

TRANSPORT AND WORKS ACT 1992
TRANSPORT AND WORKS (INQUIRIES PROCEDURES)
RULES 2004
NETWORK RAIL (HUDDERSFIELD TO WESTTOWN
(DEWSBURY) IMPROVEMENTS) ORDER

ENGINEERING AND DESIGN
PROOF OF EVIDENCE APPENDICES
Graham Thomas

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Author	Network Rail
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The Network Rail (Huddersfield to Westtown (Dewsbury) Improvements) Order 5 October 2021

Proof of Evidence Appendices – Engineering and Design

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APPENDIX 1: SUPPORTING FIGURES

TRANSPORT AND WORKS ACT 1992
TRANSPORT AND WORKS (INQUIRIES PROCEDURES)
RULES 2004
NETWORK RAIL (HUDDERSFIELD TO WESTTOWN
(DEWSBURY) IMPROVEMENTS) ORDER

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Appendix 1 – Supporting figures

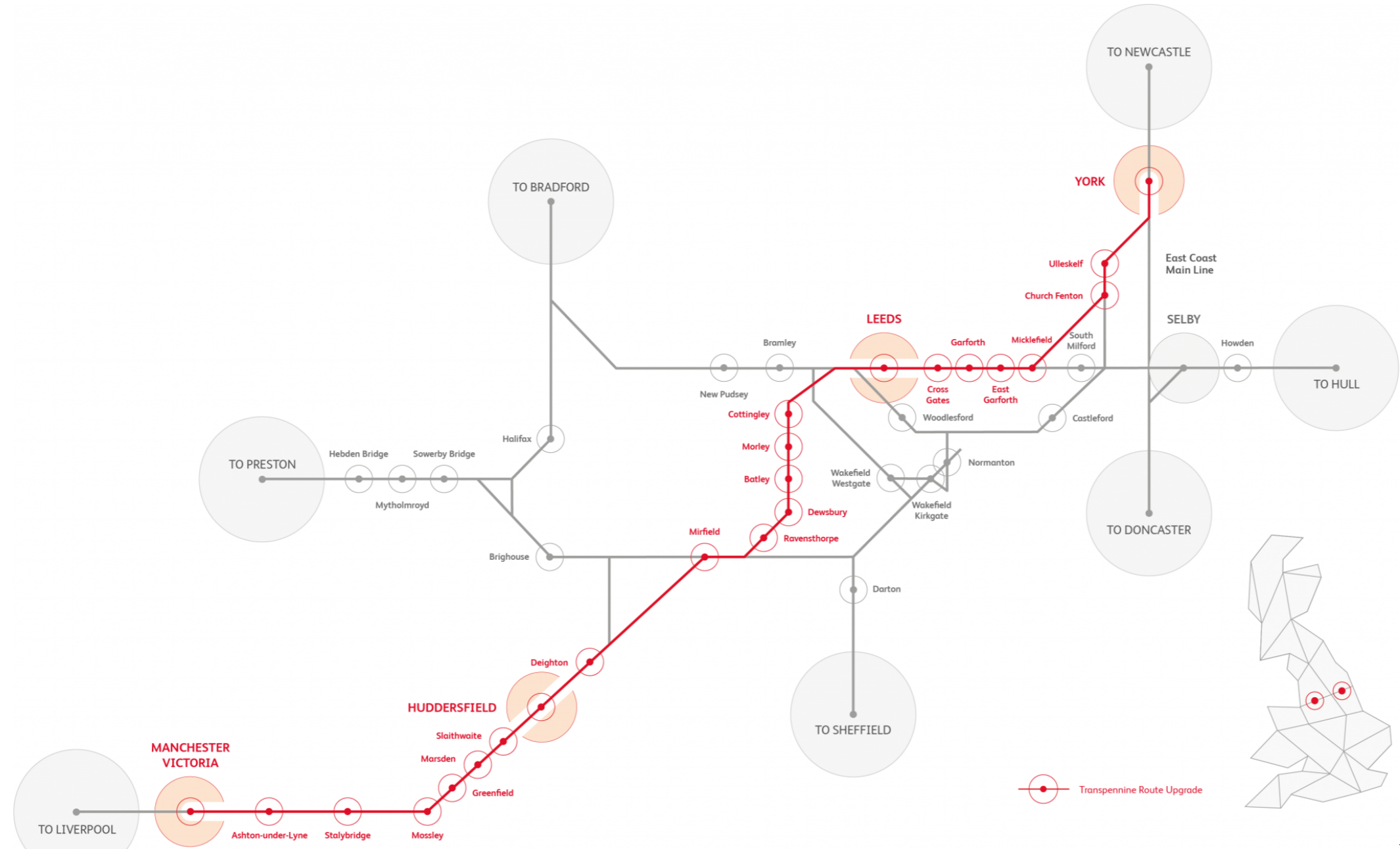
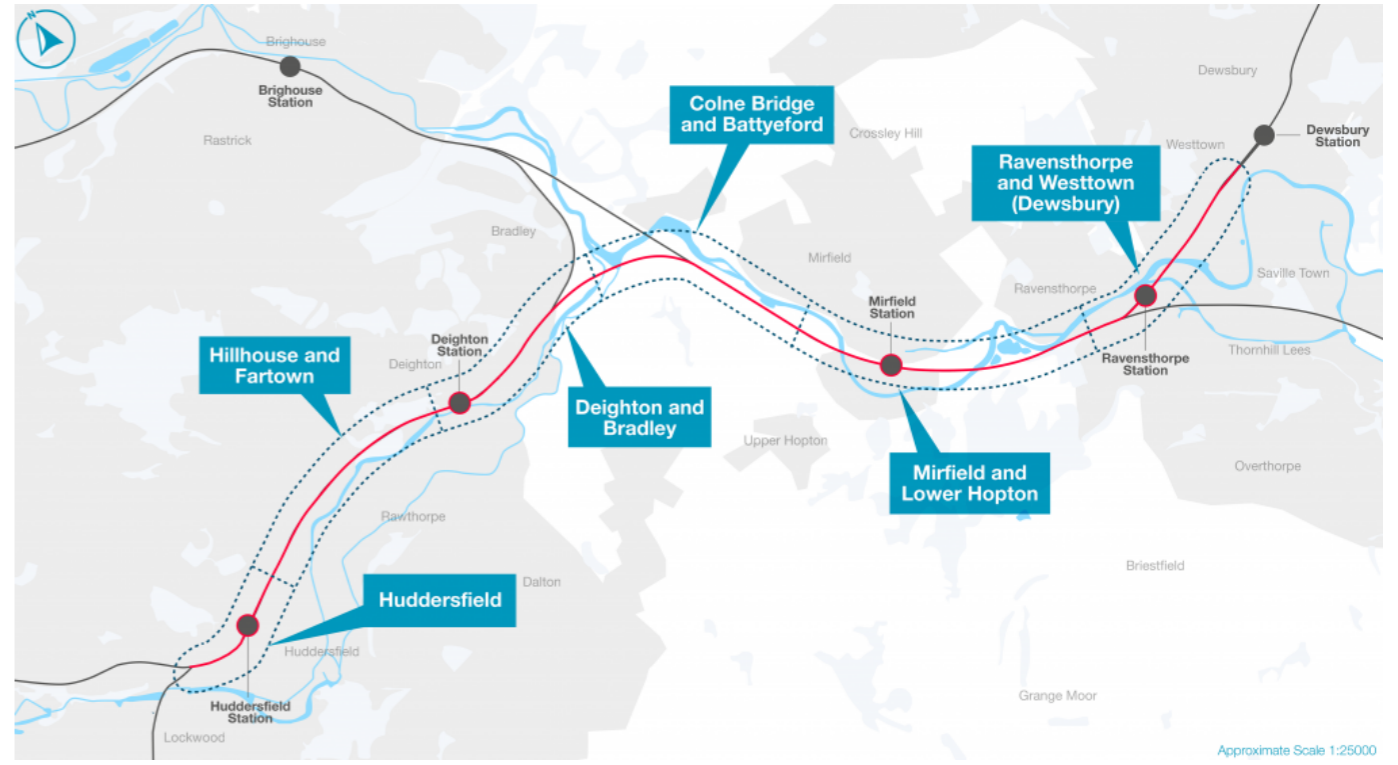
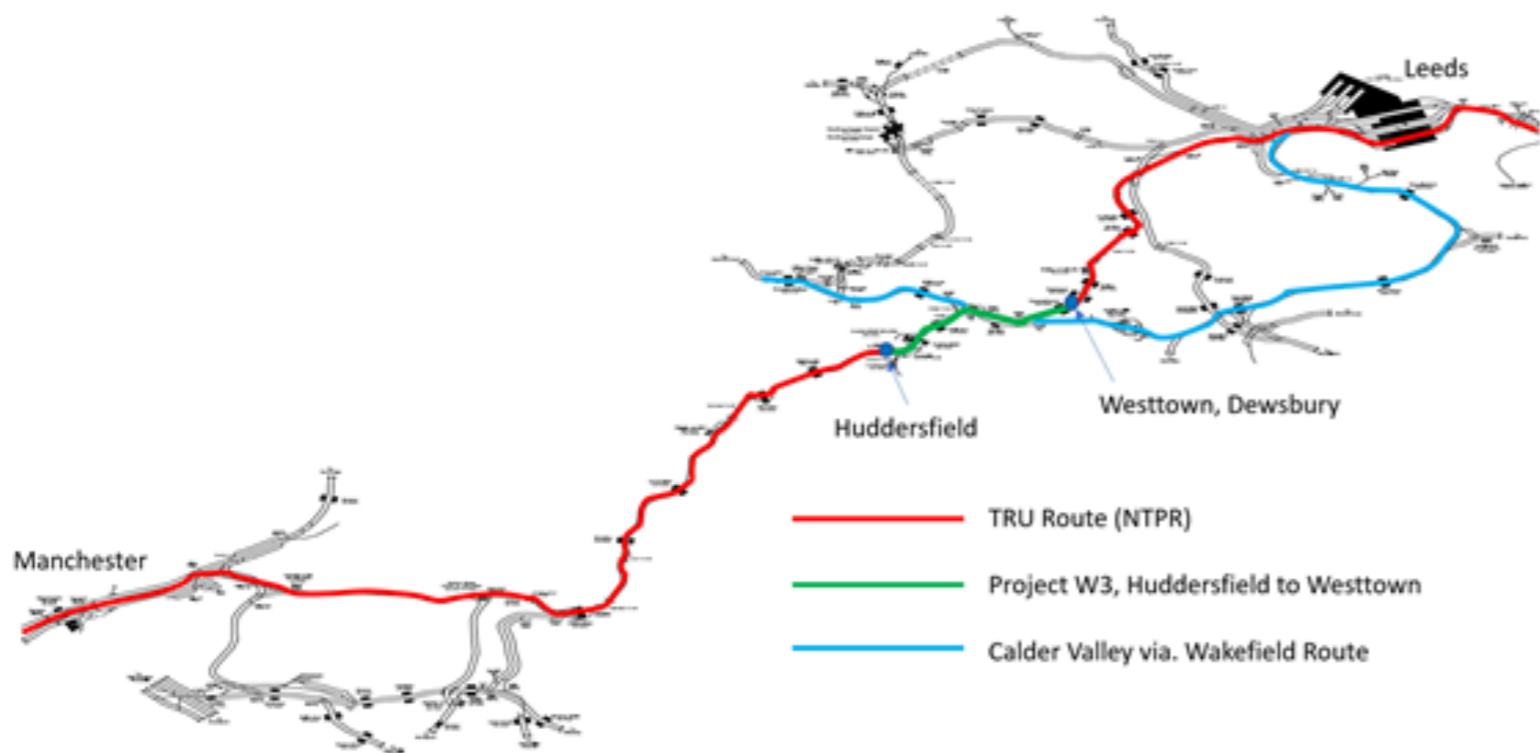
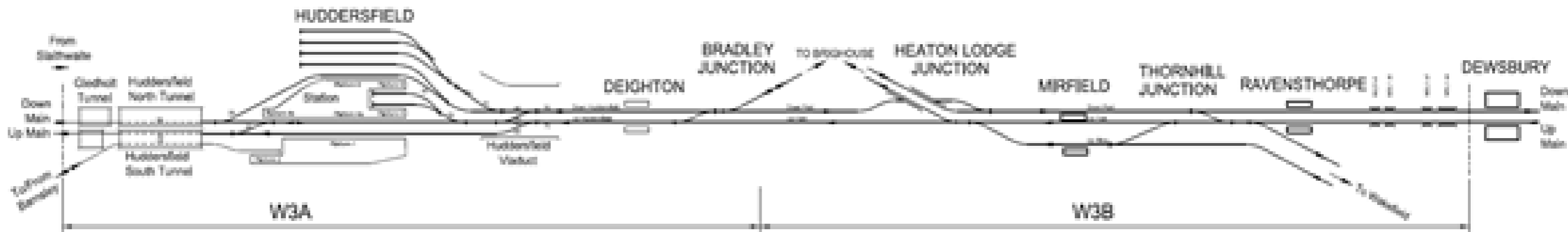
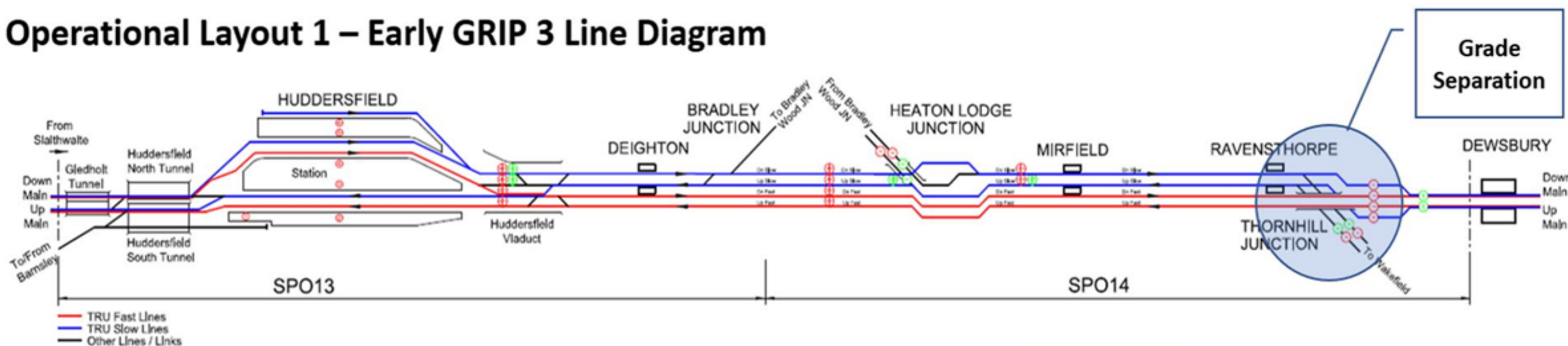


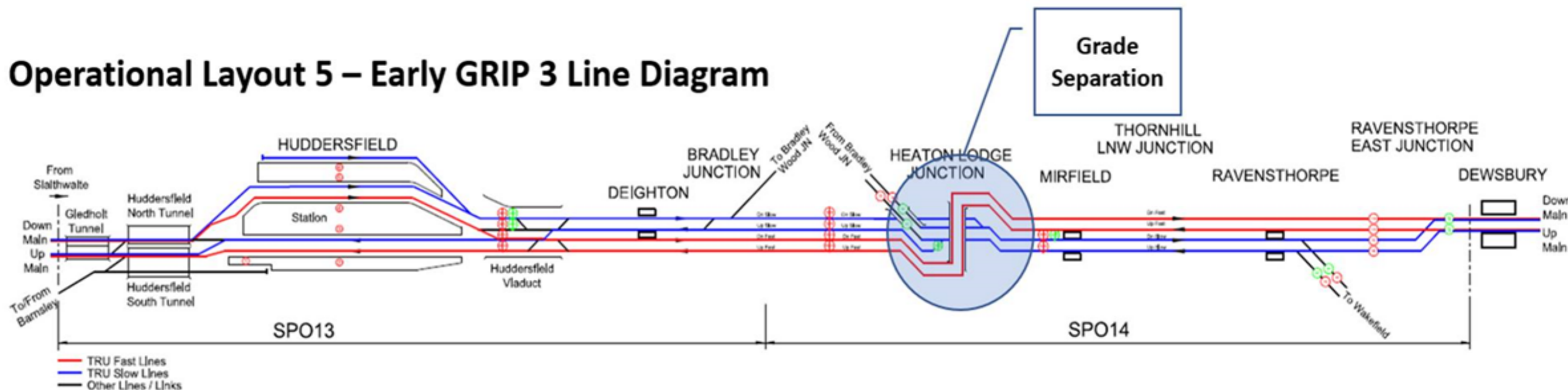
Figure 1: TRU West Route and Location of Project W3, Huddersfield to Westtown



Operational Layout 1 – Early GRIP 3 Line Diagram

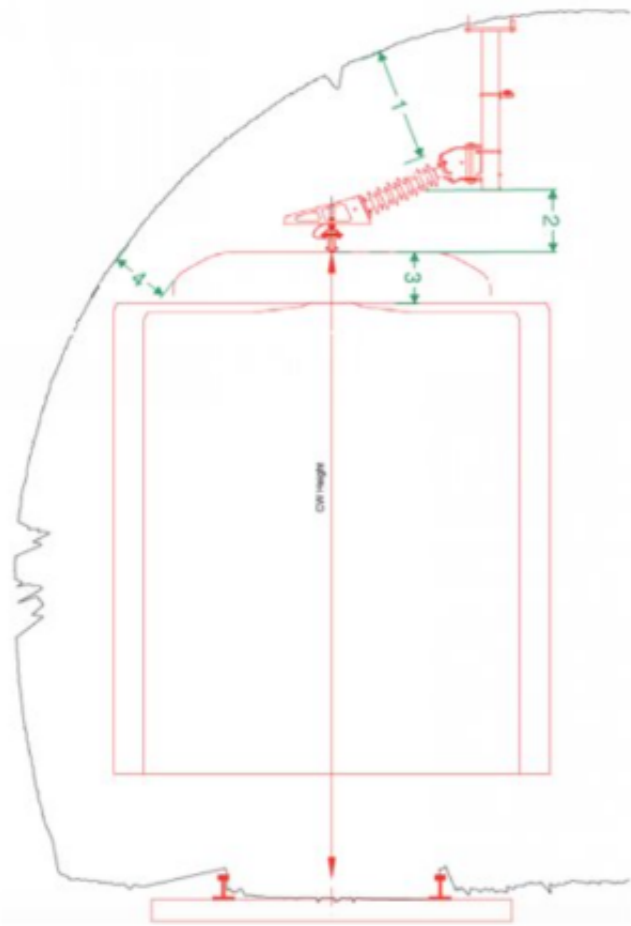


Operational Layout 5 – Early GRIP 3 Line Diagram

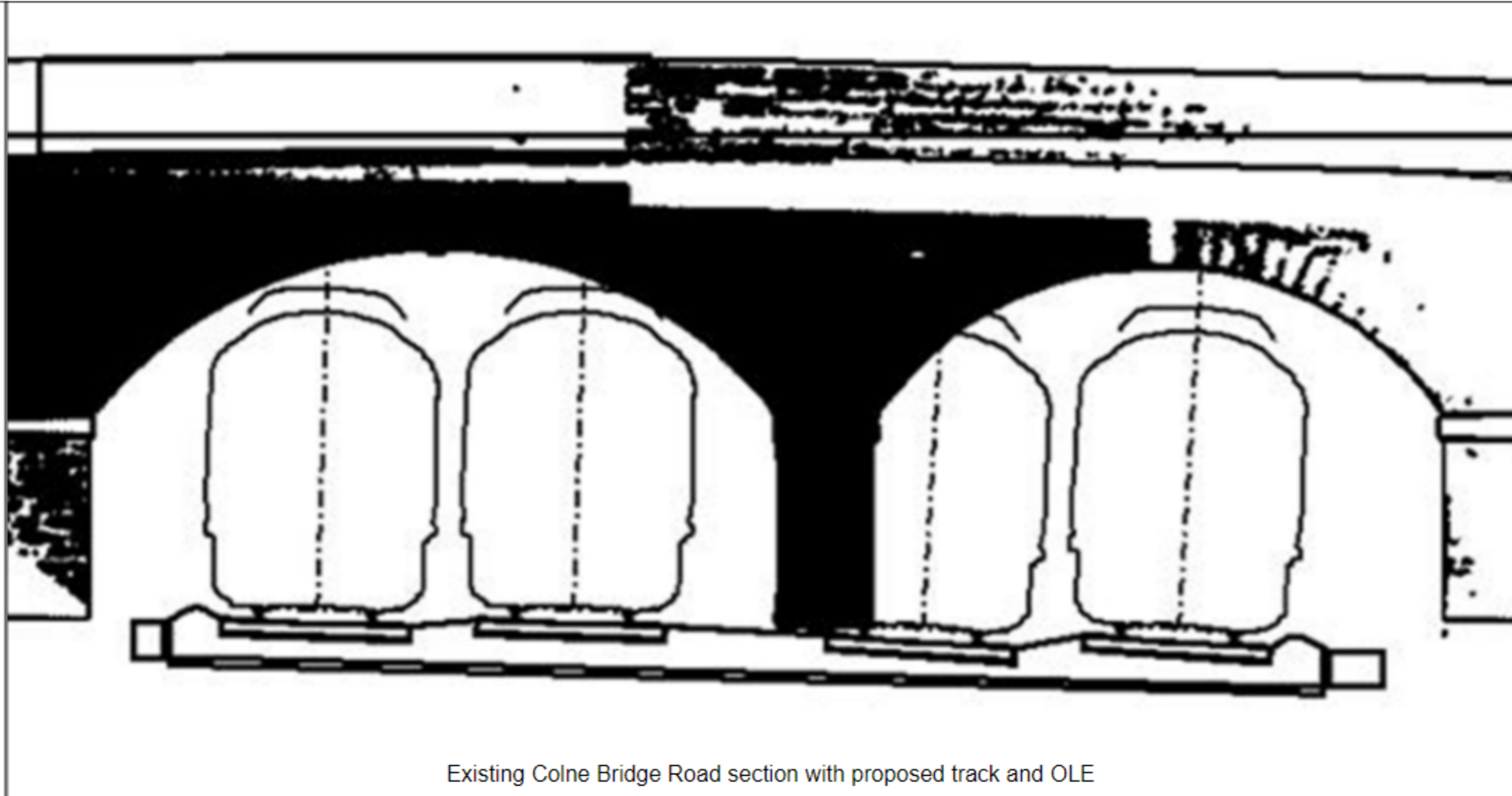


Note: Huddersfield track layout not final design

Figure 2: Project W3, Existing Operational Layout and Figure 8: GRIP3 Operational Layout Alternatives



1. Static Electrical Clearance
2. Upper Passing Electrical Clearance
3. Lower Passing Electrical Clearance
4. Passing Electrical Clearance



Existing Colne Bridge Road section with proposed track and OLE

Figure 4: OLE example gauge clearance sketches

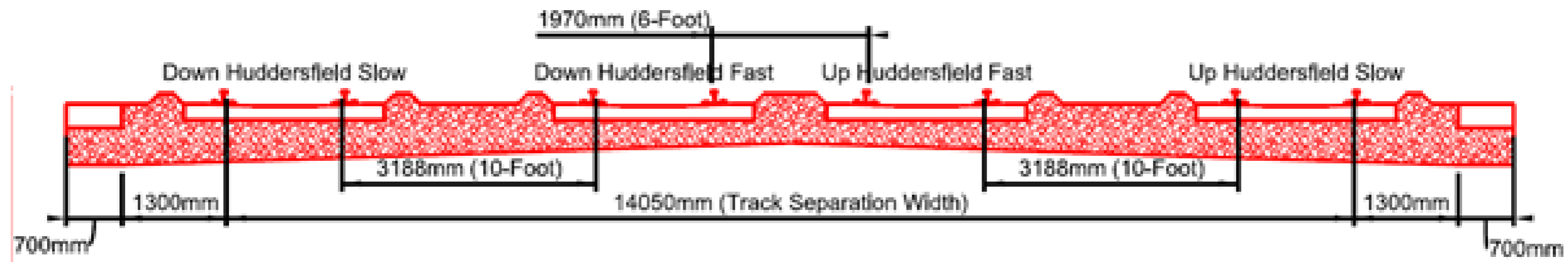


Figure 5: Slow, Fast, Fast, Slow, 4-track cross-section

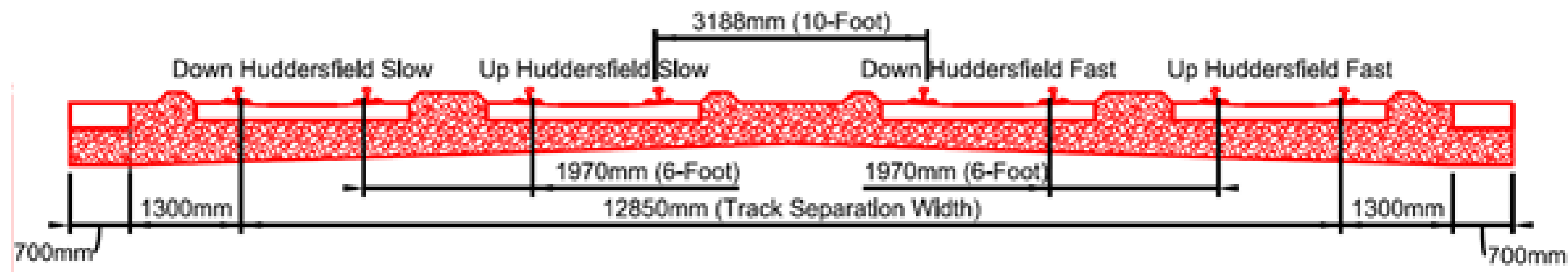


Figure 6: Slow, Slow, Fast, Fast, 4-track cross-section

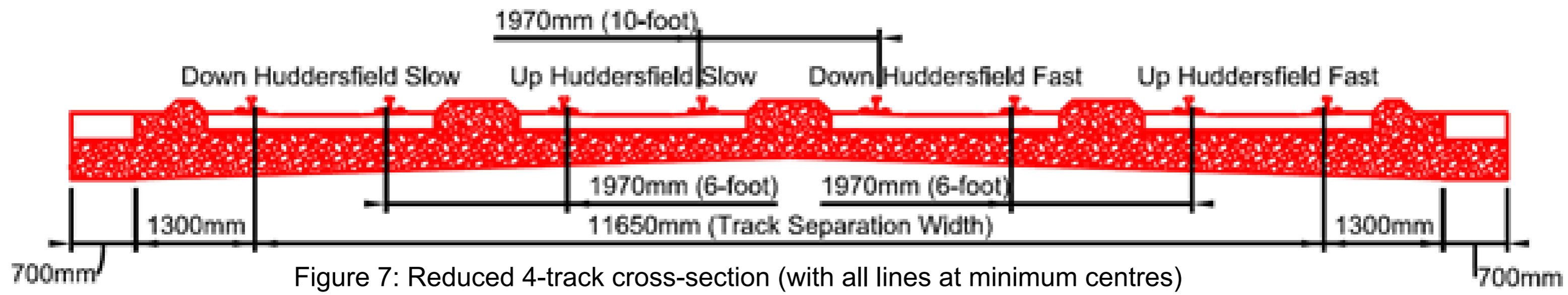
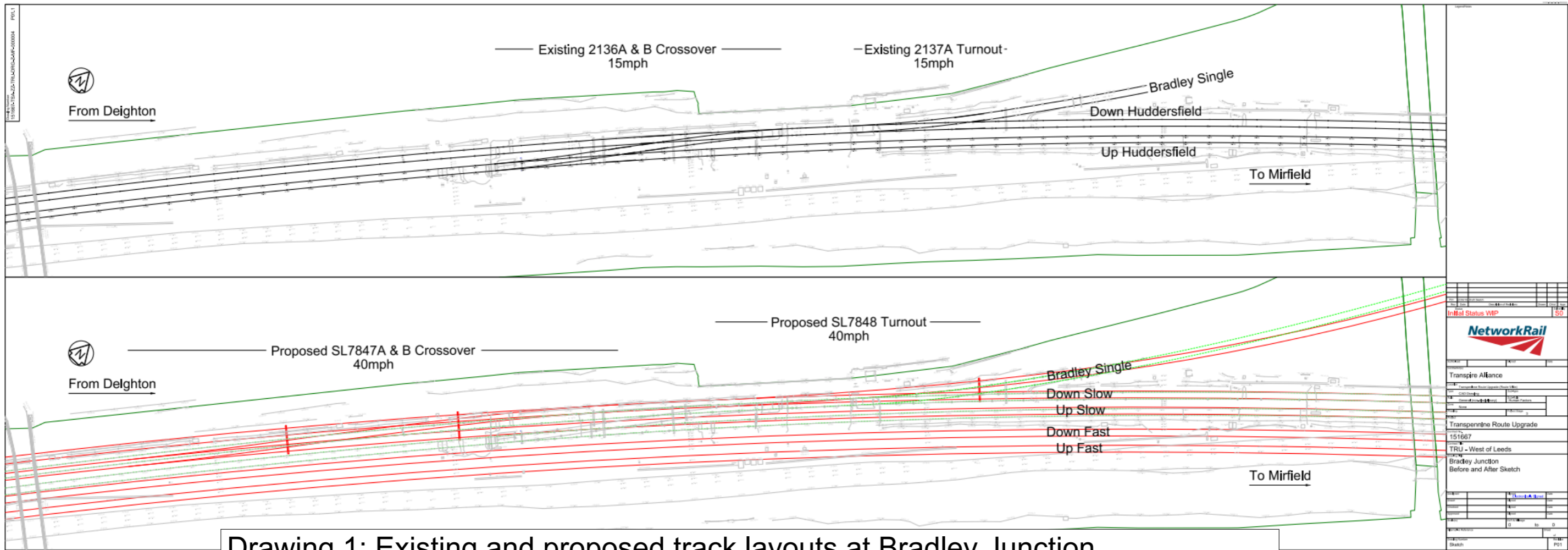


Figure 7: Reduced 4-track cross-section (with all lines at minimum centres)



Drawing 1: Existing and proposed track layouts at Bradley Junction

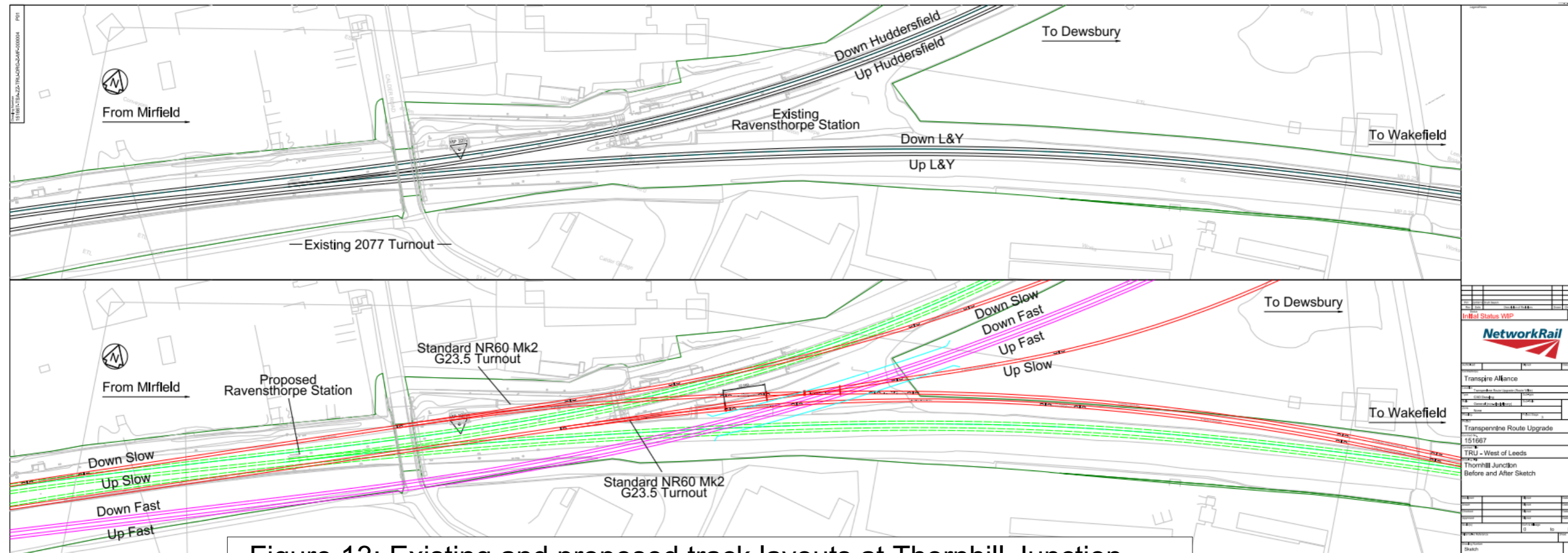
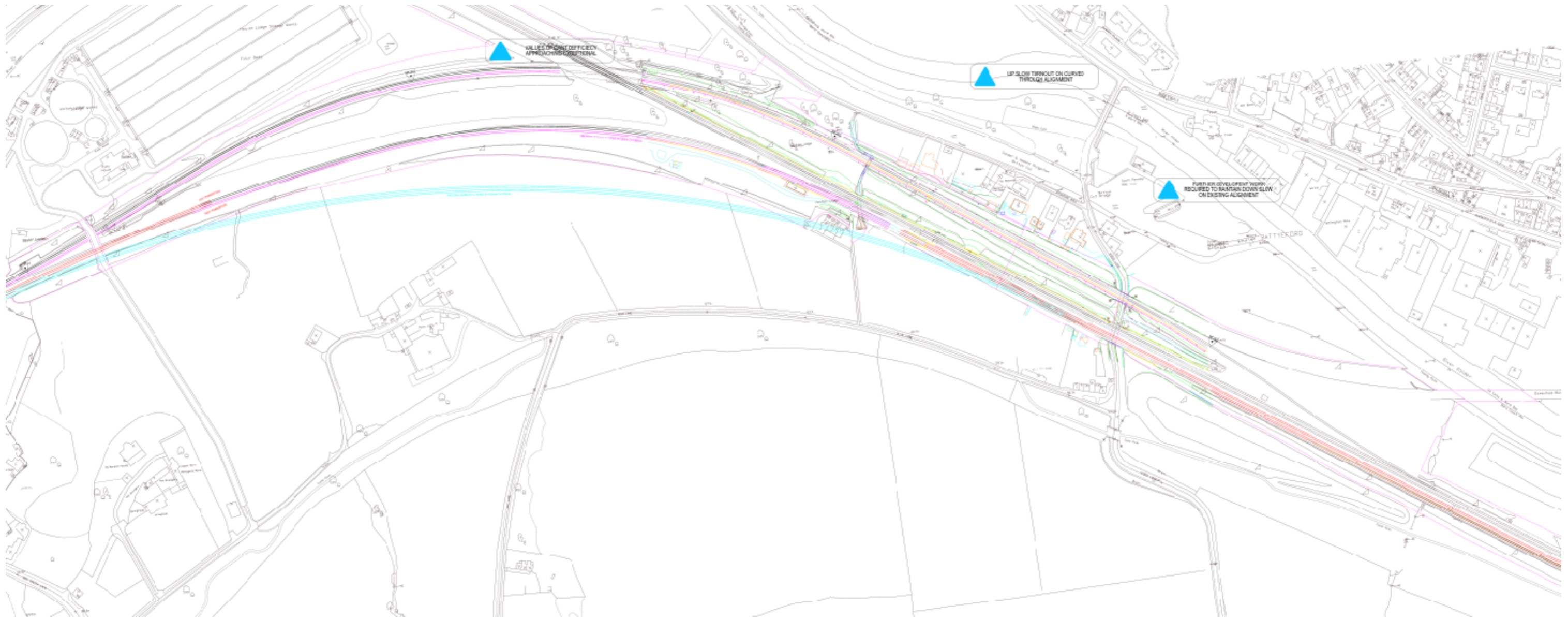


Figure 13: Existing and proposed track layouts at Thornhill Junction



Drawing 2: Layout 1, Heaton Lodge



Drawing 3: Layout 5, Heaton Lodge

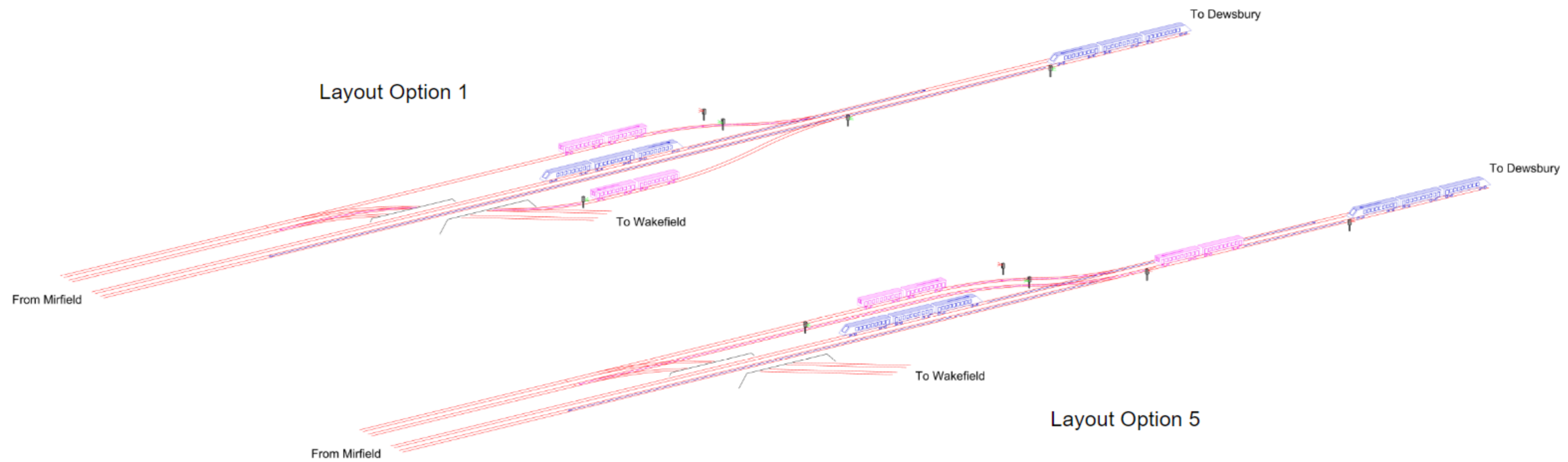


Figure 12: Ravensthorpe, comparison of junction operation

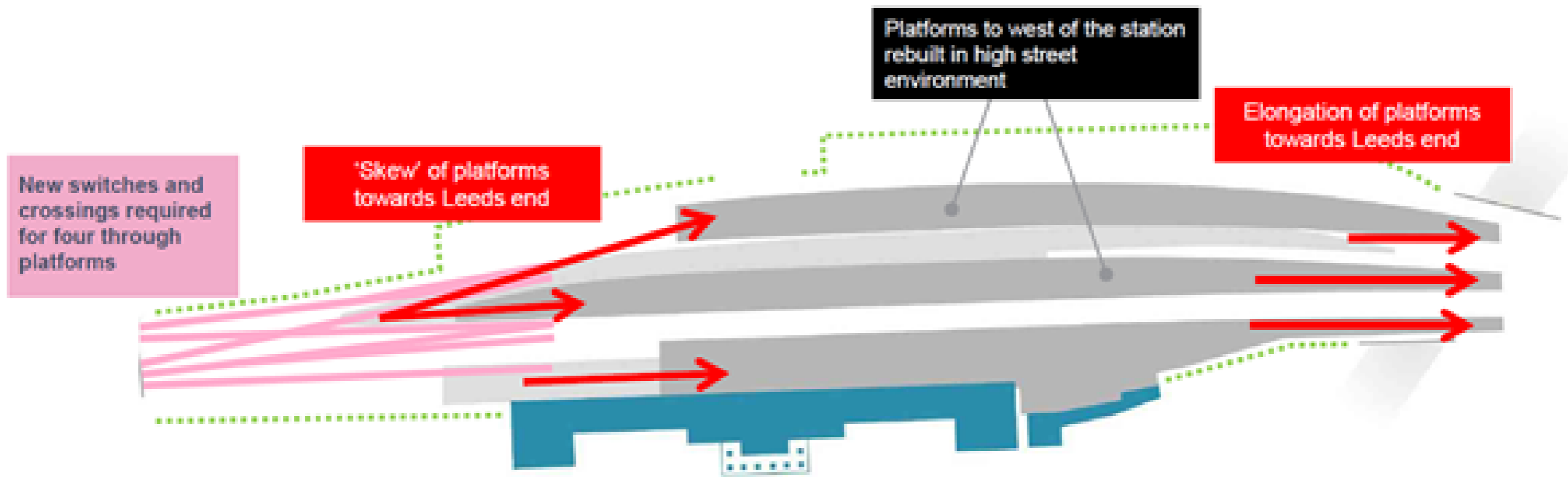


Figure 14: Huddersfield Station, platforms extended towards Leeds

Key:

- Tamping Zone 1 of 3
- Tamping Zone 2 of 3
- Tamping Zone 3 of 3

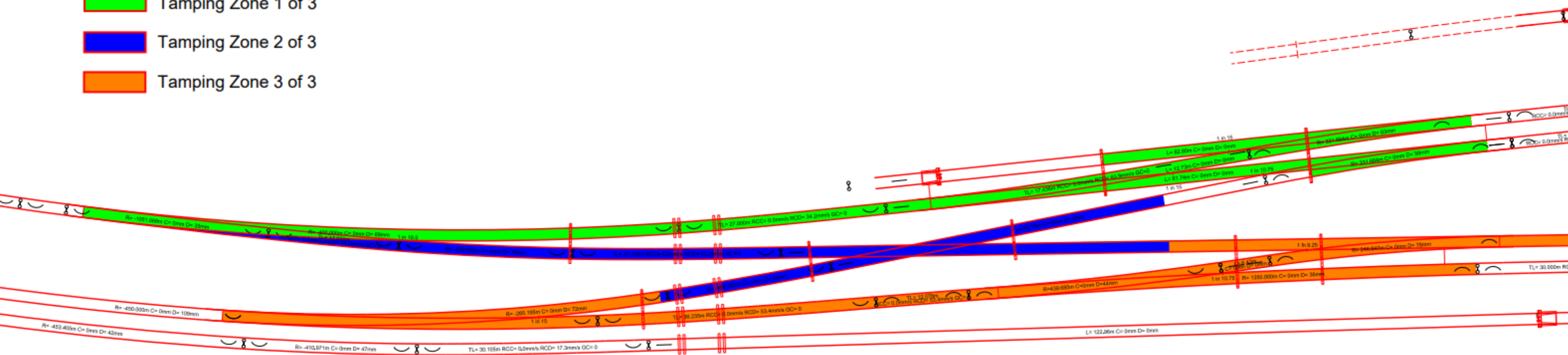


Figure 15: Huddersfield West Junction, Maintenance Tamping Layout

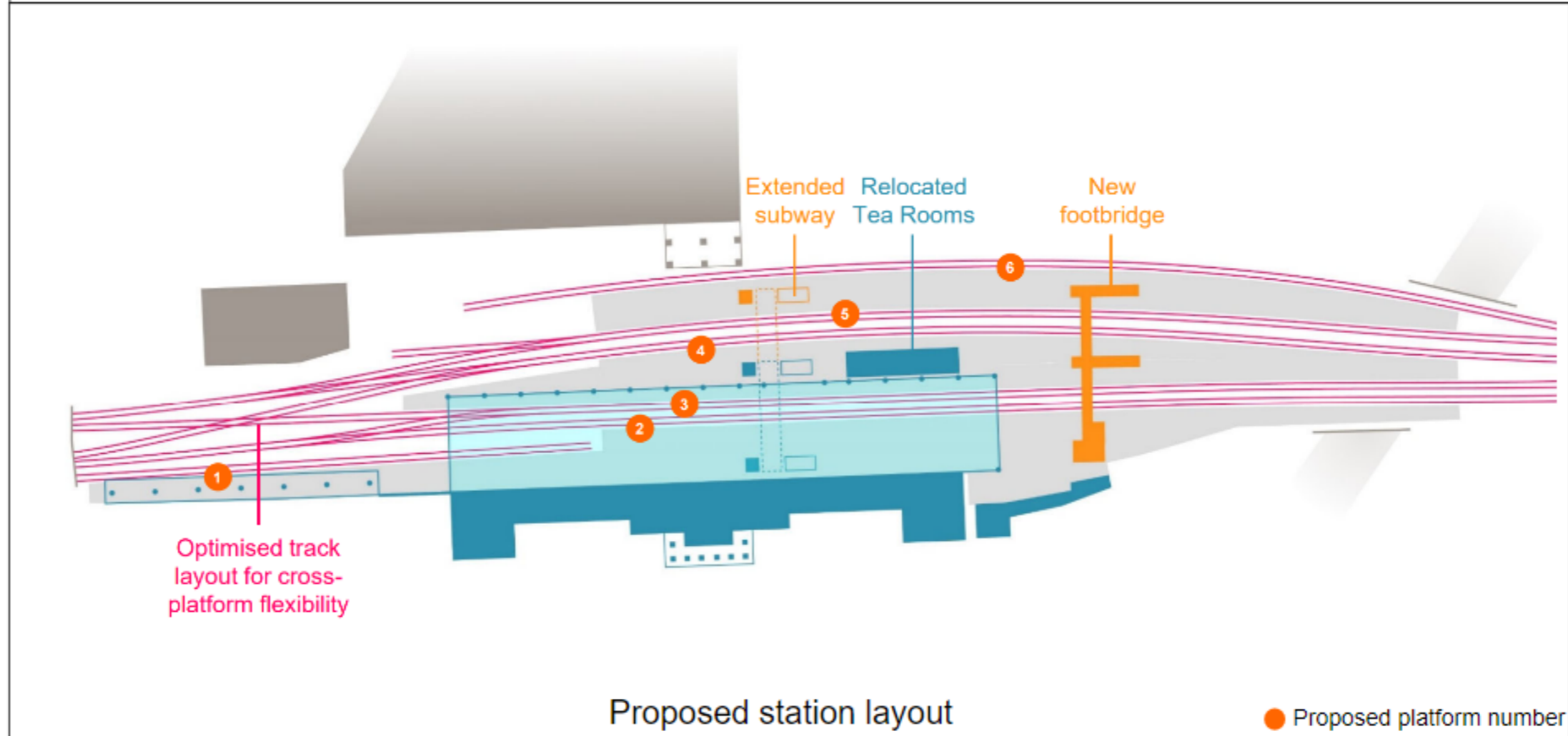
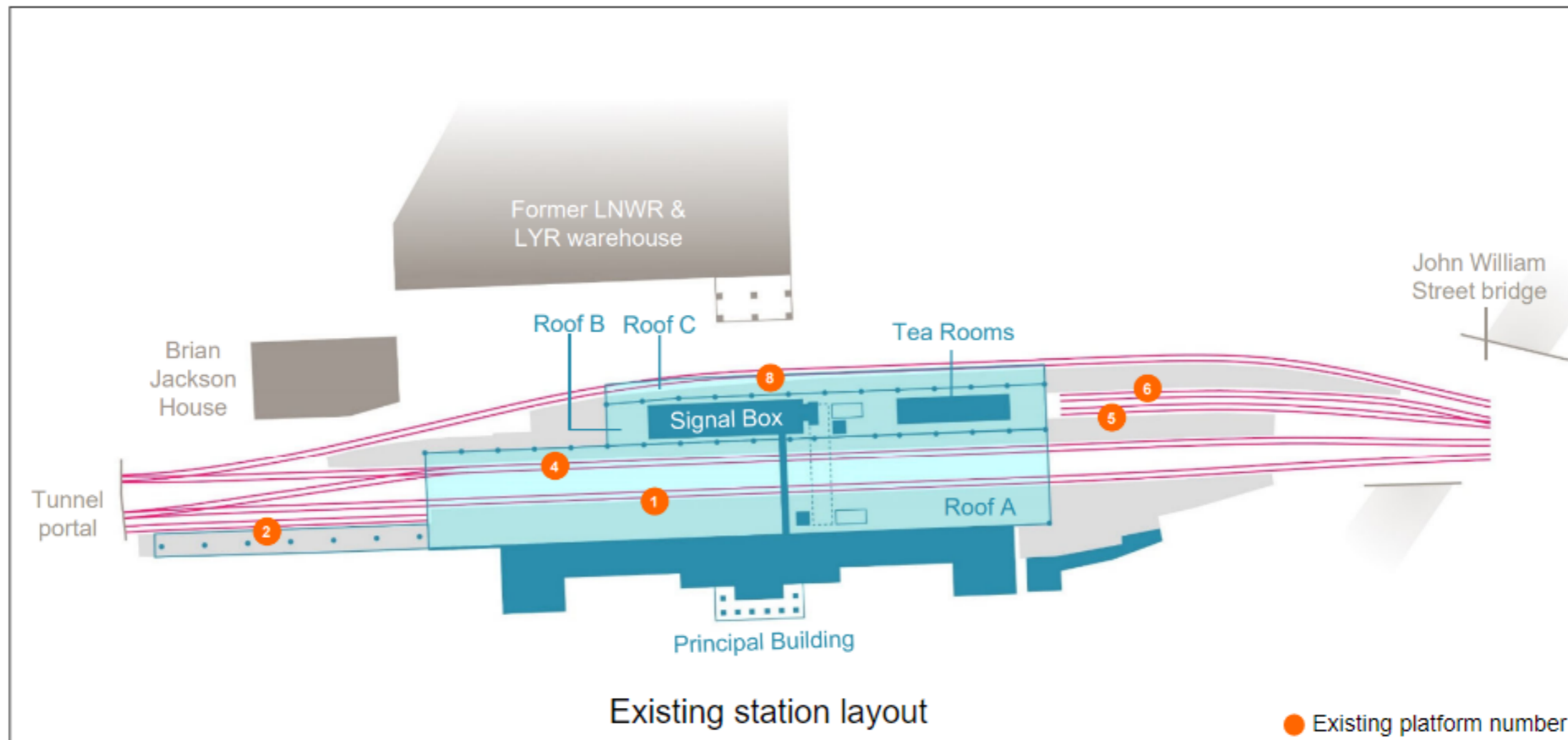
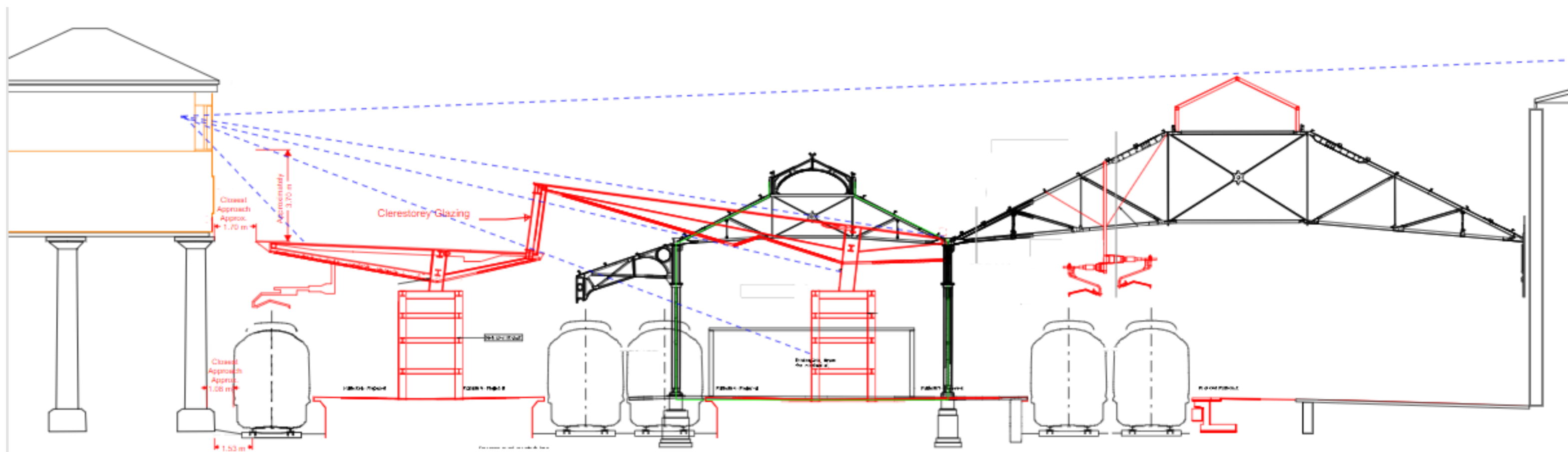


Figure 17: Huddersfield platform layout



Section Through Existing (black) and Proposed (red) Huddersfield Station Showing Closest Approach to Goods Lift Structure (Northern CI Column)

Figure 18: Section through Huddersfield Station
 Note: Existing structures shown in (black), and proposed structures shown in (red)

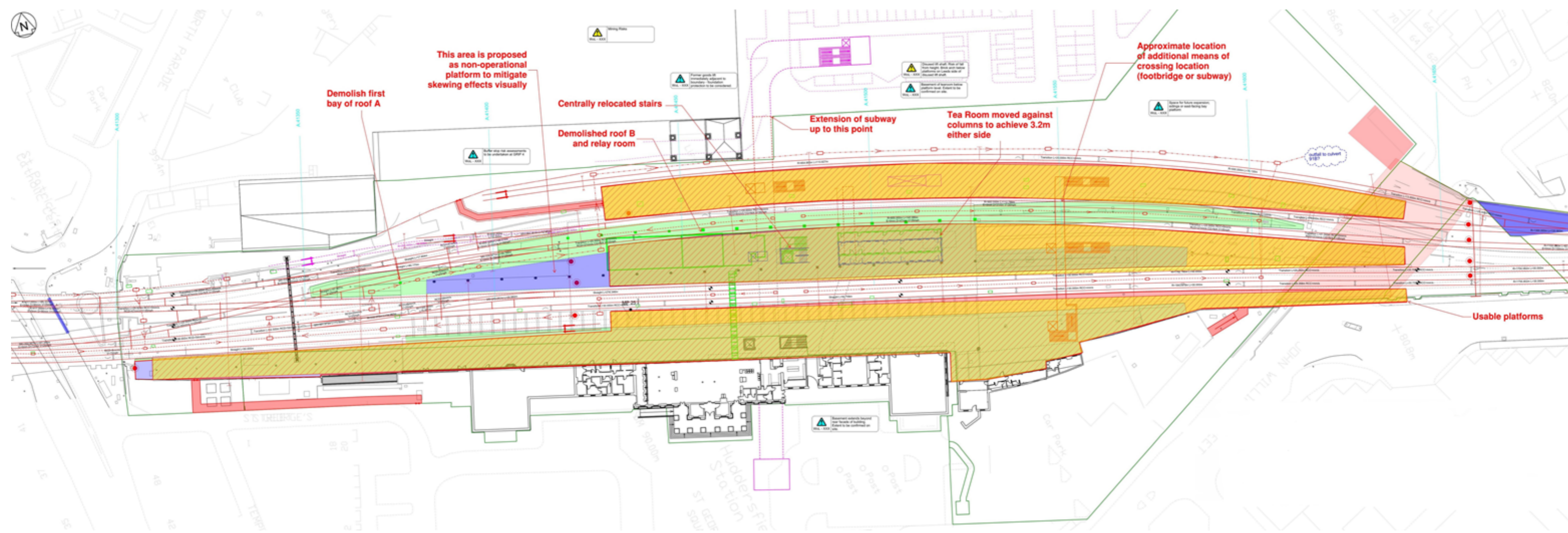


Figure 19: Huddersfield Station preferred GRIP3 option layout

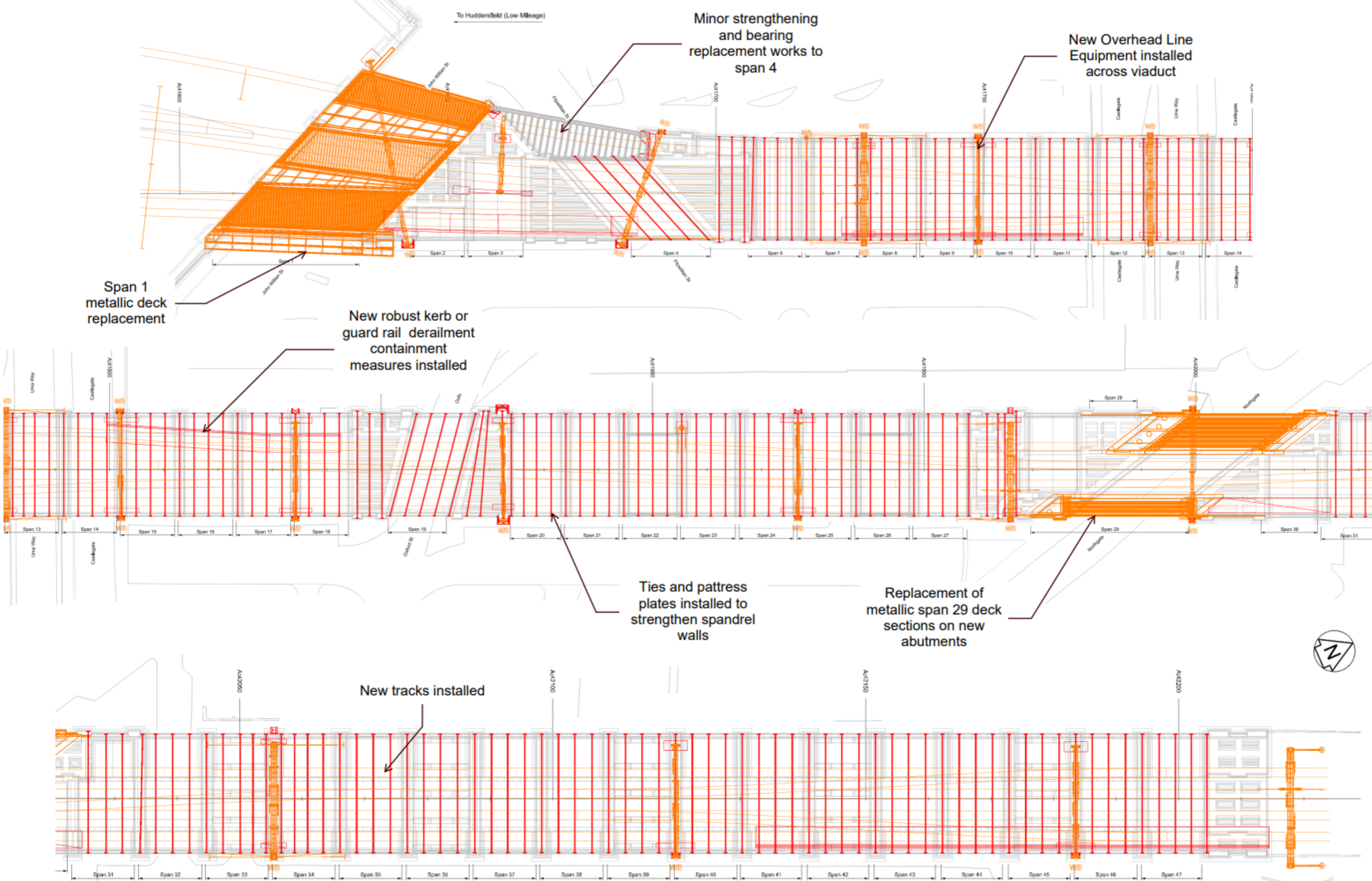
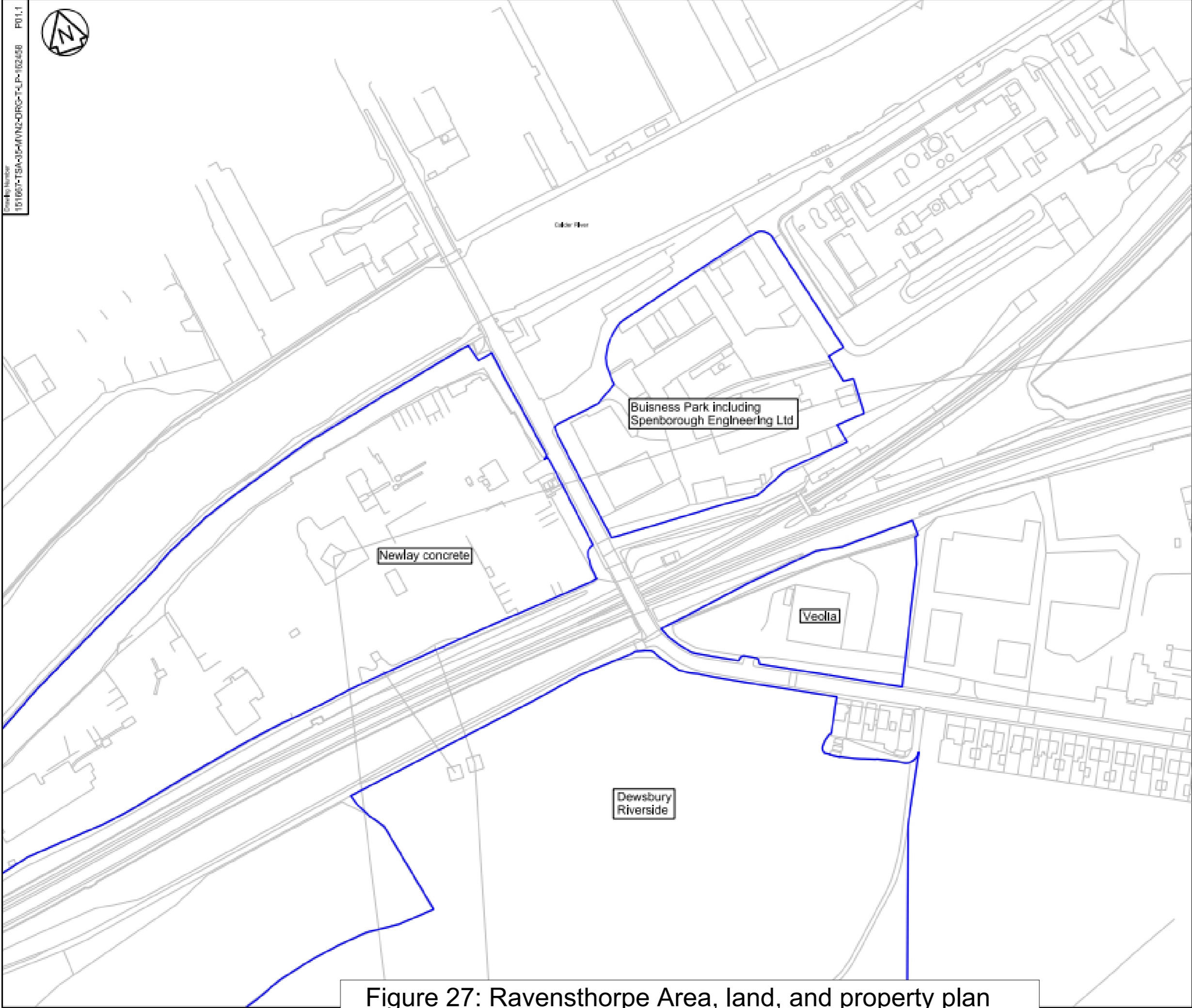


Figure 20: Overview of Huddersfield Viaduct works



Legend
—— Initial land plan areas

Rev.	Date	Description of Revision	CD	Drawn	Check	Appr.
Initial Status	WIP					S0

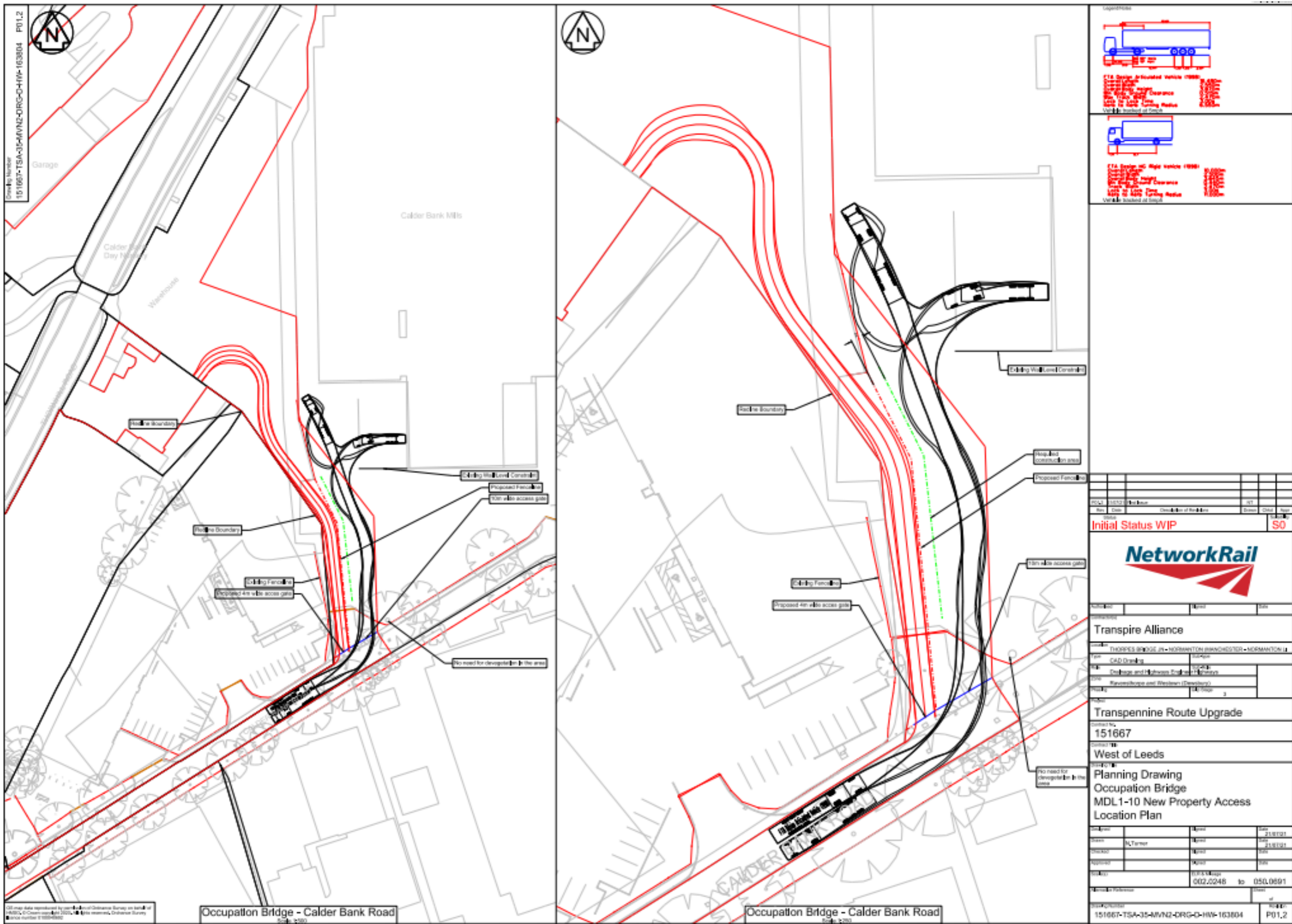


TRU West Alliance	
TRUPROJ	TRU West Alliance - NORTHWESTON (PROVISED) - NORTHWOTON
TRUPROJ	CAD Drawing
TRUPROJ	Town and Country Planner
TRUPROJ	Ravensthorpe and Westside (Dewsbury)

Transpennine Route Upgrade	
Contract No.	151667
Contract Title	West of Leeds
Contract No.	W3 - 35 - Ravensthorpe
Contract Title	Area Location Plan

Author	Issue	Date
Issue	Issue	26/09/21
Checked	Issue	26/09/21
Approved	Issue	26/09/21
Drawn	Issue	26/09/21
Scale	1:1000	
Sheet No.	002.0248	to 050.0891
Sheet Title	Area Location Plan	
Drawing Number	151667-TSA-35-MVNZ-DRG-T4LP-102458	
Sheet No.	P01.1	

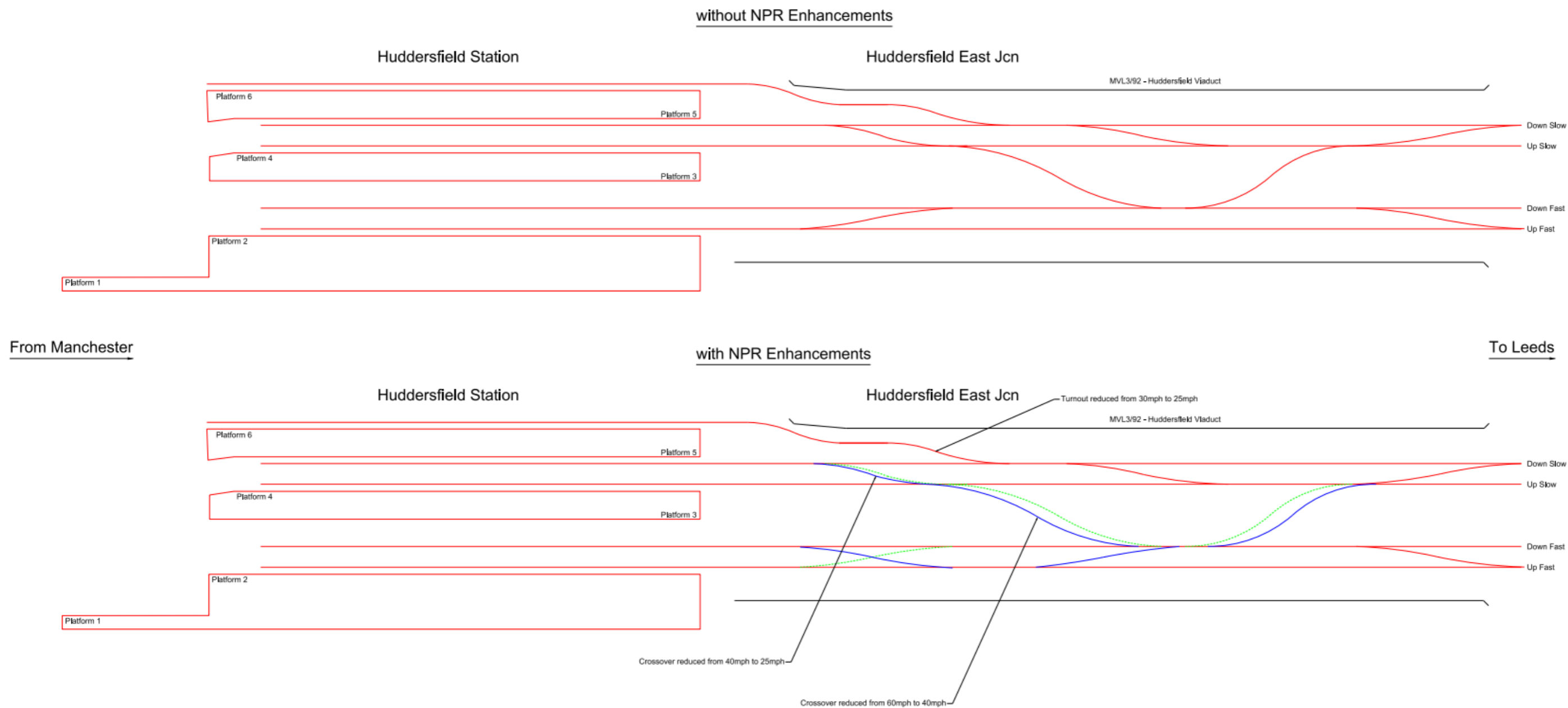
Figure 27: Ravensthorpe Area, land, and property plan



Drawing 4: New property access

151667-75-AZ2-TRU-PRC-2-100004 P11.1

Legend
 Proposed / Relocated SAC Unit, as part of NPR
 Removed SAC Unit, as part of NPR
 SAC Unit, installed as part of TRU



Initial Status	WIP	SO
NetworkRail		
Transpire Alliance		
151667		
TRU - West of Leeds		
NPR Possible Enhancements Huddersfield East Junction		

Figure 38: Huddersfield East Junction, suggested additional track crossover

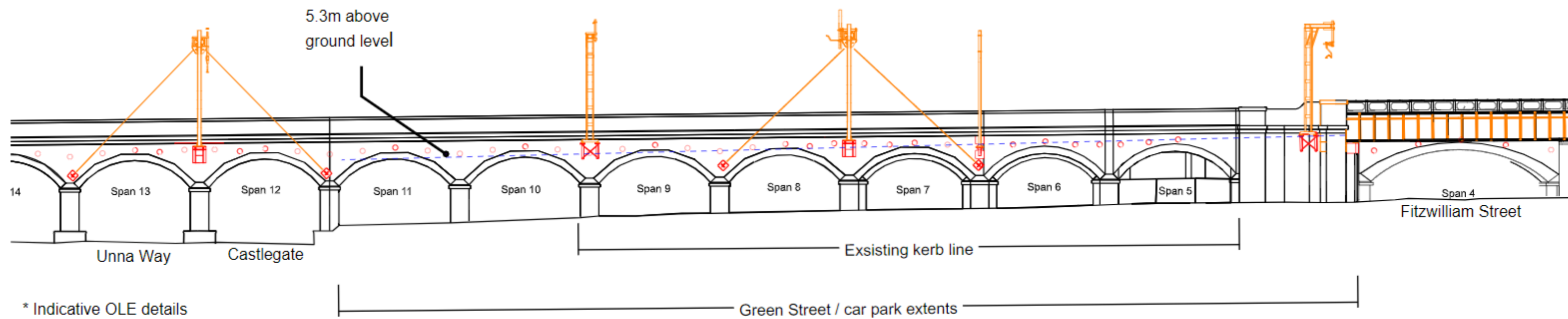
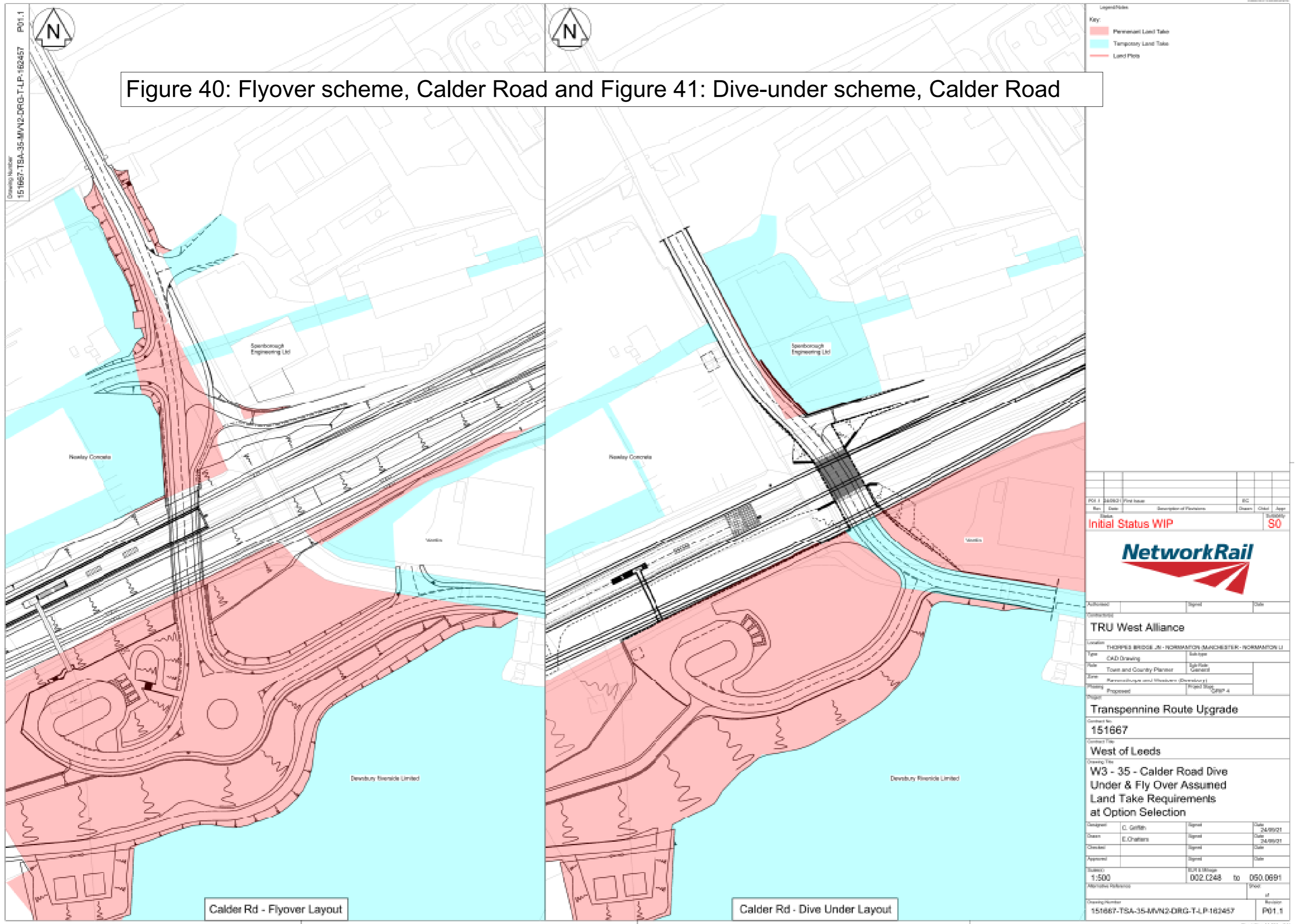


