemical testing. Implement all recommendations of BRE Special Digest 1 during	3	1	Acceptable

		aggressive ground conditions.					detailed design of buried structures.			
8.	Underground utilities, services.	Damage of existing utilities, obstruction of the South Wales Metro Line service. Injury of site workers.	3	3	High	H&S, C, T	Contact with the utility providers prior to ground investigation. Full services search prior to design development.	3	2	Acceptable
9.	Underground channels, reens.	Difficulties in excavation due to flooding, low strength soil layers, presents of organic soils.	3	3	High	H&S, C, T	Site walkover to confirm the possible locations of the historic channels, reens. Detailed GI.	3	2	Acceptable
10.	Buried historical foundations, obstructions and existing underpass foundations.	Slow progress, requirement for overdig and possible underpinning of underpass foundations. Potential for drainage pipes beneath underpass.	3	3	High	H&S, C, T	Trial pitting is required to identify the foundation type and level to progress underpass design. Additionally, drainage survey to be undertaken to determine presence.	3	2	Acceptable
11.	Low CBR values in the proposed parking area.	Poor performance of pavement, requirement for excessive maintenance and repair. Unforeseen need to increase subgrade thickness identified at construction phase.	3	3	High	H&S, C, T	Ground investigation to determine CBR values within car parking areas.	3	2	Acceptable
12.	Site and surrounding area considered to be in low risk area for UXO.	Disturbance and potential detonation of UXO during GI or excavation of foundation.	4	1	Acceptable	H&S, C, T	UXO desk study report as part of design stage excavations a UXO specialist should be consulted.	4	1	Acceptable
13.	Underpass reconstruction, unforeseen structural issues.	Relevant information is not provided, unknown foundation type and level. Flooding during reconstruction of the underpass. Failure of the structure and railway.	4	3	Severe	H&S, C, T	Provide as-built drawings, site visit prior to GI. Identifying any structural cracks.	4	2	High

Refer to plan presented in Appendix C, highlighting key geotechnical constraints.

# 12 Conclusions and recommendations

## 12.1 Conclusions

The site sits within an area of superficial soils associated with the Gwent levels. Geological maps indicate the presence of Tidal Flat deposits underlying the South Wales Main line and to its south. To the north of the mainline the underlying superficial soils comprise Head deposits. Highly weathered bedrock belonging to the Mercia Mudstone Group may be present in the extreme south east of the site.

Two sources of existing ground investigation information have been made available for the site but, it should be noted that the data associated with the South Wales mainline electrification has no accurate borehole location plans and their locations have been determined from the grid references provided. Whilst there appears to be a number of shallow trial pits within the track at the centre of the site all of the intrusive exploratory holes undertaken to depth are located to the extreme east of the site in the area where published data indicates the presence of head deposits. Despite this ground investigations indicate the presence of very soft compressible deposits, that whilst identified as Made Ground may possibly be Tidal Flat Deposits in places.

The previously issued Mott MacDonald Limited Feasibility Report states an assumed preliminary bearing pressure of 20kPa for the platforms and allowable bearing capacity of the shallow soils of 25kPa. This seems reasonable given the potentially very poor nature of the ground conditions indicated by the GI and the report rightly discusses the possible implications of excessive settlement of strip footing constructed in such material. Whilst it might be possible to develop a foundation solution based on a strip footing that achieves the bearing capacity required, it's likely that the resulting long-term settlements will be in excess of the tolerances required for platform design. Therefore, in this instance it is felt that the use of raft foundations to be more appropriate than strip. Alternatively, the use of expanded polystyrene based preformed platforms may be considered. A lightweight system such as this would naturally result in significant reduced applied load and could benefit in speed of construction and could be considered as a feasible solution.

A further option could be the use of shallow piles such as screw piles. This might be an economical option if piling is required in construction of foundations for the associated ramp structures.

Lowering of the underpass could be problematic dependant on the depth of the existing footings and the potential presence of highway drainage runs. Underpinning of existing footings may be required and their depth and foundation stratum should be proved to enable detailed design.

As stated above whilst there is a reasonable amount of GI data available it is limited to very specific areas of the site. Given the potential variability of the ground conditions in the area further ground investigations will be required to enable the design of the proposed station infrastructure including platforms, access ramps and subway improvements.



## 12.2 Ground Investigation Works

Based on the findings of this desk study it is recommended that a detailed ground investigation is undertaken at the site to confirm the ground conditions for the development. The objectives of the ground investigation will be to target residual geotechnical risk to the scheme highlighted by the study and to:

- Confirm the ground conditions beneath the site
- Confirm the groundwater levels beneath the site
- Undertake geotechnical and geo - environmental testing on soil and groundwater samples recovered during the ground investigation works to inform the design of the foundations.

The GI scope may include, but is not limited to, the following:

- Dynamic sample boreholes, using a tracked dynamic sample rig, to investigate the nature of the superficial deposits, depth to bedrock and depth to groundwater
- Rotary boreholes, to investigate rock profile and properties and to determine the presence or otherwise of potential shallow mineworking
- Standard penetration tests (SPTs)
- Soil and groundwater sampling for geotechnical and geo - environmental laboratory testing

## 13 References

1. BS EN 1997 - 1:2007, 'Eurocode 7 – Geotechnical Design – Part 1: General Rules'
2. BS EN 1998 - 2:2007, 'Eurocode 7 – Geotechnical Design – Part 2: Ground Investigation
3. and Testing'
4. BS 10175:2011(+A1:2013), 'Investigation of Potentially Contaminated Sites – Code of
5. Practice'
6. Environment Agency, 'Model Procedures for the Management of Land Contamination',  
Contaminated Land Report (CLR) 11.
7. Construction and Industry Research and Information Association (CIRIA) C552,
8. Contaminated Land Risk Assessment – A Guide to Good Practice'
9. British Geological Survey (BGS) on - line 'Geology of Britain' viewer ([www.bgs.ac.uk](http://www.bgs.ac.uk))  
(accessed March 2018)
10. British Geological Survey (BGS) on - line 'GeoIndex' viewer ([www.bgs.ac.uk](http://www.bgs.ac.uk)), (accessed  
March 2018)
11. Coal Authority on - line map viewer ([www.bgs.ac.uk](http://www.bgs.ac.uk)) (accessed October 2017)
12. Zetica Limited, Online Map Viewer, (accessed March 2018).
13. Network Rail Earthworks Database, ([www.jbamap.co.uk](http://www.jbamap.co.uk)), (accessed March 2018).
14. Network Rail – Western Route Sectional Appendix module WRI (Supplement No.37-02  
December 2017).
15. Waterman Autorail™ 5 mile diagrams.
16. Natural Resources Wales online map viewer (accessed March 2018)
17. Environment Agency, Aquifer Designations. (<http://apps.environment-agency.gov.uk>)  
(accessed March 2018).
18. Geotechnical, Undy Halt Footbridge – Factual Report on Ground Investigation, Report Ref:  
30374, May 2015.
19. ABC - Great Western Route Modernisation – Wales, Ground Investigation Report – Section  
F Ref:W1008F-TTS-REP-EGE-2200001 A04

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# A. Contaminated Land Risk Assessment Context and Methodology

## A.1 Preliminary Qualitative Risk Assessment Methodology

A qualitative risk assessment in accordance with NHBC, EA, CIEH (2008) guidance has been undertaken. This is described below:

### A.1.1 Conceptual Model

A key element of an environmental risk assessment is the development of a conceptual model which is done undertaking a Source - Pathway - Receptor analysis of the site:

- Sources (S) are potential or know contaminant sources e.g. a former land use.
- Pathways (P) are environmental systems through which a contaminant could migrate e.g. air, groundwater.
- Receptors (R) are sensitive environmental receptors that could be adversely affected by contaminants e.g. site occupiers, groundwater resources.

When a source, relevant pathway and receptor are present, a contaminant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur and a potential environmental liability is considered to exist.

### A.1.2 Preliminary Qualitative Risk Assessment

For each potential pollutant linkage identified within the conceptual model presented in this report, the potential risk has been evaluated for ecological receptors, buildings and construction/maintenance workers and the final end users using a Preliminary Qualitative Risk Assessment based on the probability of the pollution event, and the severity it may have on site users and the environment.

R&D Publication 66 (NHBC, ES, CIEH, 2008) sets out the classification used in the Preliminary Qualitative Risk Assessment. The classification has been developed from DOE Guide to Risk Assessment and Risk Management for Environmental Protection and the Statutory Guidance on Contaminated Land (DEFRA September 2006). The key to the classification is that the designation of risk is based upon the consideration of both:

- The magnitude of the potential consequence (i.e. severity); and
  - [takes into account both the potential severity of the hazard and the sensitivity of the receptor]
- The magnitude of probability (i.e. likelihood).
  - [takes into account both the presence of the hazard and receptor and the integrity of the pathway]

The methodology differs from that presented in CIRIA C552 (CIRIA, 2001), particularly in terms of the definitions of classification of consequence, which include a consideration of immediacy of hazards. The potential consequences of contamination risks occurring at this site are classified in accordance with Table 9: Classification of Consequence.

**Table 9: Classification of Consequence**

Classification	Definition of Consequence
Severe	<p>Highly elevated concentrations likely to result in 'significant harm' to human health as defined by the EPA 1990, Part 2A, if exposure occurs.</p> <p>Equivalent to a Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.</p> <p>Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long - term maintenance of the population.</p> <p>Catastrophic damage to crops, buildings or property.</p>
Medium	<p>Elevated concentrations which could result in 'significant harm' to human health as defined by the EPA 1990, Part 2A if exposure occurs.</p> <p>Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.</p> <p>Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long - term maintenance of the population.</p> <p>Significant damage to crops, buildings or property.</p>
Mild	<p>Exposure to human health unlikely to lead to 'significant harm'.</p> <p>Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.</p> <p>Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long - term maintenance of the population.</p> <p>Minor damage to crops, buildings or property.</p>
Minor	<p>No measurable effect on humans.</p> <p>Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.</p> <p>Repairable effects of damage to buildings, structures and services.</p>

The probability of contamination risks occurring at this site is classified in accordance with Table 10: Classification of Probability. Note - a pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence.

**Table 10: Classification of Probability**

Classification	Definition of Probability
High Likelihood	There is a contaminant linkage and an event would appear very likely in the short - term and almost inevitable over the long - term, or there is evidence at the receptor of harm or pollution.
Likely	There is a contaminant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short - term and likely over the long - term.
Low Likelihood	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long - term.

For each possible contaminant linkage identified, the potential risk can be evaluated based upon the following probability x consequence matrix shown in Table 11: Overall Contamination Risk Matrix.

**Table 11: Overall Contamination Risk Matrix**

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very high risk	High risk	Moderate risk	Moderate/ low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/ low risk	Low risk	Very low risk	Very low risk

R&D 66:2008 presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case. These definitions are reproduced in Table 12 Definition of Risk Categories and Likely Actions Required. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

**Table 12: Definition of Risk and Likely Actions Required**

Risk Category	Definition and Likely Actions Required
Very high	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short - term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short - term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.



## B. Site Visit Photos

**Figure 6: Existing pad foundation, west to the footbridge**



**Figure 7: Target on the rails for measuring movements**





**Figure 8: Path east of the footbridge**



**Figure 9: Leaning concrete posts**





**Figure 10: Southern entrance of underpass**



**Figure 11: Changes of the material of the underpass wall**





**Figure 12: Cracking in masonry construction**



**Figure 13: Existing Cracks**





**Figure 14: Calcite staining on surface of brick wall**



**Figure 15: Possible drainage system**





**Figure 16: Dry (blocked) weep hole and calcite above it**



**Figure 17: Drainage system**





**Figure 18: BT utilities on pavement, east of the northern entry of the underpass**



**Figure 19: Target above the underpass**



**Figure 20: Existing building on the proposed area of the carpark**





**Figure 21: Installed pile foundations**



**Figure 22: Transformer adjacent to pumping house**





**Figure 23: Barrel**

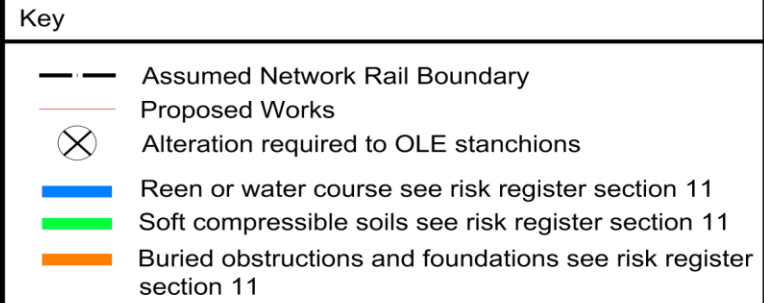


**Figure 24: Electric substation**





## C. Geotechnical Constraints



<div><div><div><div>M</div><div>M</div></div><div>MOTT MACDONALD</div></div><div>373743-WTD-CF-0001 1.04 May 2018</div></div> <div><div><div>Fitzalan House Fitzalan Road Cardiff, CF24 OEL United Kingdom</div><div>T +44 (0)29 2046 7800 F +44 (0)29 2046 7801 W mottmac.com</div></div></div> <div><div>Client</div><div>Magor Action Group On Rail (MAGOR) 22 The Paddocks Undy Caldicot Monmouthshire, NP26 3TD</div></div> <table><tr><th>Rev</th><th>Date</th><th>Drawn</th><th>Description</th><th>Ch'k'd</th><th>App'd</th></tr><tr><td>P1</td><td>05/04/18</td><td>NM</td><td>First issue</td><td>GK</td><td>PC</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <div><div><div>Title</div><div>Magor and Undy Walkway Station  Geotechnical Constraints Plan</div></div><div><div>Drawing Number</div><div>373743-WTD-BTL-DRG-GEO-001</div></div></div> <table><tr><td>Drawn</td><td>N Moktan</td><td>NM</td></tr><tr><td>Checked</td><td>G Kriston</td><td>GK</td></tr><tr><td>Approved</td><td>P Connolly</td><td>PC</td></tr><tr><td colspan="3">Scale at A3 As Shown</td></tr><tr><td>Security STD</td><td>Status PRE</td><td>Rev P1</td></tr></table>	Rev	Date	Drawn	Description	Ch'k'd	App'd	P1	05/04/18	NM	First issue	GK	PC																																					Drawn	N Moktan	NM	Checked	G Kriston	GK	Approved	P Connolly	PC	Scale at A3 As Shown			Security STD	Status PRE	Rev P1
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## **C. Environmental/Ecological Summary**

## ENVIRONMENT APPRAISAL and ACTION PLAN

<b>PROJECT TITLE</b>	Magor and Undy Walkway Station G
<b>PROJECT SCOPE AND DESCRIPTION</b>	Mott MacDonald Ltd has been commissioned by Monmouthshire County Council to undertake a GRIP 3 Environmental Appraisal of the proposed Magor and Undy Walkway Station, in order to identify key constraints and issues. The site is located on the existing South Wales Mainline railway at Undy, Monmouthshire, south-east Wales. The existing railway comprises four tracks, an Up-main and Up-relief, and a Down-main and Down-relief. The designed structure comprises of two 150m long x 3.3m wide railway platforms with waiting shelters constructed on the existing railway embankment of the Up and Down relief lines. The platform arrangement will be staged, with the westbound (Down-line) platform constructed on the southern site extent immediately west of the existing Undy Halt footbridge. The eastbound (Up-line) platform will be constructed approximately 226m west of the footbridge, on the northern site extent. An existing underpass beneath the South Wales Mainline is planned to be lowered to provide necessary headroom per pedestrian access. The proposed platforms will be accessed from the north of the site only, off the B4245 road, and the westbound platform accessed by either the footbridge or underpass. No vehicle access will be provided directly to the westbound platform. Equality Act compliant ramps will be constructed from footpath level to subway level on both sides of the railway line, with the construction of the westbound ramp requiring approx. 100m <sup>2</sup> of land purchase. The development will also comprise a parking, drop-off and bus replacement service area on a triangular parcel of land between the B4245 and railway line. A site walkover was undertaken by two Mott MacDonald ecologists and an environmental consultant on 05/04/18 to identify risks of the development to the surrounding habitats, and to inform this Environmental Appraisal.
<b>DESIGN MANAGER</b>	
<b>COMPLETED BY/DATE</b>	Sarah Hughes 12/04/18
<b>PURPOSE</b>	The purpose of this project is to identify environmental constraints and aspects that may arise during the design and construction of Magor and Undy Walkway Station, and to list the actions that should be undertaken to manage these aspects. This Environmental Appraisal also provides the means to realise opportunities which could be considered during the projects design phase.
<b>OTHER PROJECT DOCUMENTATION (Title and reference)</b>	Further relevant project documentation: -Magor and Undy Walkway Station GRIP Stage 2- Technical Feasibility April 2016 (Ref. 364017-BNI-WTD-002-A) -Magor and Undy Railway Station Geotechnical Desk Study 2018 (Ref. 373743-WTD-CE-0001) -Magor and Undy Walkway Station GRIP 3 Option Selection 2018 (Ref. 373743-WTD-BTL-OSR-0001) -Magor and Undy Walkway Station GRIP 3 Diversity Impact Assessment (Ref. 373743-WTD-BTL-DIA-0002)

Ref	Constraints	Y/N/F.I.	Aspects	Y/N/F.I.	Guidance	Comments / Progress / Actions	Status/ date	To be completed by
<b>1</b>	<b>Geotechnical, weather and climate change risks</b>							
1.1	Is the location at risk to flooding from rivers, sea, surface water or groundwater?	Y	What is the current flood resilience of the rail asset?	Adequate	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult Network Rail Asset Information Services.</li> <li>Consult Internal Network Rail GIS based tools.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> <li>Consult with/obtain consent if required (e.g. building on a flood plain/change to coastal defences).</li> </ul>	<ul style="list-style-type: none"> <li>The proposed rail asset is within an area at low to medium risk of flooding from rivers and sea.</li> <li>The proposed Down relief-line platform, and station car park is in an area at a Medium risk of surface water flooding with the Up relief-line platform in an area of Low risk of surface flooding.</li> <li>The existing railway lines are present at-grade, with the Down relief-line constructed on a soil embankment of approximately 2.5m height at the approximate location of the Down relief-line platform.</li> <li>It is considered that the current flood resilience of the asset is adequate, although consultation with Network Rail is suggested.</li> <li>Consultation with the Environment Agency is required as the proposed development may be categorised as building on a floodplain and consent may be required.</li> <li>If any changes to re-en systems are required (including discharge) consent will be required as these are potentially classed as sea defences.</li> </ul>		
1.2		Y	Is the site protected by existing third party flood defences that are maintained by environment agencies, Internal Drainage Boards or Local Authorities and the protection level is adequate for the rail asset?	Y	<ul style="list-style-type: none"> <li>Consult environment agencies, Local Authorities and Internal Drainage Boards.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> <li>Consult with/obtain consent if required (e.g. building on a flood plain/change to coastal defences).</li> </ul>	<ul style="list-style-type: none"> <li>The flood defences are adequate for the protection of the four operational lines present at the site.</li> <li>It is considered that the addition of platforms on the Up and Down relief lines will not require increased flood protection.</li> </ul>		
1.3		F.I.	Are there any plans for future construction or enhancement of third party flood defences that may protect the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult environment agencies, Local Authorities and Internal Drainage Boards (Caldicot and Wentlooge Levels Internal Drainage Board)</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> <li>Consult with/obtain consent if required (e.g. building on a flood plain/change to coastal defences).</li> </ul>	<ul style="list-style-type: none"> <li>Further information regarding any planned improvement for third party flood defences at the site is required.</li> <li>Sea defences constructed along the Severn Estuary at this location are owned by the Caldicot and Wentlooge Levels Internal Drainage Board, and managed and maintained by the Environment Agency.</li> </ul>		
1.4	Is the location at risk of geotechnical stability problems (e.g. erosion, subsidence, landslides)?	N	What is the current geotechnical stability of the rail asset?	Good	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult Internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> </ul>	<ul style="list-style-type: none"> <li>The railway embankment is situated on gradual sidelong ground, surrounded by low lying land. The station area is not within an area identified by Network Rail as being at risk of landslides.</li> <li>The asset is constructed on superficial tidal flat deposits and bedrock of mudstones and limestones. GI has indicated potentially poor ground conditions at the site and there is potential for excessive settlement with increased bearing capacity.</li> <li>There is an assumed preliminary bearing pressure of 20kPa for the platforms and an allowable bearing capacity of shallow soils of 25kPa.</li> <li>The underpass is currently geotechnically stable. Lowering of the underpass may be problematic based on depth of existing footings.</li> <li>Inspection of the rail asset by a Mott MacDonald geotechnical engineer on 28 March 2018 identified survey monitoring targets on the outer relief lines which may indicate previous subsidence of the rail embankment. Liaison with Network Rail regarding this matter is required. Further indicators of subsidence were observed on the Up-relief rail line where ballast appears to have been periodically topped up. Parts of the Up-line embankment have been excavated by small burrowing animals.</li> <li>Network Rail has given the earthwork a hazard category of A with no inspection comments, indicating that they consider the embankment is of good quality.</li> </ul>		

1.5		N	Are there any third party assets that present a risk to the rail asset with respect to geotechnical stability?	N	<ul style="list-style-type: none"> <li>Consult internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>-There are no third party assets which present a risk to the geotechnical stability of the railway asset.</li> <li>-The railway asset is not located within an area of high development, and is surrounded by agricultural and marsh land.</li> </ul>		
1.6		F.I.	Are there any plans for future construction or enhancement of third party assets that may present a risk to the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult Local Planning Authorities.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>-There are currently no plans for future construction of third party assets for which MML is aware of.</li> <li>-The existing car park approximately 0.3km north west of the subway, is the Three Fields Site. There are ongoing plans for developing a community centre at this location. Parking at this location will not be available for the proposed station. This is not anticipated to present any risk to the rail asset.</li> <li>-A large area north of Magor and Undy is known to have been safeguarded for housing and mixed development. This is located approximately 800m-1000m from the proposed station and no risk to the rail asset is anticipated.</li> </ul>		
1.7	Is the location at risk to extreme temperatures?	N	What is the current temperature resilience of the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> </ul>	-The project is not considered to be sensitive to temperature		
1.8	Is the location at risk to high wind speeds and gusts?	N	What is the current wind resilience of the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> </ul>	<ul style="list-style-type: none"> <li>-The prevailing wind direction at the site is South-Westerly.</li> <li>-The nearest weather station, at St Julians, Newport indicates generally low wind speeds averaging &lt;15mph. Gusts of up to 25mph were recorded between September 2017- March 2018.</li> <li>-This weather station is located approximately 10km NW of the site, and so weather conditions may slightly differ from those reported.</li> </ul>		
1.9	Is the location at risk to sea level rise?	N	What is the current coastal resilience of the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> <li>Consult environment agencies, Local Authorities and Internal Drainage Boards.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> <li>Consult with/obtain consent if required (e.g. building on a flood plain/change to coastal defences).</li> </ul>	<ul style="list-style-type: none"> <li>-The site is not currently considered to be at risk of sea level rise. The proposed platform is located approximately 2km north of the Severn Estuary, on top of the existing railway embankment.</li> <li>-The Magor Marsh area is flat, low-lying ground approximately 5-8 mAOD, with Undy at 9-11mAOD and the existing railway line at 13mAOD.</li> <li>-As the existing railway line is constructed on embankment on side-long ground, the asset is suitably protected from predicted sea level rise at this time.</li> </ul>		
1.10		N	Are there any plans for future construction or enhancement of third party assets that may protect the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult environment agencies, Local Authorities and Internal Drainage Boards.</li> <li>Design aspects: include in/modify design/incorporate mitigation measures.</li> <li>Consult with/obtain consent if required (e.g. building on a flood plain/change to coastal defences).</li> </ul>	<ul style="list-style-type: none"> <li>-Further information is required regarding plans for construction or enhancement of third party assets which may protect the proposed station. The sea defences in this area are managed and maintained by the Environment Agency, and lie within the Caldicot and Wentlooge levels IDB area. Consultation with these agencies is recommended.</li> </ul>		
1.11	Is the location at risk to lightning strikes?	Y	What is the current lightning resilience of the rail asset?	F.I.	<ul style="list-style-type: none"> <li>Consult Route Asset Management teams.</li> <li>Consult internal Network Rail GIS based tools.</li> <li>Consult Network Rail Asset Information Services.</li> </ul>	<ul style="list-style-type: none"> <li>-The location is at an average risk of lightning strikes, as it is constructed on flat, low lying ground.</li> <li>-The current lightning resilience of the asset is not known, and data on yearly lightning strikes at the site is unavailable.</li> </ul>		
<b>2 Ecology, protected species and habitat</b>								
2.1	Are there any <i>protected species</i> * on or close to site?	F.I.	Are protected species likely to be disturbed, damaged or destroyed?	F.I.	<ul style="list-style-type: none"> <li>Consultation with the Statutory Nature Conservation Organisation (SNCO)* and/or local authorities</li> <li>Experienced ecologist to conduct desk studies and site surveys - this should include reference to Local Biodiversity Action Plan (LBAP) and special designation/s assigned to the site.</li> <li>Experienced ecologist to conduct an assessment identifying ecological constraints, impacts and mitigation measures.</li> <li>Obtain advice from the experienced ecologist and/or SNCOs for the application of licences to permit the development of certain activities, when applicable.</li> <li>Design aspects might need to be modified to allow the inclusion of the mitigation measures.</li> <li>Working Package Plans shall include the method of work to avoid having an impact on wildlife and habitats and/or protect designated areas, and these shall be communicated to site staff.</li> </ul> <p><i>Note: Ecological surveys might be required in order for a project to obtain planning permission.</i></p>	<ul style="list-style-type: none"> <li>-There are currently no protected species licences identified by DEFRA within 2km of the site.</li> <li>-A full Phase 1 habitat survey will need to be undertaken due to habitats suitable for a number of species identified during a site walkover on 5 April 2018, including: <ul style="list-style-type: none"> <li>H301. Water voles (burrows observed in Mill Reen)</li> <li>2. Bats (potential roosts and commuting corridor, including the area marked for parking, and Undy sub station within 20m of proposed parking area.</li> <li>Tree and structure assessments within 20m of site, including stables, are required)</li> <li>3. Otters (potential for presence within reed systems)</li> <li>4. Reptiles (potential habitat in grassed areas to the north of the site, and bounding the south of the line between subway and existing footbridge)</li> <li>5. Breeding birds (potential habitat bounding the south of the line between subway and existing footbridge, and birds nests (unidentified) observed within the underpass)</li> <li>6. Great crested newts (potential habitat in Bridewell brook, and other surrounding watercourses)</li> <li>7. Dormice (Dormice populations are known within 2km of the site, at Llanvaches to the north of Magor, and south of Undy. Survey needs to identify any habitat connectivity between the two sites)</li> </ul> </li> <li>-Following this Phase 1 survey, the requirement for a Phase 2 survey and eDNA survey may be necessary to determine the absence/ presence of these protected species.</li> </ul>		

2.2			Are areas (habitats) where protected species live likely to be disturbed, damaged or destroyed?	F.I.		<p>-There is one area of habitat outside of the NR embankment which will be developed as a parking area. This habitat has potential to support populations of roosting/ foraging bats, and will be identified during Phase 1 and 2 habitat surveys.</p> <p>-There are a number of locations which have been identified as having potential to support protected species (see Section 2.1 above). Works will be undertaken within 20m of the majority of these habitats, and so it is highly likely that disturbance will occur to habitats within these areas. For example, access to the north platform will be provided through grassland habitat considered to have reptile potential.</p> <p>-It is considered likely that there are protected species, specifically birds, living in the railway embankments scrub.</p> <p>-Further information is required to determine the risks to habitats where protected species live, as currently there is no data available for protected species present within the vicinity of the site. This will involve a Phase 1 survey which will identify the habitats and potential for species to be present. Further surveys may be required as a result of the phase 1 survey.</p> <p>-Any waterbodies within 250m of the site will require survey works including HSI and potentially eDNA surveys.</p>		
2.3	Are there any <i>designated protected areas</i> * on or close to site?	Y	Is the project likely to cause damage, disturbance or destruction of designated protected areas?	Y		<p>-Gwent Levels SSSI (Magor &amp; Undy) designated for its reed and ditch habitats, insects and other invertebrates, and the shrill carder bee bounds the southern extent of the site. Project works are anticipated to take place within the SSSI, and SSSI assent will be required.</p> <p>-Gwent Levels SSSI (Redwick and Llandeveyning) designated as above, located 0.4km south-west of the site.</p> <p>-Magor Marsh SSSI designated as the largest remnant of fenlands on the Gwent coast, and supports a variety of reed, sedge and submerged and emergent aquatic plants. Breeding ground for water and marsh birds. Located 0.2km west of site.</p> <p>-Severn Estuary Ramsar, SSSI, SAC and SPA located approximately 1.3km south of the proposed station. This site is designated for wetlands of international importance, overwintering bird species, and Annex 1 Habitats Directive features.</p> <p>-A Habitat Regulations Assessment screening may be required if there is an impact pathway on the Severn Estuary SSSI, SAC, SPA.</p>		
2.4			Is work required on trees protected by a TPO?	N	Obtain a consent from the local authority when any works on TPO trees need to be undertaken.	<p>-No trees in the vicinity of the site are protected by a TPO.</p> <p>-The closest TPO to the site is approximately 95m NE of the existing Undy Halt footbridge.</p> <p>-Any works to trees and scrub (even if not protected by a TPO), will likely require ecological supervision and potential replacement planting.</p>		

[illegible]



