



**SNC • LAVALIN**

**Sheffield City Region  
HS2 Route Mitigation Study  
Sebastian Gray  
RTUKR-T39183-001  
Final**

   [snclavalin.com](http://snclavalin.com)

29 March 2017

#### NOTICE

This document contains the expression of the professional opinion of SNC-Lavalin Rail & Transit Limited (SNC-Lavalin) as to the matters set out herein, using its professional judgment and reasonable care. It is to be read in the context of the agreement dated 20/12/2016 (the "Agreement") between SNC-Lavalin and Sheffield City Region Combined Authority (the "Client"), and the methodology, procedures and techniques used, SNC-Lavalin's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

SNC-Lavalin has, in preparing any cost estimates, followed methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgement and reasonable care, and is thus of the opinion that there is a high probability that actual costs will fall within the specified error margin. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers etc.) upon which SNC-Lavalin's opinion as set out herein is based has not been verified by SNC-Lavalin; SNC-Lavalin makes no representation as to its accuracy and disclaims all liability with respect thereto.

SNC-Lavalin disclaims any liability to the Client and to third parties in respect of the publication, reference, quoting, or distribution of this report or any of its contents to and reliance thereon by any third party.

---

© Sheffield City Region Combined Authority, 2017. All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, or stored in any retrieval system of any nature, without the written permission of Sheffield City Region Combined Authority, application for which shall be made to 11 Broad Street West, Sheffield City Region Executive Team, Sheffield, S1 2BQ, United Kingdom. Sheffield City Region Combined Authority does not necessarily endorse this report or any of the options contained therein.

# 1 Executive Summary

In July 2016, the Chairman of HS2 Ltd, Sir David Higgins, published a report on revised route and station options for the HS2 eastern leg in Sheffield and South Yorkshire. Part of the reasoning for moving away from the previous route which incorporated a station at Meadowhall, was to allow the main HS2 line to be moved further east through more favourable terrain and involving fewer property demolitions. This new eastern route would closely follow the M1 and M18 and then head north to Leeds. Whilst this revised route would involve fewer property demolitions than the Meadowhall route, it would impact new areas and properties that were not previously affected. As a result of these impacts, there has been opposition to the revised route from local residents in some areas. Consequently, Sheffield City Region Combined Authority agreed to commission this study to investigate potential minor amendments to the route or design in those areas worst affected. Nevertheless, both Doncaster and Rotherham Metropolitan Borough remain opposed to the revised eastern route.

SNC-Lavalin was commissioned by Sheffield City Region to examine the potential to reduce or remove the adverse impact of the new HS2 eastern route on residential and commercial properties at six specified locations. This study considers the reasons for the choice of route, examine the scope for minor amendments to minimise the loss of property and the impact on residents and businesses and conclude whether viable route alternatives exist.

Considering each of the six locations in turn, the study reached the following conclusions:

## Wales, Aston, Morthen and Bramley

The HS2 proposed horizontal and vertical alignments are considered to have minimised property impacts and no improvements are envisaged by adopting an alternative alignment.

## Mexborough/Conisbrough

In order to avoid impacting the Shimmer development between Mexborough and Conisbrough, an alternative has been considered that follows an alignment further to the east. Although this avoids the Shimmer development, the alternative alignment would pass over the Denaby Lane Industrial Estate before then passing over properties on Pastures Road and the western end of the new Melton View development on the north side of the River Don flood plain.

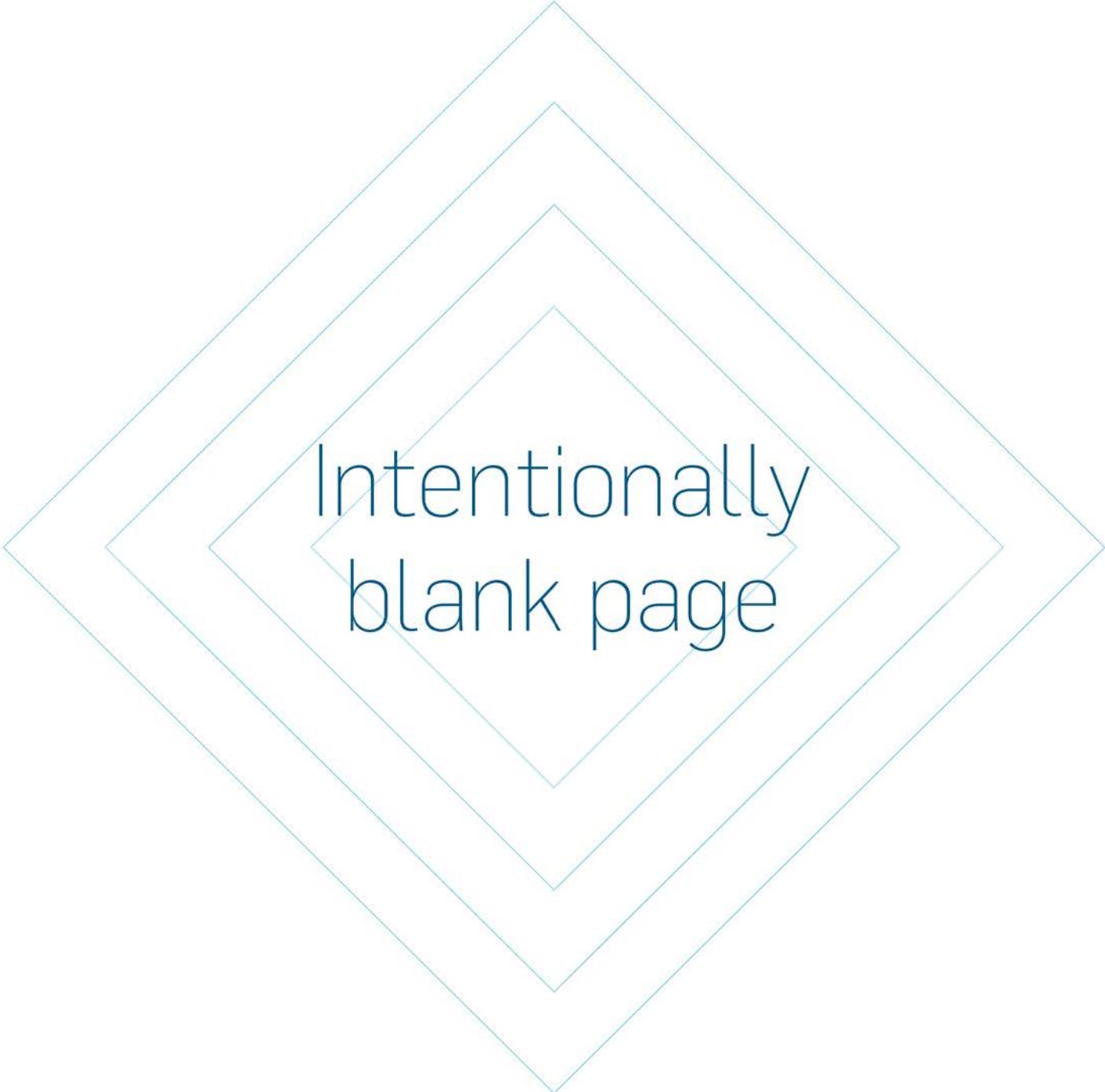
This would result in three major impacts on commercial premises and three minor impacts where the route crosses the Denaby Lane Industrial Estate and a further 12 major impacts on residential property where the route crosses the Melton View development with a further 10 properties removed from the plans for future development.

The additional cost of this option would be in the order of £58m (excluding property and land costs).

## Barnburgh

In order to reduce the impact of the high embankment east of Barnburgh, an alternative vertical alignment has been considered. This would reduce the height of the embankment by approximately 10m but would deepen the cutting to the north of Conisbrough

The additional cost of this option would be in the order of £42m (excluding property and land costs).