Figure 39: Huddersfield Viaduct Elevation from Castlegate Retail Park

Figure 40: Flyover scheme, Calder Road and Figure 41: Dive-under scheme, Calder Road



Calder Rd - Flyover Layout

Calder Rd - Dive Under Layout

Legend/Notes

Key:

- Permanent Land Take
- Temporary Land Take
- Land Plots

Rev	Date	Description of Placements	BC	Drawn	Checked	Appr	Authority
Initial Status	WIP						S0

Network Rail

TRU West Alliance

Location: THORPES BRIDGE JN - NORMANTON (MANCHESTER - NORMANTON) L

Type: CAD Drawing

Plan: Town and Country Planner

Scale: Reasonable and Measured (Dimension)

Planning: Proposed

Project: W3 - 35 - Calder Road Dive Under & Fly Over Assumed Land Take Requirements at Option Selection

Contract No: 151667

Contract Title: West of Leeds

Drawing Title: W3 - 35 - Calder Road Dive Under & Fly Over Assumed Land Take Requirements at Option Selection

Design	Checked	Checked	Appr	Date
C. Griffin	E. O'Hara			24/09/21
				24/09/21

Scale: 1:500

Sheet Range: 002.C248 to 050.0691

Drawing Number: 151667-TSA-35-MWV2-DRG-T-LP-162457

Revision: P01.1

APPENDIX 2: INFORMATION PROVIDED TO NEWLAY

**TRANSPORT AND WORKS ACT 1992
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**NETWORK RAIL (HUDDERSFIELD TO WESTTOWN
(DEWSBURY) IMPROVEMENTS) ORDER**

ENGINEERING AND DESIGN

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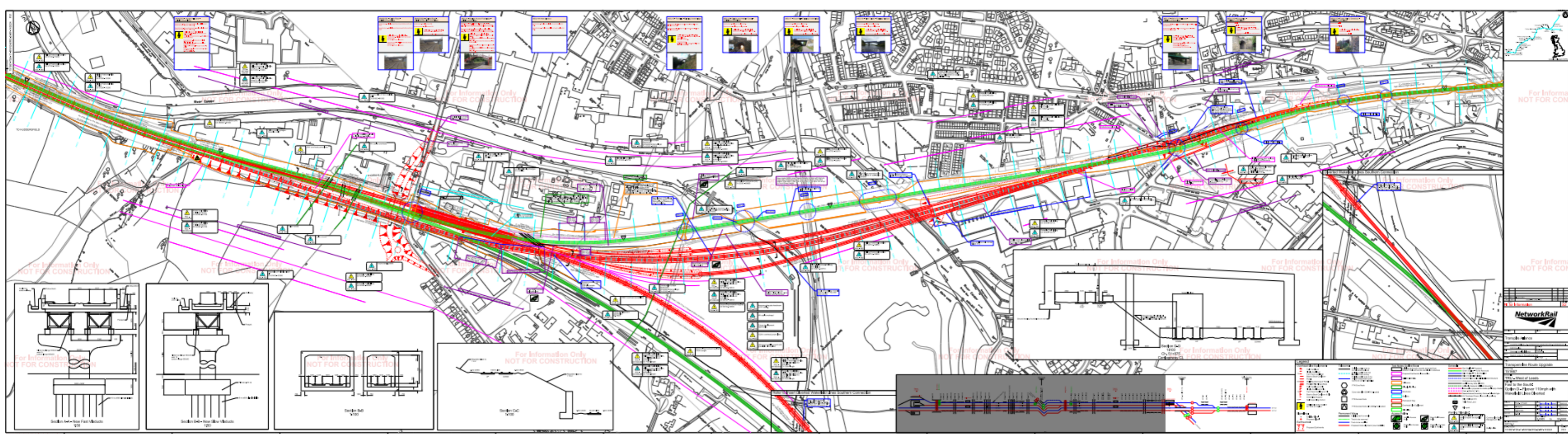
Appendix 2 – Information provided to Newlay

ENGINEERING AND DESIGN

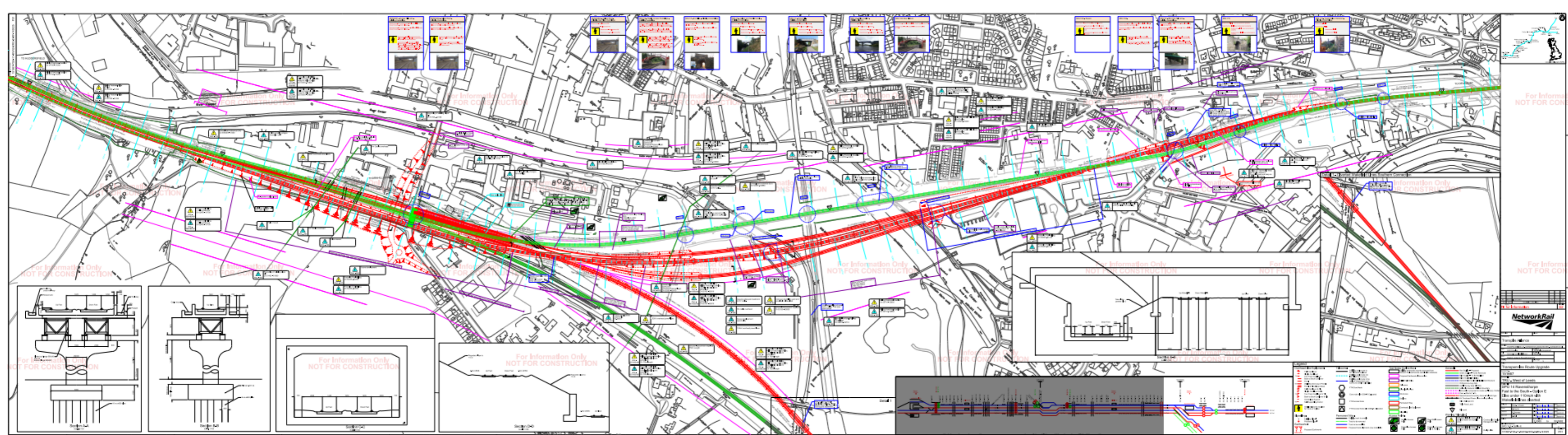
PROOF OF EVIDENCE

Appendix 2

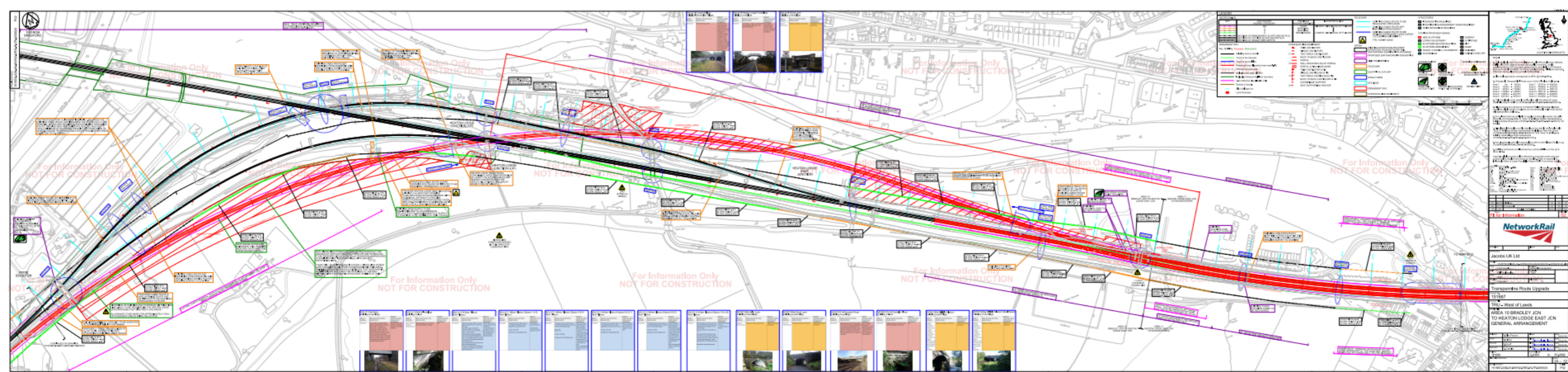
Expert Panel August 2017



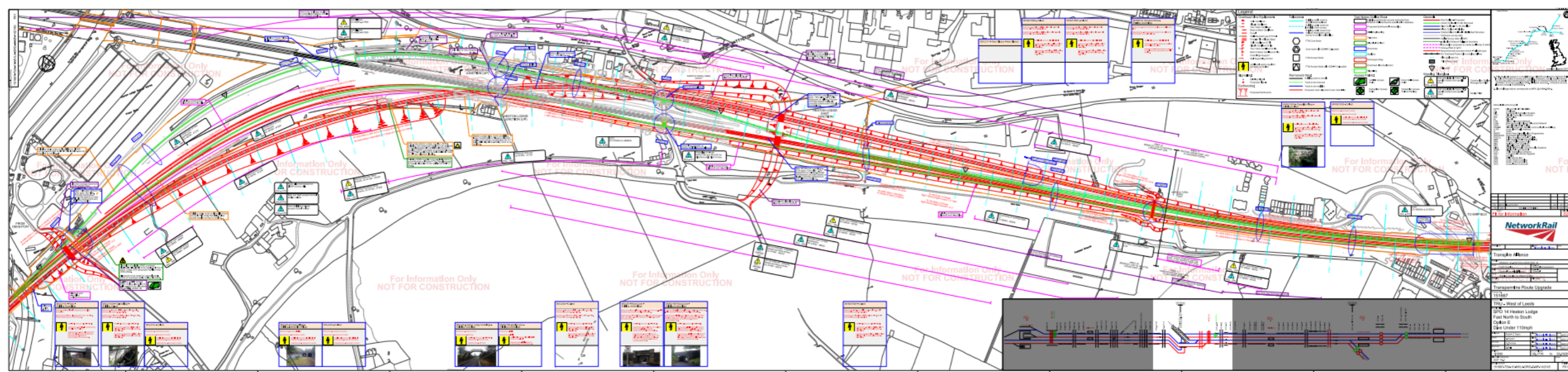
Option 1A - Ravensthorpe Flyover GA



Option 1B - Ravensthorpe Dive-under GA



Option 5A - Heaton Lodge Flyover GA



Option 5B - Heaton Lodge Dive-under GA



Transpennine Route Upgrade

Appendix A Option Capture Summary
Single Programme Option 14
Huddersfield to Ravensthorpe Major
Remodelling

22nd September 2017


ProjectWise Ref: 151667-TSA-10-MVL4-REP-W-MF-140102





Approval

Project Name	Transpire Route Upgrade West	OP Reference	151667
SPO Ref	14	SPO Title	Huddersfield to Ravensthorpe Major Remodelling
Project Manager	Simon Clark	Senior Sponsor	Kieran Dunkin

Document Title	Appendix A - Option Capture Summary Single Programme Option 14
Version Number	P02
PW Ref	151667-TSA-10-MVL4-REP-W-MF-140102

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Signature		Date	22/09/2017

Endorsed By	Simon Clark	Job Title	Package Manager
Signature		Date	22/09/2017

Authorised By	Tim Ketteringham	Job Title	Expert Panel Chair and Alliance Manager
Signature		Date	22/09/2017

PMO Approval	Neil Kerry	Job Title	PLT Appendix A Owner
Signature		Date	28/09/2017

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Document History

Version	Date	Author	Comments
P01.1	25/08/17	J Stanley	Issued for Expert Panel
P01	25/09/17	J Stanley	Issued for PLT Huddle
P02	28/11/17	J. Northcote	Final spell check and format for issue

1. Purpose

- 1.1 Appendix A's purpose is to provide a summary of each of the options considered beyond initial sift. It records the Expert Panel assessment of each options level of support to the experts' evaluation criteria. Appendix A also records the expert panel's recommendation for an option(s) to be progressed.

2. Scope

- 2.1 The scope of this Appendix is limited to the work content and geographic boundaries as detailed within **Section 1** of the **Option Selection Report**.

3. Work Content Overview

- 3.1 Work content of each **Single Programme Option (SPO)** is summarised briefly below; detail is provided within **Section 3** of **Option Selection Report**.

Option 14.1.5C

- 3.2 Detail for Option 14.1.5C is provided **Section 4** of the **Option Selection Report**.

- 3.3 4 track Railway, Fasts to the South, PO5 linespeed or better

Option 14.2.2C

- 3.4 Detail for Option 14.2.2C is provided in **Section 5** of the **Option Selection Report**.

- 3.5 4 track Railway, Fasts to the South, P05 line speed or better by cutting corner at Heaton Lodge

Option 14.2.2D

- 3.6 Detail for Option 14.2.2D is provided in **Section 6** of the **Option Selection Report**.

- 3.7 4 track Railway, Fasts to the South, P05 line speed or better by slewing Calder Valley Lines

Option 14.2.2E

- 3.8 Detail for Option 14.2.2E is provided within **Section 7** of the **Option Selection Report**.

- 3.9 4 track Railway, Fasts to the South, P05 line speed or better, Mirfield Station

Option 14.2.14B & C

- 3.10 Detail for Option 14.2.14B & C is provided **Section 8** of the **Option Selection Report**.
- 3.11 4 track Railway, Fasts North to South, PO5 linespeed or better, Flyover Grade Separation at Heaton Lodge (GRIP2), also incorporating sub-option 14.2.14C (modified GRIP2)

Option 14.2.14E

- 3.12 Detail for Option 14.2.14E is provided in **Section 9** of the **Option Selection Report**.
- 3.13 4 track Railway, Fasts North to South, PO5 linespeed or better, Diveunder Grade Separation at Heaton Lodge

Option 14.3.2A

- 3.14 Detail for Option 14.3.2A is provided in **Section 10** of the **Option Selection Report**.
- 3.15 4 track Railway, Fasts to the South, PO5 linespeed or better, Diveunder Grade Separation at Ravensthorpe

Option 14.3.2B

- 3.16 Detail for Option 14.3.2B is provided in **Section 6** of the **Option Selection Report**.
- 3.17 4 track Railway, Fasts to the South, PO5 linespeed or better, Flyover Grade Separation at Ravensthorpe

Option 14.3.2D

- 3.18 Detail for Option 14.3.2D is provided within **Section 7** of the **Option Selection Report**.
- 3.19 4 track Railway, Fasts to the South, PO5 linespeed or better, Flyover Grade Separation at Ravensthorpe

Option 14.3.2E

- 3.20 Detail for Option 14.3.2E is provided **Section 8** of the **Option Selection Report**.
- 3.21 4 track Railway, Fasts to the South, PO5 linespeed or better, Diveunder Grade Separation at Ravensthorpe.

Option 14.3.5A

3.22 Detail for Option 14.3.5A is provided in **Section 9** of the **Option Selection Report**.

3.23 4 track Railway, Fasts to the North, PO5 linespeed or better, GRIP2 Scheme

Option 14.3.5B

3.24 Detail for Option 14.3.5B is provided in **Section 10** of the **Option Selection Report**.

3.25 4 track Railway, Fasts to the North, PO5 linespeed or better, Enhanced GRIP2 Scheme avoiding Calder Bridges

'Do nothing' Option

3.1 Detail for the 'do nothing' option is provided in the **Option Selection Report**.

3.2 This option delivers no enhancement to railway capability, but includes the work required to renew the railway to deliver the 2022 Indicative Train Service Specification (ITSS).

4. SPO Option Assessment

4.1 This Appendix A also contains:-

- **SPO Option Assessment: Option Capture Summary Sheet** which provides a summary of the background and objectives to the options, findings from the Expert Panel Review and the contribution to performance, and
- **Option Appraisal Output: Option Capture Sheet.**



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Infrastructure Projects – Northern Programmes

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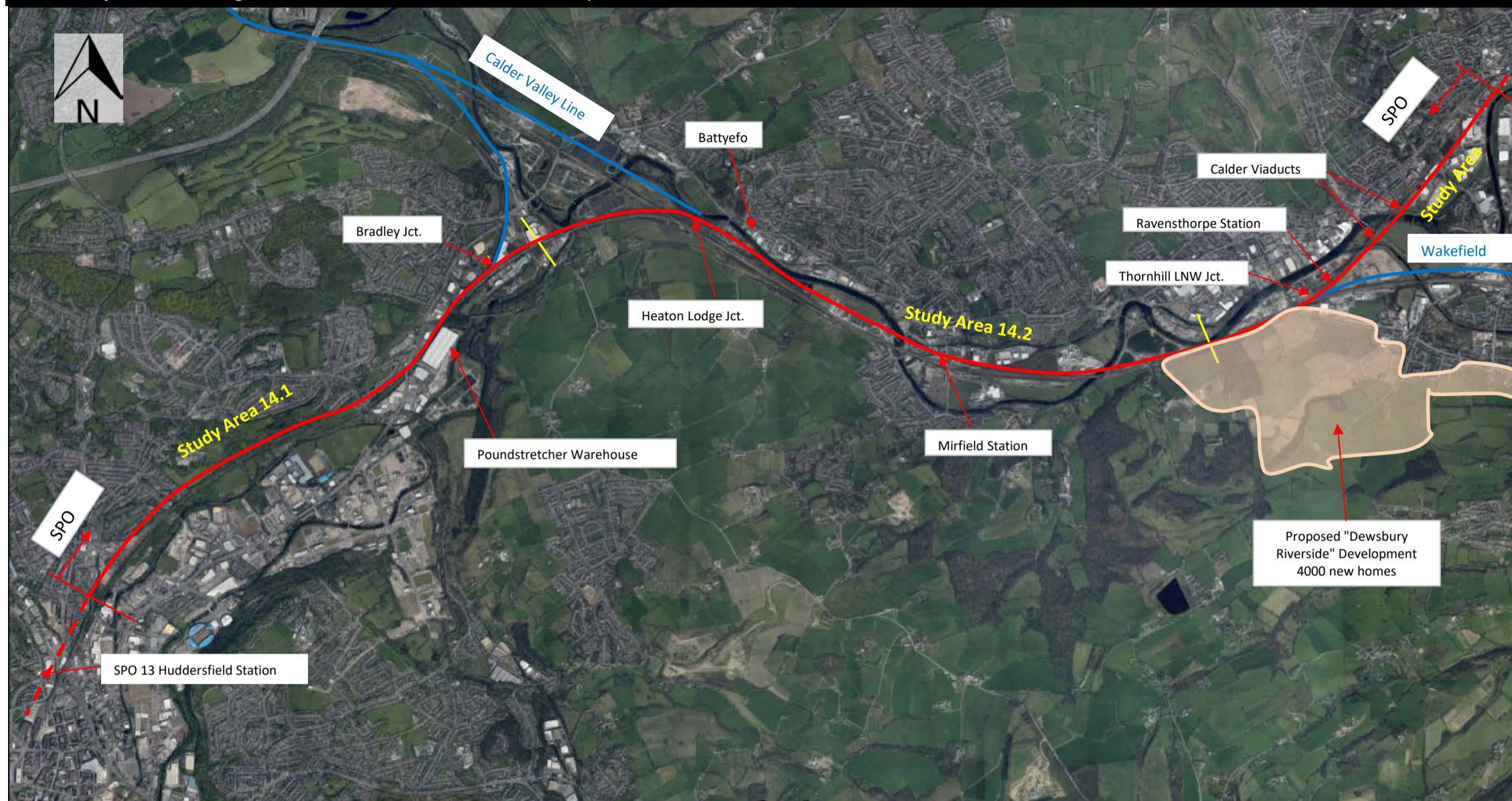
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Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location: Huddersfield East to Ravensthorpe East
Date: 31/10/2017
Revision: P04 - Final Issue

SPO 14 Major Remodelling between Huddersfield and Ravensthorpe



Overview

The Single Programme Option (SPO) between Huddersfield and Ravensthorpe addresses the most significant capacity constraint on the West of Leeds Corridor. It also increases line speed to make significant journey time improvements by replacing the existing two/three track railway between Huddersfield and Ravensthorpe with a four track railway consisting of separated slow and fast lines. This SPO should be considered in conjunction with proposals for remodelling at Huddersfield Station (SPO 13), as the two interventions are intrinsically linked.

The development of options along this corridor (including SPO 13) depends on the end to end operational layout with respect to slow/fast line positions, their effects on grade separations, line speed and junction performance. During option development, a full range of operational layouts was considered. Following the option sift process two operational layouts were taken forward for further development which were:

Operational Layout 1 - This positions the fast lines to the south side of the four track corridor between Ravensthorpe and Huddersfield. It requires a new grade separation at Ravensthorpe to pass the new fast lines either over or under the existing Wakefield lines where they diverge to the south-east at Thornhill Junction.

Operational Layout 5 - In this layout the fast lines are positioned on the north side of the 4 track corridor through the Ravensthorpe and Mirfield areas. At Heaton Lodge the fast lines are taken either over or under the Calder Valley lines which diverge to the north-west with a new grade separation. The fast lines then run along the south of the 4-track corridor into Huddersfield station (i.e. similar to layout 1).

This section of the Transpennine route is considered to be critical due to the lack of a diversionary route and limited construction accessibility. Any proposed works which affect the current operational railway are considered to be complex, and possession working would likely stop or significantly reduce services between Leeds and Manchester.

SPO 14 "End to End" Options

Four viable "end to end" options have been developed by considering either a flyover or dive-under solution at two distinct grade separation locations. These are:

Option 1A - Fast lines to the south throughout: A new junction at Ravensthorpe East where the slow lines diverge, this provides a flyover grade separation at Ravensthorpe taking the fast lines over the diverging Wakefield lines and the Up slow before running through Mirfield. The fast lines sweep to the south at Heaton Lodge, off-line from the existing track alignments before running through Deighton to Huddersfield.

Option 1B - As option 1A, but with a dive-under grade separation at Ravensthorpe.

Option 5A - At-grade double junction separates fast lines to the north through Ravensthorpe and then Mirfield before passing across the slow lines to the south via a flyover grade separation at Heaton Lodge Junction. Four tracking with fast lines to the south then continue through Deighton to Huddersfield.

Option 5B - As option 5A, but with a dive-under grade separation at Heaton Lodge.

Do Nothing

Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location: Huddersfield East to Ravensthorpe East
Date: 31/10/2017
Revision: P04 - Final Issue

If no TRU related speed increase or capacity interventions are undertaken there will be a Network Rail Route requirement for asset renewals and refurbishment to support the changes to train service planned for implementation in 2019 and 2022.

This “Do Nothing” Option delivers no enhancement to railway capability, but includes work required to renew the railway to deliver the 2022 ITSS, without significant degradation to asset reliability.

This assessed scope has been prepared by the Network Rail Route Asset Management representatives. This has been based on consistent guidance from the TRU Programme Engineering Services team and subject to peer review challenge by the RAM and Engineering Services Asset Management team. The works are based on a forecast of asset performance under future timetables.

The following information was considered to inform the assessed scope.

- TRU Performance Dashboards
- TRU Route Failure Modes, Effects & Criticality Analysis (FMECA) – Maintenance input
- Asset specific Network Rail (NR) data sources – e.g. interlocking renewal plans (based on age of asset), signalling condition assessments, compliance with standards
- Route Asset Manager knowledge
- Asset data use to Baseline the Life Cycle Cost of the today’s railway corridor

Across the route the identified work scope includes consideration of:

Track Renewals

- Re-ballasting
- Formation Renewal
- Entire renewal
- Drainage
- S&C Renewals or Refurbishment
- Re-railing
- Way beam realignment

Signalling

- Signal box refurbishment
- Re-control

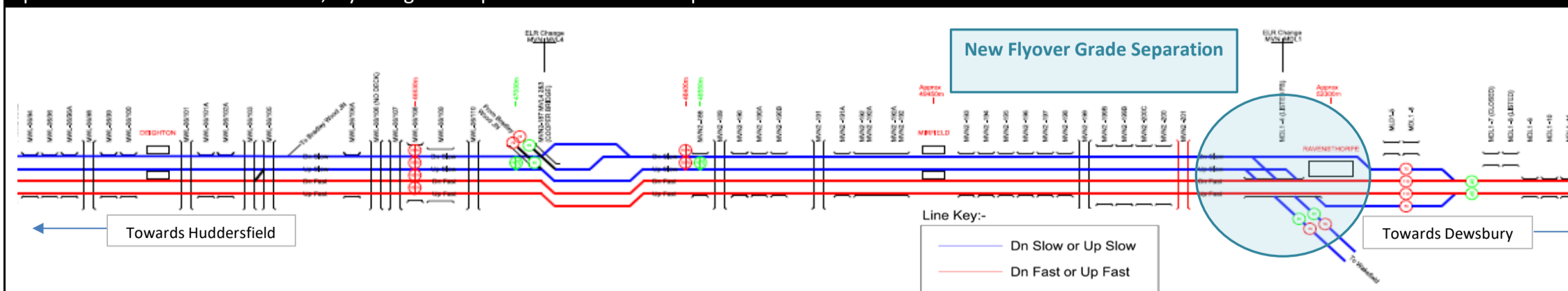
Minimal or no scope has been identified as required in other asset categories.

The specific works assessed in this SPO are:

SPO	Location	Original Description	Revised Description	Revised Category
SPO14	2077 (Thornhill Junction)	Critical location - Renew	Refurbishment	New Train Service Pattern (expected tonnage increase brings this forward)
SPO14	2071 A+B (Mirfield East Junction) 2073 A+B	Critical location - Renew	Refurbishment	New Train Service Pattern (expected tonnage increase brings this forward)
SPO14	2136 A+B 2137 A (Bradley Junction)		Renew	New Train Service Pattern (expected tonnage increase brings this forward, did a stop-gap job 2-3 years ago)

Description of work: Cat 2 Rerail – Both Rails (using the volumes summarised below)		
SPO Ref	Volume of Pre-1976 Plain Line (km)	Assume 2 tracks of Pre-1976, divide Total Plain Line Vol by 2 (km)
SPO14A	1.590	0.795
SPO14B	2.054	1.027

Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe



Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location: Huddersfield East to Ravensthorpe East
Date: 31/10/2017
Revision: P04 - Final Issue

Summary of Key Features (described moving from east to west)

- New junction at Ravensthorpe East where slow lines diverge north and south of the fast through alignment to transition into a separated 4-track railway
- The new 4-track alignment by-passes the existing grade listed Calder Viaducts on new section of elevated viaducts crossing the River Calder valley
- Grade separation at Ravensthorpe where the new fast lines pass over the diverging Wakefield lines at Thornhill junction (2 sub-option layouts proposed)
- Ravensthorpe station reconstructed with full step-free access and improved facilities with an optional enhancement to platform the Wakefield lines
- Mirfield station reconstructed with full step-free access and improved facilities with platforms to the north onto the slow lines
- A new fast lines alignment to the south of Heaton Lodge junction to cut the corner at higher speed (2 sub-option layouts proposed)
- Deighton station moved to the west and reconstructed with full step-free access and improved facilities with platforms to the north onto the slow lines
- 4-track railway continues with fast lines to the south into SPO 13 (Huddersfield Station re-modelling)

Contribution to Performance:

Journey Time: Option 1A may deliver a journey time benefit of up to 74 seconds when compared to existing journey times. When compared to linespeed profile P05 journey times may be up to 2 seconds slower.
Note: times are in diesel mode.

Train Service Capacity: Option 1A moves the grade separation from Heaton Lodge to Ravensthorpe. This option provides the same functionality as Option 5A but provides an added benefit that the Up Slow line can also use the grade separation and therefore removes a number of conflicting moves at Ravensthorpe. This option is likely to deliver the ITSS (v0.4) robustly.

Performance Risk (impact on PPM): Option 1A shows performance benefit compared to Option 5A. This design includes just one potential timetable and regulating conflict for trains running in opposite directions between the Down Slow and Up Slow lines to the west of Ravensthorpe. Performance risk has been scored as supportive.

Other key differentiators:

All the grade separation sub-options considered at Ravensthorpe result in a deconflicted junction at Ravensthorpe East. This resolves junction timings at Ravensthorpe East and enhances the overall system performance under perturbed conditions (e.g. delayed trains). This may also render the proposed loops at Batley to

There is opportunity to achieve 110 mph running throughout this section due to the improved fast line geometry through the Ravensthorpe area.

Cost range: £753m to £833m

Constructability: The sub-options generally maximise off-line construction, although a flyover arrangement is inherently less disruptive than a dive-under scheme. Where track access is required, it is considered that works can be completed within standard disruptive possessions and Rules of the Route working. The Fasts to the south options lend themselves more favourably to an access strategy where the section between Ravensthorpe and Heaton Lodge is operated as a 2-track railway during the construction and reduce the total amount of track renewal works.

Deliverability: All options require land purchase and a Transport & Works Act Order (TWAO) consent process. All options in this SPO are proposed to be delivered in a big stage strategy in extended disruptive access. It is feasible to reduce the requirements of this access by breaking this down in to smaller stages. However, the additional stage design, stage cost, risk, commissioning, signal sighting etc. that this would introduce is way above what could be saved in Schedule 4 costs.

System Safety: Removes all conflicting train movements between Fast Line services and Slow Line/Calder Valley/Wakefield Line services. Step-free access will be provided at the reconstructed Deighton, Mirfield, and Ravensthorpe Stations. Ravensthorpe station is reconstructed to give standard signal set back (overlap) lengths to protect Thornhill LNW junction.

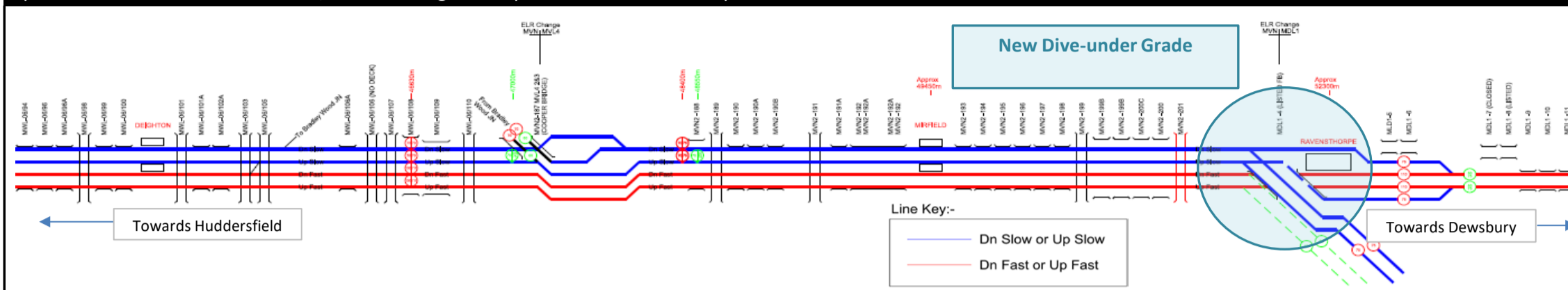
Environmental: The main environmental impact occurs at Ravensthorpe.

with potentially reduced impacts at Heaton Lodge. The sensitivity of this and impact on the consents process is unknown, so should be subject to stakeholder consultation. There is good potential for larger regeneration opportunities at Ravensthorpe.

Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location: Huddersfield East to Ravensthorpe East
Date: 31/10/2017
Revision: P04 - Final Issue

Option 1B - Fast lines to the South, Dive-under grade separation at Ravensthorpe



Summary of Key Features (described moving from east to west)

- As Option 1A, but with a dive-under grade separation where the new fast lines cross the Wakefield lines (2 sub-options proposed)

Contribution to Performance:

Journey Time: Option 1B may deliver a journey time benefit of up to 75 seconds when compared to existing journey times. When compared to linespeed profile P05 journey times may be up to 1 second slower.

Note: times are in diesel mode.

Train Service Capacity: Option 1B provides grade separation at Ravensthorpe. This option provides the same functionality as Option 1A. This option is likely to deliver the ITSS (v0.4) robustly.

Performance Risk (impact on PPM): Option 1B shows performance benefit compared to Option 5A. This design includes just one potential timetable and regulating conflict for trains running in opposite directions between the Down Slow and Up Slow lines to the west of Ravensthorpe. Performance risk has been scored as supportive.

Other key differentiators:

All the grade separation sub-options considered at Ravensthorpe result in a deconflicted junction at Ravensthorpe East. This resolves junction timings at Ravensthorpe East and enhances the overall system performance under perturbed conditions (e.g. delayed trains). This may also render the proposed loops at Batley to be unnecessary if this option were taken forward.

There is opportunity to achieve 110 mph running throughout this section due to the improved fast line geometry through the Ravensthorpe area.

Cost range: £749m to £829m

Constructability: The sub-options generally maximise off-line construction, although a dive-under scheme requires more disruptive working than a similar flyover option. Where track access is required, it is considered that works can be completed within standard disruptive possessions and Rules of the Route working. The Fasts to the South options lend themselves more favourably to a access strategy where the section between Ravensthorpe and Heaton Lodge is operated as a 2-track railway during the construction and reduce the total amount of track renewal works.

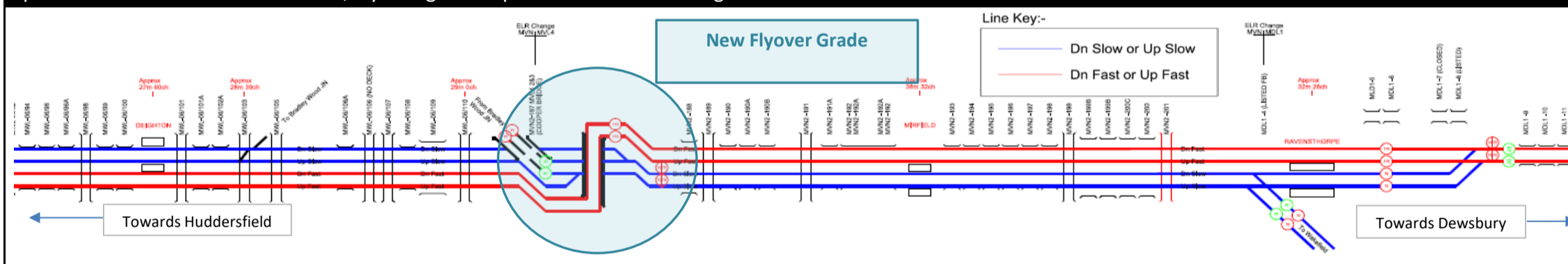
Deliverability: All options require land purchase and a TWAO consent process. All options in this SPO are proposed to be delivered in a big stage strategy in extended disruptive access. It is feasible to reduce the requirements of this access by breaking this down in to smaller stages. However, the additional stage design, stage cost, risk, commissioning, signal sighting etc. that this would introduce is way above what could be saved in Schedule 4 costs.

System Safety: Removes all conflicting train movements between Fast Line services and Slow Line/Calder Valley/Wakefield Line services. Step-free access will be provided at the reconstructed Deighton, Mirfield, and Ravensthorpe Stations. Ravensthorpe station is reconstructed to give standard signal set back (overlap) lengths to protect Thornhill LNW junction

Environmental: The main environmental impact occurs at Ravensthorpe

with potentially reduced impacts at Heaton Lodge. The sensitivity of this and impact on the consents process is unknown, so should be subject to stakeholder consultation. There is good potential for larger regeneration opportunities at Ravensthorpe.

Option 5A - Fast lines North to South, Flyover grade separation at Heaton Lodge



Summary of Key Features (described moving from east to west)

- New junction at Ravensthorpe East where slow lines diverge south (via a switch diamond) of the fast through alignment to transition into a separated 4-track railway
- The new 2-track slow line alignment by-passes the existing grade listed Calder Viaducts on new section of elevated viaduct crossing the River Calder valley
- The 2-track fast line alignment re-utilises the existing Calder Viaduct section (2 sub-options proposed, one of which by-passes the Calder Viaducts)
- Ravensthorpe station reconstructed with full step-free access and improved facilities with an optional enhancement to platform the Wakefield lines
- Mirfield station reconstructed with full step-free access and improved facilities with platforms to the south onto the slow lines
- A new grade separation at Heaton Lodge junction where the new fast lines pass from the north to the south of the existing corridor via a new high speed alignment
- Deighton station moved to the west and reconstructed with full step-free access and improved facilities with platforms to the north onto the slow lines
- 4-track railway continues with fast lines to the south into SPO 13 (Huddersfield Station re-modelling)

Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location: Huddersfield East to Ravensthorpe East
Date: 31/10/2017
Revision: P04 - Final Issue

Contribution to Performance:

Journey Time: Option 5A may deliver a journey time benefit of up to 71 seconds when compared to existing journey times. When compared to linespeed profile P05 journey times this option may not provide additional benefit
Note: times are in diesel mode.

Train Service Capacity: Option 5A is likely to deliver the ITSS (v0.4) robustly.

Performance Risk (impact on PPM): Option 5A introduces two potential timetable and regulating conflicts for trains running in opposite directions, between the Down Slow and Up Fast lines to the east of Ravensthorpe and between the Down Slow and Up Slow lines to the west of Ravensthorpe. Performance risk has been scored as neutral on the basis of these potential conflicts.

Other key differentiators:

The original scheme's viaduct has a large adverse effect on residential properties in the Battyeford area near Heaton Lodge junction. A modified alignment has been studied to alleviate this concern and reduce the environmental impact.

Cost range: £686m to £725m

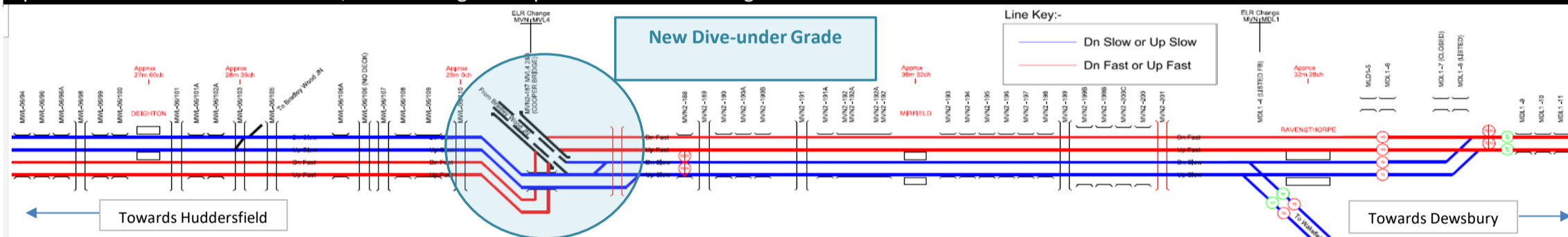
Constructability: The sub-options generally maximise off-line construction. Where track access is required, it is considered that works can be completed within standard disruptive possessions and Rules of the Route working.

Deliverability: All options require land purchase and a TWAO consent process. All options in this SPO are proposed to be delivered in a big stage strategy in extended disruptive access. It is feasible to reduce the requirements of this access by breaking down in to smaller stages. However, the additional stage design, stage cost, risk, commissioning, signal sighting etc. that this would introduce is way above what could be saved in Schedule 4 costs.

System Safety: Removes most conflicting train movements between Fast Line services and Slow Line/Calder Valley/Wakefield Line services although a new junction conflict is created at the Ravensthorpe East junction. Step-free access will be provided at the reconstructed Deighton, Mirfield, and Ravensthorpe Stations. Ravensthorpe station is reconstructed to give standard signal set back (overlap) lengths to protect Thornhill LNW junction.

Environmental: The main environmental impact occurs at Heaton Lodge, with potentially significant effects to private property from a new viaduct, although this can be mitigated with careful choice of alignment (see sub-option 14.2.14C). The sensitivity of this and impact on the consents process is unknown and should be subject to stakeholder consultation.

Option 5B - Fast lines North to South, Dive under grade separation at Heaton Lodge



Summary of Key Features (described moving from east to west)
 - As Option 5A, but with a dive-under grade separation at Heaton Lodge

Contribution to Performance:

Journey Time: Option 5B may deliver a journey time benefit of up to 71 seconds when compared to existing journey times. When compared to linespeed profile P05 journey times this option may not provide additional benefit.
Note: times are in diesel mode.

Train Service Capacity: Option 5B is likely to deliver the ITSS (v0.4) robustly.

Performance Risk (impact on PPM): Option 5B introduces three potential timetable and regulating conflicts for trains running in opposite directions, between the Down Slow and Up Fast lines to the east of Ravensthorpe, between the Down Slow and Up Slow lines to the west of Ravensthorpe and between the Up Slow (movements towards Brighouse) and Down Slow (movements from Huddersfield). Performance risk has been scored as unsupportive on the basis of these potential conflicts.

Other key differentiators:

The construction of the dive-under is more challenging than a flyover solution but considered feasible. It is likely that the dive-under construction will involve more disruptive possession working than above ground solutions. However, there may be significant environmental/consents advantages offered by this scheme.

The dive-under scheme has a consequence of losing the slow line grade

Constructability: The sub-options generally maximise off-line construction. Where track access is required, it is considered that works can be completed within standard disruptive possessions and Rules of the Route working although further design development is required to fully ascertain the construction sequence for the dive-under structure and associated access requirements.

Deliverability: All options require land purchase and a TWAO consent process. All options in this SPO are proposed to be delivered in a big stage strategy in extended disruptive access. It is feasible to reduce the requirements of this access by breaking down in to smaller stages. However, the additional stage design, stage cost, risk, commissioning, signal sighting etc. that this would introduce is way above what could be saved in Schedule 4 costs.

System Safety: Removes most conflicting train movements between Fast Line services and Slow Line/Calder Valley/Wakefield Line services although a new junction conflict is created at the Ravensthorpe East junction. Step-free access will be provided at the reconstructed Deighton, Mirfield, and Ravensthorpe Stations. Ravensthorpe station is reconstructed to give standard signal set back (overlap) lengths to protect Thornhill LNW junction.

Environmental: Third party land and planning permission for change of use of land are required in both the Heaton Lodge and Ravensthorpe areas, therefore TWAO assumed. Highway and footpath temporary



Appendix A - SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Assessment: Option Capture Summary Sheet

Location:	Huddersfield East to Ravensthorpe East
Date:	31/10/2017
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separation through the existing Cooper Bridge and substitutes with a new flat junction onto the Calder Valley lines. This will have a possible service performance disbenefit to the slow passenger and freight train services	closures and diversions required. Potential listed building consent for various bridge works and works at Ravensthorpe Station is required. All options have potential to result in significant visual impact in both the Heaton Lodge and Ravensthorpe Area. Options at Ravensthorpe involve development of a former landfill site, potential loss of safeguarded minerals resources, but also opportunities to unlock development opportunity in surrounding areas.
Cost range: £675m to £713m	

Findings Of Expert Panel Review

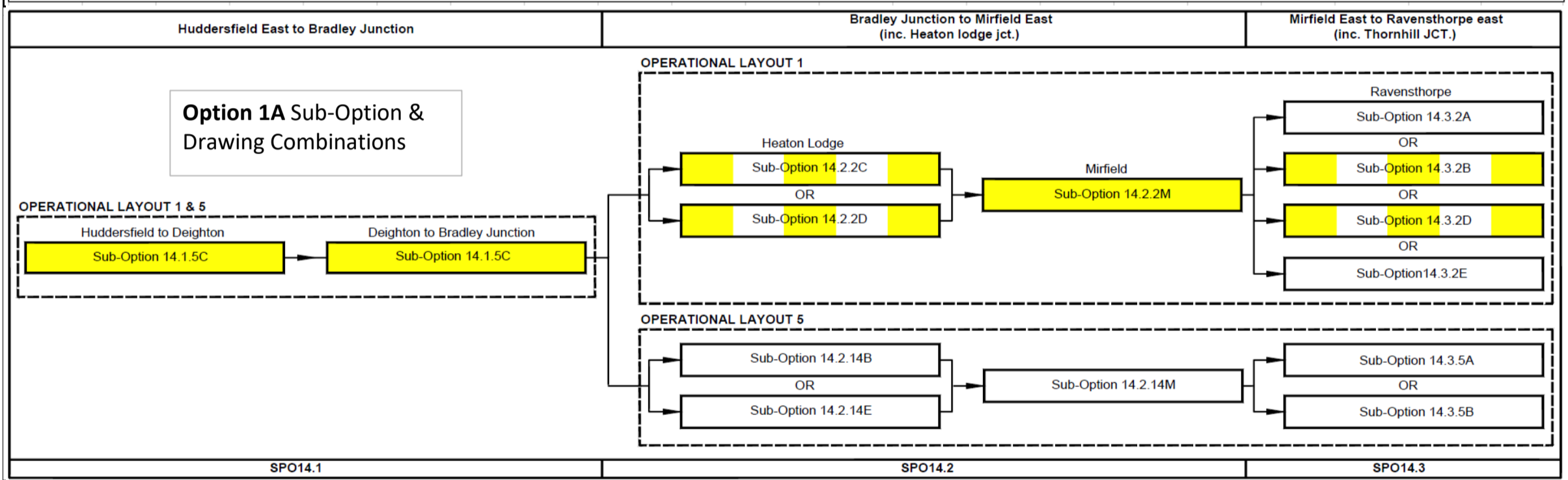
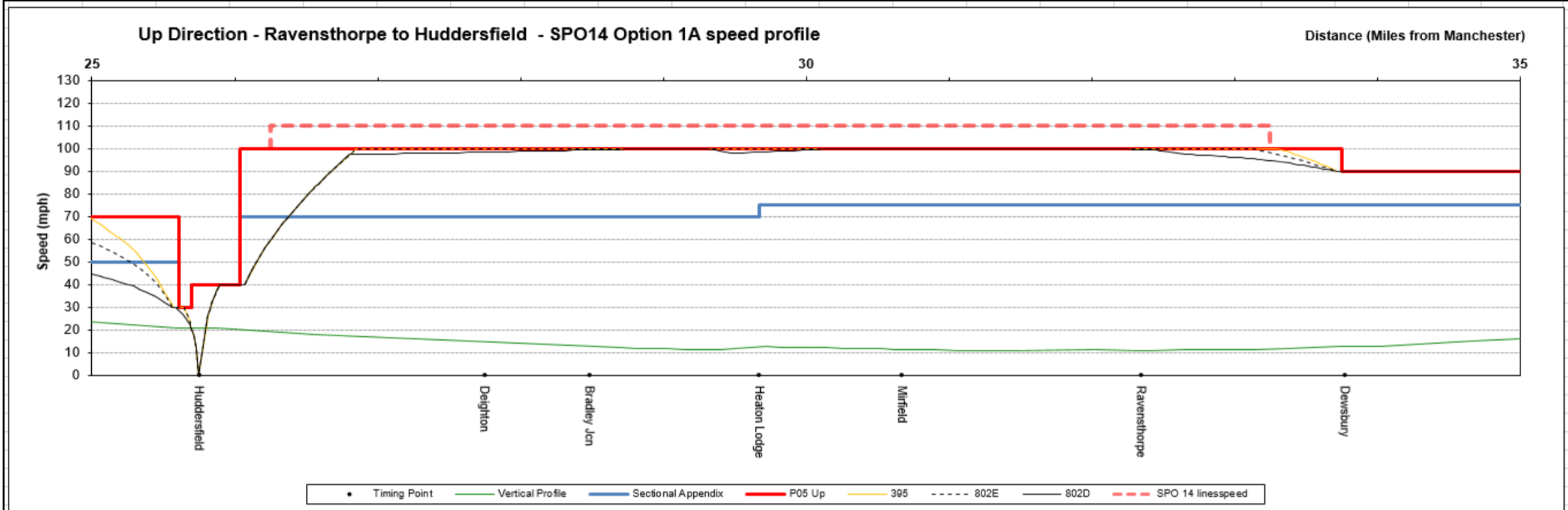
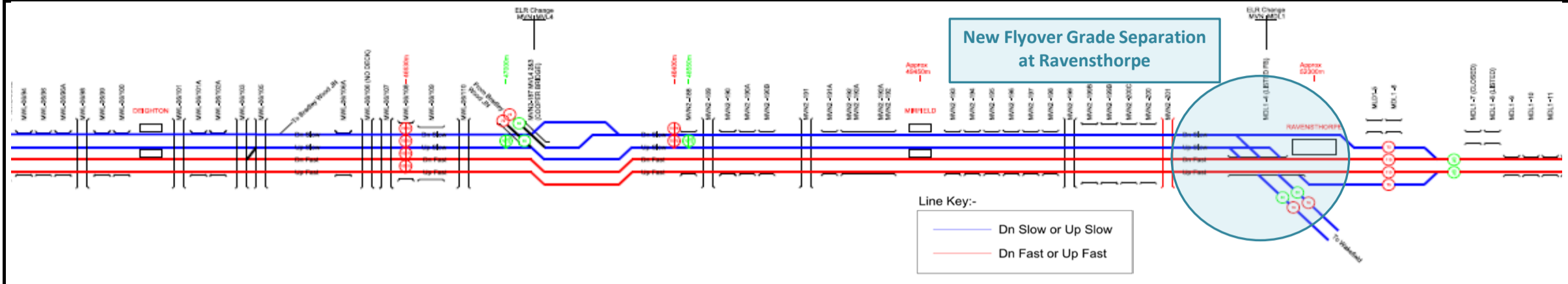
Option layout 1A preferred with Option 1B also to proceed to SDO (see detailed commentary on individual end to end options for preferred sub-option choices). All work on option layout 5 to be suspended.

Attachments or other information referenced

TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Major Remodelling between Huddersfield and Ravensthorpe
Sub-Option Ref Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe
Date: 31/10/2017
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Option Sketch



Option Overview

This option has been developed to suit the end to end operational layout 1 (fast lines to the South) and requires a grade separation site situated near to the existing Ravensthorpe station. The sub-option layouts for areas that are relevant to this option are highlighted in the table above. Key features of these are described in the sections below with detailed engineering commentary provided in each specific sub-option tab. Only areas which differ substantially to Option 5A are described in detail, which are Heaton lodge, Mirfield Station and Ravensthorpe.

HUDDERSFIELD EAST TO HEATON LODGE.

This is the section of line between the east end of Huddersfield Viaduct passing through Deighton Station, Bradley Junction and extending towards Heaton Lodge Junction. Within this section a 4-track railway is provided largely within the existing railway corridor (previously 4-track) with the fast lines positioned to the South.

Sub-Option 14.1.5C is the only option presented for this section (for all options 1A, 1B, 5A, 5B) following the sift process.

HEATON LODGE.

At this location the fast lines sweep to the South off-line from the existing track alignments and are constructed nominally at grade. Two viable sub-options have been developed which are a trade off between extent of land acquisition, off-line construction, environmental impact and existing infrastructure impact.

Sub-option 14.2.2C simply cuts the corner with a 110mph alignment on the best route to avoid private properties and to keep the works off-line. This option requires large land take, albeit agricultural land, and some environmental mitigations are envisaged such as the provision of a green tunnel to retain local farm and property accesses as well as visually/acoustically screening the new line. The alignment requires significant modifications to existing structures and embankments on the approach to Bradley junction where the line crosses the River Calder and Canal. From a constructability viewpoint this option can be built almost entirely off-line although road access in this area is difficult for large scale works including a large earthworks content.

Sub-option 14.2.2D proposes a similar high speed alignment but stays largely within existing Network Rail land boundaries with a much reduced requirement for land purchase. This is achieved by slewing the existing Calder Valley lines to the North and modifying the existing Huddersfield up and down chord lines as a result. The alignment shown achieves 100mph, but with further refinement may improve upon this (ultimately achieving a 110mph alignment may require demolition of Heaton Lodge cottages).



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Major Remodelling between Huddersfield and Ravensthorpe
Sub-Option Ref Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe
Date: 31/10/2017
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MIRFIELD STATION.

The existing Mirfield station is a sub-optimal layout derived from historical interventions with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required car park.

Sub-option 14.2.2M shows an entirely re-constructed station with twin 200m long side platforms situated onto a straight section of the re-aligned slow lines. Passenger lifts and stairs would be provided down to a new passenger subway leading to a new station building facility located to the south and adjacent to an enlarged car park.

RAVENSTHORPE.

At this location a grade separation is required to pass the new fast line alignment over the existing Wakefield lines where they diverge at Thornhill LNW Junction. Two viable sub-options have been developed which study the effects of vertical grade separation geometry with and without slewing of the existing Wakefield line alignment. Within these sub-options there are a large number of possible variants and opportunities for refining the overall concept, which are described in more detail within each sub-option tab. Some of the common features of all the "Fasts to the South" options developed at Ravensthorpe are:

- train conflict separation at Ravensthorpe East junction where the vertical geometry allows for the diverging up slow line to be passed under the new fast line alignment.
- 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out.
- ability to platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access.
- possible abandonment of the existing alignment over the cast iron grade II listed Calder Viaducts (or alternatively re-using them for the re-aligned down slow line)

Sub-Option 14.3.2B is a flyover grade separation with the Wakefield lines maintained on their current alignment. This geometry results in the fast line alignment intersecting the existing Calder Road near to grade and therefore requires a large scale diversion of Calder Road as shown on the sub-option GA drawing (or stopping up and an alternative route found).

Sub-Option 14.3.2D is a flyover grade separation with the Wakefield lines slewed onto a new alignment into the triangle of land bounded by the existing rail corridors. This enables the grade separation location to be moved approximately 200m to the east and allows the fast line vertical alignment to pass under a re-aligned Calder Road (thereby avoiding a large scale road diversion). It also provides for a more optimum arrangement for off-line construction and eventual slow line re-alignment back through the existing cutting at Ravensthorpe including Ravensthorpe Station which can be re-constructed on straight track.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs					
					Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive	
					-	-	0	+	++	
Performance										
A	Journey Time	contribution to the system outputs for journey time	-1 to -1.5s v P05 -70s v existing							
A	Train Capacity	provision for specified capacity								
E	Train Length	provision for specified capacity		Deighton, Mirfield and Ravensthorpe reconstructed.						
B	Train Performance	Reliability of infrastructure		Supportive despite additional asset population. Option to realign Calder Valley route not preferred						
B		Number of Incidents / response time		Generally supportive but neutral @ Flyover given likely access restrictions						
B		Resilience (ability to recover)		Increased system resilience as 4 tracking provides a 2 track railway system resilience/redundancy.						
A		capacity for further growth								
D	Operational Safety	layout risk assessment, residual hazards CSM review		Generally supportive except for neutral view at Mirfield because staging is more difficult than Layout 5 options.						
B	Operability	Support vision of future railway state		Improvement towards future railway state						
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state						
F	Engineering	compliance to engineering and operational specifications		Generally neutral or supportive as some minor non compliances which are expected to be resolved.						
Sustainability and Environmental										
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable						
H		Visual impact, landscape and townscape impacts		Generally unsupportive, notable visual impact						
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Generally neutral.						
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		Generally neutral.						
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		Unsupportive: either known or anticipated orders / reserves						
H	Cultural Heritage	International - UNESCO World Heritage Site		Not Applicable						
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		Generally unsupportive. Numerous listed structures at a variety of locations throughout the sections						
		Local - Conservation Areas		Generally unsupportive, some local conservation areas.						
		National Trust Property		Not Applicable						
H	Air Quality	Air Quality Management Areas		Generally unsupportive						
H	Noise and Vibration	Sensitivity of potential receptor		Consistent and unsupportive.						
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Neutral except for unsupportive @ Ravensthorpe with mineral workings						
H		Best and most versatile land		Some areas unsupportive although information limited						
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		Unsupportive near River Calder Flood plain affecting east section						
H	Carbon Footprint	Rail Carbon Tool		Ranges from unsupportive to supportive across the intervention.						
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		Neutral						
H	Local wellbeing	Network Rail Social Performance themes		Neutral						
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Generally unsupportive						
H		Impacts on connectivity for local community.		Neutral						
H	Resource Management	Waste, material use and reuse, water use		Consistent and unsupportive						
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable						



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Major Remodelling between Huddersfield and Ravensthorpe
Sub-Option Ref Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe
Date: 31/10/2017
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H		National Cycle Network, long distance walking trails		Ranging from unsupportive to neutral					
H		Public open space (parks) and Public Rights of Way;		Consistent and unsupportive					
H		Recreational waterways		Ranging from unsupportive to neutral					
H		Other sensitive receptors (community & education facilities, residential etc.)		Generally unsupportive					
H		Assets of Community Value (ACV)		Neutral					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Generally neutral or supportive save for the bridge protection issues around Mirfield Station.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		<p>(MPs: Neutral; LAs: Supportive; Local c/b: Unsupportive; Rail passengers: Highly supportive)</p> <p>MPs covering the intervention are broadly in favour of work to upgrade the transpennine route, but any specific views on the work involved in SPO 14 aren't known (but the work is likely to improve the area and bring economic benefits). This option is likely to provide enhanced services in the area, particularly via the "grade separation option", and also ties in with plans by Kirklees Council to regenerate the area and boost economic attractiveness, in particular the work at Ravensthorpe station. Work will likely result in negative impact on the community, particularly nearby residents and businesses, and the Dewsbury Riverside development, but could well be accepted as having more benefits than drawbacks. Increased speeds will bring significant long-term enhancements to rail users, as will the improvements to Ravensthorpe station.</p>					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Generally unsupportive. Multiple 3rd party land requirements etc. TWAO					
I	Timescale		74+ Months	Huddersfield to Deighton and Mirfield sections Highly Unsupportive (74 & 64 months respectively). Remainder unsupportive					
E	Technical Complexity			Complex structures and associated works					
H	Consent Risk			Generally unsupportive: TWAO assumed. Listed					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Significant risks associated to the construction of the grade separation flyover. Significant HV service diversions and associated risks. Development of stations along the route thus improving passenger safety					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable and off-line construction better arranged and station recon location improved Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£753m to £833m	Unsupportive at Huddersfield to Deighton and Ravensthorpe Note: The cost figure illustrates a range of potential combination of options within an SPO. These options and costs are detailed in the estimate section.					



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Major Remodelling between Huddersfield and Ravensthorpe
Sub-Option Ref Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>TWAO consent process in general and political impact of decision making e.g. choice of grade separation site</p> <p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside</p> <p>Affects on utilities largely unknown. Several HV power lines cross the Ravensthorpe area and may require diversion (particular risk for flyover schemes in that area)</p> <p>The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction</p> <p>Site access in the Heaton Lodge area is generally poor to difficult</p> <p>Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk.</p> <p>Significant track slews and/or tie-ins are required at Ravensthorpe and at Heaton Lodge as well as the re-provision of the fourth running line between Heaton lodge and Ravensthorpe. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Sub-option with Wakefield line diversion releases land for potential train depot/maintenance facility site or private industrial/commercial re-development - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating industrial facility to NW of Ravensthorpe station to vacant land to the east - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside <p>Enhancement of the linespeed profile from 100mph (P05) to 110mph may be achieved relatively easily</p> <p>Review of the overall length of the 4-tracked section to determine any potential construction savings</p> <p>The use of Adjacent Open Line working where possible</p> <p>Maximise daytime working where possible by building offline of the operational railway</p>
Assumptions	<p>Do nothing options are not viable for SPO14 to deliver the required capacity and journey time improvements for the West of Leeds scheme.</p> <p>In order to create sufficient capacity on the system for the indicative train service specification, separated fast lines are required between Huddersfield and Ravensthorpe i.e. a 4-track railway with grade separations where conflicts occur. This results from previous operational modelling.</p> <p>OLE masts and portals erected through this section (for the electrification on option) are acceptable and do not carry significant consent or engineering risk.</p>
Dependencies	<p>Any required diversions of HV cables in the Ravensthorpe area can be aligned with the railway construction programme & TWAO process.</p> <p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Increased linespeed of 100mph throughout this section of route (in line with the P05 line speed profile) contributes substantially to the journey time improvement between Manchester and York. An enhanced linespeed profile of 110mph may be achievable by this option.	Has major environmental impacts throughout the Ravensthorpe area including: possible visual/noise/vibration intrusion onto the proposed Dewsbury Riverside development; and may require a major diversion (or stopping up) of Calder Road, although this can be mitigated by re-positioning the grade separation and slewing the Wakefield lines.
Removes all conflicting train movements between the fast lines and the Slow/Calder Valley/Wakefield lines (including the new Ravensthorpe East junction) and provision of a four track railway dramatically improves capacity through this area and enhances the overall system robustness during operation and maintenance.	Effects on major HV electricity lines crossing the Ravensthorpe area are currently unknown, but one of more large scale HV line diversions may be required as a result of this option.
The main environmental impact is moved from Heaton Lodge to Ravensthorpe and utilises brownfield land, which may be viewed as a benefit but has to be tested as part of a robust Stakeholder engagement programme.	
The grade separation option at Ravensthorpe enables significant re-development opportunities outside of the scope of the Transpennine project and may enable positive engagement with local stakeholders including the local authority (Kirklees CC) to both help deliver this scheme and other schemes of mutual benefit. It aligns with the current local development plan and therefore may attract funding from other sources to assist with elements of the scheme e.g. Ravensthorpe Station.	
This scheme proposes the abandonment of the River Calder and Calder & Hebble Navigation viaducts and the associated section of rail corridor. The listed structures are a large consent and cost risk to the project. The abandoned section of line may be re-used as a development opportunity (also see comments above).	
Ravensthorpe station may be re-provided in a more optimum location near to the main access road and adjacent to the proposed new housing development. Platforming the Wakefield lines as part of the same station re-development is also an optional enhancement.	
A grade separation at Ravensthorpe allows the possible deferment of a line speed increase scheme at Heaton Lodge (if funding has to be spread over a longer period)	
An end to end scheme with fast lines positioned to the south is the simplest scheme to stage from a construction viewpoint and minimise the amount of track renewal works within the corridor between Heaton Lodge and Ravensthorpe	

Total scheme cost (Range low to high depending on sub-option choice)	£753m (Low)	£833m (High)
	£799,123,148 Alliance rework on 10th Oct	

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject

TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Major Remodelling between Huddersfield and Ravensthorpe
Sub-Option Ref Option 1A - Fast lines to the South, Flyover grade separation at Ravensthorpe
Date: 31/10/2017
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Option layout 1A preferred with 110mph cutting the corner option at Heaton Lodge and grade separated flyover at Ravensthorpe. This option provides significant operational benefits, reducing more conflicts than other options presented. It was generally favoured across the expert panel example being from a CDM perspective and when considering external stakeholders (less roadworks / closures are required).

Record of Expert Panel and Consultees Attendees



Attendance Sheet
Experts

Role	Name	Signed
Chair	Tim Ketteringham	
Verification and Validation	James Hodge	
Consents	Anne Dugdale	
Programme	Jon Ainsworth	
Client Services	Martin Clerkin	
	Nick Speight	
	Alex Robinson	
Stakeholder	Faye Jenkins	
	Sarah Doherty	
	Keir Dawson	
	Rachael Blake	
Principal Designer	Jeff Boden	
Operations & Maintenance	Steven Bell	
Safety & Sustainability	Iain Grainey	
	Jason Agar	
Cost – Capital & Lifecycle	Grant Robinson	
	Peter Hanslip	
	Mark Coyle	
Operational Train Performance	Paul Whitaker	
	Keith Burrows	

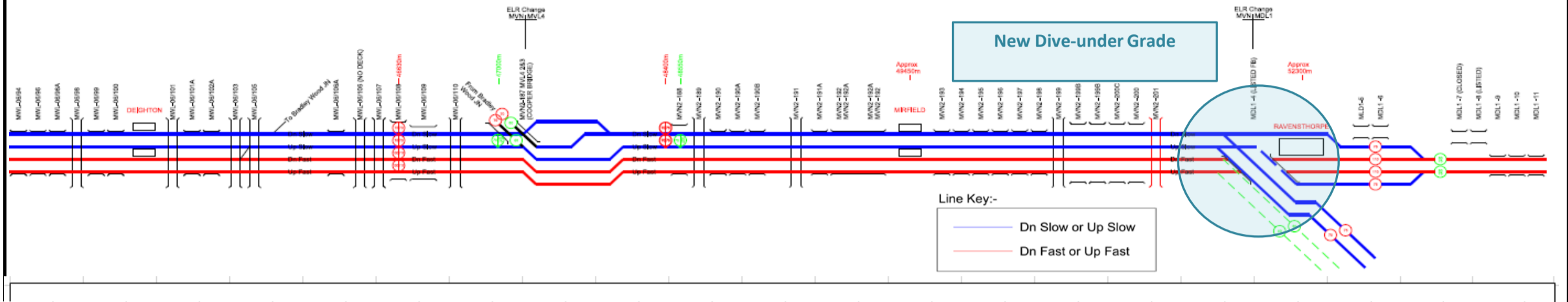
Attendance Sheet (cont...)
Additional Guests

Role	Name	Signed
Package Manager (C)	Simon Clark	
Assistant Package Manager (C)	Julia Stanley	
Package Engineering Manager (C)	Graham Thomas	
Package Manager (D)	Ian Fowler	
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Senior RAM – Signalling & (LNW)	Adam Checkley	
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Senior RAM (LNE)	Simon Pumphrey	
Process lead (TRU PLT)	Theo Thanopoulos	
	Jenny Illingworth	

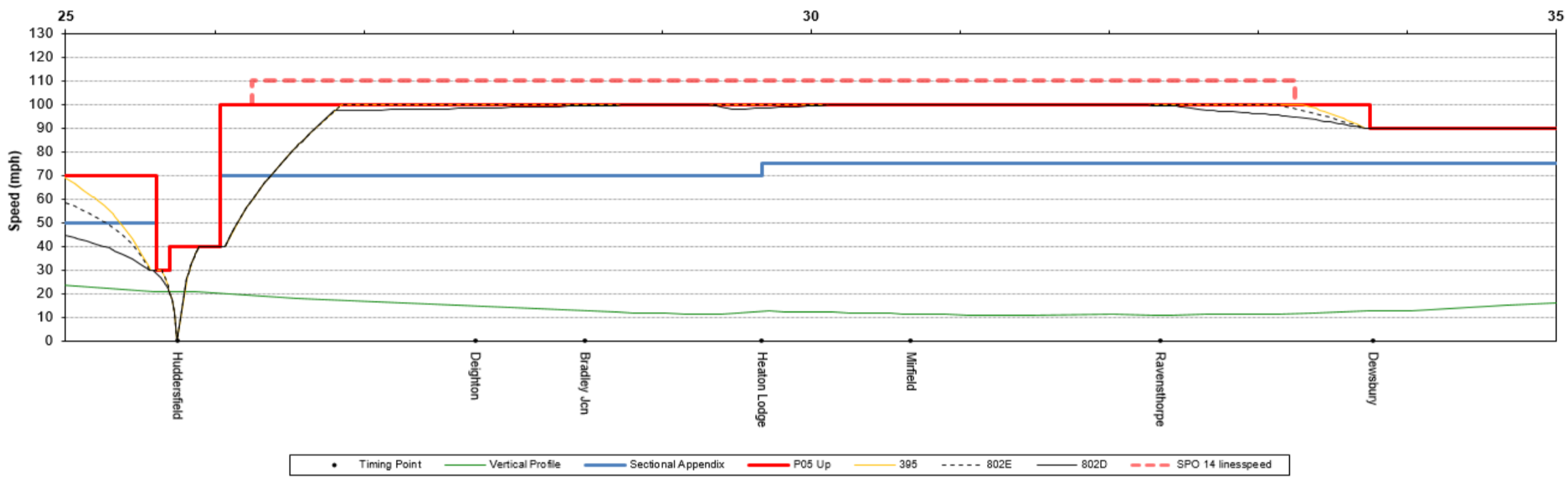
TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 1B - Fast lines to the South, Diveunder grade separation at Ravensthorpe
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Up Direction - Ravensthorpe to Huddersfield - SPO14 Option 1B speed profile

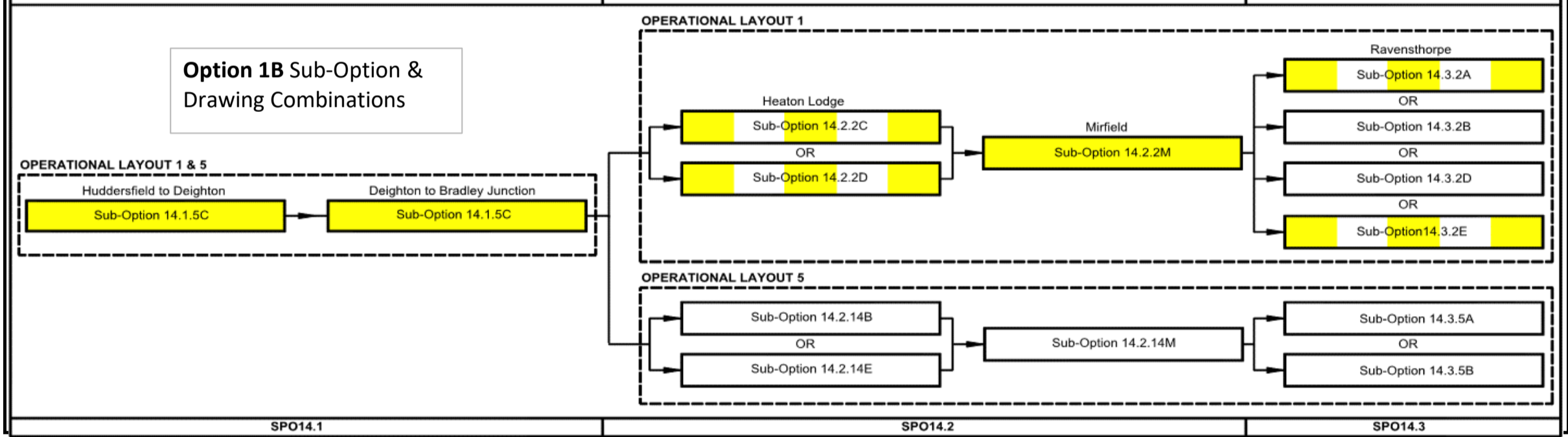


Huddersfield East to Bradley Junction

(inc. Heaton lodge jct.)

(inc. Thornhill JCT.)

Option 1B Sub-Option & Drawing Combinations



Option Overview

This option has been developed to suit the end to end operational layout 1 (fast lines to the South) and requires a grade separation site situated near to the existing Ravensthorpe station. The sub-option layouts for areas that are relevant to this option are highlighted in the table above. Key features of these are described in the sections below with detailed engineering commentary provided in each specific sub-option tab. Only areas which differ substantially to Option 5A are described which are Heaton lodge, Mirfield Station and Ravensthorpe.

HUDDERSFIELD EAST TO HEATON LODGE. This is the section of line between the east end of Huddersfield Viaduct passing through Deighton Station, Bradley Junction and extending towards Heaton Lodge Junction. Within this section a 4-track railway is provided largely within the existing railway corridor (previously 4-track) with the fast lines positioned to the South.

Sub-Option 14.1.5C is the only option presented for this section (for all options 1A, 1B, 5A, 5B) following the sift process.

HEATON LODGE. At this location the fast lines sweep to the South off-line from the existing track alignments and are constructed nominally at grade. Two viable sub-options have been developed which are a trade off between extent of land acquisition, off-line construction, environmental impact and existing infrastructure impact.

Sub-option 14.2.2C simply cuts the corner with a 110mph alignment on the best route to avoid private properties. This option requires large land take, albeit agricultural land, and some environmental mitigations are envisaged such as the provision of a green tunnel to retain local farm and property accesses as well as visually/acoustically screening the new line. The alignment requires significant modifications to existing structures and embankments on the approach to Bradley junction where the line crosses the River Colne and Huddersfield Canal. From a constructability viewpoint this option can be built almost entirely off-line.

Sub-option 14.2.2D proposes a similar high speed alignment but stays largely within existing Network Rail land boundaries with a much reduced requirement for land purchase. This is achieved by slewing the existing Calder Valley lines to the North and modifying the existing Huddersfield up and down chord lines as a result. The alignment shown achieves 100mph, but with further refinement may improve upon this.



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 1B - Fast lines to the South, Diveunder grade separation at Ravensthorpe
Date: 31/10/2017
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MIRFIELD STATION. The existing Mirfield station is a sub-optimal layout derived from historical interventions with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required carpark
Sub-option 14.2.2M shows an entirely re-constructed station with twin 200m long side platforms situated onto a straight section of the re-aligned slow lines. Passenger lifts and stairs would be provided down to a new passenger subway leading to a new station building facility located to the south and adjacent to an enlarged car park.

RAVENSTHORPE. At this location a grade separation is required to pass the new fast line alignment under the existing Wakefield lines where they diverge at Thornhill LNW Junction. Two viable sub-options have been developed which study the effects of vertical grade separation geometry with and without slewing of the existing Wakefield line alignment. Within these sub-options there are a large number of possible variants and opportunities for refining the overall concept, which are described in more detail within each sub-option tab. Some of the common features of all the "Fasts to the South" options developed at Ravensthorpe are:

- train conflict separation at Ravensthorpe East junction where the vertical geometry allows for the diverging up slow line to be passed over the new fast line alignment.
- 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out.
- ability to platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access.
- possible abandonment of the existing alignment over the cast iron grade II listed Calder Viaducts (or alternatively re-using for the down slow)

Sub-Option 14.3.2A is a dive-under grade separation with the Wakefield lines maintained on their current alignment. This geometry results in the dive-under structure being built in a phased operation around disruptive possessions on the Wakefield line or by staged slewings of the Wakefield line within its historical four track corridor. The depth of the cutting required and scale of retaining structures would be very difficult to achieve in the limited space available at the grade separation location. As the new fast lines pass well below the existing Calder road, a new bridge and associated highway diversion can be simply provided at grade.