4.1	Is contaminated land suspected to be present on site ? (including things like knotweed)	Y	Are the project works likely to cause disturbance of contaminated land and/or mobilisation of the contaminants?	Y	<ul style="list-style-type: none"><li>· Consultation with the local authority when remediation is required.</li><li>· Modelling contaminant-pathway-receptor to identify risks.</li><li>· Agree on a remediation approach with the local authority or environmental regulator.</li><li>· Obtain an appropriate environmental permit or exemption.</li><li>· Working Package Plans shall include the method of work to avoid spreading the contaminants, and these shall be communicated to site staff.</li><li>· Contingency plans should be in place to manage unexpected findings.</li></ul> <p><i>Note: Contaminated Land remediation assessments might be required in order for a project to obtain planning permission.</i></p>	<ul style="list-style-type: none"><li>-The project works are being undertaken on top of the existing railway embankment and surrounding land. As such, contaminated land is anticipated associated with:<ul style="list-style-type: none"><li>1. Operation of the existing railway</li><li>2. Made Ground and fill associated with the construction of the railway</li><li>3. Fly tipping around railway land (observed abandoned 205l sealed drum)</li></ul></li><li>-The project works will cause disturbance to the existing railway embankment during construction of the new platforms.</li><li>-Contaminated land will not require remediation due to the ongoing use of the site as an operational railway. Any excavated waste material will require classification and appropriate disposal at a licensed facility with a relevant environmental permit.</li><li>-It is likely that the construction works will mobilise contaminants due to excavation of the embankments. Mitigation measures include reducing ground disturbance to minimise contaminant exposure to the surface, and covering of any excavated materials during rain to avoid spread into the nearby SSSI.</li><li>-No Knotweed has been identified on the site during an ecological walkover on 5 April 2018.</li><li>-Good working practice and use of PPE is required by construction workers to reduce human uptake pathways.</li><li>-A detailed contaminated land risk assessment and Construction Environmental Management Plan (Working Package Plans) will be required to reduce environmental pathways into the adjacent designated area.</li></ul>		
4.2	Are there potential contaminant-pathway-receptor linkages?	Y	Will the activities open up pathways from contaminated land areas?	Y		<ul style="list-style-type: none"><li>-The underlying bedrock is classified as Secondary A and Principal Aquifers with high permeability. Groundwater levels at the site are not known, but expected to be high due to the presence of standing water and complex reens systems draining the ground.</li><li>-Potential contaminant- pathway-receptor linkages include human uptake pathways to construction workers, contaminant leachate, and horizontal and vertical migration of contaminants. Superficial deposits at the site are impermeable and as such contaminant pathways from embankment works will be horizontal migration across ground surface and draining into the nearby reens. Superficial deposits are unlikely to be contaminated as such vertical migration into permeable bedrock and groundwater is unlikely.</li><li>-It is unlikely that the activities will open up pathways from the contaminated railway line, although further information is required on construction methodology to determine risks to receptors.</li></ul>		
5 Nuisance								
5.1	Are there adjacent receptors? (e.g. residents, wildlife, etc.)	Y	Are the activities going to affect local residents (e.g. eye irritation, lighting glare)?	Y	<ul style="list-style-type: none"><li>· Identify sensitive receptors.</li><li>· Consultation with the local authority to develop an air emissions management plan.</li><li>· Careful selection and planning of temporary lighting to reduce the effects of light pollution.</li><li>· Careful planning of works to take all the reasonable and practicable steps to minimise noise and vibration.</li><li>· Engage with the community.</li><li>· Adopt working hours to restrict nuisance to certain less sensitive periods of the day.</li></ul>	<ul style="list-style-type: none"><li>-The closest residential buildings to the proposed station are located approximately 20m to the north ( row of houses along the B4245), and 5m to the south (one dwelling).</li><li>-Temporary effects to local residents include construction noise, vibration and traffic, temporary visual impact from construction lighting and plant.</li><li>-Permanent effects from the scheme include visual impacts such as lighting glare and loss of landscape, increased traffic on the B4245 and associated car park. No significant noise impacts are anticipated as rail services will not be increased from the current baseline.</li><li>-It is considered that the key local residents to be impacted by the development are those residing at the property 5m south of railway line (access via The Causeway and W End lane), as the south platform will be constructed in line with the property, increasing pedestrian traffic past this property.</li></ul>		
5.2			Is the project likely to damage crops and ecology (e.g. plant growth is susceptible cement dust)?	N		<ul style="list-style-type: none"><li>-The extent of the works are minor and localised of a short duration, therefore it is unlikely that damage to ecology will occur due to construction activities.</li><li>-There are no crops in the vicinity of the site, and one small orchard currently bounding the northern site extent will be purchased by the scheme for parking.</li></ul>		
5.3			Are the activities going to cause disturbance to residents and wildlife? (e.g. high noise levels)	Y		<ul style="list-style-type: none"><li>-The construction activities are likely to cause noise and vibration disturbance to residents and wildlife, which are both in close proximity to the proposed site.</li><li>-The residual activities associated with the proposed works, including increased vehicle and pedestrian disturbance and subsequent increased noise levels to the local area.</li><li>-The operation of the station at Magor and Undy will provide a source of ongoing minor disturbance, as the 4-track railway line is already operational. It is expected that wildlife in the area is unlikely to have a major increase in disturbance.</li></ul>		
5.4 Dust, air emissions and odours								
5.4.1	Are the activities on site going to generate emissions to air? (e.g. dust, pollutants, odours, etc.)		Is the site within or close to an Air Quality Management Area (AQMA)?	N	<ul style="list-style-type: none"><li>· Agree on a remediation approach with the local authority or environmental regulator.</li><li>· Obtain an appropriate consent from the regulator when applicable.</li><li>· Working Package Plans shall include the method of work to minimise emissions to air, and these shall be communicated to site staff.</li><li>· Careful selection of equipment, construction methods and programming.</li><li>· Monitoring.</li></ul>	<ul style="list-style-type: none"><li>-The closest AQMA is located approximately 8.5km west of the site on the M4 at Christchurch.</li><li>-Whilst the site is not within an AQMA, construction should follow best practice and the Construction Environmental Management Plan to minimise dust production. For example, this will include dampening of work surfaces where possible, and site speed limits to be set to limit potential for dust generation.</li></ul>		

5.4.2			Are there any set up National or Local air quality objectives or standards?	Y		<p>-The air quality objectives in Wales are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138) and The Air Quality (Amendment) Wales Regulations 2002, No 3182 (Wales 238).</p> <p>-The Local Air Quality Monitoring Objectives for Monmouthshire are provided in the 2017 Air Quality Progress Report for Monmouthshire County Council.</p>		
5.4.3			Will the project activities generate large quantities of noxious gases or change the local air quality?	N		<p>-The project involves the construction of two 150m x 3.3m platforms, lowering of existing underpass, and creation of a parking area. These activities are not considered to be highly polluting, and are extremely unlikely to change local air quality during construction.</p> <p>-It is recommended that in order to reduce any impacts to air quality, the plant used is well-maintained and correctly functioning, and dust generation is limited by dampening the ground.</p>		
5.5	<b>Lighting</b>							
5.5.1	Is the lighting on site likely to cause light spillage?	F.I.	Is the site within or close to an Dark-Sky protected area?	N	<p>- Agree on a remediation approach with the local authority or environmental regulator.</p> <p>- Obtain an appropriate consent from the regulator when applicable.</p>	<p>-There are no Dark-Sky protected areas within 30km of the site.</p> <p>-Further information is required on the lighting to be used at the site during construction, and the hours which the lighting will be used. Due to the close proximity of residential properties, best practice should be used during selection of lighting, and placement should be considerably selected to minimise any impacts to local receptors, as well as foraging bats which may be present within the local area.</p> <p>-During operation of the station, lighting should be placed sympathetically for both local residents and foraging bats (if found). This may include low placement of lighting on handrails and walkways, and the implementation of bat lighting (hooded directional lights). Lighting should be operated on motion sensing timer switches.</p>		
5.6	<b>Noise and vibration</b>							

5.6.1	Are the activities on site likely to cause excessive noise?	Y	Is noise or vibration likely to increase from existing levels at site during construction?	Y	<ul style="list-style-type: none"> <li>- Consultation with the local authorities (Environmental Health Officer).</li> <li>- Obtain the relevant consents.</li> <li>- Careful selection of equipment, construction methods and programming.</li> <li>- Monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>- During construction, noise and vibration will exceed current levels. The construction methodology to be employed at the site has not yet been finalised, but will include selection of equipment to limit negative impacts.</li> <li>- It is recommended that local residents are informed of construction periods prior to works beginning.</li> <li>- Working hours should be kept to standard working hours (where possible) to minimise impact on local residents.</li> </ul>		
<b>6 Water</b>								
6.1	Is the project close to a watercourse**and/or drainage system?  **rivers, streams, lakes, ponds, canals, ditches groundwater and coastal waters	Y	Is the project likely to abstract from or discharge water onto nearby watercourses, ground, and drains or foul sewer ?	N	<ul style="list-style-type: none"> <li>- Consultation with the SNCOs, local authorities, the appropriate Internal Drainage Board and Marine Management Agency, where applicable.</li> <li>- Site surveys to be carried out: review plans, site drawings, drainage drawings, etc.</li> <li>- Modelling source-pathway-receptor to identify risks.</li> <li>- Design aspects might need to be modified to allow the inclusion of the mitigation measures.</li> <li>- Obtain the relevant permits and licences (e.g. water discharge permits)</li> </ul>	<ul style="list-style-type: none"> <li>- The proposed station and associated works bound Magor Marsh/Gwent Levels, which comprise a complex reed system draining the Bridewell Common area immediately south of the site.</li> <li>- During the site walkover on 5 April 2018, there were two observed small areas of pooling surface water.</li> <li>- Drainage of the station and car park (if required) should consider the protected designations of this habitat, and the impacts of discharge into reens.</li> <li>- If any discharge into the watercourses will be required, prior consultation with the IDB and Natural Resources Wales is recommended.</li> </ul>		
6.2			Is the project likely to affect the flow and/or quality of the watercourses?	N		<ul style="list-style-type: none"> <li>- The project is unlikely to affect the flow or quality of these watercourses.</li> <li>- If any discharge into watercourses is required, flow and quality will be affected and consultation with Natural Resources Wales will be required.</li> <li>- Design aspects should be modified to avoid discharge into reens due to their protected status and their potential as a habitat for Great Crested Newts, Otters and Water Voles.</li> </ul>		
6.3	Are there potential contaminant-pathway-receptor linkages?	Y	Will the activities open up pathways and reaching receptors?	Y		<ul style="list-style-type: none"> <li>- The activities have potential to open up potential contaminant pathways in watercourses. Refer to Section 4.2 for further information.</li> </ul>		
6.4	Will the activities require land clearance and shaping?	Y	Is the project taking into consideration the prevention and management of runoff and salty water?	Y	<ul style="list-style-type: none"> <li>- Consultation with the SNCOs, local authorities, the appropriate Internal Drainage Board and Marine Management Agency, where applicable.</li> <li>- Site surveys to be carried out: review plans, site drawings, drainage drawings, etc.</li> <li>- Modelling source-pathway-receptor to identify risks.</li> <li>- Design aspects might need to be modified to allow the inclusion of the mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>- Track drainage will be diverted through the platform footprint. It is therefore anticipated that no further implementation of drainage will be required.</li> <li>- The station car park will include drainage, and an allowance for an attenuated drainage system has been made. Further information on car park drainage is required to assess the impacts.</li> </ul>		
6.5	Are there any Water Source Protection Areas* on or close to site?	N	Is the project likely to affect those Water Source Protection Areas?	N	<ul style="list-style-type: none"> <li>- Consultation with the environmental regulators.</li> <li>- Site surveys to be carried out.</li> <li>- Identification of risks.</li> <li>- Design aspects might need to be modified to allow the inclusion of the mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>- The site is not located within a Groundwater Source Protection Area.</li> <li>- The closest recorded Groundwater Source Protection Area to the site is approximately 5km east at Caldicot.</li> <li>- There is considered to be no risk of the project affecting this SPA, and no modification of design aspects/ mitigation measures will be required.</li> </ul>		
<b>7 Energy Consumption</b>								
7.1	The project scope should include reduction of energy consumption during the operational phase, when reasonably practicable.	Y	Will the project consider the incorporation of renewable energy technologies into the design?	Y	<ul style="list-style-type: none"> <li>- Consultation with designers, engineers and architects to include energy efficiency opportunities in the design stage.</li> <li>- Consult the Whole Life Cost Manual (WLC) <a href="http://connect/communities/whole-life-costing/default.aspx">http://connect/communities/whole-life-costing/default.aspx</a></li> </ul>	<ul style="list-style-type: none"> <li>- It is recommended that the design should consider sustainable technologies and renewable energy sources during the design process. This could include the use of solar photovoltaic panels or small wind turbines to provide platform and subway lighting.</li> <li>- Due to the development of a community centre in the vicinity of the station, it could be suggested that both developments share renewable energy technologies.</li> </ul>		
7.2			Will the project use a modelling tool to predict energy savings?	F.I.		<ul style="list-style-type: none"> <li>- It is considered unlikely that the project would warrant use of an energy saving modelling tool due to its small-scale. At the site, there will be only one or two self service ticket machines and lighting using energy. There will be no waiting rooms or restrooms. Therefore, based on the current scheme, there will be a low operational energy demand at the site.</li> </ul>		
7.3			Will the project develop a whole-life cost study to drive investment decisions towards long-term energy and cost reduction?	F.I.		<ul style="list-style-type: none"> <li>- It is unlikely that a whole-life cost study will be undertaken at the site to drive energy reduction. It is suggested that any energy reduction targets are met by using renewable energy, and not through direct reductions such as less lighting.</li> </ul>		
7.4	The project scope should include reduction of energy consumption during the construction phase, when reasonably practicable.	Y	Will fuel efficient machinery be used?	Y	<ul style="list-style-type: none"> <li>- Careful selection of equipment, construction methods and programming.</li> <li>- Liaise with suppliers and contractors for the provision and use of low energy consumption plant and equipment.</li> <li>- Awareness and training.</li> </ul>	<ul style="list-style-type: none"> <li>- Fuel efficient machinery will be used where available.</li> <li>- All machinery to be used on site should be well-maintained and regularly serviced to ensure efficiency.</li> </ul>		
7.5			Will consultation with national logistics companies be held? (to help planning deliveries more effectively)	F.I.		<ul style="list-style-type: none"> <li>- The project is very small scale and is considered too small to benefit from such consideration.</li> </ul>		
7.6			Will the project consider the incorporation of renewable energy technologies into the construction phase? (e.g. solar photovoltaic panels, wind turbines)	Y		<ul style="list-style-type: none"> <li>- The project should consider, where possible, the incorporation of renewable energy technologies during construction.</li> <li>- Solar photovoltaic panels could be implemented at the site to provide construction lighting, although due to the small scale of the project this is not considered to be feasible.</li> <li>- It is unlikely that the project duration would warrant implementation of larger infrastructure such as wind turbines.</li> </ul>		
<b>8 Materials</b>								
8.1	The project scope shall include the procurement of responsibly sourced of materials, where reasonably practicable.	Y	Will the project aim to maximise the procurement of responsibly sourced certified materials?	Y	<ul style="list-style-type: none"> <li>- Consultation with designers, engineers and architects to favour the use of certified materials.</li> <li>- Liaise with the procurement team to ensure certified materials are procured for the project.</li> <li>- Liaise with suppliers and contractors to seek for alternative materials.</li> <li>- Network Rail timber policy statement.</li> </ul>	<ul style="list-style-type: none"> <li>- It is suggested that the project design incorporates responsibly sourced materials where possible.</li> </ul>		
8.2			Will the project aim to maximise the procurement of materials with recycled content? (e.g. pulverised fuel ash (PFA) as cement replacement)	Y		<ul style="list-style-type: none"> <li>- It is suggested that the project design attempts to incorporate materials containing recycled content where realistic.</li> <li>- Further details on construction and design are required in order to consider these options.</li> <li>- For example, the car parking and bus drop off area could be constructed using EcoGrid, a recycled geotextile installation which allows vegetation to grow through it.</li> </ul>		



12.1	Has the project included social impact in its scope of works?	Y	Has economic, environmental and social benefits been considered? e.g. maximum value from public spend.	Y	- Social Value Act considerations. - NSC consultation. - Liaise with procurement team. - Sustainability team consultation.	-Economic benefits of the scheme have been considered during design. It is expected that as a result of the station development, there will be increased rail commuter travel into Cardiff, Newport and Bristol. . -Environmental benefits of the scheme have been considered. The platforms are being constructed as walkway platforms, with no access from the south. This mitigates negative impacts to the adjacent SSSI. There will be a small car park constructed, but this is not considered key to the use of the station, and cycling and walking to the station will be encouraged, with bike racks on site. There is opportunity for the station to promote the local area, for example by using information boards to provide information on the importance of the designated areas, local wildlife, archaeological history etc. -Social benefits of the scheme have been considered. The station is expected to service a population of approximately 6100, increasing connectivity between local towns, and will promote rail commuting which has environmental benefits. Consultation with Magor Action Group on Rail has been undertaken throughout design, and represent the local communities views and requirements. Continued consultation with the action group is essential to maintain community relationships, with potential for schools input into aesthetic design of walls/ underpass. -Regarding social impact of the scheme of works, there is scope for the design to consider the community centre currently being designed for the Three Fields Centre. This may include sharing renewable energy technologies, car parking designs, facilities etc, but also may be small-scale considerations such as signage and potentially display boards at the station to promote local events.		
12.2			Will positive social value be delivered as part of the project? e.g. local employment, local suppliers, local skills development, volunteering, etc.	Y		-Positive social value can be incorporated into the project. There will not be any local employment directly as a result of the station development as it is unmanned, but it will provide extra opportunities for working in other areas accessible by train, and potential for increased tourism at Magor providing increased opportunities for businesses. -The station may provide positive social value by increasing town pride and connectivity with other local areas, as more people travel from the outside area to Magor to use the station. -There is opportunity for volunteering to occur at the station, potentially including litter picking, station upkeep and gardening in the car park area. This would provide a chance for local schools to be involved in the development, and skills development for young groups. Short-term volunteering opportunity could arise from workshops to create local artwork/ research the local area for information boards etc.		
12.3			Will the project require any additional investment in community safety initiatives? e.g. electrification safety or general railway safety considerations?	F.I.		-Further information is required regarding the requirement of additional investment for community safety initiatives, although this would be beneficial to the local community and would improve relations between N&R and public. -The opportunity for general railway safety initiatives, especially in schools is recommended.		

\* see next sheet: Terminology

# D. Hazard Log



Project Hazard Log		Project Title		Magor and Undy Station		DESIGN STAGE		GRIP 3																							
		Location		Main Road, Undy, NP26 3DL																											
		Doc Ref		373743-WTD-BTL-001																											
		Revision Number		A		Date		27 March 2018																							
HAZARD ASSESSMENT																						HAZARD TRANSFER									
Hazard ID	Location	Source	Discipline	Sub-discipline - Topic within the engineering discipline (eg. Cess).	Hazard Description - Description of the Hazard relating to building construction, use (as a workplace), operating in normal/emergency/degraded modes, cleaning and maintaining, altering, dismantling and demolition of a structure.	Hazard Consequences	Red List Hazard	Persons at Risk	Risk			DESIGNER CONTROL MEASURES					RESIDUAL RISK					Project Transfer Status - Details of status of hazard when residual risk is being transferred to identified owner. No entry required until hazard formally offered to residual risk owner.									
									F	C	Result	Measures Taken by Designer - Detail the hazard elimination or risk reduction actions.	F	C	Result	Location of details	Status	Designer comments - Designer comments on the designer control measures section contents that records decisions taken and clarification of actions taken by the designer.	Residual Hazard Description - Description of the Residual Hazard relating to building construction, using (as a workplace), operating in normal/emergency/degraded modes, cleaning and maintaining, altering, dismantling and demolition of a structure.	Persons at Risk	Possible Residual Control Measures		Residual Hazard Owner	Residual Hazard Information Transmission	Designer Comments to Explain Residual Hazard (To be completed where necessary for clarity and convey intent)						
1	West End Subway (G)	Buried service information	Civils	Utilities	Contact with buried services	Electrocution, gas leak or water leak, during works	Yes	Workers, Members of the Public	3	4	Intolerable Risk	Details of existing buried services to be requested and appropriately highlighted on drawings in future GRIP stages.	1	4	Tolerable Risk		Mitigation Identified	None	Contact with buried services: Electrocution, gas leak or water leak, during works. Potential for clash with unknown services during future maintenance or alterations works.	Workers, Members of the Public	An investigation into services within the proximity of the proposed station is to be undertaken prior to commencement of works. Services to be rerouted as part of the works where necessary. Maintain and update hazard logs.	Contractor									
2	West End Subway (Options 2,3,4)	Design Proposal	Civils	Excavation	Instability of existing masonry abutments and piers during excavation	Collapse causing injury / serious injury / death	No	Workers	3	5	Intolerable Risk	Assessment of existing condition to be completed to identify risk of instability being generated when construction works are taking place	1	5	Tolerable Risk		Mitigation Identified	None	Collapse of existing structure during demolition / structural instability	Workers	Detailed demolition staging to be provided at later design stages. Staging to ensure excavation maintains lateral loading on subway. Latest NWR Assessment and inspections for the structure will be reviewed by designer to inform excavation staging.	Contractor									
3	West End Subway (G)	Design Proposal	Civils	Excavation	Potential contaminants e.g. asbestos in existing structure exposed during excavation	Long term illness / death	Yes	Workers	2	4	Tolerable Risk	Request further GI and contaminant testing	1	4	Tolerable Risk		Open	None	Potential contaminants e.g. asbestos in embankments exposed during demolition	Workers	Ground Investigation to be carried out at later design stage. Suitable method for disposal of contaminated material to be identified by contractor prior to undertaking works.	Contractor									
4	All works	Design Proposal	Civils	Excavation / Construction	Existing hazards on railway line	Injury/serious injury / death	Yes	Workers	2	4	Tolerable Risk	Look into the National Hazard Directory in the next stage of design to identify any key hazards in the area that would require addressing.	1	4	Tolerable Risk	National Hazard Directory	Mitigation Identified	None	Hazards identified in National Hazard Directory	Workers											
5	West End Subway (G)	Design Proposal	Civils	Excavation	Extent of existing structure unknown	Damage to existing structure and plant. Programme and cost increase COMMERCIAL - NWR	No	Workers, Members of the Public	3	3	Tolerable Risk	Use as-built and record drawings to determine extents of existing structure. Carry out intrusive investigations to confirm location of structure. Walers to be provided to support walls of subway during any excavation of the base.	2	3	Tolerable Risk		Mitigation Identified	None	Extent of existing structure unknown. Collapse of existing structure during demolition / structural instability												
6	Proposed station platforms	Design Proposal	Civils	Construction	Detailed make up of ground unknown, soft / hard spots and ground instability may be encountered	Injury/serious injury / death	Yes	Workers	2	4	Tolerable Risk	Available GI used to aid design	1	4	Tolerable Risk		Mitigation Identified	None	Make up of embankment unknown Slope instability	Workers	Undertake further GI to inform later grip stages.	Contractor									
7	Platform construction and West End Subway (Options 2,4)	Design Proposal	Civils	Construction	Manual handling	Injury/serious injury	No	Workers	3	3	Tolerable Risk	Pre-cast elements to be used in design and lifted in to place with cranes. The use of modular platform systems has been considered due to their lightweight nature and their allowance for quick construction to reduce time of exposure to this hazard.	2	3	Tolerable Risk		Mitigation Identified	None	Manual handling	Workers	Suitable method statements to be developed by the contractor.	Contractor									
8	West End Subway (Options 2,4)	Design Proposal	Civils	Construction	Use of Mortars / Concrete	Chemical burns (mortars, concrete) leading to injury or impacting on long term health	No	Workers	3	3	Tolerable Risk	Pre-cast elements to be used where possible to reduce use of wet concrete and mortars on site.	2	3	Tolerable Risk		Mitigation Identified	None	Injury, burn	Workers	Contractor to follow safe systems of work.	Contractor									
9	Undy Halt Footbridge and West End Subway (Options 1,2,4)	Design Proposal	Civils	Construction	Working at height	Injury through falling from height, falling equipment	No	Workers, Members of the Public	4	4	Intolerable Risk	Not practicable to design out working at height for works to subway or footbridge. Design to incorporate precast / prefabricated elements that can be dropped into position and thus reducing the construction time and time working at height. Number of elements to be limited where possible to limit the assembly time whilst working at height.	2	4	Tolerable Risk		Mitigation Identified	None	Fall from height	Workers	Contractor to consider temporary handrails.	Contractor									
10	All works	Design Proposal	Civils	Maintenance	Working at height during maintenance	Injury through falling from height, falling equipment	No	Workers, Members of the Public	2	4	Tolerable Risk	Not practicable to design out working at height for footbridge and subway maintenance, due to standard maintenance and inspection regimes. Design to include application of NR standard design details where possible to allow for standard maintenance regimes to be followed.	1	4	Tolerable Risk		Mitigation Identified	None	Fall from height	Workers	Maintain fencing and headwalls.	Maintainer									
11	All works	Design Proposal	Civils	Construction	Working adjacent to a road	Disruption to traffic flows, struck by vehicle, injury, serious injury, death	No	Workers, Members of the Public	3	5	Intolerable Risk	Construction to be completed through use of precast elements where possible to reduce exposure to this risk.	1	5	Tolerable Risk		Mitigation Identified	None	Struck by vehicle	Workers, Members of the Public	Contractor to detail and maintain traffic management and site extents.	Contractor									
12	All works	Design Proposal	Civils	Construction	Working adjacent to rail	Struck by train, injury, serious injury, death	No	Workers, Members of the Public	2	5	Intolerable Risk	All trackside works to be completed during a possession, to be detailed in construction sequence. Consider use of modular platform systems to increase speed of construction and reduce exposure to working near rail.	1	4	Tolerable Risk		Mitigation Identified	None	Struck by train	Workers, Members of the Public	Contractor to ensure track side works are completed under possession.	Contractor									
13	Platform Construction and West End Subway (Options 2,4)	Design Proposal	Civils	Construction / Operation	Disruption to rail	Cost to NWR, risk to asset COMMERCIAL NWR	No	Members of the Public	2	4	Tolerable Risk	Pre-cast elements to be used in design and lifted in to place with cranes where possible to reduce possession time. Construction of platforms immediately after train passes nearby signal to be avoided to prevent distraction to driver when reading signal.	1	4	Tolerable Risk		Mitigation Identified	None	Disruption to rail	Passengers	Construction activities to be well planned.	Contractor									
14	Platform Construction	Design Proposal	Civils	Backfilling structure	Stability of existing ground	Embankment slip	No	Workers	2	5	Intolerable Risk	Available GI used to aid design. Backfilling with appropriate material to be used where required.	1	5	Tolerable Risk		Mitigation Identified	None	Settlement, slope stability	Workers	Slope of excavation to be informed by further ground investigation.	Contractor									
15	Platform construction and West End Subway (Options 2,4)	Design Proposal	Civils	Construction	Use of machinery	Injury / serious injury / death due to moving parts	No	Workers	4	4	Intolerable Risk	Main concrete structure to be pre-cast in controlled environment to reduce risk from use of machinery.	2	4	Tolerable Risk		Mitigation Identified	None	Use of machinery	Workers	Constructor to follow safe system of work.	Contractor									
16	West End Subway (Options 2,4)	Design Proposal	Civils	Construction / Operation	Construction of new subway deck after the Great Western Electrification Programme (GWEP) has taken place	Injury/serious injury / death, risk to asset COMMERCIAL NWR	No	Workers, Members of the Public	3	4	Intolerable Risk	Review gantry locations and ensure that construction proposals provide no interference. Locate platforms safe distance from OLE.	1	4	Tolerable Risk		Mitigation Identified	None	Presence of OLE/gantry	Workers, Members of the Public	Continue co-ordination in the following GRIP stages.	Designer									