Intentionally  
blank page

# Contents

# Page

<b>1</b>	<b>Executive Summary</b>	<b>1</b>
<b>2</b>	<b>Glossary of Abbreviations and Acronyms</b>	<b>4</b>
<b>3</b>	<b>Introduction</b>	<b>4</b>
<b>4</b>	<b>Objective</b>	<b>4</b>
<b>5</b>	<b>Meetings</b>	<b>5</b>
<b>6</b>	<b>Sources of Information</b>	<b>5</b>
<b>7</b>	<b>HS2 Route Assessment</b>	<b>7</b>
7.1	General Route Considerations	7
7.2	Wales	8
7.3	Aston	10
7.4	Morthen	10
7.5	Bramley	12
7.6	Mexborough/Conisbrough	14
7.7	Barnburgh	17
<b>8</b>	<b>Conclusion</b>	<b>19</b>
	<b>Amendment Record</b>	<b>23</b>

## APPENDICES

Appendix A Route Alignment Drawings [7 Pages]

Appendix B Cross Sections and Impacts [12 Pages]

Appendix C Basis of Cost Estimation [1 Page]

## 2 Glossary of Abbreviations and Acronyms

Abbreviation	Description
<b>HS2</b>	High Speed 2
<b>MBC</b>	Metropolitan Borough Council
<b>RFQ</b>	Request for Quotation
<b>SCR</b>	Sheffield City Region

## 3 Introduction

In July 2016, the Chairman of HS2 Ltd, Sir David Higgins, published a report on revised route and station options for the HS2 eastern leg in Sheffield and South Yorkshire. Part of the reasoning for moving away from the previous route which incorporated a station at Meadowhall, was to allow the main HS2 line to be moved further east through more favourable terrain and involving fewer property demolitions. This new eastern route would closely follow the M1 and M18 and then head north to Leeds. Whilst this revised route would involve fewer property demolitions than the Meadowhall route, it would impact new areas and properties that were not previously affected. As a result of these impacts, there has been opposition to the revised route from local residents in some areas. Consequently, Sheffield City Region Combined Authority agreed to commission this study to investigate potential minor amendments to the route or design in those areas worst affected. Nevertheless, both Doncaster and Rotherham Metropolitan Borough Councils remain opposed to the revised eastern route.

SNC-Lavalin was commissioned by Sheffield City Region (SCR) to undertake a Mitigation Study of the proposed revised HS2 route through an area in South Yorkshire extending between Wales to the south and Barnburgh to the north. The revised HS2 route introduced impacts on several defined locations and a study was therefore required to confirm both the local impacts and the feasibility for any amendment to the route to mitigate these impacts.

The Specification set out primary objectives for the assessment of the route proposed by HS2. These confirmed that the study should consider the reasons for the choice of route, examine the scope for minor amendments to minimise the loss of property and the impact on residents and businesses and conclude whether viable route alternatives exist.

The Specification identified five locations that the study should cover. These were located within the Doncaster Metropolitan Borough Council (MBC) and the Rotherham MBC areas. The Mitigation Study Map included in the Specification highlighted a further sixth location within the Rotherham MBC area; this was included in the study.

## 4 Objective

Section C of the Request for Quotation provided the Specification for the study. This confirmed that the study should consider the following:

1. Examine and assess the new route at the specified locations, identifying the extent of the safeguarded corridor and potential property acquisition and demolition, using information available from HS2 Ltd;
2. Show these locations on a map of the wider route through the SCR and consider why this particular route was selected using information from HS2 Ltd as far as possible;
3. Examine the scope for minor amendments to the route alignment or design at these locations in order to minimise the loss of property and the adverse impact on residents and businesses. In addition to alternative alignments this could include alternative design options such as tunnels, cuttings, viaducts, and noise barriers

where appropriate. High level engineering feasibility and cost estimates should be provided for each alternative option considered, as well as an estimate of any impact on HS2 line speeds and journey times. However, it should be noted that any mitigations should be minor in order to avoid any adverse up-line time impacts or significant cost implications which may make the alternatives unfavourable.

4. Conclude whether there are any viable alternative routes or design options at these locations or whether the proposed HS2 alignment is the best possible, taking into account both local issues and the wider objectives of HS2.
5. Briefly review the HS2 Ltd property scheme including the consultation proposals, setting out what mitigation or compensation measures are available to land and property owners, and suggest any other measures that may assist in ameliorating the impact.

The Specification set out the five locations for the study as:

#### Doncaster MBC

- River Don and Sheffield & South Yorkshire Navigation Viaduct / Shimmer Estate, Mexborough;
- Barnburgh – route east of village.

#### Rotherham MBC

- Bramley / M18 Junction 1 area;
- Aston – Worksop Road and A57 crossings;
- Wales - where the route passes under School Road

A set of maps illustrating these study locations was included in Appendix B of the RFQ. This confirmed a total of six locations. The additional location was:

#### Rotherham MBC

- Morthen/Thurcroft – Morthen Road crossing

## 5 Meetings

A start up meeting was held in Sheffield on 5<sup>th</sup> January 2017 attended by representatives of Sheffield City Region, Doncaster MBC and Rotherham MBC. This provided background for the six local study areas and the perceived impact at each. It also confirmed the programme, identified the reporting lines and provided points of contact within the organisations concerned.

An interim meeting was held with the HS2 Programme Board on 25<sup>th</sup> January 2017. Following initial consideration of the route and potential route options, a presentation was made confirming these initial findings both in terms of impacts and potential route alternatives.

A second and final presentation meeting is to be held with the HS2 Programme Board on 2<sup>nd</sup> March 2017 at which the findings of the study will be presented.

## 6 Sources of Information

The alignment proposed by HS2 was confirmed from the drawings available on the HS2 website. These comprised the following drawings:

- C321-MMD-RT-DPP-120-581401 P04 - HSL 14 Preferred Route Sheet 1 of 3
- C321-MMD-RT-DPP-120-581402 P04 - HSL 14 Preferred Route Sheet 2 of 3

- C321-MMD-RT-DPP-120-581403 P05 - HSL 14 Preferred Route Sheet 3 of 3
- C321-MMD-RT-DPP-120-581601 P05 - HSL 16 Preferred Route Sheet 1 of 4
- C321-MMD-RT-DPP-120-581602 P04 - HSL 16 Preferred Route Sheet 2 of 4

Further detailed information was obtained from Doncaster MBC regarding planning information for the Mexborough/Conisbrough corridor.

HS2 Letter referenced 8312nov03/DH/pg handed over from Doncaster MBC regarding the HS2 route East of Conisbrough proposed alternative alignment.

# 7 HS2 Route Assessment

## 7.1 General Route Considerations

### 7.1.1 Horizontal Alignment

The proposed HS2 route runs through two distinct areas, each with their own objectives.

Initially the route runs to the west of the M1 and M18 motorways following these as closely as the differing alignment constraints will allow. In this section from the south of Wales to the north of Bramley the HS2 route has been aligned to pass through particular points of constraint in order to minimise the impact.

North of Bramley the M18 turns towards the east whilst the HS2 route continues to run towards the north. It is aligned to run through the narrow gap between the towns of Mexborough and Conisbrough and then to east of the villages of Barnburgh and Harlington.

### 7.1.2 Vertical Alignment

The HS2 vertical alignment adopts a common approach to the various topographical and route constraints.

The HS2 route crosses a number of watercourses and associated flood plains. At each the route is shown to be carried on viaduct across the entire flood plain in order to avoid any impact on these.

Two existing railways are crossed; these follow existing valleys so that the HS2 route passes over these. The clearance requirements therefore dictate the lowest vertical alignment that could be adopted at these locations.

Where the route follows the M1/M18 corridor, the vertical alignment adopts a similar profile. In particular, where the motorway passes beneath overbridges, the route aims to do the same although the differing clearance requirements would require the route to be at a lower level. However, at the M1/M18 junction, the HS2 route has to pass over the motorway and associated slip roads which consequently dictate the vertical alignment both at the crossing and on the approaches to this location.

### 7.1.3 Noise Mitigating Measures

HS2 Ltd has proposed to employ a number of mitigating measures that will attempt to reduce the noise effects resulting from the high speed railway. The following are mitigating measures suggested by HS2:

- Locating the route away from areas of population where reasonably practicable.
- Locating the route close to existing transport corridors, where reasonably practicable.
- Lowering the route alignment by placing it in cuttings or tunnels where reasonably practicable.

Although the consultation route has taken an alignment away from major areas of population, it impacts a number of smaller areas. This is particularly an issue where the route crosses ribbon developments following east-west routes. It is at these that a minor adjustment of the route alignment may produce reductions in impacts.

As stated in section 7.1.1 above, the consultation route successfully follows the M1/M18 north south corridor between Wales and Bramley.

The placing of the route in cuttings or tunnels is only feasible along small portions of this section of the consultation route. The presence of topographical constraints, particularly watercourses and flood plains, impose limits on the lowest vertical alignment that could be adopted resulting in some sections of extended viaduct or embankment. Similarly the presence of existing transport links and their proximity to the topographical constraints have

dictated that the consultation route passes over these again resulting in sections of embankments.

Further mitigation measures include the use of noise barriers and earth mounds, both of which can be effective alone, or combined – noise barriers typically reduce railway noise up to 17db.