Sub-Option 14.3.2E is a dive-under grade separation with the Wakefield lines slewed onto a new alignment into the triangle of land bounded by the existing lines. This enables the grade separation location to be moved approximately 200m to the east and allows for an optimum arrangement for off-line construction with the dive-under structure being constructed in advance with the slewed Wakefield lines subsequently diverted over the top. This sub-option also results in a more optimum eventual track alignment back through the existing cutting at Ravensthorpe including Ravensthorpe Station which can be re-constructed on straight track.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	-2s v P05 -71s v existing						
A	Train Capacity	provision for specified capacity							
E	Train Length	provision for specified capacity		Deighton, Mirfield and Ravensthorpe reconstructed.					
B	Train Performance	Reliability of infrastructure		Supportive despite additional asset population. Option to realign Calder Valley route not preferred					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response. 3 level railway may make access more restrictive. Dive under for fasts					
B		Resilience (ability to recover)		Increased system resilience as 4 tracking provides a 2 track railway system resilience/redundancy.					
A		capacity for further growth							
D	Operational Safety	layout risk assessment, residual hazards CSM review		Generally neutral but unsupportive for concerns with Dive under and associated additional contaminated land work in flood plain and requiring permanent pumping solution.					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Preferred dive under sub option is compliant.					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaduct. Visual impact of various bridge works, embankment new and widened and cuttings, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		Generally neutral.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		Unsupportive: either known or anticipated orders / reserves					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not Applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		Generally unsupportive. Numerous listed structures at a variety of locations throughout the sections					
		Local - Conservation Areas		Generally unsupportive, some local conservation areas.					
		National Trust Property		Not Applicable					
H	Air Quality	Air Quality Management Areas		Generally unsupportive					
H	Noise and Vibration	Sensitivity of potential receptor		Consistent and unsupportive.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Neutral except for unsupportive @ Ravensthorpe with mineral workings					
H		Best and most versatile land		Some areas unsupportive although information limited					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		Unsupportive near River Calder Flood plain affecting east section					
H	Carbon Footprint	Rail Carbon Tool		Ranges from unsupportive to supportive across the intervention.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		Neutral					
H	Local wellbeing	Network Rail Social Performance themes		Neutral					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Generally unsupportive					
H		Impacts on connectivity for local community.		Neutral					
H	Resource Management	Waste, material use and reuse, water use		Consistent and unsupportive					



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

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H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Ranging from unsupportive to neutral					
H		Public open space (parks) and Public Rights of Way;		Consistent and unsupportive					
H		Recreational waterways		Ranging from unsupportive to neutral					
H		Other sensitive receptors (community & education facilities, residential etc.)		Generally unsupportive					
H		Assets of Community Value (ACV)		Neutral					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Generally neutral or supportive save for the bridge protection issues around Mirfield Station.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		<p>(MPs: Neutral; LAs: Supportive; Local c/b: Unsupportive; Rail passengers: Highly supportive)</p> <p>MPs covering the intervention are broadly in favour of work to upgrade the transpennine route, but any specific views on the work involved in SPO 14 aren't known (but the work is likely to improve the area and bring economic benefits). This option is likely to provide enhanced services in the area, particularly via the "grade separation option", and also ties in with plans by Kirklees Council to regenerate the area and boost economic attractiveness, in particular the work at Ravensthorpe station. Work will likely result in negative impact on the community, particularly nearby residents and businesses, and the Dewsbury Riverside development, but could well be accepted as having more benefits than drawbacks. Increased speeds will bring significant long-term enhancements to rail users, as will the improvements to Ravensthorpe station.</p>					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Generally unsupportive. Multiple 3rd party land requirements etc. TWAO					
I	Timescale		74+ Months	Huddersfield to Deighton and Mirfield sections Highly Unsupportive (74 & 64 months respectively). Remainder unsupportive					
E	Technical Complexity			Complex structures and associated works					
H	Consent Risk			Generally unsupportive: TWAO assumed. Dive under likely to be more palatable than flyover option (1A)					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Significant risks associated to the construction of the grade separation dive under. Significant HV service diversions and associated risks. Development of stations along the route thus improving passenger safety					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable but more complex Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£749m to £829m	Note: The cost figure illustrates a range of potential combination of options within an SPO. These options and costs are detailed in the estimate section.					

TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 1B - Fast lines to the South, Diveunder grade separation at Ravensthorpe
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>TWAO consent process in general and political impact of decision making e.g. choice of grade separation site</p> <p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside</p> <p>Effects on utilities largely unknown.</p> <p>The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction</p> <p>Site access in the Heaton Lodge area is generally poor to difficult</p> <p>Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk.</p> <p>Significant track slews and/or tie-ins are required at Ravensthorpe and at Heaton Lodge as well as the re-provision of the fourth running line between Heaton lodge and Ravensthorpe. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Sub-option with Wakefield line diversion releases land for potential train depot/maintenance facility site or private industrial/commercial re-development - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating cement batching facility to NW of Ravensthorpe station to vacant land to the east - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside - Enhancement of the linespeed profile from 100mph (P05) to 110mph may be achieved relatively easily
Assumptions	<p>Do nothing options are not viable for SPO14 to deliver the required capacity and journey time improvements for the West of Leeds scheme.</p> <p>In order to create sufficient capacity on the system for the indicative train service specification, separated fast lines are required between Huddersfield and Ravensthorpe i.e. a 4-track railway with grade separations where conflicts occur. This results from previous operational modelling.</p> <p>OLE masts and portals erected through this section (for the electrification on option) are acceptable and do not carry significant consent or engineering risk.</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Increased linespeed of 100mph throughout this section of route (in line with the P05 line speed profile) contributes substantially to the journey time improvement between Manchester and York. An enhanced linespeed profile of 110mph may be achievable by this option.	Has major environmental impacts throughout the Ravensthorpe area including possible visual/noise/vibration intrusion onto the proposed Dewsbury Riverside development. However, due to the dive-under grade separation this environmental impact is potentially largely offset.
Removes all conflicting train movements between the fast lines and the Slow/Calder Valley/Wakefield lines (including the new Ravensthorpe East junction) and provision of a four track railway dramatically improves capacity through this area and enhances the overall system robustness during operation and maintenance.	Complexities and risks associated with the formation of deep cuttings (compared to a flyover scheme)
The main environmental impact is moved from Heaton Lodge to Ravensthorpe and utilises brownfield land, which may be viewed as a benefit but has to be tested as part of a robust Stakeholder engagement programme.	A dive-under alignment is most likely to require a wet well pumping shaft for drainage into the River Calder. This will require regular maintenance and associated operating costs throughout its life.
The grade separation option at Ravensthorpe enables significant re-development opportunities outside of the scope of the Transpennine project and may enable positive engagement with local stakeholders including the local authority (Kirklees CC) to both help deliver this scheme and other schemes of mutual benefit. It aligns with the current local development plan and therefore may attract funding from other sources to assist with elements of the scheme e.g. Ravensthorpe Station.	Long term operational risk of building a dive-under structure close to a main river flood plain. Future flood levels including climate change may result in the inundation of a dive-under
This scheme proposes the abandonment of the River Calder and Calder & Hebble Navigation viaducts and the associated section of rail corridor. The listed structures are a large consent and cost risk to the project. The abandoned section of line may be re-used as a development opportunity (also see comments above).	
Ravensthorpe station may be re-provided in a more optimum location near to the main access road and adjacent to the proposed new housing development. Platforming the Wakefield lines as part of the same station re-development is also an optional enhancement.	
A grade separation at Ravensthorpe allows the possible deferment of a line speed increase scheme at Heaton Lodge (if funding has to be spread over a longer period)	
An end to end scheme with fast lines positioned to the south is the simplest scheme to stage from a construction viewpoint and minimise the amount of track renewal works within the corridor between Heaton Lodge and Ravensthorpe	

Total scheme cost (Range low to high depending on sub-option choice) £749m (Low) £829m (High)
 £794,453,804 Alliance rework on 10th Oct

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Option 1B is to be progressed to SDO stage and all appendices developed. This option was not suspended due to the consents benefits a dive-under presents as opposed to flyover.

Record of Expert Panel and Consultees Attendees

TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: **14 - Huddersfield East to Ravensthorpe East Re-modelling**
 Sub-Option Ref: **Option 1B - Fast lines to the South, Diveunder grade separation at Ravensthorpe**
 Date: **31/10/2017**
 Revision: **P04 - Final Issue**



Attendance Sheet
Experts

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Chair	Tim Ketteringham	
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	Nick Speight	
	Alex Robinson	
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	Sarah Doherty	
	Keir Dawson	
	Rachael Blake	
Principal Designer	Jeff Boden	
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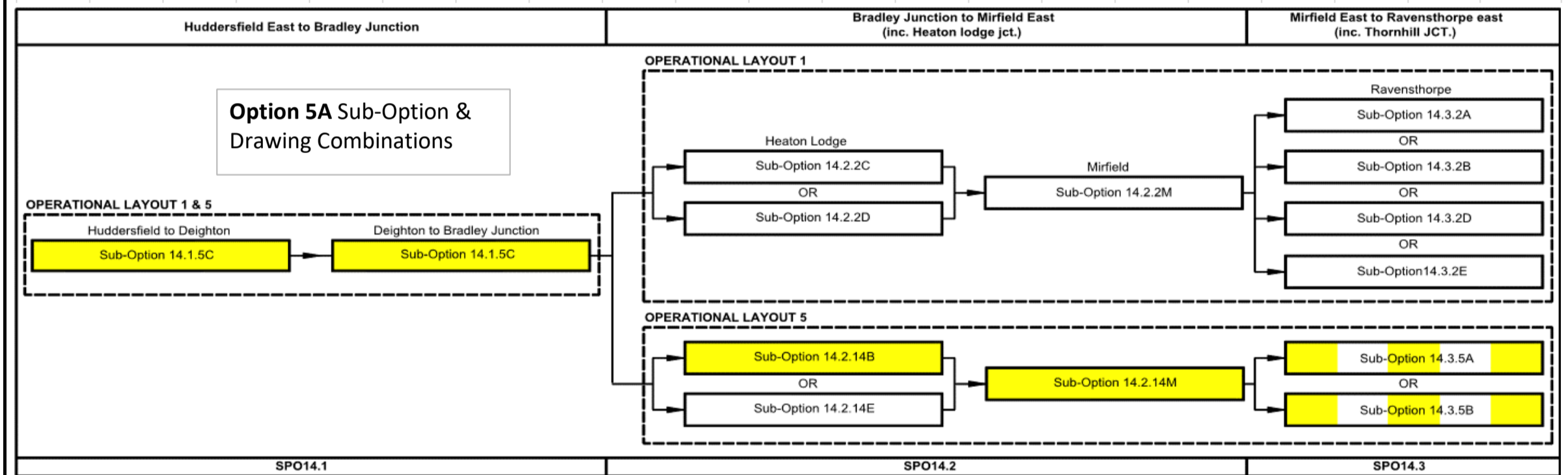
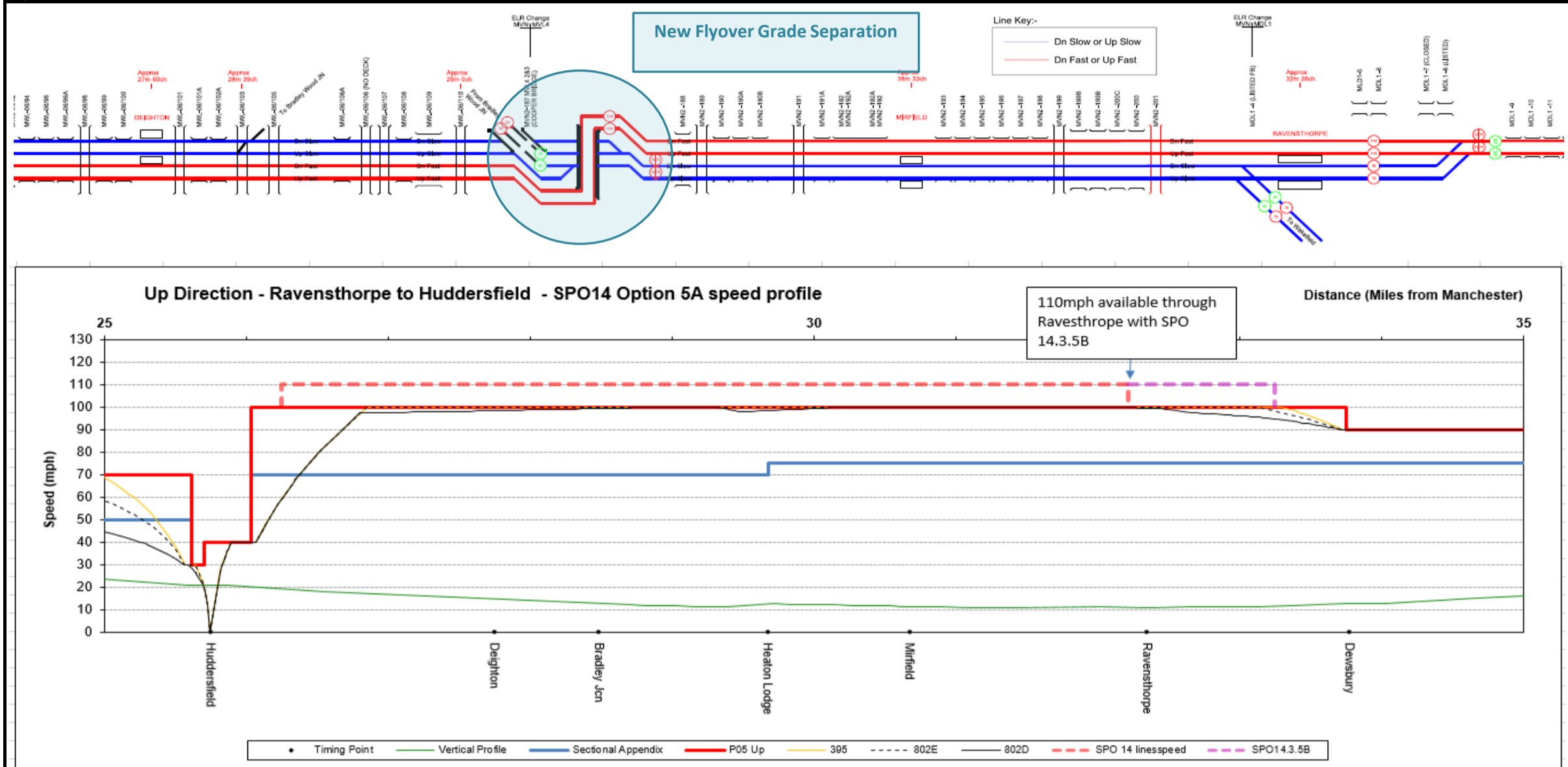
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Senior RAM (LNE)	Simon Pumphrey	
Process lead (TRU PLT)	Theo Thanopoulos	
	Jenny Illingworth	

TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5A - Fast lines North to South, Flyover grade separation at Heaton Lodge
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

This option is the end to end operational layout 5 (fast lines to the North through Ravensthorpe crossing to the South before Bradley junction) and requires a grade separation site situated near to the existing junction at Heaton Lodge. The sub-option layouts for areas that are relevant to this option are highlighted in the table above. Key features of these are described in the sections below with detailed engineering commentary provided in each specific sub-option tab.

HUDDERSFIELD EAST TO HEATON LODGE.

This is the section of line between the east end of Huddersfield Viaduct passing through Deighton Station, Bradley Junction and extending towards Heaton Lodge Junction. Within this section a 4-track railway is provided largely within the existing railway corridor (previously 4-track) with the fast lines positioned to the South.

Sub-Option 14.1.5C is the only option presented for this section (for all options 1A, 1B, 5A, 5B) following the sift process.

HEATON LODGE.

At this location the fast lines approaching from the east cross from the North to the South of the new four track railway. Two viable flyover sub-options have been developed which have subtly different impacts on extent of land acquisition and environmental impact.

Sub-option 14.2.14B consists of a flyover constructed largely off-line. This option requires large land take including agricultural land to the west and residential land to the north east in the vicinity of Battieford. Because of the elevated nature of the alignment and lie of the land the visual and acoustic impact potentially extends some distance to the North of the immediate properties affected. The alignment is capable of 110mph running in order to maximise the 110mph linespeed opportunity through this area.

Sub-option 14.2.14C is a variation in alignment in order to make better use of existing Network Rail land ownership and to mitigate the environmental impacts of a flyover scheme particularly on the residential properties in Battieford. This has been achieved by moving the flyover alignment further to the east and tightening the horizontal radii. The resulting alignment results in a much reduced land take and distances the viaduct from Battieford (albeit there is still an impact). The alignment achieves 100mph at normal values and 110mph at exceptional values (a 110mph alignment at normal values would likely require acquisition of Heaton Lodge cottages).

MIRFIELD STATION.

The existing Mirfield station is a sub-optimal layout derived from historical interventions with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required carpark. The only option presented shows an entirely re-constructed station with twin 200m long side platforms situated onto the re-aligned slow lines. Passenger lifts and stairs would be provided down to a new passenger subway leading to a new station building facility located to the south and adjacent to an enlarged car park.



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5A - Fast lines North to South, Flyover grade separation at Heaton Lodge
Date: 31/10/2017
Revision: P04 - Final Issue

RAVENSTHORPE.

At this location the fast lines as they approach from the west simply diverge at grade to the northeast towards Dewsbury and Leeds. Two viable sub-options have been developed including a variant which proposes a higher line speed. Some of the common features of all the "Fasts to the North" options developed at Ravensthorpe are:
 - a new at grade switch diamond crossing - Ravensthorpe East Junction - introduces some conflicting train movements for the down slow over the up fast. However with this geometry up slow trains can be stabled on the four track section to wait for a clear path and therefore do not impact on the fast services.
 - 100mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road smoothed. (Note sub-option 14.3.5B proposes an enhanced 110mph alignment)

In Sub-Option 14.3.5A, minor modifications have been made to the track geometry around the Thornhill Road reverse curves to achieve a compliant design at the desired 100mph linespeed. The slow lines diverge South at the new Ravensthorpe East junction and cross the River Calder floodplain and Calder & Hebble Navigation by means of a new twin track viaduct. This new alignment forms an approx. 1km long loop back to the reconfigured Thornhill LNW Junction allowing Ravensthorpe station to be re-built further to the east with compliant signalling overlap lengths to protect the junction. The fast lines will continue to use the existing alignment over the life-expired Calder viaducts which would require reconstruction.

Sub-Option 14.3.5B is a variant to produce a 110mph capable alignment to maximise the linespeed opportunity in the area. This sub-option replicates some of the features of the "fasts to the south" sub-options whereby the Calder viaduct alignment is abandoned in favour of a new four track viaduct over the Calder floodplain and canal and therefore requires a greater land take. In addition the alignment back towards Dewsbury is straightened to remove the reverse curve near Thornhill Road.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	-0 to -0.5s v P05 -69.5 to 70s v existing						
A	Train Capacity	provision for specified capacity							
E	Train Length	provision for specified capacity		Deighton, Mirfield and Ravensthorpe rebuilt and satisfies requirements					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth							
D	Operational Safety	layout risk assessment, residual hazards CSM review		Significant 900m viaduct constructed on Flood plain. Major visual impact and similar outputs can be achieved utilising less resources. At grade junctions at Ravensthorpe introduces additional conflicting moves and retention of existing Calder Viaduct structures to carry lines is not preferred.					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Compliant					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable					
H		Visual impact, landscape and townscape impacts		Generally unsupportive, notable visual impact, 900m long viaduct					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not Applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		Generally neutral.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		Unsupportive: either known or anticipated orders / reserves					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not Applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		Generally unsupportive. Numerous listed structures at a variety of locations throughout the sections					
		Local - Conservation Areas		Generally unsupportive, some local conservation areas.					
		National Trust Property		Not Applicable					
H	Air Quality	Air Quality Management Areas		Generally unsupportive					
H	Noise and Vibration	Sensitivity of potential receptor		Consistent and unsupportive.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Neutral except for unsupportive @ Ravensthorpe with mineral workings					
H		Best and most versatile land		Some areas unsupportive although information limited					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		Unsupportive near River Calder Flood plain affecting east section					
H	Carbon Footprint	Rail Carbon Tool		Ranges from unsupportive to supportive across the intervention.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		Neutral					
H	Local wellbeing	Network Rail Social Performance themes		Neutral					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Generally unsupportive					
H		Impacts on connectivity for local community.		Neutral					
H	Resource Management	Waste, material use and reuse, water use		Consistent and unsupportive					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Ranging from unsupportive to neutral					
H		Public open space (parks) and Public Rights of Way;		Consistent and unsupportive					



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SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
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H		Recreational waterways		Ranging from unsupportive to neutral					
H		Other sensitive receptors (community & education facilities, residential etc.)		Generally unsupportive					
H		Assets of Community Value (ACV)		Neutral					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Generally neutral but unsupportive as it retains MDL1/6 and 8 Calder Viaducts.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		<p>(MPs: Neutral; LAs: Supportive; Local c/b: Unsupportive; Rail passengers: Highly supportive)</p> <p>MPs covering the intervention are broadly in favour of work to upgrade the transpennine route, but any specific views on the work involved in SPO 14 aren't known (but the work is likely to improve the area and bring economic benefits). This option is likely to provide enhanced services in the area, particularly via the "grade separation option", and also ties in with plans by Kirklees Council to regenerate the area and boost economic attractiveness, in particular the work at Ravensthorpe station. Work will likely result in negative impact on the community, particularly nearby residents and businesses, and the Dewsbury Riverside development, but could well be accepted as having more benefits than drawbacks. Increased speeds will bring significant long-term enhancements to rail users, as will the improvements to Ravensthorpe station.</p>					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Generally unsupportive. Third party land required and TWAO assumed.					
I	Timescale		67 Months	Complex staging required.					
E	Technical Complexity			Complex structures, geotechnical and associated works					
H	Consent Risk			Significant consents risk (e.g. Colne Viaduct) and multiple structures requirements. TWAO but concerns over demonstrating case.					
J	Implementation Risks			<p>Mine workings</p> <p>Groundwater risk/floodplain</p> <p>Settlement risk of new infrastructure with Transpire</p> <p>Staffing levels considered (Disruptives)</p> <p>Construction access challenging</p>					
C	Safety			<p>Significant risks associated to the construction of the grade separation dive under.</p> <p>Significant HV service diversions and associated risks. Development of stations along the route will impose construction risks but improve passenger safety. Work at height and construction risks associated to reconstruction of life expired viaducts.</p>					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		<p>Staging viable</p> <p>Significant off-line benefit</p> <p>Disruptive access required (track/civils & signalling)</p> <p>Access considered and accounted for- will likely be challenging but workable</p> <p>Utilises traditional techniques and equipment</p>					
Cost									
K	Capital Cost		£686m to £725m	Note: The cost figure illustrates a range of potential combination of options within an SPO. These options and costs are detailed in the estimate section.					



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5A - Fast lines North to South, Flyover grade separation at Heaton Lodge
Date: 31/10/2017
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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>TWAO consent process in general and political impact of decision making e.g. choice of grade separation site</p> <p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council</p> <p>Effects on utilities largely unknown.</p> <p>The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction</p> <p>Site access in the Heaton Lodge area is generally poor to difficult</p> <p>Reconstruction of grade listed Calder Viaducts has a very high consent and cost associated risk (noting that the existing structures are effectively life expired).</p> <p>Significant track slews and/or tie-ins are required at Ravensthorpe and at Heaton Lodge as well as the re-provision of the fourth running line between Heaton lodge and Ravensthorpe. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor (sub-option 14.3.5B only). - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside <p>Enhancement of the linespeed profile from 100mph (P05) to 110mph may be achieved up to Ravensthorpe (sub-option 14.3.5B extends the 110mph running beyond Ravensthorpe East junction).</p>
Assumptions	<p>Do nothing options are not viable for SPO14 to deliver the required capacity and journey time improvements for the West of Leeds scheme.</p> <p>In order to create sufficient capacity on the system for the indicative train service specification, separated fast lines are required between Huddersfield and Ravensthorpe i.e. a 4-track railway with grade separations where conflicts occur. This results from previous operational modelling.</p> <p>100mph+ fast line alignments over the Calder Viaducts will require complete reconstruction of these bridges with associated consents consequences</p> <p>OLE masts and portals erected through this section (for the electrification on option) are acceptable and do not carry significant consent or engineering risk (noting previous comments regarding the Calder viaducts).</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Increased linespeed of 100mph throughout this section of route (in line with the P05 line speed profile) contributes substantially to the journey time improvement between Manchester and York. An enhanced linespeed profile of 110mph may be achievable in part by this option.	The scheme has major environmental impacts in the Heaton Lodge area in particular the acquisition of residential property and associated blight of nearby properties with respect to possible visual/noise intrusion. Sub-option 14.2.14C reduces some of the environmental concerns and land take.
Most of the conflicting train movements between the fast lines and the Slow/Calder Valley/Wakefield lines are removed apart from the new Ravensthorpe East junction where there remains a conflict between the up fast and down slow lines. Provision of a four track railway dramatically improves capacity through this area and enhances the overall system robustness during operation and maintenance.	The scheme proposes the re-use of the Calder Viaducts which are grade listed, have zero assessed capacity and are effectively life expired. Reconstruction would be required and this is a large consent and cost risk. Sub-option 14.3.5B proposes the abandonment of these structures with a new four track alignment to the South.
	The operational layout 5 is more difficult to stage for the end to end construction and involves more track renewals within the Heaton Lodge to Ravensthorpe corridor.

Total scheme cost (Range low to high depending on sub-option choice) £686m (Low) £725m (High)

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 All works regarding Option 5 to be suspended - this option is more visually intrusive and does not reduce as many operational conflicts as Option 1.

Record of Expert Panel and Consultees Attendees

Attendance Sheet			Attendance Sheet (cont...)		
Experts			Additional Guests		
Role	Name	Signed	Role	Name	Signed
Chair	Tim Ketteringham		Package Manager (C)	Simon Clark	
Verification and Validation	James Hodge		Assistant Package Manager (C)	Julia Stanley	
Consents	Anne Dugdale		Package Engineering Manager (C)	Graham Thomas	
Programme	Jon Ainsworth		Package Manager (D)	Ian Fowler	
Client Services	Martin Clerkin		Engineering Lead (D SPO 03)	Greg Dowdy	
	Nick Speight		Programme Manager (Transpire programme integration)	Ian Watson	
	Alex Robinson		Project Manager (Transpire programme integration)	Trevor Marshall	
Stakeholder	Faye Jenkins		SPM (Transpire programme integration)	Alex Legge	
	Sarah Doherty		SPM (Transpire programme integration)	Hayley Robinson	
	Keir Dawson		SPM (Transpire programme integration)	Tara Cochrane	
	Rachael Blake		Senior Project Manager (IP Signalling)	Isobel Crockford	
Principal Designer	Jeff Boden		Senior Project Engineer (IP Signalling)	Matthew Briggs	
Operations & Maintenance	Steven Bell		Programme Engineering Manager (IP Signalling)	David Freer	
Safety & Sustainability	Iain Graine		Senior RAM - Track (LNW)	Carole Bayliss	
Cost - Capital & Lifecycle	Jason Agar		Senior RAM - Signalling & (LNW)	Adam Checkley	
	Grant Robinson		Senior RAM (LNE)	Roger Griffiths	
	Peter-Hanslip		Senior RAM (LNE)	Simon Pumphrey	
Operational Train Performance	Mark Coyle		Process lead (TRU PLT)	Theo Thanopoulos	
	Paul Whitaker				



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

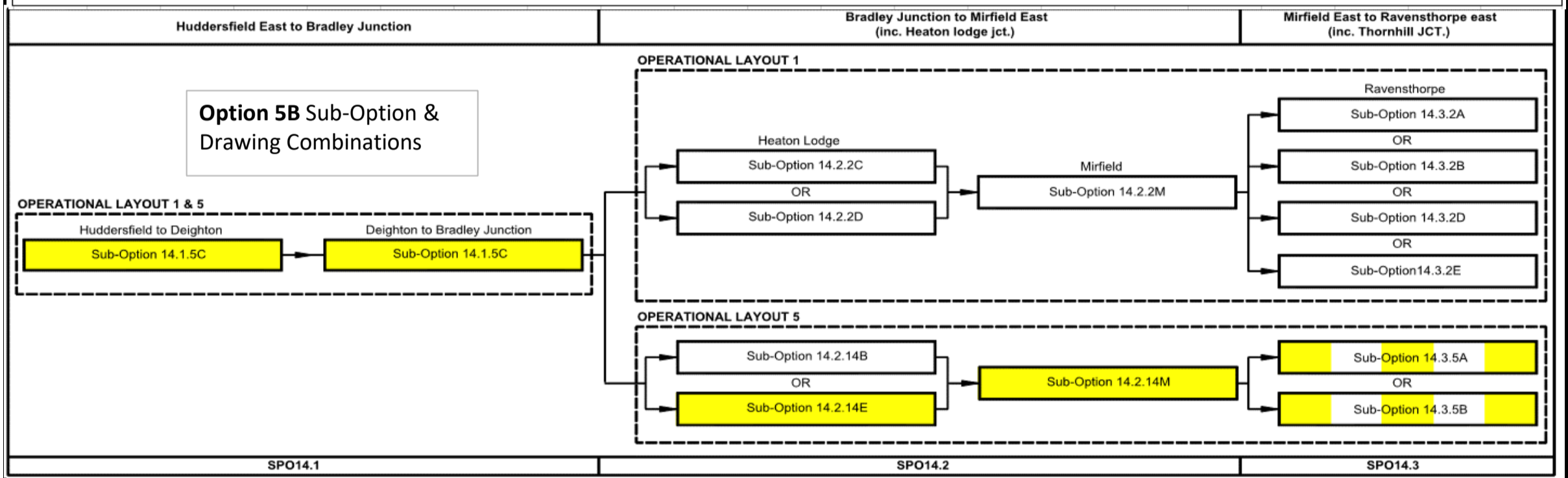
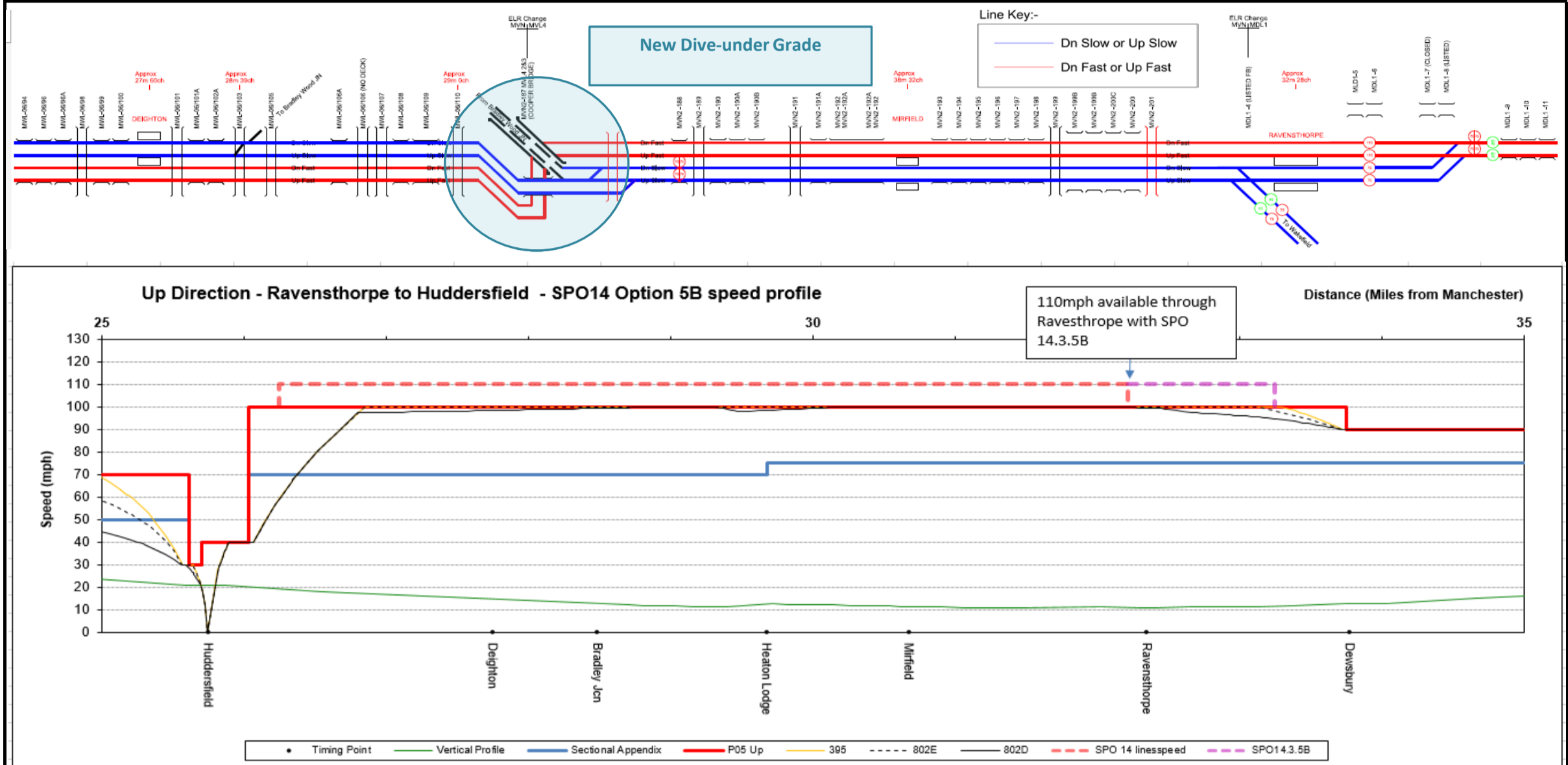
SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5A - Fast lines North to South, Flyover grade separation at Heaton Lodge
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	Keith Burrows				Jenny Illingworth	
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TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5B - Fast lines North to South, Diveunder grade separation at Heaton Lodge
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Option Sketch



Option Overview

This option is a variation to suit the end to end operational layout 5 (fast lines to the North through Ravensthorpe crossing to the South before Bradley junction) and requires a grade separation site situated near to the existing junction at Heaton Lodge. The sub-option layouts for areas that are relevant to this option are highlighted in the table above. Key features of these are described in the sections below with detailed engineering commentary provided in each specific sub-option tab.

HUDDERSFIELD EAST TO HEATON LODGE. This is the section of line between the east end of Huddersfield Viaduct passing through Deighton Station, Bradley Junction and extending towards Heaton Lodge Junction. Within this section a 4-track railway is provided largely within the existing railway corridor (previously 4-track) with the fast lines positioned to the South.

Sub-Option 14.1.5C is the only option presented for this section (for all options 1A, 1B, 5A, 5B) following the sift process.

HEATON LODGE. At this location the fast lines approaching from the east cross from the North to the South of the new four track railway. A dive-under sub-option have been developed which has substantially different impacts on environment, constructability and operations than the Option 5A flyover schemes.

Sub-option 14.2.14E is a dive-under scheme utilising the same horizontal alignment as 14.2.14C in order to make best use of existing Network Rail land ownership and to mitigate potential environmental impacts from off-line incursions particularly on the residential properties in Battysford. The alignment achieves 100mph at normal values and 110mph at exceptional values. The dive-under structure will require disruptive possession working in order to stage construction. A notable operational issue is that the dive-under scheme will necessitate the abandonment of the existing Cooper Bridge alignment and the creation of an at-grade junction for the slow lines onto the Calder valley lines.

MIRFIELD STATION. The existing Mirfield station is a sub-optimal layout derived from historical interventions with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required carpark. The only option presented shows an entirely re-constructed station with twin 200m long side platforms situated onto the re-aligned slow lines. Passenger lifts and stairs would be provided down to a new passenger subway leading to a new station building facility located to the south and adjacent to an enlarged car park.



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5B - Fast lines North to South, Diveunder grade separation at Heaton Lodge
Date: 31/10/2017
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RAVENSTHORPE. At this location the fast lines as they approach from the west simply diverge at grade to the northeast towards Dewsbury and Leeds. Two viable sub-options have been developed including a variant which proposes a higher line speed. Some of the common features of all the "Fasts to the North" options developed at Ravensthorpe are:
 - a new at grade switch diamond crossing - Ravensthorpe East Junction - introduces some conflicting train movements for the down slow over the up fast. However with this geometry up slow trains can be stabled on the four track section to wait for a clear path and therefore do not necessarily impact on the fast services.
 - 100mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road smoothed. (Note sub-option 14.3.5B proposes an enhanced 110mph alignment)
 In **Sub-Option 14.3.5A** minor modifications have been made to the track geometry around the Thornhill Road reverse curves to achieve a compliant design at the desired 100mph linespeed. The slow lines diverge South at the new Ravensthorpe East junction and cross the River Calder floodplain and Calder & Hebble Navigation by means of a new twin track viaduct. This new alignment forms an approx. 1km long loop back to the reconfigured Thornhill LNW Junction allowing Ravensthorpe station to be re-built further to the east with compliant signalling overlap lengths to protect the junction. The fast lines will re-use the existing Calder viaducts which will have to be re-constructed.
Sub-Option 14.3.5B is a variant to produce a 110mph capable alignment to maximise the linespeed opportunity in the area. This sub-option replicates some of the features of the "fasts to the south" sub-options whereby the Calder viaduct alignment is abandoned in favour of a new four track viaduct over the Calder floodplain and canal and therefore requires a greater land take. In addition the alignment back towards Dewsbury is straightened to remove the reverse curve near Thornhill Road.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	-0.5s v P05 -70s v existing						
A	Train Capacity	provision for specified capacity							
E	Train Length	provision for specified capacity		Deighton, Mirfield and Ravensthorpe rebuilt and satisfies requirements					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth							
D	Operational Safety	layout risk assessment, residual hazards CSM review		At grade double junction with conflicting potential. May remove existing Calder bridges.					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Minor exceedances that can be overcome					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaduct. Visual impact of various bridge works, embankment new and widened and cuttings, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		Generally neutral					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		Generally unsupportive, comprehensive CEMP assumed for all options					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		Generally unsupportive. Numerous listed structures at a variety of locations throughout the sections					
		Local - Conservation Areas		Generally unsupportive, Thornhill Conservation Area impacted.					
		National Trust Property		Not applicable					
H	Air Quality	Air Quality Management Areas		Generally unsupportive due to construction dust. Comprehensive CEMP assumed.					
H	Noise and Vibration	Sensitivity of potential receptor		Consistent and unsupportive due to construction noise. Comprehensive CEMP assumed.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Neutral except for unsupportive @ Ravensthorpe with mineral workings					
H		Best and most versatile land		Generally neutral but limited online information available for Bradley Junction to Mirfield East, new section of railway may result in loss of areas of best and most versatile agricultural land (Grade II).					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		Unsupportive near River Calder Flood plain affecting east section					
H	Carbon Footprint	Rail Carbon Tool		Generally neutral. Unsupportive for the area Huddersfield East to Ravensthorpe					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		Neutral					
H	Local wellbeing	Network Rail Social Performance themes		Neutral					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Unsupportive due to additional traffic and works to bridges.					
H		Impacts on connectivity for local community.		Neutral					
H	Resource Management	Waste, material use and reuse, water use		Consistent and unsupportive due to material use, waste and additional traffic					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Generally unsupportive as affects a number of cycle routes					
H		Public open space (parks) and Public Rights of Way;		Consistent and unsupportive					
H		Recreational waterways		Ranging from unsupportive to neutral					
H		Other sensitive receptors (community & education facilities, residential etc.)		Generally unsupportive					
H		Assets of Community Value (ACV)		Neutral					
Stakeholders									



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

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Sub-Option Ref Option 5B - Fast lines North to South, Diveunder grade separation at Heaton Lodge
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L	Network Rail Route Asset Management	Level of support from Route Asset Management for option						
				Ranges from supportive to unsupportive where it retains MDL1/6 and 8 Calder Viaducts.				
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		<p>(MPs: Neutral; LAs: Supportive; Local c/b: Unsupportive; Rail passengers: Highly supportive)</p> <p>MPs covering the intervention are broadly in favour of work to upgrade the transpennine route, but any specific views on the work involved in SPO 14 aren't known (but the work is likely to improve the area and bring economic benefits). This option is likely to provide enhanced services in the area, particularly via the "grade separation option", and also ties in with plans by Kirklees Council to regenerate the area and boost economic attractiveness, in particular the work at Ravensthorpe station. Work will likely result in negative impact on the community, particularly nearby residents and businesses, and the Dewsbury Riverside development, but could well be accepted as having more benefits than drawbacks. Increased speeds will bring significant long-term enhancements to rail users, as will the improvements to Ravensthorpe station.</p>				
Deliverability								
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Generally unsupportive. Third party land required and TWAO assumed				
I	Timescale		74 Months	Complex staging required				
E	Technical Complexity			Complex structures and associated works				
H	Consent Risk			Third party land acquisition required therefore TWAO assumed.				
J	Implementation Risks			Mine workings Groundwater risk Settlement risk of new infrastructure with Transpire Staffing levels considered (Disruptive) Construction access challenging				
C	Safety			Significant risks associated to the construction of the grade separation dive under. Significant HV service diversions and associated risks. Development of stations along the route will impose construction risks but improve passenger safety. Work at height and construction risks associated to reconstruction of life expired viaducts.				
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable but complex Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment				
Cost								
K	Capital Cost		£675m to £713m	Note: The cost figure illustrates a range of potential combination of options within an SPO. These options and costs are detailed in the estimate section.				



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Option Ref Option 5B - Fast lines North to South, Diveunder grade separation at Heaton Lodge
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>TWAO consent process in general and political impact of decision making e.g. choice of grade separation site Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council Affects on utilities largely unknown. The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction Site access in the Heaton Lodge area is generally poor to difficult Reconstruction of grade listed Calder Viaducts has a very high consent and cost associated risk (noting that the existing viaducts are effectively life expired). Significant track slews and/or tie-ins are required at Ravensthorpe and at Heaton Lodge as well as the re-provision of the fourth running line between Heaton lodge and Ravensthorpe. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Regeneration opportunities at Ravensthorpe including: - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor (sub-option 14.3.5B only). - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside Enhancement of the linespeed profile from 100mph (P05) to 110mph may be achieved up to Ravensthorpe (sub-option 14.3.5B extends the 110mph running beyond Ravensthorpe East junction).</p>
Assumptions	<p>Do nothing options are not viable for SPO14 to deliver the required capacity and journey time improvements for the West of Leeds scheme. In order to create sufficient capacity on the system for the indicative train service specification, separated fast lines are required between Huddersfield and Ravensthorpe i.e. a 4-track railway with grade separations where conflicts occur. This results from previous operational modelling. 100mph+ fast line alignments over the Calder Viaducts will require complete reconstruction of these bridges with associated consents consequences OLE masts and portals erected through this section (for the electrification on option) are acceptable and do not carry significant consent or engineering risk (noting previous comments regarding Calder viaducts).</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Increased linespeed of 100mph throughout this section of route (in line with the P05 line speed profile) contributes substantially to the journey time improvement between Manchester and York. An enhanced linespeed profile of 110mph may be achievable in part by this option.	A dive-under alignment is most likely to require a wet well pumping shaft for drainage into the River Calder. This will require regular maintenance and associated operating costs throughout its life.
Most of the conflicting train movements between the fast lines and the Slow/Calder Valley/Wakefield lines are removed apart from the new Ravensthorpe East junction where there remains a conflict between the up fast and down slow lines. Provision of a four track railway dramatically improves capacity through this area and enhances the overall system robustness during operation and maintenance.	The construction of a dive-under below the existing Calder Valley and Transpennine lines may cause significant disruption to train services during construction (although it is likely that an acceptable sequence of construction can be developed to minimise this impact)
This scheme is likely to have the least adverse environmental impact of all the grade separation options in the Heaton Lodge area with little adverse affect on properties in Battleyford other than during construction. Although this will have to be tested via Stakeholder consultation.	Option 14.3.5A proposes the re-use of the Calder Viaducts which are grade listed, have zero assessed capacity and are effectively life expired. Reconstruction would be required and this is a large consent and cost risk. Sub-option 14.3.5B proposes the abandonment of these structures with a new four track alignment to the South.
	Complexities and geotechnical risk associated with excavation for a dive-under (compared to a flyover)

Total scheme cost (Range low to high depending on sub-option choice) £675m (Low) £713m (High)

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject

Option layout 1 preferred. All work on option layout 5 to be suspended.

Record of Expert Panel and Consultees Attendees



TRU SPO 14 Major Remodelling between Huddersfield and Ravensthorpe Option Appraisal Output : Option Capture Sheet

SPO Number and Description: **14 - Huddersfield East to Ravensthorpe East Re-modelling**
 Sub-Option Ref **Option 5B - Fast lines North to South, Diveunder grade separation at Heaton Lodge**
 Date: **31/10/2017**
 Revision: **P04 - Final Issue**



Attendance Sheet
Experts

Role	Name	Signed
Chair	Tim Ketteringham	
Verification and Validation	James Hodge	
Consents	Anne Dugdale	
Programme	Jon Ainsworth	
Client Services	Martin Clerkin	
	Nick Speight	
	Alex Robinson	
Stakeholder	Faye Jenkins	
	Sarah Doherty	
	Keir Dawson	
	Rachael Blake	
Principal Designer	Jeff Boden	
Operations & Maintenance	Steven Bell	
Safety & Sustainability	Iain Graine	
	Jason Agar	
Cost – Capital & Lifecycle	Grant Robinson	
	Jon Grady Peter Hanslip	
	Mark Coyle	
Operational Train Performance	Paul Whitaker	
	Keith Burrows	

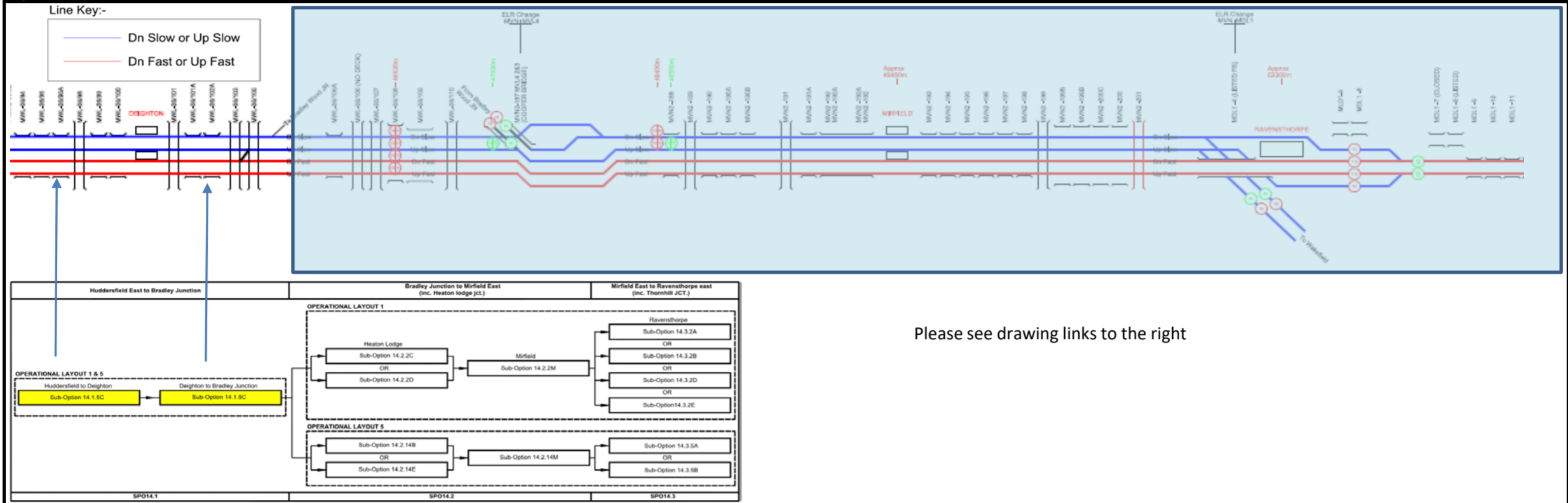
Attendance Sheet (cont...)
Additional Guests

Role	Name	Signed
Package Manager (C)	Simon Clark	
Assistant Package Manager (C)	Julia Stanley	
Package Engineering Manager (C)	Graham Thomas	
Package Manager (D)	Ian Fowler	
Engineering Lead (D SPO 03)	Greg Dowdy	
Programme Manager (Transpire programme integration)	Ian Watson	
Project Manager (Transpire programme integration)	Trevor Marshall	
SPM (Transpire programme integration)	Alex Legge	
SPM (Transpire programme integration)	Hayley Robinson	
SPM (Transpire programme integration)	Tara Cochrane	
Senior Project Manager (IP Signalling)	Isobel Crockford	
Senior Project Engineer (IP Signalling)	Matthew Briggs	
Programme Engineering Manager (IP Signalling)	David Freer	
Senior RAM – Track (LNW)	Carole Bayliss	
Senior RAM – Signalling & (LNW)	Adam Checkley	
Senior RAM (LNE)	Roger Griffiths	
Senior RAM (LNE)	Simon Pumphrey	
Process lead (TRU PLT)	Theo Thanopoulos	
	Jenny Illingworth	

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
SPO Sub-Area Ref. 14.1 Huddersfield East to Bradley Junction
Sub-Option Ref. 14.1.5C 4-track Railway, Fasts to the South, P05 linespeed or better (GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

Summary Description: This is the section of line between the east end of Huddersfield Viaduct passing through Deighton Station, Bradley Junction and extending towards Heaton Lodge Junction. Within this section a 4-track railway is provided largely within the existing railway corridor (historically 4-track) with the fast lines positioned to the South. The operation of Bradley junction is unaffected by this layout with the current ladder junction replicated onto the up and down slow lines. Deighton station is re-constructed as part of this option and re-sited further to the west of its current location with improved step free access and car parking facilities.

Sub-Option 14.1.5C is the only option presented for this section (for all options 1A, 1B, 5A, 5B) following the sift process. It is unchanged from the layout presented at GRIP2.

Permanent Way: This option makes use of vales of both Rate of change in Cant and Rate of Change in Cant Deficiency which are above Normal but less than Maximum in order to achieve to P05 linespeed. Increasing the linespeed to 110mph would perpetuate this and would rely above Normal but less than Maximum values of Cant Deficiency. S&C associated with Bradley Junction is positioned on curved at canted track.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section the main issue with respect to an OLE on option is clearances through the restricted gap between the Poundstretcher Warehouse and the new four-track alignment. This can probably be solved by adopting non-standard spacings between lines over a short distance and by additional protective measures to live equipment.

Structures: Works to 4 No underbridges: replaced MVL3/96 (new deck needed for four track); MVL3/99, MVL3/101, (new horizontal alignment); strengthened (understrength) MVL3/94. If electrified, 5 No overbridges replaced for vertical clearance: MVL3/98, MVL3/102, MVL3/103, MVL3/105, MVL3/107. If electrified or non-electrified, 3 No overbridges rebuilt due to clash with new horizontal alignment: MVL3/98, MVL3/102 (including adjacent MVL3/101A culvert); MVL3/103. MVL3/102 carries the main A62 Leeds Road from Huddersfield town centre: its replacement could comprise major works, especially if an online highway scheme is required. Deighton Station remodelling may include a new footbridge / subway (MVL3/100A) with the existing MVL3/100 infilled.

Geotechnics:

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Construction of a new station at Deighton can mostly be completed off line with a timescale of approximately six months governed by the time taken to install the lift from platform level to the footbridge. The redundant station platform being of a modular type could be dismantled & removed during RoR possessions. The installation of drainage generally can be conducted off line with ALO working with materials supply & spoil removal in RoR possessions. Much of the earthworks to embankments/cuttings & earth retaining structures on the line of the new track bed can generally achieved with ALO working. Physical barriers if needed to facilitate the works can be installed/removed in RoR possessions.

Output:

Per Way: 4 No 54 hr possessions to divert existing slows onto new slow alignment 1No 76hr & 1No 54hr possession to install new crossover & turnout at Bradley Jcn and install connection to new slow lines.

Civils: Engineering access will be required separately

S&T:

Support to P-Way with tails ON/OFF for track renewals/slews

Enabling works to shift Signalling Locs and cable route to facilitate build of new four track railway

Support to P-way diversion of slow lines to enable Station build

Installation of WTS Locs and fibre network

Overlay of axle counter

Data design, principles test, and Signaller screen design

Two Relay fringes to be provided

Works within the P-Way possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					-	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		See option overviews					
E	Train Length	provision for specified capacity		Deighton rebuilt and satisfies requirements					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
SPO Sub-Area Ref. 14.1 Huddersfield East to Bradley Junction
Sub-Option Ref. 14.1.5C 4-track Railway, Fasts to the South, P05 linespeed or better (GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy							
A		capacity for further growth		See option overviews required for all options							
D	Operational Safety	layout risk assessment, residual hazards CSM review		Deighton station reconstructed mostly off line (DIA compliant) – existing modular platform does not present significant demolition risk No exceptional track values proposed Bradley Junction unaffected 4 tracking at 100mph – may impact existing lineside access bit does not increase CPOS distances Benefit of new station							
B	Operability	Support vision of future railway state		Improvement towards future railway state							
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state							
F	Engineering	compliance to engineering and operational specifications		Minor non-compliances that can be resolved							
Sustainability and Environmental											
H	Landscape/Townscape Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable							
H		Visual impact, landscape and townscape impacts		Embankment widening and bridge works would change views and impact townscape. Visual and landscape impact of new station buildings, and associated car park and access, at Deighton. New footbridge and lifts at Deighton Station. Extensive major bridge works along this section of route at: MVL3/101 Whiteacre St Overbridge; MVL3/102 A62 Leeds road bridge, MVL3/101 Wheatley's overbridge, MVL3/105 Bradley's No 2 overbridge, MVL/107 Bridge Road, MVL3/108/s Huddersfield Broad Canal bridge, MVL3/109 Colne Viaduct, plus various culvert works. Assume night works required and best practice measures to minimise light pollution would be employed.							
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable							
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		The southern section of this part of the route is within a SSSI risk area. Within such areas the Local Planning Authority would consult Natural England on development proposals							
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		Dalton Bank LNR is 0.5 miles east of this section of the route. It's a mix of conifer plantations, native woodlands, and grassland. It is anticipated that protected species and habitats would be encountered. It is assumed that a comprehensive CEMP would incorporate best practice ecological mitigation measures.							
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable							
H		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		There are numerous listed structures along this section of the route. The closest include: the Grade II listed Calder and Hebble Navigation Hall Wood Lock Sir John Ramsdens Canal Hall Wood Lock and Canal Riddings Lock, Canal Fieldhouse Lock and Canal Number 8 Lock and Red Doles Lock. At Hillhouse the railway coal chutes and tramway with walls and gates are Grade II listed. The Hillhouse Lane Railway Bridge (1432641) and Huddersfield Railway Viaduct are Grade II listed. There are a number of listed buildings centred around Colne Bridge, including a Grade II listed Mill, the Calder and Hebble Navigation Bridge taking Colne Bridge Road Sir John Ramsdens Canal Bridge Taking Colne Bridge Road (Grade II listed).							
H		Local - Conservation Areas		Not applicable							
H		National Trust Property		Not applicable							
H	Air Quality	Air Quality Management Areas		No AQMA identified from online resources. Numerous residential and commercial properties and Fartown High School are adjacent to this section of the route. Demolition, construction and earthworks have the potential to generate dust and other air borne pollutants. It is anticipated that the comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.							
H	Noise and Vibration	Sensitivity of potential receptor		Residential and commercial areas, public spaces, footpaths and Fartown High School are adjacent to this section of the route. Demolition, construction, including earthworks and works at night, would generate noise and vibration. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.							
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Not applicable. Former mine workings noted on drawings.							
H		Best and most versatile land		Not applicable							
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		The route crosses areas of high flood risk from rivers at Red Doles Road and at Hillhouse Lane and Colne Bridge. Areas of surface water flooding risk follow highways and footpaths							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
SPO Sub-Area Ref. 14.1 Huddersfield East to Bradley Junction
Sub-Option Ref. 14.1.5C 4-track Railway, Fasts to the South, P05 linespeed or better (GRIP2)
Date: 31/10/2017
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H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 50,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Extensive works to numerous bridges would require temporary highway closures, diversions and careful traffic management planning. New Deighton station and car parking will generate additional traffic on local road, would be served by new highway access. Construction activity will generate additional traffic on local roads. It is anticipated that the CEMP would incorporate standard best practice traffic management planning measures					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Demolition, excavation, and construction will use materials, generate waste and associated traffic movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Greenway from Deighton Station to Fartown follows the west side of the railway in this location. National Cycle Route 69 crosses the railway at Colliery Bridge					
H		Public open space (parks) and Public Rights of Way;		There are playing fields and public open space adjacent to sections of this part of the route. A tow path follows the Huddersfield Broad Canal, which flows along side this section of the route.					
H		Recreational waterways		The Huddersfield Broad Canal or Sir John Ramsden's Canal, is a wide-locked navigable canal. The waterway is 3.75 miles (6 km) long and has 9 wide locks. It follows the valley of the River Colne and connects the Calder and Hebble Navigation at Cooper Bridge junction with the Huddersfield Narrow Canal near Aspley Basin in Huddersfield. There is potential for canal users to be impacted by construction works (noise, dust, lighting).					
H		Other sensitive receptors (community & education facilities, residential etc.)		Fartown High School is adjacent to this section of the route, residential properties, commercial premises, users of public open space and footpaths. Impact on neighbouring residential properties of new Deighton Station and associated car park.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Benefits in terms of new structures, assuming adherence to RRD.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Supportive; Local c/b: Unsupportive; Rail passengers: Neutral) The MP is broadly in favour of plans to upgrade the transpennine route, but any specific views on the work involved in SPO 14 aren't known. This option is likely to provide enhanced services in the area, in particular the improvements to Deighton station. Work will likely result in negative impact on the community, and some nearby businesses will be particularly affected. Increased speeds will bring significant long-term enhancements to rail users, as will the improvements to Deighton station, but are counterbalanced by potential speed restrictions and "greater than envisaged impact on train services".					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		This option requires acquisition of third party land in multiple locations (Deighton station, VW garage, at the River Colne etc) therefore TWAO should be assumed. It is assumed that the VW garage is shown as a potential location for the new Station only. It is assumed that extensive temporary working areas and compounds would be needed to enable the multiple bridge modifications.					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
SPO Sub-Area Ref. 14.1 Huddersfield East to Bradley Junction
Sub-Option Ref. 14.1.5C 4-track Railway, Fasts to the South, P05 linespeed or better (GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

I	Timescale		74 Months	39 months design, 24 months construction. Fails to achieve target timescale, full benefits not realised without SPO3. Timescales based on TWAO, high complexity design and disruptive access requirements (inc 100hr).					
E	Technical Complexity			Complex structures and associated works					
H	Consent Risk			Third party land acquisition required therefore TWAO assumed. Planning permission required for new Station at Deighton and change of use of land for access and car park. Highway and footpath temporary closures and diversions required. Potential listed building consent					
J	Implementation Risks			Mine workings Staffing levels considered (Disruptives)					
C	Safety			Risks associated to construction and maintenance of OLE coupled with the risk incurred to lineside neighbours. Development of stations along the route will impose construction risks but improve passenger safety Deighton station will be constructed mainly offline. Risks associated to major excavations and embankment cutting works.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Significant off-line benefit (ALO working as well) Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£217m to £240m	Huddersfield to Bradley Jct. - GRIP2					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
SPO Sub-Area Ref. 14.1 Huddersfield East to Bradley Junction
Sub-Option Ref. 14.1.5C 4-track Railway, Fasts to the South, P05 linespeed or better (GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Structures: MVL3/4 strengthening may affect grade II listed status. Other heritage concerns MVL3/4 is grade II listed; MVL3/103 and MVL3/107 may be "possibly of special interest" (ABA, 2015).</p> <p>OLE: Consent agreements with adjacent businesses in the "Poundstretcher gap" e.g. an isolation agreement may need to be negotiated with Poundstretcher for maintenance access to their property.</p>
Opportunities	<p>Structures: Coupling MVL3/102 replacement with highway alignment improvement works: existing horizontal alignment is poor. Refining horizontal alignment to avoid need to rebuild overbridges where a clash with substructure exists (MVL3/98, MVL3/102, MVL3/103), or with underbridges where outside existing footprint (MVL3/101). MVL3/4 intrusive investigative works and assessment to demonstrate strengthening (likely spandrel works including tie bars) not needed.</p>
Assumptions	<p>MVL3/100 can be infilled with alternative access provided by new MVL3/100A.</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Four track railway re-provided largely within the existing corridor with standard track spacings (note only restriction at Poundstretcher gap). This significantly adds to the operational capacity between Huddersfield and Ravensthorpe.	Potentially significant works required in the Poundstretcher Warehouse area with associated impacts on adjacent businesses (VW dealership) to achieve 4-track railway with standard clearances and track spacings. Electrification makes the situation more difficult due to the need to maintain electrical clearances.
100mph alignment at normal values to make best use of high speed capability along this section of line and contributing towards overall journey time savings. Greater speed may be available running at exceptional values and it is feasible that 110mph can be achieved through this section with some design development.	Large scale intervention within the existing rail corridor will require significant construction works close to running lines and the potential for a greater than envisaged impact on train services due to extended possessions, multiple signalling stages and possible line speed restrictions.
Deighton station is re-built in a more accessible location with improved provision for parking and step free access to platforms.	

Total scheme cost £230,233,424

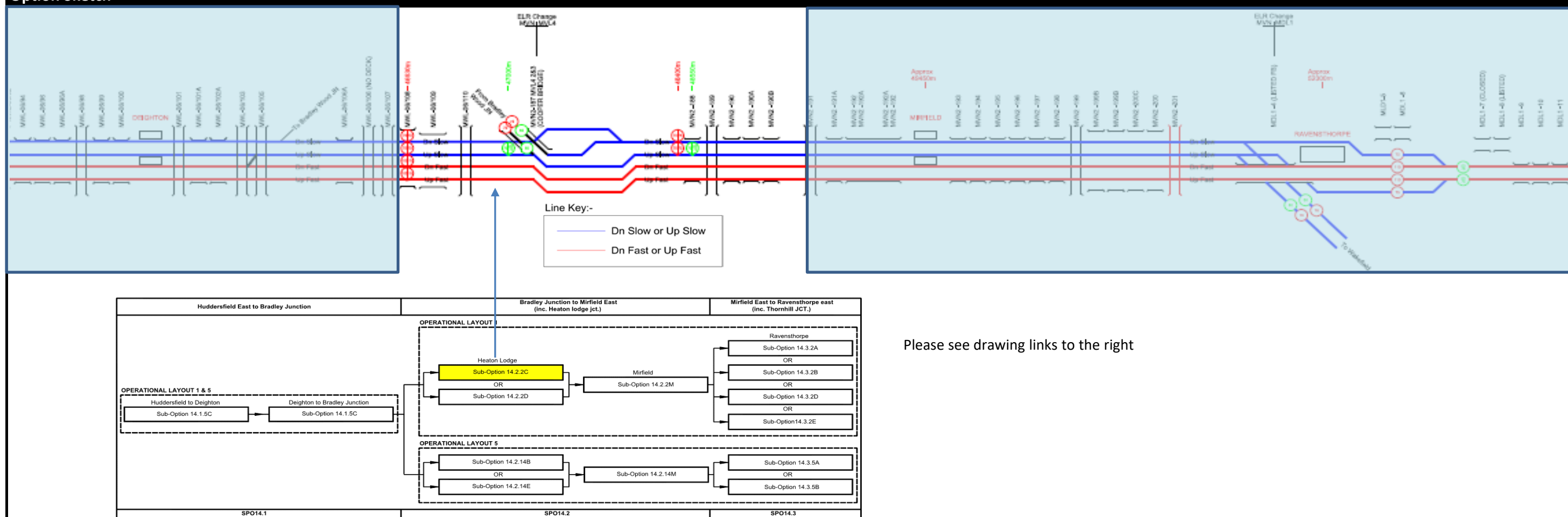
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Continue as preferred option.

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2C 4-track Railway, Fasts to the South, P05 line speed or better by cutting corner at Heaton Lodge
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

Summary Description: Sub-option 14.2.2C simply cuts the corner at Heaton Lodge with a 110mph alignment on the best route to avoid private properties and to keep the construction works off-line. This option requires a large land take of agricultural land to the South of the existing Network Rail boundary in the vicinity of Helm farm. The alignment and associated earthworks cutting passes close to the front of Heaton Lodge Cottages, and some environmental mitigations are envisaged such as the provision of a green tunnel to retain local property/farm accesses as well as visually/acoustically screening the new line. The alignment requires significant modifications to existing structures and embankments on the approach to Bradley junction where the line crosses the River Colne and Huddersfield Broad Canal. In this area some land purchase is also required including small industrial/commercial premises. From a constructability viewpoint this option can be built almost entirely off-line although road access in this area is difficult for large scale works including a large earthworks content and significant structures near to the River Colne. For electrification to be implemented the scheme is relatively straightforward with the exception of Cooper Bridge on the down slow line which has very tight clearances and would require a significant track lower in order to fit OLE equipment.

Permanent Way: This option uses vales of Rate of change in Cant which are marginally above Normal but less than Maximum in order to achieve 110mph. Values of Cant and Cant Deficiency are within Normal values.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section the main issue with respect to an OLE on option is clearances through the existing Cooper Bridge dive-under (see structures comment).

Structures: Works to 5 No existing underbridges: replaced MVL3/108 (understrength); rebuilt MVL3/108S (new horizontal alignment); new MVL3/109A underbridge alongside MVL3/109; MVN2/190 widened. MVL3/109A Colne Viaduct's new fast alignment bridge is approx. 20 m upstream of the existing bridge, 4 spans of total length 80 m on new foundations. 2 No new overbridges MVL4/1 and MVL3/110 on new highway alignment, existing bridges demolished. If electrified, MVL4/2 Cooper Bridge invert may need to be substantially lowered affecting structure stability and existing gravity drainage. MVN2/188 infilled, MVL4/4 removed.

Geotechnics: The geotechnical works involve the excavation of a large cutting through an area of historic coal mining activity. Groundwater levels in this area are high and therefore there is a risk of groundwater inflow during construction and this also may need to be managed as part of the permanent works (slope drainage and higher capacity track drainage to discharge). A strategy will need to be developed to manage the large quantities of earthworks materials arising from the cutting. No assessment has been carried out as to the engineering suitability of the materials, but it can be assumed that some material may be suitable as embankment fill required in the Ravensthorpe area. Non suitable fill may be used for general landscaping purposes either locally around Heaton Lodge or at Ravensthorpe.

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access from B6118 will require works to improve. Ensure that the new Deighton Station is constructed before this intervention to allow the slow lines to be diverted onto the new alignment. Allows trains to stop at Mirfield and Deighton during the construction works. Also ensure that intervention at Mirfield to recon the platforms and diversion of the slows to the North takes place in advance of this option- allows new deck on MVN2/193 to accept new track alignment and installation of subway, stairs and lift shaft. Bridge recons can be done off-line (MVL3/108 S and MVL3/109 and MVL3/110, MVN2/190). P/Way: Most of the p/way will be done off-line. The up (L&Y) line will be incorporated in the down & up slow at Thornhill Jn prior to this intervention. All of the civils works need to take place in advance of the track works.

S&T:

Assumes bulk of new railway to be built as greenfield construction with new signalling infrastructure included. Disconnections/false feeds to support removal of Up Slow line. Support to PWay for tails On/Off and equipment replacement during relay of Up/Dn fasts track towards east and build of new 4 track railway. Diversion of cable route and protection of assets to facilitate later cut-in of new PWay tie in at Heaton Lodge junction and Bradley Junction (2x 54h possessions to achieve diversions- likely to require 2x UTX provision). Support to PWay for tails On/Off and equipment replacement during relay of track at extremities. TSRs may be required to allow existing alignment to be maintained during this period. WTS locs, new signalling equipment and axle counters to be provided to support the final commissioning stage. Done during rules of route and other possessions. Commissioning of final layout to new equipment during final PWay blockade and changeover Wheels free of 72h required. Assumes commissioning of Ravensthorpe takes place at same time to facilitate 4 track railway provision. If the two track railway only has been commissioned then a temporary diversion of the fast lines onto the slow lines may be required with a further commissioning later to bring into use the remaining two tracks. OLE: Bases and supports to be done in parallel with p/way and final tie-in conducted in RoR possessions.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Priority	Unsupportive	Unsupportive	Neutral	Supportive
					+	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		See option overviews					
E	Train Length	provision for specified capacity		No stations					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets. Principally Plain line					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system					
A		capacity for further growth		resilience/redundancy See option overviews					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: **14 - Huddersfield East to Ravensthorpe East Re-modelling**
 Sub-Area Ref: **14.2 Bradley Junction to Mirfield East**
 Sub-Option Ref: **14.2.2C 4-track Railway, Fasts to the South, P05 line speed or better by cutting corner at Heaton Lodge**
 Date: **31/10/2017**
 Revision: **P04 - Final Issue**

Category	Sub-Category	Impact Description	Assessment	1	2	3	4	5
D	Operational Safety	layout risk assessment, residual hazards CSM review	Large proportion of work on line Line in cutting (not in flood plain) 110mph compliant track Reconstruction in new position for River and Canal bridges – demolition and removal of existing? Potential significant waste off site - TBC No exceptional track values proposed Track lower would be required for Cooper St bridge if electrified with suspension					
B	Operability	Support vision of future railway state	Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state	Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications	Minor non-compliances that can be resolved					
Sustainability and Environmental								
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty	Not applicable					
H		Visual impact, landscape and townscape impacts	Four tracking, development of green field land; demolition and reconstruction of bridges; removal of overbridges, infilling underbridges; creation of large embankments and Colne Valley viaduct; demolition of a garage and further west a residential property at Heaton Lodge; which would change views and impact landscapes and townscape. Noted that proposals could include cut & cover 'green tunnel' and works to create cutting would reduce long term visual impact. This section of the route crosses Green Belt, which is designated principally to maintain openness. Assume night works for online activities required and best practice measures to minimise light pollution would be employed.					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar	Not applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders	The southern section of this part of the route is within a SSSI risk area. Within such areas the Local Planning Authority would consult Natural England on development proposals.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)	It is anticipated that protected species and habitats would be encountered. It is assumed that a comprehensive CEMP would incorporate best practice ecological mitigation measures.					
H	Cultural Heritage	International - UNESCO World Heritage Site	Not applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments	There are 5 listed buildings centred around Colne Bridge, including the Grade II listed warehouse on south east side of the Huddersfield Broad Canal. The Calder and Hebble Navigation Bridge taking Colne Bridge Road Sir John Ramsdens Canal Bridge (Grade II listed), the Number 2 Lock to the north of the Colne Bridge					
		Local - Conservation Areas	No Conservation Areas. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
		National Trust Property	Not applicable. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
	Air Quality	Air Quality Management Areas	No AQMA identified from online resources. Numerous residential and commercial properties are adjacent to this section of the route. Demolition, construction and earthworks have the potential to generate dust and other air borne pollutants. It is anticipated that the comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.					
H	Noise and Vibration	Sensitivity of potential receptor	Residential and commercial areas, public spaces, footpaths are adjacent to this section of the route. Demolition, construction, including earthworks and works at night, would generate noise and vibration. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)	Not applicable. Former mine workings noted on drawings.					
H		Best and most versatile land	Limited online information available. However the new section of railway may result in loss of areas of best and most versatile agricultural land (Grade II).					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)	The route crosses areas of high flood risk from rivers at Colne Bridge. Areas of surface water flooding risk follow highways and the canal. There is also a risk of flooding from reservoirs. It is anticipated that a consent application would be accompanied by a FRA.					
H	Carbon Footprint	Rail Carbon Tool	Embodied carbon of works < 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.	All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes	Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.	Extensive works to numerous bridges would require temporary highway closures, diversions and careful traffic management planning. Construction activity, demolition and earthworks would generate additional traffic on local roads. Demolition of MVL4/1 overbridge and replacement to create new access to sewage treatment works. Demolition and construction of overbridge MVL3/107 (B6118 overbridge). It is anticipated that the CEMP would incorporate standard best practice traffic management planning measures					
H		Impacts on connectivity for local community.	Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use	Demolition, excavation, earthworks and construction will use materials, generate waste and associated traffic movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.					
H	Land use / Amenity	Allotments; Village Greens, Common Land	Not applicable					
H		National Cycle Network, long distance walking trails	Users of National Cycle Route 69 would be impacted by additional traffic caused by construction and by road and path diversions, and by visual and landscape changes.					
H		Public open space (parks) and Public Rights of Way;	There are playing fields, public open space and public rights of way adjacent to sections of this part of the route. A tow path follows the Huddersfield Broad Canal, which flows along side this section of the route.					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: **14 - Huddersfield East to Ravensthorpe East Re-modelling**
 Sub-Area Ref **14.2 Bradley Junction to Mirfield East**
 Sub-Option Ref **14.2.2C 4-track Railway, Fasts to the South, P05 line speed or better by cutting corner at Heaton Lodge**
 Date: **31/10/2017**
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H		Recreational waterways		The Huddersfield Broad Canal or Sir John Ramsden's Canal, is a wide-locked navigable canal. The waterway is 3.75 miles (6 km) long and has 9 wide locks. It follows the valley of the River Colne and connects the Calder and Hebble Navigation at Cooper Bridge junction with the Huddersfield Narrow Canal near Aspley Basin in Huddersfield. Realignment of canal banks and construction of new MVL3/10855 near Lock No 2 and potential works to MVL3/108 underbridge would impact users of the the Huddersfield Broad Canal (noise, dust, lighting during construction and changed views operationally).					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential properties, commercial premises, users of public open space and footpaths; Yorkshire Water Wastewater Treatment Works					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. It is assumed that all new and altered structures will be in accordance with the RRD. Some clarification is required around the proposals for MVL3/107 and MVL3/1085					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Neutral; Local c/b: Highly unsupportive; Rail passengers: Supportive) MPs covering the area area are broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option isn't likely to provide enhanced services in the area. Work will likely result in negative impact on the community, particularly nearby residents, farmers and some businesses. Increased speeds will bring significant long-term enhancements to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		This option requires acquisition of third party land including agricultural land, a residential property and commercial properties (garage) in multiple locations; therefore TWAO should be assumed. It is assumed that extensive temporary working areas and compounds would be needed to enable the multiple bridge modifications.					
I	Timescale		62 Months	39 months design, 14 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements (inc 100hr).					
E	Technical Complexity			Complex structures and associated works					
H	Consent Risk			Third party land acquisition, including residential, commercial and agricultural property, required therefore TWAO assumed. Planning permission required for change of use of land, demolition of property. Highway and footpath temporary closures and diversions required. Potential listed building consent. Listed building consent for works to Colne Bridge.					
J	Implementation Risks			Mine workings Groundwater risk Settlement risk of new infrastructure with Transpire Staffing levels considered (Disruptives) Construction access Reasonable					
C	Safety			Development of stations along the route will impose construction risks but improve passenger safety, offline construction is also relevant in this location. Risks associated to major excavations. There is also a risk of mine workings in this location. Demolition risks associated to removal of a small number of residential and commercial properties. Work at height risks associated new bridge construction. Interface with overhead powerlines. Risks associated to working over water. More preferred option of the 2 but still unsupported. al Grid power lines. ALO risks on tie in to existing track.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable (Considered Green Tunnel) Off-line benefit Disruptive access required (track/civils & signalling) Access considered and accounted for- will likely be challenging but workable Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£115m to £127m	Heaton Lodge Fasts South Cut Corner					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



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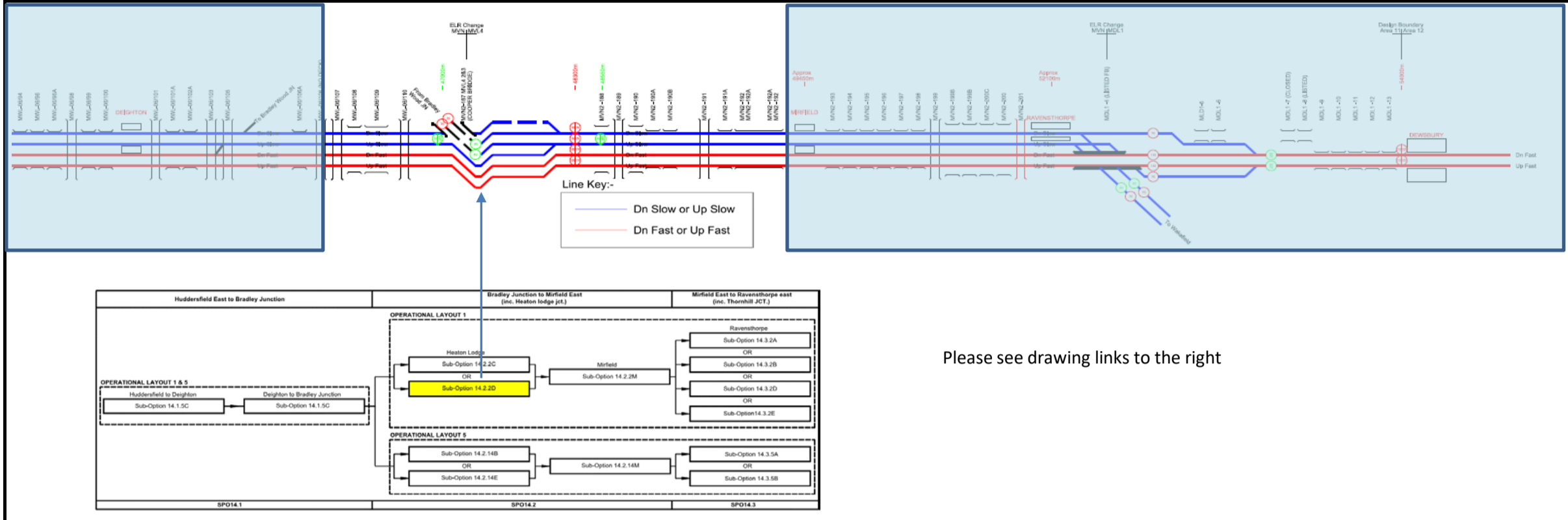
Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Volume of land purchase to achieve line speed may be open to challenge at public enquiry when there are alternative options (such as 14.2.2D) which can achieve a similar output with much less land purchase.</p> <p>Large volume of earthworks material to dispose of. (see opportunities below)</p> <p>Environmental impact may require much greater accommodation/screening works e.g. longer or multiple green tunnels and/or additional farm accommodation bridge.</p> <p>Access for construction and potential restrictions on haul routes/working hours as a result of consent conditions.</p> <p>Ground conditions generally including old mine workings, ground water levels/springs and suitability of excavated materials.</p> <p>Structures: MVL3/109A construction: clash with third party pipe bridge over the river; Environment Agency permissions. Heritage: MVL4/4 may be "possibly of special interest"</p>
Opportunities	<p>Use surplus fill generated in embankment works at Ravensthorpe (perhaps train hauled?) or landscape mounds/green tunnel</p> <p>Build new 4-track railway on new alignment. Would suit OLE scheme whereby Cooper Bridge dive-under is abandoned and a new flat junction provided for the slow lines onto the Calder Valley line.</p> <p>In conjunction with above return large areas of redundant NR land to agricultural and possible residential use (also possibilities of land swap deals to acquire land/property).</p> <p>Structures: Retain MVN2/188 and MVL4/2 if rail alignments are adjusted to remain unchanged from existing. Rebuilt MVL3/108S could include canal bank realignment to minimise span length.</p> <p>Reduction in amount of land take in cutting by using some steeper (strengthened) slopes and/or retaining walls.</p>
Assumptions	<p>Structures: New MVL4/1 and MVL3/110 has to be offline from existing highway alignment – vehicular access to sewerage treatment works must be maintained at all times. If MVL4/2 (Cooper Bridge) invert lowered for electrification, new pumped drainage required. MVN2/190 can be widened without reducing headroom to carriageway.</p>
Dependencies	<p>This sub-option depends on a grade separation being achieved for the fast lines in the Ravensthorpe area</p> <p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
110mph alignment at normal values to make best use of high speed capability along this section of line and contributing towards overall journey time savings. Greater speed may be available running at exceptional values	Large agricultural land take plus some small industrial/commercial properties. Also severance of land plots adjacent to Helm Farm. There are other schemes that produce almost similar outputs for a much reduced land take (albeit with greater disruption to the operational railway).
This intervention can be built almost entirely off-line with nominal effects on the operational railway during construction. Potentially if combined with Ravensthorpe grade separation, then this whole section can be built off-line with ALO working on the operational lines to the North. Tie-ins at each end of the new alignment will require extended possessions (54/72 hours) to achieve.	Significant works around the River Colne and Huddersfield Broad Canal requiring new bridges with difficult foundations works and potentially large multiple spans.
Visual/Noise environmental impacts are kept away from the Battyeford area (albeit greater impacts to southern properties e.g. Helm farm, Heaton Lodge cottages)	
Total scheme cost	£122,048,973
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject	
Preferred option.	
Record of Expert Panel and Consultees Attendees	
As per attached expert panel minutes and attendance sheet.	