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									F	C	Result	Measures Taken by Designer - Detail the hazard elimination or risk reduction actions.	F	C	Result	Location of details	Status	Designer comments - Designer comments on the designer control measures section contents that records decisions taken and clarification of actions taken by the designer.	Residual Hazard Description - Description of the Residual Hazard relating to building construction, using (as a workplace), operating in normal/ abnormal/emergency/degraded modes, cleaning and maintaining, altering, dismantling and demolition of a structure.	Persons at Risk	Possible Residual Control Measures		Residual Hazard Owner	Residual Hazard Information Transmission	Designer Comments to Explain Residual Hazard (To be completed where necessary for clarity and convey intent)	Project Transfer Status - Details of status of hazard when residual risk is being transferred to identified owner. No entry required until hazard formally offered to residual risk owner.
17	Platform Construction and Undy Halt Footbridge (Option 1)	Design Proposal	Civils	Construction	Stability of piling rig	Injury/serious injury / death, risk to asset, due to collapse of bridge or embankment COMMERCIAL NWR	No	Passengers, Workers, Members of the Public	3	5	Intolerable Risk	Review and identify construction zones. Contractor to identify appropriate mitigation measures during construction.	1	5	Tolerable Risk		Open	None	Stability of piling rig	Workers, Members of the Public	Stabilising works to embankments and piling rig to be undertaken as necessary. Consider using a suitable hydraulic self-moving sheet piling press. Consider undertaking piling works under shorter possessions as appropriate.	Contractor				
18	Platform Construction and Undy Halt Footbridge	Design Proposal	Civils	Operation	Shared use subway, collision of cyclists and other pedestrians	Injury/serious injury	No	Members of the Public	3	3	Tolerable Risk	Agreement required with Monmouthshire County Council on the requirements for use of preferred access routes across the station.	2	3	Tolerable Risk		Open	None	Collision of end users within subway							
19	Platform Construction	Design Proposal	Civils	Construction	Potential of striking unexploded ordnance	Injury/serious injury	No	Passengers, Workers, Members of the Public	2	5	Intolerable Risk	Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment report, prepared by Bomb Search reviewed and risk identified.	1	5	Tolerable Risk		Open	None	Potential of striking unexploded ordnance	Workers, Members of the Public	Contractor to develop UXO risk management plan, survey for UXOs and undertake UXO awareness safety briefings prior to commencing works.	Contractor				
20	All works	Design Proposal	Civils	Construction	Public access to work site	Injury/serious injury	No	Workers, Members of the Public	3	4	Intolerable Risk	Public footpaths to be closed/diverted as necessary. Traffic management system to be implemented during construction to co-ordinate traffic and plant movement.	1	4	Tolerable Risk		Open	None	Public access to worksite	Workers, Members of the Public	Contractor to erect suitable hoarding, close/divert public footpaths as appropriate and implement traffic management systems.	Contractor				
21	West End Subway (G)	Design Proposal	Civils	Operation	Poor integration with of pedestrian / cycle routes between this project and the existing highway layout.	Injury/serious injury	No	Members of the Public	4	4	Intolerable Risk	Agreement required with Monmouthshire County Council on the requirements for use of preferred access routes across the station.	2	4	Tolerable Risk		Open	None	Poor integration with existing highway layout	Members of the Public	Detailed design to consider integration of subway with existing pedestrian and cycle routes.	Designer				
22	All works	Design Proposal	Civils	Construction	Poor visibility during night time working	Injury/serious injury	No	Workers	2	4	Tolerable Risk	Explore opportunity for using alternative construction methods to reduce requirements for night working.	1	4	Tolerable Risk		Open	None	Collision of members of the public in and around proximity of subway	Members of the Public						
23	West End Subway (Options 1,2,4)	Design Proposal	Civils	Construction	Stability of precast units during transportation and during storage on site.	Units topple, serious injury, death, damage to units	No	Workers, Members of the Public	2	5	Intolerable Risk	Units to be designed to allow stable storage and safe lifting.	1	5	Tolerable Risk		Mitigation Identified	None	Poor storage of precast units	Workers, Members of the Public						
24	West End Subway (Options 2,4)	Design Proposal	Civils	Excavation	Encountering tarmacadam materials containing coal tar (pre1980's) whilst removing existing materials from subway or adjacent highway	Long term illness / death	No	Workers, Members of the Public	2	5	Intolerable Risk	Review as-builts and carry out necessary testing to existing structure where potential for tar presence exists.	1	5	Tolerable Risk		Open	None	Potential tarmacadam materials in existing structure	Workers, Members of the Public	Ground Investigation to be carried out at later design stage. Suitable method for disposal of contaminated material to be identified by contractor prior to undertaking works.	Contractor				
25	Platform Construction	Design Proposal	Civils	Construction	Settlement of station platforms	Platform collapse causing injury / serious injury / death	No	Workers, Members of the Public	3	4	Intolerable Risk	Available GI used to aid design	1	4	Tolerable Risk		Mitigation Identified	None	Platform settlement	Workers, Members of the Public						
26	All works	Design Proposal	Civils	Operation	Additional stop on existing line	Delays in travel	No	Passengers	2	3	Tolerable Risk	Current timetabling to be assessed and appropriate integration of stops at the proposed station to be made.	1	3	Negligible Risk		Open	None	Travel delays due to implementation of additional stop on railway line	Passengers						
27	West End Subway	Design Proposal	Civils	Operation	Poor lighting in subway	Injury/serious injury	No	Workers, Members of the Public	3	4	Intolerable Risk	Increase clearance in modified subway to allow for installation of lighting units to provide compliant visibility.	1	4	Tolerable Risk		Open	None	Collision of members of the public in and around proximity of subway	Workers, Members of the Public	Sufficient headroom to be provided to modified subway to allow for inclusion of lighting units to offer compliant visibility	Designer				
28	Undy Halt Footbridge	Design Proposal	Civils	Construction	Excess ramp lengths for existing footbridge	Injury/serious injury	No	Members of the Public	4	3	Intolerable Risk	Consider providing steeper gradients where possible to reduce overall length of ramps. Review optimum arrangement based on estimated total rise of ramps to be provided.	2	3	Tolerable Risk		Open	None	Access difficulties along footbridge ramps	Members of the Public	Suitable location of ramps to be considered in future GRIP stages	Designer				
29	All works	Design Proposal	Civils	Construction	Trespassing of the railway line	Injury/serious injury / death	No	Members of the Public	2	5	Intolerable Risk	Existing steel palisade fence to prevent access by members of the public. Where panels of the fence are required to be removed for construction works, temporary fencing to be provided around area of construction to prevent access to railway line	1	5	Tolerable Risk		Mitigation Identified	None	Trespassing of railway line by members of the public leading to getting struck by train	Members of the Public						

# E. Rail Operations

## Westbound Timetables

Headcode		1894	6Y99	6A12	6Z41	3P12	6V01	3P18	1P00	6D74	6Z72	6C12	2U00	2L43	2U02	1V01	4J34	1B01	4J36	1C01	1V02	2U04
Origin		London Paddington	Dagenham Dock Reception	York Yard South (Fhh)	Tees N.Y.	St Philips Mrsh H S T D	Port Clarence (Gbrf)	St Philips Mrsh H S T D	Bristol Temple Meads	Starts here	Tees N.Y.	Wembley Eur Frt Ops Cntr	Bristol Temple Meads	Cheltenham Spa	Taunton	Birmingham New Street	Southampton M.C.T.	Westbury	Tilbury I.R.F.T. (Ft)	London Paddington	Birmingham New Street	Taunton
Destination		Swansea	Bridgend Ford Sidings	Port Talbot Grange Sdg Fhh	Margam T.C.	Hereford	Cardiff Docks Greenergy	Hereford	Cardiff Central	Maindee Depot Isu (Ce)	Margam T.C.	Cardiff Tidal T.C.	Cardiff Central	Maesteg	Cardiff Central	Cardiff Central	Wentloog (Freightline rs)	Cardiff Central	Wentloog (Freightline rs)	Swansea	Cardiff Central	Cardiff Central
Gloucester	dep	x	x	x	x	x	x	x	x	x	x	x	x	05:50:00 x		06:14:00 x	x	x	x		07:01:00 x	
Awre	dep	x	x	x	x	x	x	x	x	x	x	x	x	06:03:00 x		06:26:30 x	x	x	x		07:13:30 x	
Lydney	dep	x	x	x	x	x	x	x	x	x	x	x	x	06:09:00 x		06:33:00 x	x	x	x		07:20:00 x	
Chepstow	dep	x	x	x	x	x	x	x	x	x	x	x	x	06:19:00 x		06:42:00 x	x	x	x		07:29:00 x	
Patchway	dep	01:06:00	02:53:00	03:15:30	03:30:00	03:45:00	04:03:30	05:13:30	05:40:00 x		05:18:30	05:50:30	06:07:00 x		06:36:00 x		06:29:00	07:05:30	07:18:30	07:29:00 x		07:44:00
Pilning	dep	01:09:00	02:56:30	03:19:30	03:33:30	03:49:00	04:08:30	05:16:30	05:43:00 x		05:48:00	05:53:30	06:11:00 x		06:40:00 x		06:43:30	07:08:30	07:21:30	07:32:00 x		07:48:30
Severn Tunnel East	dep	01:10:00	02:58:00	03:21:00	03:35:00	03:51:00	04:10:00	05:17:30	05:44:00 x		05:50:30	05:55:00	06:12:00 x		06:42:00 x		06:47:00	07:09:30	07:22:30	07:33:00 x		07:49:30
Severn Tunnel West	dep	01:16:30	03:04:30	03:27:30	03:41:00	03:55:00	04:16:30	05:21:00	05:48:00 x		05:56:30	06:04:30	06:16:00 x		06:46:00 x		06:51:30	07:13:00	07:27:00	07:36:30 x		07:53:30
Severn Tunnel Junction	arr	x	x	x	x	x	x	x	x	x	x	x	06:18:00	06:29:00	06:48:00	06:53:00 x		07:15:00 x	x		07:40:00	07:55:00
Severn Tunnel Junction	dep	01:17:30	03:07:30	03:32:30	03:46:30	03:56:00	04:19:30	05:23:00	05:49:00	06:00:00	06:01:30	06:08:30	06:18:00	06:29:00	06:48:00	06:54:00	06:56:00	07:15:00	07:29:30	07:37:30	07:41:00	07:56:00
Magor & Undy WW	arr	01:19:00	03:10:30	03:35:30	03:49:30	03:58:30	04:22:00	05:25:00	05:52:00	06:04:30	06:04:30	06:12:30	06:22:00	06:33:00	06:51:00	06:56:00	06:59:00	07:17:30	07:35:30	07:38:30	07:44:00	07:58:30
Magor & Undy WW	dep	01:19:00	03:10:30	03:35:30	03:49:30	03:58:30	04:22:00	05:25:00	05:52:00	06:04:30	06:04:30	06:12:30	06:22:00	06:33:30	06:51:30	06:56:00	06:59:00	07:17:30	07:35:30	07:38:30	07:44:30	07:59:00
Magor	dep	01:19:30	03:11:00	03:36:00	03:50:00	03:59:00	04:22:30	05:25:30	05:52:30	06:05:00	06:05:00	06:13:00	06:22:30	06:34:00	06:52:00	06:56:30	06:59:30	07:18:00	07:36:00	07:39:00	07:45:00	07:59:30
Llanwern West Junction	dep	01:24:00	03:19:00	03:43:30	03:57:30	04:06:00	04:28:30	05:31:30	06:00:00	06:12:00	07:34:00	06:22:30	06:29:30	06:38:30	06:56:30	07:00:30	07:07:00	07:22:00	07:50:30	07:43:00	07:49:00	08:04:00
Maindee West Junction	dep	01:26:00	03:26:30	03:47:30	04:00:00 x		04:32:30 x		06:05:00 x		07:40:00	06:26:30	06:34:30	06:41:30	06:58:30	07:03:30	07:14:00	07:25:00	07:57:30	07:46:00	07:52:00	08:07:00
Newport	arr	01:28:00	03:28:30	03:50:30 x		x	x	x	06:07:00 x	x	x	x	06:36:00	06:42:00	07:00:00	07:05:00 x		07:26:00 x		07:48:00	07:53:00	08:08:00
Newport	dep	01:29:00	04:46:30	03:52:30	04:01:30 x		04:34:30 x		06:08:00 x		07:42:00	06:28:30	06:37:00	06:44:00	07:01:00	07:06:00	07:15:30	07:28:00	08:02:00	07:48:00	07:55:00	08:10:00
Ebbw Jn	dep	01:32:30	04:52:30	03:57:30	04:17:30 x		04:37:30 x		06:12:00 x		07:51:00	06:37:30	06:40:00	06:46:30	07:04:00	07:09:00	07:22:00	07:30:30	08:05:00	07:52:30	07:58:00	08:12:30
Marshfield	dep	01:37:00	04:57:30	04:05:30	04:24:30 x		04:43:30 x		06:17:00 x		07:59:00	06:45:30	06:44:30	06:51:00	07:08:30	07:13:30	07:30:00	07:35:00	08:11:00	07:57:00	08:02:00	08:17:00
Cardiff Central	arr	01:43:00 x		x	x	x	x	x	06:23:00 x	x	x	x	06:51:00	07:00:00	07:16:00	07:21:00 x		07:41:00 x		08:03:00	08:09:00	08:24:00
Cardiff Central	dep	01:46:00	05:14:30	04:22:30	04:30:00 x		x	x	x	x	08:09:00 x		x	07:03:00 x	x	x	x	x	x	08:05:00 x	x	
Impact compared with Dec 2017 SX														00:00:00	00:01:00						00:01:00	00:01:00

Headcode		1B04	1B05	2L47	2U06	1B09	1V03	1F06	1B10	2L49	2U08	1B12	1V04	1F08	1B15	2U10	1B17	1V05	1F10	1B20	2L53	6E46
Origin		Frome	London Paddington	Cheltenham Spa	Bristol Temple Meads	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Cheltenham Spa	Bristol Temple Meads	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Taunton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Cheltenham Spa	Round Oak
Destination		Cardiff Central	Swansea	Maesteg	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Maesteg	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Maesteg	Margam T.C.
Gloucester	dep	x	x	07:58:00 x	x	08:25:00 x	x	x	x	x	x	09:25:00 x	x	x	x	x	x	10:25:00 x	x	x	10:58:00	11:04:00
Awre	dep	x	x	08:12:00 x	x	08:37:30 x	x	x	09:14:00 x	x	x	09:37:30 x	x	x	x	x	x	10:37:30 x	x	x	11:13:00	11:19:00
Lydney	dep	x	x	08:17:00 x	x	08:42:30 x	x	x	09:17:00 x	x	x	09:42:30 x	x	x	x	x	x	10:44:00 x	x	x	11:17:00	11:24:30
Chepstow	dep	x	x	08:27:00 x	x	08:51:00 x	x	x	09:27:00 x	x	x	09:51:00 x	x	x	x	x	x	10:52:00 x	x	x	11:27:00	11:33:30
Patchway	dep	08:06:00	08:11:00 x	08:36:00	08:43:30 x	09:04:00	09:11:00 x	09:35:00	09:47:00 x	10:05:00	10:11:00	10:36:00	10:43:30 x	11:04:00	11:11:00 x	x						
Pilning	dep	08:10:00	08:15:00 x	08:40:30	08:46:30 x	09:07:00	09:14:00 x	09:39:30	09:50:00 x	10:08:00	10:14:00	10:40:30	10:46:30 x	11:07:00	11:14:00 x	x						
Severn Tunnel East	dep	08:11:00	08:16:00 x	08:41:30	08:47:30 x	09:08:00	09:15:00 x	09:40:30	09:51:00 x	10:09:00	10:15:00	10:41:30	10:47:30 x	11:08:00	11:15:00 x	x						
Severn Tunnel West	dep	08:14:30	08:19:30 x	08:45:30	08:51:00 x	09:11:30	09:18:30 x	09:44:30	09:54:30 x	10:12:30	10:18:30	10:45:30	10:51:00 x	11:11:30	11:18:30 x	x						
Severn Tunnel Junction	arr	x	x	08:38:00	08:47:00 x	x	x	x	09:38:00	09:46:00 x	x	x	x	x	x	10:47:00 x	x	x	x	x	11:37:00 x	
Severn Tunnel Junction	dep	08:15:30	08:20:30	08:38:00	08:48:00	08:52:00	09:02:00	09:13:00	09:19:30	09:38:00	09:46:00	09:55:30	10:00:00	10:13:30	10:19:30	10:48:00	10:52:00	10:59:00	11:12:30	11:19:30	11:38:00	11:44:00
Magor & Undy WW	arr	08:17:00	08:21:30	08:42:00	08:52:00	08:53:30	09:03:00	09:14:30	09:20:30	09:44:00	09:49:30	09:56:30	10:01:00	10:15:00	10:20:30	10:50:30	10:53:30	11:00:30	11:14:00	11:20:30	11:42:30	11:47:00
Magor & Undy WW	dep	08:17:00	08:21:30	08:42:30	08:52:30	08:53:30	09:03:00	09:14:30	09:20:30	09:44:30	09:50:00	09:56:30	10:01:00	10:15:00	10:20:30	10:51:00	10:53:30	11:00:30	11:14:00	11:20:30	11:43:00	11:47:00
Magor	dep	08:17:30	08:22:00	08:43:00	08:53:00	08:54:00	09:03:30	09:15:00	09:21:00	09:45:00	09:50:30	09:57:00	10:01:30	10:15:30	10:21:00	10:51:30	10:54:00	11:01:00	11:14:30	11:21:00	11:43:30	11:47:30
Llanwern West Junction	dep	08:22:00	08:26:00	08:47:30	09:00:00	08:59:00	09:07:30	09:19:30	09:25:00	09:49:30	09:55:00	10:01:00	10:05:30	10:20:00	10:25:00	10:56:00	10:59:00	11:05:00	11:19:00	11:25:00	11:48:00	14:43:00
Maindee West Junction	dep	08:25:00	08:29:30	08:50:30	09:04:00	09:02:30	09:10:30	09:22:30	09:28:00	09:52:30	09:58:00	10:04:00	10:08:30	10:25:00	10:30:30	11:00:00	11:02:30	11:08:00	11:24:00	11:28:30	11:51:30	14:49:00
Newport	arr	08:26:00	08:31:00	08:51:00	09:06:00	09:04:00	09:12:00	09:24:00	09:30:00	09:54:00	09:59:00	10:06:00	10:11:00	10:28:00	10:32:00	11:02:00	11:04:00	11:11:00	11:25:00	11:30:00	11:53:00 x	
Newport	dep	08:28:00	08:33:00	08:53:00	09:07:00	09:06:00	09:13:00	09:25:00	09:31:00	09:56:00	10:01:00	10:07:00	10:13:00	10:28:00	10:34:00	11:03:00	11:06:00	11:12:00	11:27:00	11:32:00	11:55:00	14:51:00
Ebbw Jn	dep	08:30:30	08:36:00	08:56:30	09:11:00	09:09:00	09:16:00	09:28:00	09:34:30	09:58:30	10:03:30	10:10:30	10:15:30	10:31:30	10:37:00	11:07:00	11:09:00	11:15:00	11:29:30	11:35:00	11:58:30	14:54:00
Marshfield	dep	08:35:00	08:40:30	09:01:00	09:17:00	09:13:30	09:20:30	09:32:30	09:39:00	10:03:00	10:08:00	10:15:00	10:20:00	10:36:00	10:41:30	11:13:00	11:13:30	11:19:30	11:34:00	11:39:30	12:05:00	15:00:00
Cardiff Central	arr	08:43:00	08:48:00	09:08:00	09:27:00	09:21:00	09:27:00	09:42:00	09:45:00	10:12:00	10:15:00	10:21:00	10:27:00	10:43:00	10:48:00	11:23:00	11:23:00	11:28:00	11:43:00	11:46:00	12:14:00	15:19:00
Cardiff Central	dep	x	08:52:00	09:18:00 x	x	x	x	x	09:52:00	10:18:00 x	x	x	x	x	10:50:00 x	x	x	x	x	11:48:00	12:18:00	15:23:00
Impact compared with Dec 2017 SX				00:00:00	00:01:00					00:00:00	00:01:00					00:01:00	00:00:00				00:00:00	

Headcode		2U12	1B22	1V06	1F12	1B25	2G55	2U14	1B27	1V07	1F14	1B28	2U16	1B31	1Z08	1F16	1B35	6G01 Hayes & H'ton Tarmac <small>Grine</small> Moreton- lugg (Tarmac)	2L59	4L02	2U18	1B37
Origin		St James' Park	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Cheltenham Spa	Taunton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Taunton	London Paddington	Birmingham New Street	Portsmouth Harbour	London Paddington		Cheltenham Spa	Daventry Drs (Tesco)	Taunton	London Paddington
Destination		Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea		Tondu	Wentloog (Freightline rs)	Cardiff Central	Cardiff Central
Gloucester	dep	x	x	11:25:00	x	x	11:58:00	x	x	12:25:00	x	x	x	x	13:25:00	x	x	x	13:58:00	14:03:00	x	x
Awre	dep	x	x	11:37:30	x	x	12:11:30	x	x	12:37:30	x	x	x	x	13:37:30	x	x	x	14:12:00	14:18:30	x	x
Lydney	dep	x	x	11:42:30	x	x	12:18:00	x	x	12:42:30	x	x	x	x	13:44:00	x	x	x	14:17:00	14:24:00	x	x
Chepstow	dep	x	x	11:51:00	x	x	12:27:00	x	x	12:51:00	x	x	x	x	13:52:00	x	x	x	14:27:00	14:32:30	x	x
Patchway	dep	11:35:00	11:43:30	x	12:04:00	12:11:00	x	12:35:00	12:43:30	x	13:04:00	13:11:00	13:35:00	13:46:00	x	14:04:00	14:11:00	14:21:30	x	x	14:36:00	14:43:30
Pilning	dep	11:39:00	11:46:30	x	12:07:00	12:14:00	x	12:39:30	12:46:30	x	13:07:00	13:14:00	13:39:00	13:49:00	x	14:07:00	14:14:00	14:25:00	x	x	14:40:30	14:46:30
Severn Tunnel East	dep	11:40:00	11:47:30	x	12:08:00	12:15:00	x	12:40:30	12:47:30	x	13:08:00	13:15:00	13:40:00	13:50:00	x	14:08:00	14:15:30	14:27:00	x	x	14:41:30	14:47:30
Severn Tunnel West	dep	11:44:00	11:51:00	x	12:11:30	12:18:30	x	12:44:30	12:51:00	x	13:11:30	13:18:30	13:44:00	13:53:30	x	14:11:30	14:19:00	14:33:00	x	x	14:45:30	14:51:00
Severn Tunnel Junction	arr	11:46:00	x	x	x	x	12:38:00	12:46:00	x	x	x	x	13:46:00	x	x	x	x	14:38:00	x	x	14:47:00	x
Severn Tunnel Junction	dep	11:48:00	11:52:00	11:59:00	12:14:00	12:19:30	12:39:00	12:46:00	12:52:00	12:59:00	13:13:30	13:19:30	13:46:00	13:54:30	13:59:00	14:13:00	14:20:00	14:35:00	14:38:00	14:53:00	14:48:00	14:52:00
Magor & Undy WW	arr	11:51:00	11:53:00	12:00:00	12:15:30	12:20:30	12:42:00	12:50:00	12:53:30	13:00:30	13:15:00	13:21:30	13:49:00	13:55:30	14:02:00	14:14:30	14:21:30	14:38:00	14:42:00	14:57:00	14:51:30	14:54:30
Magor & Undy WW	dep	11:51:30	11:53:00	12:00:00	12:15:30	12:20:30	12:42:30	12:50:30	12:53:30	13:00:30	13:15:00	13:21:30	13:49:30	13:55:30	14:02:00	14:14:30	14:21:30	14:38:00	14:42:30	14:57:00	14:52:00	14:54:30
Magor	dep	11:52:00	11:53:30	12:00:30	12:16:00	12:21:00	12:43:00	12:51:00	12:54:00	13:01:00	13:15:30	13:22:00	13:50:00	13:56:00	14:02:30	14:15:00	14:22:00	14:38:30	14:43:00	14:57:30	14:52:30	14:56:30
Llanwern West Junction	dep	11:56:30	11:57:30	12:04:30	12:20:30	12:25:00	12:47:30	12:55:30	12:58:00	13:05:00	13:20:00	13:27:00	13:54:30	14:00:00	14:04:30	14:19:30	14:26:00	14:47:00	14:49:30	15:07:00	14:58:00	15:02:30
Maindee West Junction	dep	11:59:30	12:01:00	12:07:30	12:23:30	12:29:00	12:50:30	12:59:30	13:02:30	13:08:00	13:23:00	13:30:30	13:57:30	14:03:30	14:07:30	14:24:00	14:29:30	x	14:53:30	15:12:00	15:02:00	15:05:30
Newport	arr	12:01:00	12:03:00	12:10:00	12:25:00	12:31:00	12:52:00	13:01:00	13:04:00	13:09:00	13:25:00	13:32:00	13:59:00	14:05:00	14:09:00	14:26:00	14:31:00	x	14:56:00	x	15:04:00	15:07:30
Newport	dep	12:02:00	12:04:00	12:12:00	12:26:00	12:32:00	12:54:00	13:02:00	13:06:00	13:11:00	13:26:00	13:34:00	14:00:00	14:07:00	14:11:00	14:27:00	14:33:00	x	15:00:00	15:14:30	15:05:00	15:08:30
Ebbw Jn	dep	12:05:00	12:07:30	12:14:30	12:29:30	12:35:30	12:56:30	13:06:30	13:09:00	13:13:30	13:30:30	13:37:00	14:03:00	14:10:00	14:13:30	14:29:30	14:36:00	x	15:02:30	15:17:30	15:09:00	15:12:00
Marshfield	dep	12:09:30	12:12:00	12:19:00	12:34:00	12:40:00	13:01:00	13:12:30	13:13:30	13:18:00	13:35:00	13:41:30	14:07:30	14:14:30	14:18:00	14:34:00	14:40:30	x	15:08:00	15:23:30	15:15:00	15:16:30
Cardiff Central	arr	12:22:00	12:21:00	12:26:00	12:40:00	12:47:00	13:09:00	13:23:00	13:23:00	13:30:00	13:42:00	13:48:00	14:14:00	14:21:00	14:26:00	14:41:00	14:47:00	x	15:15:00	x	15:26:00	15:25:00
Cardiff Central	dep	x	x	x	x	12:50:00	x	x	x	x	x	13:50:00	x	x	x	x	14:49:00	x	15:19:00	x	x	x
Impact compared with Dec 2017 SX		00:03:00					00:01:00	00:01:00	00:01:00				00:01:00						00:00:00	00:05:00	00:01:00	00:02:00



Headcode		1V09	1840	1867	2U20	1842	1V10	1F20	1846	6F97	2U22	1848	1V11	1F24	1851	6F04	2L65	2U24	1855	1V12	1F26	1859
Origin		Nottingham	London Paddington	Gloucester	Paignton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Theale Murco	Taunton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Westbury Tarmac Colas Rail	Cheltenham Spa	Taunton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington
Destination		Cardiff Central	Swansea	Fishguard Harbour	Cardiff Central	Cardiff Central	Cardiff Central	Newport (South Wales)	Swansea	Robeston Sdgs	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Aberthaw Tarmac Colas Rail	Maesteg	Cardiff Central	Swansea	Cardiff Central	Newport (South Wales)	Swansea
Gloucester	dep	14:25:00 x		14:48:00 x	x	15:25:00 x	x	x	x	x	x	x	16:25:00 x	x	x	x	16:58:00 x	x	17:25:00 x	x		
Awre	dep	14:37:30 x		15:01:00 x	x	15:37:30 x	x	x	x	x	x	x	16:37:30 x	x	x	x	17:13:00 x	x	17:37:30 x	x		
Lydney	dep	14:42:30 x		15:07:00 x	x	15:42:30 x	x	x	x	x	x	x	16:44:00 x	x	x	x	17:17:00 x	x	17:44:00 x	x		
Chepstow	dep	14:51:00 x		15:17:00 x	x	15:51:00 x	x	x	x	x	x	x	16:53:00 x	x	x	x	17:27:00 x	x	17:52:00 x	x		
Patchway	dep	x	15:11:00 x		15:35:00	15:43:30 x		16:04:00	16:11:00	16:20:00	16:36:00	16:43:30 x		17:06:30	17:11:00	16:28:00 x		17:33:00	17:43:30 x		18:04:30	18:11:00
Pilning	dep	x	15:14:00 x		15:39:00	15:46:30 x		16:07:00	16:14:00	16:26:00	16:40:30	16:46:30 x		17:09:30	17:14:00	17:21:00 x		17:37:00	17:46:30 x		18:07:30	18:14:00
Severn Tunnel East	dep	x	15:15:00 x		15:40:00	15:47:30 x		16:08:00	16:15:00	16:35:00	16:41:30	16:47:30 x		17:10:30	17:16:00	17:24:00 x		17:38:00	17:47:30 x		18:08:30	18:15:00
Severn Tunnel West	dep	x	15:18:30 x		15:44:00	15:51:00 x		16:12:00	16:18:30	16:40:00	16:45:30	16:51:00 x		17:14:00	17:19:30	17:31:30 x		17:42:00	17:51:00 x		18:12:00	18:18:30
Severn Tunnel Junction	arr	x	x	15:28:00	15:46:00 x	x	x	x	x	x	16:47:00 x	x	x	17:16:00 x	x	x	17:38:00	17:44:00 x	x	x	18:14:00 x	
Severn Tunnel Junction	dep	14:58:30	15:19:30	15:28:00	15:46:00	15:52:00	16:00:30	16:13:00	16:19:30	16:42:00	16:48:00	16:52:00	17:01:00	17:16:00	17:20:30	17:33:30	17:38:00	17:44:00	17:52:00	18:00:30	18:14:00	18:19:30
Magor & Undy WW	arr	15:00:00	15:20:30	15:31:00	15:49:00	15:53:00	16:01:30	16:14:30	16:20:30	16:45:00	16:50:30	16:53:30	17:02:00	17:18:30	17:22:00	17:36:30	17:43:00	17:47:00	17:53:00	18:01:30	18:16:30	18:20:30
Magor & Undy WW	dep	15:00:00	15:20:30	15:31:30	15:49:30	15:53:00	16:01:30	16:14:30	16:20:30	16:45:00	16:51:00	16:53:30	17:02:00	17:18:30	17:22:00	17:36:30	17:43:30	17:47:30	17:53:00	18:01:30	18:16:30	18:20:30
Magor	dep	15:00:30	15:21:00	15:32:00	15:50:00	15:53:30	16:02:00	16:15:00	16:21:00	16:45:30	16:51:30	16:54:00	17:02:30	17:19:00	17:22:30	17:37:00	17:44:00	17:48:00	17:53:30	18:02:00	18:17:00	18:21:00
Llanwern West Junction	dep	15:04:30	15:25:00	15:36:30	15:54:30	15:58:30	16:06:00	16:19:30	16:25:00	16:54:00	16:58:00	16:59:00	17:06:30	17:23:00	17:27:00	17:45:30	17:48:30	17:52:30	17:57:30	18:06:00	18:21:00	18:25:00
Maindee West Junction	dep	15:07:30	15:28:30	15:39:30	15:57:30	16:02:00	16:09:00	16:22:30	16:28:00	16:58:00	17:02:00	17:02:00	17:09:30	17:26:00	17:30:00	18:43:00	17:51:30	17:57:00	18:00:30	18:09:00	18:24:00	18:28:00
Newport	arr	15:10:00	15:30:00	15:41:00	15:59:00	16:04:00	16:12:00	16:25:00	16:30:00 x		17:04:00	17:04:00	17:11:00	17:27:00	17:32:00 x		17:53:00	17:58:00	18:02:00	18:11:00	18:25:00	18:30:00
Newport	dep	15:12:00	15:32:00	15:43:00	16:00:00	16:08:00	16:13:00	16:25:00	16:31:00	17:00:00	17:05:00	17:07:00	17:12:00	17:29:00	17:33:00	18:45:30	17:55:00	18:00:00	18:04:00	18:12:00	18:27:00	18:32:00
Ebbw Jn	dep	15:14:30	15:35:00	15:45:30	16:03:00	16:11:30	16:16:00 x		16:34:30	17:03:00	17:08:30	17:10:30	17:15:00	17:31:30	17:36:30	18:50:00	17:57:30	18:02:30	18:07:00	18:16:00 x		18:35:00
Marshfield	dep	15:19:00	15:39:30	15:50:00	16:07:30	16:16:00	16:20:30 x		16:39:00	17:09:00	17:14:30	17:15:00	17:19:30	17:36:00	17:41:00	18:55:00	18:02:00	18:07:00	18:11:30	18:20:30 x		18:39:30
Cardiff Central	arr	15:30:00	15:46:00	15:59:00	16:16:00	16:22:00	16:30:00	16:41:00	16:45:00 x		17:27:00	17:23:00	17:30:00	17:43:00	17:47:00 x		18:11:00	18:14:00	18:22:00	18:28:00	18:42:00	18:49:00
Cardiff Central	dep	x	15:48:00	16:04:00 x	x	x	x		16:48:00	17:19:30 x	x	x	x		17:51:00	19:14:00	18:13:00 x		18:25:00 x	x		18:52:00
Impact compared with Dec 2017 SX				00:00:00	00:01:00	00:00:00				00:01:00	00:00:00						00:01:00	00:01:00				