In addition, HS2 Ltd expects improvements to be made in noise control for the next generation of trains which are in line with European standards, and expect these same improvements to be in the procurement of any rolling stock purchased for HS2.

Furthermore, The Noise Insulation Regulations suggests that acoustic double glazing may be installed where noise levels exceed established levels. In certain circumstances, HS2 may offer to install noise installation, however this cannot be guaranteed.

Finally, it is expected that further methods of reducing airborne noise mitigation will be examined as the scheme progresses, As the scheme develops it will become clearer where these noise mitigation measures will be employed along the proposed route.

## **7.2 Wales**

### **7.2.1 Description**

The HS2 alignment appears to have adopted this location as a primary constraint. The HS2 route passes immediately to the west of the M1, passing through the western extreme of Wales. It passes beneath the B6059. The vertical alignment is somewhat lower than the M1 due to the alignment constraints of watercourses of County Dike and Pigeon Brook and the Sheffield to Lincoln railway either side of this location.

It is assumed that retaining walls would be built on both the eastern and western boundaries of the HS2 route corridor to support the adjacent motorway and the adjacent housing; beyond this we have assumed a nominal 10m strip for construction purposes.

### **7.2.2 Alignment**

The horizontal alignment in this area follows a large reverse curve, in order to generally follow the M1. To the south of Wales, the horizontal position is best suited to provide the required elevation to clear the existing roadway (Killamarsh Lane) and the County Dike Tributary). Further west, the existing ground level would require unnecessarily large viaduct piers. To the north of Wales, the alignment is positioned so as to cross the A57 at the most opportune location. Any shift to the east would require HS2 to cross the A57 at the junction with the M1.

### **7.2.3 Route Alternatives**

The HS2 proposed horizontal and vertical alignments are considered to have minimised property impacts and no improvements are envisaged by adopting an alternative alignment.

### **7.2.4 Minimum Property Impacts**

An assessment of property impacts are 5 major impacts and 1 minor impact. Drawing SNC-T39183-HS2-P-SHT-CV-000001 Rev 2 shows our assessment.

### **7.2.5 Schedule of Impacts HS2 Bands**

HS2 Ltd defined multiple bands that properties in close proximity to HS2's proposed route may be grouped into. The number of properties affected is divided into two categories, those east of the proposed alignment and those to the west of the proposed alignment. Table 1

shows a summary of the property impact for Wales, see drawing SNC-T39183-HS2-P-SHT-CV-000013 for a summary of properties impacted to the West of the proposed alignment.

<b>Band</b>	<b>Number of properties - East</b>	<b>Number of properties - West</b>
<b>Route on surface</b>	0	0
<b>Safeguarded Area</b>	0	19
<b>Rural Support Zone (RSZ)</b>	6	33
<b>Homeowner payment (HOP) zone 1</b>	5	40
<b>Homeowner payment (HOP) zone 2</b>	5	37
<b>Homeowner payment (HOP) zone 3</b>	15	39
<b>Total number of properties affected</b>	31	168

*Table 1 – Wales Property Impact*

## 7.3 Aston

### 7.3.1 Description

The HS2 horizontal alignment runs to the east of Aston passing over the Pigeon Bridge Brook and the A57 trunk road on a relatively high embankment before crossing Worksop Road approximately at grade. A new bridge would be required at this location. North of here the route climbs towards the M1/M18 junction which forms a primary constraint.

### 7.3.2 Alignment

Horizontally, the alignment generally continues to follow the M1, particularly to the north of Aston. To the south, the position is constrained by the M1 junctions. Vertically, there is a proposed cutting – embankment - cutting at the M1 / A57 junction. Any attempt to reduce the embankment here would compromise the crossing of the A57 and the clearance to the Sheffield - Lincoln railway. Consequently this was discounted.

### 7.3.3 Route Alternatives

The HS2 proposed horizontal and vertical alignments are constrained by features north and south of this location. Little reduction in the height of the embankment south of Aston could be achieved.

### 7.3.4 Minimum Property Impacts

The property impacts are unchanged from the HS2 assessment.

### 7.3.5 Schedule of Impacts – HS2 Bands

The HS2 compensation bands are described in Section 7.2.5. Table 2 shows a summary of the property impact for Aston, see drawing SNC-T39183-HS2-P-SHT-CV-000014 for a summary of properties impacted to the East of the proposed alignment.

Band	Number of properties - East	Number of properties - West
Route on surface	0	0
Safeguarded Area	0	0
Rural Support Zone (RSZ)	5	14
Homeowner payment (HOP) zone 1	3	20
Homeowner payment (HOP) zone 2	4	9
Homeowner payment (HOP) zone 3	8	21
<b>Total number of properties affected</b>	<b>20</b>	<b>64</b>

Table 2 – Aston Property Impact

## 7.4 Morthen

### 7.4.1 Description

7.4.2 The HS2 alignment appears to have adopted this location as a primary constraint.

South of Morthen the HS2 route runs immediately to the west of the M1/M18 junction, passing over the M1 and M18 sliproads. It crosses the B6060 Morthen Road approximately

at grade. A new bridge would be required at this location carrying Morthen Road over the M18 and the HS2 alignment.

### 7.4.3 Alignment

The horizontal alignment in this area comprises a large curve, in order to follow the slip roads from the M1 to the M18. The vertical alignment has been designed to provide vertical clearance for the HS2 route to pass over both the M1 and M18. The B6060 Morthen Road is immediately north of the junction and the alignment at this location is entirely governed by the adjacent crossing of the motorway junction.

### 7.4.4 Route Alternatives

There is no scope for a reduction in impacts on properties on Morthen Road due to the highly constrained horizontal and vertical alignments at the crossing of the M1/M18 junction.

### 7.4.5 Minimum Property Impacts

The property impacts are unchanged from the HS2 assessment.

### 7.4.6 Schedule of Impacts – HS2 Bands

The HS2 compensation bands are described in Section 7.2.5. Table 3 shows a summary of the property impact for Aston, see drawing SNC-T39183-HS2-P-SHT-CV-000014 for a summary of properties impacted to the East of the proposed alignment.

Band	Number of properties - East	Number of properties - West
Route on surface	0	0
Safeguarded Area	0	1
Rural Support Zone (RSZ)	0	0
Homeowner payment (HOP) zone 1	19 (18 allotments + 1 commercial)	3 (inc sub-station)
Homeowner payment (HOP) zone 2	18 (15 allotments + 3 commercial)	5
Homeowner payment (HOP) zone 3	56 (residential + commercial)	5
<b>Total number of properties affected</b>	93 (33 allotments + 60 residential/commercial)	14 (Inc sub-station)

Table 3 – Morthen Property Impact

## **7.5 Bramley**

### **7.5.1 Description**

The HS2 alignment appears to have adopted this location as a primary constraint. The HS2 route runs immediately to the west of the M18, passing adjacent to the eastern extremity of Bramley. It passes beneath the A631/M18 junction. The route alignment is lower than the M18 due to the headroom constraints beneath the A631 bridge.

It is assumed that retaining walls would be built on both the eastern and western boundaries of the HS2 route corridor to support the adjacent motorway junction slip road and the adjacent housing; beyond this we have assumed a nominal 10m strip for construction purposes.

### **7.5.2 Alignment**

The vertical profile through Bramley is fixed due to the necessity to traverse below the existing roadways. It appears these levels have already been maximised, while also being constrained by the maximum 2.5% gradient to the north of the area. There is a combination of cuts and fills along this portion of the vertical alignment, while maintaining sufficient clearance over Firsby Brook.

### **7.5.3 Route Alternatives**

The HS2 proposed horizontal and vertical alignments are considered to have minimised property impacts and no improvements are envisaged by adopting an alternative alignment.

### **7.5.4 Minimum Property Impacts**

An assessment of property impacts are no major impacts and 5 minor impacts. Drawing SNC-T39183-HS2-P-SHT-CV-000002 Rev 2 shows our assessment.

### 7.5.5 Schedule of Impacts HS2 Bands

The HS2 compensation bands are described in Section 7.2.5. Table 4 shows a summary of the property impact for Bramley, see drawing SNC-T39183-HS2-P-SHT-CV-000015 for a summary of properties impacted to the West of the proposed alignment.