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2D 4-track Railway, Fast to the South, P05 line speed or better by slewing Calder Valley Lines
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

Summary Description: Sub-option 14.2.2D proposes a similar high speed alignment (to sub-option 14.2.2C) but stays largely within existing Network Rail land boundaries with a much reduced requirement for land purchase. This is achieved by slewing the existing Calder Valley lines to the North and modifying the existing Huddersfield up and down chord lines as a result. The alignment shown achieves 100mph, but with further refinement may improve upon this especially if exceptional track values are considered (ultimately achieving a 110mph alignment at normal values may require acquisition and demolition of Heaton Lodge cottages).

The basic principle is that the valley between the existing Calder Valley line embankment and the existing down main Huddersfield to Leeds line is infilled using materials arising from an enlarged cutting to the southwest, which is required for the enlarged radius for the up and down fast line alignment. The infilled valley then gives an at-grade platform upon which new track alignments can be largely built off-line to eventually slew the Calder Valley lines across to allow the new Transpennine up and down fast lines to be constructed overshooting their current alignment to the north.

The alignment has been positioned to avoid encroachment towards the Battyeford area and also passes behind the existing Heaton Lodge cottages with very little encroachment towards those properties. As a result only a relatively small area of new farmland is required on the inside of the new fast alignment. The alignment ties-in very well at the southwest end of the intervention with the fast lines being back onto the existing historic trackbed as they approach the River Colne viaduct.

From a constructability point of view the main issue is the earthworks operation to move materials from the cut to the fill area between the operational railway lines and staging the new alignment works to cause minimal disruption to the existing railway.

For electrification to be implemented the scheme is relatively straightforward with the exception of Cooper Bridge on the down slow line which has very tight clearances and would require a significant track lower in order to fit OLE equipment.

Permanent Way: This option relies on vales of Cant Deficiency which are above Normal values but less than Exceptional values to achieve 100mph. The option also uses vales of Rate of change in Cant and Rate of change in Cant Deficiency which are above Normal and approaching Maximum in order to achieve 100mph. This option also requires significant realignment to the MVN lines which introduces a reverse alignment and revised the connections to the MVL Lines

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section the main issue with respect to an OLE on option is clearances through the existing Cooper Bridge dive-under (see structures comment).

Structures: Works to 3 No existing underbridges: replaced MVL3/108 (understrength); rebuilt MVL3/108S (new horizontal alignment). New combined MVL4/5-MVN2/190. Note that alignment remains wholly on existing MVL3/109 Colne Viaduct.

1 No new overbridge combining MVL4/1 and MVL3/110 on new highway alignment.
 If electrified, MVL4/2 Cooper Bridge invert lowered or bridge re-built with a shallow deck
 MVN2/188 infilled, MVL4/4 removed.

Geotechnics: The geotechnical works involve the excavation of a large cutting through an area of historic coal mining activity. Groundwater levels in this area are high and therefore there is a risk of groundwater inflow during construction and this also may need to be managed as part of the permanent works (slope drainage and higher capacity track drainage to discharge).

A strategy will need to be developed to manage the large quantities of earthworks materials arising from the cutting. No assessment has been carried out as to the engineering suitability of the materials, but it is assumed that sufficient material will be suitable as embankment fill required to infill the valley between the existing Calder Valley and down main lines. Non suitable fill may be used for general landscaping purposes either locally around Heaton Lodge or at Ravensthorpe.

Environment, Consents & Sustainability: Anne Dugdale



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Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2D 4-track Railway, Fasts to the South, P05 line speed or better by slewing Calder Valley Lines
Date: 31/10/2017
Revision: P04 - Final Issue

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access from B6118 will require works to improve. Ensure that the new Deighton Station is constructed before this intervention to allow the slow lines to be diverted onto the new alignment. Allows trains to stop at Mirfield and Deighton during the construction works. Also ensure that intervention at Mirfield to recon the platforms and diversion of the slows to the North takes place in advance of this option- allows new deck on MVN2/193 (Mirfield Station Bridge) to accept new track alignment and installation of subway, stairs and lift shaft. New MVL3/110 Bridge substructure in ALO and superstructure in RotR prior to main works, MVN2/190 Wood Lane, will need to be reconstructed ALO and using RotR for superstructure installation. Do new cutting to use fill to create trackbed for MVN2/MVL4 to the North, build off-line portion of MVN2 and MVL4 Down, construct new section of MVN2/190. P/Way: Construct connections of MVN2 to new alignment, including MVL4 Down & Up connections and slews, MVN lines diverted and MVL lines diverted. Most of the p/way will be done off-line. The up (L&Y) line will be incorporated in the down & up slow at Thornhill Jn prior to this intervention. All of the civils works need to take place in advance of the track works. All of the tie-ins and slews can be done as three separate worksites in 2 X 56h disruptive possessions.

S&T:
 Enabling works to allow replacement of Heaton Lodge RR with provision of REB and diversion of lineside multicores. 2x 54h possessions.
 Westrace interface I/O used to allow relock and maintain existing track infrastructure. Relock of Heaton Lodge to facilitate alterations and allow for PWay changes.
 Support to PWay in major relay to reposition Up/Dn Fast to final alignment with the Up Slow being disconnected/false fed to support build of new bypass lines. At the same time build of new Up Huddersfield to support removal of existing Up Huddersfield and commissioning on existing interlocking, thereby allowing maximum build of greenfield track layout.
 Support to PWay for tails On/Off and equipment replacement during relay of Up/Dn fasts track towards east and build of new 4 track railway. Diversion of cable route and protection of assets to facilitate later cut-in of new PWay tie in at Heaton Lodge junction and Bradley Junction (1x 54h possessions to achieve diversions- likely to require 2x UTX provision).
 Support to PWay for tails On/Off and equipment replacement during relay of track at extremities. TSRs may be required to allow existing alignment to be maintained during this period. WTS locs, new signalling equipment and axle counters to be provided to support the final commissioning stage. Done during rules of route and other possessions.
 Commissioning of final layout to new equipment during final PWay blockade and changeover Wheels free of 72h required. Assumes commissioning of Ravensthorpe takes place at same time to facilitate 4 track railway provision. If the two track railway only has been commissioned then a temporary diversion of the fast lines onto the slow lines may be required with a further commissioning later to bring into use the remaining two tracks.
 OLE: Bases and supports to be done in parallel with p/way and final tie-in conducted in RoR possessions.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					++	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		No stations					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets. Principally Plain line. Affects Calder Valley lines					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Large proportion of work off line - but staying mainly within land boundary - less land take Significant Operational interface during works inc alignment changes to Calder Valley lines Embankment infilling - potential of differential settlement May need screening to cottages Reconstruction in current position for River and Canal bridges (no additional demolition) ALO risk with new alignment Requires use of exceptional values					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Full use of exceptional cant deficiency					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable					
H		Visual impact, landscape and townscape impacts		Four tracking, development of green field land; demolition and reconstruction of bridges (inc. MVL 4/5 and MVL 3/10; removal of overbridges, associated highway works infilling underbridges; creation of large embankments, new cutting and Colne Valley viaduct; development close to residential properties on Waterside Walk/Wood Lane would change views and impact landscapes and townscape. This section of the route crosses Green Belt, which is designated principally to maintain openness. Assume night works for online activities required and best practice measures to minimise light pollution would be employed.					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		The southern section of this part of the route is within a SSSI risk area. Within such areas the Local Planning Authority would consult Natural England on development proposals.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		It is anticipated that protected species and habitats would be encountered. It is assumed that a comprehensive CEMP would incorporate best practice ecological mitigation measures.					
	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable					

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Sub-Area Ref 14.2 Bradley Junction to Mirfield East
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Date: 31/10/2017
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H		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		There are 5 listed buildings centred around Colne Bridge, including the Grade II listed warehouse on south east side of the Huddersfield Broad Canal. The Calder and Hebble Navigation Bridge taking Colne Bridge Road Sir John Ramsdens Canal Bridge (Grade II listed), the Number 2 Lock to the north of the Colne Bridge					
		Local - Conservation Areas		No Conservation Areas. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
		National Trust Property		Not applicable. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
	Air Quality	Air Quality Management Areas		No AQMA identified from online resources. Numerous residential and commercial properties are adjacent to this section of the route. Demolition, construction and earthworks have the potential to generate dust and other air borne pollutants. It is anticipated that the comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.					
H	Noise and Vibration	Sensitivity of potential receptor		Residential and commercial areas, public spaces, footpaths are adjacent to this section of the route. Demolition, construction, including earthworks and works at night, would generate noise and vibration. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Not applicable. Former mine workings noted on drawings.					
H		Best and most versatile land		Limited online information available. However the new section of railway may result in loss of areas of best and most versatile agricultural land (Grade II).					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		The route crosses areas of high flood risk from rivers at Colne Bridge. Areas of surface water flooding risk follow highways and the canal. There is also a risk of flooding from reservoirs. It is anticipated that a consent application would be accompanied by a FRA.					
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Extensive works to numerous bridges would require temporary highway closures, diversions and careful traffic management planning. Construction activity, demolition and earthworks would generate additional traffic on local roads. Demolition and replacement of overbridges. It is anticipated that the CEMP would incorporate standard best practice traffic management planning measures					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Demolition, excavation, earthworks and construction will use materials, generate waste and associated traffic movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Users of National Cycle Route 69 would be impacted by additional traffic caused by construction and by road and path diversions, and by visual and landscape changes.					
H		Public open space (parks) and Public Rights of Way;		There are playing fields, public open space and public rights of way adjacent to sections of this part of the route. A tow path follows the Huddersfield Broad Canal, which flows along side this section of the route.					
H		Recreational waterways		The Huddersfield Broad Canal or Sir John Ramsden's Canal, is a wide-locked navigable canal. The waterway is 3.75 miles (6 km) long and has 9 wide locks. It follows the valley of the River Colne and connects the Calder and Hebble Navigation at Cooper Bridge junction with the Huddersfield Narrow Canal near Aspley Basin in Huddersfield. Realignment of canal banks and construction of new MVL31085S near Lock No 2 and potential works to MVL3/108 underbridge would impact users of the the Huddersfield Broad Canal (noise, dust, lighting during construction and changed views operationally). Impact of construction on users of the Calder and Hebble Navigation and its tow path.					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2D 4-track Railway, Fasts to the South, P05 line speed or better by slewing Calder Valley Lines
Date: 31/10/2017
Revision: P04 - Final Issue

H		Other sensitive receptors (community & education facilities, residential etc.)		Residential properties, commercial premises, users of public open space and footpaths; Yorkshire Water Wastewater Treatment Works					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. It is assumed that all new and altered structures will be in accordance with the RRD. Some clarification is required around the proposals for MVL3/107 and MVL3/108S					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Neutral; Local c/b: Unsupportive; Rail passengers: Supportive) **Impact on Heaton Lodge cottages would need to be assessed** MPs covering the area are broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option isn't likely to provide enhanced services in the area. Work will likely result in negative impact on the community, particularly nearby residents (closures of footpath), and farmers. Increased speeds will bring significant long-term enhancements to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		This option requires acquisition of third party land including agricultural land. However it avoid CPO of residential property and commercial premises. TWAO should be assumed. It is assumed that extensive temporary working areas and compounds would be needed to enable the multiple bridge modifications.					
I	Timescale		55 Months	39 months design, 11 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO and disruptive access requirements (inc 100hr).					
E	Technical Complexity			Complex structures and associated works. Extra staging					
H	Consent Risk			Third party land acquisition required therefore TWAO assumed. Planning permission required for change of use of land, demolition of property. Highway and footpath temporary closures and diversions required. Potential listed building consent. Listed building consent for works to Colne Bridge.					
J	Implementation Risks			Mine workings Groundwater risk Settlement risk of new infrastructure with Transpire Staffing levels considered (Disruptives) Construction access challenging					
C	Safety			Development of stations along the route will impose construction risks but improve passenger safety. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. Risks associated to working over water. More preferred option of the 2 but still unsupported.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Off-line benefit Disruptive access required (track/civils & signalling) Access considered and accounted for- will likely be challenging but workable Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£140m to £155m	Heaton Lodge Fasts South Slew Calder Lines					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2D 4-track Railway, Fasts to the South, P05 line speed or better by slewing Calder Valley Lines
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Environmental impact may require much greater accommodation/screening works than anticipated e.g. acquisition of Heaton Lodge cottages (although this may be an opportunity, see below)</p> <p>Access for construction and potential restrictions on haul routes/working hours as a result of consent conditions.</p> <p>Ground conditions generally including old mine workings, ground water levels/springs and suitability of excavated materials.</p> <p>Settlement/movement of existing embankments/rail alignments during earthworks operations requiring extensive monitoring and possible risk of line speed restrictions.</p> <p>Greater than anticipated impact on operational railway during construction for slewing/tie-in works and multiple signalling stages.</p> <p>Structures: Heritage: MVL4/4 may be "possibly of special interest". Intrusive works and assessment to MVL3/109 show strengthening works required – most likely to spandrel walls and general refurbishment works.</p>
Opportunities	<p>Use of surplus unsuitable fill generated for landscape mounds or train hauled to Ravensthorpe for similar landscape works.</p> <p>Build new 4-track railway on new alignment. Would suit OLE scheme whereby Cooper Bridge dive-under is abandoned and new flat junction for slow lines onto Calder Valley line.</p> <p>In conjunction with above return large areas of redundant NR land to agricultural and possible residential use (also possibilities of land swap deals to acquire land/property).</p> <p>Further refinement of proposed scheme (perhaps including purchase of Heaton Lodge cottages) to achieve a 110mph (or faster) alignment to make best use of the line speed opportunities along this corridor.</p> <p>Structures: Retain MVN2/188 and MVL4/2 if rail alignments are adjusted to remain unchanged from existing. Rebuilt MVL3/108S could include canal bank realignment to minimise span length.</p> <p>Reduction in amount of land take in cutting by using some steeper (strengthened) slopes and/or retaining walls.</p>
Assumptions	<p>The existing public footpath and associated subway behind Heaton lodge cottages can be closed and diverted via Wood Lane.</p> <p>Structures: New MVL4/1 and MVL3/110 has to be offline from existing highway alignment – vehicular access to sewerage treatment works must be maintained at all times.</p> <p>If MVL4/2 invert lowered for electrification, new pumped drainage required.</p> <p>Substandard (but improved on existing) headroom to new MVL4/5-MVN2/190 is acceptable.</p> <p>Geotechnics: Sufficient volumes of suitable fill will be sourced in adjacent cutting excavations to avoid import of materials.</p>
Dependencies	<p>This sub-option depends on a grade separation being achieved for the fast lines in the Ravensthorpe area</p> <p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
100mph alignment in accordance with P05 speed profile and the possible opportunity to refine the layout to achieve 110mph running to maximise journey time improvements	Large scale intervention within the existing rail corridor will require significant construction works close to running lines and the potential for a greater than envisaged impact on train services due to extended possessions, multiple signalling stages and possible line speed restrictions.
Minimises land purchase and long term environmental impacts in the Heaton lodge area making best use of existing Network Rail owned land. This scheme has the best footprint of all sub-options considered in this area.	
Ties in well to existing railway infrastructure at the southwest end of the alignment avoiding large interventions around the River Colne area	
The existing sub-standard headroom bridge over Wood Lane will be demolished with a new bridge provided to standard headroom / replaced by an overbridge on a new alignment	

Total scheme cost £148,707,634

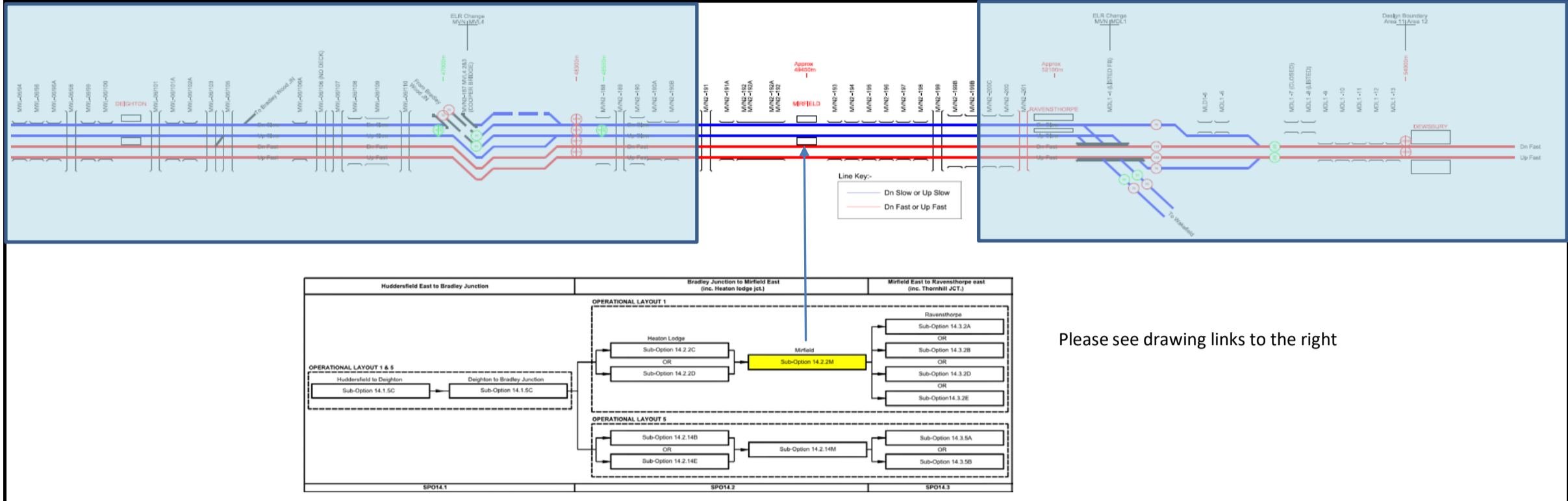
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Carried forward to SDO.

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2M 4-track Railway, Fasts to the South, P05 line speed or better, Mirfield Station
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

Summary Description: The existing Mirfield station is a sub-optimal layout derived from historical interventions, with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required car park. Security may also be a problem with poor lighting coupled with the restrictive access, poor parking arrangements and an out of town location.
 Sub-option 14.2.2M shows an entirely re-constructed station with twin 200m long side platforms situated onto a straight section of the re-aligned slow lines to the north side of the existing rail corridor. Passenger lifts and stairs would be provided down to a new passenger subway leading directly to a new station building facility located to the south and adjacent to an enlarged car park. Secure waiting facilities could be provided at the new building and safe direct access to the platforms via the new subway.

Permanent Way: There are no notable track alignment/geometry features in this option where the fast lines are to the south. Mirfield station platforms are on straight horizontal elements.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14. It should be noted that there are two listed bridge structures over the River Calder either side of Mirfield which may pose consents issues for OLE structures

Structures: 5 No underbridge reassessments for additional track leading to possible strengthening: MVN2/192, 192A, 193, 194, 196. MVN2/192A reassessment will likely lead to strengthening works. If MVN2/196 strengthening required, likely spandrel ties and possible saddling. New station footbridge / subway / incorporation into MVN2/193 for remodelled station including lifts / ramps.

Geotechnics: There are no significant geotechnical works in this section other than those associated with construction of a new station subway which is likely to be a box jack structure beneath the existing alignment

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access from existing car park and adjacent open land. Land take required for proposed car park to the new station. Access for construction is good. Staging not complex. Off-line construction benefit for the platform build and fast line construction. Bridge MVN2/193 requires a new section to carry the new track alignment and platform. Installing new fast line to the South and works around Mirfield station. The subway construction will be staged with works commencing at the South working North requiring possessions for the LNY and MVN (Down & Up lines)- 3 x 56h disruptive (the new deck to MVN2/193 can be done at the same time as these works). P/way can be done within the civils disruptive. MVN2/199 Sands Lane will need to be reconstructed due to inadequate clearance between the upside abutment & the slewed track, these works can be undertaken within the other civils disruptive possessions.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly un-supportive	Un-supportive	Neutral	Supportive	Highly Supportive
					-	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		New station 200m long platforms on slow lines					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets.					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2M 4-track Railway, Fasts to the South, P05 line speed or better, Mirfield Station
Date: 31/10/2017
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H		Public open space (parks) and Public Rights of Way;		Tow path and interconnecting network of footpaths. This option incorporates a new step free access and subway at Mirfield Station (MVN2/193A - Station Road - Existing Underbridge).					
H		Recreational waterways		Users of the River Calder and the Calder and Hebble Navigation and associated tow path.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Improved accessibility of Mirfield Station and additional parking would have positive impacts on the wider community. Range of residential, commercial, recreational uses near the works.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Note that MVN2/193 suffers the most bridge strikes on the route and that the abutments are currently regularly monitored for settlement. The proposal only shows works to the superstructure and no works to the substructure. MVN2/197 is also susceptible to bridge strikes and the proposal shows no works to this structure. MVN2/196 is a high scour risk with a settled span. The proposals only show work to the arch span. On this basis the Structures RAM is unsupportive, however if the proposed works were to address these problems then this would change to supportive.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Supportive; Local c/b: Supportive; Rail passengers: Supportive) The MP is broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. Improvements to Mirfield station will bring significant benefits to the community, and ties in with plans to regenerate the area, although work to achieve the improvements could be disruptive – includes "landtake". Work could impact on the community, such as diversions, but in the long-term will bring more benefits than drawbacks. Increased speeds, and station improvements, will bring significant long-term enhancements to rail users, but with some short-term disruption.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Unclear whether additional car parking for Mirfield Station can be achieved within NR landownership					
I	Timescale		64 Months	39 months design, 20 months construction. Fails to achieve target timescale, full benefits not realised without SPO3. Timescales based on TWAO, high complexity design and disruptive access requirements (inc 100hr).					
E	Technical Complexity			Complex structures and associated works.					
H	Consent Risk			Streetworks consents to improve access to Mirfield Station Car Park. Unclear whether third party land required to deliver additional parking at Mirfield Station. As a precautionary approach TWAO is assumed. However if land can be secured by negotiation then only planning permission would be required. Prior approval may be required for Station works.					
J	Implementation Risks			Mine workings Staffing levels considered (Disruptives)					
C	Safety			Development of stations along the route will impose construction risks but improve passenger safety. No real significant unusual risks have been identified in this location. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge works and structural improvements.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Significant off-line benefit Disruptive access required (track/civils & signalling) Access considered and accounted for (A644 North OK) Utilises traditional techniques and equipment					
Cost									
K	Capital Cost			Mirfield Station Fasts South (costs included in SPO 13.3)					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.2M 4-track Railway, Fasts to the South, P05 line speed or better, Mirfield Station
Date: 31/10/2017
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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Staging of the track slews and new station construction whilst maintaining services on the existing lines. Greater than anticipated disruption.</p> <p>Ground obstructions from historic station buildings and other rail infrastructure hindering the new subway construction (which may be a box jack).</p> <p>Electrification may effect the adjacent grade II listed River Bridge and associated consent issues.</p> <p>Poor access from the North side (due to low bridge) will restrict construction activities.</p> <p>Structures: Heritage: MVN2/192, 192A is grade II listed. MVN2/194, 196, 198, 200A and 200 are "possibly of special interest"</p>
Opportunities	<p>The existing main road access (Station Road) from Mirfield town centre has very restricted headroom clearance at the railway underbridge (signed at 3.2m). There may be an opportunity as part of this intervention to study ways of improving this e.g. a track lift through the station with a road lower (although drainage & flooding is an issue close to the River Calder). Provision of an improved access from the north side of the station.</p> <p>Adopt 110mph running on the fast line throughout this section to contribute towards journey time savings.</p> <p>Improving security and passenger experience of Mirfield Station - providing manned facilities</p> <p>Structures: Rationalisation of highway accesses under western land spans of MVN2/192 and 192A. MVN2/193 scheme including highway vertical realignment re-profiling to reduce bridge strike risk. Underbridge and culverts around Ladywood Road MVN2/199A, 200A, 200B and 200 are in various states of use / infilling – study to determine whether demolition / infilling possible for these crossings in close proximity.</p>
Assumptions	<p>Structures: MVN2/198 has been fully infilled – to be checked by intrusive works.</p>
Dependencies	<p>This sub-option depends on a grade separation being achieved for the fast lines in the Ravensthorpe area</p> <p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Mirfield station will be completely re-built to modern standards with step free access, improved lighting, signage, ticket office/waiting rooms and extended car parking	The existing low headroom road access will remain.
The fasts to the south option makes the staging of Mirfield station slightly easier and could be carried out as an advanced works project	
The new platforms will be on a straight alignment	

Total scheme cost inc. in SPO 14.3

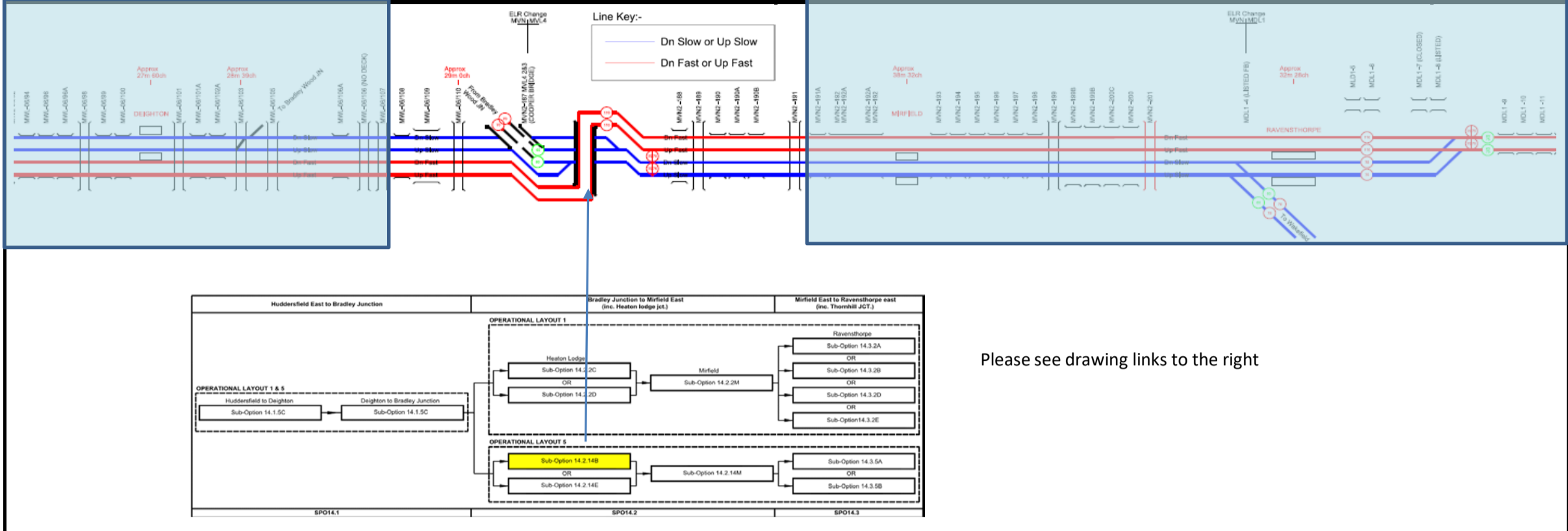
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
Continued as preferred option.

Record of Expert Panel and Consultees Attendees
As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14B 4-track Railway, Fast North to South, P05 linespeed or better, Flyover Grade Separation at Heaton Lodge (GRIP2) also incorporating sub-option 14.2.14C (modified GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Option Overview

Summary Description: The GRIP2 scheme is also presented with a variant sub-option, which provides similar outputs but has differing environmental and land purchase impacts. **Sub-option 14.2.14B** is the GRIP2 scheme consists of a fast line flyover constructed largely off-line. This option requires large land take including agricultural land to the southwest and residential land to the northeast in the vicinity of Battyeford. Because of the elevated nature of the alignment and lie of the land the visual and acoustic impact potentially extends some distance to the North of the immediate properties affected in Battyeford. The alignment is capable of 110mph running in order to maximise the 110mph linespeed opportunity through this area.

Sub-option 14.2.14C is a variation to the GRIP2 alignment in order to make better use of existing Network Rail land ownership and to mitigate the environmental impacts of a flyover scheme particularly on the residential properties in Battyeford. This has been achieved by moving the flyover alignment further to the east and tightening the horizontal radii. The resulting alignment results in a much reduced land take and distances the viaduct from Battyeford (albeit there is still an impact). The alignment achieves 100mph at normal values and 110mph at exceptional values (a 110mph alignment at normal values would likely require acquisition of Heaton Lodge cottages).

Permanent Way: The GRIP 2 alignment is geometrically capable of 110mph. At this linespeed values of Cant and Cant Deficiency remain within Normal values with values of Rate of Change in Cant lie between Normal and Maximum. At 100mph Rate of Change in Cant and Cant Deficiency are less than Normal.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section the main issue with respect to an OLE on option is clearances through the existing Cooper Bridge dive-under (see structures comment).

Structures: Fast carried on new viaduct 900 m long.

Works to 3 No existing underbridges: replaced MVL3/108 (understrength); rebuilt MVL3/108S (new horizontal alignment); widened MVL3/109.

1 No new overbridges: single replacement for MVL4/1 and MVL3/110 on new highway alignment.

If electrified, MVL4/2 Cooper Bridge invert lowered or bridge re-built with a shallow deck

MVN2/188 infilled, MVL4/4 removed.

Geotechnics: The new rail alignment passes through an area of historic mine workings to the south west and then as it crosses cover to the north east into an area of floodplain and very poor ground conditions. The new viaduct structure would need extensive piling in the soft ground to achieve satisfactory lateral deflection performance. It is assumed that the alignment can be adjusted to obtain a reasonable cut/fill earthworks balance in this area although the suitability of excavated material is to be established

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access from B6118 will require works to improve. Ensure that the new Deighton Station is constructed before this intervention to allow the slow lines to be diverted onto the new alignment. Allows trains to stop at Mirfield and Deighton during the construction works. Also ensure that intervention at Mirfield to recon the platforms and diversion of the slows to the North takes place in advance of this option- allows new deck on MVN2/193 (Mirfield Station Bridge) to accept new track alignment and installation of subway, stairs and lift shaft. Majority of civils works to be done off-line and ALO for viaduct piers next to the operational MVN2 and MVL4 lines. RotR possessions will be required for lifting in new viaduct section crossing these lines. P/Way: Construct new lines off-line and tie-ins to be done in 1 X 56h disruptive possession. Civils works to be completed in advance of the p/way.

S&T:

Except for Wheels Free Testing no additional possession time is required

OLE: Bases and supports to be done in parallel with civils works and final tie-in conducted in RoR possessions.

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					marginally unsupported	Unsupported	Neutral	Supportive marginally	Supportive
					-	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14B 4-track Railway, Fasts North to South, P05 linespeed or better, Flyover Grade Separation at Heaton Lodge (GRIP2) also incorporating sub-option 14.2.14C (modified GRIP2)
Date: 31/10/2017
Revision: P04 - Final Issue

A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		No stations					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets.					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response. Viaduct area restricts ease of access to infrastructure.					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Reviewed at 100mph as 110mph only by further option and would require exceptional values which would not be supported. New 900m Off line flyover – requiring large land take and construction in flood plain Construction affecting Wakefield lines Flyover will be significant visual impact on area adjacent to properties States similar outputs can be achieved with less intrusion					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Compliant					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable					
H		Visual impact, landscape and townscape impacts		New 30 span high level viaduct; four tracking, development of green field land; demolition and reconstruction of bridges (inc. MVL 4/5 and MVL 3/10; removal of overbridges, associated highway works infilling underbridges; creation of large embankments, demolition of residential properties on Waterside Walk/Wood Lane and further 3/4 residential properties at Heaton Lodge would have significant visual and landscape impacts. This section of the route crosses Green Belt, which is designated principally to maintain openness. Assume night works for online activities required and best practice measures to minimise light pollution would be employed.					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		The southern section of this part of the route is within a SSSI risk area. Within such areas the Local Planning Authority would consult Natural England on development proposals.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		It is anticipated that protected species and habitats would be encountered. It is assumed that a comprehensive CEMP would incorporate best practice ecological mitigation measures.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		There are 5 listed buildings centred around Colne Bridge, including the Grade II listed warehouse on south east side of the Huddersfield Broad Canal. The Calder and Hebble Navigattion Bridge taking Colne Bridge Road Sir John Ramsdens Canal Bridge (Grade II listed), the Number 2 Lock to the north of the Colne Bridge					
		Local - Conservation Areas		No Conservation Areas. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
		National Trust Property		Not applicable. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
	Air Quality	Air Quality Management Areas		No AQMA identified from online resources. Numerous residential and commercial properties are adjacent to this section of the route. Demolition, construction and earthworks have the potential to generate dust and other air borne pollutants. It is anticipated that the comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.					
H	Noise and Vibration	Sensitivity of potential receptor		Residential and commercial areas, public spaces, footpaths are adjacent to this section of the route. Demolition, construction, including earthworks and works at night, would generate noise and vibration. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Not applicable. Former mine workings noted on drawings.					
H		Best and most versatile land		Limited online information available. However the new section of railway may result in loss of areas of best and most versatile agricultural land (Grade II).					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		The route crosses areas of high flood risk from rivers at Colne Bridge. Areas of surface water flooding risk follow highways and the canal. There is also a risk of flooding from reservoirs. It is anticipated that a consent application would be accompanied by a FRA.					
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 75,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14B 4-track Railway, Fasts North to South, P05 linespeed or better, Flyover Grade Separation at Heaton Lodge (GRIP2) also incorporating sub-option 14.2.14C (modified GRIP2)
Date: 31/10/2017
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H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals will negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to CPO.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Extensive works to numerous bridges would require temporary highway closures, diversions and careful traffic management planning. Construction activity, demolition and earthworks would generate additional traffic on local roads. Demolition and replacement of overbridges. It is anticipated that the CEMP would incorporate standard best practice traffic management planning measures					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Demolition, excavation, earthworks and construction will use materials, generate waste and associated traffic movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Users of National Cycle Route 69 would be impacted by additional traffic caused by construction and by road and path diversions, and by visual and landscape changes.					
H		Public open space (parks) and Public Rights of Way;		There are playing fields, public open space and public rights of way adjacent to sections of this part of the route. A tow path follows the Huddersfield Broad Canal, which flows along side this section of the route.					
H		Recreational waterways		The Huddersfield Broad Canal or Sir John Ramsden's Canal, is a wide-locked navigable canal. The waterway is 3.75 miles (6 km) long and has 9 wide locks. It follows the valley of the River Colne and connects the Calder and Hebble Navigation at Cooper Bridge junction with the Huddersfield Narrow Canal near Aspley Basin in Huddersfield. Realignment of canal banks and construction of new MVL31085S near Lock No 2 and potential works to MVL3/108 underbridge would impact users of the the Huddersfield Broad Canal (noise, dust, lighting during construction and changed views operationally). Impact of construction on users of the Calder and Hebble Navigation and its tow path.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential properties, commercial premises, users of public open space and footpaths; Yorkshire Water Wastewater Treatment Works					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Neutral.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Unsupportive; Local c/b: Highly Unsupportive; Rail passengers: Supportive) MPs covering the area are broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known (although unlikely to be supportive of residential demolitions). The intervention is unlikely to bring benefits to the area, or economic regeneration. The need for "acquisition of residential properties" and "landtake" will likely lead to serious and vocal opposition, coupled with potentially negative media coverage and social media coverage. Increased speeds will bring significant long-term enhancements to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		This option requires acquisition of third party land including approximately 10 residential properties and extensive agricultural land. TWA0 should be assumed. It is assumed that extensive temporary working areas and compounds would be needed to enable the multiple bridge modifications.					
I	Timescale		55 Months	46 months design, 11 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design and disruptive access requirements.					
E	Technical Complexity			Complex structures including long viaduct and geotechnical issues					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: **14 - Huddersfield East to Ravensthorpe East Re-modelling**

Sub-Area Ref **14.2 Bradley Junction to Mirfield East**

Sub-Option Ref **14.2.14B 4-track Railway, Fasts North to South, P05 linespeed or better, Flyover Grade Separation at Heaton Lodge (GRIP2) also incorporating sub-option 14.2.14C (modified GRIP2)**

Date: **31/10/2017**

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H	Consent Risk			Third party land acquisition required therefore TWAO assumed. Planning permission required for change of use of land, demolition of property. Highway and footpath temporary closures and diversions required. Potential listed building consent. Listed building consent for works to Colne Bridge. Limited information currently available regarding the appearance of the viaduct structure in this part of the structure. Application for consent likely to attract significant objections and there is a risk that consent would not be granted given the scale and impact of the works.					
J	Implementation Risks			Mine workings Groundwater risk/floodplain Settlement risk of new infrastructure with Transpire Staffing levels considered (Disruptives) Construction access challenging					
C	Safety			Risks associated to construction and maintenance of OLE coupled with the risk incurred to lineside neighbours. Construction and work at height risks associated to construction of a new fly over Development of stations along the route will impose construction risks but improve passenger safety . Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. There is a flood risk in this location.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Significant off-line benefit Disruptive access required (track/civils & signalling) Access considered and accounted for- will likely be challenging but workable Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£184m to £205m	Heaton Lodge Flyover - GRIP2					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

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Sub-Area Ref 14.2 Bradley Junction to Mirfield East
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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Volume of land purchase and associated environmental impact in Battyeford to achieve the line speed may be open to challenge at public enquiry when there are alternative options which can achieve a similar output with much less land purchase and associated environmental impact. (Variant scheme reduces this impact)</p> <p>Environmental impact may require much greater accommodation/screening works such a noise fences, acoustic bunds, double/triple glazing homes, etc.</p> <p>Access for construction and potential restrictions on haul routes/working hours as a result of consent conditions.</p> <p>Ground conditions generally including old mine workings, ground water levels/springs and suitability of excavated materials for embankment works.</p> <p>The GRIP2 alignment affects the River Calder flood plain to the North. May be an issue for consents & construction risk also.</p>
Opportunities	<p>Adopt 110mph running through this area to contribute to overall journey time improvement.</p>
Assumptions	<p>New MVL4/1 and MVL3/110 has to be offline from existing highway alignment – vehicular access to sewerage treatment works must be maintained at all times.</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
<p>This scheme is largely an off-line solution and will have minimal impacts on the operational railway during construction. Extended possessions will be required for the tie-in works at either end of the new alignment.</p>	<p>The proposed viaduct as shown in the GRIP2 scheme has a large environmental footprint requiring acquisition of residential properties and blight over an extended area. It is likely to come under severe challenge at a public enquiry. The modified GRIP2 scheme (sub-option 14.2.14C) goes some way towards reducing this impact.</p>
<p>The main civil engineering works is the above ground construction of a flyover which is a relatively routine form of construction with reduced ground related risk than alternative dive-under schemes</p>	
<p>100mph alignment in accordance with P05 speed profile and the possible opportunity to refine the layout to achieve 110mph running to maximise journey time improvements</p>	

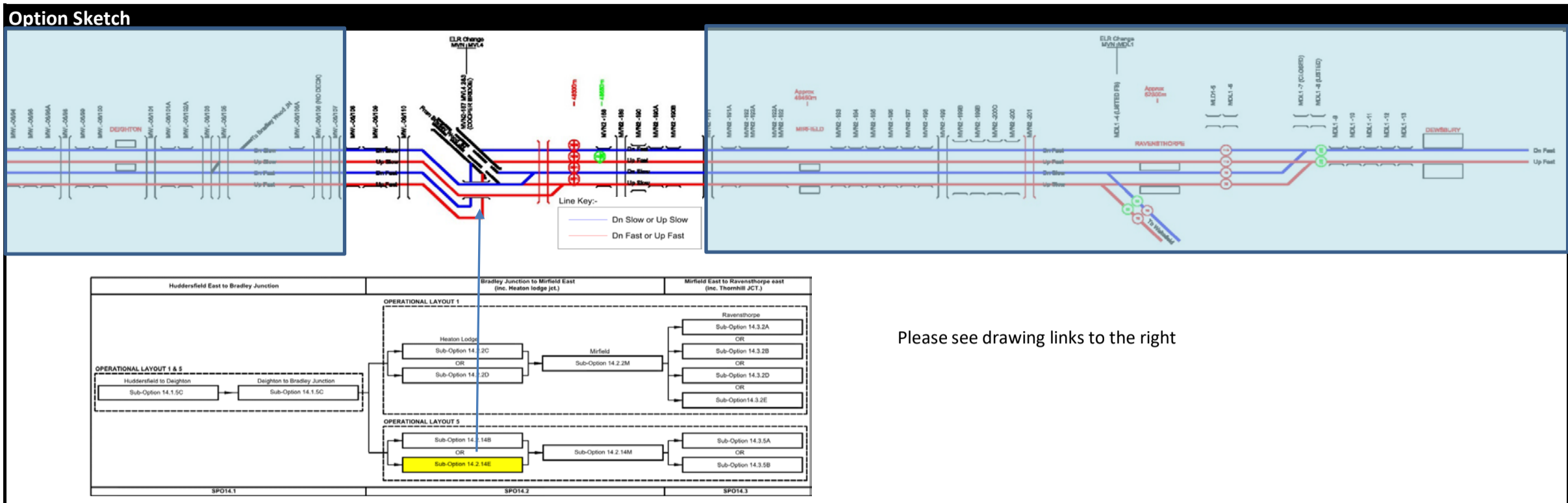
Total scheme cost £195,236,847

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Suspended due to the high risk of approval not being given. (Application for consent likely to attract significant objections and there is a risk that consent would not be granted given the scale and impact of the works.)

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14E 4-track Railway, Fasts North to South, P05 linespeed or better, Diveunder Grade separation at Heaton Lodge
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Option Overview

Summary Description: Sub-option 14.2.14E is a dive-under grade separation scheme utilising the same horizontal alignment as 14.2.14C (modified GRIP2) in order to make best use of existing Network Rail land ownership and to mitigate potential environmental impacts from off-line incursions particularly on the residential properties in Battysford. The alignment achieves 100mph at normal values and 110mph at exceptional values. The dive-under structure will require staged disruptive possession working in order to be constructed beneath the existing Calder Valley and up Huddersfield lines. A notable operational issue is that the dive-under scheme will necessitate the abandonment of the existing Cooper Bridge alignment for the down Huddersfield line and the creation of an at-grade junction for the new slow lines onto the Calder valley lines.

A local access road passing through Battysford, Wood Lane, would be intersected by the dive-under approach cutting. Therefore this road would either need diverting or stopping up and alternative routes found. A tentative diversion route and new bridge structure is shown on the scheme GA drawing, but that are other alternatives to explore should this sub-option be developed further.

Permanent Way: The diveunder alignment is geometrically capable of 110mph. At this linespeed values Cant Deficiency are above Normal values and approaching the Exceptional limit. Values of Rate of Change in Cant lie marginally above Normal

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Copper Bridge is abandoned in this option, therefore the OLE on clearance issue is no longer a problem.

Structures: Fasts carried in new concrete box 125 m long with pumped drainage under slewed slows and existing Calder Valley lines. As much of the box as possible is constructed in-situ offline, with area under operational lines in top-down arrangement.

Works to 3 No existing underbridges: replaced MVL3/108 (understrength); rebuilt MVL3/108S (new horizontal alignment); widened MVL3/109.

4 No new overbridges: single replacement for MVL4/1 and MVL3/110 on new highway alignment, existing bridges demolished; repositioned MVL4/5 and MVN2/190 for Wood Lane highway scheme; new, lengthened MVN2/191.

MVL4/2 Cooper Bridge infilled.

MVN2/188 infilled, MVL4/4 removed, existing MVL4/1 and MVL3/110 infilled / demolished.

Geotechnics: The geotechnical works involve the excavation of a deep cutting and diveunder structure through an area of historic coal mining activity. Groundwater levels in this area are high and therefore there is a risk of high groundwater inflows during construction and this will also need to be managed as part of the permanent works (slope drainage and higher capacity track drainage to discharge, and collection of seepage within the dive-under structure). Buoyancy may be an issue for the dive-under structure and sufficient ballast weight and/or tension piles may be required at the deepest sections. Approach wall and dive-under box construction will need to be water retaining requiring the use of interlocking secant pile walls or diaphragm walls if top down construction utilised.

A strategy will need to be developed to manage the large quantities of earthworks materials arising from the cutting. No assessment has been carried out as to the engineering suitability of the materials, but it assumed that sufficient material will be suitable as embankment fill required for the diversion of Wood Lane. Non suitable fill may be used for general landscaping purposes either locally around Heaton Lodge or at Ravensthorpe.

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access from B6118 will require works to improve. Ensure that the new Deighton Station is constructed before this intervention to allow the slow lines to be diverted onto the new alignment. Allows trains to stop at Mirfield and Deighton during the construction works. Also ensure that intervention at Mirfield to recon the platforms and diversion of the slows to the North takes place in advance of this option- allows new deck on MVN2/193 (Mirfield Station Bridge) to accept new track alignment and installation of subway, stairs and lift shaft. Significant land take required. Challenging access for construction. Staging more complex. Off-line construction benefit. Big muck shift. Wood Lane severed (diversion/closure). Cutting deeper. Massive groundwater risk- positive drainage/dewatering required. Lots of track temporary arrangements. (Assume balanced/cut fill). Earthworks in floodplain. Settlement on new could be a big issue for Transpire (will be new, not existing infrastructure). Bridge MVN2/191 and new bridges for Wood Lane diversion will require RotR for installing the new decks. RotR possession for piling and Deck Installation and MVL3/110 recon off-line.

Output:

Per Way: 3 No 56 hr possessions to divert MVN2 up&down and MVL4 up to allow dive under box construction. Fast line construction (new) will be constructed off-line

S&T:

Support to P-Way with tails ON/OFF for track renewals/slews

Support to P-way diversion of MVN2 and MVL4 to allow dive under construction. Significant works to Heaton Lodge Relay room removal. Except for Wheels Free Testing and commissioning - no additional time is required

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions



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Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		No stations					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets. Dive under area requires permanent pumping.					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response.					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Dive Under Grade separation Significant works in poor ground prone to flooding and with major watercourses nearby and potential settlement issues. Need for pumping and consent to discharge to River – confined space Significant temporary works and potential significant waste off site Would require new at-grade junction with Calder Valley slow lines Would require stopping up and re-routing of Cooper bridge + 1 other roadway Unsupportive in own right, tending to highly unsupportive when compared to alternative options available.					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Coherent with future railway state					
F	Engineering	compliance to engineering and operational specifications		Full use of exceptional cant deficiency					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable					
H		Visual impact, landscape and townscape impacts		Widened Colne viaduct; concrete box and dive under four tracking, development of green field land; demolition and reconstruction of bridges (inc. MVL 4/5 and MVL 3/10; removal of overbridges, associated highway works infilling underbridges; creation of large embankments, no demolition of residential properties however some loss of garden space on Waterside Walk/Wood Lane. This section of the route crosses Green Belt, which is designated principally to maintain openness. Assume night works for online activities required and best practice measures to minimise light pollution would be employed.					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		The southern section of this part of the route is within a SSSI risk area. Within such areas the Local Planning Authority would consult Natural England on development proposals.					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		It is anticipated that protected species and habitats would be encountered. It is assumed that a comprehensive CEMP would incorporate best practice ecological mitigation measures.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		There are 5 listed buildings centred around Colne Bridge, including the Grade II listed warehouse on south east side of the Huddersfield Broad Canal. The Calder and Hebble Navigattion Bridge taking Colne Bridge Road Sir John Ramsdens Canal Bridge (Grade II listed), the Number 2 Lock to the north of the Colne Bridge					
		Local - Conservation Areas		No Conservation Areas. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
		National Trust Property		Not applicable. Given the scale of greenfield development, it is reasonable to assume that previously unknown archaeological remains would be encountered during construction. Therefore a comprehensive CEMP would incorporate standard best practice archaeological mitigation measures planned through preparation of a Written Scheme of Archaeological Investigation.					
	Air Quality	Air Quality Management Areas		No AQMA identified from online resources. Numerous residential and commercial properties are adjacent to this section of the route. Demolition, construction and earthworks have the potential to generate dust and other air borne pollutants. It is anticipated that the comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.					
H	Noise and Vibration	Sensitivity of potential receptor		Residential and commercial areas, public spaces, footpaths are adjacent to this section of the route. Demolition, construction, including earthworks and works at night, would generate noise and vibration. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					



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H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Not applicable. Former mine workings noted on drawings.					
H		Best and most versatile land		Limited online information available. However the new section of railway may result in loss of areas of best and most versatile agricultural land (Grade II).					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		The route crosses areas of high flood risk from rivers at Colne Bridge. Areas of surface water flooding risk follow highways and the canal. There is also a risk of flooding from reservoirs. It is anticipated that a consent application would be accompanied by a FRA. Presumably a dive under structure requires extensive drainage and discharge solution yet to be designed; assumed this is achievable.					
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Extensive works to numerous bridges would require temporary highway closures, diversions and careful traffic management planning. Construction activity, demolition and earthworks would generate additional traffic on local roads. Demolition and replacement of overbridges. It is anticipated that the CEMP would incorporate standard best practice traffic management planning measures					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Demolition, excavation, earthworks and construction will use materials, generate waste and associated traffic movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		Users of National Cycle Route 69 would be impacted by additional traffic caused by construction and by road and path diversions, and by visual and landscape changes.					
H		Public open space (parks) and Public Rights of Way;		There are playing fields, public open space and public rights of way adjacent to sections of this part of the route. A tow path follows the Huddersfield Broad Canal, which flows along side this section of the route.					
H		Recreational waterways		The Huddersfield Broad Canal or Sir John Ramsden's Canal, is a wide-locked navigable canal. The waterway is 3.75 miles (6 km) long and has 9 wide locks. It follows the valley of the River Colne and connects the Calder and Hebble Navigation at Cooper Bridge junction with the Huddersfield Narrow Canal near Aspley Basin in Huddersfield. Realignment of canal banks and construction of new MVL31085S near Lock No 2 and potential works to MVL3/108 underbridge would impact users of the the Huddersfield Broad Canal (noise, dust, lighting during construction and changed views operationally). Impact of construction on users of the Calder and Hebble Navigation and its tow path.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential properties, commercial premises, users of public open space and footpaths; Yorkshire Water Wastewater Treatment Works					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. It is assumed that all new and altered structures will be in accordance with the RRD.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Unsupportive; Local c/b: Unsupportive; Rail passengers: Supportive) MPs covering the area are broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. The intervention is unlikely to bring benefits to the area, or economic regeneration. Work will likely result in negative impact on the community, and particularly impacts on nearby roads, with need for diversions, plus disruption to farmers in the area. Increased speeds will bring significant long-term enhancements to rail users, albeit with some disruption during construction.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		This option requires acquisition of third party land including some garden space of residential properties and extensive agricultural land. TWA0 should be assumed. It is assumed that extensive temporary working areas and compounds would be needed to enable the multiple bridge modifications.					



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Date: 31/10/2017
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I	Timescale		55 Months	46 months design, 8 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design and disruptive access requirements.				
E	Technical Complexity							
H	Consent Risk			Third party land acquisition required therefore TWAO assumed. Planning permission required for change of use of land, demolition of structures. Highway and footpath temporary closures and diversions required. t. Listed building consent for works to Colne Bridge. Application for consent likely to attract objections.				
J	Implementation Risks			Mine workings Groundwater risk Settlement risk of new infrastructure with Transpire Staffing levels considered (Disruptives) Construction access challenging				
C	Safety			Construction risks associated to grade separation including the new dive under. Development of stations along the route will impose construction risks but improve passenger safety . Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Excavation and construction risks associated to working in the River Calder flood plane. There will be a requirement to install pumping stations for removal of water, this will also induce confined space working risks. Benefits a portion of works can be constructed offline.				
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable but complex Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment				
Cost								
K	Capital Cost		£173m to £193m	Heaton Lodge Dive-Under				
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx					
Value								
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options						



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14E 4-track Railway, Fasts North to South, P05 linespeed or better, Diveunder Grade separation at Heaton Lodge
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Environmental impact may require much greater accommodation/screening works than anticipated.</p> <p>Access for construction and potential restrictions on haul routes/working hours as a result of consent conditions.</p> <p>Ground conditions generally including old mine workings, ground water levels/springs and suitability of excavated materials.</p> <p>Settlement/movement of existing embankments/rail alignments during earthworks operations requiring extensive monitoring and possible risk of line speed restrictions.</p> <p>Greater than anticipated impact on operational railway during construction for slewing/tie-in works and multiple signalling stages.</p> <p>Structures: MVL3/109A construction: clash with third party pipe bridge over the river; Environment Agency permissions – flood plain; access difficulties.</p>
Opportunities	<p>Use of surplus unsuitable fill generated for landscape mounds or train hauled to Ravensthorpe for similar landscape or embankment works.</p> <p>Adopt 110mph running on fast lines through this section to contribute towards journey time savings</p> <p>Structures: Retain MVN2/188 and MVL4/2 if rail alignments are adjusted to remain unchanged from existing. Rebuilt MVL3/108S could include canal bank realignment to minimise span length. Drainage study may remove need for pumping: gravity flows to existing MVL4/2 drainage.</p>
Assumptions	<p>The existing public footpath and associated subway behind Heaton lodge cottages can be closed and diverted via Wood Lane.</p> <p>Structures: New MVL4/1 and MVL3/110 has to be offline from existing highway alignment – vehicular access to sewerage treatment works must be maintained at all times.</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
When completed the scheme generally has a low environmental impact with regard to noise and visual intrusion from the railway. However, Wood Lane diversion may cause a visual intrusion.	Relatively large land take of farmland to achieve deep earthworks cutting and Wood Lane diversion. Other possible schemes require less land.
There appears to be no need to purchase any property to implement the scheme. Properties at Battyeford and Heaton Lodge are not affected (other than during construction) and would benefit from the scheme as current noise levels should be reduced.	Large volume of surplus earthworks material which may be difficult to dispose of within scheme. Possible use for landscaping and some embankment works at Wood Lane and Ravensthorpe.
	A dive-under alignment is most likely to require a wet well pumping shaft for drainage into the River Calder. This will require regular maintenance and associated operating costs throughout its life.
	Operationally the situation on the slow lines is made worse by introducing a flat junction onto the Calder Valley lines as the Cooper bridge alignment is abandoned (this a possible benefit for electrification)
	The construction of a dive-under below the existing Calder Valley and Transpennine lines may cause significant disruption to train services during construction (although it is likely that an acceptable sequence of construction can be developed to minimise this impact) Geotechnical risk during construction and operation - mining, variable soils and high groundwater

Total scheme cost £183,772,109

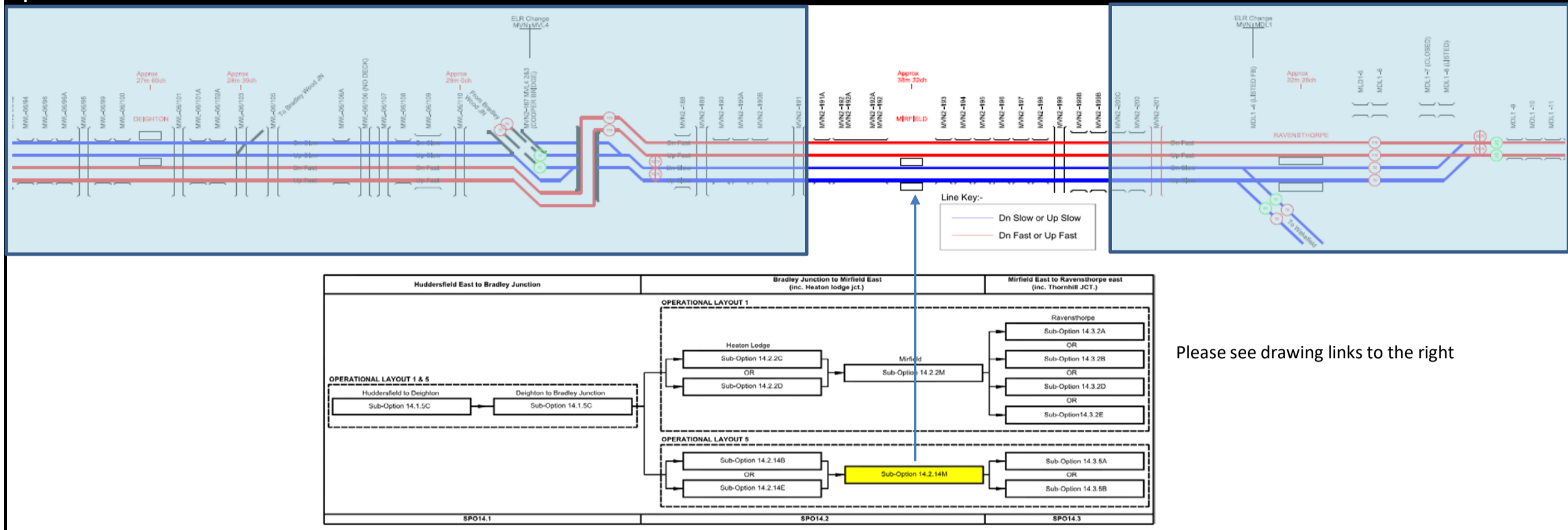
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Preferred option for layout 5 but work to be suspended due to consents risks at Heaton Lodge

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14M 4-track Railway, Fasts to the North, P05 line speed or better, Mirfield Station
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Please see drawing links to the right

Option Overview

Summary Description: The existing Mirfield station is a sub-optimal layout derived from historical interventions, with a large island platform serving the up and down main lines and a side platform serving the slow line. Passenger access is poor with no step free facilities and a smaller than required car park. Security is also a problem with poor lighting coupled with the restrictive access, poor parking arrangements and an out of town location.

Sub-option 14.2.14M shows an entirely re-constructed station with twin 200m long side platforms situated onto the re-aligned slow lines to the south side of the existing rail corridor. Passenger lifts and stairs would be provided down to a new passenger subway leading directly to a new station building facility located to the south and adjacent to an enlarged car park. Secure waiting facilities could be provided at the new building and safe direct access to the platforms via the new subway.

Permanent Way: There are no notable track alignment/geometry features in this option where the fast lines are to the north. Mirfield station platforms are on curved horizontal elements greater than 1000m radius.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14. It should be noted that there are two listed bridge structures over the River Calder either side of Mirfield which may pose consents issues for OLE structures

Structures: 5 No underbridge reassessments for additional track leading to possible strengthening: MVN2/192, 192A, 193, 194, 196. MVN2/192A reassessment will likely lead to strengthening works. If MVN2/196 strengthening required, likely spandrel ties and possible saddling. New station footbridge / subway / incorporation into MVN2/193 for remodelled station including lifts / ramps.

Geotechnics: There are no significant geotechnical works in this section other than those associated with construction of a new station subway which is likely to be a box jack structure beneath the existing alignment

Environment, Consents & Sustainability: Anne Dugdale

Constructability: This option utilises traditional construction techniques and equipment for all disciplines. Works to construct new platforms on Mirfield Station can be undertaken mainly in RoR possessions to install new riser walls over MVN2/193 (Station Road U/B) & out to the east end of the new construction. The new subway to Mirfield station can be constructed in one 56hr possession using precast reinforced concrete box sections with most of the piling works to support the lift shafts being undertaken in RoR possessions prior to the main blockade. MVN2/193 (Station Road U/B) will require a new deck the preparatory works for this can be undertaken once the new subway & access steps are constructed to give access to the present down & up platforms. The installation of the new bridge deck will be implemented in one 56hr possession, the new deck being lifted in by crane. MVN2/199 Sands Lane will need to be reconstructed due to inadequate clearance between the upside abutment & the slewed track, these works can be undertaken within the other civils disruptive possessions

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		New station 200m long platforms on slow lines					
B	Train Performance	Reliability of infrastructure		Improvement in overall reliability despite additional assets.					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		TBC					
B	Operability	Support vision of future railway state		Improvement towards future railway state					
B	Maintainability	Supports vision for future railway state		Improvement towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Compliant					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14M 4-track Railway, Fasts to the North, P05 line speed or better, Mirfield Station
Date: 31/10/2017
Revision: P04 - Final Issue

Sustainability and Environmental								
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable				
H		Visual impact, landscape and townscape impacts		Parts of this section of the route are within the Green Belt, which is designated primarily to maintain openness. Works include removal and replacement of the bridge deck on MVN2/193 Station Road underbridge; works to Mirfield Station Subway (MVN2/193A) to create staircase and lift at each end); replacement of MVN2/199 Sands Lane overbridge with longer span; widening of embankment. These have potential to impact views and townscape during construction and operation. Assumed track works bridge redeck would involve night works.				
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable				
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult Natural England on relevant development proposals.				
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		It is anticipated that protected species would be encountered during construction. Assumed that a comprehensive CEMP would incorporate standard best practice ecological mitigation measures.				
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable				
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		There are a number of listed structures in proximity to where the railway crosses the River Calder at East-Thorpe. The railway bridge itself over the River (Mirfield Copper Bridge Line) is Grade II listed. The neighbouring Legard highway bridge over the River Calder is also Grade II listed. To the north, the former lock keepers cottage and the Calder and Hebble Navigation Flood Lock at Newgate Bridge are Grade II listed. To the north of the existing line various other locks on the River and Navigation are listed also.				
		Local - Conservation Areas		Not applicable				
	National Trust Property		Not applicable					
	Air Quality	Air Quality Management Areas		There are no AQMA in proximity to this section of the route. It is anticipated that earthworks and construction would generate dust and other air borne pollutants. It is assumed that a comprehensive CEMP would incorporate standard best practice measures to minimise air pollution as far as is reasonably practicable.				
H	Noise and Vibration	Sensitivity of potential receptor		There are a range of residential, commercial and recreational uses adjacent to the route. Construction and embankment works would generate noise and vibration and it is assumed would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise and manage noise and vibration as far as is reasonably practicable				
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		Not applicable. Probable coal mining and mining features noted on drawings.				
H		Best and most versatile land		Not applicable				
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River Calder and reservoirs. It is anticipated that FRA would be required and CEMP would incorporate Flood Plans. Flood risk potential is noted on drawings.				
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.				
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.				
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.				
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional vehicle movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management Plans. Potential to provide additional car parking at Mirfield Station noted, opportunities for enhanced intermodal facilities should also be explored. Bridge works would require temporary road closures and diversion.				
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.				
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associate vehicle movements. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including Traffic Management and Site Waste Management Plans.				
H	Land use / Amenity	Allotments; Village Greens, Common Land		not applicable. There are allotment gardens to the south of Mirfield Station.				
H		National Cycle Network, long distance walking trails		National Cycle Route 66 follows the route of the A644 then passes under the railway at Mirfield Station before crossing the Legard Bridge. Noted that bridge redeck likely to require temporary diversion of this route.				
H		Public open space (parks) and Public Rights of Way;		Tow path and interconnecting network of footpaths. This option incorporates a new step free access and subway at Mirfield Station (MVN2/193A - Station Road - Existing Underbridge).				
H		Recreational waterways		Users of the River Calder and the Calder and Hebble Navigation and associated tow path.				



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14M 4-track Railway, Fasts to the North, P05 line speed or better, Mirfield Station
Date: 31/10/2017
Revision: P04 - Final Issue

H		Other sensitive receptors (community & education facilities, residential etc.)		Improved accessibility of Mirfield Station and additional parking would have positive impacts on the wider community. Range of residential, commercial, recreational uses near the construction works.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option							
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Unsupportive; Local c/b: Unsupportive; Rail passengers: Supportive) The MP is broadly in favour of plans to upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. Improvements to Mirfield station will bring significant benefits to the community, and ties in with plans to regenerate the area, although work to achieve the improvements could be disruptive but short-term. Work could impact on the community, such as diversions, but in the long-term will bring more benefits than drawbacks. Increased speeds, and station improvements, will bring significant long-term enhancements to rail users, but with some short-term disruption.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Unclear whether additional car parking for Mirfield Station can be achieved within NR landownership					
I	Timescale		67 Months	39 months design, 22 months construction. Fails to achieve target timescale, full benefits not realised without SPO3. Timescales based on TWAO, high complexity design and disruptive access requirements.					
E	Technical Complexity			Complex structures and associated works.					
H	Consent Risk			Streetworks consents to improve access to Mirfield Station Car Park. Highway consents (temporary closure and diversion) for bridge redeck works. Unclear whether third party land required to deliver additional parking at Mirfield Station. As a precautionary approach TWAO is assumed. However if land can be secured by negotiation then only planning permission would be required. Prior approval may be required for Station works.					
J	Implementation Risks			Mine workings New riser walls in RoR- reduced disruption Staffing levels considered (Disruptives)					
C	Safety			Construction risks associated to grade separation including the new fly over. Risks associated to demolition of residential properties Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. There is a flood risk in this location. Benefits a portion of works can be constructed offline and the work at height risk is significantly reduced in comparison to other options					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£ cc	Mirfield Station Fasts North - GRIP2(costs included in SPO 13.3)					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.2 Bradley Junction to Mirfield East
Sub-Option Ref 14.2.14M 4-track Railway, Fasts to the North, P05 line speed or better, Mirfield Station
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Staging of the track slews and new station construction whilst maintaining services on the existing lines. Greater than anticipated disruption.</p> <p>Ground obstructions from historic station buildings and other rail infrastructure hindering the new subway construction (which may be a box jack).</p> <p>Electrification may effect the adjacent grade II listed River Bridge and associated consent issues.</p> <p>Poor access from the North side (due to low bridge) will restrict construction activities.</p> <p>Structures: Heritage: MVN2/192, 192A is grade II listed. MVN2/194, 196, 198, 200A and 200 are "possibly of special interest"</p>
Opportunities	<p>The existing main road access (Station Road) from Mirfield town centre has very restricted headroom clearance at the railway underbridge (signed at 3.2m). There may be an opportunity as part of this intervention to study ways of improving this e.g. a track lift through the station with a road lower (although drainage & flooding is an issue close to the River Calder). Provision of an improved access from the north side of the station.</p> <p>Adopt 110mph running on the fast line throughout this section to contribute towards journey time savings.</p> <p>Structures: Rationalisation of highway accesses under western land spans of MVN2/192 and 192A. MVN2/193 scheme including highway vertical realignment re-profiling to reduce bridge strike risk. Underbridge and culverts around Ladywood Road MVN2/199A, 200A, 200B and 200 are in various states of use / infilling – study to determine whether demolition / infilling possible for these crossings in close proximity.</p>
Assumptions	<p>Structures: MVN2/198 has been fully infilled – to be checked by intrusive works.</p>
Dependencies	<p>This sub-option depends on a grade separation being achieved for the fast lines in the Heaton Lodge area</p> <p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Mirfield station will be completely re-built to modern standards with step free access, improved lighting, signage, ticket office/waiting rooms and extended car parking	The existing low headroom road access will remain.

Total scheme cost inc. in SPO14.3

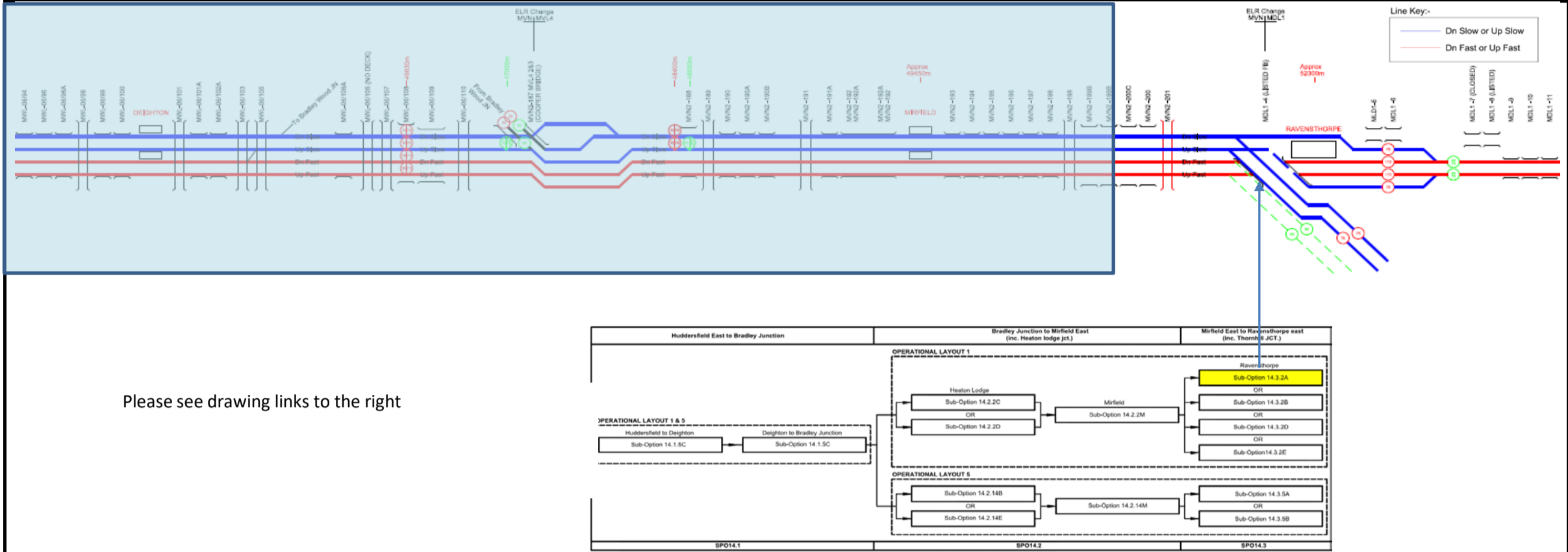
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Preferred sub-option for layout 5 but work to be suspended.

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2A 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade Separation at Ravensthorpe
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Please see drawing links to the right

Option Overview

Summary Description: This is one of a number of similar grade separation schemes proposed for the Ravensthorpe area which have some common features as follows:

- Ravensthorpe East Junction. At this junction the slow lines diverge or join the main fast through alignment from/to the outside therefore separating out conflicts (i.e. no train path crossings). The vertical grade separation geometry allows for the diverging up slow line to be passed over or under over the new fast line alignment.
- Linespeed. 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out. The resulting alignment moves further north at Thornhill Road which requires a small highway scheme to re-build an underbridge and retaining walls and re-align the road horizontally and vertically. Fall Lane would be permanently closed with new residential property accesses provided to the south and north side of the new underbridge.
- Ravensthorpe Station. The track layout gives the ability to simply platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access. There are many sub-variants on how this may be achieved (such as moving Thornhill LNW Junction to the east side of a two platform station or by staggering the junction around a three platform station), and these would be studied should the Ravensthorpe grade separation option be taken further forward.
- Calder Viaducts. The preferred option is to abandon the existing alignment over the cast iron grade II listed viaducts to get the best possible geometry for the new junction. As a consequence the proposed arrangement avoids the reconstruction of these viaducts. Alternatively the viaducts could be re-used for the down slow as a single line, although this would still most necessitate their reconstruction.