Headcode		2L67	2U26	1B63	1V13	1F28	1B69	4L33	2L69	2U28	1B76	6G67	1V14	1F30	1B79	1V65	2L71	6H48	1B81	1V15	1F32	2U32
Origin		Cheltenham Spa	Taunton	London Paddington	Nottingham	Portsmouth Harbour	London Paddington	Acton T.C.	Cheltenham Spa	Taunton	London Paddington	Westerleigh Murco	Nottingham	Portsmouth Harbour	London Paddington	Manchester Piccadilly	Cheltenham Spa	Fairwater Yard	London Paddington	Nottingham	Portsmouth Harbour	Bristol Temple Meads
Destination		Maesteg	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Swansea	Moreton-on-lugg (Tarmac)	Maesteg	Cardiff Central	Swansea	Robeston Sdgs	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Maesteg	Marshfield	Swansea	Cardiff Central	Cardiff Central	Cardiff Central
Gloucester	dep	17:58:00	x	x	18:31:00	x	x	x	19:00:00	x	x	19:16:00	19:25:00	x	x	x	19:58:00	x	x	20:25:00	x	x
Awre	dep	18:13:00	x	x	18:43:30	x	x	x	19:13:30	x	x	19:32:00	19:37:30	x	x	x	20:13:00	x	x	20:37:30	x	x
Lydney	dep	18:17:00	x	x	18:48:30	x	x	x	19:20:00	x	x	19:37:00	19:42:30	x	x	x	20:17:00	x	x	20:42:30	x	x
Chepstow	dep	18:27:00	x	x	18:55:30	x	x	x	19:29:00	x	x	19:46:00	19:51:00	x	x	x	20:27:00	x	x	20:49:30	x	x
Patchway	dep	x	18:37:00	18:43:30	x	19:04:30	19:13:30	18:53:00	x	19:36:00	19:43:30	x	x	20:04:30	20:11:00	20:25:00	x	20:31:00	20:44:00	x	21:04:00	21:36:00
Pilning	dep	x	18:41:30	18:46:30	x	19:07:30	19:16:30	19:20:30	x	19:40:00	19:46:30	x	x	20:07:30	20:14:00	20:29:00	x	20:35:00	20:47:00	x	21:07:00	21:40:00
Severn Tunnel East	dep	x	18:44:00	18:47:30	x	19:08:30	19:17:30	19:22:30	x	19:41:00	19:47:30	x	x	20:08:30	20:15:00	20:31:00	x	20:36:30	20:48:00	x	21:08:00	21:41:00
Severn Tunnel West	dep	x	18:48:00	18:52:30	x	19:12:00	19:21:00	19:28:00	x	19:45:00	19:51:00	x	x	20:12:00	20:18:30	20:35:00	x	20:43:00	20:51:30	x	21:11:30	21:45:00
Severn Tunnel Junction	arr	18:38:00	18:50:00	x	x	19:14:00	x	x	19:39:00	19:47:00	x	x	x	20:14:00	x	20:36:00	20:37:00	x	x	x	21:13:00	21:47:00
Severn Tunnel Junction	dep	18:38:00	18:50:00	18:54:30	19:02:30	19:14:00	19:23:00	19:29:30	19:40:00	19:47:00	19:52:00	19:58:00	20:01:30	20:14:00	20:19:30	20:37:00	20:38:00	20:46:00	20:52:30	20:59:30	21:14:00	21:47:00
Magor & Undy WW	arr	18:43:00	18:53:00	18:56:00	19:03:30	19:16:30	19:24:00	19:32:30	19:43:30	19:50:00	19:53:30	20:01:00	20:02:30	20:16:30	20:20:30	20:39:00	20:43:30	20:48:30	20:53:30	21:00:30	21:16:00	21:50:00
Magor & Undy WW	dep	18:43:30	18:53:30	18:56:00	19:03:30	19:16:30	19:24:00	19:32:30	19:44:00	19:50:30	19:53:30	20:01:00	20:02:30	20:16:30	20:20:30	20:39:00	20:44:00	20:48:30	20:53:30	21:00:30	21:16:00	21:50:30
Magor	dep	18:44:00	18:54:00	18:57:30	19:04:00	19:17:00	19:24:30	19:33:00	19:44:30	19:51:00	19:55:00	20:01:30	20:03:00	20:17:00	20:21:00	20:39:30	20:44:30	20:49:00	20:54:00	21:01:00	21:16:30	21:51:00
Llanwern West Junction	dep	18:48:30	18:58:30	19:02:30	19:08:00	19:21:00	19:28:30	19:40:30	19:49:00	19:55:30	19:59:30	20:09:00	20:07:00	20:21:00	20:25:00	20:43:00	20:49:00	20:56:00	20:58:00	21:05:00	21:20:30	21:55:30
Maindee West Junction	dep	18:51:30	19:04:00	19:08:30	19:13:00	19:24:00	19:31:30	x	19:52:00	19:58:30	20:03:00	20:15:00	20:09:00	20:24:00	20:30:00	20:46:00	20:52:00	21:00:00	21:01:00	21:08:00	21:23:30	21:58:30
Newport	arr	18:53:00	19:05:00	19:11:00	19:14:00	19:25:00	19:33:00	x	19:54:00	20:00:00	20:05:00	x	20:11:00	20:25:00	20:32:00	20:47:00	20:53:30	x	21:03:00	21:10:00	21:25:00	22:00:00
Newport	dep	18:55:00	19:07:00	19:12:00	19:16:00	19:27:00	19:35:00	x	19:55:00	20:01:00	20:06:00	20:18:00	20:13:00	20:29:00	20:34:00	20:49:00	20:55:30	21:01:00	21:04:00	21:12:00	21:26:00	22:01:00
Ebbw Jn	dep	18:57:30	19:09:30	19:15:30	19:18:30	19:30:30	19:38:00	x	19:58:00	20:04:00	20:09:30	20:24:00	20:15:30	20:31:30	20:37:00	20:51:30	20:58:00	21:04:00	21:07:30	21:14:30	21:29:00	22:04:00
Marshfield	dep	19:02:00	19:14:00	19:20:00	19:23:00	19:35:30	19:42:30	x	20:02:30	20:08:30	20:14:00	20:32:00	20:20:00	20:37:00	20:41:30	20:56:00	21:02:30	21:10:00	21:12:00	21:19:00	21:35:00	22:08:30
Cardiff Central	arr	19:10:00	19:24:00	19:27:00	19:33:00	19:42:00	19:49:00	x	20:13:00	20:15:00	20:20:00	x	20:28:00	20:47:00	20:52:00	21:03:00	21:11:00	x	21:18:00	21:28:00	21:44:00	22:15:00
Cardiff Central	dep	19:11:00	x	19:30:00	x	x	19:52:00	x	20:14:00	x	20:25:00	20:41:30	x	x	20:54:00	x	21:11:00	x	21:24:00	x	x	x
Impact compared with Dec 2017 SX		00:01:00	00:01:00	00:00:00					00:01:00	00:01:00	00:00:00						00:01:00					00:01:00

Headcode		1B88	1V16	1F34	5T48	6H55	1F36	1B91	6J11	2G75								
Origin		London Paddington	Nottingham	Portsmouth Harbour	Bristol Temple Meads	Masborough F.D.	Portsmouth Harbour	London Paddington	Round Oak	Cheltenham Spa								
Destination		Swansea	Cardiff Central	Cardiff Central	Swansea	Cardiff Tidal T.C.	Cardiff Central	Swansea	Margam T.C.	Cardiff Central								
Gloucester	dep	x	21:21:00 x	x		22:26:30 x	x	x		23:14:00								
Awre	dep	x	21:33:30 x	x		22:44:00 x	x	x		23:27:30								
Lydney	dep	x	21:40:00 x	x		22:49:30 x	x	x		23:34:00								
Chepstow	dep	x	21:49:00 x	x		22:58:30 x	x	x		23:43:00								
Patchway	dep	21:43:30 x		22:06:00	22:58:00 x		23:06:00	23:26:00	23:34:30 x									
Pilning	dep	21:46:30 x		22:11:00	23:01:00 x		23:10:00	23:29:00	23:38:00 x									
Severn Tunnel East	dep	21:47:30 x		22:12:00	23:02:00 x		23:11:00	23:30:00	23:39:30 x									
Severn Tunnel West	dep	21:51:00 x		22:15:30	23:05:30 x		23:14:30	23:33:30	23:45:00 x									
Severn Tunnel Junction	arr	x	22:00:00	22:17:00 x	x		23:16:00 x	x		23:55:00								
Severn Tunnel Junction	dep	21:52:00	22:01:00	22:18:00	23:06:30	23:11:30	23:18:00	23:37:00	23:49:30	23:56:00								
Magor & Undy WW	arr	21:53:30	22:03:00	22:21:00	23:09:00	23:14:00	23:21:30	23:38:30	23:51:30	23:58:30								
Magor & Undy WW	dep	21:53:30	22:03:00	22:21:30	23:09:00	23:14:00	23:22:00	23:38:30	23:51:30	23:59:00								
Magor	dep	21:55:00	22:03:30	22:22:00	23:09:30	23:14:30	23:22:30	23:39:00	23:52:00	23:59:30								
Llanwern West Junction	dep	21:59:30	22:07:30	22:27:30	23:16:30	23:21:00	23:29:00	23:43:30	23:57:00	00:04:00								
Maindee West Junction	dep	22:02:30	22:10:30	22:34:00	23:20:30	23:26:30	23:33:00	23:46:30 x		00:08:30								
Newport	arr	22:05:00	22:12:00	22:36:00 x	x		23:34:00	23:48:00 x		00:10:00								
Newport	dep	22:06:00	22:14:00	22:37:00	23:24:30	23:28:30	23:34:00	23:50:00 x		00:15:00								
Ebbw Jn	dep	22:11:30	22:17:30	22:44:00	23:30:30	23:48:30	23:43:00	23:53:00 x		00:24:00								
Marshfield	dep	22:18:00	22:22:30	22:50:00	23:35:00	23:55:30	23:47:30	23:55:30 x		00:29:00								
Cardiff Central	arr	22:26:00	22:35:00	22:58:00	23:45:00 x		23:56:00	00:08:00 x		00:37:00								
Cardiff Central	dep	22:29:00 x	x		23:48:00 x	x		00:11:00 x	x									
Impact compared with Dec 2017 SX		00:01:00		00:01:00			00:01:00			00:01:00								

**Key:**

- Train having Magor and Undy walkway call inserted
- Other train requiring retiming
- Passenger train timed on relief lines
- Passenger train timed on relief lines (due to impact of Magor and Undy call)

**Eastbound Timetable**

Headcode		6A87	6A62	6A60	6Z99	6B72	5L16	6D08	1L05	1L08	6C35	2G50	1L14	1F03	1M00	1L20	1M25	2G52	1L24	1F05	1M92	1L32
Origin		Cardiff Tidal T.C.	Margam T.C.	Margam T.C.	Robeston Sdgs	Moreton-on-lugg (Tarmac) Hayes & Sides	Landore T.M.D.	Ebbw Jn	Swansea	Swansea	Aberthaw Tarmac Colas Rail	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Swansea
Destination		Masborough F.D.	Acton T.C.	Round Oak	Theale Murco	H'ton Tarmac Sides	Cheltenham Spa	Fairwater Yard	London Paddington	London Paddington	Westbury Tarmac Colas Rail	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Manchester Piccadilly	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington
Cardiff Central	arr	x	x	x	x	x	03:50:30	x	05:09:00	05:52:00	x	x	06:23:00	x	x	06:53:00	x	x	07:23:00	x	x	07:53:00
Cardiff Central	dep	x	00:47:00	x	02:38:30	x	04:19:00	x	05:15:00	05:55:00	05:42:00	06:12:00	06:26:00	06:30:00	06:40:00	06:56:00	07:00:00	07:05:00	07:26:00	07:30:00	07:45:00	07:56:00
Marshfield	dep	x	01:00:30	x	02:50:00	x	04:26:30	x	05:24:00	06:01:30	05:53:00	06:20:00	06:32:30	06:37:00	06:47:00	07:02:30	07:07:30	07:12:30	07:32:30	07:37:30	07:53:00	08:02:30
Ebbw Jn	dep	x	01:10:00	x	02:58:30	x	04:31:30	x	05:27:30	06:04:00	06:00:00	06:23:30	06:35:00	06:39:30	06:50:30	07:05:00	07:10:00	07:16:00	07:35:00	07:41:00	07:55:30	08:05:00
Newport	arr	23:41:30	01:14:00	x	x	x	x	x	05:31:00	06:07:00	x	06:26:00	06:38:00	06:42:00	06:53:00	07:08:00	07:13:00	07:19:00	07:38:00	07:44:00	07:59:00	08:08:00
Newport	dep	00:08:30	01:30:00	01:58:30	03:03:30	x	04:34:00	04:39:00	05:33:00	06:09:00	06:02:30	06:28:00	06:40:00	06:44:00	06:55:00	07:10:00	07:14:00	07:23:00	07:40:00	07:44:00	08:02:00	08:10:00
Maindee West Junction	dep	00:12:30	01:32:30	01:56:00	03:05:30	x	04:36:00	04:40:30	05:35:00	06:10:30	06:04:00	06:29:00	06:41:30	06:45:30	06:56:00	07:11:30	07:16:00	07:25:00	07:41:30	07:46:30	08:03:00	08:11:30
Llanwern West Junction	dep	00:17:00	01:35:30	01:50:00	03:09:30	04:00:00	04:39:00	04:52:00	05:38:00	06:12:30	06:08:00	06:31:00	06:43:30	06:47:30	06:58:00	07:13:30	07:18:00	07:27:00	07:44:30	07:48:30	08:05:00	08:13:30
Magor	dep	00:22:00	01:41:30	02:45:00	03:17:30	04:06:30	04:46:30	x	05:43:30	06:16:30	06:21:00	06:35:30	06:47:30	06:51:30	07:02:00	07:17:30	07:21:30	07:34:00	07:48:30	07:53:00	08:10:00	08:17:30
Magor & Undy WW	arr	00:22:30	01:42:00	02:45:30	03:18:00	04:07:00	04:47:00	x	05:44:00	06:17:00	06:21:30	06:36:00	06:48:00	06:52:00	07:02:30	07:18:00	07:22:00	07:34:30	07:49:00	07:53:30	08:10:30	08:18:00
Magor & Undy WW	dep	00:22:30	01:42:00	02:45:30	03:18:00	04:07:00	04:47:00	x	05:44:00	06:17:00	06:21:30	06:36:30	06:48:00	06:52:30	07:02:30	07:18:00	07:22:30	07:35:00	07:49:00	07:53:30	08:10:30	08:18:00
Severn Tunnel Junction	arr	x	x	x	x	x	x	x	x	x	x	06:39:00	x	06:55:00	07:05:00	x	07:25:00	07:39:00	x	07:56:00	x	x
Severn Tunnel Junction	dep	00:24:00	01:44:00	02:47:30	03:21:00	04:09:30	04:50:00	05:08:00	05:46:00	06:18:00	06:27:00	06:40:00	06:49:00	06:56:00	07:05:00	07:19:00	07:26:00	07:39:00	07:50:00	07:56:00	08:12:30	08:19:00
Severn Tunnel West	dep	00:25:00	01:45:30	02:48:30	03:22:00	04:10:30	04:51:00	05:15:30	05:48:00	06:19:00	06:28:00	x	06:50:00	06:58:00	x	07:20:00	07:27:00	x	07:51:00	07:58:30	x	08:20:00
Severn Tunnel East	dep	00:30:00	01:51:30	02:54:30	03:28:00	04:16:30	04:55:00	x	05:53:00	06:22:30	06:33:00	x	06:53:30	07:02:00	x	07:23:30	07:31:00	x	07:54:30	08:02:30	x	08:23:30
Pilning	dep	00:32:00	02:00:00	02:58:30	03:32:00	04:20:00	04:56:00	05:29:30	05:54:30	06:23:30	06:35:00	x	06:54:30	07:03:00	x	07:25:30	07:32:30	x	07:55:30	08:03:30	x	08:24:30
Patchway	dep	00:37:00	02:13:30	03:10:30	03:45:00	04:27:30	05:01:30	05:48:30	05:58:30	06:27:30	06:46:00	x	06:58:30	07:09:00	x	07:28:30	07:38:00	x	07:58:30	08:08:00	x	08:28:30
Chepstow	dep	x	x	x	x	x	x	x	x	x	x	06:51:00	x	x	07:16:00	x	x	07:50:00	x	x	08:19:30	x
Lydney	dep	x	x	x	x	x	x	x	x	x	x	07:00:00	x	x	07:25:00	x	x	07:59:00	x	x	08:25:00	x
Awre	dep	x	x	x	x	x	x	x	x	x	x	07:06:30	x	x	07:31:00	x	x	08:06:30	x	x	08:34:00	x
Gloucester	dep	x	x	x	x	x	x	x	x	x	x	07:23:00	x	x	07:46:00	x	x	08:22:00	x	x	08:49:00	x
Impact compared with Dec 2017 SX												00:01:00		00:01:00			00:01:00	00:01:00				

Headcode		2C67	1L34	1F07	1M01	1L38	2C69	2G54	1L42	1F09	1M60	1L46	6C41	2C71	2G56	1L48	1F11	1M94	1L51	2C73	4K99	1L52
Origin		Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central	Carmarthen	Cardiff Central	Cardiff Central	Cardiff Central	Robeston Sdgs	Cardiff Central	Maesteg	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Aberthaw Rec Sdgs	Swansea
Destination		Paignton	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Penzance	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Westerleigh Murco	Taunton	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Taunton	Eastleigh Works-alston-fl	London Paddington
Cardiff Central	arr	x	08:23:00	x	x	08:53:00	x	08:48:00	09:23:00	x	x	x	x	x	10:07:00	10:23:00	x	x	x	x	x	11:23:00
Cardiff Central	dep	08:00:00	08:26:00	08:30:00	08:45:00	08:56:00	09:00:00	09:12:00	09:26:00	09:30:00	09:45:00	09:56:00	09:39:00	10:00:00	10:09:00	10:26:00	10:30:00	10:45:00	10:56:00	11:00:00	11:01:30	11:26:00
Marshfield	dep	08:08:00	08:32:30	08:37:00	08:52:30	09:02:30	09:08:00	09:19:30	09:32:30	09:37:00	09:52:30	10:02:30	09:51:00	10:07:30	10:17:00	10:32:30	10:37:30	10:52:30	11:02:30	11:07:30	11:12:00	11:32:30
Ebbw Jn	dep	08:11:00	08:35:00	08:39:30	08:55:00	09:05:00	09:11:00	09:23:00	09:35:00	09:39:30	09:55:00	10:05:30	09:59:00	10:10:30	10:20:30	10:35:00	10:41:00	10:55:00	11:05:00	11:10:30	11:15:00	11:35:00
Newport	arr	08:14:00	08:38:00	08:42:00	08:58:00	09:08:00	09:14:00	09:26:00	09:38:00	09:42:00	09:58:00	10:09:00	x	10:13:00	10:23:00	10:38:00	10:43:00	10:58:00	11:08:00	11:13:00	x	11:38:00
Newport	dep	08:15:00	08:40:00	08:44:00	09:00:00	09:10:00	09:15:00	09:28:00	09:40:00	09:44:00	10:00:00	10:10:00	10:02:00	10:15:00	10:27:00	10:40:00	10:45:00	11:00:00	11:10:00	11:15:00	11:21:00	11:40:00
Maindee West Junction	dep	08:16:30	08:41:30	08:45:30	09:01:00	09:11:30	09:16:30	09:29:00	09:41:30	09:45:30	10:01:00	10:12:00	10:03:30	10:16:00	10:28:00	10:41:30	10:46:30	11:01:00	11:11:30	11:16:00	11:22:30	11:41:30
Llanwern West Junction	dep	08:18:30	08:43:30	08:47:30	09:03:00	09:13:30	09:18:30	09:31:00	09:43:30	09:47:30	10:03:00	10:14:00	10:08:00	10:18:00	10:30:00	10:43:30	10:48:30	11:03:00	11:13:30	11:18:00	11:24:30	11:43:30
Magor	dep	08:23:00	08:47:30	08:51:30	09:08:00	09:17:30	09:23:00	09:36:00	09:47:30	09:51:30	10:08:00	10:18:00	10:19:00	10:24:00	10:34:30	10:47:30	10:53:00	11:08:00	11:17:30	11:22:30	11:29:00	11:47:30
Magor & Undy WW	arr	08:23:30	08:48:00	08:52:00	09:08:30	09:18:00	09:23:30	09:36:30	09:48:00	09:52:00	10:08:30	10:18:30	10:19:30	10:24:30	10:35:00	10:48:00	10:53:30	11:08:30	11:18:00	11:23:00	11:29:30	11:48:00
Magor & Undy WW	dep	08:24:00	08:48:00	08:52:00	09:08:30	09:18:00	09:24:00	09:37:00	09:48:00	09:52:00	10:08:30	10:18:30	10:19:30	10:25:00	10:35:30	10:48:00	10:53:30	11:08:30	11:18:00	11:23:30	11:29:30	11:48:00
Severn Tunnel Junction	arr	08:27:00	x	08:54:00	x	x	09:27:00	09:38:00	x	09:54:00	x	x	x	10:27:30	10:38:00	x	x	x	x	11:26:00	x	x
Severn Tunnel Junction	dep	08:27:00	08:49:00	08:55:00	09:10:00	09:19:00	09:27:00	09:39:00	09:49:00	09:55:00	10:10:00	10:19:30	10:24:00	10:28:30	10:39:00	10:49:00	10:55:00	11:10:00	11:19:00	11:27:00	11:31:00	11:49:00
Severn Tunnel West	dep	08:29:30	08:50:00	08:57:00	x	09:20:00	09:29:30	x	09:50:00	09:57:00	x	10:20:30	x	10:30:30	x	10:50:00	10:56:00	x	11:20:00	11:29:00	11:34:00	11:50:00
Severn Tunnel East	dep	08:33:30	08:53:30	09:01:00	x	09:23:30	09:33:30	x	09:53:30	10:01:00	x	10:24:00	x	10:34:30	x	10:53:30	11:00:00	x	11:23:30	11:33:00	11:40:30	11:53:30
Pilning	dep	08:34:30	08:54:30	09:02:00	x	09:24:30	09:34:30	x	09:54:30	10:02:00	x	10:25:00	x	10:35:30	x	10:54:30	11:01:00	x	11:25:30	11:34:00	11:44:00	11:54:30
Patchway	dep	08:40:00	08:58:30	09:06:30	x	09:28:30	09:40:00	x	09:58:30	10:06:30	x	10:29:00	x	10:41:30	x	10:58:30	11:04:30	x	11:28:30	11:40:00	11:53:30	11:58:30
Chepstow	dep	x	x	x	09:18:00	x	x	09:50:00	x	x	10:18:00	x	10:34:00	x	10:50:00	x	x	11:16:30	x	x	x	x
Lydney	dep	x	x	x	09:25:30	x	x	09:59:00	x	x	10:25:30	x	10:48:00	x	10:59:00	x	x	11:25:00	x	x	x	x
Awre	dep	x	x	x	09:30:30	x	x	10:07:00	x	x	10:30:30	x	10:56:30	x	11:05:30	x	x	11:31:00	x	x	x	x
Gloucester	dep	x	x	x	09:50:00	x	x	10:22:00	x	x	10:50:00	x	11:14:30	x	11:22:00	x	x	11:50:00	x	x	x	x
Impact compared with Dec 2017 SX		00:01:00					00:01:00	00:01:00						00:02:30	00:01:00					00:01:00		



Headcode		1F13	1M64	1L54	2C75	2G58	1L55	1F17	1M99	1L60	2C77	2G60	1L62	1F19	4L65	4L50	1M68	1L65	2C79	1L66	1F23	1M98
Origin		Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Maesteg	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Maesteg	Swansea	Cardiff Central	Wentloog (Freightline rs)	Margam T.C.	Cardiff Central	Cardiff Central	Cardiff Central	Swansea	Cardiff Central	Cardiff Central
Destination		Portsmouth Harbour	Nottingham	London Paddington	Taunton	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Exeter St Davids	Gloucester	London Paddington	Portsmouth Harbour	Southampton M.C.T.	York Holgate Siding (Flhh)	Nottingham	London Paddington	Taunton	London Paddington	Portsmouth Harbour	Nottingham
Cardiff Central	arr	0 x	x	x	x	12:08:00	12:23:00	x	x	x	x	13:08:00	13:23:00	x	x	x	x	x	x	14:23:00	x	x
Cardiff Central	dep	11:30:00	11:45:00	11:56:00	12:00:00	12:12:00	12:26:00	12:30:00	12:45:00	12:56:00	13:00:00	13:12:00	13:26:00	13:30:00	x	13:15:00	13:45:00	13:56:00	14:00:00	14:26:00	14:30:00	14:45:00
Marshfield	dep	11:37:00	11:52:30	12:02:30	12:07:30	12:19:30	12:32:30	12:37:00	12:52:30	13:02:30	13:08:00	13:19:30	13:32:30	13:37:00	13:33:00	13:37:30	13:52:30	14:02:30	14:07:30	14:32:30	14:37:00	14:52:30
Ebbw Jn	dep	11:39:30	11:55:00	12:05:00	12:10:30	12:24:00	12:35:00	12:39:30	12:55:00	13:05:00	13:11:30	13:25:00	13:35:00	13:39:30	13:37:00	13:42:00	13:55:00	14:05:00	14:10:30	14:35:00	14:39:30	14:55:00
Newport	arr	11:42:00	11:59:00	12:08:00	12:13:00	12:27:00	12:38:00	12:42:00	12:59:00	13:08:00	13:14:00	13:28:00	13:38:00	13:42:00	x	x	13:58:00	14:08:00	14:13:00	14:38:00	14:42:00	14:58:00
Newport	dep	11:44:00	12:00:00	12:10:00	12:15:00	12:28:00	12:40:00	12:44:00	13:01:00	13:10:00	13:16:00	13:28:00	13:40:00	13:44:00	13:40:00	13:46:30	14:00:00	14:10:00	14:15:00	14:40:00	14:44:00	15:00:00
Maindee West Junction	dep	11:45:30	12:03:00	12:11:30	12:16:00	12:29:30	12:41:30	12:45:30	13:02:30	13:11:30	13:17:00	13:30:30	13:41:30	13:45:30	13:42:00	13:48:00	14:01:00	14:11:30	14:16:00	14:41:30	14:45:30	15:02:00
Llanwern West Junction	dep	11:47:30	12:05:00	12:13:30	12:18:00	12:31:30	12:43:30	12:47:30	13:04:30	13:13:30	13:19:00	13:32:30	13:43:30	13:47:30	13:46:00	13:50:00	14:03:00	14:13:30	14:18:00	14:43:30	14:47:30	15:04:00
Magor	dep	11:52:00	12:09:00	12:17:30	12:22:30	12:36:00	12:47:30	12:52:00	13:08:30	13:17:30	13:23:30	13:37:00	13:47:30	13:51:30	13:54:30	13:59:30	14:08:00	14:17:30	14:22:30	14:47:30	14:51:30	15:08:00
Magor & Undy WW	arr	11:52:30	12:09:30	12:18:00	12:23:00	12:36:30	12:48:00	12:52:30	13:09:00	13:18:00	13:24:00	13:37:30	13:48:00	13:52:00	13:55:00	14:00:00	14:08:30	14:18:00	14:23:00	14:48:00	14:52:00	15:08:30
Magor & Undy WW	dep	11:52:30	12:09:30	12:18:00	12:23:30	12:37:00	12:48:00	12:52:30	13:09:00	13:18:00	13:24:30	13:38:00	13:48:00	13:52:00	13:55:00	14:00:00	14:08:30	14:18:00	14:23:30	14:48:00	14:52:00	15:08:30
Severn Tunnel Junction	arr	x	x	x	12:26:00	12:40:00	x	x	x	x	13:27:00	13:40:00	x	x	x	x	x	x	14:26:00	x	x	x
Severn Tunnel Junction	dep	11:54:00	12:11:00	12:19:00	12:27:00	12:40:00	12:49:00	12:54:00	13:10:30	13:19:00	13:28:00	13:40:00	13:49:00	13:53:30	13:58:00	14:03:30	14:10:00	14:19:00	14:27:00	14:49:00	14:53:30	15:10:00
Severn Tunnel West	dep	11:55:00	x	12:20:00	12:29:00	x	12:50:00	12:55:00	x	13:20:00	13:30:00	x	13:50:00	13:55:00	13:59:30	14:04:30	x	14:20:00	14:29:00	14:50:00	14:54:30	x
Severn Tunnel East	dep	11:59:00	x	12:23:30	12:33:00	x	12:53:30	12:59:00	x	13:23:30	13:34:00	x	13:53:30	13:59:00	14:04:00	14:09:00	x	14:23:30	14:33:00	14:53:30	14:58:30	x
Pilning	dep	12:00:00	x	12:24:30	12:34:00	x	12:54:30	13:00:00	x	13:24:30	13:35:00	x	13:54:30	14:00:00	14:06:00	14:10:30	x	14:24:30	14:34:00	14:54:30	14:59:30	x
Patchway	dep	12:04:30	x	12:28:30	12:40:00	x	12:58:30	13:04:30	x	13:28:30	13:41:00	x	13:58:30	14:04:30	14:14:30	14:18:30	x	14:28:30	14:40:00	14:58:30	15:04:00	x
Chepstow	dep	x	12:18:00	x	x	12:52:00	x	x	13:18:00	x	x	13:53:00	x	x	x	x	14:16:30	x	x	x	x	15:18:00
Lydney	dep	x	12:26:30	x	x	13:01:00	x	x	13:26:00	x	x	14:02:00	x	x	x	x	14:25:00	x	x	x	x	15:25:30
Awre	dep	x	12:31:30	x	x	13:07:00	x	x	13:31:00	x	x	14:08:00	x	x	x	x	14:31:00	x	x	x	x	15:30:30
Gloucester	dep	x	12:48:00	x	x	13:23:00	x	x	13:50:00	x	x	14:23:00	x	x	x	x	14:50:00	x	x	x	x	15:50:00
Impact compared with Dec 2017 SX					00:01:00	00:01:00					00:01:00	00:01:00							00:01:00			