<b>Band</b>	<b>Number of properties - East</b>	<b>Number of properties - West</b>
<b>Route on surface</b>	0	0
<b>Safeguarded Area</b>	0	87
<b>Rural Support Zone (RSZ)</b>	0	23
<b>Homeowner payment (HOP) zone 1</b>	1	37
<b>Homeowner payment (HOP) zone 2</b>	0	52
<b>Homeowner payment (HOP) zone 3</b>	0	64
<b>Total number of properties affected</b>	1	263

*Table 4 – Bramley Property Impact*

## 7.6 Mexborough/Conisbrough

### 7.6.1 Description

**7.6.2** The HS2 alignment appears to have been aimed at the 'gap' between the towns of Conisbrough to the east and Mexborough to the west. It crosses the Sheffield to Doncaster railway and River Don flood plain via a viaduct. Although the horizontal alignment avoids impacting either the Denaby Lane Industrial Estate on the western fringe of Conisbrough or the main body of Mexborough it passes directly through the new Shimmer development located between Mexborough and Conisbrough. Although HS2 will be on a viaduct through this location, it would cause significant property impacts.

### 7.6.3 Alignment

The proposed HS2 alignment follows a reverse curve approaching Conisbrough from the south. It skirts the western side of Denaby/Conisbrough and crosses the River Don flood plain before straightening as it passes to the east of Mexborough and curving towards the north west passing Barnburgh. Vertically the route descends towards the River Don and the Sheffield to Doncaster railway before rising over the River Dearne floodplain and climbing towards Barnburgh at a maximum gradient.

### 7.6.4 Route Alternatives

In order to avoid impacting the Shimmer development between Mexborough and Conisbrough, an alternative has been considered that follows an alignment further to the east. To achieve such a shift, the horizontal radius of the curve in this area would be significantly increased (from 5930m to approximately 7000m). With this realignment, the vertical alignment requires slightly less cut and fill, whilst still maintaining clearances above and below the roadways. However, this requires an increased length of viaduct, as a greater length of the alignment crosses the flood plain.

Although this avoids the Shimmer development, the alternative alignment would pass over the Denaby Lane Industrial Estate before then passing over properties on Pastures Road and the western end of the new Melton View development on the north side of the River Don flood plain.

### 7.6.5 Minimum Property Impacts

A number of property impacts, both industrial and residential, result from the alternative alignment.

Where the alternative route crosses the Denaby Lane Industrial Estate, although it would be supported on viaduct there would be three major impacts on commercial premises and three minor impacts. The suggested alternative passes to the East of the Shimmer development, where there would be zero residential properties that fall within the viaduct boundary.

The route proposed by HS2 passes immediately to the West of the Shimmer development where there would be 14 residential properties that fall within the viaduct boundary.

Therefore, the suggested alternative route saves 14 residential properties within the Shimmer development from direct impact.

See drawings SNC-T39183-HS2-P-SHT-CV-000012 and SNC-T39183-HS2-P-SHT-CV-000017 for a summary of the property impact.

Where the alternative route passes over Pastures Road north of the River Don flood plain it passes over a section of the Melton View development before skirting the western fringe of an extension of the development. There would be 12 major impacts on residential property on the main crossing with a further 10 properties removed from the plans for future development.

The net improvement in direct impacts would be a reduction in 2 residential properties but with the loss of three commercial properties and 10 potential future residential properties

Drawings SNC-T39183-HS2-P-SHT-CV-000004 Rev 2, SNC-T39183-HS2-P-SHT-CV-000005 Rev 2, SNC-T39183-HS2-P-SHT-CV-000006 Rev 1 and SNC-T39183-HS2-P-SHT-CV-000007 Rev 1 show our assessment.

## 7.6.6 Schedule of Impacts HS2 Bands

The HS2 compensation bands are described in Section 7.2.5. Table 5 shows a summary of the property impact for the HS2 consultation route for Mexborough/Conisbrough. Table 6 shows the property impact for the alternative route at this location. See drawings SNC-T39183-HS2-P-SHT-CV-000016, SNC-T39183-HS2-P-SHT-CV-000017 and SNC-T39183-HS2-P-SHT-CV-000018 for a summary of property impact.

<b>Band</b>	<b>Number of properties - East</b>	<b>Number of properties - West</b>
<b>Route on surface</b>	13	0
<b>Safeguarded Area</b>	35	59
<b>Rural Support Zone (RSZ)</b>	43	51
<b>Homeowner payment (HOP) zone 1</b>	49	68
<b>Homeowner payment (HOP) zone 2</b>	48	114
<b>Homeowner payment (HOP) zone 3</b>	28	157
<b>Total number of properties affected</b>	216	449

*Table 5 – Mexborough/Conisbrough HS2 Consultation Route*

Band	Number of properties - East	Number of properties - West
Route on surface	10	14
Safeguarded Area	85	68
Rural Support Zone (RSZ)	70	58
Homeowner payment (HOP) zone 1	105	60
Homeowner payment (HOP) zone 2	121	71
Homeowner payment (HOP) zone 3	76	59
<b>Total number of properties affected</b>	<b>467</b>	<b>330</b>

*Table 6 – Mexborough/Conisbrough Alternative Route*

### 7.6.7 Cost

The difference in cost between the HS2 proposed route and the alternative route are as follows:

- HS2 proposals: £237.53m
- Alternative alignment: £295.98m
- Cost Increase: £58.45m

While savings are made due to decreased cut and fill, there is an increase in the length of viaduct required which has contributed to the cost increase. Costs have been estimated at HS2 2014 based rates (including the HS2 mandated factors).

## 7.7 Barnburgh

### 7.7.1 Description

The HS2 alignment turns towards the north west as it passes to the east of Barnburgh. The vertical alignment proposed by HS2 results in a significant height of embankment at its nearest point to Barnburgh. Therefore, an alternative vertical alignment has been considered.

### 7.7.2 Alignment

Horizontally, the alignment here is positioned so as to pass to the east of both villages of Barnburgh and Hickleton. Vertically, the sinuous alignment clears several roads near Barnburgh, and then rises at the maximum 2.5% gradient towards Hickleton. The HS2 profile here would require significant fill areas.

### 7.7.3 Route Alternatives

An alternative vertical alignment has been considered as the route rises from the River Dearne flood plain and passes east of Barnburgh. The vertical curve is extended towards the north before climbing at the maximum gradient of 2.5%. This results in a reduction of approximately 10m in the height of the embankment although the St Helens Lane access road would need to be rerouted.

### 7.7.4 Property Impacts

There are no property impacts resulting from the alternative vertical alignment. However there would be a reduction in visual impact on east facing properties in Barnburgh.

### 7.7.5 Schedule of Impacts HS2 Bands

The HS2 compensation bands are described in Section 7.2.5. Table 7 shows a summary of the property impact for Barnburgh, see drawing SNC-T39183-HS2-P-SHT-CV-000019 for a summary of properties impacted. Although no residential properties have been affected, agricultural and leisure properties have been included in the Route on surface and Rural Support Zone bands to give a worst case scenario.

Band	Number of properties - East	Number of properties - West
Route on surface	4	0
Safeguarded Area	0	0
Rural Support Zone (RSZ)	4	1
Homeowner payment (HOP) zone 1	0	0
Homeowner payment (HOP) zone 2	0	0
Homeowner payment (HOP) zone 3	0	0
<b>Total number of properties affected</b>	<b>8</b>	<b>1</b>

Table 7 – Barnburgh Property Impact

### 7.7.6 Cost

The difference in cost between the HS2 proposed route and the alternative route are as follows:

- HS2 proposals: £277.70m
- Alternative alignment: £319.95m
- Cost increase: £42.25m

While the total volume of embankments and cuttings has not changed dramatically, there is substantially more cutting which has a high associated cost. Costs have been estimated at HS2 2014 based rates (including the HS2 mandated factors).

## 8 Conclusion

The study has concluded that out of the six locations considered, the alignment at four of these has either been specifically engineered to minimise the impacts or are sufficiently constrained such that alternative alignments are not feasible. These locations comprise:

- Wales
- Aston
- Morthen
- Bramley

However, at two locations, alternative alignments are considered to be feasible with a potential reduction in impacts albeit with an increase in costs.

### Mexborough/Conisbrough

The proposed HS2 route at Mexborough/Conisbrough avoids impacts on the Denaby Lane Industrial Estate and the main residential area of Mexborough. However, it has a significant impact on the new Shimmer development between Mexborough and Conisbrough.

An alternative alignment has been considered that would move the HS2 alignment slightly to the east. Although this would remove the impact from the Shimmer development it would introduce impacts elsewhere. Specifically, it would result in three major impacts on commercial premises and three minor impacts where the route crosses the Denaby Lane Industrial Estate and a further 12 major impacts on residential property where the route crosses the Melton View development with a further 10 properties removed from the plans for future development.