Sub-Option 14.3.2A is a dive-under grade separation with the Wakefield lines maintained on their current alignment. This geometry results in the dive-under structure being built in a phased operation around disruptive possessions on the Wakefield line or by staged slewings of the Wakefield line within its historical four track corridor. The depth of the cutting required and scale of retaining structures in the vicinity of the grade separation would be very difficult to achieve in the limited space available at this location. As the new fast lines pass well below the existing Calder road, a new bridge and associated highway diversion can be simply provided at the same level as the existing crossing (or raised to suit OLE requirements).

Permanent Way: The dive-under alignment is geometrically capable of 110mph. At this linespeed values Cant Deficiency are below Normal limiting values. Rates of Change in Cant and Rates of Change Deficiency are generally at or below Normal values for the Fast lines. On the approach to where the two track railway bifurcates into Fast and Slow lines, there is one instance of a transition with Rates of Change in Cant above Normal but less than Maximum permitted values. Similarly the Slow lines have an instance of Rates of Change in Cant above Normal but less than Maximum values. This option affords the opportunity to create an additional grade separated junction thereby simplifying the S&C to two single 70mph leads at 'Ravensthorpe East Junction' Thornhill Junction where the Wakefield Lines converge with the slow lines is a tradition 70mph flat junction. There is an opportunity to open this out to two leads and a crossover to remove the need for a switch diamond.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14.

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 for Calder Road highway diversion works.

Fast decent on upside to dive under between new retaining walls, then entering concrete box. Box constructed top-down to minimise possession / blockade requirement on Wakefield lines. Fasts and slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 abandoned. East of River Calder, new retaining wall to south limits land purchase around the waste recycling centre.

2 No underbridges rebuilt for new horizontal alignments: MDL1/9, 10.
MDL1/12 infilled.

Geotechnics: The dive-under is in an area of coal mining and former railway sidings so ground voids and obstructions may be a problem. Contaminated ground will most likely be encountered during excavations within the former quarry site for the dive-under approaches and viaduct foundations. Ravensthorpe cutting will need to be significantly widened to accept the new dive-under vertical alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting.

Environment, Consents & Sustainability: Anne Dugdale



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2A 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade Separation at Ravensthorpe
Date: 31/10/2017
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Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is complex. Off-line construction benefit for the earthworks and viaducts over the canal and River Calder. Platform build off-line of the Down Leeds platform Up Leeds platform will need to be constructed after final realignment of p/way. Bridge MVN2/202 will require a new road bridge constructed off-line and the exiting deck/substructure removed. This work will need to be done in advance of the main works. Construct additional section to MDL1/9 to take new alignment, including necessary retaining walls and embankment. Significant cutting and embankment works as well as construction of the new viaducts and the dive under box for the new fast lines. Disruptive access required for constructing the dive under box, connecting the new lines into existing and for the bridge reconstruction. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs					
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive	
					-	-	0	+	++	
Performance										
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options						
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options						
E	Train Length	provision for specified capacity		Ravensthorpe Station rebuilt. Flexible options						
B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Grade separation but via dive under						
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response.						
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy						
A		capacity for further growth		Not applicable, see main end to end options						
D	Operational Safety	layout risk assessment, residual hazards CSM review		Dive under Grade separated junction Grade separation with Wakefield lines maintaining existing alignment – significant constructability issues and impact on operational railway Requires pumping station and possible consent to discharge to River – potential confined space issues Significant excavation in contaminated ground, requiring remediation, and flood plain with major watercourses nearby and potential settlement issues Significant temporary works Fast and slow lines on new viaducts and new alignment – off track work Removes risk from existing condition of bridges over river and canal navigation No decision on what to do with existing Listed structures viaducts Potential significant waste off site (contaminated) Cutting slopes severe and requiring retaining structures and widening of Ravensthorpe cutting Unsupportive tending to Highly unsupportive due to deep excavation in contaminated land and risks with Wakefield on-line construction						
B	Operability	Support vision of future railway state		Grade separation helps advance towards future railway state						
B	Maintainability	Supports vision for future railway state		Coherent with future railway state and simpler mechanised maintenance and access						
F	Engineering	compliance to engineering and operational specifications		Non-compliant platform widths and overlaps						
Sustainability and Environmental										
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.						
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of extensive new viaduct. Visual impact of various bridge works, embankments, cutting, associated highway works						
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.						
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals						
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland.						
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.						

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SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
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		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation, long cut, is Grade II listed. The Ravensthorpe -Dewsbury Railway Bridge of the River Calder is also Grade II listed. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). Noted that listed footbridge would be removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is approximately 0.2 miles north west of the railway line. Noted new viaduct would be alongside listed bridge structures, potential to affect setting although avoids direct impacts.				
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.				
		National Trust Property		Not applicable.				
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.				
H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.				
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.				
H		Best and most versatile land		Not applicable.				
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths				
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.				
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.				
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.				
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed.				
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.				
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.				
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable				
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.				
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.				
H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.				
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.				
H		Assets of Community Value (ACV)		Not applicable				
Stakeholders								



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L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. The option removes a number of underbridges from the operational railway, which is welcome, particularly with respect to MDL1/6 & MDL1/8 which are currently of concern to the Structures RAM. It is noted that new or replacement structures are of preferred materials and it is assumed that these structures will comply with the requirements of the RRD.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Supportive; Local c/b: Neutral; Rail passengers: Supportive) The MP is in favour of upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option is likely to provide enhanced services in the area, in particular the improvements to – and additional services for – Ravensthorpe station, but could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings long-term benefits. Increased speeds, and improvements at Ravensthorpe station, bring significant benefits to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWAO.					
I	Timescale		55 Months	46 months design, 8 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements.					
E	Technical Complexity			Complex structures and associated works. Fasts dive under Wakefield lines. Less preferred					
H	Consent Risk			listed building consent to remove Ravensthorpe footbridge. Third party land required and planning permission for change of use of land. Assume TWAO.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Risks associated to construction and maintenance of OLE coupled with the risk incurred to lineside neighbours. Construction risks associated to grade separation. Development of stations along the route will impose construction risks but improve passenger safety. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. There is a flood risk in this location.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable (including slews around diveunder box) Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£360m to £398m	Ravensthorpe Fast South Dive-Under					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside (note that the widening of the cutting to the south of Thornhill LNW Junction takes some land that is currently part of the proposed housing development).</p> <p>Affects on utilities largely unknown or not investigated in detail at this stage (see assumptions)</p> <p>Construction of viaduct foundations and substructures within the River Calder flood plain</p> <p>The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction.</p> <p>General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes.</p> <p>Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk.</p> <p>Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating cement batching facility to NW of Ravensthorpe station to vacant land to the east in the Ravensthorpe Triangle. - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside <p>Down slow reuses existing alignment over Calder flood plain – omits need for new viaduct, but maintains MDL1/6 and 8 cast iron bridge risks.</p>
Assumptions	<p>This sub-option will not have a large impact on the existing HV power cables that cross the Ravensthorpe Area (one pylon near crest of cutting may need protective works or re-siting)</p> <p>Works can be staged whilst keeping the existing Ravensthorpe station in operation and temporary platforms are not required.</p> <p>MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
New junction at Ravensthorpe East gets rid of conflicted train movements (As GRIP2 or similar sub-options) and therefore improves junction time tabling opportunities and operational robustness in the case of perturbed train working.	Large land take (including part of wholesale acquisition of licensed landfill site). This includes some encroachment onto the land set aside in Kirklees CC local plan for the Dewsbury Riverside new town development.
Fast line alignment achieves 110mph throughout as an enhancement to the P05 line speed profile and adds to the journey time improvement. The dive-under scheme helps train acceleration in the up direction to make best use of this line speed capability.	Increased impact at Thornhill Road with some additional land purchase and highway re-alignment scheme.
Large scale regeneration opportunities are released in the Ravensthorpe area inc. ability to create a Parkway type station serving both the Leeds and Wakefield lines which can be planned in conjunction with the Dewsbury Riverside new town development (4000 homes)	Staging of the dive-under construction around the Wakefield lines and other alignment tie-ins/track slews may have a greater than anticipated impact on train services during construction particularly on the Wakefield lines.
Although a large scale scheme, environmental impacts may be less than other alternatives. Dive-under grade separation visually and acoustically hides the new fast line from current and future housing development. Some other redevelopment opportunities released by the scheme may have a positive environmental impact.	A dive-under alignment is most likely to require a wet well pumping shaft for drainage into the River Calder. This will require regular maintenance and associated operating costs throughout its life.
The Calder Viaducts (River Calder and Calder&Hebble Navigation bridges) may not be re-used by this scheme and abandoned. This avoids the difficult and risky reconstructions of these grade II listed cast iron structures.	Geotechnical risk (mining, groundwater, unforeseen conditions) during construction and in operation.
Impact at Calder Road is less than other Ravensthorpe schemes with flyover type schemes as road bridge can be re-provided at a similar level to existing.	

Total scheme cost £381,473,954

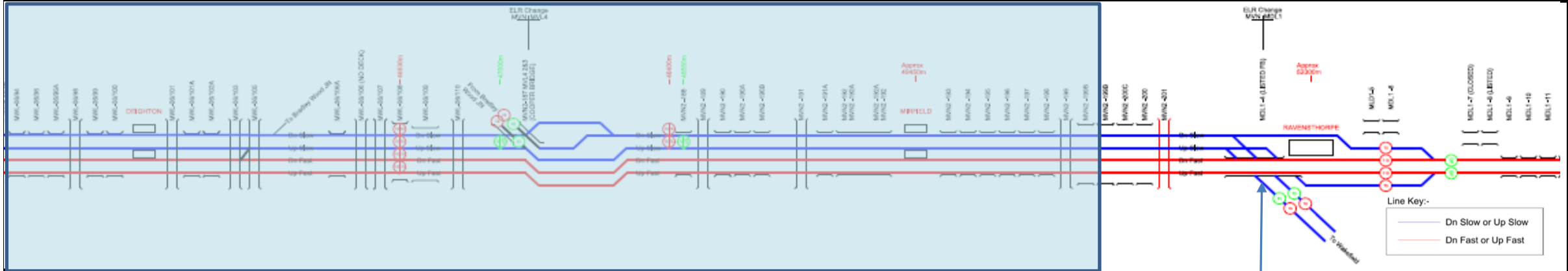
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Suspended due to non-compliant platform widths and overlaps

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

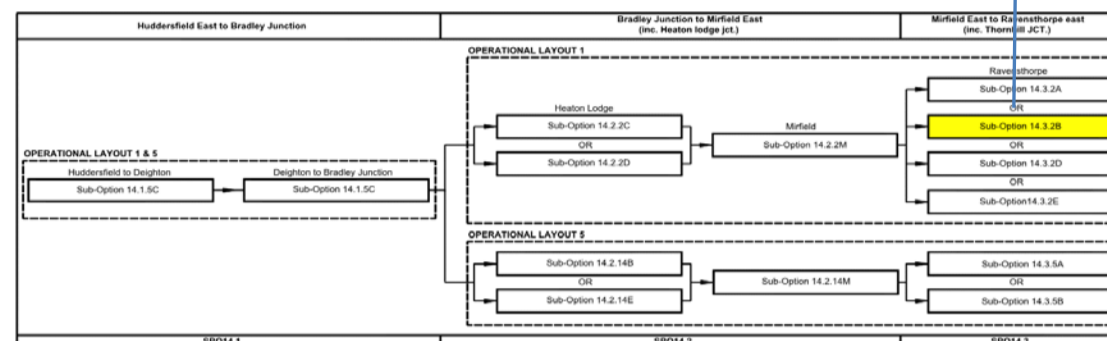
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Option Sketch



Please see drawing links to the right



Option Overview

Summary Description: This is one of a number of similar grade separation schemes proposed for the Ravensthorpe area which have some common features as follows:

- Ravensthorpe East Junction. At this junction the slow lines diverge or join the main fast through alignment from/to the outside therefore separating out conflicts (i.e. no train path crossings). The vertical grade separation geometry allows for the diverging up slow line to be passed over or under over the new fast line alignment.
- Linespeed. 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out. The resulting alignment moves further north at Thornhill Road which requires a small highway scheme to re-build an underbridge and retaining walls and re-align the road horizontally and vertically. Fall Lane would be permanently closed with new residential property accesses provided to the south and north side of the new underbridge.
- Ravensthorpe Station. The track layout gives the ability to simply platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access. There are many sub-variants on how this may be achieved (such as moving Thornhill LNW Junction to the east side of a two platform station or by staggering the junction around a three platform station), and these would be studied should the Ravensthorpe grade separation option be taken further forward.
- Calder Viaducts. The preferred option is to abandon the existing alignment over the cast iron grade II listed viaducts to get the best possible geometry for the new junction. As a consequence the proposed arrangement avoids the reconstruction of these viaducts. Alternatively the viaducts could be re-used for the down slow as a single line, although this would still most necessitate their reconstruction.

Sub-Option 14.3.2B is a flyover grade separation with the Wakefield lines maintained on their current alignment. This geometry results in the fast line alignment on flyover intersecting the existing Calder Road near to grade and therefore requires a large scale diversion of Calder Road as shown on the sub-option GA drawing (or stopping up and an alternative route found). The road diversion follows the route of an existing highway past Ravensthorpe Power Station and utilises an existing bridge (MDL 1/5) to pass under the existing Transpennine route. It then crosses the "Ravensthorpe Triangle" before passing beneath the Wakefield lines at a re-opened underbridge (Lee Hall Bridge) before re-connecting with existing highway network via a widened existing lane.

Permanent Way: The flyover alignment is geometrically capable of 110mph. At this linespeed values Cant Deficiency are below Normal limiting values. Rates of Change in Cant and Rates of Change Deficiency are generally at or below Normal values for the Fast lines. On the approach to where the two track railway bifurcates into Fast and Slow lines, there is one instance of a transition with Rates of Change in Cant above Normal but less than Maximum permitted values. Similarly the Slow lines have an instance of Rates of Change in Cant above Normal but less than Maximum values. This option affords the opportunity to create an additional grade separated junction thereby simplifying the S&C to two single 70mph leads at 'Ravensthorpe East Junction'. Thornhill Junction where the Wakefield Lines converge with the slow lines is a tradition 70mph flat junction. There is an opportunity to open this out to two leads and a crossover to remove the need for a switch diamond.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14.

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 for Calder Road highway diversion works (not rebuilt if diversion by alternative route). Fast climb on upside to flyover on new retaining wall above slows. Intersection structure is precast concrete portal over existing Wakefield lines alignment, and over slows on concrete box. Fasts and slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 abandoned. East of River Calder, new retaining wall to south limits land purchase around the waste recycling centre.
 2 No underbridges rebuilt for new horizontal alignments: MDL1/9, 10.
 MDL1/12 infilled.

Geotechnics: Former coal mining voids and shafts are likely to be encountered in this area. Contaminated ground will most likely be encountered during excavations within the former quarry site for the construction of viaduct foundations. Ravensthorpe cutting will need to be widened to accept the new fast line alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting.

Environment, Consents & Sustainability: Anne Dugdale



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Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is complex. Off-line construction benefit for the earthworks and viaducts over the canal and River Calder as well as the MDL lines. Platform build off-line of the Down Leeds platform Up Leeds platform will need to be constructed after final realignment of p/way. Bridge MVN2/202 will be removed after the road diversion. This work will need to be done in advance of the main works. Construct additional section to MDL1/9 to take new alignment, including necessary retaining walls and embankment. Significant cutting and embankment works as well as construction of the new viaducts for the new fast lines can be done off-line, however the fly-over box section carrying the fast lines over the MVN lines and the MDL up line will require significant possession access for the piling and portal works. The box section for the MDL up line can be done mainly off-line. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation.
S&T:
 OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		Ravensthorpe Station rebuilt. Flexible options					
B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Grade separation and space for opening out slows junction with Wakefield lines					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response.					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Flyover Grade separation - with Wakefield lines maintain existing alignment Grade separation with Wakefield lines maintaining existing alignment – significant constructability issues and impact on operational railway Excavation / piling in contaminated ground requiring remediation Requires stopping off and diversion of Calder Road and impact on new housing Significant working at height / working over water Fast and slow lines on new viaducts and new alignment – off track work Removes risk from existing condition of bridges over river and canal navigation No decision on what to do with existing Listed structures viaducts Unsupportive tending to due to deep excavation in contaminated land and risks with Wakefield on-line construction Ravensthorpe Stn on curve and slimmer platforms					
B	Operability	Support vision of future railway state		Grade separation helps advance towards future railway state					
B	Maintainability	Supports vision for future railway state		Coherent with future railway state and simpler mechanised maintenance and access					
F	Engineering	compliance to engineering and operational specifications		Non-compliant platform widths and overlaps					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of flyover structure. Visual impact of various bridge works, embankment new and widened, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.					

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		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation, long cut, is Grade II listed. The Ravensthorpe -Dewsbury Railway Bridge of the River Calder is also Grade II listed. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). Noted that listed footbridge would be removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is approximately 0.2 miles north west of the railway line. Noted new route of railway would be alongside listed bridge structures, potential to affect setting although avoids direct impacts.				
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.				
		National Trust Property		Not applicable.				
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.				
H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.				
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.				
H		Best and most versatile land		Not applicable.				
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths				
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.				
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.				
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.				
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed. Extensive highway works over a larger area.				
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.				
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.				
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable				
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.				
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.				
H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.				
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.				
H		Assets of Community Value (ACV)		Not applicable				
Stakeholders								



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2B 4-track Railway, Fasts to the South, P05 linespeed or better, Flyover Grade Separation at Ravensthorpe
Date: 31/10/2017
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L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. The option removes a number of underbridges from the operational railway, which is welcome, particularly with respect to MDL1/6 & MDL1/8 which are currently of concern to the Structures RAM. It is noted that new or replacement structures are of preferred materials and it is assumed that these structures will comply with the requirements of the RRD.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Supportive; Local c/b: Neutral; Rail passengers: Supportive) The MP is in favour of upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option is likely to provide enhanced services in the area, in particular the improvements to – and additional services for – Ravensthorpe station, but could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings long-term benefits. Increased speeds, and improvements at Ravensthorpe station, bring significant benefits to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWA0.					
I	Timescale		67 x Months	46 months design, 22 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWA0 requirements and disruptive access requirements (inc 5d blockade Spring 23					
E	Technical Complexity			Complex structures and associated works. Significant bridge works.					
H	Consent Risk			listed building consent to remove Ravensthorpe footbridge. Third party land required and planning permission for change of use of land. Assume TWA0.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Risks associated to construction and maintenance of OLE coupled with the risk incurred to lineside neighbours. Construction risks associated to grade separation including the new fly over. Development of stations along the route will impose construction risks but improve passenger safety. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. There is a flood risk in this location.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£371m to £410m	Ravensthorpe Fast South Flyover					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



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Date: 31/10/2017
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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside (note that the widening of the cutting to the south of Thornhill LNW Junction takes some land that is currently part of the proposed housing development and the proposed diversion of Calder Road).</p> <p>Effects on utilities largely unknown or not investigated in detail at this stage. However, it is likely that there will be some impact on overhead HV lines requiring diversions in advance of the works with associated programme risks.</p> <p>Construction of viaduct foundations and substructures within the River Calder flood plain</p> <p>The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction.</p> <p>General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes.</p> <p>Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk.</p> <p>Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating cement batching facility to NW of Ravensthorpe station to vacant land to the east in the Ravensthorpe Triangle. - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside. <p>Down slow reuses existing alignment over Calder flood plain – omits need for new viaduct, but maintains MDL1/6 and 8 cast iron bridge risks.</p>
Assumptions	<p>Works can be staged whilst keeping the existing Ravensthorpe station in operation and temporary platforms are not required.</p> <p>MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties.</p> <p>SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
New junction at Ravensthorpe East gets rid of conflicted train movements (As GRIP2 or similar sub-options) and therefore improves junction time tabling opportunities and operational robustness in the case of perturbed train working.	Large land take (including part of wholesale acquisition of licensed landfill site). This includes some encroachment onto the land set aside in Kirklees CC local plan for the Dewsbury Riverside new town development.
Fast line alignment achieves 110mph throughout as an enhancement to the P05 line speed profile and adds to the journey time improvement. (The viaduct gradient on the up line may prevent trains in diesel mode from achieving 110mph in the up direction i.e. better suited to OLE).	Increased impact at Thornhill Road with some additional land purchase and highway re-alignment scheme.
Large scale regeneration opportunities are released in the Ravensthorpe area inc. ability to create a Parkway type station serving both the Leeds and Wakefield lines which can be planned in conjunction with the Dewsbury Riverside new town development (4000 homes)	Staging of the flyover construction around the Wakefield lines and other alignment tie-ins/track slews may have a greater than anticipated impact on train services during construction particularly on the Wakefield lines and construction safety risks and inefficiencies
The Calder Viaducts (River Calder and Calder&Hebble Navigation bridges) may not be re-used by this scheme and abandoned. This avoids the difficult and risky reconstructions of these grade II listed cast iron structures.	Environmental impact greater than other similar schemes in the area as fast lines are close to grade in the vicinity of existing and proposed housing developments. Also large highway diversion required for Calder Road which will further impact on existing residential properties.

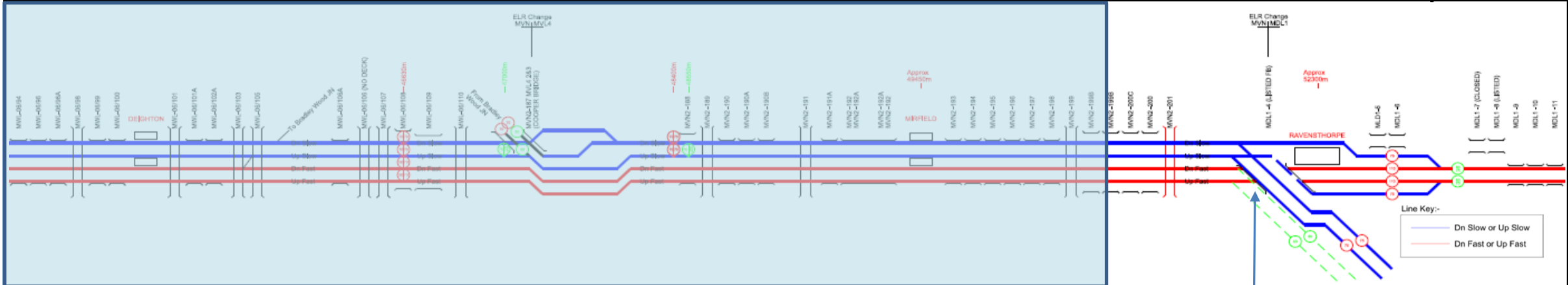
Total scheme cost £393,254,903

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Suspended due to non-compliant platform widths and overlaps

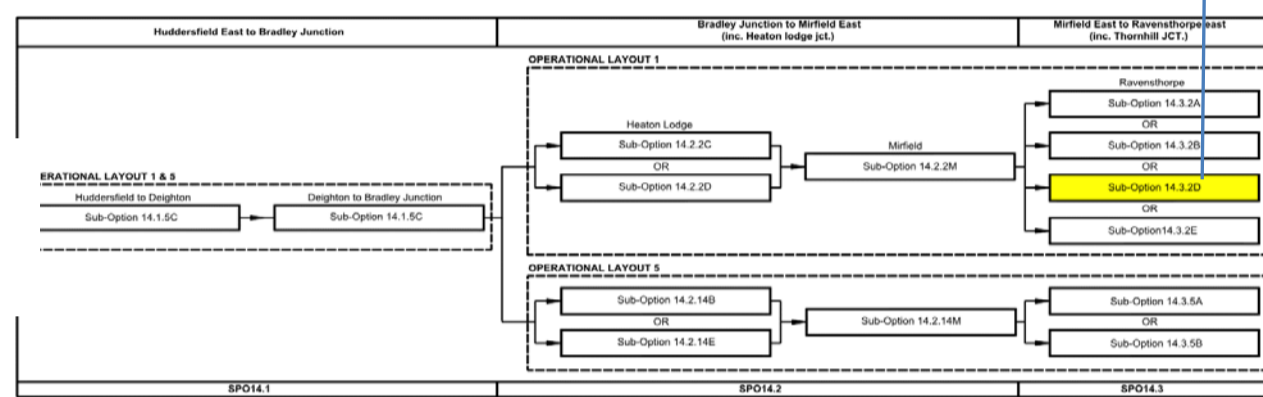
TRU SPO Option Appraisal Output : Option Capture Sheet

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Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
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Option Sketch



Please see drawing links to the right



Option Overview

Summary Description: This is one of a number of similar grade separation schemes proposed for the Ravensthorpe area which have some common features as follows:

- Ravensthorpe East Junction. At this junction the slow lines diverge or join the main fast through alignment from/to the outside therefore separating out conflicts (i.e. no train path crossings). The vertical grade separation geometry allows for the diverging up slow line to be passed over or under over the new fast line alignment.
- Linespeed. 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out. The resulting alignment moves further north at Thornhill Road which requires a small highway scheme to re-build an underbridge and retaining walls and re-align the road horizontally and vertically. Fall Lane would be permanently closed with new residential property accesses provided to the south and north side of the new underbridge.
- Ravensthorpe Station. The track layout gives the ability to simply platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access. There are many sub-variants on how this may be achieved (such as moving Thornhill LNW Junction to the east side of a two platform station or by staggering the junction around a three platform station), and these would be studied should the Ravensthorpe grade separation option be taken further forward.
- Calder Viaducts. The preferred option is to abandon the existing alignment over the cast iron grade II listed viaducts to get the best possible geometry for the new junction. As a consequence the proposed arrangement avoids the reconstruction of these viaducts. Alternatively the viaducts could be re-used for the down slow as a single line, although this would still most necessitate their reconstruction.

Sub-Option 14.3.2D is a flyover grade separation with the Wakefield lines slewed onto a new alignment into the triangle of land bounded by the existing rail corridors. This enables the grade separation location to be moved approximately 200m to the east and allows the fast line vertical alignment to pass under a re-aligned Calder Road (thereby avoiding a large scale road diversion). It also provides for a more optimum arrangement for off-line construction and slow line/Wakefield line re-alignment back through the existing cutting at Ravensthorpe including Ravensthorpe Station which can be re-constructed on straight track.

Permanent Way: The dive-under alignment is geometrically capable of 110mph. At this linespeed values Cant Deficiency are below Normal limiting values. Rates of Change in Cant and Rates of Change Deficiency are generally at or below Normal values for the Fast lines. On the approach to where the two track railway bifurcates into Fast and Slow lines, there is one instance of a transition with Rates of Change in Cant above Normal but less than Maximum permitted values. Similarly the Slow lines have a handful of instances of Rates of Change in Cant above Normal but less than Maximum values. This option affords to opportunity to create an additional grade separated junction thereby simplifying the S&C to two single 70mph leads at 'Ravensthorpe East Junction' Thornhill Junction where the Wakefield Lines converge with the slow lines is a tradition 70mph flat junction. There is an opportunity to open this out to two leads and a crossover to remove the need for a switch diamond. Ravensthorpe Station platform alignments are improved (more straight) in comparison to sub-options 14.3.2A and B.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14.

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 for Calder Road highway diversion works (not rebuilt if diversion by alternative route).

Fast climb on upside to flyover on new retaining wall above slows, then viaduct to the intersection. Intersection structure is offline construction concrete boxes: 1 No carrying fasts over 2 No Wakefield lines, 1 No over Up Slow. Fasts and slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 abandoned. East of River Calder, new retaining wall to south limits land purchase around the waste recycling centre.

2 No underbridges rebuilt for new horizontal alignments: MDL1/9, 10.

MDL1/12 infilled.

Geotechnics: Former coal mining voids and shafts are likely to be encountered in this area. Contaminated ground will most likely be encountered during excavations within the former quarry site for the construction of viaduct foundations. Ravensthorpe cutting will need to be widened to accept the new fast line alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting. Wakefield line to be realigned in an area where ground improvement is required.

Environment, Consents & Sustainability: Anne Dugdale



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Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is complex. Off-line construction benefit for the earthworks and viaducts over the canal and River Calder as well as the MDL lines. Platform build off-line of the Down Leeds platform Up Leeds platform (partially sufficient to be operational post blockade), remainder will need to be constructed after final realignment of p/way (in blockade). Bridge MVN2/202 will be removed after the road diversion and construction of the replacement structure. This work will need to be done in advance of the main works. Construct additional section to MDL1/9 to take new alignment, including necessary retaining walls and embankment. Significant cutting and embankment works as well as construction of the new viaducts for the new fast lines can be done off-line, however the fly-over box section carrying the fast lines over the MVN lines and the MDL up line can be constructed mainly off-line. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		Ravensthorpe Station rebuilt on straight alignment					
B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Grade separation and space for opening out slows junction with Wakefield lines					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response. 3 level railway may make access more restrictive					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Flyover Grade separation - with Wakefield lines on new alignment as 14.3.2B above Plus: Ravensthorpe Stn rebuilt on better alignment Flyover Grade separation - with Wakefield lines on new alignment meaning more Fast line work will be off line Excavation / piling in contaminated ground requiring remediation Significant working at height / working over water Avoids impact on Calder Road in 2B above Optimises off line construction Achieves 110mph with no exceedences Supportive subject to clarification: Does down slow re-uses exiting viaducts which are in poor condition and will require significant strengthening works Does work have significant impact on overhead HV Powerlines					
B	Operability	Support vision of future railway state		Grade separation helps advance towards future railway state					
B	Maintainability	Supports vision for future railway state		Coherent with future railway state and simpler mechanised maintenance and access					
F	Engineering	compliance to engineering and operational specifications		Compliant					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaducts (25 spans and 22 spans). Visual impact of various bridge works, embankment new and widened and cuttings, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.					



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		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation, long cut, is Grade II listed. The Ravensthorpe -Dewsbury Railway Bridge of the River Calder is also Grade II listed. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). Noted that listed footbridge would be removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is approximately 0.2 miles north west of the railway line. Noted new route of railway would be alongside listed bridge structures, potential to affect setting although avoids direct impacts.				
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.				
		National Trust Property		Not applicable.				
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.				
H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.				
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.				
H		Best and most versatile land		Not applicable.				
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths				
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.				
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.				
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.				
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed. Highway works over a larger area.				
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.				
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.				
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable				
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.				
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.				
H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.				
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.				
H		Assets of Community Value (ACV)		Not applicable				
Stakeholders								
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option						

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G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Supportive; Local c/b: Neutral; Rail passengers: Supportive) The MP is in favour of upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option is likely to provide enhanced services in the area, in particular the improvements to – and additional services for – Ravensthorpe station, but could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings benefits. Increased speeds, and improvements at Ravensthorpe, bring significant benefits to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWAO.					
I	Timescale		62 Months	39 months design, 13 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements					
E	Technical Complexity			Complex structures and associated works. Significant bridge works. Additional staging on Wakefield Lines					
H	Consent Risk			listed building consent to remove Ravensthorpe footbridge. Third party land required and planning permission for change of use of land. Assume TWAO.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Construction risks associated to grade separation including the new fly over. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. There is a flood risk in this location. Benefits avoids a major highway diversion and a portion of works can be constructed offline.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable and off-line construction better arranged and station recon location improved Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£421m to £466m	Ravensthorpe Fasts South Flyover - Wakefield Diversion					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside (note that the widening of the cutting to the south of Thornhill LNW Junction takes some land that is currently part of the proposed housing development, but less than dive-under options). Effects on utilities largely unknown or not investigated in detail at this stage. However, it is likely that there will be some impact on overhead HV lines requiring diversions in advance of the works with associated programme risks. Construction of viaduct foundations and substructures within the River Calder flood plain The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction. General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes. Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk. Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Wakefield line diversion releases land for potential train depot/maintenance facility site or private industrial/commercial re-development - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating cement batching facility to NW of Ravensthorpe station to vacant land to the east in the Ravensthorpe Triangle. - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside. <p>Down slow reuses existing alignment over Calder flood plain – omits need for new viaduct, but maintains MDL1/6 and 8 cast iron bridge risks.</p>
Assumptions	<p>Works can be staged whilst keeping the existing Ravensthorpe station in operation and temporary platforms are not required. MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
New junction at Ravensthorpe East gets rid of conflicted train movements (As GRIP2 or similar sub-options) and therefore improves junction time tabling opportunities and operational robustness in the case of perturbed train working.	Large land take (including part of wholesale acquisition of licensed landfill site). This includes some encroachment onto the land set aside in Kirklees CC local plan for the Dewsbury Riverside new town development.
Fast line alignment achieves 110mph throughout as an enhancement to the P05 line speed profile and adds to the journey time improvement. (The viaduct gradient on the up line may prevent trains in diesel mode from achieving 110mph in the up direction i.e. better suited to OLE).	Increased impact at Thornhill Road with some additional land purchase and highway re-alignment scheme.
Large scale regeneration opportunities are released in the Ravensthorpe area inc. ability to create a Parkway type station serving both the Leeds and Wakefield lines which can be planned in conjunction with the Dewsbury Riverside new town development (4000 homes). Also potential to release land for a new train depot/maintenance facility on the footprint of the existing Wakefield line corridor.	Overall environmental impact. However, potentially a reduced impact in comparison to 14.3.2B as the alignment is much lower as it passes areas of residential property or proposed future development.
The Calder Viaducts (River Calder and Calder&Hebble Navigation bridges) may not be re-used by this scheme and abandoned. This avoids the difficult and risky reconstructions of these grade II listed cast iron structures.	Geotechnical risk increased compared to 14.3.2B - ground improvement work over landfill for realigned Wakefield lines
Impact at Calder Road is reduced with the fast line alignment lowered sufficiently so that the side road diversion works are very localised (in comparison to 14.3.2B)	
More of the construction can be completed off-line with staged diversions onto completed sections of work. Reduced impacts of train services during construction, safer working, reduced construction risk generally.	

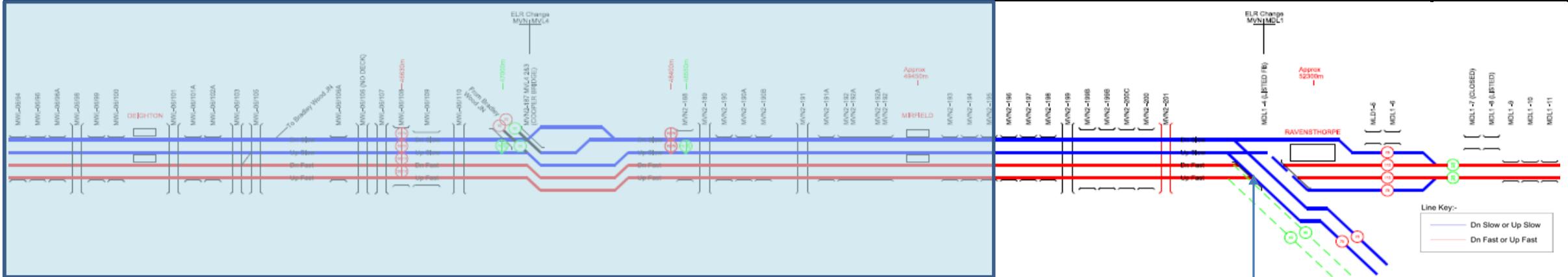
Total scheme cost £446,840,751

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
Preferred Option

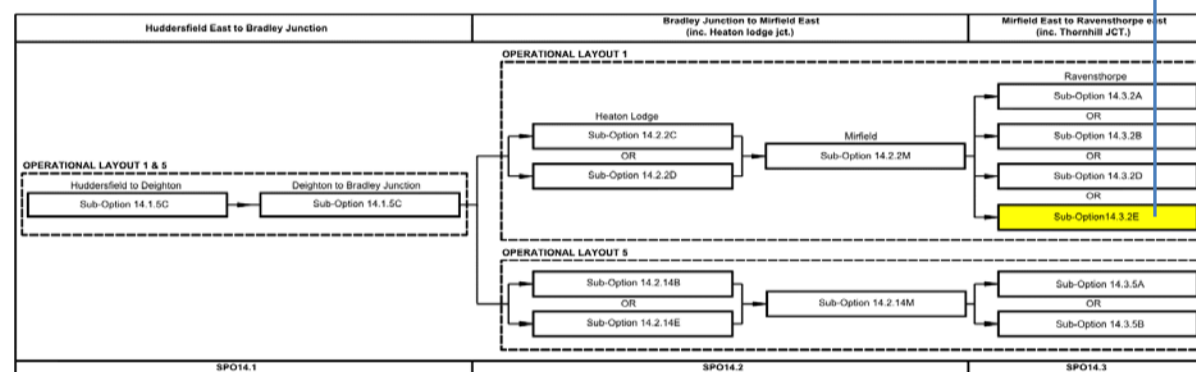
TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2E 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade separation at Ravensthorpe with diverted Wakefield Lines
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Please see drawing links to the right



Option Overview

Summary Description: This is one of a number of similar grade separation schemes proposed for the Ravensthorpe area which have some common features as follows:

- Ravensthorpe East Junction. At this junction the slow lines diverge or join the main fast through alignment from/to the outside therefore separating out conflicts (i.e. no train path crossings). The vertical grade separation geometry allows for the diverging up slow line to be passed over or under the new fast line alignment.
- Linespeed. 110mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road straightened out. The resulting alignment moves further north at Thornhill Road which requires a small highway scheme to re-build an underbridge and retaining walls and re-align the road horizontally and vertically. Fall Lane would be permanently closed with new residential property accesses provided to the south and north side of the new underbridge.
- Ravensthorpe Station. The track layout gives the ability to simply platform all slow lines at Ravensthorpe, including the Wakefield lines, in a compact arrangement near to the Calder Road access. There are many sub-variants on how this may be achieved (such as moving Thornhill LNW Junction to the east side of a two platform station or by staggering the junction around a three platform station), and these would be studied should the Ravensthorpe grade separation option be taken further forward.
- Calder Viaducts. The preferred option is to abandon the existing alignment over the cast iron grade II listed viaducts to get the best possible geometry for the new junction. As a consequence the proposed arrangement avoids the reconstruction of these viaducts. Alternatively the viaducts could be re-used for the down slow as a single line, although this would still most necessitate their reconstruction.

Sub-Option 14.3.2E is a dive-under grade separation with the Wakefield lines slewed onto a new alignment into the triangle of land bounded by the existing lines. This enables the grade separation location to be moved approximately 200m to the east and allows for an optimum arrangement for off-line construction with the dive-under structure being constructed in advance with the slewed Wakefield lines subsequently diverted over the top. This sub-option also results in a more optimum eventual track alignment back through the existing cutting at Ravensthorpe including Ravensthorpe Station which can be re-constructed on straight track.

Permanent Way: The flyover alignment is geometrically capable of 110mph. At this linespeed values Cant Deficiency are below Normal limiting values. Rates of Change in Cant and Rates of Change Deficiency are generally at or below Normal values for the Fast lines. On the approach to where the two track railway bifurcates into Fast and Slow lines, there is one instance of a transition with Rates of Change in Cant above Normal but less than Maximum permitted values. Similarly the Slow lines have a handful of instances of Rates of Change in Cant above Normal but less than Maximum values. This option affords the opportunity to create an additional grade separated junction thereby simplifying the S&C to two single 70mph leads at 'Ravensthorpe East Junction' Thornhill Junction where the Wakefield Lines converge with the slow lines is a tradition 70mph flat junction. There is an opportunity to open this out to two leads and a crossover to remove the need for a switch diamond. Ravensthorpe Station platform alignments are improved (more straight) in comparison to sub-options 14.3.2A and B.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14.

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 for Calder Road highway diversion works.

Fast decent on upside to dive under between new retaining walls, then entering concrete box. Box constructed offline. Fasts and slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 abandoned. East of River Calder, new retaining wall to south limits land purchase around the waste recycling centre.

2 No underbridges rebuilt for new horizontal alignments: MDL1/9, 10.

MDL1/12 infilled.

Geotechnics: The dive-under is in an area of coal mining and former railway sidings so ground voids and obstructions may be a problem. Contaminated ground will most likely be encountered during excavations within the former quarry site for the dive-under approaches and viaduct foundations. Ravensthorpe cutting will need to be significantly widened to accept the new dive-under vertical alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting. Wakefield line to be realigned in an area where ground improvement is required.

Environment, Consents & Sustainability: Anne Dugdale



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2E 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade separation at Ravensthorpe with diverted Wakefield Lines
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Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is complex. Off-line construction benefit for the earthworks and viaducts over the canal and River Calder as well as the MDL and MVN lines. Platform build off-line of the Down Leeds platform Up Leeds platform (partially sufficient to be operational post blockade), remainder will need to be constructed after final realignment of p/way (in blockade). Bridge MVN2/202 will be removed after the road diversion and construction of the replacement structure. This work will need to be done in advance of the main works. Construct additional section to MDL1/9 to take new alignment, including necessary retaining walls and embankment. Significant cutting and embankment works as well as construction of the new viaducts for the new fast lines can be done off-line, however the dive under box section carrying the fast lines under the MVN lines and the MDL up line can be constructed mainly off-line. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					--	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		Ravensthorpe Station rebuilt on straight alignment					
B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Grade separation (dive under) and space for opening out slows junction with Wakefield lines.					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response. 3 level railway may make access more restrictive. Dive under for fasts					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Dive under Grade separation with Wakefield lines on new alignment Issues as 14.3.2A Requires pumping station and possible consent to discharge – potential confined space issues Significant excavation in contaminated ground, requiring remediation, and flood plain with major watercourses nearby and potential settlement issues Significant temporary works Fast and slow lines on new viaducts and new alignment – off track work Removes risk from existing condition of bridges over river and canal navigation No decision on what to do with existing Listed structures viaducts Potential significant waste off site (contaminated) Cutting slopes severe and requiring retaining structures and widening of Ravensthorpe cutting Unsupportive tending to Highly unsupportive due to deep excavation in contaminated land – better option than 3.2.A sub-option will not have a large impact on the existing HV power cables that cross the Ravensthorpe Area (
B	Operability	Support vision of future railway state		Grade separation helps advance towards future railway state					
B	Maintainability	Supports vision for future railway state		Coherent with future railway state and simpler mechanised maintenance and access					
F	Engineering	compliance to engineering and operational specifications		Compliant					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaduct . Visual impact of various bridge works, embankment new and widened and cuttings, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.					

TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2E 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade separation at Ravensthorpe with diverted Wakefield Lines
Date: 31/10/2017
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		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation, long cut, is Grade II listed. The Ravensthorpe -Dewsbury Railway Bridge of the River Calder is also Grade II listed. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). Noted that listed footbridge would be removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is approximately 0.2 miles north west of the railway line. Noted new route of railway would be alongside listed bridge structures, potential to affect setting although avoids direct impacts.				
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.				
		National Trust Property		Not applicable.				
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.				
H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.				
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.				
H		Best and most versatile land		Not applicable.				
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths. Drainage and storage issues of operating a dive under in a flood zone noted.				
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.				
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.				
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.				
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed. Highway works over a larger area.				
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.				
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.				
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable				
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.				
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.				



TRU SPO Option Appraisal Output : Option Capture Sheet

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Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2E 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade separation at Ravensthorpe with diverted Wakefield Lines
Date: 31/10/2017
Revision: P04 - Final Issue

H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		No exceptional cant deficiencies noted. Option includes new earthworks and it is assumed that these will be in accordance with the RRD. The option removes a number of underbridges from the operational railway, which is welcome, particularly with respect to MDL1/6 & MDL1/8 which are currently of concern to the Structures RAM. It is noted that new or replacement structures are of preferred materials and it is assumed that these structures will comply with the requirements of the RRD.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		The MP is in favour of upgrade works along transpennine route, but specific views on work involved in SPO 14 aren't known. This option is likely to provide enhanced services in the area, in particular the improvements to – and additional services for – Ravensthorpe station, but could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings benefits. Increased speeds, and improvements at Ravensthorpe, bring significant benefits to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWAO.					
I	Timescale		62 Months	46 months design, 11 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements (inc 2 x blockades).					
E	Technical Complexity			Complex structures and associated works. Significant bridge works and geotechnical complexity. Additional staging on Wakefield Lines					
H	Consent Risk			listed building consent to remove Ravensthorpe footbridge. Third party land required and planning permission for change of use of land. Assume TWAO.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Construction risks associated to grade separation including the new dive under. Development of stations along the route will impose construction risks but improve passenger safety. Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. Excavation and construction risks associated to working in the River Calder flood plane.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable but more complex Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£417m to £461m	Ravensthorpe Fast South Dive-Under - Wakefield Diversion					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ XX						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

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Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.2E 4-track Railway, Fasts to the South, P05 linespeed or better, Diveunder Grade separation at Ravensthorpe with diverted Wakefield Lines
Date: 31/10/2017
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Risks	<p>Key Risks, Opportunities, Assumptions & Dependencies</p> <p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside (note that the widening of the cutting to the south of Thornhill LNW Junction takes some land that is currently part of the proposed housing development, but less than dive-under options). Effects on utilities largely unknown or not investigated in detail at this stage (see assumptions). Construction of viaduct foundations and substructures within the River Calder flood plain The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction. General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes. Reconstruction of Calder Viaducts (may be abandoned by this option) has a high consent and cost associated risk. Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Significant regeneration opportunities at Ravensthorpe including:</p> <ul style="list-style-type: none"> - Wakefield line diversion releases land for potential train depot/maintenance facility site or private industrial/commercial re-development - Potential for creating a NE corridor towards Dewsbury for a Ravensthorpe relief road (Kirklees Council aspiration) by utilising the abandoned section of railway corridor. - Potential for re-locating cement batching facility to NW of Ravensthorpe station to vacant land to the east in the Ravensthorpe Triangle. - Development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside. <p>Down slow reuses existing alignment over Calder flood plain – omits need for new viaduct, but maintains MDL1/6 and 8 cast iron bridge risks.</p>
Assumptions	<p>This sub-option will not have a large impact on the existing HV power cables that cross the Ravensthorpe Area (one pylon near crest of cutting may need protective works or re-siting) Works can be staged whilst keeping the existing Ravensthorpe station in operation and temporary platforms are not required. MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

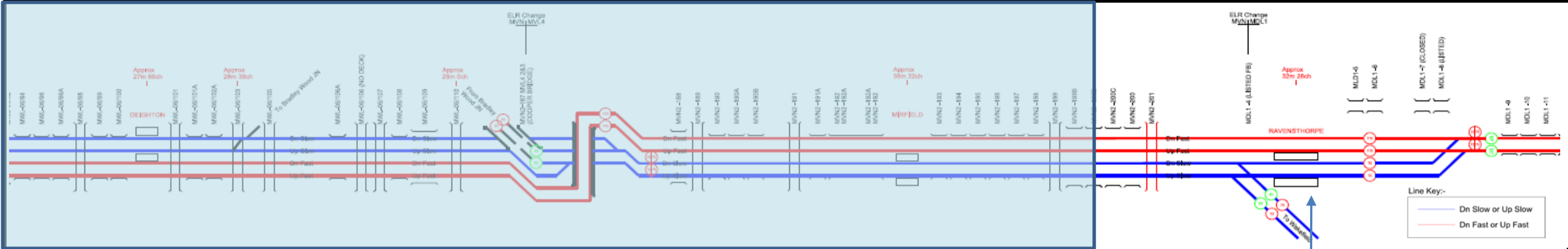
Summary of benefits	
Benefits	Dis-benefits
New junction at Ravensthorpe East gets rid of conflicted train movements (As GRIP2 or similar sub-options) and therefore improves junction time tabling opportunities and operational robustness in the case of perturbed train working.	Large land take (including part of wholesale acquisition of licensed landfill site). This includes some encroachment onto the land set aside in Kirklees CC local plan for the Dewsbury Riverside new town development.
Fast line alignment achieves 110mph throughout as an enhancement to the P05 line speed profile and adds to the journey time improvement. The dive-under scheme helps train acceleration in the up direction to make best use of this line speed capability.	Increased impact at Thornhill Road with some additional land purchase and highway re-alignment scheme.
Large scale regeneration opportunities are released in the Ravensthorpe area inc. ability to create a Parkway type station serving both the Leeds and Wakefield lines which can be planned in conjunction with the Dewsbury Riverside new town development (4000 homes). Also potential to release land for a new train depot/maintenance facility on the footprint of the existing Wakefield line corridor.	A dive-under alignment is most likely to require a wet well pumping shaft for drainage into the River Calder. This will require regular maintenance and associated operating costs throughout its life.
The Calder Viaducts (River Calder and Calder&Hebble Navigation bridges) may not be re-used by this scheme and abandoned. This avoids the difficult and risky reconstructions of these grade II listed cast iron structures.	increased geotechnical risk - deep excavations, ground improvement for Wakefield lines interventions
Impact at Calder Road is less than other Ravensthorpe schemes with flyover type schemes as road bridge can be re-provided at a similar level to existing.	
More of the construction can be completed off-line with staged diversions onto completed sections of work. Reduced impacts of train services during construction	
Although a large scale scheme, environmental impacts may be less than other alternatives. Dive-under grade separation visually and acoustically hides the new fast line from current and future housing development. Some other redevelopment opportunities released by the scheme may have a positive environmental impact.	
Total scheme cost	£442,171,407

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject

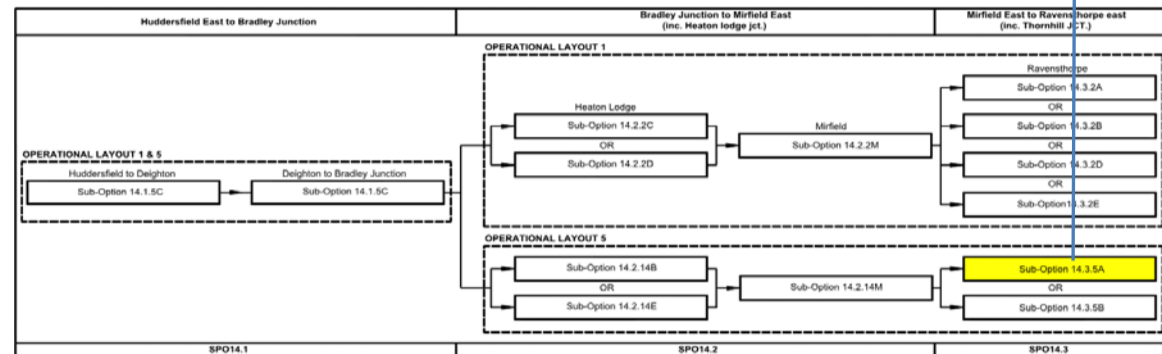
TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.5A 4-track Railway, Fasts to the North, P05 linespeed or better, GRIP2 Scheme
Date: 31/10/2017
Revision: P04 - Final Issue

Option Sketch



Please see drawing links to the right



Option Overview

Summary Description: At this location the fast lines as they approach from Mirfield simply diverge at grade to the northeast towards Dewsbury and Leeds. Two viable sub-options have been developed which are the GRIP2 scheme and a variant which proposes a higher line speed (see sub-option 14.3.5B). Some of the common features of both options developed at Ravensthorpe are:

- Ravensthorpe East Junction. This new at grade switch diamond crossing introduces some conflicting train movements for the down slow over the up fast. However, with this geometry up slow trains can be stabled on the four track section to wait for a clear path and therefore do not necessarily impact on the fast services.
- Line Speed. 100mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road smoothed. (Note sub-option 14.3.5B proposes an enhanced 110mph alignment)

Sub-Option 14.3.5A is the GRIP2 scheme. Minor modifications have been made to the track geometry around the Thornhill Road reverse curves to achieve a compliant design at the desired 100mph linespeed. The slow lines diverge South at the new Ravensthorpe East junction and cross the River Calder floodplain and Calder & Hebble Navigation by means of a new twin track viaduct. This new alignment forms an approx. 1km long loop back to the reconfigured Thornhill LNW Junction allowing Ravensthorpe station to be re-built further to the east with compliant signalling overlap lengths to protect the junction. The fast lines will continue to use the existing alignment over the life-expired Calder viaducts which will require reconstruction.

Permanent Way: The GRIP 2 alignment is geometrically capable of 100mph at Normal values of Cant and Cant Deficiency and capable of 105mph at above Normal values of Cant Deficiency. At 100mph values of Rate of Change in Cant lie between Normal and Maximum and feature sub-2 second element length around Thornhill Road, however have been developed further to bring these values closer to Normal. Ravensthorpe East Junction is a traditional flat double junction with switch diamond with limited opportunities to revise to two leads and a crossover.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14. It should be noted that there are two listed bridge structures over the River Calder and the Calder & Hebble navigation which may pose consents issues for mounting of OLE structures

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 if electrified.

Slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 carries fast lines.

Geotechnics: Former coal mining voids and shafts are likely to be encountered in this area. Contaminated ground will most likely be encountered during excavations within the former quarry site for the construction of viaduct foundations. Ravensthorpe cutting will need to be widened to accept the new fast line alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting.

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is fairly simple. Off-line construction benefit for the earthworks and bridges over the canal and River Calder. Partial platform build off-line of the Up Leeds platform; Down Leeds platform and remainder of Up platforms can be completed post blockade- meaning station might need to be closed. Fast lines can be built off-line following diversion of traffic to the new slow lines. Bridge MVN2/202 will be reconstructed and MVN2/201 will be reconstructed. Move bridge MDL1/9 to take new alignment- to be done in the blockade. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation. New station parking to be constructed.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					-	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		Ravensthorpe Station rebuilt					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.5A 4-track Railway, Fasts to the North, P05 linespeed or better, GRIP2 Scheme
Date: 31/10/2017
Revision: P04 - Final Issue

B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Traditional double junction					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response.					
B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Ravensthorpe at grade switch diamond crossing – conflicting move potential Fast lines continue on life expired (listed) viaducts – require significant strengthening and may need exceptional values for linespeed New twin track viaduct to south for slow lines Significant track slues and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction Unsupportive tending to Highly unsupportive because of proposal to construct new viaduct and retain existing which are in poor condition					
B	Operability	Support vision of future railway state		(Concern over potential crossing moves Down Slow/Up fast) Ops safety issue?					
B	Maintainability	Supports vision for future railway state		Coherent with future railway state					
F	Engineering	compliance to engineering and operational specifications		Compliant					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaduct (MDL 1/4), replacement and modification works to various bridges including the Grade II listed Calder and Hebble canal under bridge, plus MDL 1/9 and MDL 1/10; replacement of MVN2/201 Hunger Hill Lane, MVN2/202 Calder Road and 202A Gas Pipe Bridge; removal of Ravensthorpe Grade II listed bridge; new Ravensthorpe Station and associated highway works and parking. Visual and landscape impact of embankments new and widened and cuttings, associated highway works					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCs)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland. It is anticipated that protected species would be encountered during construction and that a comprehensive CEMP would incorporate best practice ecological management and mitigation measures.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation and the River Calder are Grade II listed and would be impacted by this option. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). The station would be closed and the footbridge removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is approximately 0.2 miles north west of the					
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.					
		National Trust Property		Not applicable.					
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
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Date: 31/10/2017
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H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.					
H		Best and most versatile land		Not applicable.					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths.					
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works < 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed. New highway access to new station location.					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/ road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.					
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.					
H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option		Retains MDL1/6 and 8.					
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Neutral; Local c/b: Neutral; Rail passengers: Supportive) The MP is in favour of upgrade works along the transpennine route, but specific views on work involved in SPO 14 aren't known. This option could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development, but provides redevelopment of Ravensthorpe station, including the possibility of tying in with the new development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings benefits. Increased speeds, and improvements at Ravensthorpe station, bring benefits to rail users					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWAO.					
I	Timescale		62 Months	46 months design, 14 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements (inc 2 x 5d blockade Summer 22).					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
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E	Technical Complexity			Complex structures and associated works. Calder Viaduct reconstruction for the Fasts. May be more complex because of consents requirements					
H	Consent Risk			Listed building consent to remove Ravensthorpe footbridge and carry out works to MDL1/8 and MDL1/6. Third party land required and planning permission for change of use of land. Assume TWAO. Station Closure procedure.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Development of stations along the route will impose construction risks but improve passenger safety . Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. Excavation and construction risks associated to working Work at height risks associated to working at height on the new viaduct and working on the existing viaduct.					
J	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£267m to £295m	Ravensthorpe Fasts North - GRIP2					
K	Life Cycle Cost	at SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



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Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside. Affects on utilities largely unknown or not investigated in detail at this stage. (see assumptions) Construction of viaduct foundations and substructures within the River Calder flood plain The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction. General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes. Extensive reconstruction of Calder Viaducts has a high consent and cost associated risk. Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Regeneration opportunity at Ravensthorpe for development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside. If not electrified, potential to re-use of MVN2/202 (Calder Road) with no need for highway diversion.</p>
Assumptions	<p>This sub-option will not have a large impact on the existing HV power cables that cross the Ravensthorpe Area. MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Fast line alignment achieves 100mph in accordance with the desired P05 line speed profile and adds to the journey time improvement over this section.	New junction at Ravensthorpe East creates some conflicting train moves at the diamond crossing (although fast lines services should not be affected as train can be stabled on the down slow)
Impact at Calder Road is manageable with the bridge requiring reconstruction either on line or as a localised side road diversion.	Some impact at Thornhill Road with land purchase and reconstruction of a bridge and retaining walls in a restricted location.
Overall environmental impact fairly neutral with main impact being views over the Calder Valley floodplain and the listed Calder viaducts.	River Valder viaduct and the Calder&Hebble Navigation viaduct are life expired structures and will need to be reconstructed. These are grade II listed structures and therefore carry a high consent and related cost risk.
Much of the construction can be completed off-line with staged diversions onto completed sections of work. Reduced impacts of train services during construction	Proposed location of Ravensthorpe station is more remote from the principal road and footway access points. It will be difficult to access for mobility impaired users. Also location is not as suitable for creating a new Parkway type station for adjacent development.
Moderate land take in the Calder Valley in comparison to the "Fasts to the South" alternatives.	

Total scheme cost £281,964,186

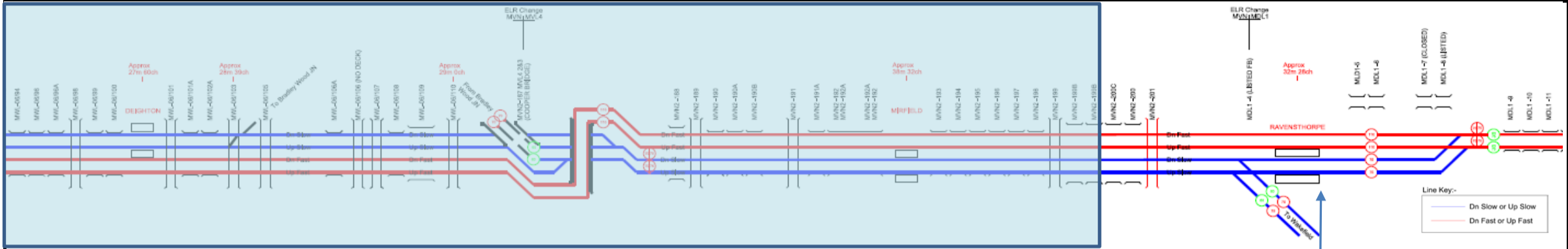
Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Preferred option for layout 5 but work to be suspended due to consents risks at Heaton Lodge.

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

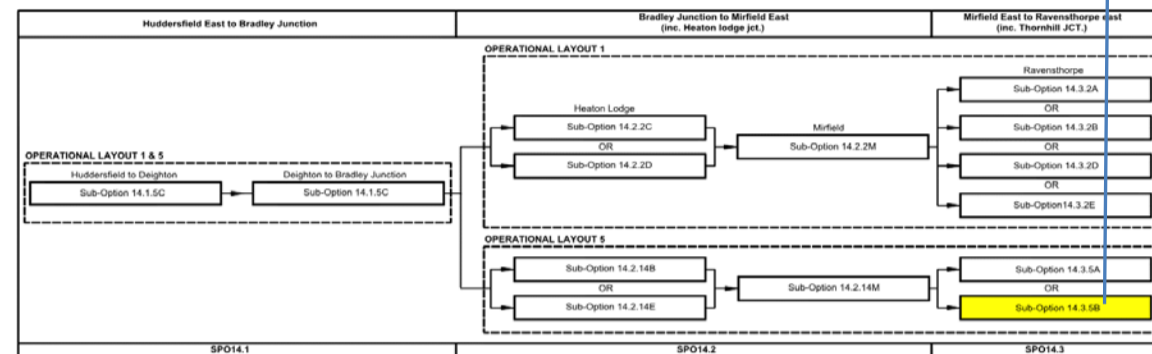
TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.5B 4-track Railway, Fasts to the North, P05 linespeed or better, Enhanced GRIP2 Scheme avoiding Calder Bridges
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Option Sketch



Please see drawing links to the right



Option Overview

Summary Description: At this location the fast lines as they approach from Mirfield simply diverge at grade to the northeast towards Dewsbury and Leeds. Two viable sub-options have been developed which are the GRIP2 scheme (see sub-option 14.3.5A) and a variant which proposes a higher line speed. Some of the common features of both options developed at Ravensthorpe are:

- **Ravensthorpe East Junction.** This new at grade switch diamond crossing introduces some conflicting train movements for the down slow over the up fast. However, with this geometry up slow trains can be stabled on the four track section to wait for a clear path and therefore do not necessarily impact on the fast services.
- **Line Speed.** 100mph capable through alignment for the fast lines with the existing speed/geometry limiting reverse curve near to Thornhill Road smoothed. (Note sub-option 14.3.5B proposes an enhanced 110mph alignment).

Sub-Option 14.3.5B is a variant of the GRIP2 scheme to produce a 110mph capable alignment to maximise the linespeed opportunity in the area. This sub-option replicates some of the features of the "fasts to the south" sub-options whereby the Calder viaduct alignment is abandoned in favour of a new four track viaduct over the Calder floodplain and canal and therefore requires a greater land take. In addition the alignment back towards Dewsbury is straightened to remove the reverse curve near Thornhill Road.

Permanent Way: The GRIP 2 development alignment is geometrically capable of 110mph at Normal values of Cant and Cant Deficiency. All Slow geometry is within Normal values Ravensthorpe East Junction is a traditional flat double junction with switch diamond with limited opportunities to revise to two leads and a crossover.

Signalling: Refer to SPO3 for costs and commentary on the signalling system. Through this section there are no particular items that affect option selection for SPO14.

OLE: Refer to SPO4 for costs and commentary on the OLE system. Through this section there are no particular items that affect option selection for SPO14.

Structures: 2 No overbridges rebuilt: MVN2/201 for widened track bed; MVN2/202 for Calder Road highway diversion works.

Fasts and slows cross River Calder flood plains on new viaducts: existing alignment including cast iron arches of MDL1/6 and 8 abandoned. East of River Calder, new retaining wall to south limits land purchase around the waste recycling centre.

2 No underbridges rebuilt for new horizontal alignments: MDL1/9, 10.
MDL1/12 infilled.

Geotechnics: Former coal mining voids and shafts are likely to be encountered in this area. Contaminated ground will most likely be encountered during excavations within the former quarry site for the construction of viaduct foundations. Ravensthorpe cutting will need to be widened to accept the new fast line alignment and to re-grade the existing over steep slopes. Weak weathered rock is likely to be encountered in the base of the cutting.

Environment, Consents & Sustainability: Anne Dugdale

Constructability: The option utilises traditional construction techniques and equipment for all disciplines. Access for this intervention will be challenging due to ground conditions, contaminated land and disruption to surrounding areas. Land take required. Access for construction is reasonably good after alterations to existing roads in the area. Staging is fairly simple. Off-line construction benefit for the earthworks and bridges over the canal and River Calder. Platform build off-line of the Up Leeds platform; Down Leeds platform partial, remainder will need to be constructed after final realignment of p/way (in blockade). Fast lines can be built off-line, and completed post blockade. Bridge MVN2/202 will be removed after the road diversion and construction of the replacement structure. This work will need to be done in advance of the main works. Move bridge MDL1/9 to take new alignment- to be done in the blockade. The permanent way will require new S&C, at the tie-ins at both ends as well as new track. New troughing routes and track drainage will be created. Sufficient areas available for construction/staging area adjacent to the PowerStation.

S&T:

OLE: All works to be conducted with the main civils, trackbed works. Installation of wire and anchoring/tie-in with ends to be done in RoR possessions

Lead Expert Area	Criteria	Criteria Definition	Measurable Contribution / Impact	Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
					Highly unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
					-	-	0	+	++
Performance									
A	Journey Time	contribution to the system outputs for journey time	x minutes JT	Not applicable, see main end to end options					
A	Train Capacity	provision for specified capacity		Not applicable, see main end to end options					
E	Train Length	provision for specified capacity		Ravensthorpe new station					
B	Train Performance	Reliability of infrastructure		Little improvement in overall reliability and additional assets. Traditional double junction					
B		Number of Incidents / response time		Moderate improvement in accessibility including diversion options to assist response.					



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B		Resilience (ability to recover)		4 tracking provides a 2 track railway system resilience/redundancy					
A		capacity for further growth		Not applicable, see main end to end options					
D	Operational Safety	layout risk assessment, residual hazards CSM review		Ravensthorpe at-grade switch diamond crossing – conflicting move potential New 4 track viaduct constructed mainly off line Achieves 110mph with no exceptional values Abandonment of existing listed structures – not clear on what will be required to leave Diversion of Calder Road Neutral in that benefit of new viaduct is weighed against retention of at-grade junction on high speed line and associated mtce thereof..					
B	Operability	Support vision of future railway state		(Concern over potential crossing moves Down Slow/Up fast) Ops safety issue?					
B	Maintainability	Supports vision for future railway state		Coherent and moves towards future railway state					
F	Engineering	compliance to engineering and operational specifications		Minor cant deficiency exceedances that can be removed					
Sustainability and Environmental									
H	Landscape/Townscape - Visual	National Park; Areas of Outstanding Natural Beauty		Not applicable.					
H		Visual impact, landscape and townscape impacts		Visual and landscape impacts of new viaduct (MDL 1/4), replacement and modification works to various bridges including: MVN2/202 and 202A and removal of Ravensthorpe Grade II listed bridge: potential road diversion associated with MDL1/5; new Ravensthorpe Station and associated highway works and parking. Visual and landscape impact of embankments new and widened and cuttings, associated highway works. Noted no works to MVN2/201 Hunger Hill Lane.					
H	Ecology - Biodiversity	International (designated, proposed and compensatory) - SAC, SPA and Ramsar		Not applicable.					
H		National- National Nature Reserve, SSSI, Ancient Woodland and 'Veteran Trees', limestone pavement orders		This part of the route is within the risk area of a SSSI. Within such areas the local planning authority would consult with Natural England on relevant development proposals					
H		Local - Local Nature Reserve, Tree Preservation Orders, Sites of Importance for Nature Conservation (SINCS)		The Lower Spen Wildlife Area (LNR) in Ravensthorpe is approx 0.3 miles north west of the railway. It comprises woodland, scrubland, meadow and wetland. It is anticipated that protected species would be encountered during construction and that a comprehensive CEMP would incorporate best practice ecological management and mitigation measures.					
H	Cultural Heritage	International - UNESCO World Heritage Site		Not applicable.					
		National - Grade I and II* listed buildings; Grade I and II* registered parks and gardens; Scheduled Monuments		The Calder and Hebble Navigation Greenwood Lock is Grade II listed. The Lock at New Cut Top at the junction with the River Calder is Grade II listed. The Ravensthorpe-Dewsbury Railway Bridge over the Calder and Hebble Navigation and the River Calder are Grade II listed and their setting would be impacted by this option, although direct impact is avoided. Buildings on the North and South Platforms at Ravensthorpe Station are also Grade II listed (weather boarded with hipped slate roof with red brick stacks with modified cornices, single storey. Sash windows divided into 9 lights. Panelled doors. Wooden pilasters support cast-iron brackets with ornamental pierced spandrels, to canopies (now gone). Nook shafted wooden posts supported canopy where it continued beyond building to east. Gates to station with diagonal planking and iron spikes. Plain iron footbridge, possibly contemporary but with recent decking). The station would be closed and the footbridge removed under this option. Thornhill Lees Hall is Grade I listed, the Barn immediately to its North East is Grade II listed, the second hall (to the south west of Lees Hall) is Grade II* listed. On Huddersfield Road no 120, the Church of St Paulinus and the Church of St Matthew are Grade II listed. The Grade II listed (Registered Park and Garden) Dewsbury Cemetery is 0.26 miles north west of the railway. The Crow Nest Registered Park and Garden, also Grade II listed is					
		Local - Conservation Areas		The area around Thornhill Rectory Park forms part of the Thornhill Conservation Area.					
		National Trust Property		Not applicable.					
	Air Quality	Air Quality Management Areas		Construction would generate dust and other airborne pollutants. It is anticipated that a comprehensive CEMP would incorporate best practice measures to minimise air pollution as far as is reasonably practicable.					

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H	Noise and Vibration	Sensitivity of potential receptor		Construction work would generate noise and vibration. On line work would involve night working. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures to minimise noise and vibration as far as is reasonably practicable.					
H	Soils and Geology	Geological SSSI; Regionally Important Geological and Geomorphological Sites (RIGS)		The Town Planning Manager advises that the potential development area near the River Calder forms part of a minerals safeguarded area. Within minerals safeguarding areas provision is to be made for extraction prior to construction unless it can be demonstrated that the mineral is no longer of any value, the proposed development is temporary or there is an overriding need for the development proposed. Coal mining and mining features noted on drawings.					
H		Best and most versatile land		Not applicable.					
H	Water Environment	Flood Risk Areas, Water quality (Ground water source protection zones/major aquifers)		This is an area of high/medium flood risk from the River and reservoir flooding, there are also areas at risk of surface water flooding along roads and paths.					
H	Carbon Footprint	Rail Carbon Tool		Embodied carbon of works > 25,000 tonnes CO2e using standard RSSB carbon safety tool estimates for standard elements.					
H	Resilience	Route Weather Resilience & Climate Change Adaptation (WRCCA) Plan high and medium priority impact areas.		All medium and high climate impacts are considered avoidable or able to be adequately addressed through mitigation. NB: works proposed pass through localised areas identified with medium to high risk of flooding.					
H	Local wellbeing	Network Rail Social Performance themes		Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. However, proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction.					
H	Transport	Transport impacts on the local community through the transport of materials, waste and employees.		Construction would generate additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan. Bridge closures, replacements and associated highway works proposed. New highway access to new station location.					
H		Impacts on connectivity for local community.		Local road closures and associated works will have a significant impact on connectivity for the local community during construction/road closures (especially given the urban nature of this area). However may be long term benefits to the local community during the operational stage through improved rail links from local stations to towns and cities along the transpennine route.					
H	Resource Management	Waste, material use and reuse, water use		Construction would use materials, generate waste and associated additional traffic movements on local roads. It is anticipated that a comprehensive CEMP would incorporate standard best practice measures including a Traffic Management Plan and Site Waste management Plan.					
H	Land use / Amenity	Allotments; Village Greens, Common Land		Not applicable					
H		National Cycle Network, long distance walking trails		National Cycle Route 69 crossing the railway at the West Riding Union Bridge, following the route of a dismantled railway.					
H		Public open space (parks) and Public Rights of Way;		Footpaths follow the banks of the River Calder and connecting navigations.					
H		Recreational waterways		Users of the River Calder, navigational channels and their associated tow paths.					
H		Other sensitive receptors (community & education facilities, residential etc.)		Residential areas, commercial land uses, recreational areas.					
H		Assets of Community Value (ACV)		Not applicable					
Stakeholders									
L	Network Rail Route Asset Management	Level of support from Route Asset Management for option							
G	Stakeholders external to Network Rail	Stakeholders impacted by works by type and influence; considering previous relationship with network rail; potential conflict with stakeholders; impact on community/businesses		(MPs: Neutral; LAs: Neutral; Local c/b: Neutral; Rail passengers: Supportive) The MP is in favour of upgrade works along the transpennine route, but specific views on work involved in SPO 14 aren't known. This option could lead to conflict with Kirklees Council over encroachment onto planned Dewsbury Riverside development, but provides redevelopment of Ravensthorpe station, including the possibility of tying in with the new development. Impact on the nearby community, and businesses, could be significant, as well as impact on residents (including changes to roads and access), but the interference brings benefits. Increased speeds, and improvements at Ravensthorpe station, bring benefits to rail users.					
Deliverability									
G	Availability of sufficient land	For example some land uses might prevent development - hazardous facilities, important community facilities (hospitals); contaminated land; Crown Land		Third party land acquisition required. Assume TWAO.					
I	Timescale		62 Months	46 months design, 14 months construction. Partially achieves target timescale, full benefits not realised without SPO3. Timescales based on medium complexity design, TWAO requirements and disruptive access requirements (inc 2 x 5d blockade Summer 22).					



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.5B 4-track Railway, Fasts to the North, P05 linespeed or better, Enhanced GRIP2 Scheme avoiding Calder Bridges
Date: 31/10/2017
Revision: P04 - Final Issue

E	Technical Complexity			Multiple Complex structures and associated works.					
H	Consent Risk			Listed building consent to remove Ravensthorpe footbridge. Third party land required and planning permission for change of use of land. Assume TWAO. Station Closure procedure.					
J	Implementation Risks			Mine workings Offline benefit for elements (Fast lines, platforms, earthworks) Staffing levels considered (Disruptives)					
C	Safety			Development of stations along the route will impose construction risks but improve passenger safety . Risks associated to major excavations are required with respect to subways, lift shafts and embankment cutting works. There is also a risk of mine workings in this location. Work at height risks associated new bridge construction. Interface with National Grid power lines. Excavation and construction risks. Benefit of offline construction.					
J	Constructability	Consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction		Staging viable Disruptive access required (track/civils & signalling) Access considered and accounted for Utilises traditional techniques and equipment					
Cost									
K	Capital Cost		£309m to £341m	Ravensthorpe Fast North - Enhanced GRIP2					
K	Life Cycle Cost	At SPO level evaluation of differences between options and key issues. No monetary value defined.	£ xx						
Value									
K	Cost : Benefit Ratio	Considering journey time in particular note the cost per second of providing the journey time benefit. This does not include for capacity or performance benefits as measured above but allows a comparison between similar options							



TRU SPO Option Appraisal Output : Option Capture Sheet

SPO Number and Description: 14 - Huddersfield East to Ravensthorpe East Re-modelling
Sub-Area Ref 14.3 Mirfield East to Ravensthorpe East
Sub-Option Ref 14.3.5B 4-track Railway, Fasts to the North, P05 linespeed or better, Enhanced GRIP2 Scheme avoiding Calder Bridges
Date: 31/10/2017
Revision: P04 - Final Issue

Key Risks, Opportunities, Assumptions & Dependencies	
Risks	<p>Stakeholder consultation and associated preferences/concerns, in particular Kirklees Council and developers of Dewsbury Riverside. Effects on utilities largely unknown or not investigated in detail at this stage. (see assumptions) Construction of viaduct foundations and substructures within the River Calder flood plain The "Ravensthorpe Triangle" is an ex-quarry site which is currently licensed as landfill site. Therefore there is a risk of contaminated materials and poor ground for construction. General ground risks especially in existing Thornhill LNW Junction cutting inc. old mine workings, made ground, groundwater springs, over steep slopes. Significant track slews and/or tie-ins are required in the vicinity of Ravensthorpe station and Thornhill LNW Junction. In this section limited track access will be available and the full impact on existing train services during construction is not fully known at this stage.</p>
Opportunities	<p>Regeneration opportunity at Ravensthorpe for development of a integrated interchange station and park/ride facility at Ravensthorpe in conjunction with development of Dewsbury Riverside. Down slow reuses existing alignment over Calder flood plain – omits need for new viaduct, but maintains MDL1/6 and 8 cast iron bridge risks. If not electrified, potential to re-use of MVN2/202 with no need for highway diversion.</p>
Assumptions	<p>This sub-option will not have a large impact on the existing HV power cables that cross the Ravensthorpe Area. MDL1/4 Ravensthorpe Station Footbridge will be delisted – is Grade II listed by association with other station buildings which have been demolished.</p>
Dependencies	<p>The TWAO process is dependent on third parties. SPO14 is dependant on the construction and development of both SPO3 (signalling) and SPO13 (Huddersfield Station Remodelling) Each of these SPO will have some bearing on the proposed SPO14 option.</p>

Summary of benefits	
Benefits	Dis-benefits
Fast line alignment achieves 110mph throughout as an enhancement to the P05 line speed profile and adds to the journey time improvement. The dive-under scheme helps train acceleration in the up direction to make best use of this line speed capability.	New junction at Ravensthorpe East creates some conflicting train moves at the diamond crossing (although fast lines services should not be affected as train can be stabled on the down slow)
Impact at Calder Road is manageable with the bridge requiring reconstruction either on line or as a localised side road diversion.	Increased impact at Thornhill Road with some additional land purchase and highway re-alignment scheme (although potentially easier to construct as an off-line scheme)
The Calder Viaducts (River Calder and Calder&Hebble Navigation bridges) may not be re-used by this scheme and abandoned. This avoids the difficult and risky reconstructions of these grade II listed cast iron structures.	Slightly increased land take in the Calder Valley in comparison to the GRIP2 option (14.3.5A).
Much of the construction can be completed off-line with staged diversions onto completed sections of work. Reduced impacts of train services during construction	Proposed location of Ravensthorpe station is more remote from the principal road and footway access points. It will be difficult to access for mobility impaired users. Also location is not as suitable for creating a new Parkway type station for adjacent development.
Moderate land take in the Calder Valley in comparison to the "Fasts to the South" alternatives.	