Headcode		6F76	1L68	2C81	2G62	1L71	1F25	1M73	1L74	2C83	2G64	1L76	4M07	1M75	1L82	2C85	2G66	1L86	1F29	1M95	1L88	2C87
Origin		Margam T.C.	Cardiff Central	Cardiff Central	Maesteg	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Cardiff Central	Maesteg	Swansea	Wentloog (Freightline rs)	Cardiff Central	Cardiff Central	Cardiff Central	Maesteg	Swansea	Newport (South Wales)	Cardiff Central	Cardiff Central	Cardiff Central
Destination		Round Oak	London Paddington	Taunton	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Taunton	Cheltenham Spa	London Paddington	Southampton M.C.T.	Nottingham	London Paddington	Taunton	Cheltenham Spa	London Paddington	Portsmouth Harbour	Nottingham	London Paddington	Taunton
Cardiff Central	arr	x	x	x	15:06:00	15:23:00	x	x	x	x	16:09:00	16:23:00	x	x	x	x	17:06:00	17:23:00	11:37:00	x	x	x
Cardiff Central	dep	12:43:00	14:56:00	15:00:00	15:12:00	15:26:00	15:30:00	15:45:00	15:56:00	16:00:00	16:10:00	16:26:00	x	16:45:00	16:56:00	17:00:00	17:12:00	17:26:00	x	17:45:00	17:56:00	18:00:00
Marshfield	dep	12:54:30	15:02:30	15:07:30	15:19:30	15:32:30	15:37:00	15:52:30	16:02:30	16:07:30	16:18:00	16:32:30	16:34:00	16:52:00	17:02:30	17:07:30	17:19:30	17:32:30	x	17:53:30	18:02:30	18:08:00
Ebbw Jn	dep	12:59:30	15:05:00	15:11:00	15:23:30	15:35:00	15:39:30	15:55:30	16:05:00	16:11:00	16:21:30	16:35:00	16:38:00	16:54:30	17:05:00	17:11:00	17:23:00	17:35:00	x	17:56:00	18:05:00	18:11:30
Newport	arr	x	15:08:00	15:14:00	15:27:00	15:38:00	15:43:00	15:58:00	16:08:00	16:14:00	16:24:00	16:38:00	x	16:58:00	17:08:00	17:14:00	17:26:00	17:38:00	x	17:59:00	18:08:00	18:14:00
Newport	dep	13:04:30	15:10:00	15:15:00	15:28:00	15:40:00	15:44:00	16:00:00	16:10:00	16:15:00	16:27:00	16:40:00	16:41:00	17:00:00	17:10:00	17:15:00	17:28:00	17:40:00	17:46:00	18:00:00	18:10:00	18:16:00
Maindee West Junction	dep	13:06:30	15:11:30	15:16:30	15:29:30	15:41:30	15:46:00	16:01:00	16:11:30	16:16:30	16:28:00	16:41:30	16:42:30	17:01:00	17:11:30	17:16:30	17:29:00	17:41:30	17:47:00	18:01:30	18:11:30	18:17:00
Llanwern West Junction	dep	13:10:30	15:13:30	15:18:30	15:31:30	15:43:30	15:48:00	16:03:00	16:13:30	16:18:30	16:30:00	16:43:30	16:46:30	17:03:00	17:13:30	17:18:30	17:31:00	17:43:30	17:49:00	18:03:30	18:13:30	18:19:00
Magor	dep	x	15:18:00	15:23:00	15:36:00	15:47:30	15:52:00	16:08:00	16:17:30	16:23:00	16:34:30	16:47:30	16:56:00	17:07:00	17:17:30	17:23:00	17:35:30	17:47:30	17:53:30	18:08:30	18:17:30	18:23:30
Magor & Undy WW	arr	x	15:18:30	15:23:30	15:36:30	15:48:00	15:52:30	16:08:30	16:18:00	16:23:30	16:35:00	16:48:00	16:56:30	17:07:30	17:18:00	17:23:30	17:36:00	17:48:00	17:54:00	18:09:00	18:18:00	18:24:00
Magor & Undy WW	dep	x	15:18:30	15:24:00	15:37:00	15:48:00	15:52:30	16:08:30	16:18:00	16:24:00	16:35:30	16:48:00	16:56:30	17:07:30	17:18:00	17:24:00	17:36:30	17:48:00	17:54:00	18:09:00	18:18:00	18:24:30
Severn Tunnel Junction	arr	x	x	15:27:00	15:38:00	x	x	x	x	16:27:00	16:38:00	x	x	x	x	17:27:00	17:39:00	x	17:56:00	x	x	18:27:00
Severn Tunnel Junction	dep	15:17:00	15:20:00	15:27:00	15:38:00	15:49:00	15:54:00	16:10:00	16:19:00	16:27:00	16:39:00	16:49:00	17:00:30	17:09:00	17:19:00	17:27:00	17:40:00	17:49:00	17:57:00	18:10:30	18:19:00	18:28:00
Severn Tunnel West	dep	x	15:21:00	15:29:30	x	15:50:00	15:55:00	x	16:20:00	16:29:30	x	16:50:00	17:03:30	x	17:20:00	17:29:30	x	17:50:00	17:59:00	x	18:20:00	18:30:00
Severn Tunnel East	dep	x	15:24:30	15:33:30	x	15:53:30	15:59:00	x	16:23:30	16:33:30	x	16:53:30	17:08:00	x	17:23:30	17:33:30	x	17:53:30	18:03:00	x	18:23:30	18:34:00
Pilning	dep	x	15:25:30	15:34:30	x	15:54:30	16:00:00	x	16:24:30	16:34:30	x	16:54:30	17:12:00	x	17:24:30	17:34:30	x	17:54:30	18:04:00	x	18:24:30	18:35:00
Patchway	dep	x	15:28:30	15:40:00	x	15:58:30	16:04:30	x	16:28:30	16:40:00	x	16:58:30	17:24:30	x	17:28:30	17:40:00	x	17:58:30	18:08:30	x	18:28:30	18:41:00
Chepstow	dep	15:26:00	x	x	15:51:00	x	x	16:18:00	x	x	16:50:00	x	x	17:15:30	x	x	17:51:00	x	x	18:18:00	x	x
Lydney	dep	15:37:00	x	x	16:00:00	x	x	16:25:30	x	x	16:59:00	x	x	17:25:00	x	x	18:00:00	x	x	18:26:00	x	x
Awre	dep	15:43:00	x	x	16:07:00	x	x	16:30:30	x	x	17:05:30	x	x	17:31:00	x	x	18:06:30	x	x	18:31:00	x	x
Gloucester	dep	x	x	x	16:23:00	x	x	16:50:00	x	x	17:24:00	x	x	17:50:00	x	x	18:22:00	x	x	18:46:00	x	x
Impact compared with Dec 2017 SX				00:01:00	00:01:00					00:01:00	00:01:00					00:01:00	00:01:00					00:01:00

Headcode		2G68	1L90	1F31	1M84	2C89	6G88	4M02	1L92	1F99	1M85	2C91	6G39	1L94	1F37	5Z72	6O23	2C34	1M87	6I08	2G72	5C00
Origin		Maesteg	Swansea	Cardiff Central	Cardiff Central	Cardiff Central	Margam T.C.	Wentloog (Freightline rs)	Swansea	Newport (South Wales)	Cardiff Central	Cardiff Central	Onllwyn Washery	Swansea	Cardiff Central	Cardiff Canton Sidings	Llanwern Exchange Gbrf	Cardiff Central	Cardiff Central	Cardiff Tidal T.C.	Maesteg	Cardiff Central
Destination		Cheltenham Spa	London Paddington	Portsmouth Harbour	Birmingham New Street	Taunton	Hartlepool Bsc 20" Mill	Daventry Drs (Tesco)	London Paddington	Portsmouth Harbour	Gloucester	Taunton	Immingham S.S. (West Recn)	London Paddington	Portsmouth Harbour	Gloucester	Grain Thamesport (Gbrf)	Westbury	Birmingham New Street	Southall T.C.	Cheltenham Spa	Bristol Barton Hill W.R.D.
Cardiff Central	arr	18:06:00	18:23:00 x	x	x	x	x	x	19:23:00	x	x	x	x	20:23:00	x	20:47:30	x	x	x	x	21:08:00	x
Cardiff Central	dep	18:08:00	18:26:00	18:30:00	18:45:00	19:00:00	17:10:30 x		19:26:00	19:30:00	19:45:00	20:00:00	19:50:00	20:26:00	20:30:00	20:49:00	x	21:00:00	21:05:00	x	21:12:00	21:21:00
Marshfield	dep	18:16:00	18:32:30	18:37:00	18:53:00	19:07:30	17:21:00	19:02:00	19:32:30	x	19:52:00	20:08:00	20:01:00	20:32:30	20:37:00	20:57:00	x	21:07:30	21:12:00	20:51:00	21:19:30	21:27:30
Ebbw Jn	dep	18:19:30	18:35:00	18:39:30	18:55:30	19:11:00	17:32:00	19:08:00	19:35:00	x	19:54:30	20:11:30	20:06:30	20:35:00	20:39:30	21:01:00	x	21:11:00	21:15:00	x	21:23:00	21:31:00
Newport	arr	18:22:00	18:38:00	18:42:00	18:58:00	19:14:00	x	x	19:38:00	x	19:58:00	20:14:00	x	20:38:00	20:44:00	x	x	21:14:00	21:18:00	x	21:26:00	x
Newport	dep	18:24:00	18:40:00	18:44:00	19:00:00	19:15:00	17:44:00	19:11:00	19:40:00	19:44:00	20:00:00	20:16:00	20:18:30	20:40:00	20:44:00	21:03:30	x	21:15:00	21:21:00	21:14:00	21:27:00	21:34:30
Maindee West Junction	dep	18:25:00	18:41:30	18:45:30	19:02:00	19:16:30	17:46:00	19:13:00	19:41:30	19:45:30	20:01:00	20:17:00	20:20:30	20:41:30	20:46:30	21:04:30	x	21:16:30	21:22:30	21:15:30	21:28:30	21:35:30
Llanwern West Junction	dep	18:27:00	18:43:30	18:47:30	19:04:00	19:18:30	17:50:00	19:22:00	19:43:30	19:47:30	20:03:00	20:19:00	20:24:30	20:43:30	20:48:30	21:06:30	x	21:18:30	21:24:30	21:20:00	21:30:30	21:37:30
Magor	dep	18:31:30	18:47:30	18:51:30	19:08:00	19:23:00	x	19:36:30	19:47:30	19:52:00	20:07:00	20:23:30	20:33:00	20:47:30	20:52:30	21:12:30	21:13:00	21:23:00	21:28:30	21:28:00	21:35:00	21:41:00
Magor & Undy WW	arr	18:32:00	18:48:00	18:52:00	19:08:30	19:23:30	x	19:37:00	19:48:00	19:52:30	20:07:30	20:24:00	20:33:30	20:48:00	20:53:00	21:13:00	21:13:30	21:23:30	21:29:00	21:28:30	21:35:30	21:41:30
Magor & Undy WW	dep	18:32:30	18:48:00	18:52:00	19:08:30	19:24:00	x	19:37:00	19:48:00	19:52:30	20:08:00	20:24:30	20:33:30	20:48:00	20:53:00	21:13:00	21:13:30	21:24:00	21:29:00	21:28:30	21:36:00	21:41:30
Sewern Tunnel Junction	arr	18:35:00	x	18:54:00	x	19:27:00	x	x	x	x	20:11:00	20:27:00	x	x	x	x	x	21:27:00	x	x	21:39:00	x
Sewern Tunnel Junction	dep	18:36:00	18:49:00	18:55:00	19:10:00	19:27:00	19:38:00	19:43:00	19:49:00	19:54:00	20:11:00	20:28:00	20:36:30	20:49:00	20:54:30	21:15:00	21:17:00	21:27:00	21:30:30	21:31:30	21:39:00	21:42:30
Sewern Tunnel West	dep	x	18:50:00	18:57:00	x	19:29:30	x	x	19:50:00	19:55:00	x	20:31:00	x	20:50:00	20:55:30	x	21:18:00	21:29:30	x	21:32:30	x	21:44:30
Sewern Tunnel East	dep	x	18:53:30	19:01:00	x	19:33:30	x	x	19:53:30	19:59:00	x	20:35:00	x	20:53:30	20:59:30	x	21:24:00	21:33:30	x	21:38:30	x	21:48:30
Pilning	dep	x	18:54:30	19:02:00	x	19:34:30	x	x	19:54:30	20:00:00	x	20:36:00	x	20:54:30	21:00:30	x	x	21:34:30	x	23:22:30	x	x
Patchway	dep	x	18:58:30	19:06:30	x	19:40:00	x	x	19:58:30	20:04:30	x	20:41:00	x	20:58:30	21:05:00	x	21:46:30	21:40:00	x	23:31:00	x	22:16:30
Chepstow	dep	18:47:00	x	x	19:17:00	x	19:46:00	19:51:30	x	x	20:22:00	x	20:47:30	x	x	21:22:00	x	x	21:37:00	x	21:51:00	x
Lydney	dep	18:56:00	x	x	19:25:30	x	19:56:00	x	x	x	20:31:00	x	21:00:30	x	x	21:32:30	x	x	21:44:00	x	22:00:00	x
Awre	dep	19:02:30	x	x	19:30:30	x	20:02:00	20:11:00	x	x	20:37:00	x	21:11:30	x	x	21:37:30	x	x	21:49:00	x	22:06:00	x
Gloucester	dep	19:22:00	x	x	19:45:00	x	20:22:00	20:27:00	x	x	20:55:00	x	21:38:00	x	x	21:58:00	x	x	22:04:00	x	22:24:00	x
Impact compared with Dec 2017 SX		00:01:00				00:01:00					-4.00	00:01:00						00:01:00			00:01:00	

Headcode		1L96	6G66	2C94	1M89	2C95	5W03	2C96	6I22	6I12	2G74	2C97						
Origin		Swansea	Margam T.C.	Cardiff Central	Cardiff Central	Cardiff Central	Hereford	Cardiff Central	Moreton-on-lugg (Tarmac)	Maindee Depot (Su Ce)	Maesteg	Cardiff Central						
Destination		Bristol Temple Meads	Middlesbro' Dawson Ayrton	Bristol Temple Meads	Birmingham New Street	Bristol Temple Meads	St Phillips Mrsh H S T D	Bristol Temple Meads	Hothfield Siding	Chepstow	Gloucester	Bristol Temple Meads						
Cardiff Central	arr	21:23:00 x	x	x	x	x	06:28:00 x	x	x	x	23:09:00 x							
Cardiff Central	dep	21:26:00	18:46:30	21:30:00	21:50:00	22:04:00 x		22:36:00 x	x	x	23:20:00	23:27:00						
Marshfield	dep	21:32:30	18:57:00	21:37:30	21:57:00	22:11:00 x		22:45:00 x	x	x	23:27:00	23:35:30						
Ebbw Jn	dep	21:35:00	19:02:00	21:41:00	22:00:30	22:14:30 x		22:48:30 x	x	x	23:31:00	23:40:30						
Newport	arr	21:38:00 x		21:43:00	22:03:00	22:18:00 x		22:52:00 x	x	x	23:33:00	23:44:00						
Newport	dep	21:40:00	19:22:00	21:45:00	22:05:00	22:20:00 x		22:54:00 x	x	x	23:38:00	23:45:00						
Maindee West Junction	dep	21:41:30	19:24:00	21:46:30	22:06:00	22:22:00 x		22:56:00 x	x	x	23:39:00	23:48:00						
Llanwern West Junction	dep	21:43:30	19:28:00	21:48:30	22:08:00	22:27:00	22:33:30	22:59:00	23:07:00	23:29:00	23:41:00	23:51:00						
Magor	dep	21:47:30 x		21:53:00	22:12:00	22:33:00	22:42:00	23:05:30	23:14:30	23:36:30	23:47:30	23:58:00						
Magor & Undy WW	arr	21:48:00 x		21:53:30	22:12:30	22:33:30	22:42:30	23:06:00	23:15:00	23:37:00	23:48:00	23:58:30						
Magor & Undy WW	dep	21:48:00 x		21:53:30	22:12:30	22:34:00	22:42:30	23:06:00	23:15:00	23:37:00	23:48:30	23:59:00						
Severn Tunnel Junction	arr	x	x	21:55:00 x		22:38:00 x		23:09:00 x		23:40:00	23:55:00	00:03:00						
Severn Tunnel Junction	dep	21:49:00	21:50:00	21:56:00	22:14:00	22:38:00	22:46:00	23:11:00	23:18:00	23:40:00	23:59:00	00:04:00						
Severn Tunnel West	dep	21:50:00 x		21:58:30 x		22:40:30	22:49:00	23:13:30	23:19:00 x	x		00:07:00						
Severn Tunnel East	dep	21:53:30 x		22:02:30 x		22:44:30	22:53:00	23:17:30	23:25:30 x	x		00:11:00						
Pilning	dep	21:54:30 x		22:03:30 x		22:45:30	22:54:00	23:18:30	23:29:00 x	x		00:12:00						
Patchway	dep	21:58:30 x		22:08:00 x		22:51:00	23:00:00	23:23:00	23:56:00 x	x		00:17:00						
Chepstow	dep	x	21:58:00 x		22:20:30 x	x	x	x		23:50:00	00:11:00 x							
Lydney	dep	x	x	x	22:27:30 x	x	x	x	x		00:20:00 x							
Awre	dep	x	22:53:00 x		22:32:30 x	x	x	x	x		00:26:00 x							
Gloucester	dep	x	23:09:00 x		22:47:00 x	x	x	x	x		00:40:00 x							
Impact compared with Dec 2017 SX						00:01:00					00:01:00	00:01:00						

**Key:**

Train having Magor and Undy walkway call inserted

Other train requiring retiming

Passenger train timed on relief lines

Passenger train timed on relief lines (due to impact of Magor and Undy call)

## Existing freight services requiring adjustment for assumed hourly base passenger services

Freight services which will need to be adjusted to facilitate the operation of an hourly Cardiff-Cheltenham stopping passenger service as assumed in the 'Do Minimum' and base for the 'Do Something' economic cases.

**Table 14: Freight services requiring adjustment**

Headcode	Service	Days run <sup>13</sup>	Cat-egory <sup>14</sup>	Time at Severn Tunnel Junction	Status
Westbound adjustments required:					
4V59	0429 Southampton MCT - Wentloog	MSX	Q	07:47	In Working Timetable
6F97	1300 Theale Murco - Robeston Sdgs	Dated	Q	16:41	Ran on Tues 27 March
Eastbound adjustments required:					
6G88	1621 Margam T.C. - Hartlepool 20" Mill	FSX		19:38	Ran on Tues 27 March
4M02	1858 Wentloog - Daventry DRS	SX		19:43	Ran on Tues 27 March
6G39	1354 Onllwyn Washery - Immingham S.S. (West Recp)	TuThu O		20:36	Ran on Tues 27 March

<sup>13</sup> MSX: Mondays and Saturdays excepted; FSX: Fridays and Saturdays excepted; SX: Saturdays excepted; TuThuO: Tuesdays and Thursdays only.

<sup>14</sup> Q: Q path trains run 'as required'. Other services may also run under 'short term planning' arrangements, as evidenced in Table 14.

## **F. CDM Client Guide**

See attached a summary of client duties under CDM 2015.

A more comprehensive guide entitled, “CDM 2015 – Industry Guidance for Clients” is freely available online from the Construction Industry Training Board (CITB).



**CONSTRUCTION**  
(DESIGN & MANAGEMENT)  
**REGULATIONS**

**2015**

**A QUICK GUIDE FOR CLIENTS**



**Committed  
to Safety**



The CDM Regulations changed on 6 April 2015. This brief guide provides you with a summary of the key changes and how they affect your projects.

## WHAT ARE THE KEY CHANGES?

- Structural simplification of the regulations.
- Enhanced client duties.
- The removal of the role of CDM co-ordinator.
- The creation of a new role of principal designer.
- Splitting competence assessment into its component parts of skills, knowledge, training, experience and organisational capability.
- Separation of the threshold for appointment of duty holders from notification requirements.
- Appointment of a principal designer and principal contractor if there is more than one contractor working on a project.
- Changes to the notification criteria – see below.
- Removing the exemption for domestic clients.



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## WHAT YOU NEED TO DO AS A CLIENT UNDER CDM2015

- Make and maintain suitable arrangements for the management of health and safety on the project including ensuring sufficient resources and time have been allocated.
- Formally appoint a principal designer and a principal contractor (unless there is only one contractor). **If you fail to appoint a principal designer and/or a principal contractor then you must fulfil their legal duties.**
- Take reasonable steps to ensure your principal designer and principal contractor comply with their duties.
- Provide pre-construction information to every designer and contractor appointed, **or being considered for appointment**, to the project.
- Notify the project to the relevant enforcing authority.
- Ensure that a project specific construction phase plan is prepared prior to the start of construction, and that arrangements for suitable welfare facilities are in place.
- Ensure that a suitable Health and Safety File is in place.

### NOTIFICATION OF A PROJECT UNDER CDM2015:

**A project is notifiable if the construction work is scheduled to:**

- Last longer than 30 working days and have more than 20 workers working simultaneously at any point in the project; or
- Exceed 500 person days.

**Under CDM2015 it will be a client duty to submit the notice in writing to the appropriate enforcing authority as soon as is practicable before the construction phase begins.**

## WHAT YOU SHOULD DO NEXT...

Seek appropriate health and safety advice to determine your strategy for implementing CDM2015 to ensure you comply with the enhanced client duties, including:

- How your projects are affected by the regulations.
- How and when you wish to appoint principal designers on your projects.  
**Your principal designer will be the designer with control over the preconstruction phase of your project.**
- How you will continue to ensure health and safety standards are maintained throughout the lifetime of your project.

For more detailed information about the CDM regulations and how Mott MacDonald can assist you please contact us. Our project teams are supported by a regional and sector specific network of health and safety professionals.

### **YOUR KEY MOTT MACDONALD CONTACT:**

**Name:**

**T:**

**E:**

### **USEFUL WEB LINKS:**

#### **The Health and Safety Executive**

[www.hse.gov.uk/pubns/books/l153.htm](http://www.hse.gov.uk/pubns/books/l153.htm)

#### **The Construction Industry Training Board duty holder guidance documents**

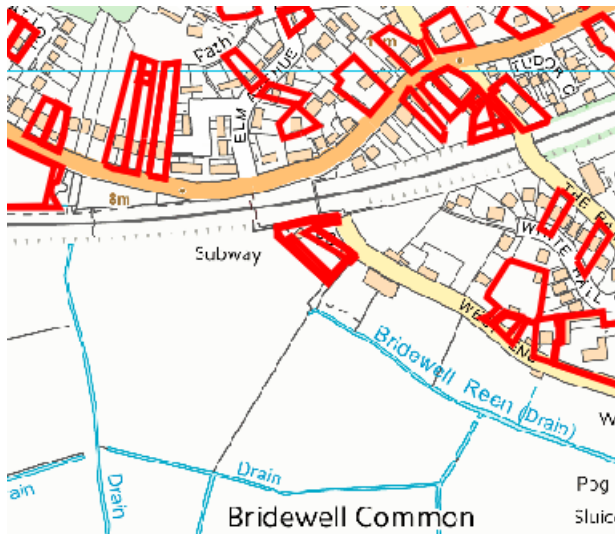
[www.citb.co.uk/health-safety-and-other-topics/health-safety/construction-design-and-management-regulations/cdm-guidance-documents](http://www.citb.co.uk/health-safety-and-other-topics/health-safety/construction-design-and-management-regulations/cdm-guidance-documents)

## G. Planning Policy Review

### Site History

A Planning History Search of the Proposed Site has been undertaken using Monmouthshire County Council's online database. It confirms that the site has no relevant planning history since 2000 (see Figure 28).

**Figure 28: Planning Applications since 2000**



Source: Monmouthshire County Council

### Planning Policy Review

#### *Introduction*

Section 38 (6) of the Planning and Compulsory Purchase Act (2004) requires that the determination of planning proposals must be made in accordance with the plan unless material considerations indicate otherwise. The development plan comprises of local planning documents which have been the subject of examination in public or testing through public inquiry, and are adopted having been through due process.

The Site falls wholly within the administrative boundary of Monmouthshire County Council. The Statutory Development Plan comprises the following documents.

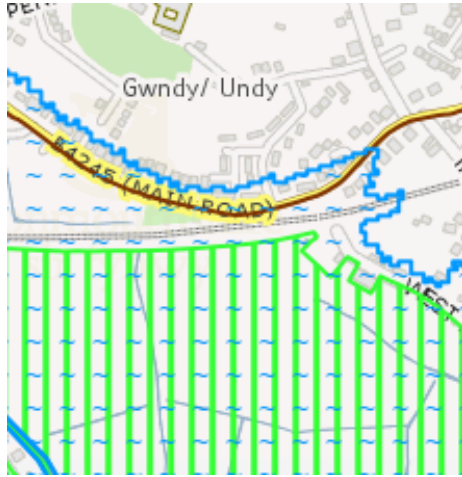
- Monmouthshire County Council Local Development Plan (LDP) 2011 – 2021;
- Proposals Map
- Constraints Map

#### *Statutory Development Plan*

The Monmouthshire County Council Proposal and Constraints Map forms part of the development and sits alongside the LDP. A review of the Constraints Map (see Figure 29) confirms that the site is located within TAN 15 Development and Flood Risk C1. It also shows that the site is located

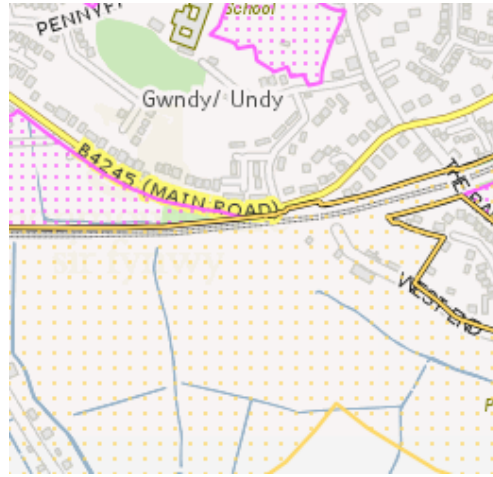
on the edge of an Area of Archaeological Sensitivity towards the north and Site of Special Scientific Interest (SSSI) is located towards the south of the proposed site.

**Figure 29: Constraints Map**



Source: Monmouthshire County Council, 2017

**Figure 30: Proposals Map**



Source: Monmouthshire County Council, 2017

The Proposals Map (see Figure 30) confirms that the site is located with a Mineral Safeguarding Area (Limestone) (as per Policy M2) and sits on the edge of the Development Boundary Northwards of the site. It also shows that there is an additional Development Boundary south and an area of Amenity Importance west.

### **Monmouthshire County Council Local Development Plan (LDP) 2011 – 2021**

The Monmouthshire County Council Local Development Plan (*'the LDP'* hereafter) was adopted on 27 February 2014, replacing the Monmouthshire Unitary Development Plan (UDP) and sets out the Council's vision and objectives for the development and use of land in Monmouthshire over a 10-year period to 2021. The LDP contains detailed policies and proposals to implement, setting out the vision, objectives and strategy for Monmouthshire, along with the strategic and detailed policies and proposals to implement these. It provides for the development and use of land and for the protection of the environment and facilitates investment decisions and the delivery of services and infrastructure.

The schedule of the LDP is made up of both strategic policies and development management policies.

In cascade of importance, relevant policies comprise the following:

- Policy S16 (Transport)
- Policy MV5 (Improvements to Public Transport Interchanges and Facilities)
- Policy MV2 (Sustainable Transport Access)
- Policy MV3 (Public Right of Way)
- Policy EP4 (Telecommunications)
- Policy M2 (Minerals Safeguarding Areas)

**Policy S16 (Transport)** confirms that where appropriate, all development proposals shall promote sustainable, safe forms of transport which reduce the need to travel, increase provision for walking and cycling and improve public transport provision.



Amongst others, those of relevance to the site include the following manners in which this will be facilitated by:

- Reducing the need to travel, especially by car;
- Favours development close to public transport facilities;
- Promoting public transport, walking and cycling;
- Improving public transport links between the County's main towns and other key settlements in the region, in line with the WSP
- Developing the role of the key settlements of Abergavenny and Chepstow, as identified in the WSP, and Monmouth, around which high capacity sustainable transport links can be developed

**Policy MV5 (Improvements to Public Transport Interchanges and Facilities)** promotes proposals for new or improved public transport facilities, especially at railway and bus stations, will be permitted subject to detailed planning considerations. Such facilities should make provision for modal interchange between walking, cycling, buses and motor vehicles. Land at or adjacent to existing public transport facilities that has the potential for providing improved facilities will be safeguarded from alternative non-transport development.

**Policy MV2 (Sustainable Transport Access)** states that the development of sites shall, dependent on their location, size and local need, include provision for and the integration of appropriate sustainable transport links, including public transport, walking and cycling. Non-car access will be supported and prioritised over access by car.

Development should link into the existing or proposed public rights of way, walking, cycleway and green infrastructure networks and this will be reflected in the layout and conditions/obligations on any permission granted.

Where deemed necessary, financial contributions will be required towards improvements in transport infrastructure and services, in particular to support sustainable travel links/public transport, cycling and walking.

Additional notes state that the TAs required as described above, together with the associated Travel Plans, will indicate what improvements or contributions are required to help to integrate new development with sustainable transport facilities.

**Policy MV3 (Public Right of Way)** notes that development that would obstruct or adversely affect a public right of way will not be permitted unless satisfactory provision is made which maintains the convenience, safety and visual amenity offered by the original right of way and this will be reflected in the layout and conditions/obligations on any permission granted.

Proposals to improve or create public rights of way will be permitted where they add to the utility and enjoyment of the network, including providing missing links in otherwise continuous routes, upgrading paths to bridleways or enhancing the green infrastructure network, provided they give rise to no unacceptable amenity or environmental impacts and comply with legislative requirements. Such proposals should be designed with the convenience, safety and visual amenity of users in mind and should also take into account the needs of those with limited mobility, the impact on the adjoining rights of way network and connectivity of that network.