The additional cost of this option would be in the order of £58m (excluding property and land costs).

Neither HS2, Sheffield City Region nor Doncaster MBC have endorsed this alternative alignment. It will be the subject of discussions between these parties.

### Barnburgh

The proposed HS2 route east of Barnburgh avoids direct impacts on the village but introduces a high embankment with visual impacts.

In order to reduce the impact of this high embankment an alternative vertical alignment has been considered. This would reduce the height of the embankment by approximately 10m but would deepen the cutting to the north of Conisbrough.

The additional cost of this option would be in the order of £42m (excluding property and land costs).

Neither HS2, Sheffield City Region nor Doncaster MBC have endorsed this alternative design. It will be the subject of discussion between these parties.

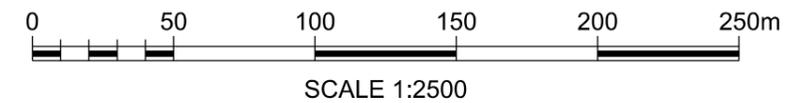
## Appendix A Route Alignment Drawings



**KEY:**

- Route on surface
- Safeguarded Area: Surface
- Rural Support Zone (RSZ)
- Homeowner payment (HOP) zone 1: 120m - 180m
- Homeowner payment (HOP) zone 2: 180m - 240m
- Homeowner payment (HOP) zone 3: 240m - 300m

Band	Number of properties
Route on surface	0
Safeguarded Area: Surface	19
Rural Support Zone (RSZ)	33
Homeowner payment plan (HOP) zone 1: 120m - 180m	40
Homeowner payment plan (HOP) zone 2: 180m - 240m	37
Homeowner payment plan (HOP) zone 3: 240m - 300m	39
<b>Total number of properties affected</b>	<b>168</b>



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes  
1) Assumed 22m wide HS2 Corridor.

Contractor(s)

Designed	-	Signed	-	Date	-
Drawn	-	Signed	-	Date	-
Checked	-	Signed	-	Date	-
Approved	-	Signed	-	Date	-

Project

**HS2 ROUTE VALIDATION**

---

Drawing Title

**LOCATION 1 - WALES**

---

**INDICATIVE PROPERTY IMPACT**

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Client

**SHEFFIELD CITY REGION**

---

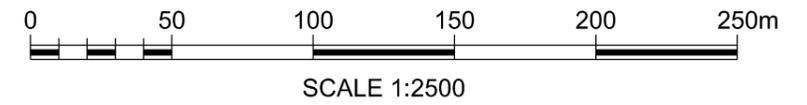
Scale(s)	1:2500	Sheet <b>1</b>
Drawing Number	<b>SNC-T39183-HS2-P-SHT-CV-000013</b>	Revision <b>1</b>



**KEY:**

- Route on surface
- Safeguarded Area: Surface
- Rural Support Zone (RSZ)
- Homeowner payment (HOP) zone 1: 120m - 180m
- Homeowner payment (HOP) zone 2: 180m - 240m
- Homeowner payment (HOP) zone 3: 240m - 300m

Band	Number of properties
Route on surface	0
Safeguarded Area: Surface	0
Rural Support Zone (RSZ)	5
Homeowner payment (HOP) zone 1: 120m - 180m	3
Homeowner payment (HOP) zone 2: 180m - 240m	4
Homeowner payment (HOP) zone 3: 240m - 300m	8
<b>Total number of properties affected</b>	<b>20</b>



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes  
1) Assumed 22m wide HS2 Corridor.

**SNC • LAVALIN**

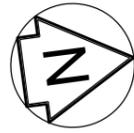
Designed	-	Signed	-	Date	-
Drawn	-	Signed	-	Date	-
Checked	-	Signed	-	Date	-
Approved	-	Signed	-	Date	-

**HS2 ROUTE VALIDATION**  
 Drawing Title  
**LOCATION 2 - 3 MORTHEN**  
**INDICATIVE PROPERTY IMPACT**

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

**SHEFFIELD CITY REGION**  
 Client  
 Scale(s) **1:2500**  
 Drawing Number **SNC-T39183-HS2-P-SHT-CV-000014**

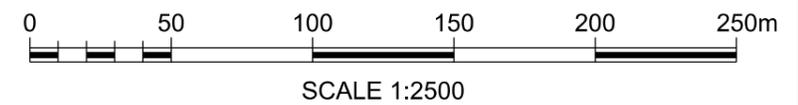
Sheet	1
Revision	1



**KEY:**

-  - Route on surface
-  - Safeguarded Area: Surface
-  - Rural Support Zone (RSZ)
-  - Homeowner payment (HOP) zone 1: 120m - 180m
-  - Homeowner payment (HOP) zone 2: 180m - 240m
-  - Homeowner payment (HOP) zone 3: 240m - 300m

Band	Number of properties
Route on surface	0
Safeguarded Area: Surface	87
Rural Support Zone (RSZ)	23
Homeowner payment (HOP) zone 1: 120m - 180m	37
Homeowner payment (HOP) zone 2: 180m - 240m	52
Homeowner payment (HOP) zone 3: 240m - 300m	64
<b>Total number of properties affected</b>	<b>263</b>



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes  
1) Assumed 22m wide HS2 Corridor.

Contractor(s)



Designed	-	Signed	-	Date	-
Drawn	-	Signed	-	Date	-
Checked	-	Signed	-	Date	-
Approved	-	Signed	-	Date	-

Project

**HS2 ROUTE VALIDATION**

Drawing Title

**LOCATION 4 - BRAMLEY**

**INDICATIVE PROPERTY IMPACT**

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Client

**SHEFFIELD CITY REGION**

Scale(s)

**1:2500**

Drawing Number

**SNC-T39183-HS2-P-SHT-CV-000015**

Sheet	<b>1</b>
Revision	<b>1</b>



**KEY:**

-  - Route on surface
-  - Safeguarded Area: Surface
-  - Rural Support Zone (RSZ)
-  - Homeowner payment (HOP) zone 1: 120m - 180m
-  - Homeowner payment (HOP) zone 2: 180m - 240m
-  - Homeowner payment (HOP) zone 3: 240m - 300m



SCALE 1:5000

Band	Number of properties
Route on surface	14
Safeguarded Area: Surface	90
Rural Support Zone (RSZ)	50
Homeowner payment (HOP) zone 1: 120m - 180m	126
Homeowner payment (HOP) zone 2: 180m - 240m	126
Homeowner payment (HOP) zone 3: 240m - 300m	55
<b>Total Number of properties affected</b>	<b>461</b>

**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p>Legend/Notes</p> <p>1) Assumed 22m wide HS2 Corridor.</p>		<p>Project</p> <p><b>HS2 ROUTE VALIDATION</b></p>	<p>Client</p> <p><b>SHEFFIELD CITY REGION</b></p>																								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Designed</td> <td style="width: 25%;">-</td> <td style="width: 25%;">Signed</td> <td style="width: 25%;">-</td> </tr> <tr> <td>Drawn</td> <td>-</td> <td>Signed</td> <td>-</td> </tr> <tr> <td>Checked</td> <td>-</td> <td>Signed</td> <td>-</td> </tr> <tr> <td>Approved</td> <td>-</td> <td>Signed</td> <td>-</td> </tr> </table>	Designed	-	Signed	-	Drawn	-	Signed	-	Checked	-	Signed	-	Approved	-	Signed	-	<p>Drawing Title</p> <p><b>LOCATION 5 - MEXBOROUGH-CONISBROUGH</b></p> <p><b>MELTON VIEW INDICATIVE PROPERTY IMPACT</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Scale(s)</td> <td style="width: 20%;">1:5000</td> <td style="width: 20%;">Sheet</td> <td style="width: 10%;">1</td> </tr> <tr> <td>Drawing Number</td> <td>SNC-T39183-HS2-P-SHT-CV-000016</td> <td>Revision</td> <td>1</td> </tr> </table>	Scale(s)	1:5000	Sheet	1	Drawing Number	SNC-T39183-HS2-P-SHT-CV-000016	Revision	1
Designed	-	Signed	-																								
Drawn	-	Signed	-																								
Checked	-	Signed	-																								
Approved	-	Signed	-																								
Scale(s)	1:5000	Sheet	1																								
Drawing Number	SNC-T39183-HS2-P-SHT-CV-000016	Revision	1																								
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rev</th> <th>Date</th> <th>Description of Revisions</th> <th>Drawn</th> <th>Chkd</th> <th>Appr</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Rev	Date	Description of Revisions	Drawn	Chkd	Appr																			
Rev	Date	Description of Revisions	Drawn	Chkd	Appr																						