Total scheme cost £320,619,417

Expert Panel Decision - Recommend / Develop Appendices / Hold /Reject
 Work to be suspended on layout 5 due to consents risks at Heaton lodge.

Record of Expert Panel and Consultees Attendees
 As per attached expert panel minutes and attendance sheet.

Transpennine Route Upgrade Programme Delivery Group

SUBJECT: SPO 14 Huddersfield East to Ravensthorpe – Major Remodelling

SPONSOR: Kieran Dunkin

PREPARED BY: Hayley Robinson

DATE: 6th October 2017

1. Purpose

This paper is to brief Programme Delivery Group on the progress with development activities for SPO 14 Huddersfield East to Ravensthorpe – Major Remodelling and seek approval of the indicative preferred option, so that it may be considered in the Single Development Option process.

2. Background

The SPO 14 Huddersfield East to Ravensthorpe – Major Remodelling scheme was defined as part of the Single Programme Approach as approved by North of England Programme Board in July 2016 (Ref Board Paper DBP030-Updated).

The scheme supports the objectives when delivered alongside other infrastructure enhancements as part of Transpennine Route Upgrade (LNE001a).

3. Current Position

Further development work of options post GRIP2 has identified a number of feasible options. These options are detailed in the Option Selection Summary in appendix A and have been presented to TRU Development Steering Group on 22nd September 2017. The Development Steering Group endorsed the indicative preferred option to be:

- Option 1A - Fast lines to the South throughout: A new junction at Ravensthorpe East where the slow lines diverge, this provides a flyover grade separation at Ravensthorpe taking the fast lines over the diverging Wakefield lines and the Up slow before running through Mirfield. The fast lines sweep to the south at Heaton Lodge, off-line from the existing track alignments before running through Deighton to Huddersfield.

Development of appendices for another option debated at expert panel will be continued to help inform SDO combinations. In summary this is:

- Option 1B - As option 1A, but with a dive-under grade separation at Ravensthorpe.

The options that have been suspended at this stage are detailed in the option selection report. In summary they are:

- Option 5A - At grade double junction separates fast lines to the North through Ravensthorpe and then Mirfield before passing across the slow lines to the South via a flyover grade separation at Heaton Lodge Junction. Four tracking with fast lines to the south then continue through Deighton to Huddersfield.
- Option 5B - As option 5A, but with a dive-under grade separation at Heaton Lodge.

This project will be assessed in combination with the other TRU enhancements to form the Single Development Option report. This may bring back some of the suspended options that in combination with other schemes deliver alternative scenarios.

To support SDO scenario combinations the Option Capture Summary (Appendix A) includes an option which summarises the work required for the railway to contribute towards the delivery of the high level output performance metric only. These are the minimum works required to prevent a significant degradation of asset reliability triggered by the increase in services, commencing in 2019. For example, an increase in the gross tonnage of traffic on some sections of the route.

4. Way Forward

The recommendation is to progress GRIP stage 3 including outline design based on the indicative preferred option. This development phase will be funded through available CP5 funding within LNE001a Transpennine Route Upgrade.

5. Decisions Required from Programme Delivery Group

TRU Programme Delivery Group is requested to:

1. **APPROVE** the indicative preferred option (1A) that will form part of the Single Development Option as part of the Transpennine Route Upgrade programme (LNE001a) submission in December 2017.
2. **NOTE** GRIP3 development will progress, based upon the preferred option (1A) and will be funded from available CP5 funding within LNE001a Transpennine Route Upgrade.
3. **NOTE** appendices production for Option 1B will continue to inform the SDO combinations.

End

Appendix A – Option Selection Summary

DRAFT

ENGINEERING AND DESIGN

PROOF OF EVIDENCE

Appendix 2

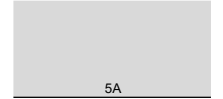
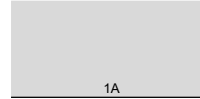
Validation Panel April 2018

Validation Panel 2 - Validation Criteria

SPO 14



Grey-shaded boxes indicate the score given to this option at expert panel stage.



Lead Expert Area	Expert	Criteria	Criteria Definition
Performance			
A	Mark Coyle	Journey Time	contribution to the system outputs for journey time
A	Mark Coyle	Train Capacity	provision for specified capacity
E		Train Length	provision for specified capacity
B		Train Performance	Reliability of infrastructure
B			Number of Incidents / response time
B	Mark Coyle		Resilience (ability to recover)
A	Mark Coyle		capacity for further growth
D	Jason Markland	Operational Safety	layout risk assessment, residual hazards CSM review
B	Mark Coyle	Operability	Support vision of future railway state
B	James Fannon	Maintainability	Supports vision for future railway state
F	Dave Gallagher / Shahbaz Khan	Engineering	compliance to engineering and operational specifications

Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
	Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
	--	-	0	+	++
				x	
				x	
				x	
				x	
				x	
Generally supportive except for neutral view at Mirfield because staging is more difficult than Layout 5 options.			x	x	
				x	
				x	
Assumes normal values				x	

Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
	Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
	--	-	0	+	++
				x	
				x	
			x		
			x		
				x	
Generally neutral but unsupportive for concerns with Dive under and associated additional contaminated land work in flood plain and requiring permanent pumping solution.		x	x		
				x	
Maintenance around pumping station			x		
Assumes normal values				x	

Notes - including key issues, impacts or contribution to objectives	Contribution to Outputs				
	Highly Unsupportive	Unsupportive	Neutral	Supportive	Highly Supportive
	--	-	0	+	++
				x	
				x	
			x		
			x		
				x	
Although much improved compared to today, this design incorporates an additional conflicting move (UF v DS) at Ravensthorpe and therefore provides a further constraint to the construction of future timetables.			x		
Significant 900m viaduct constructed on Flood plain. Major visual impact and similar outputs can be achieved utilising less resources. At grade junctions at Ravensthorpe introduces additional conflicting moves and retention of existing Calder Viaduct structures to carry lines is not preferred.			x		
				x	
Unsupportive due to access for maintenance.		x			
			x		

H	Pam Butler	Local wellbeing	Network Rail Social Performance themes
H	Pam Butler	TranSingle Program Asset management Option	Transport impacts on the local community through the transport of materials, waste and employees.
H	Pam Butler		Impacts on connectivity for local community.
H	Pam Butler	Resource Management	Waste, material use and reuse, water use
H	Pam Butler	Land use / Amenity	Allotments; Village Greens, Common Land
H	Pam Butler		National Cycle Network, long distance walking trails

Proposals are likely to support at least one of NR Social Performance themes e.g. making travel accessible and supporting Britain's economic development. Proposals may negatively impact on some of NR Social Performance Themes such as 'being a caring neighbour' due to significant noise during construction. In the long term the proposal is likely to support some of the NR Social Performance Themes e.g. making travel accessible and supporting Britain's economic development.				X		
Material generation through all 3 options will also be significant but more so in 1B				X		
Construction activity would generate additional vehicle movements on local roads. It is anticipated that bridge works would require temporary road closures and diversions.				X		
Area of landfill impacted, may require removal of waste in 1B. Material generation through all 3 options will also be significant but more so in 1B				X		
no direct impact					X	
potential impacts during construction, opportunities for others to consider options presented by redundant viaducts over viaduct to act as public areas/footpaths/cycle ways				X		

H	Pam Butler	Consent Risk	TWAO etc
J	Mokhtar Mohammed	Implementation Risks	
C	Jason Markland	Safety	
J	Mokhtar Mohammed	Constructability	consider staging viability, ease of access, disruptive possession requirements, impact on ops and maintenance during construction, construction and environment and safety in construction
Cost			

Options needs to be able to demonstrate need case to support TWAO	X				
Structures built generally above ground, access reasonable. Embryonic construction details only available, methodologies likely to be relatively simple with robust details.			X		
Significant risk with the construction of the flyover. Potential risks associated with temporary works, Earthworks and embankment works. Construction risks with large retaining structures and importing large quantities of back fill materials. Significant risk with proximity of HV overhead cables and unknown ground conditions. Working in or about a water course (Training Walls) also has significant risks when constructing the tie in viaduct.		X			
Subject to additional detail, it is envisaged that with local track slews and RoR construction of the flyover solution is practicable and preferable to Option 1B				X	
Cost					

	X				
Due to deep excavation significant additional risk from track movement due to settlement due to removal of lateral support. Permanent longitudinal drainage liable to produce a sump at the cross-over point with a pumping shaft and rising main.		X			
Significant risks associated to the construction of the dive under. Significant risk with proximity of High Pressure Gasmain Pipe. Potential risks associated with temporary works, Earthworks and embankment works. Construction risks with large retaining structures and importing large quantities of back fill materials. Significant risk with Working in or about a water course (training Walls) also has significant risks when constructing the tie in viaduct.		X			
Ground risks extensive given the 'dive under' philosophy. Potential top down methodologies may mitigate movements and buildability concerns however carry significant cost disbenefits. Detail level available inadequate to further elaborate.			X		
Cost					

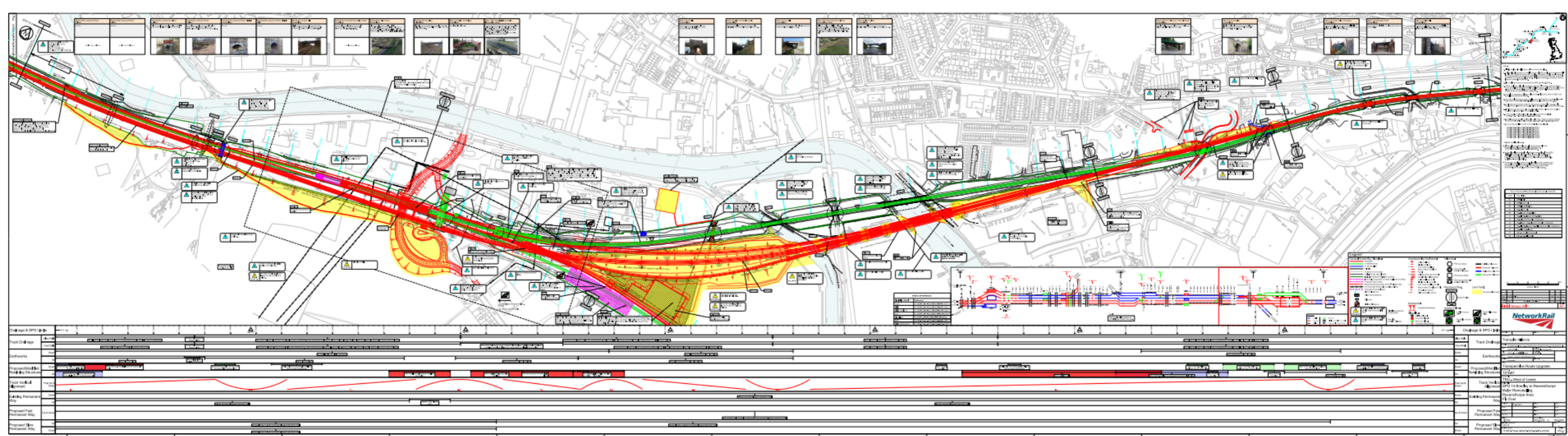
	X				
Inadequate detail to review with any level of authority, however the degree of interface with addition structures is greater than for Option 1B and thus this is likely to be less preferred			X		
While this would be an "off line " build with exception to the tie ins, the Significant risks and overall construction complexity and subsequent Maintenance risks associated to the construction of the grade separation fly over is unsupportive. Potential risks associated with temporary works, Earthworks and embankment works. Construction risks with large retaining structures and importing large quantities of construction materials. Significant impact on lineside neighbours with land take and close proximity alignment to existing		X			
The wholesale slew of slow lines to south is likely to produce additional works scope. Compared to the 1A option so this would be constructable to less preferred. Mokhtar to review.			X		
Cost					

ENGINEERING AND DESIGN

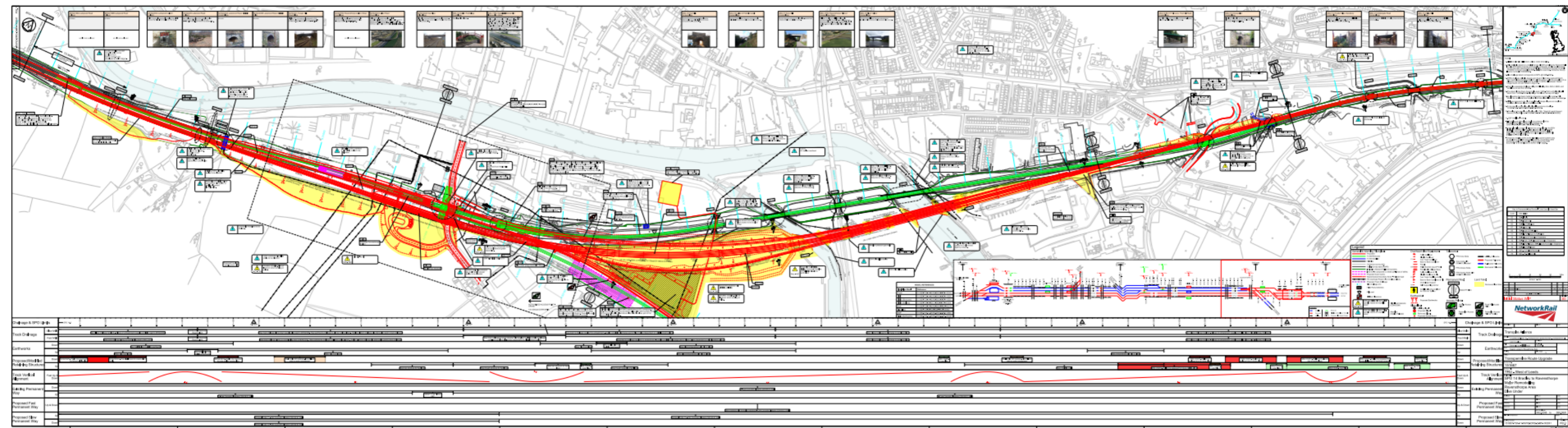
PROOF OF EVIDENCE

Appendix 2

Engineering Review June 2019



Option 1A - Ravensthorpe Flyover Grade Separation GA



Option 1B - Ravensthorpe Dive-under Grade Separation GA

Appraisal of Engineering Criteria Incorporating Comments from Engineering Review 21 June 2019 (Rev 3)

Engineering Criteria	Description	Flyover				Dive-Under			
Line Speed	The same speed (70 mph) is achieved through the junction on slow lines in both options.								
Line Speed	Normal Operations: Both layouts achieve 110 mph on the fast lines. Accelerating out of Dewsbury to 110 mph is reached before the uphill gradient for the flyover.								
Line Speed	Perturbed Operations: If a train is approaching the flyover at a lower line speed than optimum (e.g. in a perturbation situation) then the upward gradient will reduce acceleration compounding any delay. However, this effect is considered to be negligible.								
Operations & Capacity	Both options equally facilitate ITSS1.1 and contribute significantly towards the target PPM%.								
Operations & Capacity	Both options equally provide resilience in perturbed working and maintenance (line-block) situations.								
Operations & Capacity	In both options, a new station is constructed to the west of Thornhill Junction allowing both the Leeds and Wakefield lines to be platformed.								
Operations & Capacity	Penny Robinson: "the risk of flooding which would cause severe service disruption if it happened and a reliance on pumps is less than ideal and increases the maintenance burden."								
Safety	Emergency egress for non-PRMs can be provided at the Leeds end of the platforms via Calder Road overbridge in the Dive-Under option, but not in the Flyover option.								
Safety	The Flyover option necessitates the plan realignment of Calder Road. This introduces tight bends in order to tie into the Dewsbury Riverside roundabout. Sighting issues can be mitigated through provision of verges.								
Safety	In the Flyover option, the S&C is enclosed within a box structure. This increases the derailment risk ("above average") with respect to the Dive-Under and makes it harder to maintain. It is likely that this can be mitigated by switching to a double junction arrangement.								
Safety	The Flyover structures involve less than half the concrete works cf. the Dive-Under whilst the earthwork volumes are only 10% higher. Hence, it is suggested that less construction work is involved in the Flyover and hence it is marginally safer.								
Safety	There is more working at height in the Dive-Under option.								
Safety	Penny Robinson: "Being below ground is less preferential to being above ground from an access and egress perspective but this could be managed."								
Safety	The extent of "red zone" is the same in both options.								
Capital Cost	The estimate of direct cost is 11% higher for the Dive-Under option (£133M cf. £120M). However: 1) Land cost is expected to be higher in the Flyover option due to the impact on the Newlay site. 2) There is greater opportunity to reduce the cost of works in the Dive-Under option owing to the significantly greater extent of structures. Consequently, cost is not considered to reliably distinguish between the options given the factors above, the limited difference in the estimates and the current accuracy of the estimates.								
Whole Life Cost	Lowest Life Cycle Cost Project Option preferred. DU entails greater maintenance cost due to 130m long tunnel (adjacent to station) and pumps.								
Third Parties	Both options have a similar impact on the River Calder floodplain (east of Thornhill Jct).								
Third Parties	Both options have a similar impact on the Dewsbury Riverside site.								
Third Parties	Both options require temporary possession of the Veolia site for construction. This will require relocation of this business.								
Third Parties	The SE corner of the Newlay Concrete site is required to accommodate the realignment of Calder Road in the Flyover option; however, this is assumed that any adverse impact on the business can be mitigated and that it can still operate.								
Third Parties	The Dive-Under option requires a small amount of the Veolia site and land to the NE of Calder Road overbridge to be taken permanently to accommodate realignment of Calder Road. It is assumed not to impact the operation of businesses.								
Heritage Impact	Level difference between the slow and fast lines over the proposed Ravensthorpe Viaduct can be mitigated in Flyover option. This minimises the visual impact of the structure in elevation and hence its impact on MDL1/6 (Grade II listed).								
Environmental Impact	The level of the fast lines at the intersection with the current Calder Road alignment is 2m below the level of Calder Road. It is expected that the noise and visual impacts of the flyover can be mitigated through the provision of noise barriers and landscaping.								
Carbon Cost	The Flyover structures involve less than half the concrete works cf. the Dive-Under whilst the earthwork volumes are only 10% higher. It is suspected that the Dive-Under has greater embodied carbon.								
Carbon Cost	The Dive-Under has higher operational carbon due to the need to pump out rainwater.								
Diversity Impact	Both options maintain roughly the same distance between Ravensthorpe town centre and the station entrance compared to the existing station.								

Appraisal of Engineering Criteria Incorporating Comments from Engineering Review 21 June 2019 (Rev 3)

Engineering Criteria	Description	Flyover				Dive-Under			
Diversity Impact	Both options provide step-free access to both platforms and compliance with PRM TSI.								
Diversity Impact	The Flyover option necessitates a more significant plan realignment of Calder Road. This increases the distance between residential properties on Ravensthorpe Road and Ravensthorpe town centre by approx. 110m (15%). This cannot be mitigated by a ramped footbridge owing to the length of the ramps. There is no public transport serving this route.								
Utilities	Neither option requires the reconstruction of Hunger Hill bridge; the utilities in this structure are unaffected.								
Utilities	There are no significant differences between the two options in terms of budget or programme risk (Steve Cooper, 24/05/19).								
Utilities	Both options necessitate diversion of overhead HV cables for constructability (both options) and to provide sufficient vertical clearance to fast lines (Flyover option only).								
Utilities	Both options necessitate diversion of the high-pressure gas main serving Thornhill Power Station: physical clash in the Dive-Under option, very high risk to construct in its vicinity in the Flyover option.								
Utilities	There is a marginal preference for the Dive Under option on the basis that it involves fewer (16 no.) work packages cf. the Flyover option (19 no.)								
Constructability	The Flyover option requires net fill; this is advantageous in the context of the wider project which currently has a net yield of excavated material.								
Constructability	Neither option requires temporary diversion of the Wakefield lines.								
Constructability	The Flyover presents more opportunity for precasting and DFMA construction methods.								
Construction/Programme Risk	Mining voids are more likely to be encountered in the Dive Under option owing to the larger quantity of subterranean works.								
Construction/Programme Risk	There is greater risk of unearthing contaminated/hazardous materials in the Dive Under option owing to the larger quantity of subterranean works. The risk can be minimised in the Flyover option through the use of displacement piling techniques where possible.								
Construction/Programme Risk	Flooding poses a greater risk during construction in the Dive-Under option due excavation within a fluvial flood plain; this would need to be mitigated through the provision of flood barriers.								
Construction/Programme Risk	There is greater programme risk in the case of the Dive-Under owing to 2 no critical paths as a result of the configuration of earthworks and rail systems.								
Programme	Flyover programme is shorter.								
Programme	Neither option presents significant opportunities to reduce programme by undertaking work as permitted development.								
Maintenance	Track access adjacent to the existing station is retained in both options.								
Maintenance	The Dive-Under option requires additional maintenance owing to the tunnel adjacent to the station requiring more inspections and the need for pumps.								
Maintenance	Buried structures incorporate more hidden elements. Both Flyover and Dive-Under involve buried structures, but there is a greater number in the Dive-Under option.								

Northern Programmes

Minutes TRU Ravensthorpe Dive-Under/Flyover Engineering Review 13:30 21 June 2018 Kingfisher Room; Arup Leeds	
Attendees:	Apologies:
Alex Morris Ellis Richard John Lipscomb Richard Rayson Peter Hanslip Robb Radford Mike Pedley Pam Butler James Fannom Nick Speight Jason Markland Jonathan Ainsworth Graham Thomas James Park Chris Williams Ana Halangau Mark Craney David Vernon Will Darling Leon Garrett Jeff Boden Ed Lacey	Steven Bell Mokhtar Mohammed Ian Woods Jim Pearson Penny Robinson Luke Durston Richard Hallam John Collins Adam Pickles Iain Taylor
Actions are highlighted in bold .	
Notes	
<p>AM presented the additional work done to develop the Flyover (FO) and Dive-Under (DU) options for the grade separation (151667-TSA-00-TRU-BRF-W-MN-000013) following on from Validation Panel 2 (18th April 2018).</p> <p>The additional work undertaken has validated the conclusions of Validation Panel 2:</p> <ul style="list-style-type: none"> • Both options are very similar • There is no compelling case for one option over the other • There is a slight preference for the FO on the basis of lower construction risk and lower carbon; however, the feasibility of this option depends on the ability to obtain third-party land (SE corner of the Newlay concrete works). <p>Owing to the similarity of the two options, it is thought to be very risky to try to obtain the SE corner of the Newlay concrete works using CPO powers under the TWAO. Consequently, it is assumed that if the concrete works is not amenable to negotiation, the DU would be the preferred option.</p> <p>The recommendation is that both options are carried forward to Consultation Phase 1 and then reappraised. Pending reappraisal, the Flyover is the preferred scheme.</p>	

Northern Programmes

These conclusions and recommendations were agreed by attendees of the meeting. The following feedback was provided:

Piling Quantities

MP challenged the piling quantities in the DU option. GT explained that an average length has been used in the quantities spec. **AP** to provide a more detailed response and discuss with MP.

Environmental Impact of Piling

EL advised that the Environment Agency will challenge piling below the groundwater table. **AM** to include as a constructability risk in the appraisal. Boreholes to confirm water table level and ground conditions have been specified and are pending.

Project-wide cut/fill balance

MP suggested that the Flyover being a net fill solution should make it a "Preference" rather than "Weak Preference" in the scoring.

Mining Risk

EL suggested that the mining risk is similar in both options and should only be a "Weak Preference" for the Flyover. **AM** to review with AP.

Whole Life Cost

RR suggested a stronger preference towards the Flyover on the basis of whole-life cost. **AM** to catch-up with RR to update scoring and incorporate details of RR's assessment.

Emergency Egress & Safe Access to Dive-Under

MC questioned design of both options not providing safe walking route through the Dive-Under or under/over the Flyover. GT explained that this was a fundamental design basis item which had been agreed earlier in the project. **AM** to follow-up and convene a meeting to agree a way forward.

Existing Retaining Wall

PB noted existing retaining wall between track and Newlay concrete works is not shown on drawings and is in poor condition. **CW** to include this in drawings and confirm no impact on concrete works site as a result of reconstruction or regrading slopes.

Maintenance

JF questioned whether ballast on track at 1:70 gradient required more regular maintenance. This is potentially relevant to the FO. Track-slab is assumed in the DU option. **JF** to confirm whether this is an issue.

Maintenance within the structures in the DU option is slightly more onerous; lighting will be required for maintenance. **AM** to update appraisal.

Maintenance of pumps needs to be included in appraisal, slight preference for FO. **AM** to update appraisal.

Northern Programmes

DFMA/Precast Options for FO

EL commented that DFMA/precast options could be applied to the FO, but less so in the DU. **AM** to incorporate in the constructability appraisal.

Permitted Development

Does one option favour permitted development over another? Are there any significant programme benefits to one option over the other? **AM** to review.

AOB

All to provide any additional feedback to AM by cob Friday 28 June.

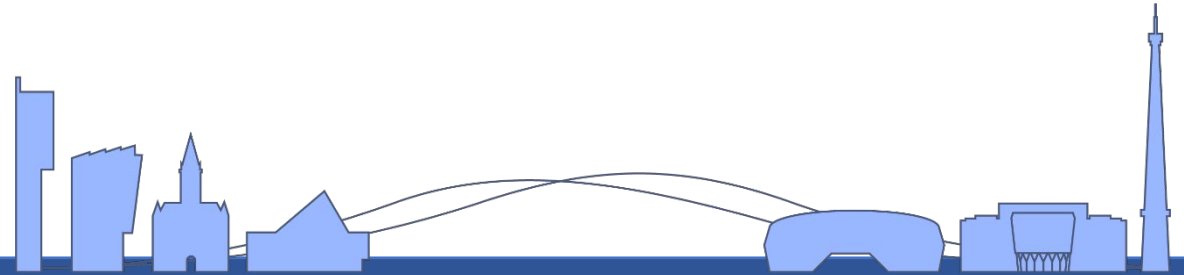


ENGINEERING AND DESIGN

PROOF OF EVIDENCE

Appendix 2

GRIP3 Stage Gate December 2019



Ravensthorpe
Grade Separation
Pre-Stage Gate Update

27 November 2019



Attendance

Sponsor

- Luke Durston (Sponsor, Project W3)
- David Vernon (Sponsor, Project W3)

Assurance

- John Lipscomb (DPE Lead, West of Leeds)

Network Rail

- Alex Legge (Integration Team)
- Kristian Willis (Integration Team)
- Alex Davies (Head of Consents & Environment)
- James Fannon (TRU Maintenance Lead)

PMO

- Jason Markland (Principal Designer Rep, PMO)
- Andy Simpson (Programme Manager Route Interface, PMO)
- Geoff Warren (TRU RAM Support Team Lead)

Consents

- Pam Butler (Consents Lead, Atkins)
- Jim Pearson (Environment, Network Rail)

Estimating

- Robb Verity (W3 Estimator, Transpire)

Constructability

- Ian Woods (W3 Constructability Lead, Transpire)
- Keith Winnery (W3 Constructability Lead, Transpire)

Transpire Project W3 Design Team

- Graham Thomas (Project Lead)
- Alex Morris (Design Lead, Ravensthorpe)
- Jenny Henderson (Consents Interface Lead)

Apologies in grey

Purpose

Feedback from the Engineering Review (21/06/19) was incorporated into the scoring of the Flyover and Dive-Under options at Ravensthorpe.

This indicated a **preference for the Flyover**; however, residual risks associated with this option led to the decision to **consult the public on both options**.

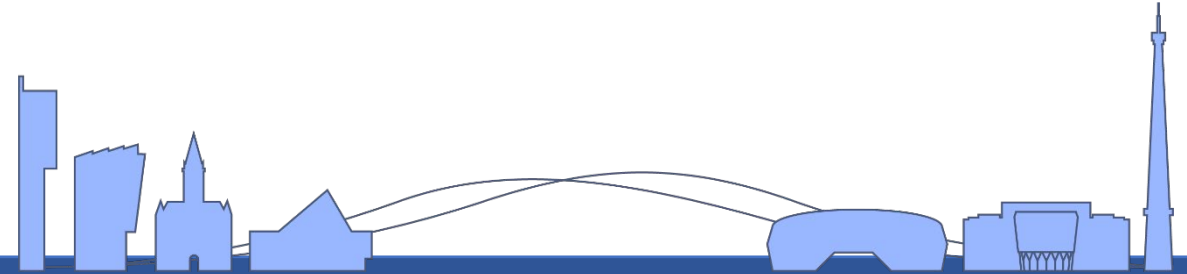
We now have interim feedback from public consultation and seek to validate a decision to **develop the Flyover option** as the basis for the TWAO application.



Flyover



Dive-Under



Ravensthorpe Grade Separation
Pre-Stage Gate Update

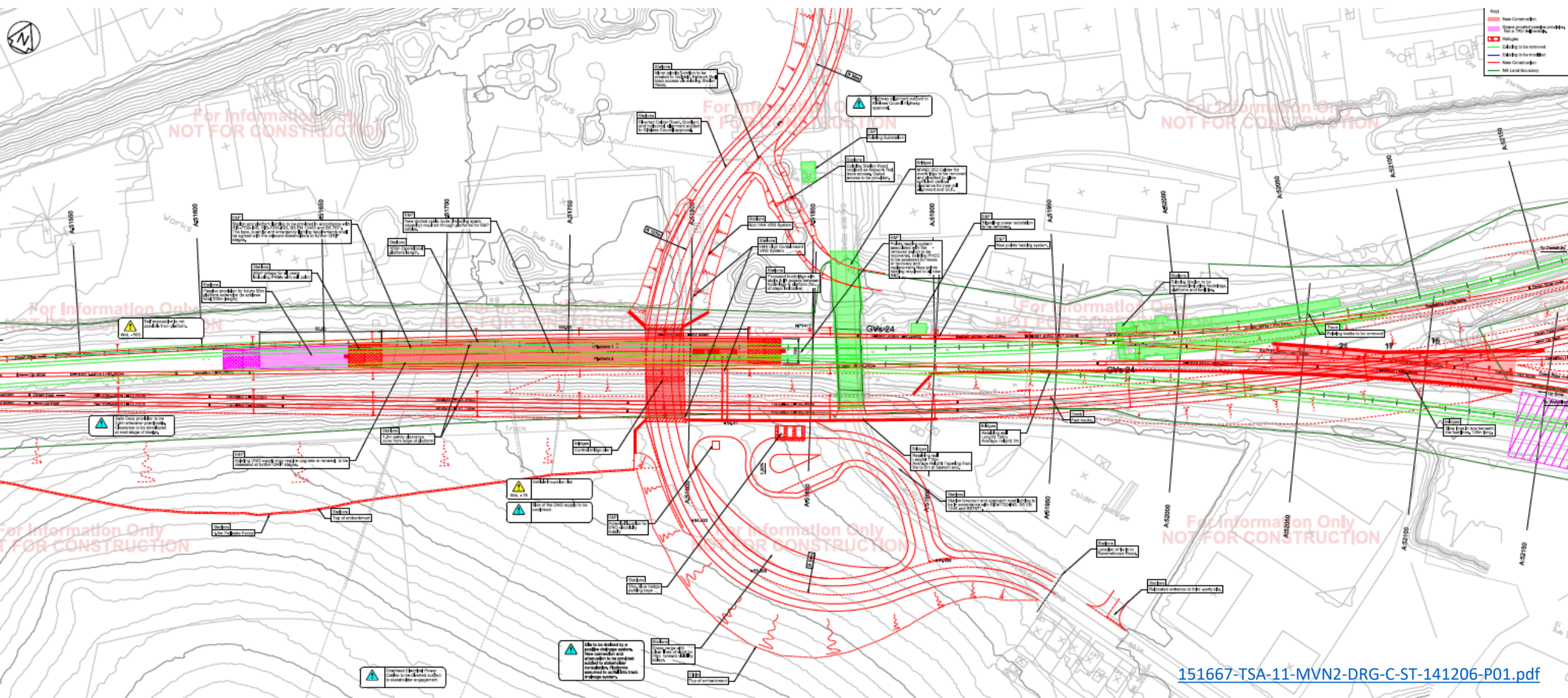
Flyover Option



ARUP

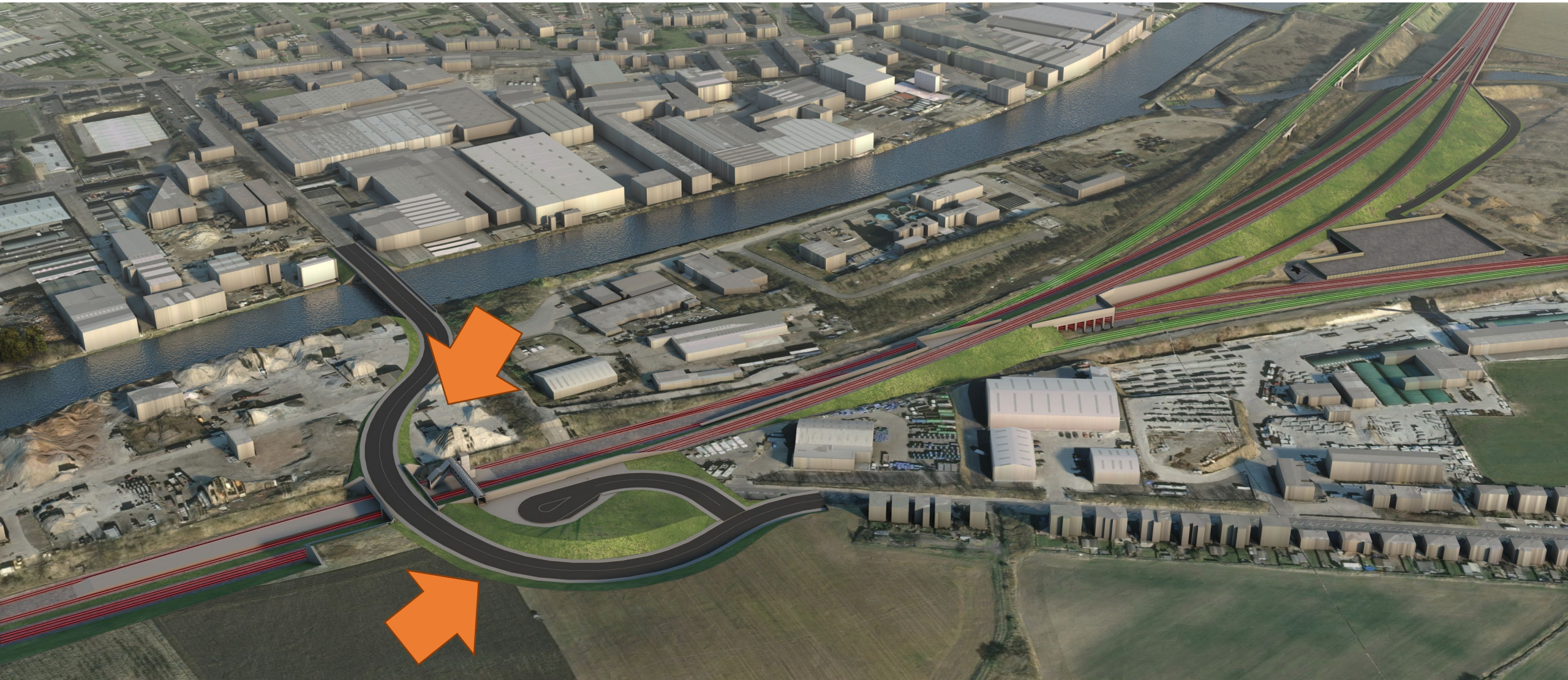


Flyover Option

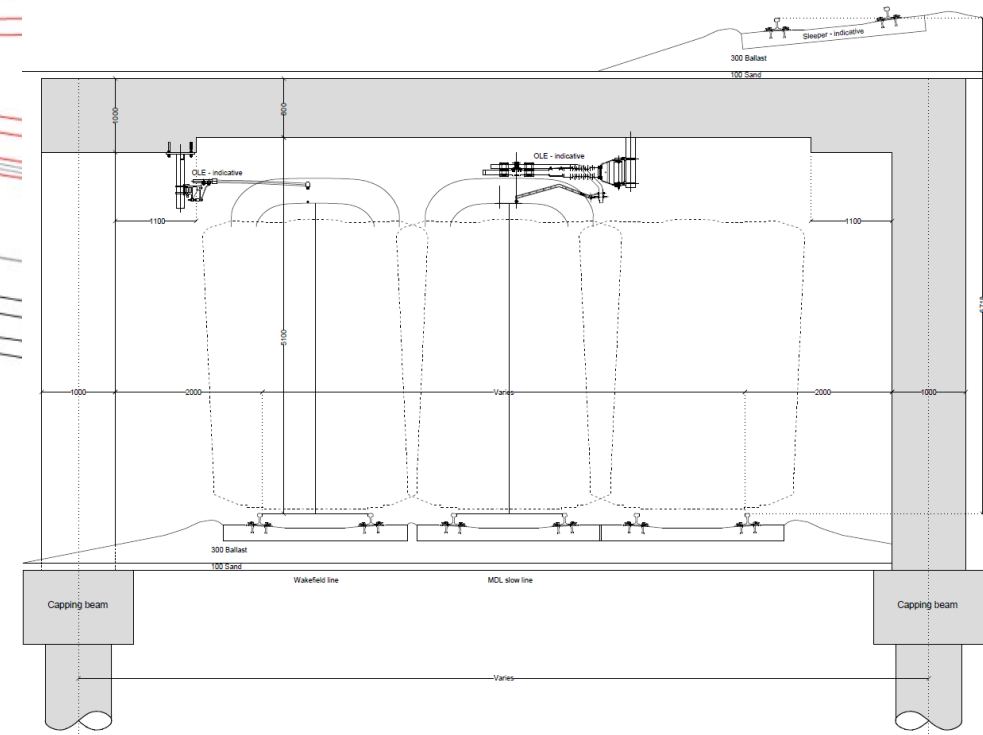
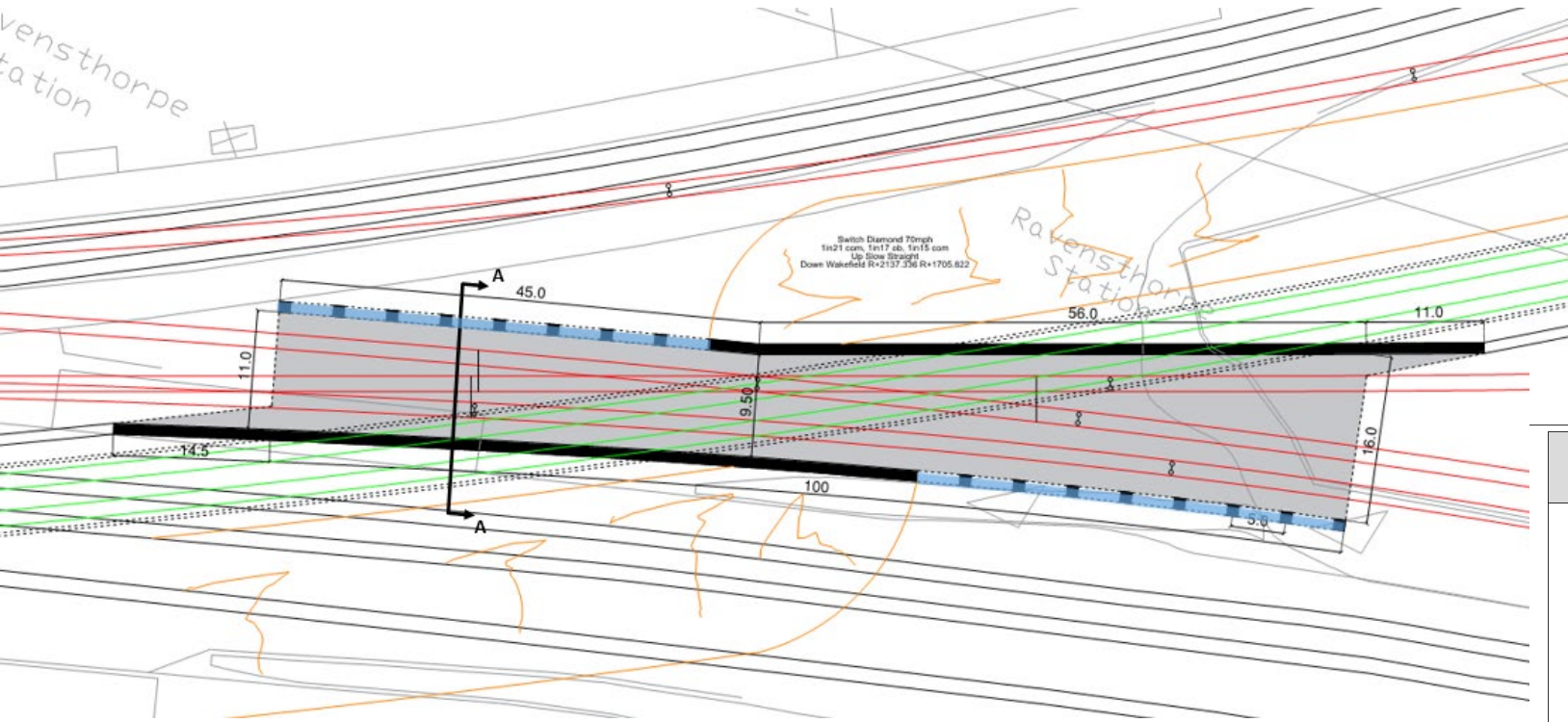


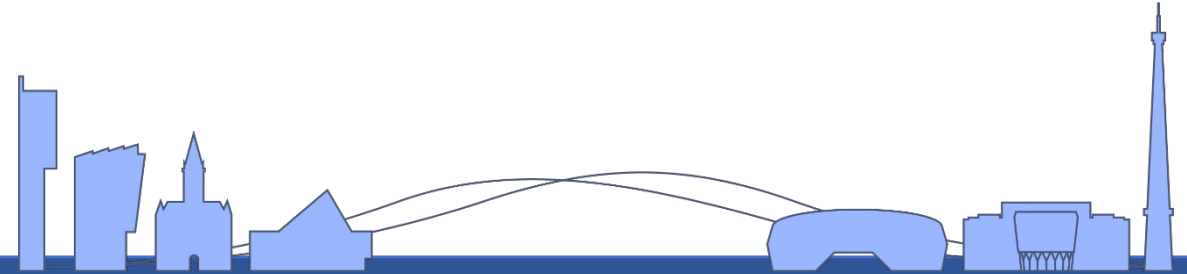
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Flyover Option



Flyover Option





Ravensthorpe Grade Separation
Pre-Stage Gate Update

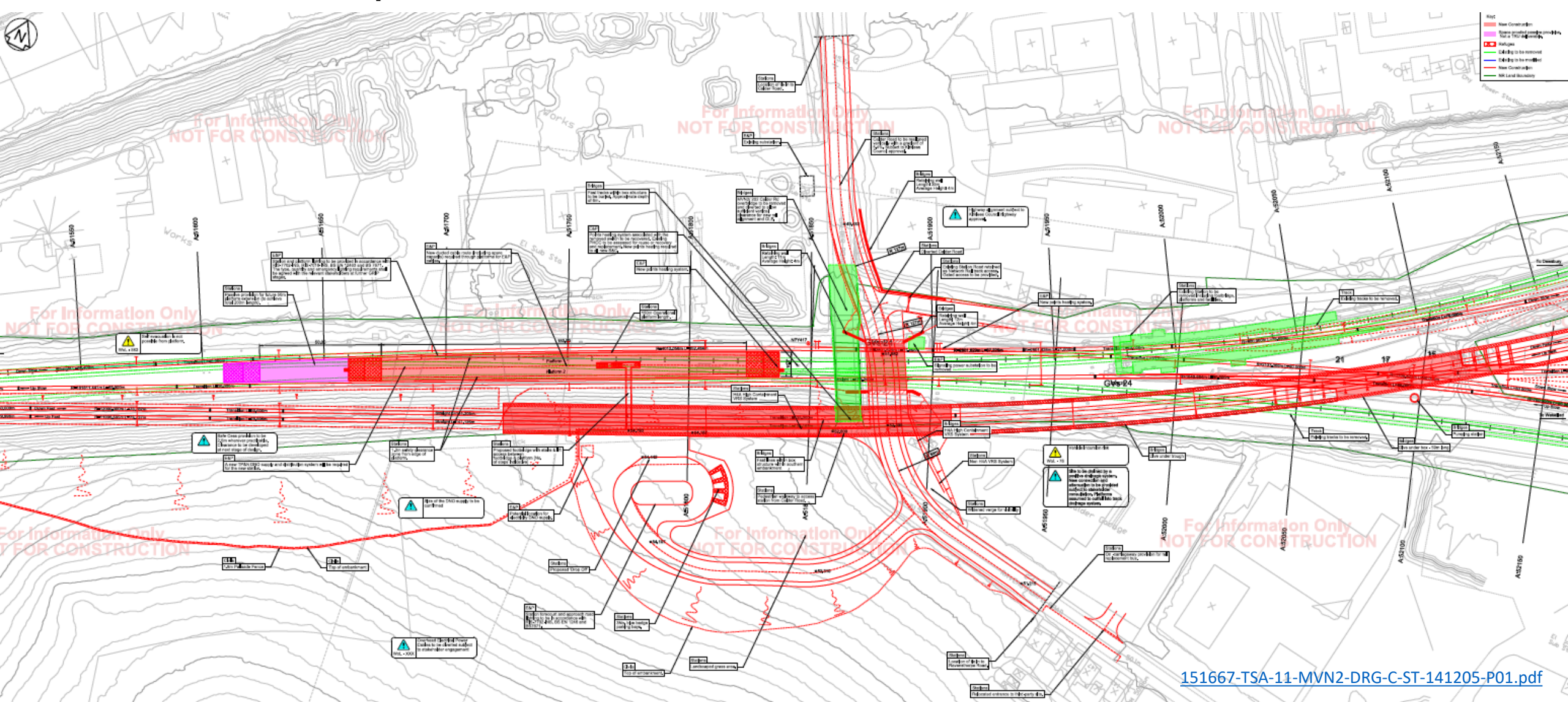
Dive-Under Option



ARUP



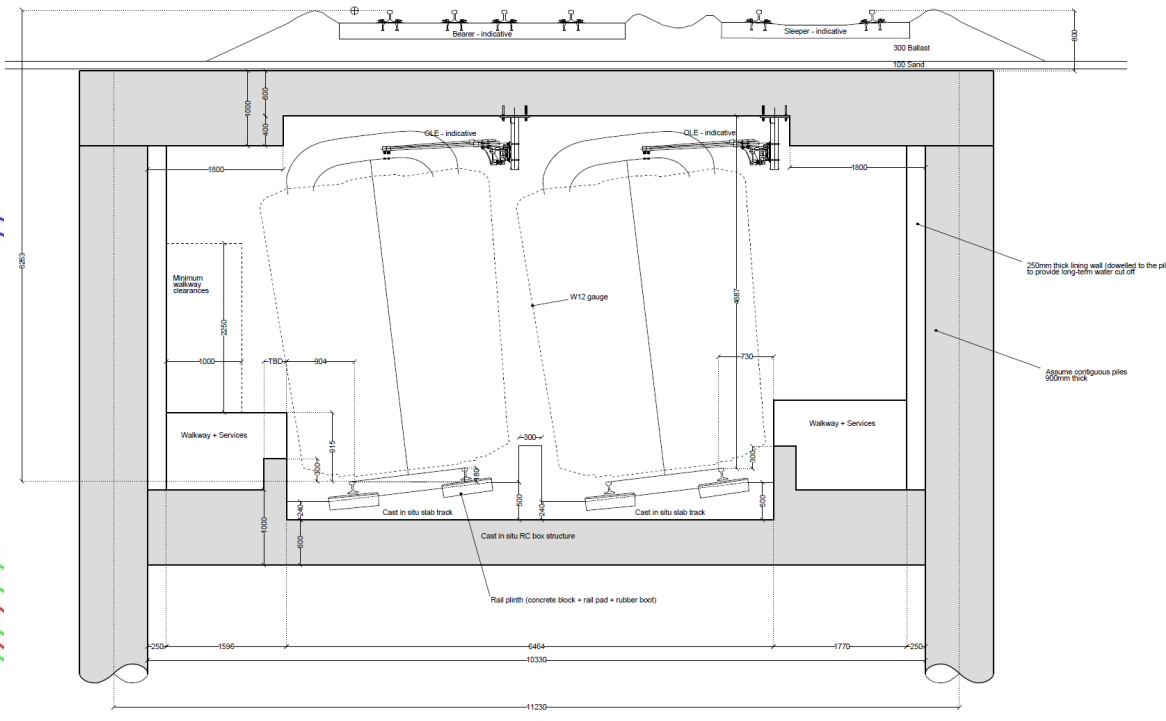
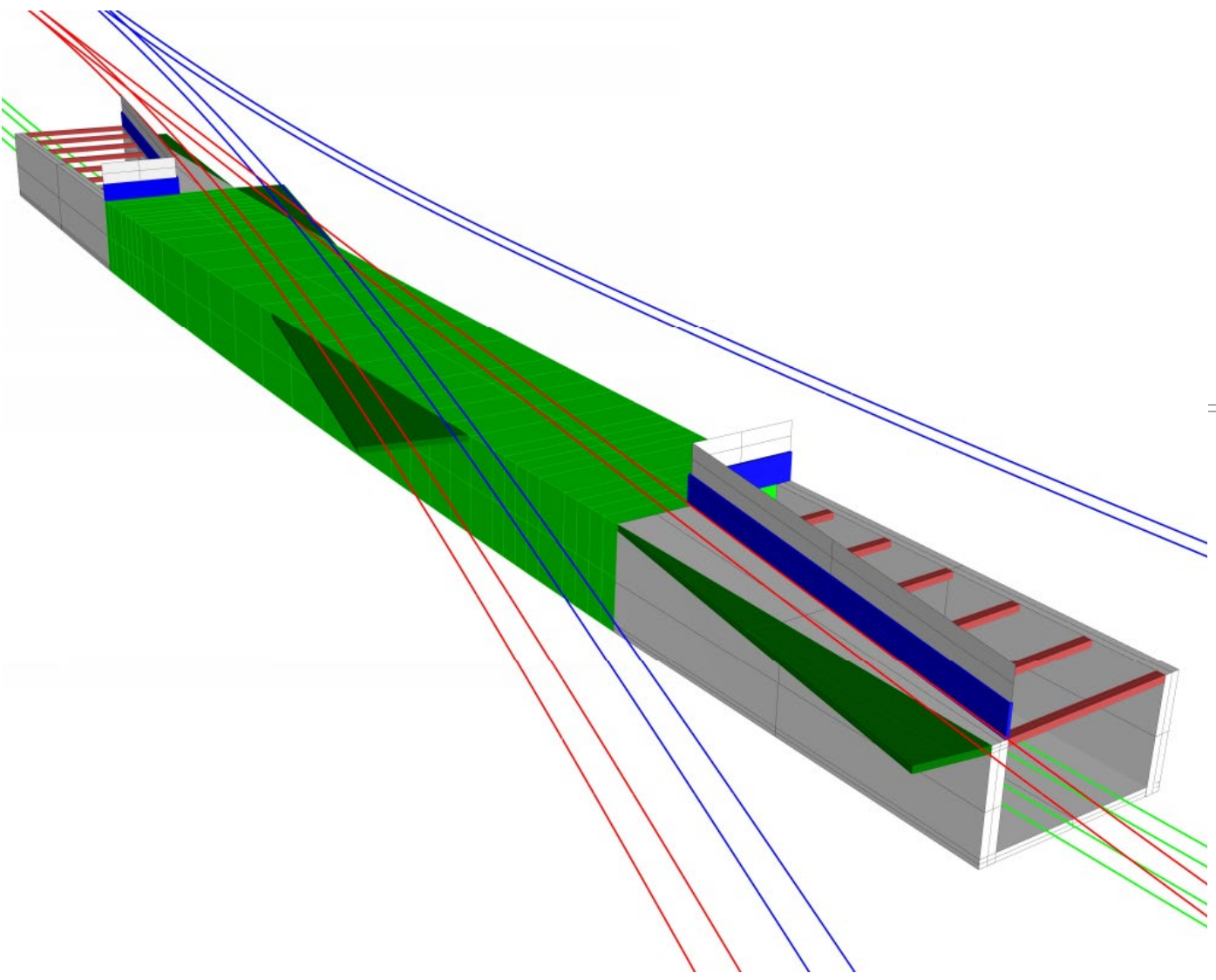
Dive-Under Option

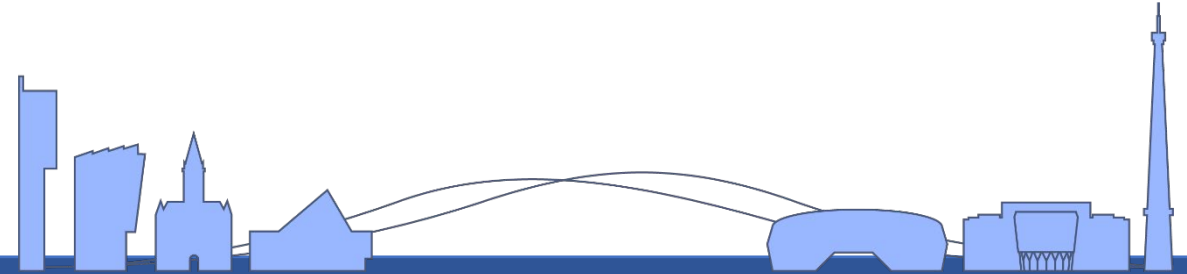


Dive-Under Option



Dive-Under Option





Ravensthorpe Grade Separation
Pre-Stage Gate Update

Design Development Timeline



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Timeline

18th April 2018: Validation Panel 2

- Flyover is preferred option
- Dive-Under to be progressed due to consents benefits

Subsequent Development

- Horizontal track layout to maximise offline construction & reduce staging
- Refined vertical track geometry and clearances
- Minimised third-party land take
- Engineered “Preferred” options for Flyover and Dive-Under
- Updated cost estimates for both options

Timeline

21st June 2019: Engineering Review

- No compelling case for one over the other
- Slight preference for Flyover:
 - Carbon Cost
 - Construction/Programme Risk
- Land acquisition and highway approval risks
- Both options to be taken forward to public consultation

Engineering Criteria	Flyover				Dive-Under			
Line Speed								
Operations & Capacity								
Safety								
Capital Cost								
Whole Life Cost								
Third Parties								
Heritage Impact								
Environmental Impact								
Carbon Cost								
Diversity Impact								
Utilities								
Constructability								
Construction/ Programme Risk								
Programme								
Maintenance								

Timeline

23rd July 2019: Rescoring based on feedback at Engineering Review

- Stronger case for Flyover:
 - Carbon Cost
 - Construction/Programme Risk
 - Safety
 - Whole Life Cost
 - Constructability
 - Programme
 - Maintenance
- Land acquisition and highway approval risks remain
- Both options to be taken forward to public consultation

Engineering Criteria	Flyover				Dive-Under			
Line Speed								
Operations & Capacity								
Safety								
Capital Cost								
Whole Life Cost								
Third Parties								
Heritage Impact								
Environmental Impact								
Carbon Cost								
Diversity Impact								
Utilities								
Constructability								
Construction/ Programme Risk								
Programme								
Maintenance								

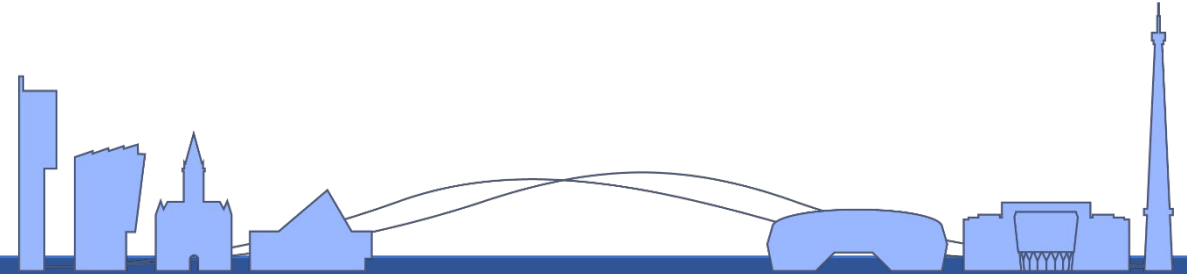
Interim Feedback from Public Consultation 1

Newlay Concrete Works Site

Open to discussions with Network Rail

Dive-Under vs. Flyover

No overall preference for Flyover or Dive-Under



Ravensthorpe Grade Separation
Pre-Stage Gate Update

Conclusion



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Conclusion

Flyover is the **preferred** option

Proceed with development of Flyover option to produce TWAO deliverables and close out residual risks

Dive-Under option **paused**

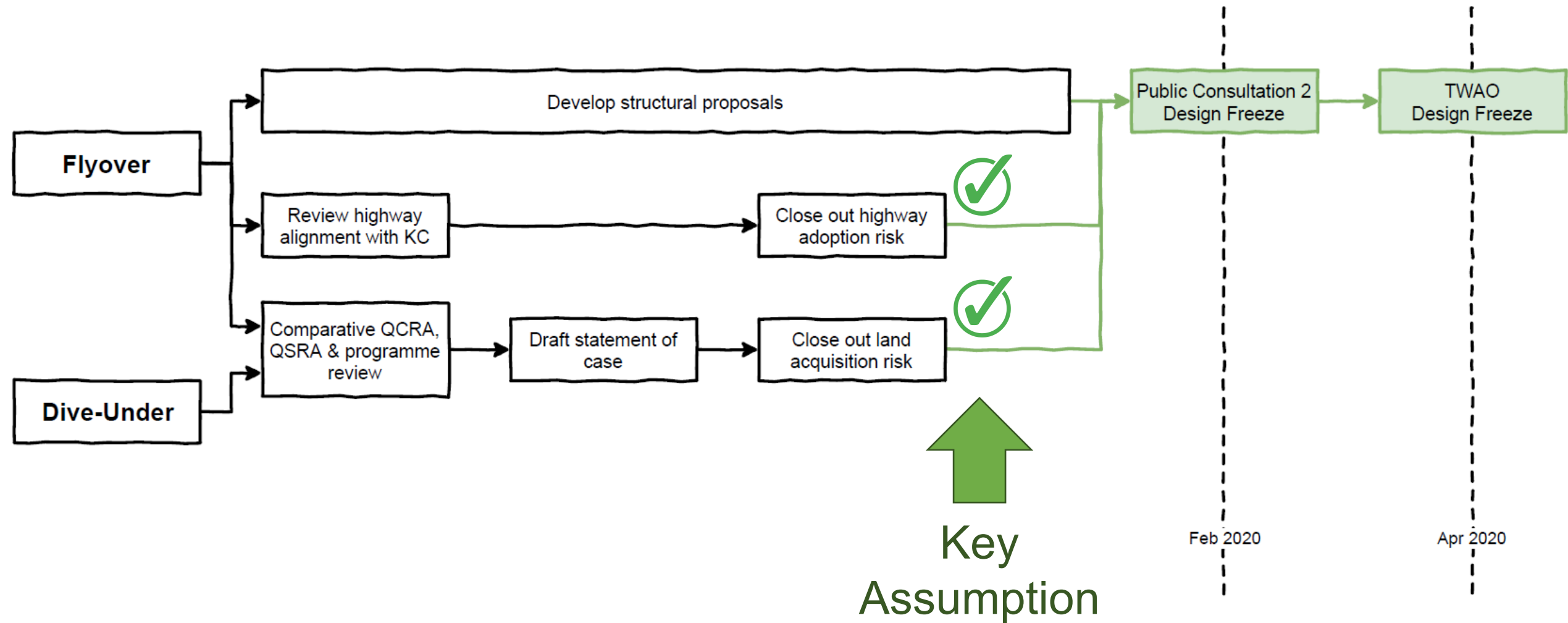
Dive-Under option will be rejected when residual risks associated with Flyover are closed:

- Highway approval
- Land acquisition

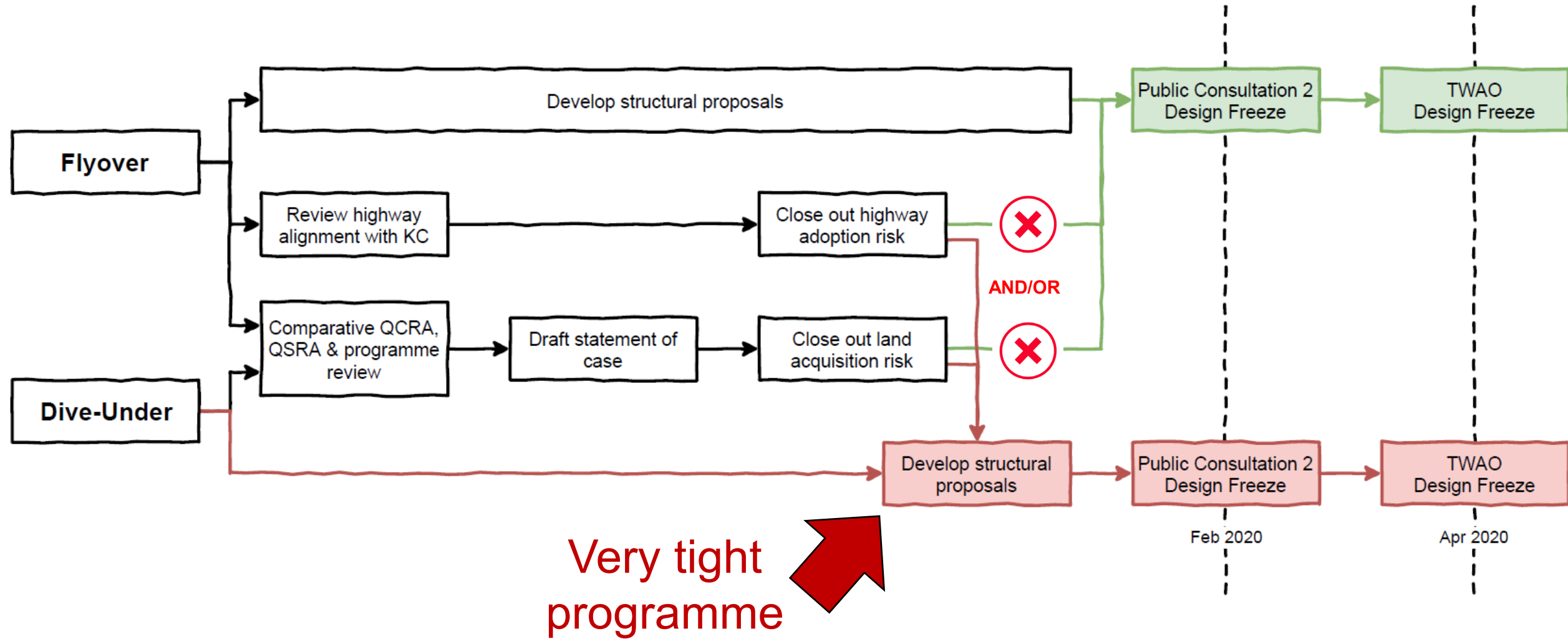


Flyover

Workflow to Final Option Selection



Workflow to Final Option Selection



Ravensthorpe Grade Separation Pre-Stage Gate Meeting – 27/11/2019

1. Option Selection Narrative

- 1.1. Alex Morris clarified at the start of the meeting that this is not a validation panel but a pre-stage gate update. Validation Panel 2 (18/04/2018) was where the Flyover grade separation was confirmed as the preferred option at Ravensthorpe.
- 1.2. The preference for a Flyover grade separation was confirmed again at an engineering review held on 21/06/2019. The case for the Flyover was strengthened when feedback from the engineering review was incorporated and circulated on 23/07/2019.

2. Flyover grade separation – the risks

- 2.1. The two key risks associated with being able to deliver the Flyover grade separation are that parts of the Calder Road highway realignment are below the desirable minimum according to the Design Manual for Roads and Bridges (DMRB) and that third-party land acquisition is required at the Newlay concrete site.
- 2.2. AM explained that a meeting with highways officers at Kirklees Council took place on 18/11/19 to discuss the highway alignment of the Flyover option. Kirklees Council are consulting their Section 38 team and intend to provide initial feedback within 3 weeks of the meeting.
- 2.3. Dave Vernon stressed the need for a strong and robust case to justify the Flyover option, particularly given that the Dive-Under option enables a compliant highway design for the Calder Road.

Action: Jack Ryder to instruct WSP to issue property cost estimates for the Newlay concrete site by 20/12/19. These costs should also include for the extinguishing of business rights.

Action: Alex Morris to arrange a meeting between Chris Williams and Dave Vernon by 20/12/19 to discuss the highway design in more detail.

Action: Alex Morris to arrange for Network Rail to send a letter to Kirklees Council (via Penny Carter) formally asking for their feedback on the proposed highway alignment of the Flyover option.

Action: Pam Butler to confirm if Kirklees Council can attend a second meeting before Christmas to discuss the Calder Road alignment. At this meeting, the issue of getting written confirmation from Kirklees Council that the Flyover scheme is acceptable from a highway perspective will be discussed.

3. Key interfaces

- 3.1. Once the TWAO has been submitted, a critical interface is with Kirklees Council for the Dewsbury Riverside scheme and the roundabout scheme (not yet committed but TRU would not obstruct this).
- 3.2. Neither option (Flyover or Dive-Under) precludes the Kirklees Council roundabout scheme.

- 3.3. There has been no confirmation of sight lines for HGVs entering and exiting the Newlay concrete site. Third-party land may be required for a turning circle.
- 3.4. Dave Vernon stated that the Newlay site is comprised of three separate yet interlinked businesses. The plan presented by Dave Vernon to Newlay during the consultation process would remove at least one of the businesses, possibly two.

Action: Alex Morris to ask the W3 design team to sketch up the highway alignment so the sight lines for the Newlay site can be assessed more effectively. This is required by 20/12/19.

Action: Dave Vernon to share a plan of how the three businesses occupying the Newlay site are divided up.

4. Conclusion

- 4.1. It was agreed that the Flyover would be progressed as the preferred option whilst the Dive-Under would be paused. This means that no GRIP Stage 4 asset level design will be undertaken on the Dive-Under scheme.

Conclusion

Flyover is the **preferred** option

Proceed with development of Flyover option to produce TWAO deliverables and close out residual risks

Dive-Under option **paused**

Dive-Under option will be rejected when residual risks associated with Flyover are closed:

- Highway approval
- Land acquisition



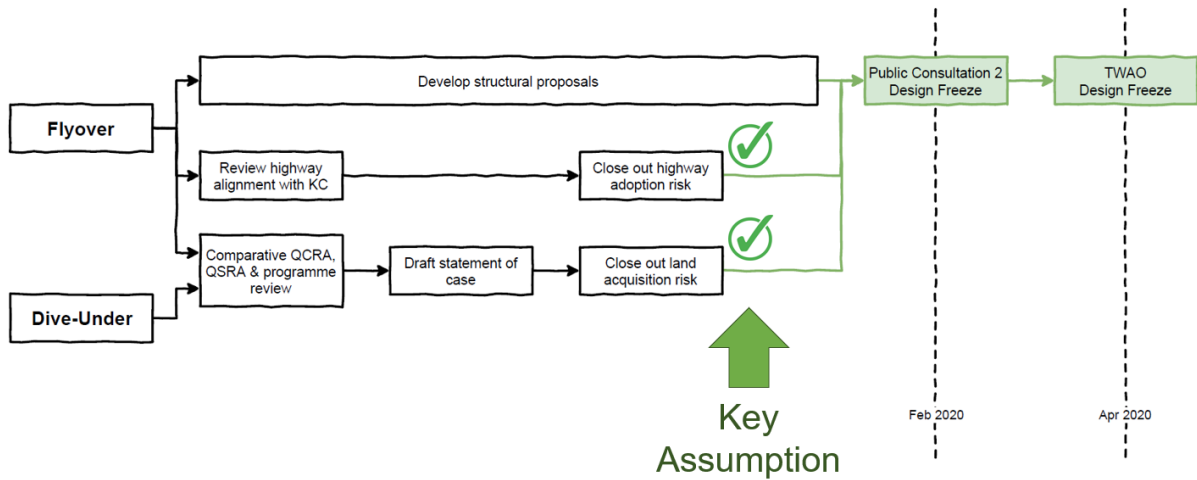
Flyover



- 4.2. Alex Davies confirmed that the Environmental Agency and Canal and River Trust have already been engaged on the grade separation but the progression of either a Flyover or Dive-Under at this stage would not affect any future engagement.
- 4.3. Andy Simpson stated at the end of the meeting that he had spoken to James Fannon (TRU Maintenance Lead) in advance of the meeting and confirmed that the decision to proceed with the Flyover option (cf. Dive-Under) has the support of the maintainer and the Route Asset Management (RAM) team.

5. Next steps

Workflow to Final Option Selection



- 5.1. It should be noted that if GRIP Stage 4 asset level design is required for the Dive-Under scheme, the programme is very tight and this design would not be ready for the public consultation design freeze.
- 5.2. Dave Vernon confirmed that this would not be too great a risk as the TWA0 design freeze is the more critical date.
- 5.3. The Structures RAM is to be engaged on the grade separation proposals in January 2020 as part of the bi-weekly meetings held by the Project W3 team.
- 5.4. Lowering of the Wakefield lines is a potential means of optimising the Flyover option. Ian Woods from the construction team confirmed that the track lowering would be a substantial intervention. The design team will explore this at GRIP4.
- 5.5. It was agreed that this track lowering option would be useful to have at public inquiry stage as justification for the preferred option of Flyover grade separation.

Attendees List



Infrastructure Projects

Northern Programmes

Project W3 Ravensthorpe Validation Meeting

Date and time: 14:00 on 27/11/19		Location: Transpire Pinnacle Office, Leeds	
Attendees (Name):	Role:	Signature:	Contact Details:
Pam Butler	ENVT & CONSENTS MANAGER		pam.butler@attinsglobal.com 07803 259 368
IAN WOODS	TRANSPIRE		ian.woods@damnutball.co.uk
GRAHAM THOMAS	W3 PROJECT LEAD		
KEITH WINJERY	BAM CONSTRUCTOR		KEITH.WINJERY@BAMUNITEK.CO.UK
ROB VERRILL	—		rob.verrill@bammutek.co.uk
ALEX MORRIS	TRANSPIRE		alex.morris@amp.com
ANDY SIMPSON	PMO		andy.simpson@beds.com
JOHN LIPSCOMB	DPE / DEM		john.lipscomb@networkrail.com
DAVID VERNON	SENIOR SPONSOR		david.vernon@correganos.co.uk
ALEX DAVIES	H of E+C		alex.davies@networkrail.co.uk
Alex Legge	Scheme Project Manager		—
KERTIAN WILLIS	PROJECT MANAGER		KERTIAN.WILLIS@NETWORKRAIL.CO.UK

TRANSPIRE WEST OF LEEDS ALLIANCE W3 Stage Gate Presentation Notes/Actions	
Date: 10/12/2019 09:30 – 15:30	Location: Leeds Arup Office, Humber Room, Rose Wharf, East Street, Leeds, LS9 8EE
ATTENDEES (see attendees sheet below)	APOLOGIES
<ul style="list-style-type: none"> • Russ Gee (RG) W3 CEM • James Haigh (JH) W3 Design Lead • Richard Hallam (RH) W3 Package Design Manager • Alex Legge (AL) W3 Scheme Project Manager • Kieran Dunkin (KD) Principal Programme Sponsor • Dave Vernon (DV) Senior Sponsor TWAO • Ross Ashton (RA) Senior Sponsor West of Leeds • John Reed (JR) Industry Programme Director TRU • Mark Chambers (MC) W3 Programme Manager • Alex Davies (AD) Head of Environment and Consents • James Fannon (JF) TRU Maintenance Interface Lead N & E Route • Mike Heywood (MH) Alliance Manager • Graham Thomas (GT) W3 Project Lead • Jenny Henderson (JHe) W3 Consents Lead • Phil Hendon (PH) PMO Lead • Ana Halangau (AH) W3 OLE CRE • Adam Pickles (AP) W3 Geotech CRE • John Lipscomb (JL) W3 DPE • Penny Robinson (PR) TRU Operations Lead • James Hodge (JHo) Development Assurance • Simon Pumphrey (SP) Senior Route Asset Manager Civils • Chris Usher (CU) W3 Project Director • Robb Radford (RR) W3 Estimating Lead • Alex Morris (AM) W3 Design Lead 	<ul style="list-style-type: none"> • Luke Durston (LD) W3 Sponsor
NOTES / ACTIONS	
INTRODUCTION	
<ul style="list-style-type: none"> • Kieran Dunkin confirmed that John Reed would be his replacement as TRU Principal Programme Sponsor. 	
OPERATIONAL PERFORMANCE	
<ul style="list-style-type: none"> • James Haigh presented the Huddersfield station S&C layout and talked about how it provides a degree of flexibility. It has not just been designed to the current remitted timetable (ITSS v1.1). • Penny Robinson (TRU Operations Lead) confirmed she is happy with the layout. • James Fannon raised issue of maintaining the fixed diamond at the west end of Huddersfield station. James Haigh confirmed that the layout had been developed with Track RAM Rep Dave Woods' involvement. 	

JOURNEY TIME SAVINGS

- Kieran Dunkin raised a concern that, when looked at without the context, the cost of W3 is not justified by the journey time figures against the i-CRD.
- Simon Pumphrey - what are the implications of not meeting the JTI requirement?

Action: Alex Legge to speak to Paul Whitaker to confirm the implications of the i-CRD journey time non-compliance.