**Policy EP4 (Telecommunications)** recognises that proposals for telecommunications will be permitted provided that the following criteria are met:

1. The siting and appearance of the proposed apparatus and associated structures should seek to minimise impact on the visual amenity, character or appearance of the surrounding area
2. If on a building, apparatus and associated structures should be sited and designed in order to seek to minimise impact on the external appearance of the host building;
3. If proposing a new mast, it should be demonstrated that the applicant has explored the possibility of erecting apparatus on existing buildings, masts or other structures. Such evidence should accompany any application made to the local planning authority
4. The development should not have an unacceptable effect on areas of ecological interest, areas of landscape importance, archaeological sites, conservation areas or buildings of architectural or historical interest
5. Within the Wye Valley AONB masts over 15 metres in height will be considered as major development and will require a more comprehensive justification in the national interest in addition to the above

When considering applications for telecommunications development, the Council will have regard to the operational requirements of telecommunications networks and the technical limitations of the technology.

Planning conditions may be imposed to secure within an agreed timescale the removal of telecommunication apparatus and site restoration following permanent decommissioning.

**Policy M2 (Minerals Safeguarding Areas)** states the development proposals which may impact minerals safeguarding areas shown on the Proposals Map will be considered against the following requirements, as applicable:

Proposals for permanent development uses within identified mineral safeguarding areas will not be approved unless:

1. The potential of the area for mineral extraction has been investigated and it has been shown that such extraction would not be commercially viable now or in the future or that it would cause unacceptable harm to ecological or other interests; or
2. The mineral can be extracted satisfactorily prior to the development taking place; or
3. There is an overriding need for the development; or
4. The development comprises infill development within a built up area or householder development or an extension to an existing building

Other policies to consider include are as follows:

- Policy DES2 (Areas of Amenity Importance)
- Policy S12 (Efficient Resource Use and Flood Risk)
- Policy SD3 (Flood Risk)
- Policy NE1 (Nature Conservation and Development)

## **H. Site Visit Report (9<sup>th</sup> March 2018)**

# Record of meeting/discussion



**Project title** Magor and Undy Station

**Revision** A

**Subject** Site Walkover

**Project no** 373743

**Location** Main Road, Undy, NP26 3EL

**Date of meeting** 9<sup>th</sup> March 2018

## Details

A site walkover was carried out to the proposed location of the Magor and Undy Station

The West End subway at the proposed location for the station was reviewed as part of this site visit. The subway was exposed to open air above between the main and relief railway lines on both the Up and Down sides of the track. The walls to the subway beneath the Mail Line tracks are constructed of stone masonry, whilst the walls at open parts of the subway and beneath the Relief Line tracks are constructed of brick masonry. Various minor cracking was observed in the Subway walls and vegetation could be seen to build up on the walls in the open area between the Down Relief and Down Main tracks. There was a build of debris and vegetation at either entrance to the subway as well. The subway deck is constructed from troughs and weepholes were identified on the underside of troughs beneath the two Main Line tracks on the western side of the subway. There was evidence of rust on some of the troughs and rivets, and various water staining/dampness indicating that deck waterproofing is not present or has failed.

In the surrounding area of the subway, weepholes were also found on the retaining wall running parallel to the footpath on Main Road, to the north of the subway.

A bus stop was noted to the west of the subway that will potentially need relocating to the other side of the subway to accommodate any modifications to the subway access gradient. A car park is located approximately 250m to the west of the existing subway. Access to the local community and potential drop off points also need to be considered at this location.

Note dimensions in the following sketches are hand measurements and have been taken for verification purposes only. A full, dimensionally accurate topographical survey should be taken prior to detailed design.

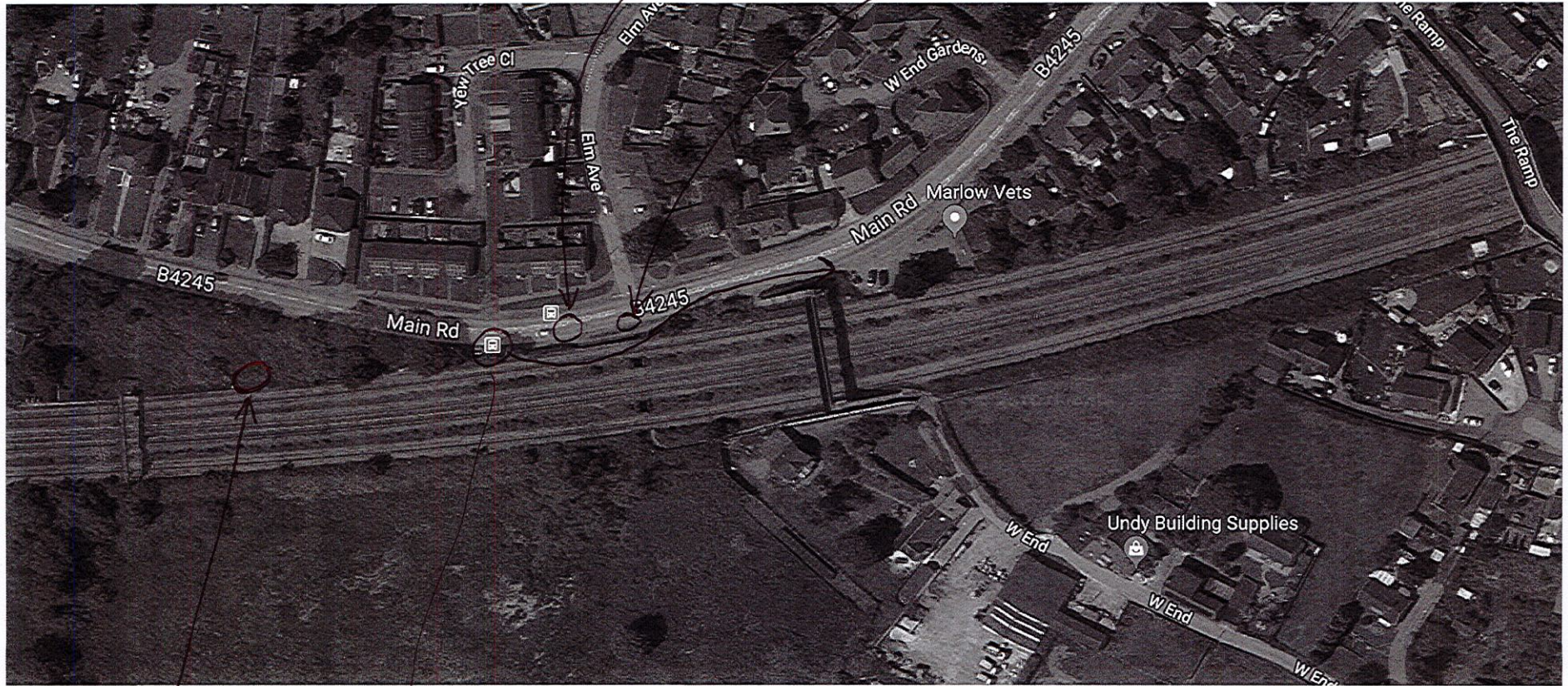


# Site Plan

Potential  
location for  
crossing

Weap holes along  
wall adjacent to footpath

N  
↑



Existing  
car  
park

OLE  
bases

Bus stop to  
be relocated

Other points to consider:

- Access to community
- Potential drop off points



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Date

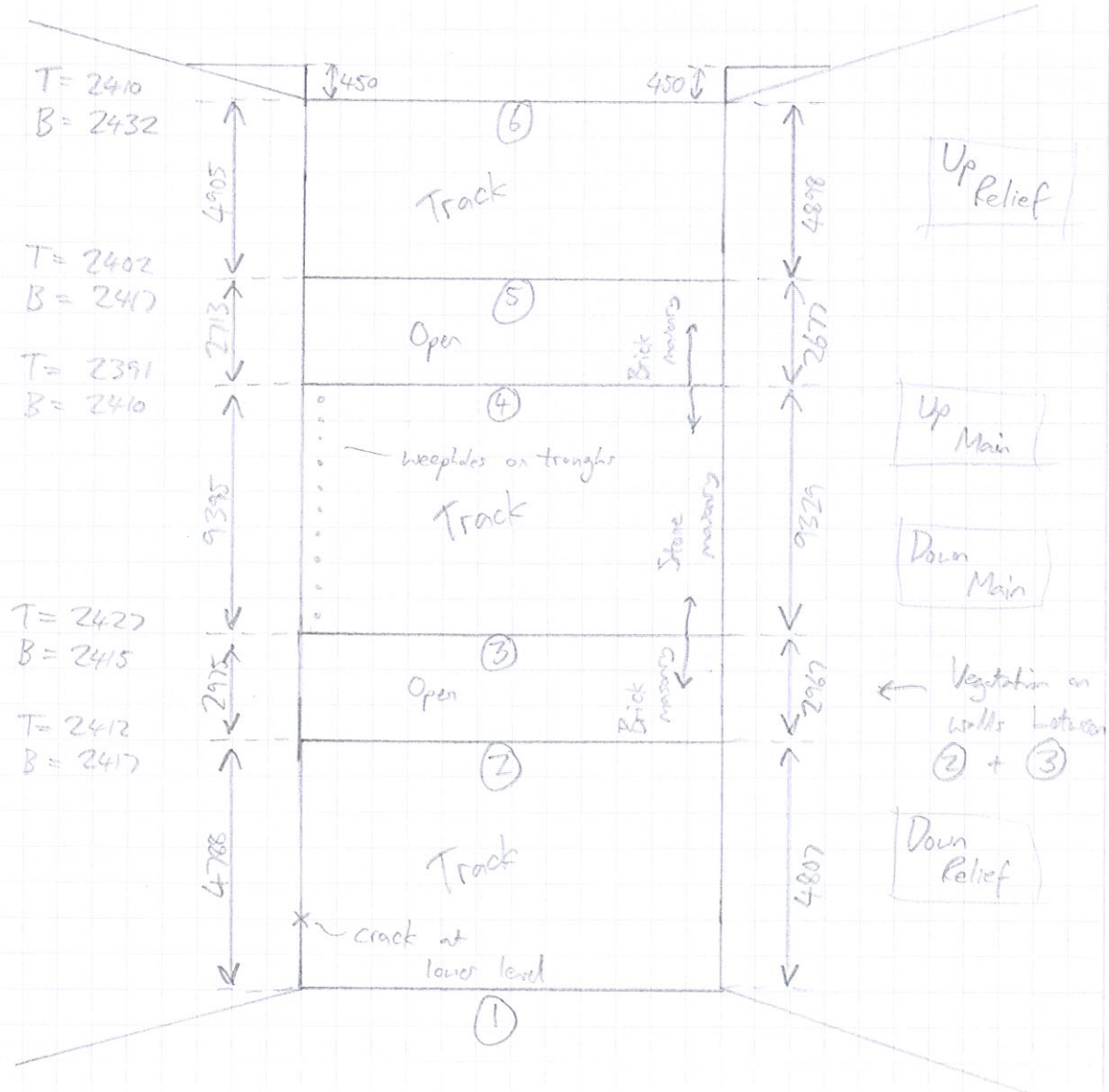
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Plan of Subway

N  
↑Troughs located  
beneath tracksT = top of troughs  
B = bottom of  
troughs



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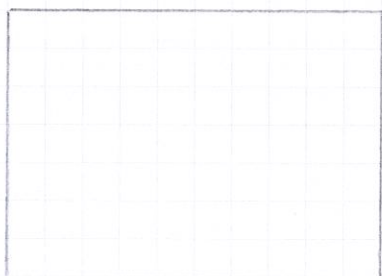
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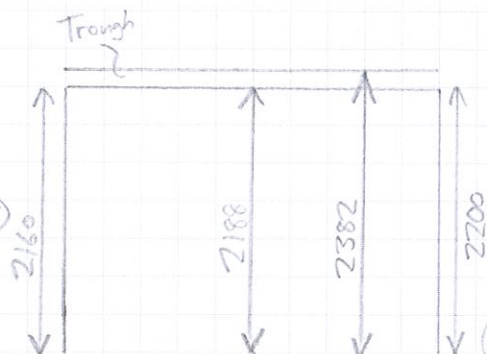
Sections of Subway

①



See Southern Entrance Section

②



① - ②

- Some rust on rivets
- Staining on masonry - looks to be calcium
- Small signs of dampness
- Single crack - no other major cracks

② - ③

- Open air
- Some minor cracks
- Dampness
- Lots of vegetation at track level

③



③ - ④

- Very damp with puddles and build up of moss
- Corrosion to troughs, particularly at bearings
- One large block missing on each wall at northern end at lower level.

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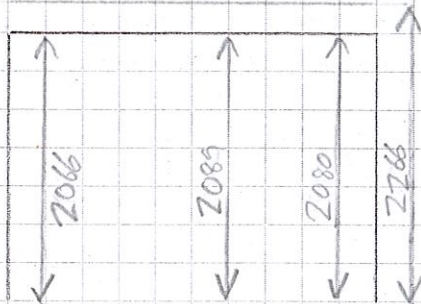
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Sections of Subway

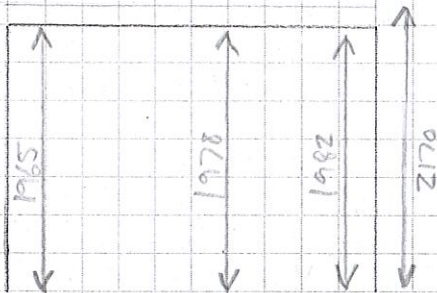
④



④ - ⑤

- Vegetation at track level
- Minor cracks
- Calcium build-up

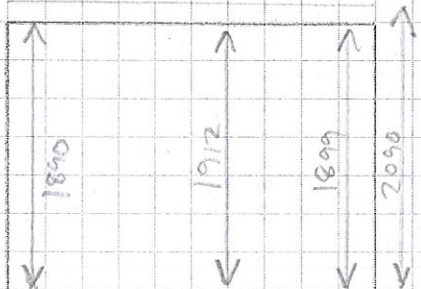
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⑤ - ⑥

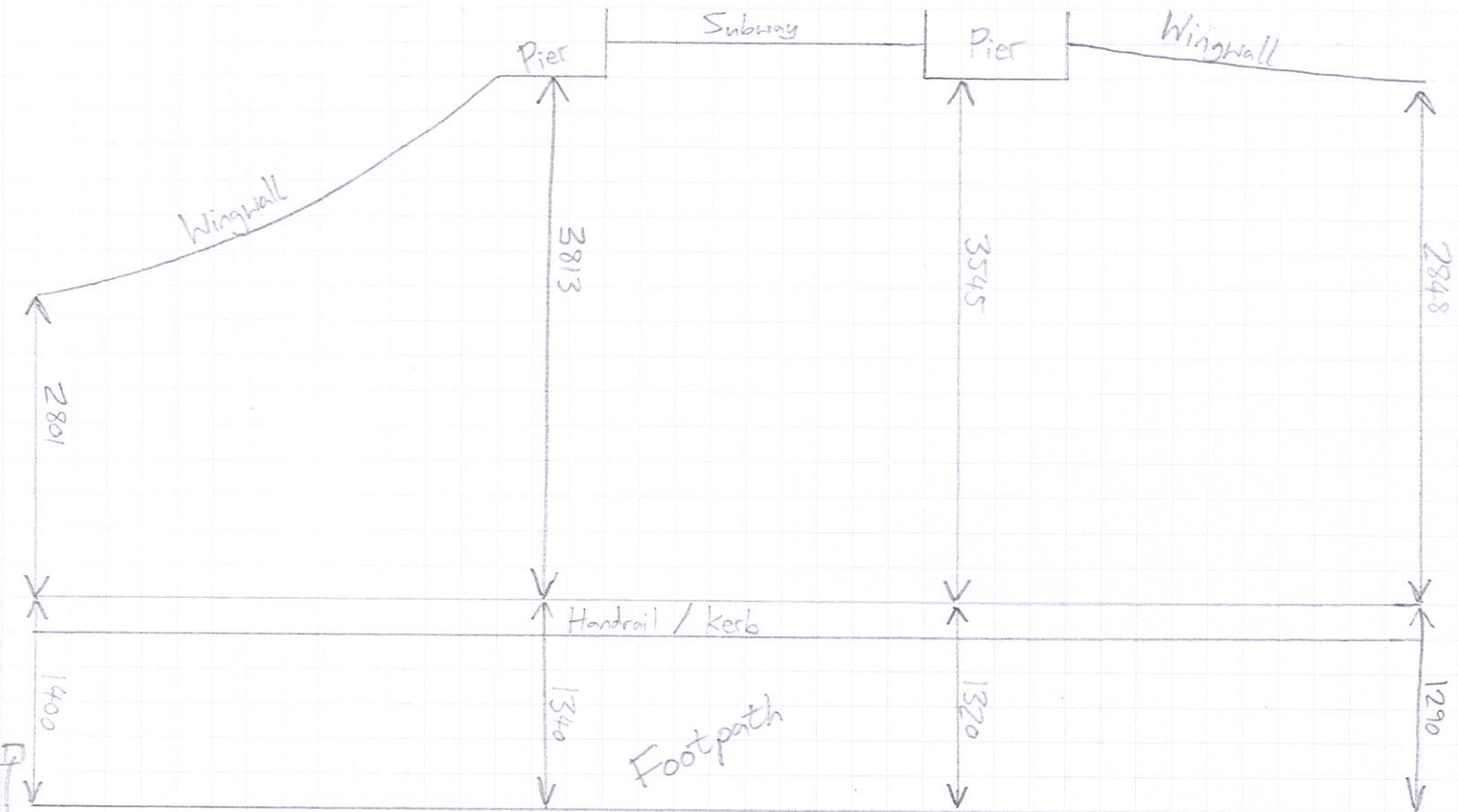
- Some spalling at bearings
- Some wet patches
- Lower headroom

⑥



Plan of North side

→ N



Manhole located 1200mm from handrail/kerb rear end of eastern wingwall











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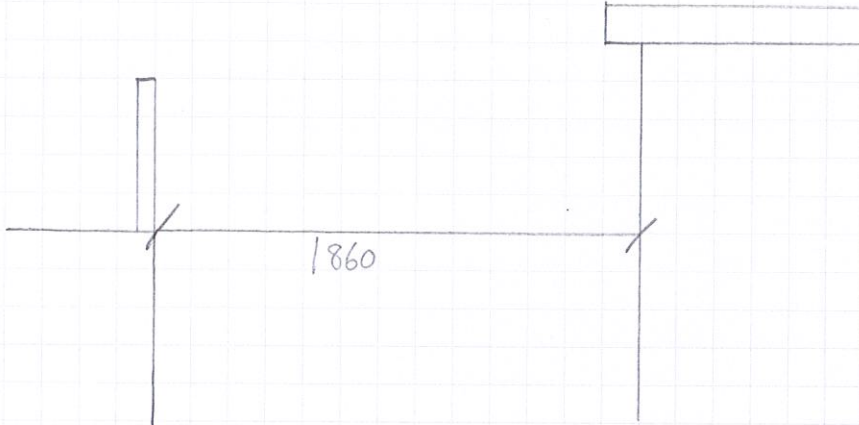
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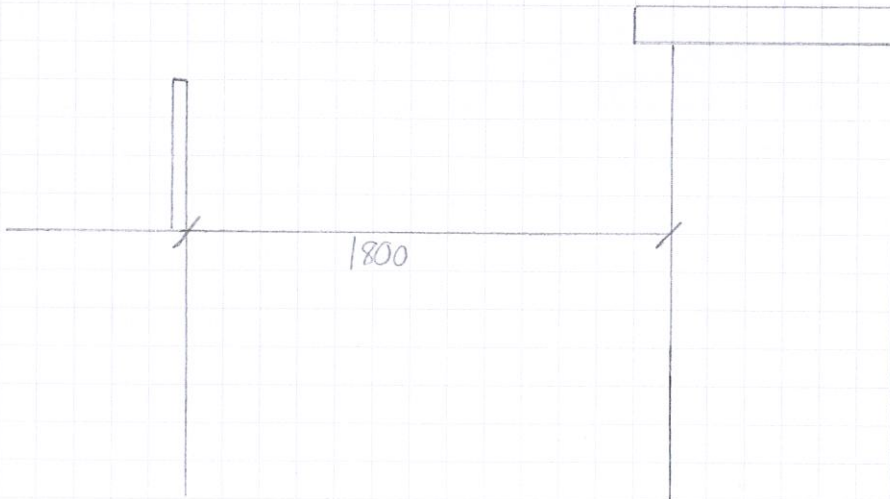
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Section A

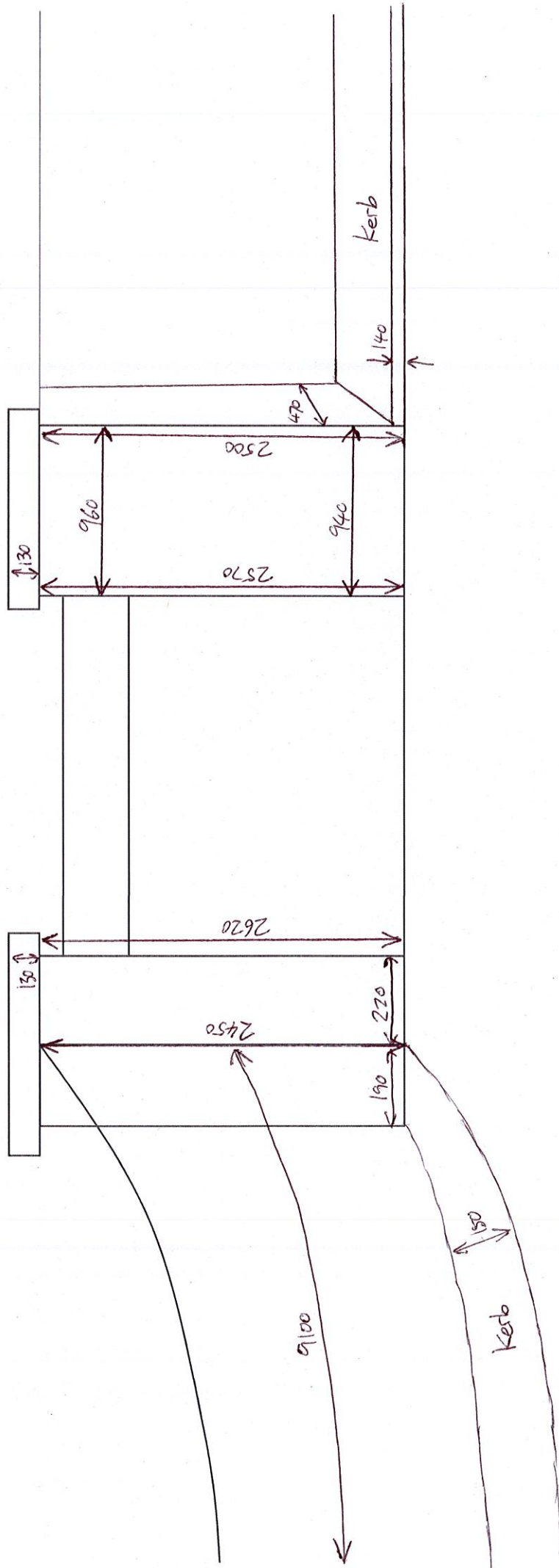


Section B





# Northern Entrance to Subway



Project

Calculations for

Division/department

Job no/file no

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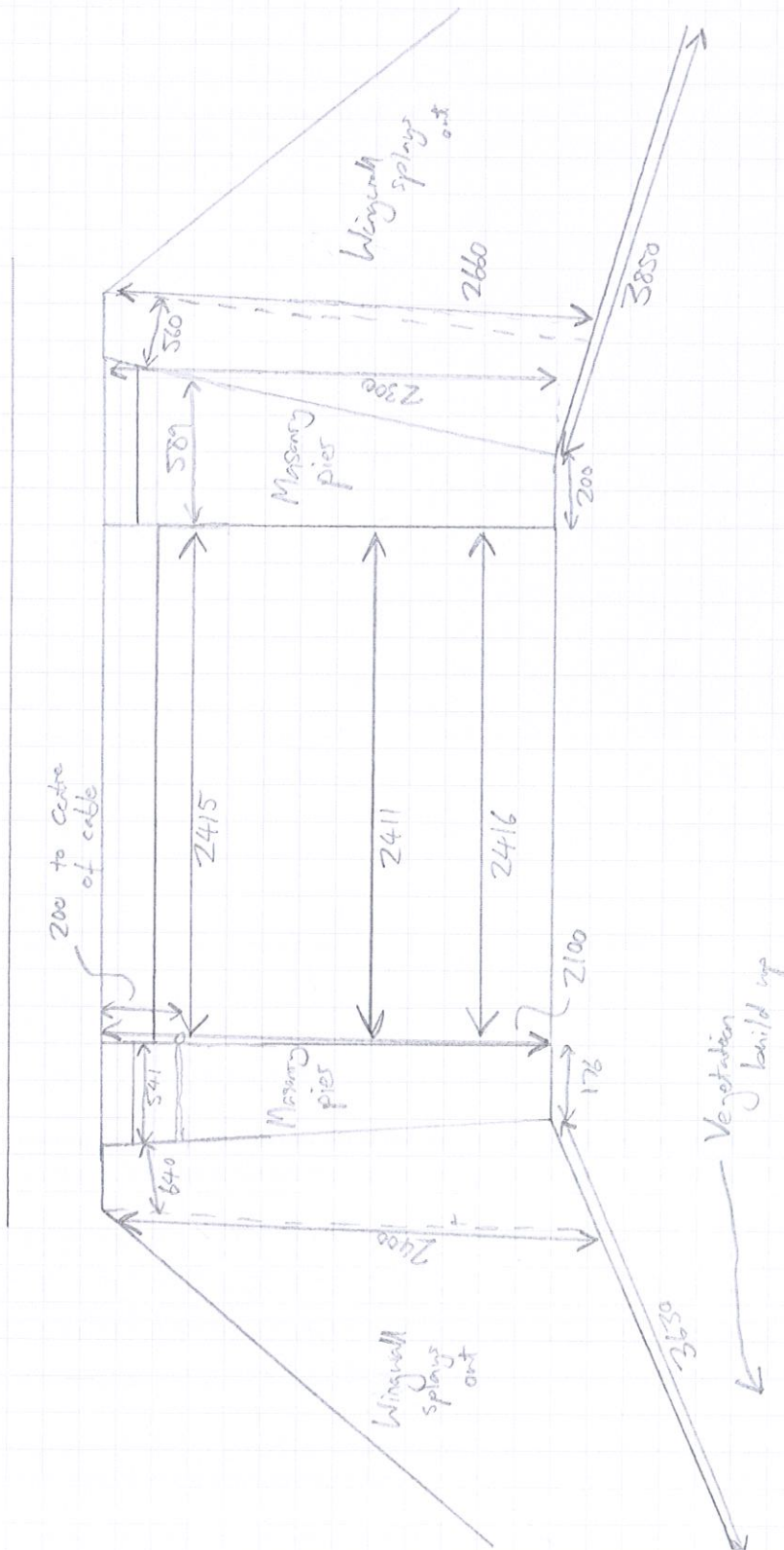
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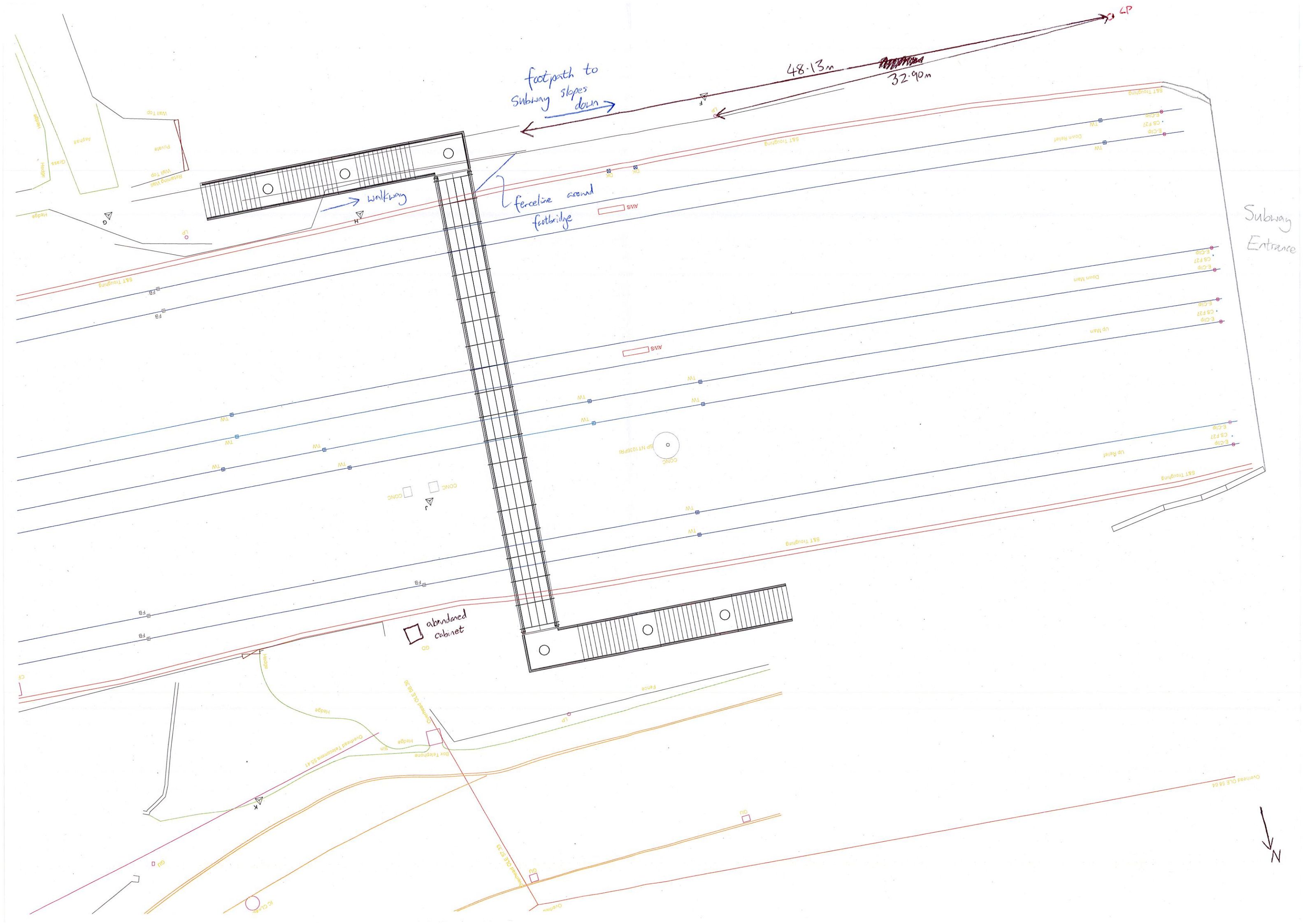
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Date

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Southern Entrance to Subway





# **I. Preliminary Assessment of Flooding Consequences**





# **Magor and Undy Walkway Station**

Preliminary Assessment of Flooding  
Consequences

04 May 2018





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# **Magor and Undy Walkway Station**

## **Preliminary Assessment of Flooding Consequences**

04 May 2018



# Issue and Revision Record

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# Executive summary

A new walkway station is proposed at Magor, Monmouthshire, to serve the communities at Magor and Undy.