**KEY:**

-  - Route on surface
-  - Safeguarded Area: Surface
-  - Rural Support Zone (RSZ)
-  - Homeowner payment (HOP) zone 1: 120m - 180m
-  - Homeowner payment (HOP) zone 2: 180m - 240m
-  - Homeowner payment (HOP) zone 3: 240m - 300m



Band	Number of Properties
Route on surface	0
Safeguarded Area: Surface	46
Rural Support Zone (RSZ)	46
Homeowner payment (HOP) zone 1: 120m - 180m	51
Homeowner payment (HOP) zone 2: 180m - 240m	51
Homeowner payment (HOP) zone 3: 240m - 300m	26
<b>Total number of properties affected</b>	<b>220</b>

**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes 1) Assumed 22m wide HS2 Corridor.		Project <h3 style="text-align: center;">HS2 ROUTE VALIDATION</h3> Drawing Title <h4 style="text-align: center;">LOCATION 5 - MEXBOROUGH CONISBROUGH</h4> <h4 style="text-align: center;">INDICATIVE PROPERTY IMPACT</h4>	Client <h3 style="text-align: center;">SHEFFIELD CITY REGION</h3>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Scale(s)</td> <td style="text-align: center;">1:5000</td> <td style="text-align: right;">Sheet</td> <td style="text-align: center;">1</td> </tr> <tr> <td colspan="2">Drawing Number</td> <td style="text-align: center;">SNC-T39183-HS2-P-SHT-CV-000017</td> <td style="text-align: right;">Revision</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="font-size: 6px;">Rev</td> <td style="font-size: 6px;">Date</td> <td style="font-size: 6px;">Description of Revisions</td> <td style="font-size: 6px;">Drawn</td> <td style="font-size: 6px;">Chkd</td> </tr> </table>	Scale(s)		1:5000	Sheet	1	Drawing Number		SNC-T39183-HS2-P-SHT-CV-000017	Revision	1	Rev	Date	Description of Revisions	Drawn	Chkd
Scale(s)		1:5000	Sheet	1															
Drawing Number		SNC-T39183-HS2-P-SHT-CV-000017	Revision	1															
Rev	Date	Description of Revisions	Drawn	Chkd															



**KEY:**

-  - Route on surface
-  - Safeguarded Area: Surface
-  - Rural Support Zone (RSZ)
-  - Homeowner payment (HOP) zone 1: 120m - 180m
-  - Homeowner payment (HOP) zone 2: 180m - 240m
-  - Homeowner payment (HOP) zone 3: 240m - 300m

Band	Number of properties
Route on surface	4
Safeguarded Area: Surface	10
Rural Support Zone (RSZ)	12
Homeowner payment (HOP) zone 1: 120m - 180m	13
Homeowner payment (HOP) zone 2: 180m - 240m	66
Homeowner payment (HOP) zone 3: 240m - 300m	93
<b>Total Number of properties affected</b>	<b>198</b>



SCALE 1:5000

**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes

1) Assumed 22m wide HS2 Corridor.

Contractor(s)



Project

**HS2 ROUTE VALIDATION**

Drawing Title

**LOCATION 5 - MEXBOROUGH - CONISBROUGH**

**INDICATIVE PROPERTY IMPACT**

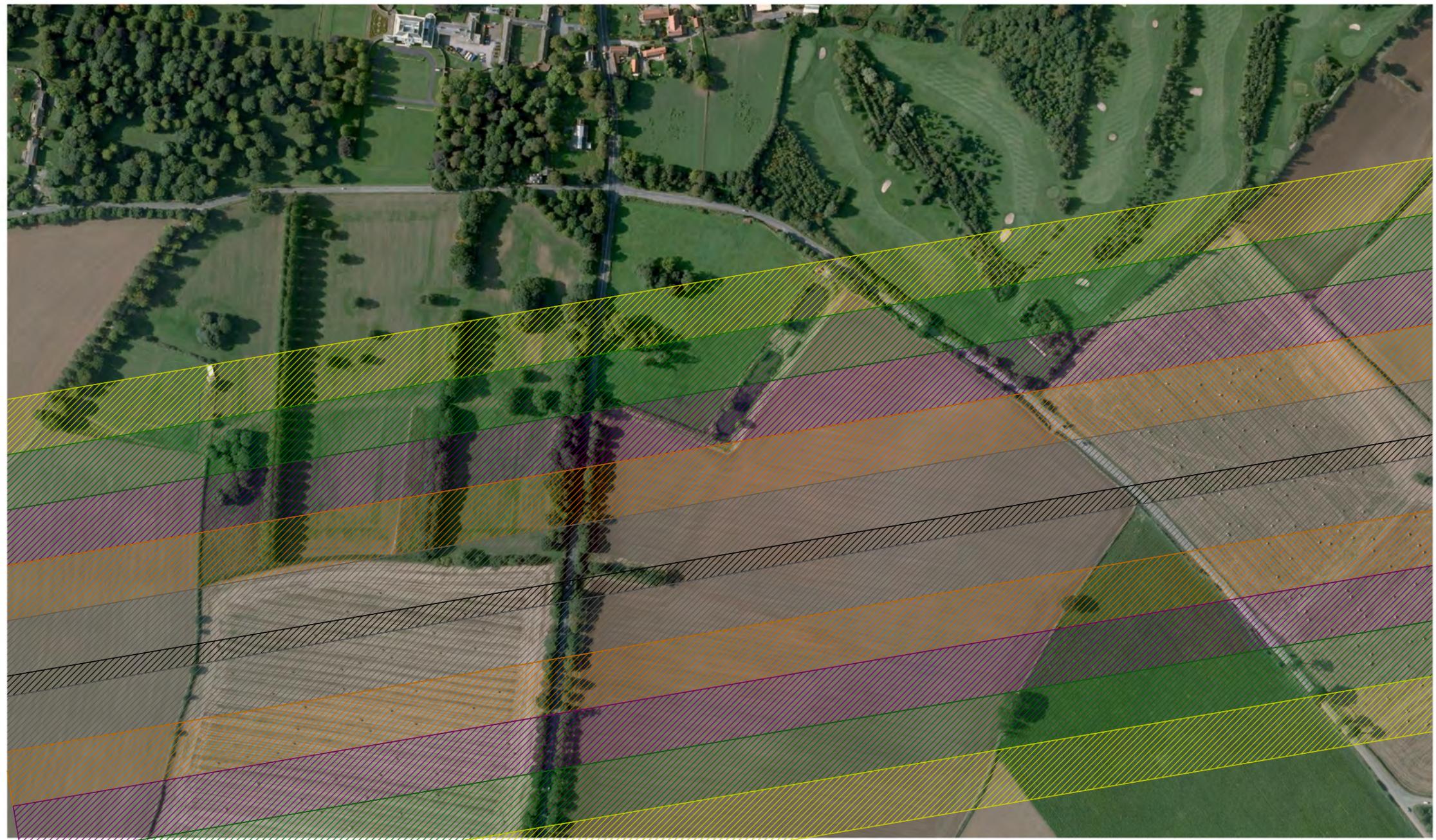
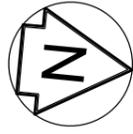
Client

**SHEFFIELD CITY REGION**

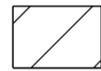
Designed	-	Signed	-	Date	-
Drawn	-	Signed	-	Date	-
Checked	-	Signed	-	Date	-
Approved	-	Signed	-	Date	-

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Scale(s)	1:5000	Sheet	1
Drawing Number	SNC-T39183-HS2-P-SHT-CV-000018	Revision	1



**KEY:**

-  - Route on surface
-  - Safeguarded Area: Surface
-  - Rural Support Zone (RSZ)
-  - Homeowner payment (HOP) zone 1: 120m - 180m
-  - Homeowner payment (HOP) zone 2: 180m - 240m
-  - Homeowner payment (HOP) zone 3: 240m - 300m

Band	Number of properties
Route on surface	4
Safeguarded Area: Surface	0
Rural Support Zone (RSZ)	4
Homeowner payment (HOP) zone 1: 120m - 180m	0
Homeowner payment (HOP) zone 2: 180m - 240m	0
Homeowner payment (HOP) zone 3: 240m - 300m	0
<b>Total number of properties affected</b>	<b>8</b>



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes  
1) Assumed 22m wide HS2 Corridor.