Action: W3 to look at ways of presenting journey time improvement differently for future external presentations. These should show actual time savings as well as comparisons with the Programme Definition.

PUTTING PASSENGERS FIRST

- There are opportunities at Mirfield station to allow passive provision or space proofing for schemes by external third parties such as WYCA or Grand Central.
- Dave Vernon confirmed that regular stakeholder engagement with WYCA is already underway.
- More strategic discussions with Kirklees Council on the Dewsbury Riverside development are required at GRIP Stage 4.

DESIGN TO COST

- The sharing of best practice between W1B (Manchester Victoria and Stalybridge) and W3 with regards to OLE construction is seen as a good opportunity. Ana Halangau added that there are monthly meetings between W3, East of Leeds and W1B on OLE matters. Chris Usher said that the current proposal is to migrate the workforce from W1B to W3 once W1B is commissioned so that skills and best practice are retained within Transpire.
- Ross Ashton – how has Project W3 deconflicted with regards to key plant/machinery? This is to be developed during GRIP Stage 4 as the design matures. The Access Design Steering Group is the forum for this discussion.
- Simon Pumphrey – is the drainage system integrated with the OLE design? Due to the nature of the W3 intervention, drainage is being replaced along much of the route and therefore can be integrated with OLE.
- The Leeds University research spend was presented as a potential opportunity to reduce track bed excavation depth.
- Simon Pumphrey raised the issue of passenger lifts at unmanned stations. Due to the implications of asset failure, a local supply chain should be used for materials. This is to be developed further at GRIP Stage 4. Use of standard designs across all station lifts will allow a shared spares holding.

Action: Simon Pumphrey to provide the business case for head span to portal conversions.

INTEGRATED ENGINEERING LIFECYCLE (IELC)

- John Lipscomb confirmed he is satisfied with the engineering deliverables and that there is a plan in place to close out any outstanding actions or DRN comments.

BI-DI WORKING

- David Miller is producing a PDG paper on bi-di working that is being presented to O&M DSG on 10/12/2019. This will be developed further during GRIP Stage 4.

HUDDERSFIELD STATION ROOF

- The W3 proposals at Huddersfield station include passive provision to extend the subway to facilitate Kirklees Council's plans for a northern gateway.
- Kieran Dunkin – is there a consistency of maintainable equipment at Huddersfield station? James Hodge confirmed that the type of S&C will be the same.
- John Lipscomb – is ballasted track or slab track being used at the west end of the station? This is still being developed and will be confirmed at GRIP Stage 4.
- Huddersfield Station roof – the current assumption is that a significant proportion of the roof can be retained / repaired with a risk value attached to this. Survey works are ongoing to understand the existing condition. Future maintenance on the roof will be more difficult once OLE is installed.
- Extent of grade listing at Huddersfield e.g. are LOC cases required to be consented? The Wellingborough job is a key comparison where good discussion has been held. Main consent will be required when affecting the fabric of existing assets described within the 'statement of significance'.
- Simon Pumphrey confirmed that, as an asset, Huddersfield station roof is now being managed by the Structures RAM team and not the Buildings RAM team (Harrison Mattinson).
- Dave Vernon and Alex Davies emphasised the need to manage expectations with Historic England and Kirklees Council regarding the scale of the intervention at Huddersfield station roof.
- The interface with the Northern Train Lengthening project's Christmas works was discussed at a meeting in November 2019.

Action: Wellingborough Scheme – Luke Durston to arrange a session so that best practice can be shared.

HILLHOUSE SIDINGS

- A GRIP 2 Feasibility Study for future use of Hillhouse is due to be issued in January 2020.

Action: W3's proposal at Hillhouse is to be presented at Route-wide DSG in January 2020 as an update. Luke Durston to action.

Action: Luke Durston to confirm the requirements for Hillhouse during the construction phase.

DEIGHTON TO BRADLEY CORRIDOR

- Temporary Speed Restrictions (TSRs) should be considered in this area during the construction phase and needs to be discussed with TOCs as to the implications.
- The ten foot is used to allow passengers to alight from trains, so operations are being involved in discussions to reduce track intervals in Deighton - Bradley corridor.

DEIGHTON STATION

Action: An update on Deighton station is to be presented to the sponsor team by the end of January 2020. This is key to GRIP 3 closeout. Kieran Dunkin suggested Chris Montgomery, Simon Green and John Reed should be involved in this. Proposal is that this will be included in the PDG paper.

- James Hodge raised the point that no station had been closed in the last 30 years. Is the possibility of no station at Deighton a viable option?
- Simon Pumphrey – is headroom at canal and river crossings being reduced? Air space is a big consents issue.

RAVENSTHORPE

- Dave Vernon advised that there are currently no developers for the Dewsbury Riverside project.

Action: Project W3 to provide Ross Ashton with the sketches showing four-tracking from Ravensthorpe East Junction to the eastern end of Dewsbury station.

- This was raised at public consultation as a technical question. Elements of additional land take would be required, and businesses would be affected.
- The Ravensthorpe flyover option will require land from three businesses (owned by one family), whereas the diveunder option does not require same level of land take. A QCSRA process is being undertaken to provide evidence-based objective justification.

Action: Can a temporary station be constructed between Wakefield Kirkgate and Thornhill LNW junction. Ross Ashton to consider next steps.

Action: W3 to confirm through Luke Durston whether Ravensthorpe would be regarded as a station change or station closure.

- Current assumption is that this is regarded as a station closure following initial discussion with Tina Bowling (Station and Depot Portfolio Surveyor).

SIGNALLING

- How do we ensure that a safe railway is delivered at the end of each construction stage?

Action: Mike Heywood to ensure that Simon Green / Chris Montgomery / Ian Quick are aligned on the ETCS signalling strategy going forward. This is required by January 2020.

Action: Mike Heywood to arrange for simplified view of overarching access plan on TRU West of Leeds (end to end) to be presented to Simon Green / Chris Montgomery / Ian Quick in January 2020 and confirm how it aligns with the Strategic Access Plan.

TRANSPORT AND WORKS ACT ORDER

- Alex Davies summarised the top risks associated with the TWAO:
 - Building a robust needs case
 - Meeting the affected landowners
 - The interface with the Canal & River Trust
 - Consent conditions being discharged to schedule
- Dave Vernon stated that resource is also a risk for delivering the TWAO on time as the current Transpire team working on it is too small. Dave Vernon also pointed out that a major assumption is that the TWAO will actually be granted.
- Kieran Dunkin would like visibility of TWAO progress at Ian Quick's level. There is a bi-weekly dashboard showing TWAO progress. The plan is to produce a periodic report (Project on a Page) from January 2020.
- John Lipscomb – how is buy-in from RAM being obtained prior to the TWAO submission?

GRIP 3 CLOSE OUT ISSUES

- Graham Thomas summarised the top risks to closing out GRIP stage 3:
 - Signalling and ETCS
 - Deighton station optioneering
 - Huddersfield station roof optioneering

SCHEDULE

- Kieran Dunkin - has the W3 possession strategy been fed into the Strategic Access Plan? See above action in the signalling section.
- The four-track capability on W3 will be ready for April 2026. This is a deterministic date.
- Penny Robinson raised a concern about closures in the Summer period, particularly with regard to Manchester Airport services. Kieran Dunkin confirmed that the Summer holiday period is the preferred time for closures as people do not want their regular commute to be affected.

Action: W3 to add an “advanced works by other consents” bar into the GRIP4-8 schedule to emphasise on-site works start in 2021. This is completed and the stage gate presentation has been updated.

Action: Advanced Works Schedule – W3 team to prepare a list of what we can consider for early works. Get every opportunity on the schedule and then review with legal, sponsor, Owner, consents etc. and categorise them to take forward or state reason why they will not progress as advanced works.

Action: W3 to add more detail on the extent of lines blocked on the possession slide when available.

Action: W3 to map out if there is any early release of benefits prior to the commissioning date of 2026. There is a need to highlight key passenger/timetable milestones in programme where major assets are complete (i.e. Mirfield station complete, 4 tracks complete etc).

ESTIMATE

- Ross Ashton raised a concern about prelim figures, which are approaching a maximum of 50% (48%). This is due to the fact that W3 is a long linear site with a large number of compounds and substantial civils works. The duration of the works is also long. All prelims have been costed (this is not a percentage overlay).

Action: Peter Hanslip to check the W3 estimate against the CP6 track rates. This is completed and the stage gate presentation has been updated.

AOB

- Interoperability – CSM needs greater focus at GRIP Stage 4.
- RAM resilience – agreement needed early in GRIP Stage 4.
- A brief summary was given of the Verification and Validation (V&V) exercise against the 2018 Intervention Client Requirements Document. Some of the fails/pendings will be addressed in the GRIP 4 transition document, others are at alliance level and awaiting further information.

GRIP 3 STAGE GATE DECISION

- Kieran Dunkin confirmed that the W3 GRIP 3 Stage Gate was passed subject to the completion of remaining activities on deliverables and the completion of the GRIP 3/GRIP 4 transition document.
- A post stage gate review will be arranged in March 2020 to demonstrate close out of the following key areas:
 - Track scope
 - An optimised digital signalling plan
 - Deighton station location
- Periodic reviews will be arranged with Luke Durston and Dave Vernon to track progress against the GRIP 3 close out.

Action: Graham Thomas to arrange a post-stage gate review in March 2020 to run through the close out actions.

NetworkRail

Infrastructure Projects

Northern Programmes

Project W3 GRIP 3 Stage Gate Meeting

Date and time: 10:00 on 10/12/19		Location: Rose Wharf, Leeds	
Attendees (Name):	Role:	Signature:	Contact Details:
Russell Gee	W3 CEM	<i>Russell Gee</i>	russell.gee@arup.com
James Hough	Appoint W3 Design Lead	<i>James Hough</i>	James.Hough@arup.com
Richard Hallam	W3 Access Design Manager	<i>Richard Hallam</i>	Richard.Hallam@arup.com
Alex Legge	W3 Scheme Project Mgr	<i>Alex Legge</i>	-
Kieran Daniels	Principal Sponsor	<i>Kieran Daniels</i>	kieran.daniels@networkrail.co.uk
DAVID VERNON	SENIOR SPONSOR TRM	<i>David Vernon</i>	david.vernon@cantorjones.co.uk
ROSS ASHTON	W3 WOL	<i>Ross Ashton</i>	ross.ashton@networkrail.co.uk
Mark Chambers	Programme Manager	<i>Mark Chambers</i>	-
ALEX DAVIER	HEAD OF CONSENTS + ENVIRONMENT	<i>Alex Davier</i>	alex.davier@gachukrovisko.com
JAMES FARREN	NIE ROUTE HOU REP	<i>James Farren</i>	James.Farren@networkrail.co.uk
MIKE HUGHES	MANAGER MGR	<i>Mike Hughes</i>	Mike.Hughes@networkrail.co.uk
GLAUCIUS THOMAS	W3 PROJECT LEAD	<i>Gladius Thomas</i>	-
SEAN HENDERSON	W3 CONSENTS (DRON)	<i>Sean Henderson</i>	SEAN.HENDERSON@arup.com
PHIL HENDON	PMO PROG TEAM	<i>Phil Hendon</i>	PHILIP.HENDON@JACOBS.COM
Ana Halanganu	W3 OLE CRE	<i>Ana Halanganu</i>	ana.halanganu@arup.com
ADAM PICKLES	W3 GEO CRE	<i>Adam Pickles</i>	adam.pickles@arup.com
JOHN LYONS	W3 OPE	<i>John Lyons</i>	john.lyons@networkrail.co.uk
PENNY ROBINSON	OPS/INTERFACE EASTERN DEVELOPMENT ASSURANCE	<i>Penny Robinson</i>	penny.robinson@networkrail.co.uk
James Hodge	Development Assurance	<i>James Hodge</i>	James.Hodge@hodgebi.co.uk
Simon Pumphrey	SEAM CIVILS.	<i>Simon Pumphrey</i>	simon.pumphrey@networkrail.co.uk
CHRIS USHER	Project Director W3+SERVIS	<i>Chris Usher</i>	CHRIS.USHER@bhamm.com

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Infrastructure Projects

Northern Programmes

ROBB REDFORD	ESTIMATOR W3	<i>Robb Redford</i>	robb.redford@networkrail.co.uk
ALEX MORRIS	DESIGN LEAD W3	<i>Alex Morris</i>	alex.morris@arup.com

GRIP Stage Gate Checklist and Certificate GRIP STAGE 3 OPTION SELECTION

Stage Gate Checklist
 This Stage Gate Checklist is automatically populated from the Product Plan, these shall be used as an input to each GRIP Stage and printed, reviewed, and signed at the end of their corresponding stage to form the Stage Gate Certificate.

Project Name	Transpennine Route Upgrade - West of Leeds - Project W3
Project ID #	151667
Client/Sponsor	Luke Durston
PRJ Manager	Mark Chambers

This box is to include any relevant notes to this Stage Gate and Products delivered:

Ref	Product Name	Required	Document Link	Signed	Comment	Category
G1	Stage Gate Checklist	yes	W3 GRIP Stage Gate Product Index		Link to SG Checklist	A
G2	Stage Gate Certificate	yes			Link to signed SG Checklist	
G3	LoC Assessment (Management Level of Control)	yes	151667-TSA-00-TRU-REP-W-MN-000007	Yes		A
CS2	Sponsors Instruction	yes	151671-NWR-ZZ-TRU-CRF-K-SE-000009 151667-TSA-08-MVL3-REP-W-MF-131000	Yes		A
CS4	Option Selection Report	yes	151667-TSA-10-MVL4-REP-W-MF-141000	No	Minor comments being addressed. Outstanding appendices - Appendix D - Formal Cost Planning Report - actions/comments from regional panel to be closed out via correspondence by 13/12/2019. Appendix D to be complete December 2019. - Appendix E - QCSRA Report - PMO assurance required once issued. Appendix E to be complete December 2019. - Appendix G - PDG Paper - paper to be presented to PDG for endorsement in January 2020. - Appendix K - Assumptions & Clarifications - minor comments to be addressed. Appendix K to be complete in January 2020 in line with headline OSR.	
CS6	Asset Management Plan (AMP-Process)	no				N
CS6	Diversity Impact Assessment	yes	W3 - SPOs 13 & 14 - Diversity Impact Assessments	No	DIAs to be fully signed off before being marked as category "A".	B
PM1	Project Management Plan	yes	151667-TSA-00-TRU-PLN-W-PM-000013-P01.pdf 151667-TSA-00-TRU-CNT-W-HF-000152	Yes		A
PM2	Stakeholder & Customer Management Plan	yes	151667-TSA-00-TRU-CNT-W-IP-000003-P01.pdf	No	Transpire GRIP Stage 3 Stakeholder Engagement Plan is signed off. Project W3-specific stakeholder engagement plan to be formally signed. This will be complete in December 2019.	B
R0	Requirements Management Plan (RMP)	yes	151671-NWR-00-TRU-REP-K-SE-000001	Yes		A
R2	Route Requirements Document (RRD)	yes	151667-TSA-00-TRU-CRE-W-SE-000004-P02.pdf	No	The I-RRD has been signed off by Transpire but is awaiting PMO approval. This is expected in January 2020.	B
CA1	Land and Consents Strategy	yes	151667-TSA-00-TRU-CNT-W-IP-000035-P01.pdf	Yes		A
CA3	Land and Consents Commitments Register	no				N
CA3	Network Change	no				N
CA4	Station and Depot Change	no				N
CP4	Cost Plan Request Form	no				N
CP2	Formal Cost Planning Report	yes	151667-TSA-00-TRU-REP-W-MF-134013	No	Actions/comments from regional panel to be closed out via correspondence by 13/12/2019. Appendix D to be complete December 2019.	B
CP5	Lifecycle Cost GRIP 3 Report	yes	151671-NWR-00-TRU-REP-K-AM-001175	No	Final signed document due on 20/12/2019.	B
RV2	Risk Register	yes	151667-TSA-00-TRU-RSA-W-MN-000036	No		A
RV4	Quantitative Cost Risk Assessment (QCRA)	yes	151667-TSA-08-MVL3-REP-W-MF-131017	No	Awaiting PMO assurance. Due for completion December 2019.	B
RV5	Programme Quantitative Schedule Risk Assessment (QSRA)	yes	151667-TSA-08-MVL3-REP-W-MF-131017	No		B
RV7	VM Option Selection	yes	151667-TSA-08-MVL3-REP-W-MF-131001-P02.pdf 151667-TSA-10-MVL4-REP-W-MF-141001-P02.pdf	Yes	PDG Paper be presented at PDG on 24th January 2020.	A
RV9	VM Lessons Learnt	yes	151667-TSA-00-TRU-REG-W-MN-000023	No	W3 GRIP Stage 3 Lessons Learnt meeting scheduled for January 2020.	B
EG5	Project Hazard Record	yes	151667-TSA-00-TRU-REG-W-SS-000059	Yes	This is a Project W3 snapshot.	A
EG4	System Definition	yes	151667-TSA-09-MVL3-RSA-W-MF-134001-P03.pdf	Yes		A
EG6	System Safety Plan	yes	151671-NWR-00-TRU-REP-K-SS-000003-P03.pdf	Yes		A
EG7	Safety Justification Report	yes	151667-TSA-00-TRU-REP-W-SS-270155-P02.pdf	Yes		A
EG2	Project Authorisation Strategy	yes	151667-TSA-00-TRU-UAP-W-MN-000001-P01.pdf	Yes	Signed by alliance. To be approved by PMO following update to their comments.	B
EG10	Engineering Compliance Certificate	yes	151667-TSA-W3-MVL3-CRF-W-MF-000002		Has been reviewed by DPE. Can only be completed once two other deliverables are complete: - Design Compliance Verification Report - due 20/12/2019 - RAM route endorsement certificate - due 20/12/2019	
EG11	Systems Integration	yes			Project not yet transitioned to SI Products	
EG12	Systems Integration Triage	yes			Project not yet transitioned to SI Products	
EG13	System Safety	yes			Project not yet transitioned to SI Products	
EG14	System Security	yes			Project not yet transitioned to SI Products	
EG15	Performance & Reliability	yes			Project not yet transitioned to SI Products	
EG16	Operational & Maintenance Readiness	yes			Project not yet transitioned to SI Products	
EG2	Project Authorisation Strategy	yes			Project not yet transitioned to SI Products	
EG10	Engineering Compliance Certificate	yes			Project not yet transitioned to SI Products	
EN1	Environmental & Social Performance Appraisal	yes	151667-TSA-00-TRU-CNT-W-IP-000033-P01.pdf 151667-TSA-00-TRU-CNT-W-IP-000034-P01.pdf	Yes		A
HS4	Safety Risk & Mitigation Log	no			This is the project hazard record (CSM)	
HS2	Project Safety Strategy	yes	151667-TSA-00-TRU-HSF-W-MN-000010-P01.pdf	Yes		A
HS3	Health and Safety File	yes	151671-328-00-TRU-HSF-W-MN-000002-P02.pdf	Yes	Document Deliverables Matrix currently has everything marked as required.	A
CDM1	CDM Plan	yes	151667-TSA-00-TRU-HSF-W-MN-000006-P01.pdf	Yes		A

Products delivered are awarded a category according to the following criteria which will determine if the project may continue into the next delivery stage:

Category	Status	Impact on Project
A	Product delivered	The project can continue to the next stage
B	Product delivered but requires Modification	The Project can continue to the next stage, but an action plan shall be put into place by the Project Manager to demonstrate that the Product will be delivered within the stage. The action plan and completion of the Product shall be monitored by the Client
C	Product undelivered, or not delivered to a satisfactory standard	The Project shall not continue to the next stage until the Product is delivered to a satisfactory standard and a Stage Gate Review is re-conducted and passed
N	Product no longer required	The Project shall continue to the next stage, but the GRIP Stage Gate Checklist shall be updated to state why the Product is no longer necessary

Approval

Project Manager	
Name	MARK CHAMBERS
Job Title	Programme Manager
Date	10/12/19
Signature	<i>[Signature]</i>
Sponsor	
Name	LUKE DURSTON
Job Title	PRINCIPAL PROGRAMME SPONSOR
Date	10/12/19
Signature	<i>[Signature]</i>

* Subject to completion of remaining activities on deliverables 10/12/19 and completion of the Grip 3/Grip 4 Transition Report. A post stage gate review will be held in March 2020 to demonstrate close out of 1. Trade Resilience 2. Optimised Digital Plan 3. Deighton Location.

[Signature]

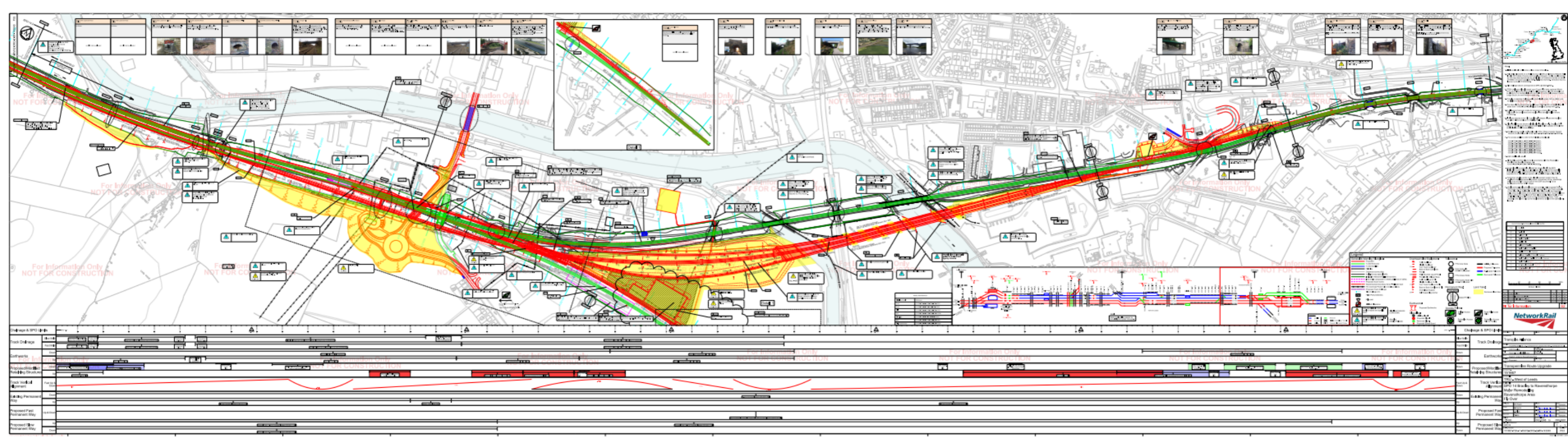


ENGINEERING AND DESIGN

PROOF OF EVIDENCE

Appendix 2

Validation Panel April 2020



Ravensthorpe and Westtown GA

Minutes TRU Ravensthorpe Dive-Under/Flyover Update 0930-1200 07 April 2020 Teams VC	
Attendees:	Apologies:
<p>Jenny Henderson (Transpire); Alex Morris (Transpire); Pam Butler (Atkins); Mark Chambers (Transpire); Chris Williams (Transpire); Alex Davies (Network Rail); Luke Durston (Network Rail); Gareth Hope (Network Rail); Graham Thomas (Transpire); John Flight (Transpire); John Lipscomb (Transpire); Gareth Jones (Transpire); Lucy Taylor (Transpire); Tara Millar (Transpire); Mike Mordaunt (Transpire); Robb Radford (Transpire); Moneeb Saqlain (Transpire); Chris Usher (Transpire); David Vernon (Network Rail); Ian Watson (Mott MacDonald); Kristian Willis (Transpire); Ian Woods (Transpire)</p>	
<p>Actions are highlighted in bold.</p>	
Notes	
<p>Supporting documents</p> <p>Presentation Slides: 151667-TSA-00-TRU-BRF-W-MN-000029</p> <p>Scoring Matrix: 151667-TSA-00-TRU-BRF-W-MN-000030</p>	
<p>Introduction</p> <p>Overview by AM.</p> <p>GT: this follows on from meeting on 25th February, which looked to achieve design freeze 2. This was to allow the EIA to commence, if this was not possible we would look to pursue multiple options. This also fed into the March public consultation which led to both options being shown at Ravensthorpe. Agreed at the February meeting that the evidence supporting preference of the fly over required additional information. This included land requirements and the diversion of Calder road - these areas of concern drove the works.</p> <p>GT: purpose of the meeting, review the updated evidence base (both design and construction), explain how this reduces the risks outlined about and, hopefully, select preferred option for design freeze.</p> <p>GT: work has included schedule and estimating for both options to make sure both schemes have been assessed on a like-for-like basis. Also, a complete review of track access schedule has been</p>	

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undertaken.

AM outlined timeline. Work since November has focused on highway alignment and land requirements.

Design (Flyover)

AM introduced Flyover design.

AD asked if Calder Road bridge resurfacing affected the structure. GT - yes. AD - need to ensure this is in the red line boundary. GT - yes added to rev 3. PB - confirmed this.

AM noted that the DfT and TfN have raised questions regarding use of TRU as a freight route in a post-NPR configuration and explained this is outside the current TRU remit. LD confirmed this, but noted that freight would use the fast line in the event the slows were closed. Need to prove that a biomass train can get up the gradient. Not a project requirement, but demonstrating this is necessary to get endorsement from stakeholders.

CW outlined highway alignment including roundabout usage.

KW asked about gradient of proposed Calder Road. CW - we refer to Kirklees Council's standard; greater than 5% is classified as a ramp. In this case Kirklees Council asks for segregated footpath.

Series of questions around the level of compliance of the road. GT - note there are a number of elements which may allow us to ease the alignment further west including work to push alignment with Kirklees Council and steepen the track gradient. The option presented here is proposed for the TWAO application based on current evidence.

DV: Does this mean the road still isn't compliant, but is better than it was? and better than existing? And as the gradient is above 5%, does Kirklees Council's own policy not state we need to review all other options to not be above 5%? CW - the guidance requires a risk assessment approach, minuted discussions to date indicate that 5.5% would be acceptable. GT - opportunity to segregate in footprint of existing bridge. MC - this would need to be shown on the order plans - AD, GT - yes.

AD: The minutes from Kirklees Council need to be added to the decision. Also, we should write a letter confirming they accepted the minutes. GT - yes noted. AM to follow up.

DV - Just to check as well - Newlay's access - is that visibility splay and gradient acceptable for the type and volume of traffic from their site? CW - yes showing 7.3m carriage, 2m footway and 2m verge. Visibility splay within footpath and verge. Vertically ties in with the existing, junction with 2.5.% gradient into the site.

AD - is that the same for Veolia's new access - visibility splays work? CW - yes

PB - how close are we to the houses? CW - we tie in here, this includes a small extension to the

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dwarf retaining wall. IW to confirm the temporary land.

JL - need to consider parking for the houses. AM to action (Pam - a visualisation from the end property of the new road and retaining might be useful to consider. Let's discuss.)

Design (Dive-Under)

AM re-capped Dive-Under which has not changed since November 2019. AM outlined the review of the Dive-Under solution based on the developments undertaken for the Flyover option. Although different they are equally developed.

MC - Why is the OLE clearance different? GT - the Flyover has a diamond crossing within the intersection structure, and the corresponding layout of the OLE drives a higher OLE clearance compared to the plain line track of the Dive-Under. Furthermore, standard OLE equipment in the Dive-Under can be recessed into the structure. We have not taken this optimisation currently in Flyover as the OLE equipment is novel.

AM - at Calder bridge the OLE clearance differs because the slow lines through the station govern in the Dive-Under, the fast lines govern in the Flyover.

CM - are there any non-compliances which will need agreeing? GT - yes, OLE - project assumption for WoL is acceptance of reduced pan gauge with CSM risk assessment, agreement of Calder Road alignment and endorsement of 1 in 80 track alignment.

Landtake

MM presented land requirements. Flyover - much reduced land take with respect to earlier GRIP 3 design for permanent and temporary. Transpire thinks this will enable the concrete works to continue to operate. IW - we have also allowed sufficient temporary landtake to maintain access to the cement works during construction. DV - will this need traffic regulation on the bridge? IW - yes, likely to need single lane working, lights etc.

MM outlined impact to the Veolia site. Access required to construct retaining wall. Propose working with Veolia to reconfigure site to allow them to remain operational with a short period. IW - we can phase our works. This assumes additional access is provided to south further along Ravensthorpe Road.

DV – The proposed area is where Veolia parks bin lorries. Can we accommodate the vehicles elsewhere? AD supports this. AD - need to understand the sequencing, and any required traffic orders (e.g. yellow lines). DV - note this will impact the RLB. **IW** to define when and where this can be achieved and whether RLB is impacted. **PB** to check if this site is permitted and therefore what facilities may be required if temporary provision is made to park lorries.

MM outlined land requirements for Dive-Under. Spenborough Engineering, impact is short term but

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major. IW - Much more difficult to work around the site safety, would look to work with them in a shut down or similar. Would not propose demolishing building.

MM outlined land requirements for Dive-Under. Veolia site is required; access needed to whole site. IW - we have looked at phasing this site but it is not possible due to the length of the retaining wall to be constructed.

Can access be maintained to Spenborough in the construction phase in both options. IW - yes, but there will be disruption much the same. DV - note that the whole business park there needs to operate.

Property Cost Estimate

MM presented PCEs.

KW noted this is worst case. GJ noted that for Veolia the worst case is the most likely due to the 16 month duration. IW - yes agreed.

Schedule Review

JF presented schedules for Dive-Under and Flyover.

Note 3 months float ahead of blockades to mitigate risk of missing blockades.

JF - note there may be some opportunity to overlap rail and civils works - not done currently due to GRIP 3 level of detail.

Completion of Dive-Under takes 9 months longer than Flyover.

GT - driven by booking blockades, agreement of this is somewhat unknown.

MC - all options assume we can access the Demex site ahead of TWAO. GT - yes. This is true of both options - driven from outline business case challenge.

BREAK

Estimate

RR presented revised estimates allowing for longer duration of Dive-Under schedule.

Higher direct cost of Dive-Under due in part to track slab along fast lines. AD - why is the track slab

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necessary? AM – minimises excavation depth and reduces maintenance. Insufficient space to transition to ballast to east prior to proposed Ravensthorpe Viaduct, hence assumption that fast lines are on slab track over the viaduct in this option.

Additional costs for Dive-Under based on longer programme. No allowance for increase in risk.

Scoring Matrix

AM presented summary of updated scoring matrix. This is an update to what was previously agreed following the Engineering Review in June 2019 ([151667-TSA-00-TRU-MIN-W-MN-078044](#)). Red boxes indicate change from last review (summer 2019).

LD – can this be mapped onto the programme-wide criteria. AM – yes, the criteria are a subset of the programme-wide criteria which facilitate more focussed option appraisal. **AM** to circulate full details of scoring and mapping to programme-wide criteria.

Independent Option Appraisal

GJ presented independent option appraisal.

Concerns raised around flooding in temp and perm state.

Preference to work above ground. Dive-Under - large excavations, confined space etc

Carbon - Dive-Under more carbon intensive

MC - is there a summary you can provide regarding the level of detail both schemes have been developed to? GJ - producing report to capture this information, and recommendation. **GJ** to circulate.

Closing Summary

AM presented summary.

GT - note the estimate is direct cost - no risk

DV - Can we put what percentage increase on the estimate the £32m is? RR - around 4%. GT - **AM** to note this on the relevant slide.

JL - what is the assumption around earthwork cost - have we assumed re-use from Heaton Lodge? GT - I believe the rates assume the materials are transported by road from Heaton Lodge. RR - yes this is correct. GT - we have assumed 50% use as engineering fill, but expect that following surveys

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it will increase.

Conclusion & Recommendation

GT: lot of design refinement, looked to minimise risk.

Recommend that Dive-Under is discounted, and Flyover taken forward as preferred scheme.

Closing Remarks / AOB

LD - thanks for all the hard work which has gone into this. Key actions:

- Provide minutes of meeting with Kirklees Council agreeing road alignment features (gradient and radii limitations) to attendees (**CW**);
- Share results of Dynamis modelling agreed with FOCs with attendees once completed (**LT**); and
- Review resurfacing of River Calder bridge with Highways England to confirm feasibility (**CW**).

GT - we will close out.

AD - yes agree with LD. Include Calder River bridge. Include possibly of NR taking on liability for this bridge.

Question from Northern Powerhouse Rail - can we have updated information. AD this will be shared, meeting on the 17th April to review.

MC - DV are you comfortable? Need to be consistent with works at Peterborough - **JL** to advise.

DV - Need to confirm approach with Kirklees. Other than these two items, happy with where we are.

KW - TWAO programme, suggest we don't need to assess both options for EIA? GT - from a project risk point of view yes. AD, MC - yes.

PB – Can I have link to latest Flyover to check bridleway? **AM** to provide.

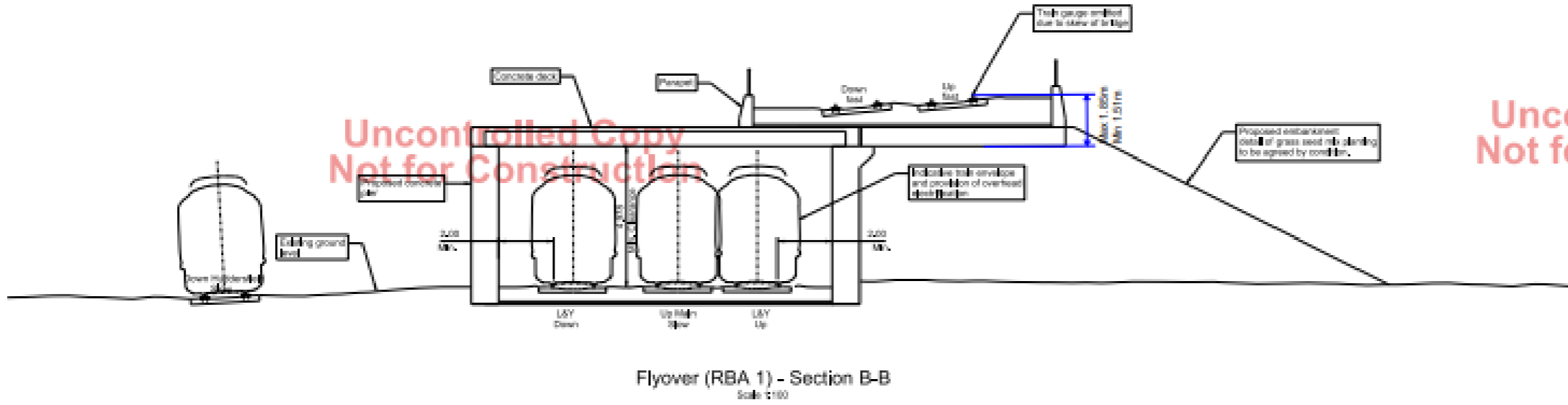
MC - I believe we have reached a decision, with close out of actions and meeting notes. Signature sheet to be circulated.

ENGINEERING AND DESIGN

PROOF OF EVIDENCE

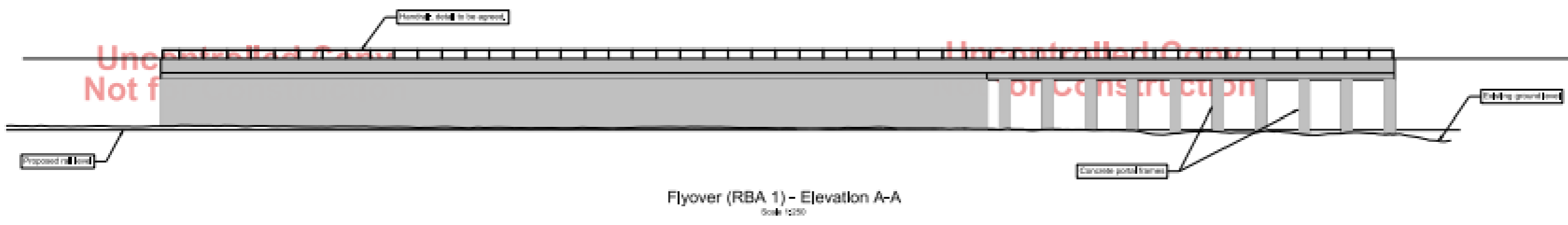
Appendix 2

Further information



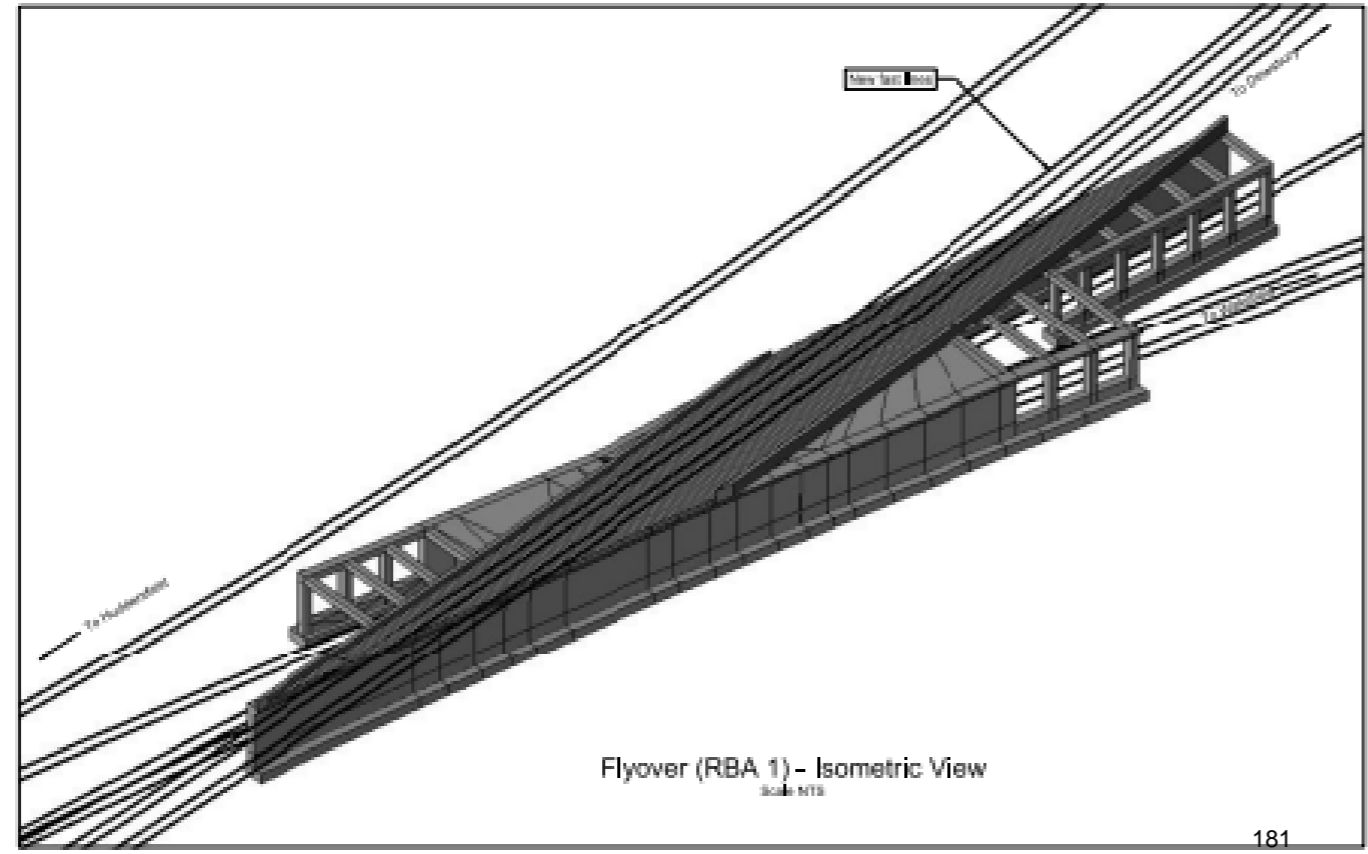
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Legend
— Existing Network Rail Boundary
— Planning Application Boundary

- Notes
1. All dimensions are in millimetres unless stated otherwise.
 2. Do not scale from this drawing.
 3. In constructing or maintaining the works identified as Scheduled Works in Schedule 1 of the Network Rail (Huddersfield) to Westtown (Dewsbury) Improvements Order Network Rail may deviate from the dimensions shown on this drawing to the extent permitted by the Order.
 4. Overhead Line Equipment (OLE) is only shown on route drawings (refer to drawings: 151667-TSA-002-003-004-T-LP-162670 to 151667-TSA-003-004-005-006-DRG-T-LP-162670) and for Listed Building Consent structures.
 5. This drawing is to be read in conjunction with drawings: 151667-TSA-35-MVW2-000-T-LP-162670.



THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER

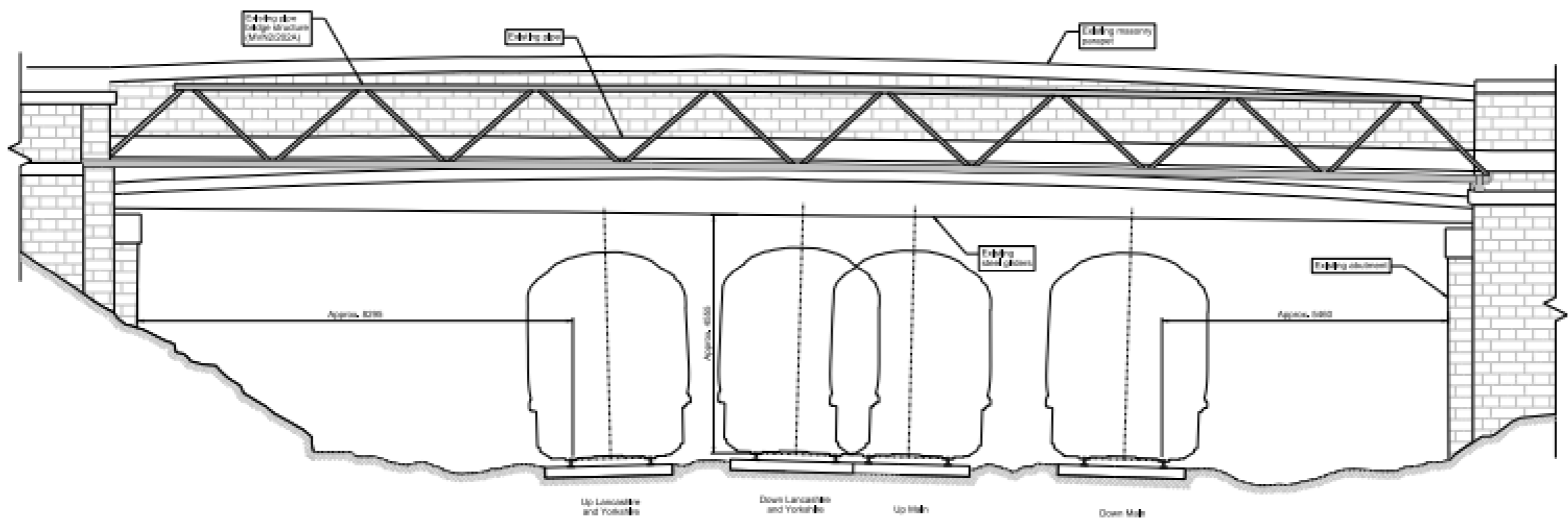
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Initial Status WIP S0

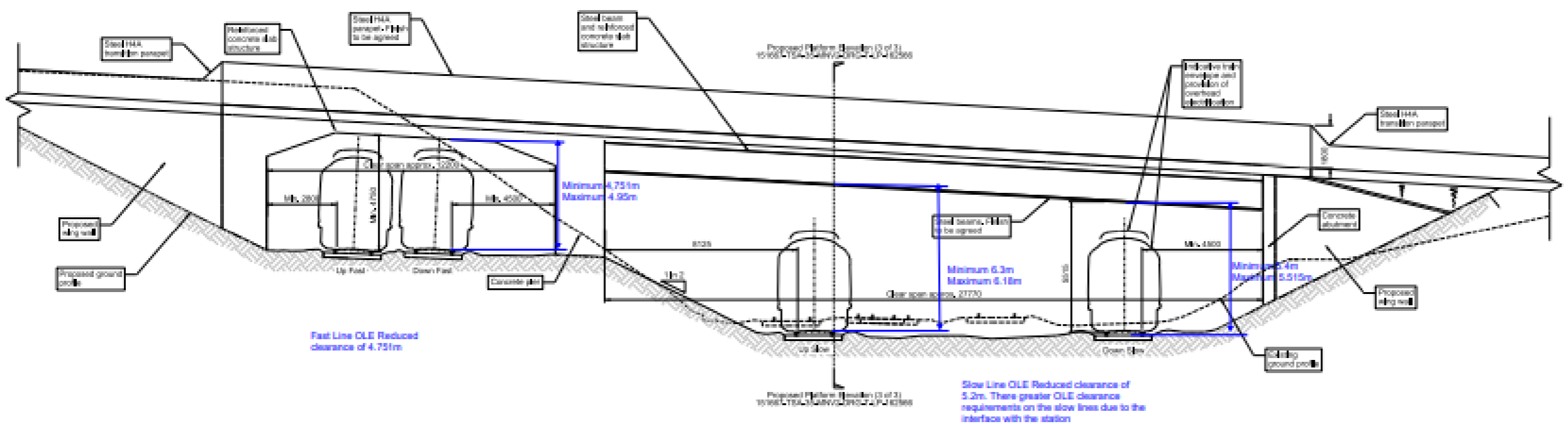


TRU West Alliance			
THORPES BRIDGE JN - NORMANTON (DEWSBURY) - NORMANTON JN			
Form	CAD Drawing	System	Location Assessment
Drawn	Drawn and County Planner	Checked	Checked
Drawn	Regional Planner and Western (Dewsbury)	Checked	Checked
Transpennine Route Upgrade			
Contract No: 151667			
Contract Title: West of Leeds			
Drawing Title: Planning Drawing Flyover (RBA 1) Proposed Elevation & Cross Section			
Drawn	C.Jordan	Check	Date: 11/05/20
Drawn	A.Mahesh	Check	Date: 11/05/20
Checked		Check	Date:
Approved		Check	Date:
Scale:	As Shown		
Sheet No:	002.0248	to	050.0691
Sheet Reference:			1 of 1
Work Order:			151667
Drawing Number:			151667-TSA-35-MVW2-DRG-T-LP-162671
Drawing Title:			P01.1

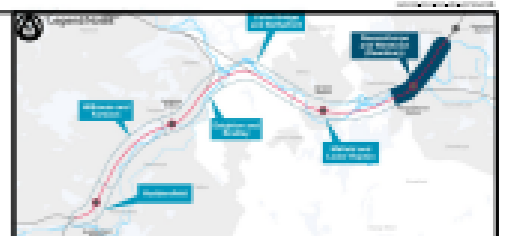
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Elevation A-A - Existing
Scale 1:20

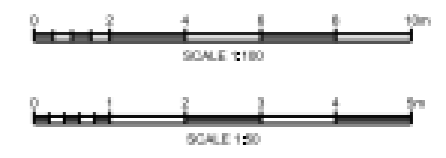


Elevation B-B - Proposed
Scale 1:20



Legend
 Existing Network Rail Land Boundary
 Planning Application Boundary

- Notes**
- All dimensions are in metres unless stated otherwise.
 - Do not scale from this drawing.
 - In considering or installing the works (defined as Scheduled Works) in Schedule 1 of the Network Rail (Huddersfield to Westtown (Devsbury) Improvements) Order Network Rail may deviate from dimensions shown on this drawing to the extent permitted by the Order.
 - This drawing should be read in conjunction with drawing 151667-TSA-35-MVN2-DRG-T-LP-162431.
 - Overhead Line Equipment (OLE) is only shown on route drawings (refer to drawings 151667-TSA-35-MVN2-DRG-T-LP-162431 and 151667-TSA-35-MVN2-DRG-T-LP-162432) and for Limited Building Consent structures.
 - For details on the material and construction of the existing bridge please refer to Design & Access Statement.



THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER

Rev	Date	Description of Revisions	Drawn	Checked	Item
001					
002					
003					

Fit for Contractor Design **D3**



Author: T. Wilson
 Date: 18/03/2021
 Project: Network Rail Speed

TRU West Alliance

THURDES BRIDGE IN - NORMANTON PROPOSED - NORMANTON II

File: CAD Drawing
 Title: TRU West Alliance

Drawn and Country: Planner
 Date: 18/03/2021
 Project: Westtown and Westtown (Devsbury)

Proposed: 18/03/21

Transpennine Route Upgrade

Contract No: 151667

Contract: West of Leeds

Drawing: Planning Drawing

Calder Road Bridge MVN2/202

Existing and Proposed Elevations

Author: A. Morgan
 Date: 18/03/2021

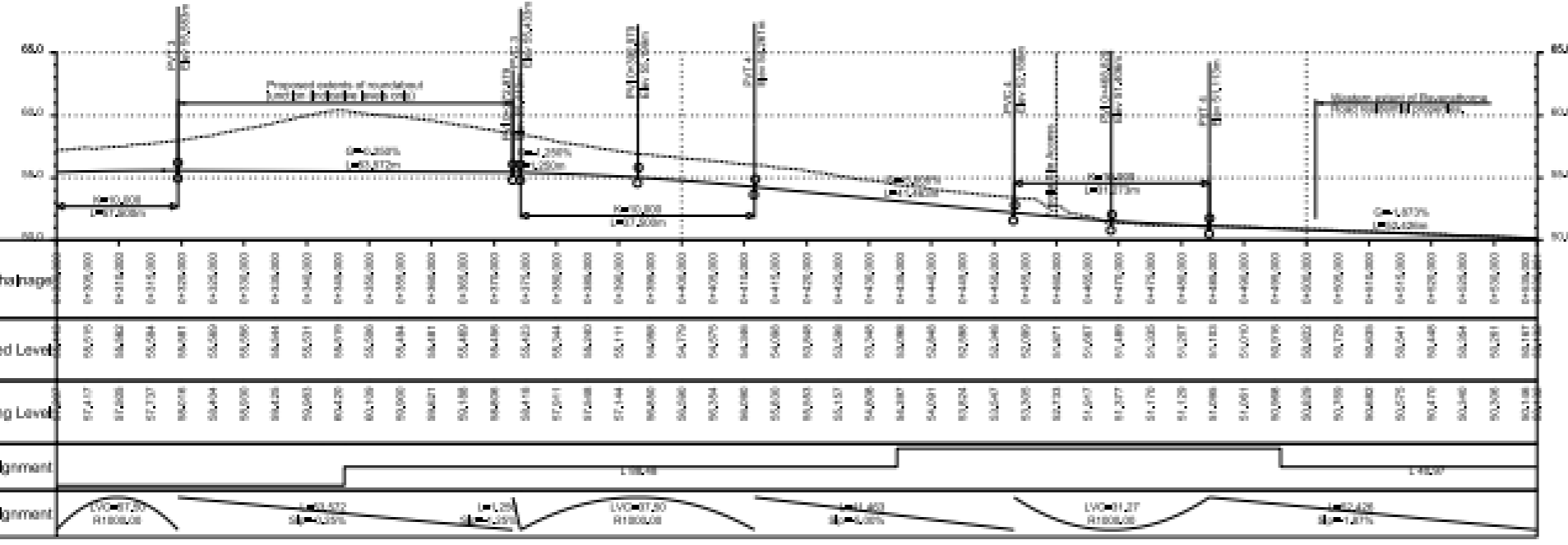
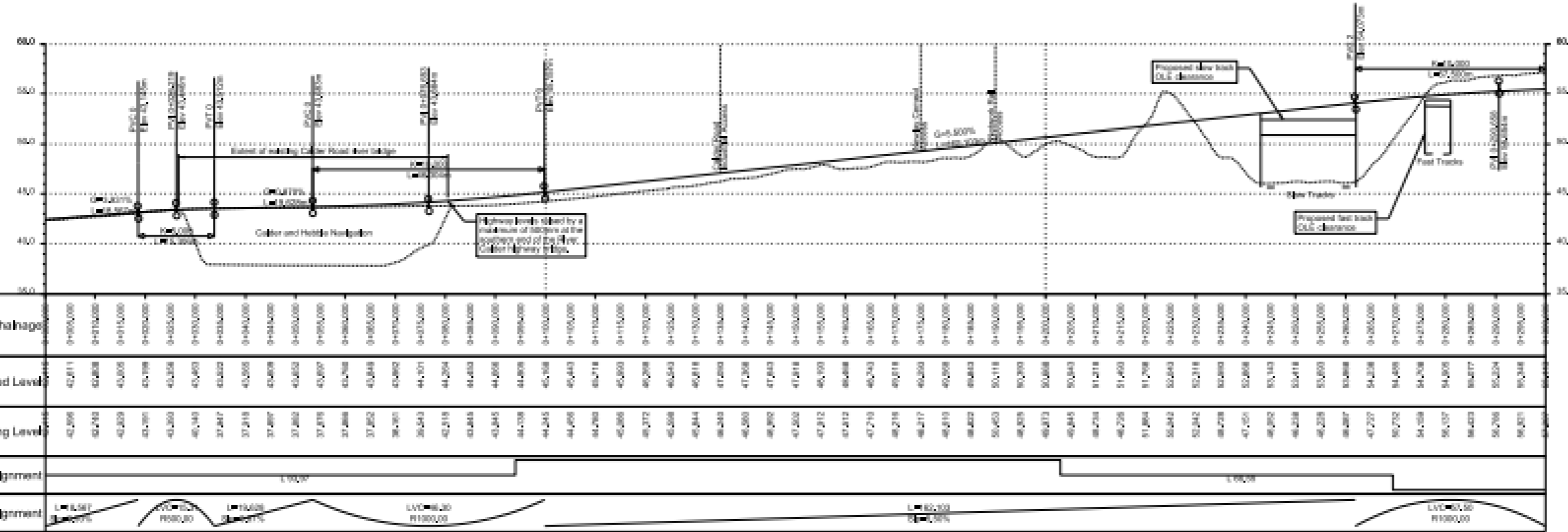
Checked: E. Challen
 Date: 18/03/2021

Approved: P. Foster
 Date: 18/03/2021

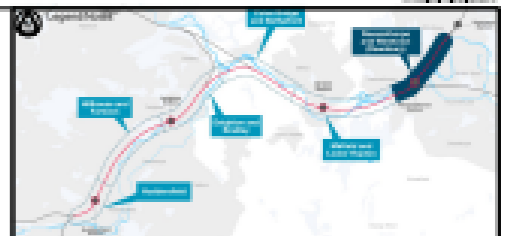
Approved: S. Thomas
 Date: 18/03/2021

As Shown: 30,1637 to 0

Number of Sheets: 2 of 2
 Drawing Number: 151667-TSA-35-MVN2-DRG-T-LP-162431
 Title: P102

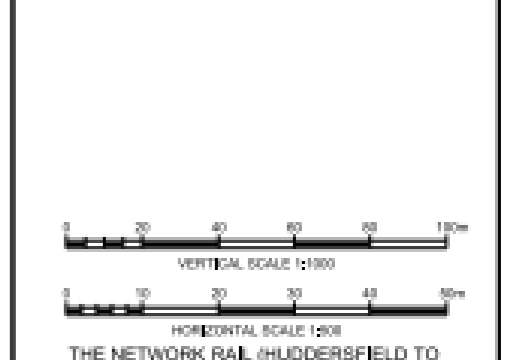


Calder Road - Vertical Profile
Scale: H:1:200 V:1:50



Legend
 Existing Network Rail Boundary
 Planning Application Boundary

- Notes
- All dimensions are in millimetres unless stated otherwise.
 - Do not scale from this drawing.
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 - Overhead Line Equipment (OLE) is only shown on route drawings (refer to drawings 151667-TSA-35-MVN2-DRG-T-LP-162441 to 151667-TSA-35-MVN2-DRG-T-LP-162442) used for 1:1000 Scale Drawing Consent Structures.
 - This drawing is to be read in conjunction with drawings:
 151667-TSA-35-MVN2-DRG-T-LP-162443
 151667-TSA-35-MVN2-DRG-T-LP-162444
 151667-TSA-35-MVN2-DRG-T-LP-162445
 151667-TSA-35-MVN2-DRG-T-LP-162446
 151667-TSA-35-MVN2-DRG-T-LP-162447
 151667-TSA-35-MVN2-DRG-T-LP-162448
 151667-TSA-35-MVN2-DRG-T-LP-162449
 151667-TSA-35-MVN2-DRG-T-LP-162450
 151667-TSA-35-MVN2-DRG-T-LP-162451



THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER

Rev	Date	Description of Revision	Drawn	Chk	App
01	15/03/21	Issue for Design			

Fit for Contractor Design D3



Author	TJL/ep	Appr	Network Rail/ep	Rev	20/03/21
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TRU West Alliance

THORPES BRIDGE JR - NORMANTON BRIDGE/STATION - NORMANTON J

Doc No	04D-0001	Doc Title	04D-0001
Doc Desc	Drawings	Doc Status	04D-0001
Doc Ref	04D-0001	Doc Ref	04D-0001
Doc Ref	04D-0001	Doc Ref	04D-0001

Transpennine Route Upgrade

Contract No: 151667

Contract Title: West of Leeds

Project Name: Calder Road Bridge (MVN2/202)

Project Title: Proposed Highway Profile

Author	LJH/ep	Appr	Network Rail/ep	Rev	11/03/21
Drawn	E.Challinor	Appr	Network Rail/ep	Rev	11/03/21
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Approved	SLThomas	Appr	Network Rail/ep	Rev	11/03/21

As Shown 38,1637 to 0

Sheet Reference: 1 of 1

Project Reference: 151667-TSA-35-MVN2-DRG-T-LP-162441

Sheet Reference: P01

Activity ID	Activity Name	Original Duration	Planned Start	Planned Finish	2023												2024												2025												2026												2027																							
					F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A																					
SPO 13/14 G6 Huddersfield To Ravensthorpe - What if Dive Under (OBC) - 080719																																																																												
Summary Programme																																																																												
Ravensthorpe																																																																												
Enabling Works																																																																												
SUM100035	Civils - Site Establishment	90d	01-Feb-23	06-Jun-23	[Red Bar]																																																																							
SUM100040	Civils - Remediate Former Tip	121d	07-Jun-23	22-Nov-23	[Green Bar]																																																																							
Utilities																																																																												
SUM101090	Civils - Gas Main Diversion	135d	01-Mar-23	05-Sep-23	[Green Bar]																																																																							
SUM101100	Civils - Burried 32KV Cable Diversion Phase 1	63d	01-Mar-23	26-May-23	[Green Bar]																																																																							
SUM101120	Civils - Overhead 133KV Cable Diversion	200d	01-Mar-23	05-Dec-23	[Green Bar]																																																																							
SUM101110	Civils - Burried 32KV Cable Diversion Phase 2	61d	08-Aug-23	31-Oct-23	[Green Bar]																																																																							
Dive Under Structures																																																																												
HR55650	Civils - Trough 2, 3 & 4 Complete	0d		15-Jan-25	◆ Civils - Trough 2, 3 & 4 Complete																																																																							
HR55660	Civils - Box 1, Trough 1 & Box 2 Complete	0d		14-May-26	◆ Civils - Box 1, Trough 1 & Box 2 Complete																																																																							
Box 1																																																																												
HR55540	Civils - Bulk Earthworks & Service Diversions Phase Season 1	111d	30-May-23	31-Oct-23	[Green Bar]																																																																							
HR32660	Civils - Phase 1 Piling & Roof Slab (East of Existing Calder Road Bridge)	83d	07-Jun-23	29-Sep-23	[Green Bar]																																																																							
HR55550	Civils - Bulk Earthworks Season 2	36d	02-Apr-24	21-May-24	[Green Bar]																																																																							
HR32550	Civils - Phase 2 Piling & Roof Slab (West of Existing Calder Road Bridge)	220d	22-May-24	25-Mar-25	[Green Bar]																																																																							
HR32560	Civils - Phase 3 Piling & Roof Slab (Under Existing Calder Road Bridge)	152d	07-Oct-24	06-May-25	[Green Bar]																																																																							
HR55560	Civils - Base Prop Slab (West)	120d	26-Mar-25	09-Sep-25	[Green Bar]																																																																							
HR55610	Civils - Base Prop Slab (East)	60d	20-Aug-25	11-Nov-25	[Green Bar]																																																																							
Trough 1																																																																												
HR32630	Civils - Phase 1 Piling & Capping Beam (West of Existing Wakefield Lines)	89d	05-Apr-23	07-Aug-23	[Green Bar]																																																																							
HR32640	Civils - Phase 2 Piling & Capping Beam (Under Existing Wakefield Linres)	62d	18-Aug-25	11-Nov-25	[Red Bar]																																																																							
HR55530	Civils - Phase 3 Base Prop Slab & Wall Lining	88d	12-Nov-25	13-Mar-26	[Green Bar]																																																																							
Box 2 (MVL1/2)																																																																												
HR32610	Civils - Phase 1 (East of Gas Main)	200d	01-Mar-23	05-Dec-23	[Green Bar]																																																																							
HR55510	Civils - Gas Main Diversion Complete	0d		05-Sep-23	◆ Civils - Gas Main Diversion Complete																																																																							
HR32620	Civils - Phase 2 (Between Gas Main & Wakefield Lines)	75d	06-Sep-23	19-Dec-23	[Green Bar]																																																																							
HR55520	Civils - Slow Lines Blockade Complete	0d		11-Aug-25	◆ Civils - Slow Lines Blockade Complete																																																																							
HR32590	Civils - Phase 3 (Under Existing Wakefield Lines)	198d	12-Aug-25	14-May-26	[Red Bar]																																																																							
HR55620	Civils - Complete for Fast Line Alignment	0d		14-May-26	◆ Civils - Complete for Fast Line Alignment																																																																							
HR55680	P-Way - Install Slab Track Box 1, Trough 1 & Box 2	10d	15-May-26	28-May-26	[Red Bar]																																																																							
SUM10230	P-Way - Fast Line Blockade	10d	24-Dec-26	03-Jan-27	[Red Bar]																																																																							
Trough 2, 3 & 4																																																																												
HR55690	Civils - Construct Trough Structures	441d	10-May-23	15-Jan-25	[Green Bar]																																																																							
HR55670	P-Way - Install Slab Track Trough 2, 3 & 4	15d	16-Jan-25	05-Feb-25	[Green Bar]																																																																							
Positive Drainage																																																																												
HR32700	Civils - Install & Commission Positive Drainage System	100d	10-Sep-25	27-Jan-26	[Green Bar]																																																																							
Ravensthorpe Viaduct																																																																												
SUM100085	Civils - Ravensthorpe Viaduct - Substructure	221d	07-Jun-23	10-Apr-24	[Red Bar]																																																																							
SUM100120	Civils - Ravensthorpe Viaduct - Structural Steel	148d	17-Nov-23	11-Jun-24	[Red Bar]																																																																							
SUM100125	Civils - Ravensthorpe Viaduct - Structural Steel Start Site Erection	0d	12-Dec-23		◆ Civils - Ravensthorpe Viaduct - Structural Steel Start Site Erection																																																																							
SUM100130	Civils - Ravensthorpe Viaduct - Deck Slab & Finishing	238d	25-Mar-24	19-Feb-25	[Red Bar]																																																																							
SUM101150	P-Way - Terminal Float & Prep For Slow Lines Blockade	150d	20-Feb-25	19-Jul-25	[Red Bar]																																																																							
SUM10210	P-Way - Wakefield & Leeds Slow Lines Blockade	23d	20-Jul-25	11-Aug-25	[Red Bar]																																																																							
SUM101020	S&T - Stage#3 - Re-Signal Heaton&Thornhill RRI to Ravensthorpe Westlock for Slow lines	0d	12-Aug-25		◆ S&T - Stage#3 - Re-Signal Heaton&Thornhill RRI to Ravensthorpe W																																																																							
Embankments																																																																												
SUM100065	Civils - Embankment Box Structure to Ravensthorpe Viaduct (Season 1)	152d	07-Jun-23	04-Jan-24	[Green Bar]																																																																							
SUM100070	Civils - Embankment Ravensthorpe Viaduct to East Tie-in South	280d	19-Oct-23	13-Nov-24	[Green Bar]																																																																							
SUM101130	Civils - Embankment Box Structure to Ravensthorpe Viaduct (Season 2)	222d	02-Apr-24	05-Feb-25	[Green Bar]																																																																							
SUM101140	Civils - Embankment Falls Lane Bridge to East Tie-in North	143d	30-May-24	16-Dec-24	[Green Bar]																																																																							
SUM101030	S&T - Stage#5 - Test & Commission Fast Lines	0d	03-Jan-27		◆ S&T - Stag																																																																							
Structures East																																																																												
SUM100730	Civils - Falls Lane Bridge (New)	361d	17-Jul-23	02-Dec-24	[Green Bar]																																																																							
SUM100740	Civils - Falls Lane Bridge (Existing)	39d	15-Oct-24	06-Dec-24	[Green Bar]																																																																							
SUM100750	Civils - Infill 3No Existing Structures	142d	30-Sep-25	15-Apr-26	[Red Bar]																																																																							

■ Actual Work
 ■ Critical Remaining Work
 ■ Critical LOE
■ Remaining Work
 ■ LOE
 ◆ Milestone

Activity ID	Activity Name	Original Duration	Planned Start	Planned Finish	2023												2024												2025												2026												2027					
					F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A			
Ravensthorpe Station																																																										
HR55570	Civils - Calder Road Bridge North & South Abutments	228d	08-Mar-23	21-Nov-25																																																						
HR55590	Civils - Divert Services & Demolish Existing Calder Road Bridge	50d	03-Jun-24	09-Aug-24																																																						
SUM100400	Civils - Footbridge Construction	99d	11-Jul-25	17-Oct-25																																																						
SUM100195	Civils - Island Platform Construction	74d	12-Aug-25	21-Nov-25																																																						
HR55580	Civils - Calder Road Bridge Centre Pier & Deck Construction	0d	18-Aug-25	18-Aug-25																																																						

█ Actual Work
 █ Critical Remaining Work
 █ Critical LOE
█ Remaining Work
 █ LOE
 ◆ Milestone

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.03	Electric Power and Plant				
1.03	Electric power and Plant				
1.03.01	Primary Power Supply				
1.03.01.02	Distribution Network Operator (DNO)				
1.03.01.02.05	Substations	2	sum	10,000.00	20,000.00
1.03.01.02	Distribution Network Operator (DNO)				20,000.00
	<i>Small power for equipment</i>				
1.03.01.02.06	Small power for equipment	4	sum	10,000.00	40,000.00
1.03.01.02.07	Points Heating : 2x PHCC, 4x,5kVA TX, 4x Trackside Connection Box, 4x Support Post / Mounting Plate ,2x Hot+Cold probes, 16x HeaterStrips, 100mts X 8c 6mm EPR/PCP Cable, 150m x 3c 16mm SWA/XLPE/LSF Cable, 90m x 2c 1.5mm EPR/PCP Cable	1	item	65,432.64	65,432.64
1.03.01.02.08	Electrical supply to Points Heating : 2x External Cubicle,2x 100A TPN Supply, 200m Supply Cable (4cx 50mm), 2x 100a TPN DB, 4 x Terminations, 2x Test & Commission + Utility Suppliers Quote.	1	item	65,665.60	65,665.60
1.03.01.02.09	Electrical Supply to FTN/GSMR Nodes & REB: 2x 125A SPN Supply, 200m Supply Cable (3cx 16mm), 2x Service Equipment, 4x Terminations, 2x Test & Commission	1	No	32,832.80	32,832.80
	Small power for equipment				203,931.04
	<i>Cables and containment</i>				
1.03.01.02.12	power Distribution cable	323	m	30.00	9,690.00
1.03.01.02.13	Test and Commission	100	item		24,589.66
	Cables and containment				34,279.66
1.03.01	Primary Power Supply				258,210.70
1.03	Electric Power and Plant				258,210.70
1.04	Permanent Way				
1.04	Permanent Way				
1.04.01	Plain Line - Track				
1.04.01.01	Track bed				
1.04.01.01.01	Track on Viaduct and tunnels assume slab tracked - 450mm thick	3,200	m	3,000.00	9,600,000.00
1.04.01.01	Track bed				9,600,000.00
	<i>Running Rails</i>				
	<i>Plain line renewal</i>				
1.04.01.01.03	CAT 14 CEN60 Plainline renewal (reraill, resleeper & reballast traxcavate) on new existing	2,130	m	1,130.00	2,406,900.00
1.04.01.01.04	New track				

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.04.01.01.03	CAT 11 CEN60 plainline new (rail, sleeper, ballast, formation traxcavate) on new formation	10,010	m	881.00	8,818,810.00
	Running Rails				11,225,710.00
<i>1.04.01.05</i>	<i>Abandonment and recovery of old materials</i>				
1.04.01.05.03	Plain Line	6,160	stm	198.00	1,219,680.00
1.04.01.05	Abandonment and recovery of old materials				1,219,680.00
1.04.01	Plain Line - Track				22,045,390.00
1.04.02	Switches and Crossings				
<i>1.04.02.03</i>	<i>Turn Outs and Crossovers</i>				
<i>1.04.02.03.01</i>	<i>Standard turnout - as CVS/DVS/EVS/FVS</i>				
1.04.02.03.02	High speed turnout - as SGVS/NR60 SG	4	nr	419,363.00	1,677,452.00
1.04.02.03	Turn Outs and Crossovers				1,677,452.00
<i>1.04.02.06</i>	<i>Abandonment and recovery of old materials</i>				
1.04.02.06.01	Recovery of spent ballast	10,546	m3		Not Priced
1.04.02.06.02	Points and crossings recovery	1	nr	25,011.46	25,011.46
1.04.02.06	Abandonment and recovery of old materials				25,011.46
1.04.02	Switches and Crossings				1,702,463.46
1.04.04	Track Drainage				
<i>1.04.04.01</i>	<i>Pipework</i>				
1.04.04.01.01	- Undertrack Drainage, depth yet to be determined	6,160	m	600.67	3,700,127.20
1.04.04.01	Pipework				3,700,127.20
<i>1.04.04.02</i>	<i>Inspection Chanbers</i>				
1.04.04.02.01	- Inspection Chambers at 50m centres	123	nr	1,772.30	217,992.90
1.04.04.02	Inspection Chanbers				217,992.90
1.04.04	Track Drainage				3,918,120.10
	Enhancement of rates				
	Enhancement of rates for Staging and locality of works	0.1	%	27,665,973.56	2,766,597.36
	Enhancement of rates				2,766,597.36
	Test and Commision				
1.04.01.04	Test and Commission	15	%		4,149,896.03
	Test and Commision				4,149,896.03

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.04	Permanent Way				34,582,466.95
1.05	Telecommunication Systems				
1.05	<i>Operational Telecomms System</i>				
1.05.04	Operational Management System				
1.05.01.04	Test and Commission	15	%		Not Priced
1.05.04	Operational Management System				
1.05	Telecommunication Systems				
1.06	Buildings and Property				
	<i>Ravensthorpe Station (Existing)</i>				
1.06.00	Facilitating Works				
1.06.00.02	<i>Major demolition works</i>				
1.06.02.02.04	Demolition of existing platforms (2 nr)	684	m3	300.00	205,200.00
1.06.02.02.04	Demolish Station Footbridge; Carefully take down decks (20m2) and supports and steps: transport to heritage museum	1	nr	200,000.00	200,000.00
1.06.02.02.04	Demolition of waiting shelter	2	nr	5,000.00	10,000.00
1.06.02.02.04	Demolition of lighting columns	8	nr	500.00	4,000.00
1.06.02.02.05	Abandonment recovery and disposal of redundant equipment : Time and Labour allowance of redundant Station Power & Lighting, Points Heating, SISS Equipment.	1	item	37,390.08	37,390.08
1.06.00.02	Major demolition works				456,590.08
1.06.00	Facilitating Works				456,590.08
1.06.02	Superstructure				
1.06.02.02	<i>Upper floors</i>				
1.06.02.02.04	Construct new platforms	1,675	m2	1,746.00	2,924,550.00
1.06.02.02	Upper floors				2,924,550.00
1.06.02	Superstructure				2,924,550.00
1.06.05	Services				
1.06.05.10	Lift for station footbridge	1	nr	333,981.00	333,981.00
1.06.05.11	Lifts for Station Footbridge : 100mx 4c35mm Supply from Power Cubicle, 100m x containment to LMR, 2 x LMR Isolators ,2x LMR Consumer Unit, 2x LMR Fit-Out c/w 4x General Lighting, 2x Emergency Lighting, & 2x Power outlets, 2x heater, 2 x Extract Fan, 2x Test & Commission.	0.5	item	23,368.80	11,684.40

Draft Cost Estimate VP3

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.06.05.12	Equipment Installation for 2No platforms : CCTV : , 1x Equipment Rack, 1x Rack mtd power supplies, 1x NVT Receivers & Transmitters, 20x Bosch Dome Cameras, 20x Mounting Bkts, 1500mts x CAT5 PE Cable, 8x Columns, 50mts x 25mm Conduit, Test & Commission. CIS : 1x Comms Cubicle, 1x IPH3 Server, 1x Control Eqpt, 1x RS 485 Hub, 2x 10Line NTI LED Displays, 2x TFT Displays, 4x 3 line DS LED Displays, 4x Gallows Supports, 2x Wall Mtd Brackets, 4x Ground Anchor Kits, 8x Power supplies, 50mts x Containment, 300mts x CAT 5 Cabling, 300mts x Power Cabling, 1x Test & Commission. PA : 1x Acoustic Model, 1x Amplifier Equipment, 1x Control PC, 2x USB Interfaces, 22x Projector Loudspeakers, 4x Ambient Noise Senors, 1x Testing & Commissioning, 50mts x Containment, 600mts x Speaker Cable Help Point : 2X PHP's, 2X Brackets / Support Steel, 1X Control Equipment, 1X Rack, 2x Induction Loops, 60mts x Containment, 2 Power supplies, 100m 3c4mm cabling, 100mts x CAT 5 PE Cable, 1x Test & Commission	1	item	504,766.08	504,766.08
1.06.05	Services				850,431.48
1.06.06	Prefabricated buildings				
1.06.06.01	New Waiting shelter	2	nr	35,000.00	70,000.00
1.06.06	Prefabricated buildings				70,000.00
1.06.08	External Works				
<i>1.06.08.02</i>	<i>Roads, paths, pavings and surfacings</i>				
1.06.08.02.01	New car park	2,422	m2	90.00	217,980.00
1.06.08.02.01	New Access Road/Footpath to car park	1,000	m2	75.00	75,000.00
1.06.08.02.02	Emergency Access from station platform	300	m2	38.50	11,550.00
1.06.08.02	Roads, paths, pavings and surfacings				304,530.00
<i>1.06.08.04</i>	<i>Fencing, railings and walls</i>				
1.06.08.04	Car park fencing	250	m	120.00	30,000.00
1.06.08.05	High containment VRS	260	m	200.00	52,000.00
1.06.08.04	Fencing, railings and walls				82,000.00
<i>1.06.08.06</i>	<i>External Drainage</i>				
1.06.08.06.02	Platform drainage ACO channel drain	150	m	120.00	18,000.00
1.06.08.06	External Drainage				18,000.00
<i>1.06.08.07</i>	<i>External services</i>				