Using existing and readily available published information, an assessment was made of the risk and potential consequences of flooding as a result of the proposed new station, to inform the design development which is being progressed to obtain funding, and to identify further flood assessment work that may be required in due course.

Due to programme constraints Natural Resources Wales and Monmouthshire County Council were not contacted directly as part of this assessment.

The site was found to be at risk of flooding from rivers and/or the sea, from surface water, and potentially from groundwater. It is understood the site is not at risk from reservoir flooding.

The site benefits from continuous tidal flood defences along the Severn Estuary. These defences are maintained by NRW.

Taking into account climate change allowances for sea level rise to 2116, the existing flood defences will be overtopped and in this scenario the proposed development is unlikely to meet the TAN 15 frequency threshold below which flooding should not be allowed. If the flood defences were to fail then this condition would not be met.

Taking into account climate change allowances for sea level rise to 2116, the existing flood defences will be overtopped and in this scenario the proposed development is very unlikely to meet the TAN 15 indicative guidance for tolerable flooding conditions during an extreme flood event, for either property or access. If the flood defences were to fail then this condition would not be met.

The site is served by a free flood alert and flood warning service. However, the site will be unmanned and used by the public and there is no assurance that users will be aware of flood risk or take appropriate action during an actual flood event or in response to a flood warning or alert. To mitigate this the site operator could implement signage and site management procedures.

The creation of a new station will attract passengers to a location that is at risk of flooding, which represents an increase in the flood risk and potential flooding consequences to people. The proposed development will also result in an increase in flood depth and associated hazard to people, within a pedestrian subway and its approaches, compared with existing conditions.

When climate change effects are taken into account, escape and evacuation routes will be impassable during an extreme event, and potentially during the threshold event below which flooding should not be allowed. Accordingly, if the development proceeds then emergency plans and procedures would need to ensure safe evacuation of the site before the onset of flooding.

It may be necessary to design the station platforms as elevated rather than solid structures such that they do not occupy space that would otherwise be used for the storage of fluvial flood water and do not significantly affect the conveyance of floodwater.

The physical infrastructure of the station may be designed as resilient structures that would not suffer significant flood damage, and would recover and could be returned to use quickly in the



aftermath of a flood. Mechanical and electrical infrastructure associated with the railway (e.g. signalling) should be located above the threshold event flood level to ensure it continues to operate during such an event.

In summary, the development is very unlikely to comply with TAN 15 acceptability criteria for flooding consequences, including those relating to threshold and extreme flooding events from rivers or the sea. If the development is to proceed then these and other flood risks and consequences will need to be managed through careful design and operational procedures.

This being the case, it is recommended that NRW is consulted as soon as practicable to:

- (a) Obtain all existing readily available flood risk information pertaining to the site, and to confirm the mechanism and mode of flooding from adjacent watercourses and the sea, such that the preliminary conclusions reached in this report may be confirmed or otherwise, and
- (b) Seek NRW's view on the acceptability of the development overall, including, whether NRW is likely to object to a planning application, the scope of any further assessment work that NRW would wish to see undertaken, and mitigation measures that NRW may wish to see implemented in order to agree to the development proceeding.

In addition, and as part of any further assessment, it is recommended that the LLFA and IDD are also consulted.

It is recommended that groundwater levels at the site are investigated and monitored to better understand the risks and consequences of groundwater flooding and the effect of groundwater on local drainage.

NRW will require that a FCA is submitted as part of a planning application. A comprehensive topographic survey to ordnance datum will need provided with any FCA for planning.

If the development proceeds a surface water management and disposal system that meets current standards will need to be designed, constructed and maintained. The design of this system will need to include for the predicted effects of climate change over the lifetime of the development, the proposed lowering of the existing West End Subway, and groundwater levels.

# 1 Introduction

As identified in the National Transport Finance Plan, referenced in Network Rail's draft Wales Route Study and included in the current South-East Wales Metro Phase 2 list of potential schemes, a new walkway station is proposed at Magor to serve the communities at Magor and Undy in Monmouthshire.

A GRIP 2 Technical Feasibility report, prepared by Mott MacDonald Ltd in April 2016, identified a preferred signalling and platform arrangement option, at the proposed location in Magor. The report also identified that:

- The site is located on the Gwent Levels at the edge of the tidal flood plain and in close proximity to two watercourses; Bridewell Reen and Mill Reen.
- The site is located in Zone C1 on the Welsh Government (WG) Development Advice Map (DAM), where Zone C1 is described as "areas of the floodplain which are served by significant infrastructure, including flood defences". Areas in Zone C1 have an annual probability of flooding of 0.1%, or greater.
- In accordance with Planning Policy Wales (PPW) Technical Advice Note 15: Development and Flood Risk (TAN 15), development can take place subject to passing the justification test, including the acceptability of consequences.
- The Natural Resources Wales (NRW) online flood map indicates that the site has a "low" risk of flooding from rivers or the sea, where "low" risk means an annual probability of flooding of between 0.1% and 1%.
- The NRW online flood map also indicates that parts of the site have a "medium" risk of flooding from surface water.
- The NRW online flood map indicates that the site is within an area where flood warnings are provided.
- As part of the scheme development and to inform any application for planning consent, the likelihood and consequences of flooding from sources including tidal, fluvial and surface water should be assessed, and appropriate mitigation measures incorporated into the development proposals.

## 1.1 Scope

The purpose of this report is to inform the design development which is currently being progressed to obtain funding, and to provide recommendations for further flood assessment work that may be required in due course.

The assessment reviewed the risk and potential consequences of flooding at the site of the proposed new station. As part of this exercise, the sources of information and conclusions reached in the GRIP 2 Technical Feasibility report were reviewed to verify whether they were still current.

At this stage it is not known whether the proposed station development will require planning consent.

If planning consent is required then, as part of the planning approval process, it will be necessary to demonstrate to NRW through submission of a flooding consequences assessment (FCA), that the consequences of flooding can be managed over the lifetime of the development.

If planning consent is not required, the flooding consequences assessment will ensure that the flood risks and likely consequences to people and property are understood and can be managed during construction and subsequent operation.

The scope of the FCA also includes an assessment of the predicted effects of climate change over the lifetime of the development.

The consultant has followed the accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, the consultant takes no liability for and gives no warranty against actual flooding of any property (client's or third party) or the consequences of flooding in relation to the performance of the service. This report has been prepared for the purposes of informing a cost estimating and feasibility exercise only.

There is always a risk that property flooding could occur one or more times in any year. Therefore, this report should not be interpreted or relied upon as providing a guarantee against flooding

This document has been prepared for the titled project Magor and Undy Walkway Station. Mott MacDonald accepts no responsibility or liability for this document to any other party other than by whom it was commissioned.

The detail and technical complexity of the assessment reflects the current stage and objectives of the development process. The exercise comprised an assessment of existing readily available information.

The information and recommendations presented within this assessment are dependent upon the accuracy and reliability of the information, correspondence and data available to Mott MacDonald, at the time of the assessment. Any party developing detailed design should not rely on assumptions made in this report but should satisfy themselves in that regard.

Our assessment of the effects of climate change is based on the recommendations from Welsh Government in place at the time of the study. These recommendations may change in the future increasing the extent of predicted effects and we would recommend that you seek further advice should this occur during the lifetime of the project.

## 1.2 Site location and description

The location of the proposed new station is shown in Figure 1.

**Figure 1: Site Location Plan**



Source: Mott MacDonald

The site is bisected by the South Wales Main Line railway. The B4245 (Main Road) lies immediately to the north of the proposed station location.

The conurbations of Magor and Undy, with an estimated combined population of over 6100, lie to the north of the site. To the south of the site is the coastal floodplain of the Severn Estuary, known as the Caldicot Levels, which is served by an extensive network of land drainage reens. The Severn Estuary is located approximately 1.5km south of the site.

The Welsh Water Undy Sub Sewage Pumping Station is located immediately to the north of the site, between the railway line and Main Road, approximately half-way along the northern site boundary.

The principal access to the site is from the north side via the B4245 (Main Road). There is an existing footbridge with stepped access over the railway toward the eastern end of the site, providing pedestrian access between Main Road to the north of the railway line, and West End (road) to the south. There is also a pedestrian underpass (West End Subway) beneath the railway, which provides access between Main Road and West End road.

Mill Reen (known as St Bride's Brook north of the M4), a Main River, lies immediately to the west of the site. It flows in a north to south direction and is culverted beneath the railway line. Mill Reen then follows the route of Whitewall road, and discharges to the Severn Estuary at Magor Pill.

Bridewell Reen, another Main River, is located to the south-east of the site, south of the railway line, and connects into Collister Pill via Prat Reen (both also Main Rivers) at its eastern end. Collister Pill discharges to the Severn Estuary to the south.

Bridewell Brook, an ordinary watercourse, flows through the site and is culverted beneath the railway line within the site. Bridewell Brook flows south from Main Road and meets the northern site boundary at its western end. The brook then turns through 90degrees and flows eastward through the site along the north side of the railway line. At roughly the midpoint of the site, adjacent to the Undy Sub sewage pumping station, the brook again turns through 90degrees and flows southward, via a culvert beneath the railway, connecting into the extensive network of land drains (reens) to the south of the site at Bridewell Common. From the limited information available it would appear that the Bridewell Brook serves as a local land drain for the undeveloped area between the railway line, the B4245 Main Road, and St Bride's Brook.

The Lead Local Flood Authority (LLFA) for the site location is Monmouthshire County Council (MCC).

The land to the south of the site is within the boundary of the Gwent, Caldicot and Wentlooge Sub District Internal Drainage District (IDD).

### 1.3 Proposed development

The proposed development is a new walkway station comprising the following:

- A 150m long platform and two waiting shelters on the north side of the railway.
- A 150m long platform and two waiting shelters on the south side of the railway.
- An area to the north of the railway, between the railway and B4245 main Road, for disabled parking, drop-off, and bus replacement service.
- Lowering of the existing West End Subway, to increase headroom and improve access under the railway.
- 80m long DDA-compliant ramp from footpath level to subway level, and associated retaining walls, on the north side of the railway.
- 100m long DDA-compliant ramp from platform level to subway level, and associated retaining walls, on the south side of the railway.

It is understood that the creation of the new station will not result in an increase in the number or frequency of trains.

A general arrangement drawing of the current development proposals is included in Appendix A.

Topographic survey information for the whole site and surrounding area was not available to inform this report. Limited topographic survey is included in Appendix B.

## 2 Sources of information and consultations

The following sources of information were reviewed as part of this assessment.

- Planning Policy Wales (PPW) and Technical Advice Note 15: Development and Flood Risk (TAN 15).
- Natural Resources Wales (NRW) online interactive long term flood risk maps (“online flood maps”)  
[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default) , last accessed March 2018.
- NRW Good Practice Guide GPG 101 “producing flood risk hydraulic models and flood consequence assessments for development planning purposes”, September 2015
- Monmouthshire County Council Preliminary Flood Risk Assessment Report – Version 1, 26 May 2011
- Monmouthshire County Council Local Flood Risk Management Strategy – Final, April 2013
- Monmouthshire County Council Flood Risk Management Plan - Final Version, February 2016
- Monmouthshire County Council Interactive Local Development Plan Map  
<http://www.monmouthshire.gov.uk/planning-policy/monmouthshire-local-development-plan-2/interactive-local-development-plan-mapping> , accessed March 2018.
- Welsh Government Policy Clarification Letter CL-03-16 (August 2016) and accompanying guidance note “Flood Consequence Assessments: Climate change allowances” (<http://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>, date not provided).
- Open source LiDAR data (<http://lle.wales.gov.uk/Catalogue/Item/LidarCompositeDataset/?lang=en>), accessed in April 2018).
- Network Rail GWRM Undy Halt Footbridge Topographical Survey Drawing number W1008D/BNU/DRG/ECV/002001 Rev Z01, dated 12/5/17
- Mott MacDonald drawing "Platform General Arrangement Costed Option" number MMD-364017-C-DR-00-XX-0007 Rev P1, dated 12/04/16.

Due to programme constraints neither NRW, the IDD, nor MCC was not contacted directly as part of this FCA.

### 2.1 Planning Policy Wales and Technical Advice Note 15

Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN 15) on Development and Flood Risk, provide a framework and technical guidance for assessing the flood risks posed to and by a development.

#### 2.1.1 Development Advice Zones

Figure 1 of TAN 15 defines three development advice zones (A, B and C), which are summarised in Table 2.1. The figure also attributes different planning actions for each of the zones.



**Table 2.1: Development Advice Zone Classification**

Zone	Sub-Zone	Description of Zone	Use within PPW and TAN 15
<b>A</b>		Considered to be at little or no risk of fluvial or tidal/coastal flooding	Used to indicate that justification test is not applicable and no need to consider flood risk further.
<b>B</b>		Areas known to have been flooded in the past evidenced by sedimentary deposits	Used as part of precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
<b>C</b>		Based Environment Agency / NRW extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
	<b>C1</b>	Areas of the floodplain which are developed and served by significant infrastructure, including flood defences	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
	<b>C2</b>	Areas of the flood plain without significant flood defence infrastructure	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

Source: Planning Policy Wales Technical Advice Note 15 (TAN 15)

### 2.1.2 Development category

Section 5 of TAN 15 states “particular flooding consequences may not be acceptable for particular types of development ... the precautionary framework identifies the vulnerability of different land uses to flooding”.

TAN 15 divides types of development into the following three categories: emergency services, highly vulnerable development, and less vulnerable development.

Figure 2 of TAN 15 identifies general industrial development, transport and utilities infrastructure and car parks, as “less vulnerable development”.

### 2.1.3 Justifying the location of development

The overarching aim of TAN15 is to ensure that new development is “directed away from zone C and towards suitable land in zone A, otherwise to zone B, where river or coastal flooding will be less of an issue”.

Furthermore, Section 6 of TAN 15 states that “highly vulnerable development in zone C2 should not be permitted”, and that all other new development should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location.

TAN 15 goes on to state that development can only be justified in that location if it can be demonstrated that:

- (i) Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or
- (ii) Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

(iii) it concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); and

(iv) The potential consequences of a flooding event for a particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 (of TAN 15) found to be acceptable.

The suitability of the site for development is discussed in Section 3.

#### 2.1.4 Assessing flooding consequences

Appendix 1.2 of TAN 15 states that the prime objective of an assessment of flooding consequences is to develop a full appreciation of:

- “The consequences of flooding on the development.”
- “The consequences of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1%.”
- “The assessment can be used to establish whether appropriate mitigation measures can be incorporated within the design of the development to ensure that development minimises risk to life, damage to property and disruption to people, etc.”

Appendix 2 of TAN 15 recognises that flood consequences will change over time as result of climate change.

##### 2.1.4.1 Acceptability criteria for flooding consequences

Appendix 1.11 and Appendix 1.12 of TAN 15 present the main criteria for deciding whether developments in flood risk areas are acceptable in line with part (iv) of the Justification Test (see Section 2.1.3 above).

- Section A1.12 states “a site should only be considered for development if the following conditions can be satisfied;
  - Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a probability of occurrence of 0.1%)
  - The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with the Environment Agency.
  - The developer must ensure that future occupiers of development are aware of the flooding risks and consequences
  - Effective flood warnings are provided at the site
  - Escape/evacuation routes are shown by the developer to be operational under all conditions
  - Flood emergency plans and procedures produced by the developer must be in place
  - The development is designed by the developer to allow the occupier the facility for rapid movement of goods/possessions to areas away from the floodwaters
  - Development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood.
  - No flooding elsewhere.”

- Section A1.14 states “development should be designed to be flood-free during the 1% fluvial flood... and 0.5% tidal flood” and “there is therefore a frequency threshold of flooding below which flooding of development should not be allowed”.
- Section A1.15 of TAN 15 states “beyond the threshold frequency, proposed development would be expected to flood under extreme conditions”. TAN 15 provides indicative value for tolerable flood conditions. Value for general infrastructure developments are given in Table 2 below.

**Table 2: Indicative value for tolerable flood conditions (in events beyond the “threshold frequency”)**

Type of Development	Maximum depth of flooding (mm)	Maximum rate of rise of flood waters (m/hr)	Maximum speed of inundation of flood risk (hrs)	Maximum velocity of flood water (metre/sec)
General Infrastructure	600	0.3	2	0.3

Source: Section A1.15 TAN 15

### 2.1.5 Surface water management

Section 8 of TAN 15 defines the surface water requirements for new developments, as follows:

- Surface water run-off from new developments should be managed so that the development does not increase the risk of flooding elsewhere.
- Sustainable Drainage Systems (SuDS) should be implemented, wherever they will be effective, in all new development proposals, irrespective of the Development Advice Zone in which they are located.
- The aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce run-off where possible.

Consideration must also be given to maintaining the effectiveness of any drainage systems.

## 2.2 Local planning policy and guidance

### 2.2.1 Local Development Plan and Supplementary Planning Guidance

The Local Development Plan (LDP) was not available online, and no Supplementary Planning Guidance (SPG) relevant to flood risk and drainage issues was identified as part of this review.

The adopted LDP proposals and constraints were available to view on the Interactive LDP Map on the Monmouthshire County Council website. No policies or constraints relating to development and flood risk or drainage were identified as part of this review, other than the over-arching Planning Policy Wales guidance.

### 2.2.2 Strategic Flooding Consequences Assessment (SFCA)

A Strategic Flooding Consequences Assessment (SFCA) for Monmouthshire was not found online.

## 2.3 Natural Resources Wales (NRW)

Natural Resources Wales (NRW) was not contacted directly as part of this assessment.

NRW online flood maps were reviewed to obtain information on: development advice zones; flood risk from rivers and the sea, surface water, and reservoirs; flood alerts and warnings; the presence and areas benefitting from flood defences; and historic flooding.

### 2.3.1 Good Practice Guide GPG 101

NRW Good Practice guide “producing flood risk hydraulic models and flood consequence assessments for development planning purposes” was published September 2015. The guidance provides good practice advice for developers and their consultants preparing flood risk documentation to support development planning proposals.

GPG 101 states that a FCA or appraisal must include consideration of climate change on all coastal levels up to and including the 0.1% (1 in 1000) annual probability of occurrence. Historically, climate change has not generally been considered in conjunction with a 0.1% (1 in 1000) annual probability event.

## 2.4 Lead Local Flood Authority (LLFA)

Monmouthshire County Council (MCC) is the Lead Local Flood Authority (LLFA) for the area in which the site is located.

MCC was not contacted directly as part of this assessment. However, the following MCC documents relevant to flood risk and drainage, were reviewed.

- Preliminary Flood Risk Assessment (PFRA)
- Local Flood Risk Management Strategy (LFRMS)
- Local Flood Risk Management Plan (LFRMP)

## 2.5 Caldicot and Wentlooge Internal Drainage District (IDD)

The land to the south of the site is within the boundary of the Gwent, Caldicot and Wentlooge Sub District Internal Drainage District (IDD), in which case, ordinary watercourses in this area will be the responsibility of the IDD not the LLFA.

IDDs are typically found in low-lying land where a particular need for water level management has been identified. IDD boundaries are determined by physical, not political, attributes and are operated in accordance with the Land Drainage Act (1991).

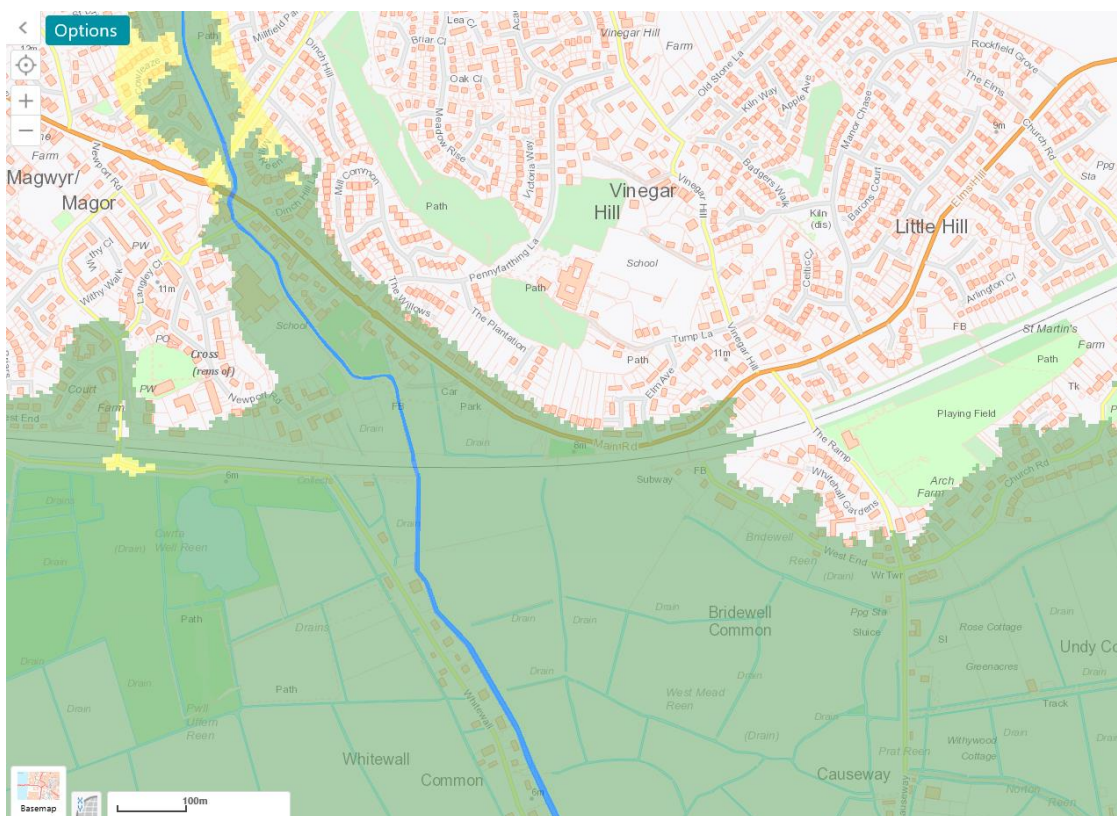
## 3 Assessment of the suitability of the site for development

### 3.1 Development advice zone

The TAN 15 Development Advice Map (DAM) indicates the extents of the development advice zones for areas in Wales.

The DAM indicates that the entire site is located in Zone C1 (Figure 2).

**Figure 2: Extract from Development Advice Map (zone C1 shaded green)**



Source:

[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default)

Zone C is used to indicate that flooding issues should be considered as an integral part of decision making.

Zone C1 is described as “areas of the floodplain which are served by significant infrastructure, including flood defences”. It is based on the NRW extreme flood outline. Areas in Zone C1 have an annual probability of flooding of 0.1%, or greater.

As noted in Section 1, it is not known at this stage whether the proposed station development will require planning consent. However, Zone C1 is used to indicate that development can take place subject to the application of the TAN 15 justification test and including the acceptability of flooding consequences.



## 4 Assessment of flooding consequences

### 4.1 Known flooding history and issues

The Monmouthshire Local Flood Risk Management Strategy (LFRMS) states that Monmouthshire has a significant section of coastline along the Severn Estuary, with earth embankment defences which protect the Caldicot Levels, and is at risk of coastal flooding as much of the area behind the defences is low lying. The impact of climate change and rising sea levels exacerbates this risk.

The Monmouthshire Local Flood Risk Management Plan (LFRMP) indicates that there was extensive coastal flooding of the Gwent Levels in 1607.

The LFRMP refers to an “investigation of flooding at West End Magor in 2013” and “local works to resolve”, but does not state the source or extent of the flood incident.

The LFRMP also refers to flooding of St Bride’s Road (which follows the route of St Brides Brook / Mill Reen, north-west of the site) from the adjacent watercourse in 2002/03 and 2013/14, and states that Newport City Council subsequently carried out work on the A48 crossing of the Brook. (Note, the A48 crosses St Brides Brook some 3km north of the site).

The LFRMP also states:

- Flooding from the St Brides Brook (Mill Reen) occurs along much of its length and affects the St Brides Road (north-west of the site).
- The Caldicot levels, which cover communities along the Severn Estuary, including Magor and Undy, are at risk of flooding from the sea due to overtopping or breach of coastal defences.
- The railway is very close to the northern extent of the flood risk area from the sea, and that almost all of the area south of the railway line is at risk of flooding from the sea. The coastal flooding risks extend north of the railway near Magor School and West End.
- The Caldicot Levels are an area of very flat reclaimed land served by flood defences that would become compromised should there be any overtopping.
- Magor with Undy is identified as number seven in the list of “Top 10 Communities at Risk from Surface Water Flooding” in Monmouthshire, with 472 people (201 properties) at risk from a 1 in 1000 year surface water event.

The NRW on-line flood maps do not identify any historic flooding affecting the site location.

No information regarding historic flooding, or flood risk, from the Bridewell Brook, was found in the course of this assessment.

### 4.2 Flooding from rivers and the sea

#### 4.2.1 NRW Flood Risk Maps

Flood zones are areas which would be affected by flooding from rivers and the sea. The NRW on-line flood risk maps indicate that the site falls entirely within Flood Zone 3 and 2 (see Figure 3).

Flood Zone 3 is defined as:

- the extent of a flood from rivers with a 1% (1 in 100) chance or greater of happening in any given year; and
- the extent of a flood from the sea with a 0.5% (1 in 200) chance or greater of happening in any given year.

Flood Zone 2 is defined as the extent of a flood from rivers or from the sea with up to a 0.1% (1 in 1000) chance of happening in any given year.

At the site location, the extent of Flood Zone 3 is approximately coincident with the extent of Flood Zone 2 (Figure 3).

**Figure 3: Extract from NRW on-line flood map – Flood zones (dark blue = Flood zone 3; light blue = flood zone 2)**



Source:

[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default) (accessed April 2018).

The NRW maps do not distinguish whether the flood zones represent flooding from rivers or flooding from the sea, they do not indicate the predicted level of floodwater for any events, and they do not include representation of allowances for climate change.

#### 4.2.2 Estimate of present day flood levels and depths at the site

Figure 4 presents LiDAR topographical data overlaid onto flood zones taken from the NRW online flood maps. The extent of both flood zone 2 and flood zone 3 approximates to the 9.0m contour in the vicinity of the site.

This allows the flood water level for an undefended flood event with a 0.1% (1 in 1000) annual probability of occurrence, to be estimated as approximately 9.0m AOD.

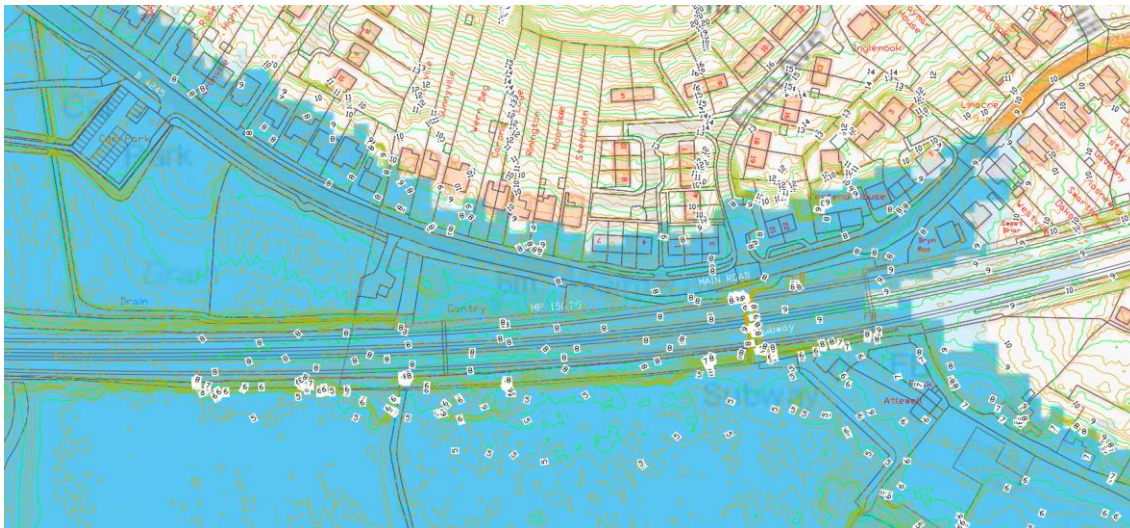
As the extent of flood zone 2 coincides with the extent of flood zone 3 at this location, the estimated flood water level for an undefended fluvial flood event with a 1% (1 in 100) annual probability of occurrence, or an undefended tidal flood event with a 0.5% (1 in 200) annual probability of occurrence, is also estimated as approximately 9.0m AOD.

Inspection of Figure 4 **Error! Reference source not found.** together with the General Arrangement drawing included in Appendix A and the topographical survey drawing included in Appendix B, this allows the flood depths across the site to be estimated as follows:

- The flooded depth along the access route to and from the north side of the site via B4245 Main Road, from both directions, and at the car park and drop-off area, will be of the order of 1m.
- The flooded depth at the accesses to the footbridge crossing, will be of the order of 1m.
- The flooded depth on the new platforms, assuming they are elevated by approximately 1m above the rail tracks, will be minimal.
- The West End Subway will be completely submerged.
- The flooded depth at the southern approach to the West End Subway could be as much as 4m.

N.B These estimates of flood levels and depths represent present-day conditions, i.e. with no allowance made for climate change.

**Figure 4: LiDAR level data overlaid onto NRW flood zone maps (dark blue = flood zone 3; light blue = flood zone 2)**



Source: Mott MacDonald, 2018. Data from:  
[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default) and <http://lle.gov.wales/Catalogue/Item/LidarCompositeDataset/?lang=en> Contains Natural Resources Wales information © Natural Resources Wales and database right.

#### 4.2.3 Estimate of flood levels and depths with an allowance for climate change

TAN 15 requires that in assessing flooding consequences, the predicted effects of climate change over the lifetime of the development should be considered.