Contractor(s)



Designed	-	Signed	-	Date	-
Drawn	-	Signed	-	Date	-
Checked	-	Signed	-	Date	-
Approved	-	Signed	-	Date	-

Project

**HS2 ROUTE VALIDATION**

Drawing Title

**LOCATION 6 - BARNBURGH**

**INDICATIVE PROPERTY IMPACT**

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Client

**SHEFFIELD CITY REGION**

Scale(s)

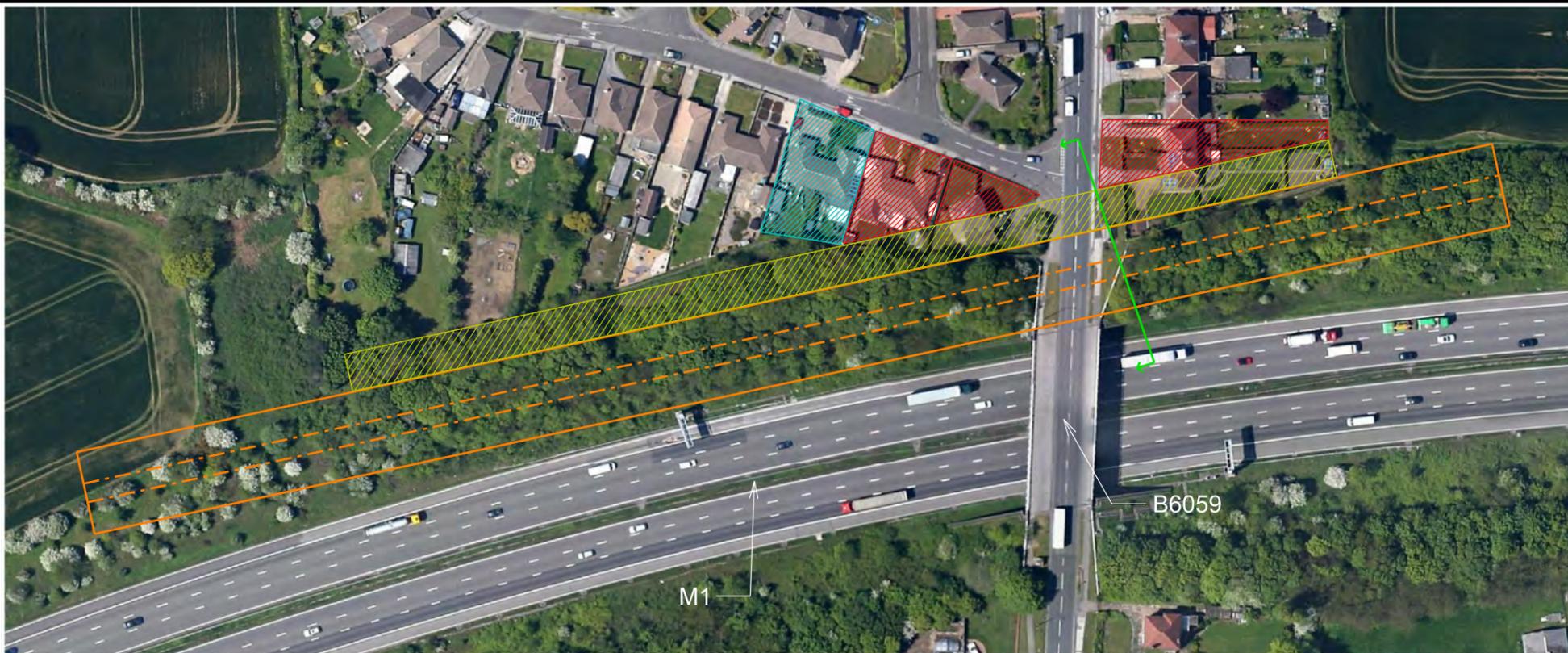
**1:5000**

Drawing Number

**SNC-T39183-HS2-P-SHT-CV-000019**

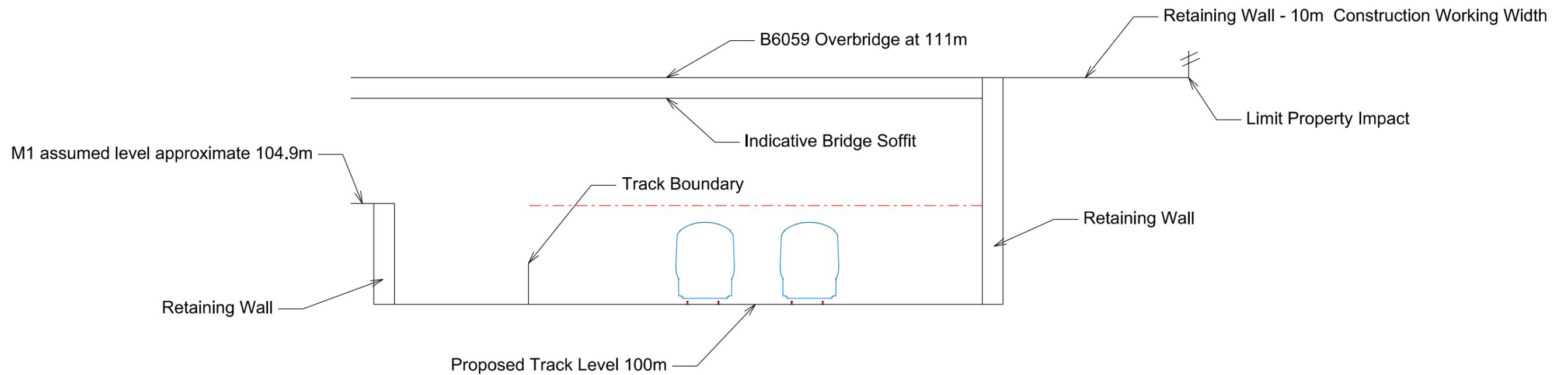
Sheet	<b>1</b>
Revision	<b>1</b>

## Appendix B cross Sections and Impacts



**KEY:**

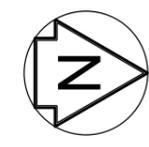
- - Cross Section
- ▨ - Minor Property Impact
- ▨ - Major Property Impact
- - - - Track Centerline
- - - - UIC - GC Loading Gauge
- ▨ - Retaining Wall
- - Track Boundary