Draft Cost Estimate VP3

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.06.08.08	Electrical supply to Ravensthorpe Station : 1x 200A TPN Supply, 100m Supply Cable (4cx 70mm), 1x Service Equipment, 1x DNO D/S Cabinet, 4x Terminations, 1x Test & Commission + Quoted Utility Supplier cost.	1	sum	32,832.80	32,832.80
1.06.08.09	New Lighting Installation for 2No platforms 80mts x Supply Cable, 1x LV Power Cubicle, 2x Lighting Controls, 1x Photocell, 2x Distribution Boards, 26 x 5mt R/L Columns , 26x LED Column Mounted Luminaires , 2x LED Canopy Mtd Luminaires , 100mts x Containment, 570mts x 3c 6mm cabling, 570mts x 16mm Earthing cable, Testing & Commissioning	1	item	126,484.18	126,484.18
1.06.08.10	Footbridge, Shelter & Emergency Exit Pathway Lighting: 50No Emergency Type Bulkhead LED Luminaires, 300mts 3c 4mm SWA Cable, 150mts 25mm Conduit, 600mts 4mm Singles Cable	1	item	45,942.62	45,942.62
1.06.08.11	Plant Rooms: 4No Distribution Boards, 4No Emergency Type Luminaires, 4No RCD Socket Outlets, 8No FCU, 4No Heaters, 4 Exhaust Fans, 100mts 3c 16mm SWA, 80mts 20mm Conduit, 40mts Trunking, 200mts Single Cable.	1	item	18,200.00	18,200.00
1.06.08.12	Car Park & Road Lighting: 1x Distribution Board, 1x Lighting Control, 36No 8mt Lighting Columns Twin Headed, 48No LED Luminaires, 1500mts 3c 10mm SWA Cable, 1x Photocell.	1	item	124,598.66	124,598.66
1.06.08.13	External Services -Junction Lighting: 1xLighting Cubicle, 1xDistribution Board, 1xLighting Controls, 1x Photocell, 10No GRP Lighting Columns, 10No LED Luminaires, 150mts 3c 25mm SWA, 150mts 3c 4mm SWA.	1	item	180,000.00	180,000.00
1.06.08.07	External services				528,058.26
<i>1.06</i>	<i>Minor Building works and ancillary buildings</i>				
1.07	New Ticket office/waiting room complete with all services, fittings,furnishings and equipment	100	m2	1,500.00	150,000.00
1.06	Minor Building works and ancillary buildings				150,000.00
1.06.08	External Works				1,082,588.26
	Enhancement of Rates				
	Enhancement of rates for Staging and locality of works	0.1	sum	5,384,159.82	538,415.98
	Enhancement of Rates				538,415.98
1.06	Buildings and Property				5,922,575.80

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07	Civil Engineering				
1.07.01	Earthworks				
<i>1.07.01.01</i>	<i>Cuttings</i>				
1.07.01.01.01	Excavation and disposal	195,000	m3	59.00	11,505,000.00
1.07.01.01	Cuttings				11,505,000.00
<i>1.07.01.02</i>	<i>Embankments</i>				
1.07.01.02.01	Excavation	9,875	m3	23.00	227,125.00
1.07.01.02.02	Disposal	9,875	m3	13.75	135,781.25
1.07.01.02.03	Type 6N filling	160,000	m3	55.36	8,857,600.00
1.07.01.02.03	Type 6C filling	19,000	m3	55.36	1,051,840.00
1.07.01.02.04	Geotextile layer beneath fill,ballast and topsoil and topsoil retention geogrid.	57,000	m2	6.87	391,590.00
1.07.01.02	Embankments				10,663,936.25
1.07.01	Earthworks				22,168,936.25
1.07.03	Tunnels and shafts				
1.07.04	Rc Box Structure (Box 1) ; internal dimensions 10.34m x 5.715m ; length 165m	1	nr	4,061,039.99	4,061,039.99
1.07.05	Rc Box Structure (Trough 1) ; internal dimensions 10.34m x 5.715m ; length 110m	1	nr	1,903,679.48	1,903,679.48
1.07.06	Rc Box Structure (Trough 2) ; internal dimensions 10.34m x 5.715m ; length 180m	1	nr	3,118,022.61	3,118,022.61
1.07.07	RC Box structure Intersection ;internal dimensions 10.34m x 5.715m ;length 137m	1	nr	3,613,069.92	3,613,069.92
1.07.07	Pump Shaft and equipment	1	nr	450,000.00	450,000.00
1.07.03	Tunnels and shafts				13,145,812.00
1.07.07	Retaining Walls				
<i>1.07.07.02</i>	<i>Retaining Walls</i>				
1.07.07.02	Sheet piled retaining wall(training wall River Calder)	1,680	m2	150.00	252,000.00
1.07.07.02	RC capping beam to retaining wall	120	m3	2,055.00	246,600.00
1.07.07.02	Retaining Walls Calder road : ; Height 4m	81	m	3,808.21	308,465.01
1.07	Retaining Wall 4 : RC Concrete retaining wall on piled foundation; Height 2-8m	250	m	8,405.30	2,101,325.00
1.07.07.02	Retaining Walls				2,908,390.01
1.07.07	Retaining Walls				2,908,390.01
1.07.08	Fencing and enclosures				
	Boundary Fencing	1,190	m	150.00	178,500.00
<i>1.07.08.02</i>	<i>Barriers and guard rails</i>				
1.07.08.02	Key klamp handrailing 1.5m high in concrete fdns	250	m	120.00	30,000.00
1.07.08.02	Barriers and guard rails				208,500.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.08	Fencing and enclosures				208,500.00
1.07.09	General Drainage				
<i>1.07.09.01</i>	<i>Surface water drainage</i>				
1.07.09.01.01	Carrier drain 225 dia.	2,930	m	93.32	273,427.60
1.07.09.01.01	- Outfall drain	72	m	346.20	24,926.40
1.07.09.01.04	Catch pit	75	nr	1,512.56	113,442.00
1.07.09.01	Surface water drainage				411,796.00
<i>1.07.09.05</i>	<i>Culverts</i>				
1.07.09.05.01	-New Culvert out flow, assume 15m connections to drains	3	nr	3,250.00	9,750.00
1.07.09.05	Culverts				9,750.00
1.07.09	General Drainage				421,546.00
1.07.05	Bridges and viaducts for road or rail vehicles				
1.07	New 4 track Viaduct underbridge ;312m long; Precast concrete deck(area 6836 m2) on structural steel plate girder supports; 6 RC piers with piled foundations;2 RC abutments with piled foundations - MDL1/6A	1	nr	13,506,358.25	13,506,358.25
<i>1.07.05.03</i>	<i>Decks</i>				
1.07.05.03	New 3 span overbridge 65 m x 10 wide(650m2) on 2 nr new abutments and 1nr piers ; MVN2/202 Calder Road	1	sum	2,400,000.00	2,400,000.00
	New 3 span steel E-Type deck with central support and new abutments piled ((690m2) MBL/1/9	1	sum	1,635,300.00	1,635,300.00
1.07.05.03	Decks				17,541,658.25
<i>1.07.05.05</i>	<i>Paving and surfacing</i>				
1.07.11	Diverted Highway -Calder Road	250	m	3,353.00	838,250.00
1.07.12	New track realignment around bridge pier-MDL1/5A to Laggs Hall Bridge	50	m	1,000.00	50,000.00
1.07.05.05	Paving and surfacing				888,250.00
1.07.05	Bridges and viaducts for road or rail vehicles				18,429,908.25
1.07.09	General drainage				
	<i>Culverts</i>				
1.07.09.05	Type 4B culvert; masonry; excavate and demolish; replace with new concrete pipe (1m dia. 30m long); reinstate track bed	1	nr	31,800.00	31,800.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.09.05	Type 4B generic culvert; masonry; excavate and demolish; replace with new concrete pipe (1m dia. 25m long); Invert 4m below ballast level; reinstate track bed	1	nr	26,500.00	26,500.00
	Culverts				58,300.00
1.07.09	General drainage				58,300.00
1.07.06	Footbridges				
	<i>Ravensthorpe Station</i>				
1.07.06	New standard LM station footbridge; with 2 sets of steps length of footbridge 18m	1	nr	578,505.56	578,505.56
1.07.06	Trial erection of footbridges at fabrication yard and prior to delivery	2	sum	30,000.00	60,000.00
1.07.06	Footbridges				638,505.56
1.07.10	Track Foundations				
1.07.10.01.01	Excavation and Disposal	26,372	m3	63.10	1,664,073.20
4.07.10.01.02	Filling to track bed	26,372	m3	84.85	2,237,664.20
1.07.10	Track Foundations				3,901,737.40
1.07.11	Roads and Pavements				
	<i>Track asset walkways</i>				
1.07.11.03.04	-Surfaced access ways - CESS	11,044	m	38.50	425,194.00
1.07.11.03.04	-Surfaced access ways - Driver Walkways	216	m	100.00	21,600.00
1.07.11.03	Track asset walkways				446,794.00
	<i>RRAPs</i>				
1.07.11	Access to track level	4	nr	50,000.00	200,000.00
1.07.11	RRAP across two tracks	4	nr	22,500.00	90,000.00
1.07.11	RRAPs				290,000.00
1.07.11	Roads and Pavements				736,794.00
1.07.12	Troughing				
	<i>Troughing - Ground Level</i>				
1.07.12.01.01	<i>Traditional Concrete Troughing</i>				
1.07.12.01.01	- C1/40 Trough Route	4,722	m	100.00	472,200.00
	- C1/7 Tie ins to equipment	552	m	150.00	82,800.00
1.07.12.01	Troughing - Ground Level				555,000.00
1.07.12	Troughing				555,000.00
1.07.03	Tunnel and shafts				
	<i>Furniture and lighting</i>				

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.03.07	tunnel Lighting	600	m	120.00	72,000.00
	Furniture and lighting				72,000.00
1.07.03	Tunnel and shafts				72,000.00
	Enhancement of Rates				
	Enhancement of rates for Staging and locality of works	0.1	sum	63,245,429.47	6,324,542.95
	Enhancement of Rates				6,324,542.95
1.07	Civil Engineering				69,569,972.42
1.08	Enabling works				
1.08	<i>Enabling Works</i>				
1.08.02	Site Clearance and preparation				
	<i>Site Clearance</i>				
1.08.02.01	Site Clearance - Agricultural land use	15,500	m2	10.00	155,000.00
1.08.02.01	Site Clearance - industrial land use	65,000	m2	35.00	2,275,000.00
	Site Clearance				2,430,000.00
1.08.02.03	Specialist Ground Works				
	Ground stabilisation below embankment <precast detail)<="" pile="" td=""> <td>19,000</td> <td>m2</td> <td>420.00</td> <td>7,980,000.00</td> </precast>	19,000	m2	420.00	7,980,000.00
	Specialist Ground works - Mine grouting	1	sum	9,580,000.00	9,580,000.00
1.08.02.03	Specialist Ground Works				17,560,000.00
1.08.02	Site Clearance and preparation				19,990,000.00
1.08.03	Structure specific enabling works				
1.08.03.01	Demolition works				
1.08.03.01.02	Demolition - entire structures				
1.08.03.01.02	Type 2B overbridge; remove steel deck (263m2) and abutments	1	sum	150,000.00	150,000.00
1.08.03.01.02	Type 2J overbridge; pipe bridge; take off space truss supporting pipe (26m long)	1	sum	25,000.00	25,000.00
	Type 1J underbridge; remove existing steel decks (130m2) and abutments	1	sum	150,000.00	150,000.00
1.08.03.01	Demolition works				325,000.00
1.08.03	Structure specific enabling works				325,000.00
	Enhancement of rates				
	Enhancement of rates for locality of works (Civils element)	0.1	sum	22,210,000.00	2,221,000.00
	Enhancement of rates				2,221,000.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.08	Enabling works				22,536,000.00
2.01	Preliminaries, overheads and profit				
2.01.01.	Contractor's Preliminaries				
2.01.01..02	Preliminaries - included at 30%	0.3	%	132,869,225.87	39,860,767.76
2.01.01..02	Possession management - included at @ 5%	0.05	%	132,869,225.87	6,643,461.29
2.01.01.	Contractor's Preliminaries				46,504,229.05
2.02.	Overheads and Profit				
2.02.01.	Contractor's overheads and profit - included at 17.9%	0.179	%	179,373,454.92	32,107,848.43
2.02.	Overheads and Profit				32,107,848.43
2.01	Preliminaries, overheads and profit				78,612,077.48
3	Project / Design Team Fees and Other Project Development Costs				
3.01.	Design Team Fees				
3.01.01.	Employer's own design fees - included at 15%	0.15	%	211,481,303.35	31,722,195.50
3.01.	Design Team Fees				31,722,195.50
3.02.	Project Management Team Fees				
3.02.01	Employer's project costs - included at 12%	0.12	%	211,481,303.35	25,377,756.40
3.02.	Project Management Team Fees				25,377,756.40
3.03.01	Other Project Costs				
3.03.01.01	<i>Compensation and property costs</i>				
3.03.01.02	<i>Fees to statutory and public bodies</i>				
3.03.01.03	<i>Payments to public and statutory bodies</i>				
3.03.01.03.01	Relocation of High Voltage overhead power lines	1	sum	5,000,000.00	5,000,000.00
3.03.01.04	<i>Sponsor's agent fees</i>				
3.03.01.05	<i>Employer's office & supplied plant costs</i>				
3.03.01.06	<i>Research for innovation products</i>				
3.03.01.07	<i>Finance Costs</i>				
3.03.01.08	<i>Marketing</i>				
3.03.01.09	<i>Stakeholder Management</i>				
3.03.01.10	<i>Archeological</i>				
3.03.01.11	<i>Insurance</i>				
3.03.01.12	Land / property costs - 3%	0.03	%	211,481,303.35	6,344,439.10
3.03.02	<i>Disruption of Asset Use</i>				
3.03.02.01	<i>Employer's Costs (Possessions & Isolation)</i>				
	Schedule 4 possession costs - 10%	0.1	%	211,481,303.35	21,148,130.34
3.03.01	Other Project Costs				32,492,569.44

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
3	Project / Design Team Fees and Other Project Development Costs				89,592,521.34
4.01.01	Risk				
	Included at 40%	0.4	%	301,073,824.69	120,429,529.88
4.01.01	Risk				120,429,529.88
5.01.01	Inflation				
5.01.01	Inflation				

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.03	Electric Power and Plant				258,210.70
1.03.01	Primary Power Supply				258,210.70
1.03.01.02	Distribution Network Operator (DNO)				20,000.00
	Small power for equipment				203,931.04
	Cables and containment				34,279.66
1.04	Permanent Way				34,582,466.95
1.04.01	Plain Line - Track				22,045,390.00
1.04.01.01	Track bed				9,600,000.00
	Running Rails				11,225,710.00
1.04.01.05	Abandonment and recovery of old materials				1,219,680.00
1.04.02	Switches and Crossings				1,702,463.46
1.04.02.03	Turn Outs and Crossovers				1,677,452.00
1.04.02.06	Abandonment and recovery of old materials				25,011.46
1.04.04	Track Drainage				3,918,120.10
1.04.04.01	Pipework				3,700,127.20
1.04.04.02	Inspection Chanbers				217,992.90
	Enhancement of rates				2,766,597.36
	Test and Commision				4,149,896.03
1.05	Telecommunication Systems				
1.05.04	Operational Management System				
1.06	Buildings and Property				5,922,575.80
1.06.00	Facilitating Works				456,590.08
1.06.00.02	Major demolition works				456,590.08
1.06.02	Superstructure				2,924,550.00
1.06.02.02	Upper floors				2,924,550.00
1.06.05	Services				850,431.48
1.06.06	Prefabricated buildings				70,000.00
1.06.08	External Works				1,082,588.26
1.06.08.02	Roads, paths, pavings and surfacings				304,530.00
1.06.08.04	Fencing, railings and walls				82,000.00
1.06.08.06	External Drainage				18,000.00
1.06.08.07	External services				528,058.26
1.06	Minor Building works and ancillary buildings				150,000.00
	Enhancement of Rates				538,415.98
1.07	Civil Engineering				69,569,972.42

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.01	Earthworks				22,168,936.25
1.07.01.01	Cuttings				11,505,000.00
1.07.01.02	Embankments				10,663,936.25
1.07.03	Tunnels and shafts				13,145,812.00
1.07.07	Retaining Walls				2,908,390.01
1.07.07.02	Retaining Walls				2,908,390.01
1.07.08	Fencing and enclosures				208,500.00
1.07.08.02	Barriers and guard rails				208,500.00
1.07.09	General Drainage				421,546.00
1.07.09.01	Surface water drainage				411,796.00
1.07.09.05	Culverts				9,750.00
1.07.05	Bridges and viaducts for road or rail vehicles				18,429,908.25
1.07.05.03	Decks				17,541,658.25
1.07.05.05	Paving and surfacing				888,250.00
1.07.09	General drainage				58,300.00
	Culverts				58,300.00
1.07.06	Footbridges				638,505.56
1.07.10	Track Foundations				3,901,737.40
1.07.11	Roads and Pavements				736,794.00
1.07.11.03	Track asset walkways				446,794.00
1.07.11	RRAPs				290,000.00
1.07.12	Troughing				555,000.00
1.07.12.01	Troughing - Ground Level				555,000.00
1.07.03	Tunnel and shafts				72,000.00
	Furniture and lighting				72,000.00
	Enhancement of Rates				6,324,542.95
1.08	Enabling works				22,536,000.00
1.08.02	Site Clearance and preparation				19,990,000.00
	Site Clearance				2,430,000.00
1.08.02.03	Specialist Ground Works				17,560,000.00
1.08.03	Structure specific enabling works				325,000.00
1.08.03.01	Demolition works				325,000.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
	Enhancement of rates				2,221,000.00
2.01	Preliminaries, overheads and profit				78,612,077.48
2.01.01.	Contractor's Preliminaries				46,504,229.05
2.02.	Overheads and Profit				32,107,848.43
3	Project / Design Team Fees and Other Project Development Costs				89,592,521.34
3.01.	Design Team Fees				31,722,195.50
3.02.	Project Management Team Fees				25,377,756.40
3.03.01	Other Project Costs				32,492,569.44
4.01.01	Risk				120,429,529.88
5.01.01	Inflation				
	TOTAL				421,503,354.57

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.03	Electric Power and Plant				
1.03	<i>Electric power and Plant</i>				
1.03.01	Primary Power Supply				
1.03.01.02	<i>Distribution Network Operator (DNO)</i>				
1.03.01.02.05	Substations	2	sum	10,000.00	20,000.00
1.03.01.02	Distribution Network Operator (DNO)				20,000.00
	<i>Small power for equipment</i>				
1.03.01.05	Small power for equipment	4	sum	10,000.00	40,000.00
1.03.01.05.06	Points Heating : 2x PHCC, 4x,5kVA TX, 4x Trackside Connection Box, 4x Support Post / Mounting Plate ,2x Hot+Cold probes, 16x HeaterStrips, 100mts X 8c 6mm EPR/PCP Cable, 150m x 3c 16mm SWA/XLPE/LSF Cable, 90m x 2c 1.5mm EPR/PCP Cable	1	item	65,432.64	65,432.64
1.03.01.05.07	Electrical supply to Points Heating : 2x External Cubicle,2x 100A TPN Supply, 200m Supply Cable (4cx 50mm), 2x 100a TPN DB, 4 x Terminations, 2x Test & Commission + Utility Suppliers Quote.	1	item	65,665.60	65,665.60
	Electrical Supply to FTN/GSMR Nodes & REB: 2x 125A SPN Supply, 200m Supply Cable (3cx 16mm), 2x Service Equipment, 4x Terminations, 2x Test & Commission	1	No	32,832.80	32,832.80
	Small power for equipment				203,931.04
	<i>Cables and containment</i>				
1.03.01.07	power Distribution cable	323	m	30.00	9,690.00
1.03.01.08	Test and Commission	100	item		24,589.66
	Cables and containment				34,279.66
1.03.01	Primary Power Supply				258,210.70
1.03	Electric Power and Plant				258,210.70
1.04	Permanent Way				
1.04	<i>Permanent Way</i>				
1.04.01	Plain Line - Track				
	<i>Running Rails</i>				
	<i>Plain line renewal</i>				
1.04.01.01.03	CAT 14 CEN60 Plainline renewal (reraill, resleeper & reballast traxcavate) on new existing	2,130	m	1,130.00	2,406,900.00
1.04.01.01.04	<i>New track</i>				
1.04.01.01.03	CAT 11 CEN60 plainline new (rail, sleeper, ballast, formation traxcavate) on new formation	13,210	m	881.00	11,638,010.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
	Running Rails				14,044,910.00
<i>1.04.01.05</i>	<i>Abandonment and recovery of old materials</i>				
1.04.01.05.03	Plain Line	6,160	stm	198.00	1,219,680.00
1.04.01.05	Abandonment and recovery of old materials				1,219,680.00
1.04.01	Plain Line - Track				15,264,590.00
1.04.02	Switches and Crossings				
<i>1.04.02.03</i>	<i>Turn Outs and Crossovers</i>				
<i>1.04.02.03.01</i>	<i>Standard turnout - as CVS/DVS/EVS/FVS</i>				
1.04.02.03.02	High speed turnout - as SGVS/NR60 SG	4	nr	419,363.00	1,677,452.00
1.04.02.03	Turn Outs and Crossovers				1,677,452.00
<i>1.04.02.06</i>	<i>Abandonment and recovery of old materials</i>				
1.04.02.06.01	Recovery of spent ballast	10,546	m3		Not Priced
1.04.02.06.02	Points and crossings recovery	1	nr	25,011.46	25,011.46
1.04.02.06	Abandonment and recovery of old materials				25,011.46
1.04.02	Switches and Crossings				1,702,463.46
1.04.04	Track Drainage				
<i>1.04.04.01</i>	<i>Pipework</i>				
1.04.04.01.01	- Undertrack Drainage, depth yet to be determined	6,160	m	600.67	3,700,127.20
1.04.04.01	Pipework				3,700,127.20
<i>1.04.04.02</i>	<i>Inspection Chanbers</i>				
1.04.04.02.01	- Inspection Chambers at 50m centres	123	nr	1,772.30	217,992.90
1.04.04.02	Inspection Chanbers				217,992.90
1.04.04	Track Drainage				3,918,120.10
	Enhancement of rates				
	Enhancement of rates for locality of works (Civils element)	0.1	%	20,885,173.56	2,088,517.36
	Enhancement of rates				2,088,517.36
	Test and Commision				
1.04.01.04	Test and Commission	15	%		3,132,776.03
	Test and Commision				3,132,776.03

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.04	Permanent Way				26,106,466.95
1.05	Telecommunication Systems				
1.05	<i>Operational Telecomms System</i>				
1.05.04	Operational Management System				
1.05.01.04	Test and Commission	15	%		
1.05.04	Operational Management System				
1.05	Telecommunication Systems				
1.06	Buildings and Property				
1.06.00	Facilitating Works				
1.06.00.02	<i>Major demolition works</i>				
1.06.02.02.04	Demolition of existing platforms (2 nr)	684	m3	300.00	205,200.00
1.06.02.02.04	Demolish Station Footbridge; Carefully take down decks (20m2) and supports and steps: transport to heritage museum	1	nr	200,000.00	200,000.00
1.06.02.02.04	Demolition of waiting shelter	2	nr	5,000.00	10,000.00
1.06.02.02.04	Demolition of lighting columns	8	nr	500.00	4,000.00
1.06.02.02.05	Abandonment recovery and disposal of redundant equipment : Time and Labour allowance of redundant Station Power & Lighting, Points Heating, SISS Equipment.	1	item	37,390.08	37,390.08
1.06.00.02	Major demolition works				456,590.08
1.06.00	Facilitating Works				456,590.08
1.06.02	Superstructure				
1.06.02.02	<i>Upper floors</i>				
1.06.02.02.04	Construct new platforms	1,679	m2	1,746.00	2,931,534.00
1.06.02.02	Upper floors				2,931,534.00
1.06.02	Superstructure				2,931,534.00
1.06.05	Services				
1.06.05.10	Lift for station footbridge	1	nr	333,981.00	333,981.00
1.06.05.11	Lifts for Station Footbridge : 100mx 4c35mm Supply from Power Cubicle, 100m x containment to LMR, 2 x LMR Isolators ,2x LMR Consumer Unit, 2x LMR Fit-Out c/w 4x General Lighting, 2x Emergency Lighting, & 2x Power outlets, 2x heater, 2 x Extract Fan, 2x Test & Commission.	0.5	item	23,368.80	11,684.40

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Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.06.05.12	Equipment Installation for 2No platforms : CCTV :, 1x Equipment Rack, 1x Rack mtd power supplies, 1x NVT Receivers & Transmitters, 20x Bosch Dome Cameras, 20x Mounting Bkts, 1500mts x CAT5 PE Cable, 8x Columns, 50mts x 25mm Conduit, Test & Commission. CIS : 1x Comms Cubicle, 1x IPH3 Server, 1x Control Eqpt, 1x RS 485 Hub, 2x 10Line NTI LED Displays, 2x TFT Displays, 4x 3 line DS LED Displays, 4x Gallows Supports, 2x Wall Mtd Brackets, 4x Ground Anchor Kits, 8x Power supplies, 50mts x Containment, 300mtsx CAT 5 Cabling, 300mtsx Power Cabling, 1xTest & Commission. PA : 1x Acoustic Model, 1x Amplifier Equipment, 1x Control PC, 2x USB Interfaces, 22x Projector Loudspeakers, 4x Ambient Noise Senors, 1xTesting & Commissioning, 50mts x Containment, 600mts x Speaker Cable Help Point : 2X PHP's, 2X Brackets / Support Steel, 1X Control Equipment, 1X Rack, 2x Induction Loops, 60mts x Containment, 2 Power supplies, 100m 3c4mm cabling, 100mts x CAT 5 PE Cable, 1x Test & Commission	1	item	504,766.08	504,766.08
1.06.05	Services				850,431.48
1.06.06	Prefabricated buildings				
1.06.06.01	New Waiting shelter	2	nr	35,000.00	70,000.00
1.06.06	Prefabricated buildings				70,000.00
	Footbridge				
1.07.06	New standard LM station footbridge; with 1 sets of steps length of footbridge 27m	1	nr	624,786.00	624,786.00
1.07.06	Trial erection of footbridges at fabrication yard and prior to delivery	1	sum	30,000.00	30,000.00
	Footbridge				654,786.00
1.06.08	External Works				
<i>1.06.08.02</i>	<i>Roads, paths, pavings and surfacings</i>				
1.06.08.02.01	New car park	1,725	m2	90.00	155,250.00
1.06.08.02.01	New Access Road/Footpath to car park	300	m2	75.00	22,500.00
1.06.08.02	Roads, paths, pavings and surfacings				177,750.00
<i>1.06.08.04</i>	<i>Fencing, railings and walls</i>				
1.06.08.04	Platform fencing	300	m	120.00	36,000.00
1.06.08.04	Fencing, railings and walls				36,000.00
<i>1.06.08.06</i>	<i>External Drainage</i>				

Draft Cost Estimate VP3

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.06.08.06.02	Platform drainage ACO channel drain	300	m	120.00	36,000.00
1.06.08.06	External Drainage				36,000.00
<i>1.06.08.07</i>	<i>External services</i>				
1.06.08.07.02	Electrical supply to Ravensthorpe Station : 1x 200A TPN Supply, 100m Supply Cable (4cx 70mm), 1x Service Equipment, 1x DNO D/S Cabinet, 4x Terminations, 1x Test & Commission + Quoted Utility Supplier cost.	1	sum	32,832.80	32,832.80
1.06.08.07.09	New Lighting Installation for 2No platforms 80mts x Supply Cable, 1x LV Power Cubicle, 2x Lighting Controls, 1x Photocell, 2x Distribution Boards, 26 x 5mt R/L Columns , 26x LED Column Mounted Luminaires , 2x LED Canopy Mtd Luminaires , 100mts x Containment, 570mts x 3c 6mm cabling, 570mts x 16mm Earthing cable, Testing & Commissioning	1	item	126,484.18	126,484.18
1.06.08.07.10	Footbridge, Shelter & Emergency Exit Pathway Lighting: 50No Emergency Type Bulkhead LED Luminaires, 300mts 3c 4mm SWA Cable, 150mts 25mm Conduit, 600mts 4mm Singles Cable	1	item	45,942.62	45,942.62
1.06.08.07.11	Plant Rooms: 4No Distribution Boards, 4No Emergency Type Luminaires, 4No RCD Socket Outlets, 8No FCU, 4No Heaters, 4 Exhaust Fans, 100mts 3c 16mm SWA, 80mts 20mm Conduit, 40mts Trunking, 200mts Single Cable.	1	item	18,200.00	18,200.00
1.06.08.07.12	Car Park & Road Lighting: 1x Distribution Board, 1x Lighting Control, 36No 8mt Lighting Columns Twin Headed, 48No LED Luminaires, 1500mts 3c 10mm SWA Cable, 1x Photocell.	1	item	124,598.66	124,598.66
1.06.08.07	External Services -Junction Lighting: 1xLighting Cubicle, 1xDistribution Board, 1xLighting Controls, 1x Photocell, 10No GRP Lighting Columns, 10No LED Luminaires, 150mts 3c 25mm SWA, 150mts 3c 4mm SWA.	1	item	35,738.98	35,738.98
1.06.08.07	External services				383,797.24
<i>1.06</i>	<i>Minor Building works and ancillary buildings</i>				
1.07	New Ticket office/waiting room complete with all services, fittings,furnishings and equipment	100	m2	1,500.00	150,000.00
1.06	Minor Building works and ancillary buildings				150,000.00
1.06.08	External Works				783,547.24

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
	Enhancement of Rates				
	Enhancement of rates for Staging & locality of works	0.1	%	5,746,888.80	574,688.88
	Enhancement of Rates				574,688.88
1.06	Buildings and Property				6,321,577.68
1.07	Civil Engineering				
1.07.01	Earthworks				
<i>1.07.01.01</i>	<i>Cuttings</i>				
1.07.01.01.01	Excavation	166000	m3	59.00	9,794,000.00
1.07.01.01	Cuttings				9,794,000.00
<i>1.07.01.02</i>	<i>Embankments</i>				
1.07.01.02.01	Excavation	7,875	m3	23.00	181,125.00
1.07.01.02.02	Disposal	7,875	m3	13.75	108,281.25
1.07.01.02.03	Type 6N filling	233000	m3	55.36	12,898,880.00
1.07.01.02.03	Type 6C filling	17,000	m3	55.36	941,120.00
1.07.01.02.04	Geotextile layer beneath fill,	51,000	m2	6.87	350,370.00
1.07.01.02	Embankments				14,479,776.25
1.07.01	Earthworks				24,273,776.25
1.07.03	Tunnels and shafts				
	RC Box structure ;internal dimensions 11.0-16 M wide x 5.6 m high m ;length 115m	1	nr	2,669,118.76	2,669,118.76
1.07.03	Tunnels and shafts				2,669,118.76
1.07.07	Retaining Walls				
<i>1.07.07.02</i>	<i>Retaining Walls</i>				
1.07.07.02	Sheet piled retaining wall(training wall River Calder)	1,680	m2	150.00	252,000.00
1.07.07.02	RC capping beam to retaining wall	120	m3	2,055.00	246,600.00
1.07.07.02	RC insitu retaining wall 5-5.5m high	295	m	5,836.41	1,721,740.95
1.07.07.02	RC insitu retaining wall 3m high	95	m	3,770.70	358,216.50
1.07.07.02	Retaining Walls				2,578,557.45
1.07.07	Retaining Walls				2,578,557.45
1.07.08	Fencing and enclosures				
	Boundary Fencing	1,190	m	150.00	178,500.00
<i>1.07.08.02</i>	<i>Barriers and guard rails</i>				
1.07.08.02	Key klamp handrailing 1.5m high in concrete fdns	2,172	m	120.00	260,640.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.08.02	Barriers and guard rails				439,140.00
1.07.08	Fencing and enclosures				439,140.00
1.07.09	General Drainage				
<i>1.07.09.01</i>	<i>Surface water drainage</i>				
1.07.09.01.01	Carrier drain 225 dia.	2,930	m	93.32	273,427.60
1.07.09.01.01	- Outfall drain	72	m	346.20	24,926.40
1.07.09.01.04	Catch pit	75	nr	1,512.56	113,442.00
1.07.09.01	Surface water drainage				411,796.00
<i>1.07.09.05</i>	<i>Culverts</i>				
1.07.09.05.01	-New Culvert out flow, assume 15m connections to drains	3	nr	3,250.00	9,750.00
1.07.09.05	Culverts				9,750.00
1.07.09	General Drainage				421,546.00
1.07.05	Bridges and viaducts for road or rail vehicles				
1.07	New 4 track Viaduct underbridge ;366m long; Precast concrete deck(area 6836 m2) on structural steel plate girder supports; 7 RC piers with piled foundations;2 RC abutments with piled foundations	1	nr	15,698,530.10	15,698,530.10
<i>1.07.05.03</i>	<i>Decks</i>				
1.07.05.03	New 4 span overbridge 65 m x 10 wide(650m2) on 2 nr new abutments and 3nr piersMVN2/202 Calder Road	1	sum	2,400,000.00	2,400,000.00
	New 3 span steel E-Type deck with central support and new abutments piled ((690m2) MBL/1/9	1	sum	1,635,300.00	1,635,300.00
1.07.05.03	Decks				19,733,830.10
<i>1.07.05.05</i>	<i>Paving and surfacing</i>				
1.07.11	Diverted Highway -Calder Road	380	m	3,353.00	1,274,140.00
1.07.05.05	Paving and surfacing				1,274,140.00
1.07.05	Bridges and viaducts for road or rail vehicles				21,007,970.10
1.07.09	General drainage				
	<i>Balancing ponds and retention basins</i>				
1.07.10	Attenuation pond 18000m2 Excavation and disposal	36,000	m3	50.00	1,800,000.00

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.11	Puddle clay lining	18,000	m2	60.00	1,080,000.00
	Balancing ponds and retention basins				2,880,000.00
	<i>Culverts</i>				
1.07.09.05	Type 4B culvert; masonry; excavate and demolish; replace with new concrete pipe (1m dia. 30m long); reinstate track bed	1	nr	31,800.00	31,800.00
1.07.09.05	Type 4B generic culvert; masonry; excavate and demolish; replace with new concrete pipe (1m dia. 25m long); Invert 4m below ballast level; reinstate track bed	1	nr	26,500.00	26,500.00
	Culverts				58,300.00
1.07.09	General drainage				2,938,300.00
1.07.10	Track Foundations				
1.07.10.01.01	Excavation and Disposal	27,838	m3	63.10	1,756,577.80
4.07.10.01.02	Filling to track bed	27,838	m3	84.85	2,362,054.30
1.07.10	Track Foundations				4,118,632.10
1.07.11	Roads and Pavements				
<i>1.07.11.03</i>	<i>Track asset walkways</i>				
1.07.11.03.04	-Surfaced access ways - CESS	5,760	m	38.50	221,760.00
1.07.11.03.04	-Surfaced access ways - Driver Walkways	216	m	100.00	21,600.00
1.07.11.03	Track asset walkways				243,360.00
<i>1.07.11</i>	<i>RRAPs</i>				
1.07.11	Access to track level	4	nr	50,000.00	200,000.00
1.07.11	RRAP across two tracks	4	nr	22,500.00	90,000.00
1.07.11	RRAPs				290,000.00
1.07.11	Roads and Pavements				533,360.00
1.07.12	Troughing				
<i>1.07.12.01</i>	<i>Troughing - Ground Level</i>				
<i>1.07.12.01.01</i>	<i>Traditional Concrete Troughing</i>				
1.07.12.01.01	- C1/40 Trough Route	5,760	m	100.00	576,000.00
	- C1/7 Tie ins to equipment	576	m	150.00	86,400.00
1.07.12.01	Troughing - Ground Level				662,400.00
1.07.12	Troughing				662,400.00
1.07.03	Tunnel and shafts				
	<i>Furniture and lighting</i>				

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07.03.07	Furniture and Lighting	180	m	120.00	21,600.00
	Furniture and lighting				21,600.00
1.07.03	Tunnel and shafts				21,600.00
	Enhancement of Rates				
	Enhancement of rates for Staging and locality of works	0.1	%	59,664,400.66	5,966,440.07
	Enhancement of Rates				5,966,440.07
1.07	Civil Engineering				65,630,840.73
1.08	Enabling works				
1.08	<i>Enabling Works</i>				
1.08.02	Site Clearance and preparation				
	<i>Site Clearance</i>				
1.08.02.01	Site Clearance - Agricultural land use	15,500	m2	10.00	155,000.00
1.08.02.01	Site Clearance - industrial land use	65,000	m2	35.00	2,275,000.00
	Site Clearance				2,430,000.00
<i>1.08.02.03</i>	<i>Specialist Ground Works</i>				
	Ground stabilisation below embankment	17,000	m2	420.00	7,140,000.00
	Specialist Ground works - Mine grouting	1	sum	9,580,000.00	9,580,000.00
1.08.02.03	Specialist Ground Works				16,720,000.00
1.08.02	Site Clearance and preparation				19,150,000.00
1.08.03	Structure specific enabling works				
<i>1.08.03.01</i>	<i>Demolition works</i>				
<i>1.08.03.01.02</i>	<i>Demolition - entire structures</i>				
1.08.03.01.02	Type 2B overbridge; remove steel deck (263m2) and abutments	1	sum	150,000.00	150,000.00
1.08.03.01.02	Type 2J overbridge; pipe bridge; take off space truss supporting pipe (26m long)	1	sum	25,000.00	25,000.00
	Type 1J underbridge; remove existing steel decks (130m2) and abutments	1	sum	150,000.00	150,000.00
1.08.03.01	Demolition works				325,000.00
1.08.03	Structure specific enabling works				325,000.00
	Enhancement of rates				
	Enhancement of rates for Staging and locality of works	0.1	%	19,475,000.00	1,947,500.00
	Enhancement of rates				1,947,500.00

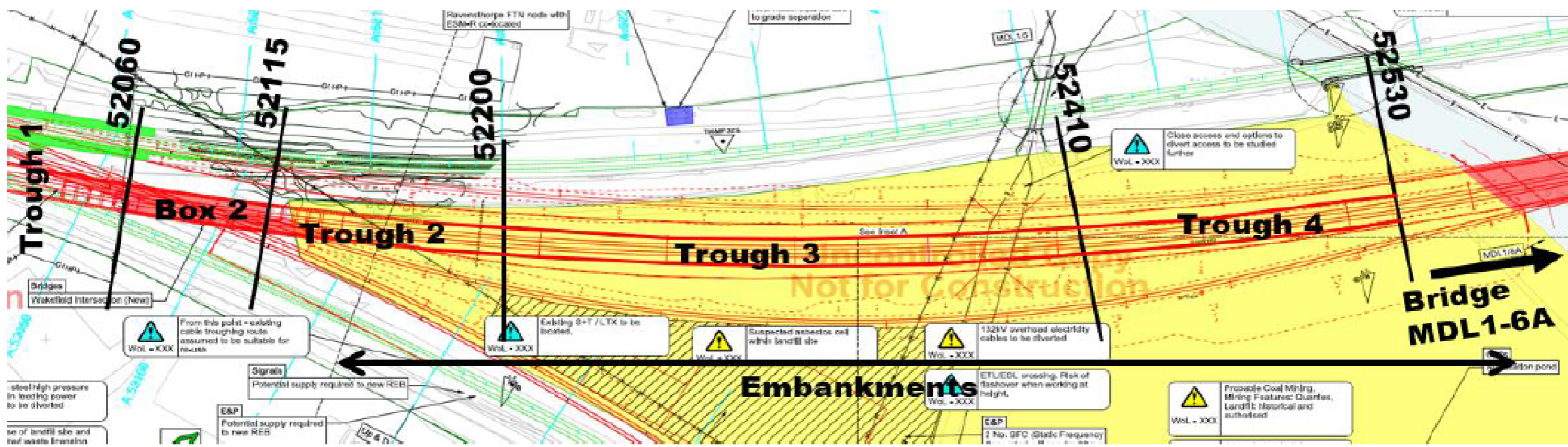
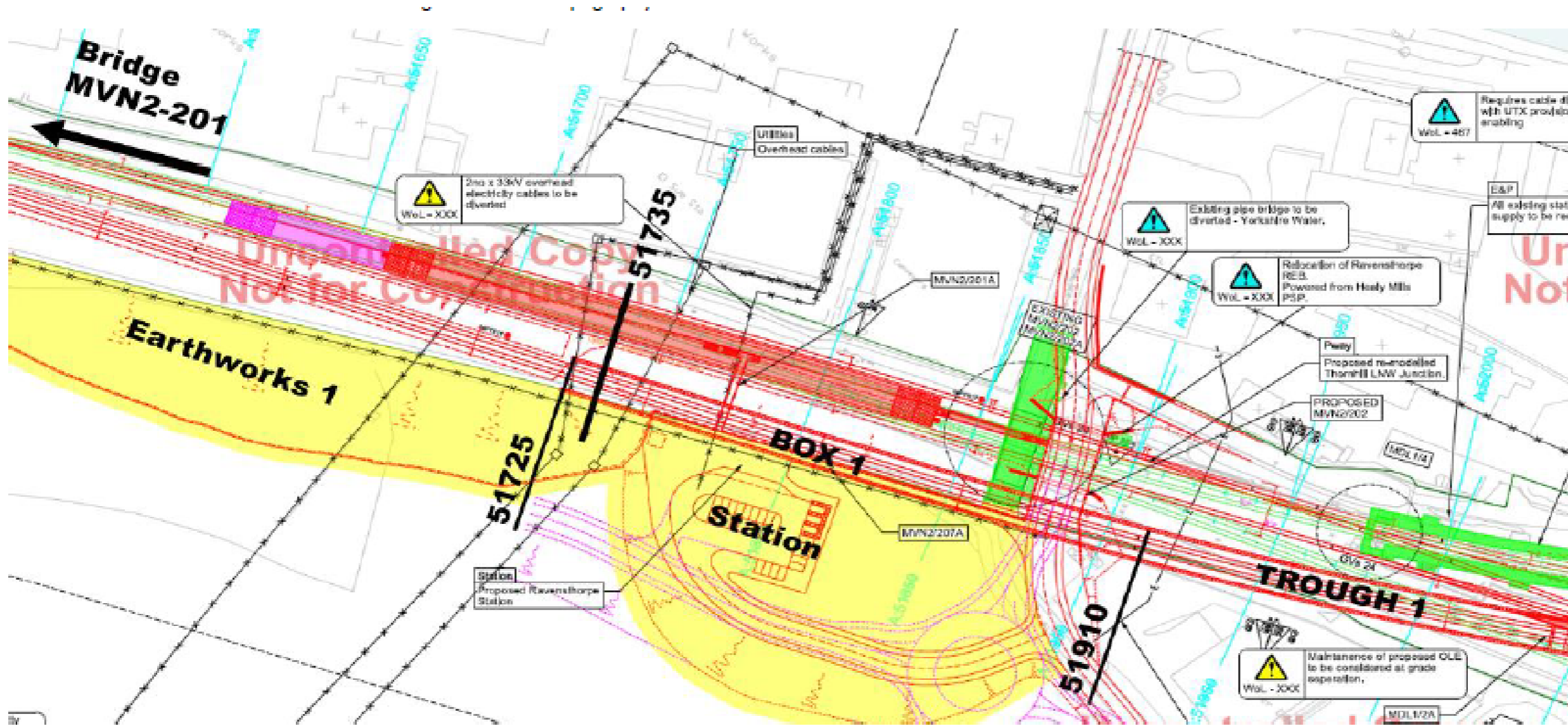
Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.08	Enabling works				21,422,500.00
2.01	Preliminaries, overheads and profit				
2.01.01.	Contractor's Preliminaries				
2.01.01..02	Preliminaries - included at 30%	0.3	%	119,739,596.06	35,921,878.82
2.01.01..02	Possession management - included at @ 5%	0.05	%	119,739,596.06	5,986,979.80
2.01.01.	Contractor's Preliminaries				41,908,858.62
2.02.	Overheads and Profit				
2.02.01.	Contractor's overheads and profit - included at 17.9%	0.179	%	161,648,454.68	28,935,073.39
2.02.	Overheads and Profit				28,935,073.39
2.01	Preliminaries, overheads and profit				70,843,932.01
3	Project / Design Team Fees and Other Project Development Costs				
3.01.	Design Team Fees				
3.01.01.	Employer's own design fees - included at 15%	0.15	%	190,583,528.07	28,587,529.21
3.01.	Design Team Fees				28,587,529.21
3.02.	Project Management Team Fees				
3.02.01	Employer's project costs - included at 12%	0.12	%	190,583,528.07	22,870,023.37
3.02.	Project Management Team Fees				22,870,023.37
3.03.01	Other Project Costs				
3.03.01.01	<i>Compensation and property costs</i>				
3.03.01.02	<i>Fees to statutory and public bodies</i>				
3.03.01.03	<i>Payments to public and statutory bodies</i>				
3.03.01.03.01	Relocation of High Voltage overhead power lines	1	sum	5,000,000.00	5,000,000.00
3.03.01.04	<i>Sponsor's agent fees</i>				
3.03.01.05	<i>Employer's office & supplied plant costs</i>				
3.03.01.06	<i>Research for innovation products</i>				
3.03.01.07	<i>Finance Costs</i>				
3.03.01.08	<i>Marketing</i>				
3.03.01.09	<i>Stakeholder Management</i>				
3.03.01.10	<i>Archeological</i>				
3.03.01.11	<i>Insurance</i>				
3.03.01.12	Land / property costs - 3%	0.03	%	190,583,528.07	5,717,505.84
3.03.02	<i>Disruption of Asset Use</i>				
3.03.02.01	<i>Employer's Costs (Possessions & Isolation)</i>				

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
3.03.01	Schedule 4 possession costs - 10%	0.1	%	190,583,528.07	19,058,352.81
	Other Project Costs				29,775,858.65
3	Project / Design Team Fees and Other Project Development Costs				81,233,411.23
4.01.01	Risk				
4.01.01	Included at 40%	0.4	%	271,816,939.30	108,726,775.72
	Risk				108,726,775.72

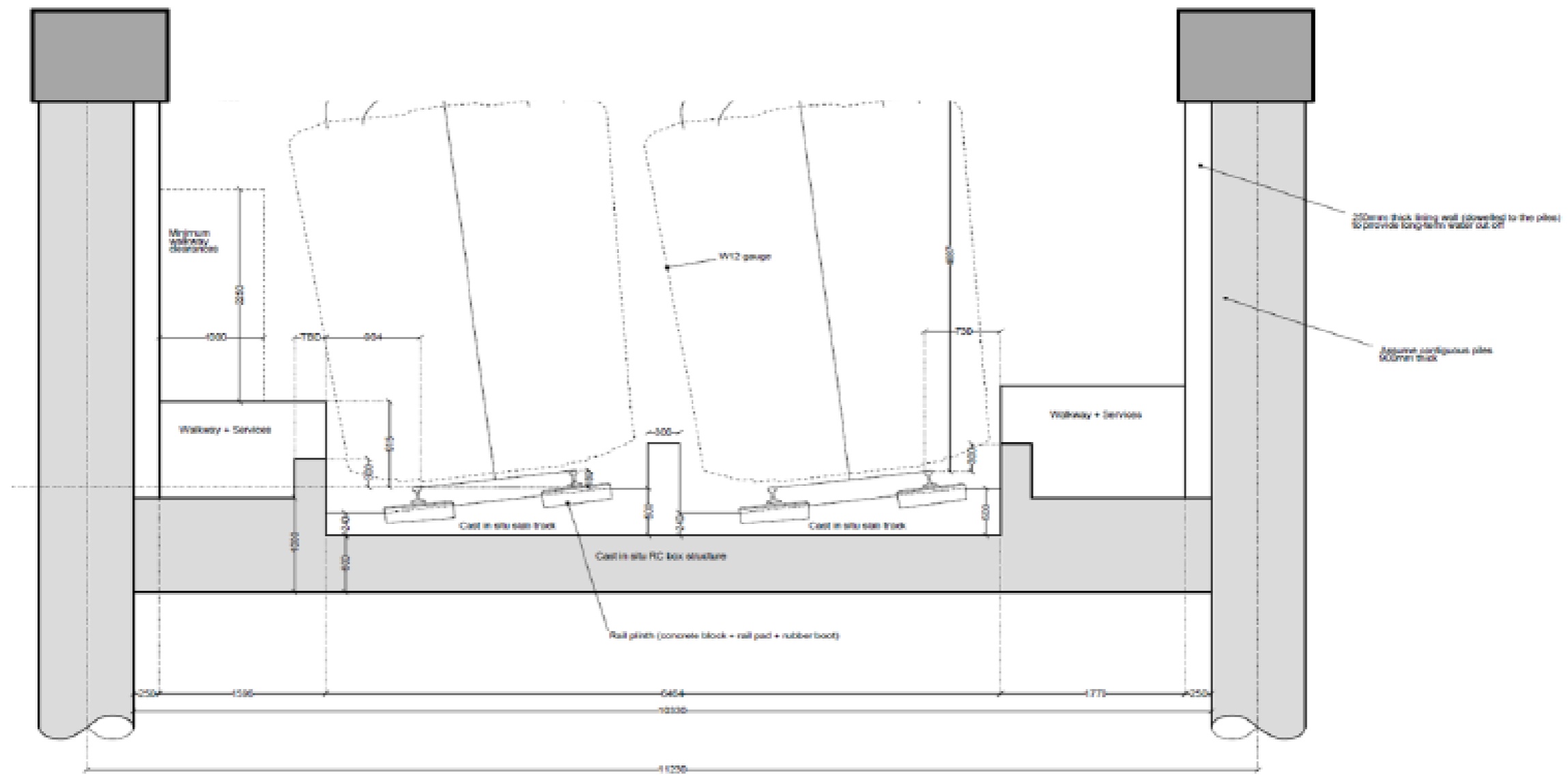
Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.03	Electric Power and Plant				258,210.70
1.03.01	Primary Power Supply				258,210.70
1.03.01.02	Distribution Network Operator (DNO)				20,000.00
	Small power for equipment				203,931.04
	Cables and containment				34,279.66
1.04	Permanent Way				26,106,466.95
1.04.01	Plain Line - Track				15,264,590.00
1.04.01.05	Running Rails				14,044,910.00
	Abandonment and recovery of old materials				1,219,680.00
1.04.02	Switches and Crossings				1,702,463.46
1.04.02.03	Turn Outs and Crossovers				1,677,452.00
1.04.02.06	Abandonment and recovery of old materials				25,011.46
1.04.04	Track Drainage				3,918,120.10
1.04.04.01	Pipework				3,700,127.20
1.04.04.02	Inspection Chambers				217,992.90
	Enhancement of rates				2,088,517.36
	Test and Commision				3,132,776.03
1.05	Telecommunication Systems				
1.05.04	Operational Management System				
1.06	Buildings and Property				6,321,577.68
1.06.00	Facilitating Works				456,590.08
1.06.00.02	Major demolition works				456,590.08
1.06.02	Superstructure				2,931,534.00
1.06.02.02	Upper floors				2,931,534.00
1.06.05	Services				850,431.48
1.06.06	Prefabricated buildings				70,000.00
	Footbridge				654,786.00
1.06.08	External Works				783,547.24
1.06.08.02	Roads, paths, pavings and surfacings				177,750.00
1.06.08.04	Fencing, railings and walls				36,000.00
1.06.08.06	External Drainage				36,000.00
1.06.08.07	External services				383,797.24
1.06	Minor Building works and ancillary buildings				150,000.00
	Enhancement of Rates				574,688.88

Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.07	Civil Engineering				65,630,840.73
1.07.01	Earthworks				24,273,776.25
1.07.01.01	Cuttings				9,794,000.00
1.07.01.02	Embankments				14,479,776.25
1.07.03	Tunnels and shafts				2,669,118.76
1.07.07	Retaining Walls				2,578,557.45
1.07.07.02	Retaining Walls				2,578,557.45
1.07.08	Fencing and enclosures				439,140.00
1.07.08.02	Barriers and guard rails				439,140.00
1.07.09	General Drainage				421,546.00
1.07.09.01	Surface water drainage				411,796.00
1.07.09.05	Culverts				9,750.00
1.07.05	Bridges and viaducts for road or rail vehicles				21,007,970.10
1.07.05.03	Decks				19,733,830.10
1.07.05.05	Paving and surfacing				1,274,140.00
1.07.09	General drainage				2,938,300.00
	Balancing ponds and retention basins				2,880,000.00
	Culverts				58,300.00
1.07.10	Track Foundations				4,118,632.10
1.07.11	Roads and Pavements				533,360.00
1.07.11.03	Track asset walkways				243,360.00
1.07.11	RRAPs				290,000.00
1.07.12	Troughing				662,400.00
1.07.12.01	Troughing - Ground Level				662,400.00
1.07.03	Tunnel and shafts				21,600.00
	Furniture and lighting				21,600.00
	Enhancement of Rates				5,966,440.07
1.08	Enabling works				21,422,500.00
1.08.02	Site Clearance and preparation				19,150,000.00
	Site Clearance				2,430,000.00
1.08.02.03	Specialist Ground Works				16,720,000.00

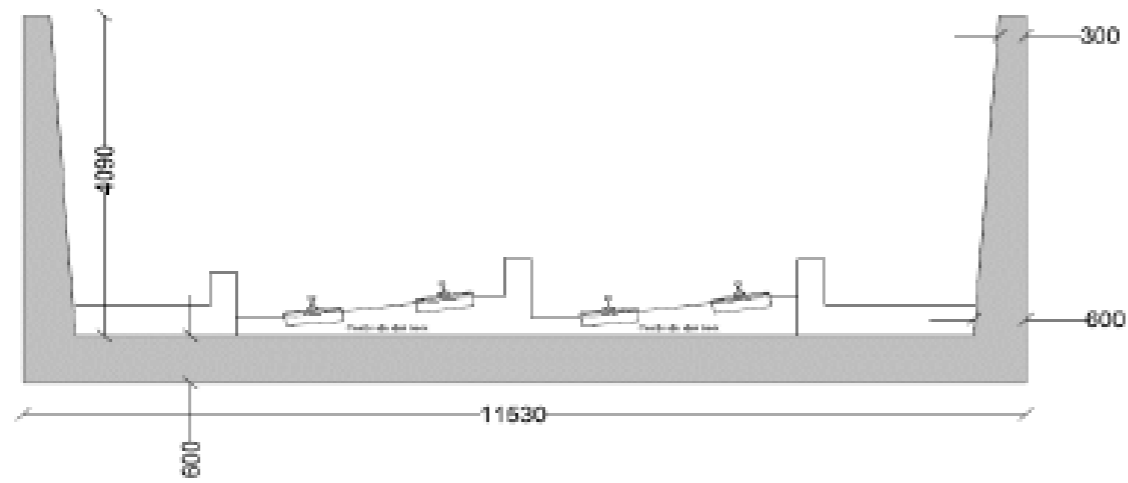
Item	Bill description	Quantity	Unit	Net	
				Rate	Amount
1.08.03	Structure specific enabling works				325,000.00
1.08.03.01	Demolition works				325,000.00
	Enhancement of rates				1,947,500.00
2.01	Preliminaries, overheads and profit				70,843,932.01
2.01.01.	Contractor's Preliminaries				41,908,858.62
2.02.	Overheads and Profit				28,935,073.39
3	Project / Design Team Fees and Other Project Development Costs				81,233,411.23
3.01.	Design Team Fees				28,587,529.21
3.02.	Project Management Team Fees				22,870,023.37
3.03.01	Other Project Costs				29,775,858.65
4.01.01	Risk				108,726,775.72
	TOTAL				380,543,715.02



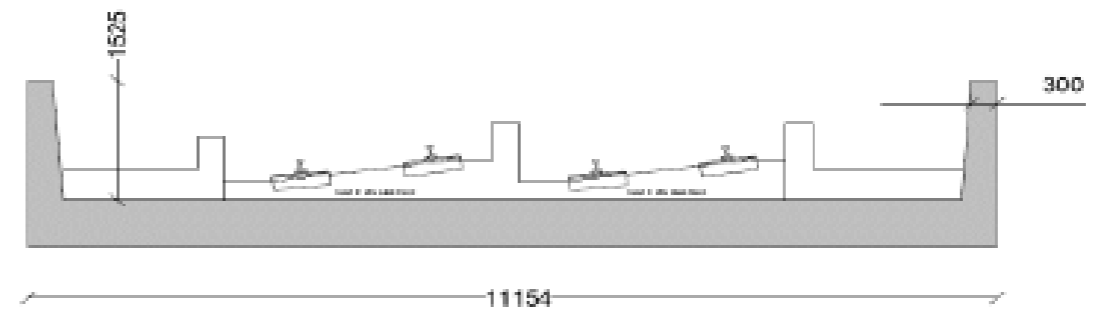
Trough one



Trough three

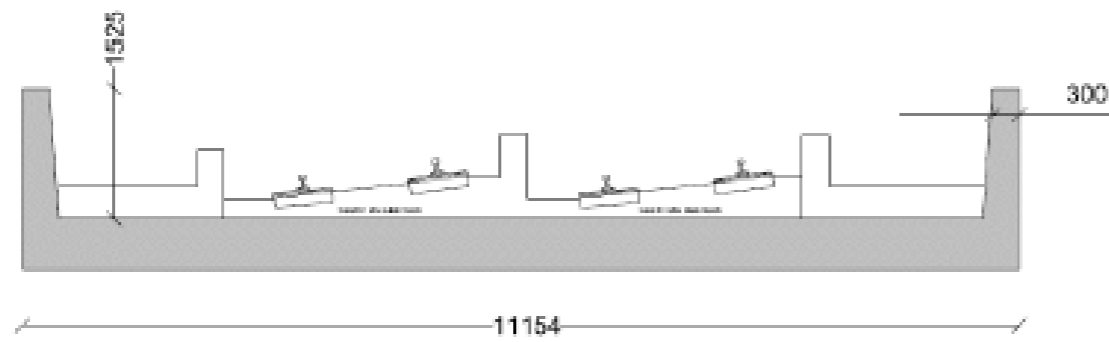


CH 52 200

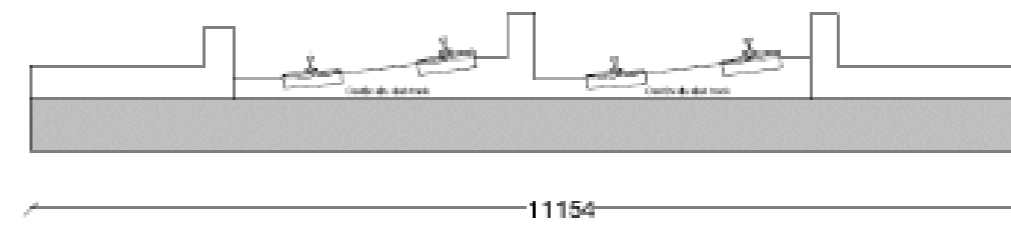


CH 52 410

Trough four



CH 52 410



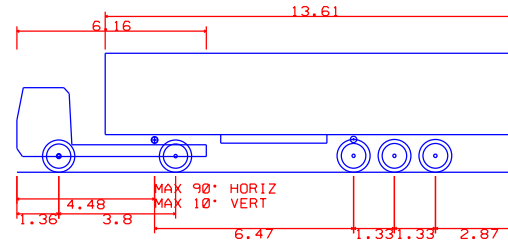
CH 52 530

Flood modelling

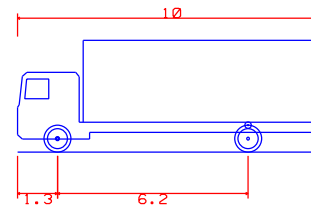
In terms of the information request from Newlay

From a flood point of view, we have set the soffit levels for the new Baker Viaduct based on the following;

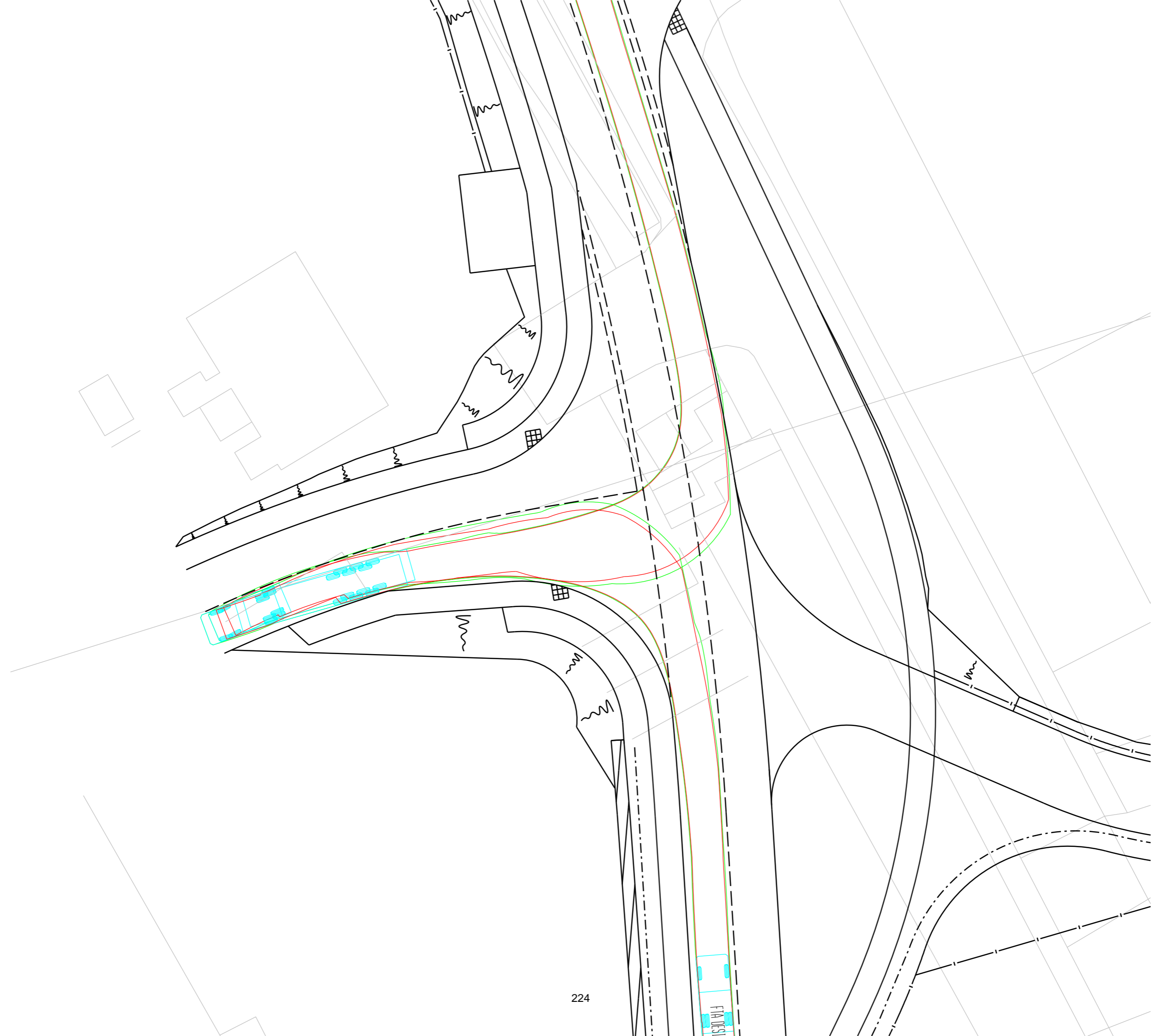
The maximum flood level at the existing railway embankment (floodplain) on the approach to MDL1/8 River Calder crossing is estimated to be 40.53m AOD for the 1% annual chance event, including an upper end (50%) allowance for the effects of climate change. The proposed bridge soffit level has therefore been set at 47.05m AOD.



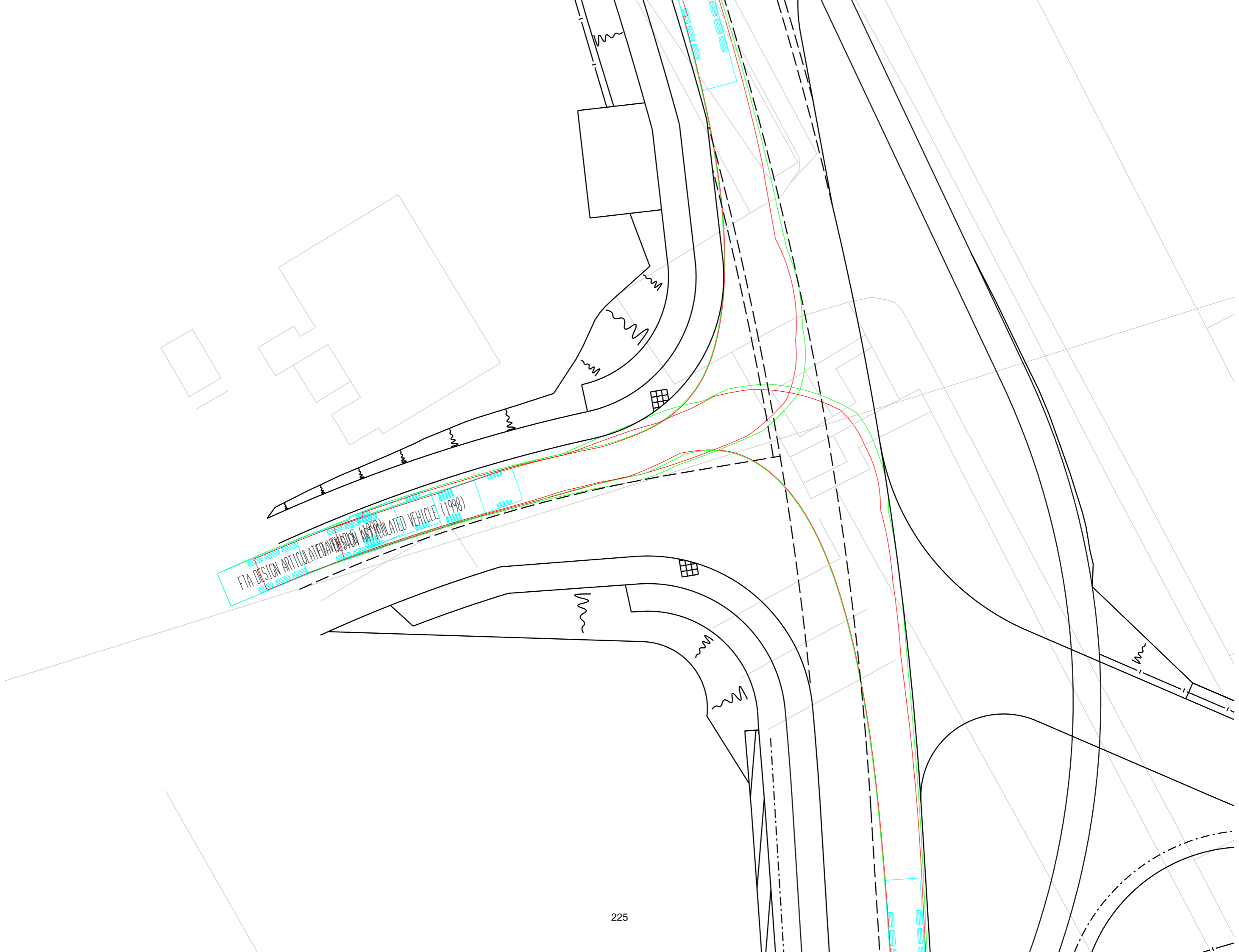
FTA DESIGN ARTICULATED VEHICLE (1998)
 OVERALL LENGTH 16.480M
 OVERALL WIDTH 2.550M
 OVERALL BODY HEIGHT 3.070M
 MIN BODY GROUND CLEARANCE 0.515M
 MAX TRACK WIDTH 2.470M
 LOCK TO LOCK TIME 3.00S
 KERB TO KERB TURNING RADIUS 6.550M

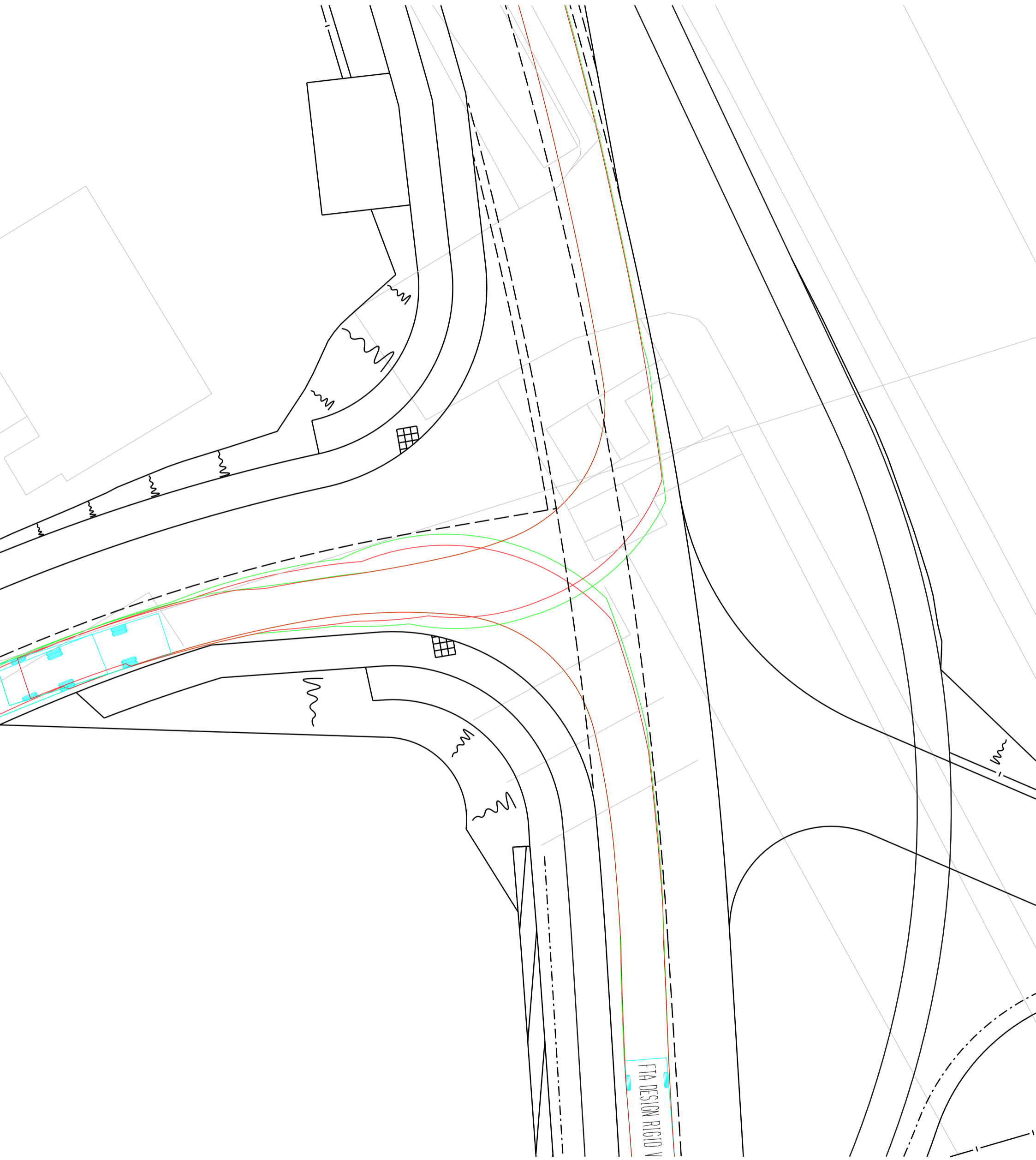


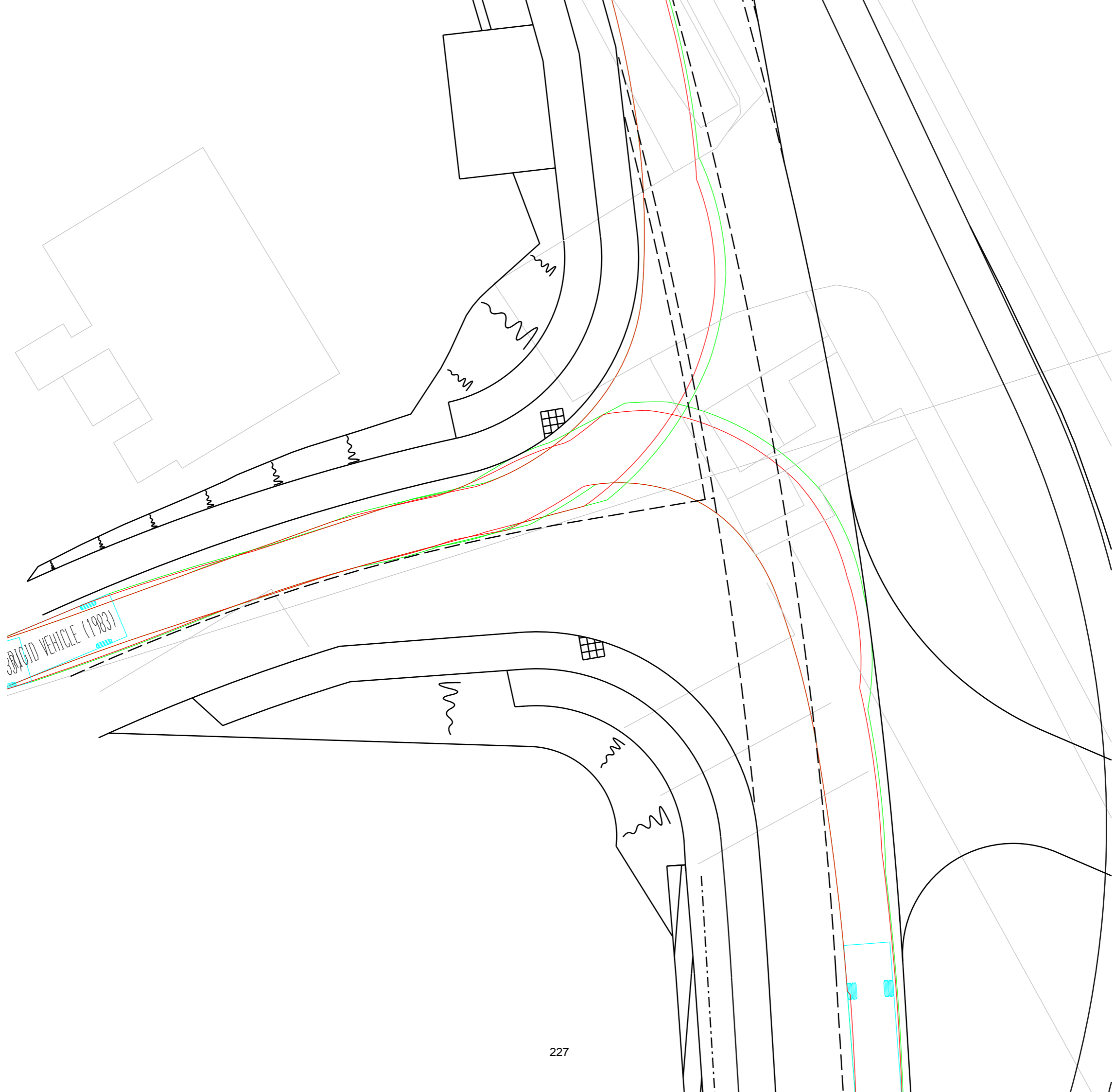
FTA DESIGN RIGID VEHICLE (1983)
 OVERALL LENGTH 10.000M
 OVERALL WIDTH 2.500M
 OVERALL BODY HEIGHT 3.632M
 MIN BODY GROUND CLEARANCE 0.427M
 TRACK WIDTH 2.500M
 LOCK TO LOCK TIME 4.00S
 KERB TO KERB TURNING RADIUS 12.000M



FTA DESIGN ARTICULATED VEHICLE (1998)







387610 VEHICLE (1983)