Welsh Government guidance on climate change allowances for Flood Consequence Assessments includes allowances both for increases in peak river flows and for sea level rise, for a range of time horizons. For this type of development it is usual to assume a design life of 100 years.

Without hydraulic modelling of watercourses it is not possible to predict or to reliably estimate the effects of increases in flows on the extent or depth (water level) of fluvial flood events.

Welsh Government guidance is that the cumulative sea level rise to 2116, using 2008 as the baseline, is 1094mm (i.e. 1.1m).

As the development is located on the edge of the tidal floodplain it is reasonable to assume that, including climate change allowances, tidal flooding will be dominant at this location.

NRW document GPG 101 states that a FCA or appraisal must include consideration of climate change on all coastal levels up to and including the 0.1% (1 in 1000) annual probability of occurrence.

Subject to confirmation through consultation with NRW, it is considered likely that the tidal flood extents illustrated on the NRW flood maps are derived from sea levels at discrete node locations within the Severn Estuary, with the levels projected in-land over a digital terrain model to produce the flood outline.

Therefore, by adding 1.1m to the estimated level for the present day 0.1% annual probability event, the tidal flood levels for an extreme event (0.1% annual probability of occurrence) with an allowance for climate change due to sea level rise to 2116, may be estimated as 10.1m AOD.

This indicates that, for the undefended 0.1% annual probability tidal flood event (with an allowance for climate change):

- The flooded depth along the access route to and from the north side of the site via B4245 Main Road, from both directions, and at the car park and drop-off area, will be of the order of 2m.
- The flooded depth at the accesses to the footbridge crossing, will be of the order of 2m.
- The flooded depth on the new platforms, assuming they are elevated by approximately 1m above the rail tracks, will be of the order of 1m.
- The West End Subway will be completely submerged.
- The flooded depth at the southern approach to the West End Subway could be more than 5m.

Again taking into account that the extent of flood zone 2 coincides with the extent of flood zone 3 at this location, the estimated flood level and corresponding depths for the 0.5% annual probability tidal flood event with an allowance for climate change, will be approximately the same as the values estimated above for the 0.1% annual probability tidal flood event with an allowance for climate change.

More extensive topographic survey information will enable a better comparison with predicted flood extents and a more reliable estimate of likely flood water levels. In any event NRW will require that a comprehensive topographic survey to ordnance datum is provided with any FCA submitted as part of a planning application.

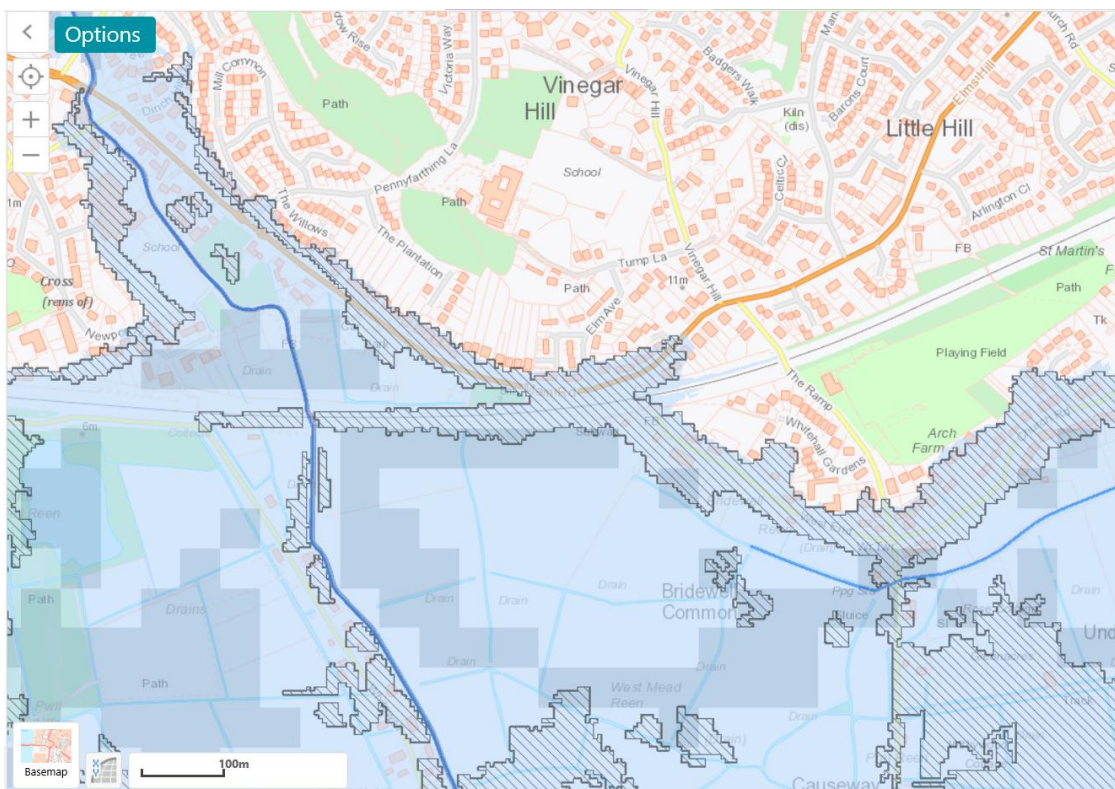


#### 4.2.4 Existence and effect of flood defences

The NRW on-line flood maps also indicate that all of the site is in an area that has a “low” risk of flooding from rivers and the sea, where “low” means that each year, there is a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%). Immediately to the north-west and to the south of the site lie areas that are shown to have a “medium” risk of flooding from rivers and the sea, where “medium” means that each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%). These risk designations take into account the effect of flood defences that may be in the area. Flood defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail.

The NRW online flood maps indicate the presence of continuous flood defences along the estuary shoreline to the south of the site. The maps (extract for site below in Figure 5) illustrate that areas benefitting from these defences include the existing railway line within the site boundary, the access to the north side of the site from B4245 Main Road (from both west and east), and access to the south side of the site via West End. This means that these areas benefit from flood defences in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year.

**Figure 5: Extract from NRW online flood map – Risk of Flooding from Rivers & Sea, and areas benefitting from flood defences (hatched area = area benefitting from flood defences)**



Source:

[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default) (accessed April 2018).

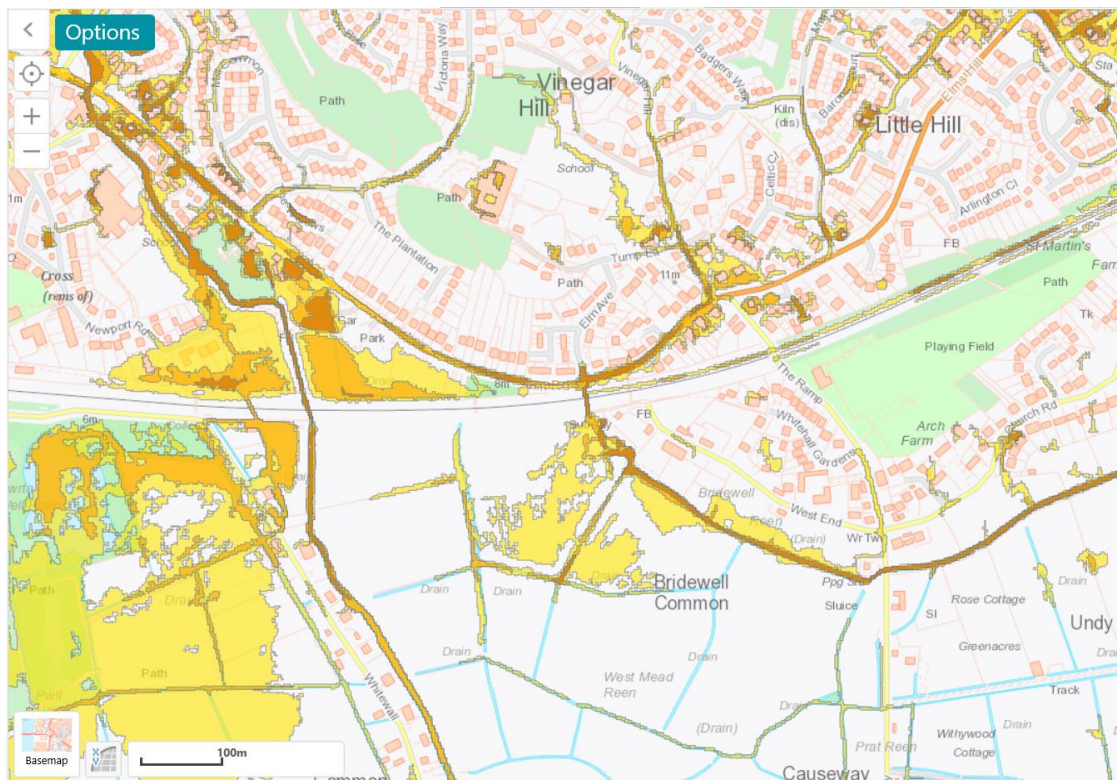
### 4.3 Flooding from surface water

Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.

The NRW on-line flood risk maps indicate that the undeveloped area of land to the north of the site, bounded by the railway line, B4245 Main Road, and St Bride's Brook, is at risk of surface water flooding. The level of risk varies from "low risk" and "medium risk" immediately adjacent to the railway, to "high risk" further north. The railway line itself and the land immediately to the south, are not shown as being at risk from surface water flooding. The West End Subway is shown to be at high risk of surface water flooding.

In this context, "low risk" means areas of land that, each year, have a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%). "Medium risk" means land that, each year, has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%). "high risk" means land that, each year, has a chance of flooding of greater than 1 in 30 (3.3%).

**Figure 6: Extract from NRW on-line flood risk map – Surface Water Flood Risk**



Source:

[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default) (accessed April 2018).

### 4.4 Flooding from sewers and drains

No information on buried sewers or drains was obtained or reviewed as part of this assessment.



#### **4.5 Flooding from groundwater**

No information on groundwater levels was available to inform this assessment.

If groundwater levels are near the existing ground level at any time of the year, then the proposed lowering of the West End Subway may introduce or exacerbate groundwater flooding at that location. It is therefore recommended that groundwater levels at the site are investigated and monitored to better understand the likely risks and associated consequences.

#### **4.6 Flooding from artificial sources**

The NRW on-line flood risk map does not indicate that the site is at risk from reservoir flooding. This review has identified no evidence that the site is at risk of flooding from canals.

#### **4.7 Summary of flooding consequences**

The site is at risk of flooding from rivers and/or the sea, from surface water, and potentially from groundwater. Tidal flooding is considered to be the predominant source of flood risk, with the greatest potential consequences. The site is not thought to be at risk from reservoir flooding.

## 5 TAN15 acceptability criteria

Where development at a site can be justified, the development must then meet the acceptability criteria detailed in TAN15 Section 7 and Appendix 1, summarised in Section 9 of TAN 15 as follows:

- Acceptable consequences for nature of use
- Flood defences adequate
- Agreement for construction and maintenance costs secured
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Effective flood warning provided
- Flood emergency plans and procedures
- Flood resistant design
- No increase in flooding elsewhere

In addition to the above, Section 8 of TAN 15 provides guidance for the management of surface water from new development.

### 5.1 Acceptability of flooding consequences for the nature of use

#### 5.1.1 Flooding from rivers and the sea - frequency threshold

Appendix 1 of TAN 15 states that development should be designed to be flood free during the 1% (annual probability) fluvial flood and the 0.5% tidal/coastal flood, and this represents a frequency threshold below which flooding of development should not be allowed.

Taking into account the presence of flood defences, the proposed development will meet this guidance for the present-day scenario. However, if the defences were to fail then this condition would not be met.

If climate change is taken into account then the defences will be overtopped and at greater risk of failure, and this condition is unlikely to be met even if the defences remain in place.

#### 5.1.2 Flooding from rivers and the sea - extreme conditions

Beyond the threshold frequency, proposed development would be expected to flood under “extreme conditions”. Extreme conditions are generally taken to be a 0.1% annual probability fluvial or tidal/coastal flood event. TAN 15 indicative guidance is that the maximum depth of flooding under extreme conditions for general infrastructure, should be 600mm for both property and access.

During “extreme conditions” the flood defences will be overtopped and therefore at increased risk of failure.

For the present-day scenario, if the flood defences do not fail then it is possible that this condition will be met for both property and access. However, if the defences fail then this condition will not be met for either property or access.

If the 0.1% tidal flood event is considered with climate change to 2116, then the defences will be overtopped and this condition is very unlikely to be met even if the defences remain in place.

### 5.1.3 Surface water flooding

The areas shown to be at low risk of surface water flooding includes the parcel of land currently proposed for parking, drop-off and bus replacement service (refer to the "Platform General Arrangement Costed Option" drawing in Appendix A). Further interrogation of the NRW online flood maps reveals that the corresponding level of hazard at this location varies from "low" to "danger for some", where "low" means "A flood risk area with shallow flowing water or deep standing water", and "Danger for some" means "A flood risk area with deep or fast flowing water. Dangerous to children, the elderly and the infirm." Also that the depth of flooding at this location varies from zero to 0.6m, and the velocity of surface water may exceed 0.25m/s.

The West End Subway is shown to be at high risk of surface water flooding. The flood depth associated with this risk is less than 0.15m, the flood water velocity is greater than 0.25m/s, and the corresponding flood hazard is "low". For lower frequency events (between 1 in 1000 (0.1%) and 1 in 100 (1%) annual probability), the depth of flooding of the West End Subway is predicted to exceed 0.9m, and the hazard increases to "danger for all", defined as "A flood risk area with very deep fast flowing water. An extreme risk including emergency services". The development proposals also include the lowering of the existing West End Subway. This will increase the likelihood and potential depth of surface water flooding to the subway.

## 5.2 Flood defences adequate

TAN15 advises that a FCA must show that flood defences will be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a probability of occurrence of 0.1%).

The site currently benefits from tidal flood defences along the Severn and Usk Estuaries. These defences are maintained by NRW.

NRW has permissive powers (but not a duty) to carry out flood and coastal risk management work, including maintenance of flood defences. There are two strategic plans that indicate whether these flood defences will be maintained by NRW in the long-term:

- Eastern Valleys and Wye and Usk Catchment Flood Management Plan (CFMP).
- Severn Estuary Shoreline Management Plan 2 (SMP2).

The strategy outlined in the above plans for this area is to continue to maintain (and possibly improve) the defences.

## 5.3 Agreement for construction and maintenance costs

The purpose of this report is to inform and support an application for funding. Confirmation of agreement for construction and maintenance costs will need to be addressed as part of further work.

## 5.4 Occupiers aware of flood risk

As the station will be unmanned there will be no one in attendance to inform site users of the flood risk. To mitigate this the site operator could (for example) erect prominent notices to make site users aware of the risks and potential consequences of flooding, and the appropriate actions to be taken in response to a flood warning or flood alert.

## 5.5 Escape and evacuation routes present

Ordinarily, pedestrian and vehicular access to the site is available from the north via B4245 Main Road and pedestrian access only is available from the south via West End. Pedestrian access between the north and south sides of the site is available via both the West End Subway beneath the railway, and the footbridge over the railway.

The shortest and safest route away from the site during a fluvial or tidal flood event, is toward the east via the B4245 Main Road.

During a fluvial flood event of 1% annual probability or a tidal flood event of 0.5% annual probability, most of the site and all access and egress routes will be protected from flooding by flood defences. However, if these defences were to fail, then in such an event the site would not be accessible from the south, and the West End Subway would be submerged and therefore impassable. Access to the north side of the site from B4245 Main Road would also be flooded, as would access to the footbridge on both sides.

It is unlikely that trains will arrive at the station during a fluvial or tidal flood event, as the track will be flooded both to the west and to the east of the site.

Passengers that have not evacuated the station in advance of the onset of flooding may become stranded on one of the station platforms, or on the footbridge.

The proposals also include the provision of parking spaces. Drivers that have parked at the station and travelled elsewhere by rail are unlikely to become aware of flood warnings or alerts at the station and, even if they are aware of them, may not be able to return to the station in time to safely evacuate their vehicles.

## 5.6 Effective flood warning provided

NRW provides a free flood warning service, to help people prepare for flooding and take action.

The NRW on-line flood risk maps indicate that the site is located in an area served by both flood warnings and flood alerts, namely the "Coast at the Caldicot Levels" Flood Warning Area and the "Coast from Aberthaw to Severn Bridge" Flood Alert Area.

A Flood Alert is issued when flooding is possible, to enable people to prepare. Flood Alerts are issued between two hours and two days in advance of flooding.

A Flood Warning is issued when flooding is expected and immediate action is required. Flood Warnings are issued between half an hour and one day in advance of flooding.

A Severe Flood Warning is issued when there is severe flooding and danger to life.

Flood warnings are provided for an address or location, via telephone and email.

However, and as noted above, the station will be unmanned so ordinarily there will be no one in attendance to receive a flood warning or alert, or to act on a warning or alert once received. To mitigate this the site operator could (for example):

- Erect prominent notices to inform site users of the appropriate actions to be taken in response to a flood warning or flood alert.
- Relay flood warnings and flood alerts via electronic notice boards and automated audio warnings at the station.

- Attend the station immediately when a flood alert or warning is issued, and prior to the onset of flooding, to ensure the effective evacuation and closure of the station. e.g. using lockable gates or barriers.
- Close the station such that trains do not stop when a flood alert or warning is in operation.

## 5.7 Flood emergency plans and procedures

Flood emergency plans and procedures are discussed in the sections above on flood warning, escape and evacuation.

## 5.8 Flood resistant design

The physical infrastructure of the station (i.e. platforms, parking areas, bridge and underpass) may be designed as resilient structures that would not suffer significant flood damage, and would recover and could be returned to use quickly in the aftermath of a flood. However, there may be implications for mechanical and electrical infrastructure associated with the railway (e.g. signalling) which may need to be located above the threshold flood level to ensure it continues to operate during such an event.

## 5.9 No increase in flooding

The creation of a new station will attract passengers to a location that is at risk of flooding, which may be considered an increase in the flood risk and potential flooding consequences to people. However, it is understood that the creation of the new station will not in itself result in an increase in the number or frequency of trains.

The proposed development will result in an increase in flood depth within the West End Subway and its approaches, which would need to be managed.

Based on the information reviewed as part of this assessment it is not anticipated that the development will increase existing flood risk elsewhere.

However, depending on the mode of flooding and the sensitivity to flooding of other receptors in the catchment, it is possible that NRW will require that hydraulic modelling is undertaken to demonstrate that the proposed development will not exacerbate flooding to other receptors.

If this is the case then due consideration should be made in the design of the station platforms such that they do not occupy space that would otherwise be used for the storage of fluvial flood water and do not significantly affect the conveyance of floodwater. For example, the platforms may be designed as elevated rather than solid structures.

### 5.9.1 Surface water management and disposal

Section 8 of TAN 15 deals with surface water run-off from new development. In summary: development should not increase the risk of flooding elsewhere; Sustainable Drainage Systems (SuDS) should be implemented wherever they will be effective; and redevelopment should reduce run-off where possible.

The current proposals include increasing the impermeable area around the existing railway, by the construction of: two new platforms and four rail waiting shelters; ramps to the existing West End Subway beneath the railway; and a surfaced area for parking/drop-off adjacent to the B4245. The cumulative increase in impermeable area is estimated to be of the order of 1,500m<sup>2</sup> for the parking area alone and an additional 1,500m<sup>2</sup> for the other elements of the development. Without mitigation this increase will result in an increase in the volume and rate of surface water run-off to adjacent land, and hence an increase to flood risk.

The proposed lowering of the existing West End Subway will also require the existing drainage system serving the subway to be lowered. Groundwater levels may also impact the surface water drainage for the lowered West End Subway and the design will need to account for this.

In order to meet the requirements of TAN 15 a surface water management and disposal system that meets current standards will need to be designed, constructed and maintained. The design of this system will need to include for the predicted effects of climate change over the lifetime of the development.

### 5.10 Residual risks

The development is very unlikely to comply with TAN 15 acceptability criteria for flooding consequences, including those relating to threshold and extreme flooding events from rivers or the sea. If the development is to proceed then these and other flood risks and consequences will need to be managed through careful design and operational procedures.

This being the case, it is recommended that NRW is consulted as soon as practicable to:

- (a) Obtain all existing readily available flood risk information pertaining to the site, and to confirm the mechanism and mode of flooding from adjacent watercourses and the sea, such that the preliminary conclusions reached in this report may be confirmed or otherwise, and
- (b) Seek NRW's view on the acceptability of the development overall, including, whether NRW is likely to object to a planning application, the scope of any further assessment work that NRW would wish to see undertaken, and mitigation measures that NRW may wish to see implemented in order to agree to the development proceeding.

In addition and as part of any further assessment, it is recommended that the LLFA and IDD are also consulted.



## 6 Summary and conclusion

The site is at risk of flooding from rivers and/or the sea, from surface water, and potentially from groundwater. Tidal flooding is considered to be the predominant source of flood risk, with the greatest potential consequences. The site is not thought to be at risk from reservoir flooding.

Reviewed against TAN 15 acceptability criteria, the assessment of flood risk and consequences may be summarised as follows.

- The site benefits from continuous tidal flood defences along the Severn Estuary. These defences are maintained by NRW.
- Taking into account climate change allowances for sea level rise to 2116, the existing flood defences will be overtopped and the proposed development is unlikely to meet the TAN 15 frequency threshold below which flooding should not be allowed. If the flood defences were to fail then this condition would not be met.
- Taking into account climate change allowances for sea level rise to 2116, the existing flood defences will be overtopped and the proposed development is very unlikely to meet the TAN 15 indicative guidance for tolerable flooding conditions during an extreme flood event, for either property or access. If the flood defences were to fail then this condition would not be met.
- The creation of a new station will attract passengers to a location that is at risk of flooding, which represents an increase in the flood risk and potential flooding consequences to people.
- Escape and evacuation routes from the southern (westbound) platform may require use of a footbridge which will not be accessible to all users (e.g. wheelchair users). In any case, evacuation routes will be impassable during an extreme event, and potentially during the threshold event below which flooding should not be allowed. Accordingly, emergency plans and procedures would need to ensure evacuation of the site before the onset of flooding.
- The site is served by a free flood alert and flood warning service. However, the site will be unmanned and used by the public. Therefore, there is no assurance that users will be aware of flood risk or take appropriate action during an actual flood event or in response to a flood warning or alert. To mitigate this the site operator could (for example):
  - Erect prominent notices to make site users aware of the risks and potential consequences of flooding, and the appropriate actions to be taken in response to a flood warning or flood alert.
  - Relay flood warnings and flood alerts via electronic notice boards and automated audio warnings at the station.
  - Attend the station immediately when a flood alert or warning is issued, and prior to the onset of flooding, to ensure the effective evacuation and closure of the station. e.g. using lockable gates or barriers.
  - Close the station such that trains do not stop when a flood alert or warning is in operation.
- The physical infrastructure of the station (i.e. platforms, parking areas, bridge and underpass) may be designed as resilient structures that would not suffer significant flood damage, and would recover and could be returned to use quickly in the aftermath of a flood. Mechanical and electrical infrastructure associated with the railway (e.g. signalling) should be located above the threshold event flood level to ensure it continues to operate during such an event.

- The proposed development will result in an increase in flood depth, and associated hazard to people, within the West End Subway and its approaches.
- If necessary to avoid increasing flood risk elsewhere, the station platforms should be designed as elevated rather than solid structures such that they do not occupy space that would otherwise be used for the storage of fluvial flood water and do not significantly affect the conveyance of floodwater.

In summary, the development is very unlikely to comply with TAN 15 acceptability criteria for flooding consequences, including those relating to threshold and extreme flooding events from rivers or the sea. If the development is to proceed then these and other flood risks and consequences will need to be managed through careful design and operational procedures.

## 6.1 Recommendations for further work

It is recommended that NRW is consulted as soon as practicable to:

- (a) Obtain all existing readily available flood risk information pertaining to the site, and to confirm the mechanism and mode of flooding from adjacent watercourses and the sea, such that the preliminary conclusions reached in this report may be confirmed or otherwise, and
- (b) Seek NRW's view on the acceptability of the development overall, including, whether NRW is likely to object to a planning application, the scope of any further assessment work that NRW would wish to see undertaken, and mitigation measures that NRW may wish to see implemented in order to agree to the development proceeding.

In addition and as part of any further assessment, it is recommended that the LLFA and IDD are consulted.

It is recommended that groundwater levels at the site are investigated and monitored to better understand the risks and consequences of groundwater flooding and the effect of groundwater on local drainage.

NRW will require that a FCA is submitted as part of a planning application. A comprehensive topographic survey to ordnance datum will need provided with any FCA for planning.

If the development proceeds a surface water management and disposal system that meets current standards will need to be designed, constructed and maintained. The design of this system will need to include for the predicted effects of climate change over the lifetime of the development, the proposed lowering of the existing West End Subway, and groundwater levels.

# Appendices

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B.	Topographical Survey	30

## **A. Platform General Arrangement Costed Option**

Mott MacDonald drawing number MMD-364017-C-DR-00-XX-0007 Rev P1, dated 12/04/16

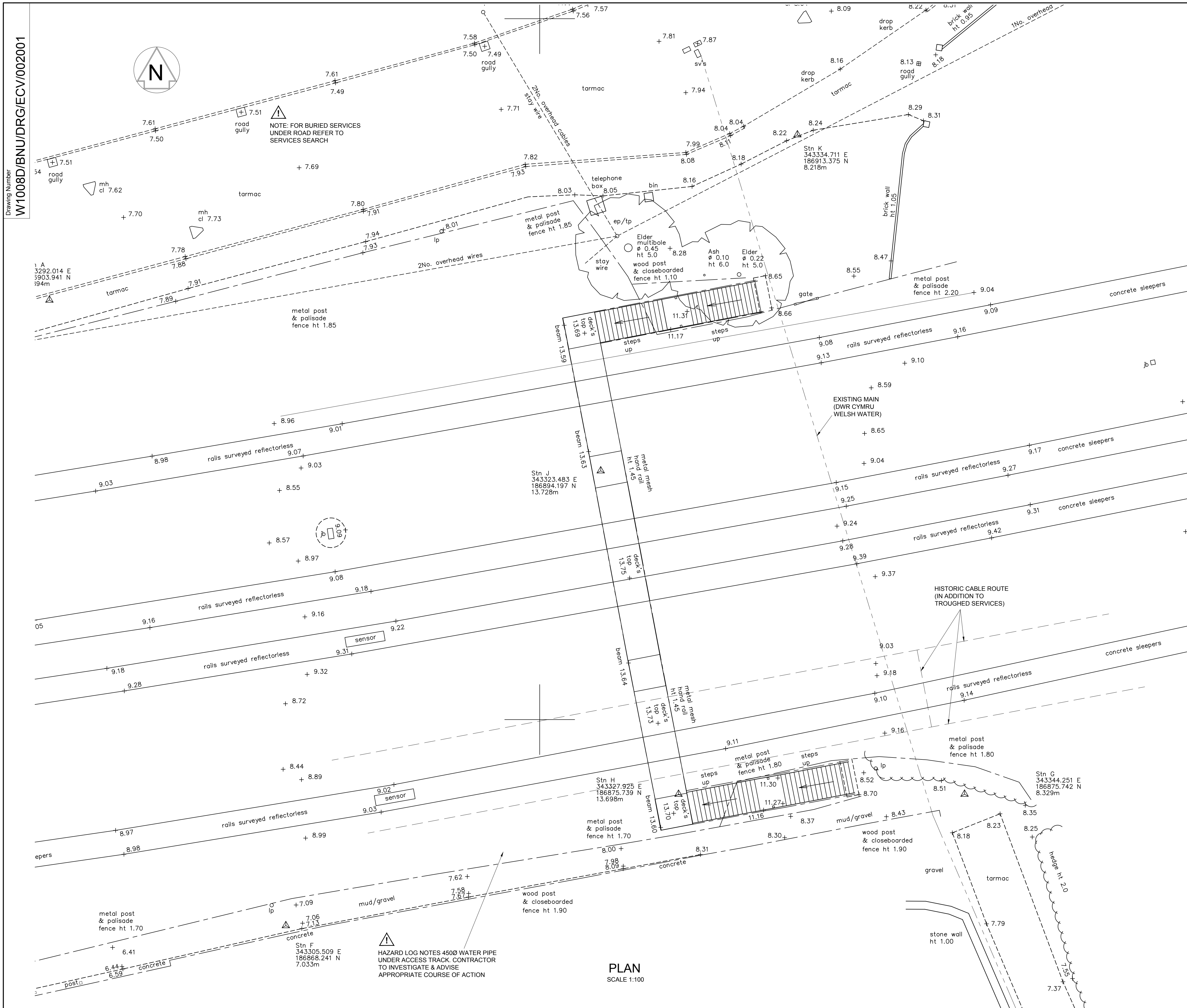


## **B. Topographical Survey**

Network Rail GWRM Undy Halt Footbridge Topographical Survey Drawing number  
W1008D/BNU/DRG/ECV/002001 Rev Z01, dated 12/5/17



Drawing Number  
W1008D/BNU/DRG/ECV/002001



Legend/Notes

0 2 4 6 8 10m  
SCALE 1:100

- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- THERE MAY BE BURIED TELECOMS CABLES IN THIS AREA (N.R. OWNERSHIP). CONTRACTOR TO REFER TO HAZARD DIRECTORY.
- LOCATIONS OF BURIED SERVICES INDICATED ARE APPROXIMATE ONLY.

Rev	Date	Description of Revisions	Drawn	Chkd	Appr	Suitability
AS-BUILT						S6

Contractor(s)

**NetworkRail**

**bam**  
nuttall

**CASS HAYWARD**  
CONSULTING ENGINEERS

Project

GWRM  
UNDY HALT FOOTBRIDGE  
SWM2 150 Miles 51 Chains

Drawing Title

TOPOGRAPHICAL SURVEY

Designed	A. White	Signed	Date
Drawn	D. Obermaier	Signed	19-1-15
Checked	A. White	Signed	19-1-15
Approved	A. Monnickendam	Signed	1-6-15

Scale(s)	Route Section	ELR & Mileage
As Shown @ A1	8	SWM2 150m 51ch

Alternative Reference	Sheet
4314	1 of 1

Drawing Number	Revision
W1008D/BNU/DRG/ECV/002001	Z01

Sheet Size A1 594 x 841