**CONFIDENTIAL**

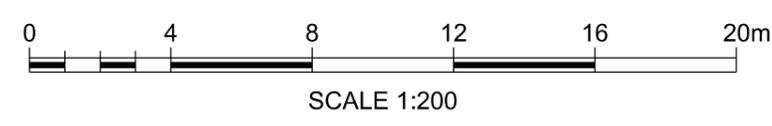
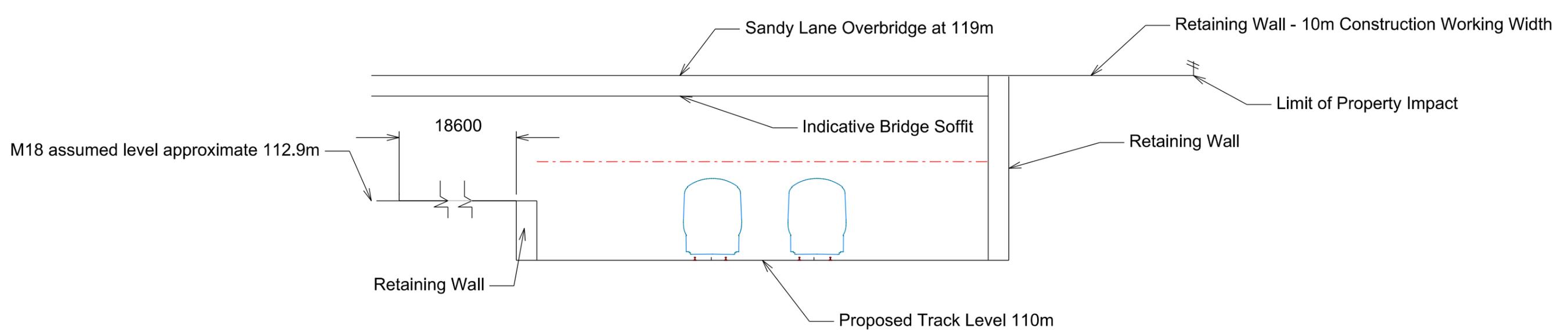
DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p><small>Legend/Notes</small></p> <ol style="list-style-type: none"> <li>1. All Dimensions are in mm unless otherwise stated.</li> <li>2. The level of the road was calculated from the existing level of the B6059 and the standard clearance of 5.1 meters between roadway and overbridge, and an additional 1m for construction clearance.</li> <li>3. Existing levels and proposed levels are taken from drawing C321-MMD-RT-DPP-120-581401.</li> <li>4. The proposed track level is dictated by vertical alignment constraints either side of road bridge.</li> <li>5. Assumed 10m working room at WP of retaining wall.</li> <li>6. Assumed 22m HS2 corridor.</li> </ol>	<p><b>SNC • LAVALIN</b></p>	<p><b>Project</b></p> <p><b>HS2 ROUTE VALIDATION</b></p> <hr/> <p><small>Drawing Title</small></p> <p><b>LOCATION 1 - WALES</b></p>	<p><small>Client</small></p> <p><b>SHEFFIELD CITY REGION</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;"><small>Scale(s)</small></td> <td style="text-align: center;">1:200</td> <td style="width: 5%;"><small>Sheet</small></td> <td style="text-align: center;">1 of 1</td> </tr> <tr> <td><small>Drawing Number</small></td> <td colspan="2" style="text-align: center;"><b>SNC-T39183-HS2-P-SHT-CV-000001</b></td> <td><small>Revision</small></td> </tr> <tr> <td></td> <td style="text-align: center;">2</td> <td></td> <td style="text-align: center;">2</td> </tr> </table>	<small>Scale(s)</small>	1:200	<small>Sheet</small>	1 of 1	<small>Drawing Number</small>	<b>SNC-T39183-HS2-P-SHT-CV-000001</b>		<small>Revision</small>		2		2						
<small>Scale(s)</small>	1:200	<small>Sheet</small>	1 of 1																			
<small>Drawing Number</small>	<b>SNC-T39183-HS2-P-SHT-CV-000001</b>		<small>Revision</small>																			
	2		2																			
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 5%;"><small>Rev</small></th> <th style="width: 10%;"><small>Date</small></th> <th style="width: 60%;"><small>Description of Revisions</small></th> <th style="width: 5%;"><small>Drawn</small></th> <th style="width: 5%;"><small>Chkd</small></th> <th style="width: 15%;"><small>Appr</small></th> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">22/02</td> <td style="text-align: center;">General Update</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">14/02</td> <td style="text-align: center;">General Update</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> </tr> </table>	<small>Rev</small>	<small>Date</small>	<small>Description of Revisions</small>	<small>Drawn</small>	<small>Chkd</small>	<small>Appr</small>	2	22/02	General Update	-	-	-	1	14/02	General Update	-	-	-		
<small>Rev</small>	<small>Date</small>	<small>Description of Revisions</small>	<small>Drawn</small>	<small>Chkd</small>	<small>Appr</small>																	
2	22/02	General Update	-	-	-																	
1	14/02	General Update	-	-	-																	



- KEY:**
- Cross Section
  - Minor Property Impact
  - Major Property Impact
  - Track Centerline
  - UIC - GC Loading Gauge
  - Retaining Wall
  - Track Boundary

Cut Line Drawing 3



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

**Legend/Notes**

1. All Dimensions are in mm unless otherwise stated.
2. The level of the road was calculated from the existing level of Sandy Lane Road and the standard clearance of 6.1 meters between roadway and overbridge.
3. Existing levels and proposed levels are taken from drawing C321-4MMD-RT-DPP-120-581403
4. The proposed track level is following the vertical alignment of the adjacent motorway.
5. Assumed 10m working room at WP of retaining wall.
6. Assumed 22m HS2 corridor.

Designed	-	Signed	-
Drawn	-	Signed	-
Checked	-	Signed	-
Approved	-	Signed	-

**Project**

HS2 ROUTE VALIDATION

---

**Drawing Title**

LOCATION 4 - BRAMLEY  
SANDY LANE CROSS SECTION

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
2	22/02	General Update	-	-	-
1	14/2	General Update	-	-	-

**Client**

SHEFFIELD CITY REGION

---

**Scale(s)**

1:200

**Sheet**

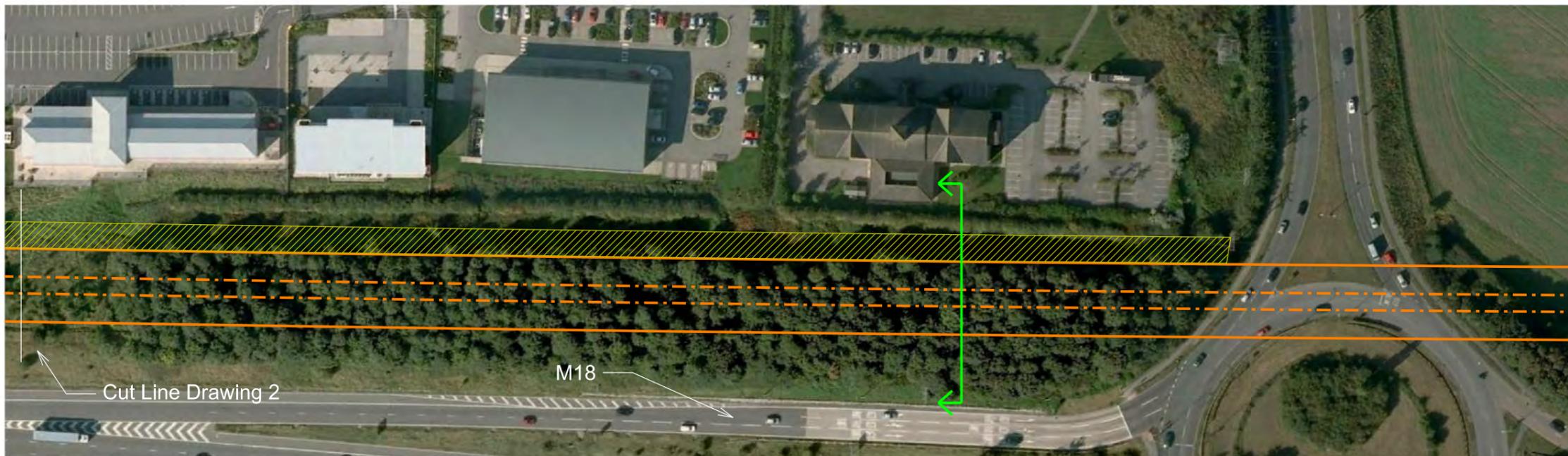
1 of 2

**Drawing Number**

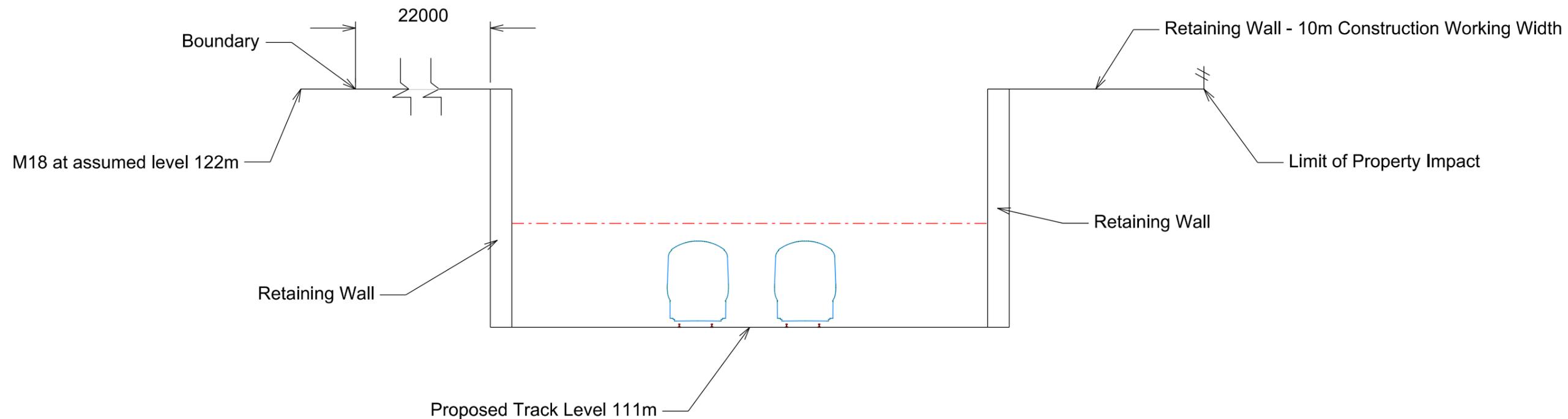
SNC-T39183-HS2-P-SHT-CV-000002

**Revision**

2



- KEY:**
- Cross Section
  - Minor Property Impact
  - Major Property Impact
  - Track Centerline
  - UIC - GC Loading Gauge
  - Retaining Wall
  - Track Boundary



**CONFIDENTIAL**

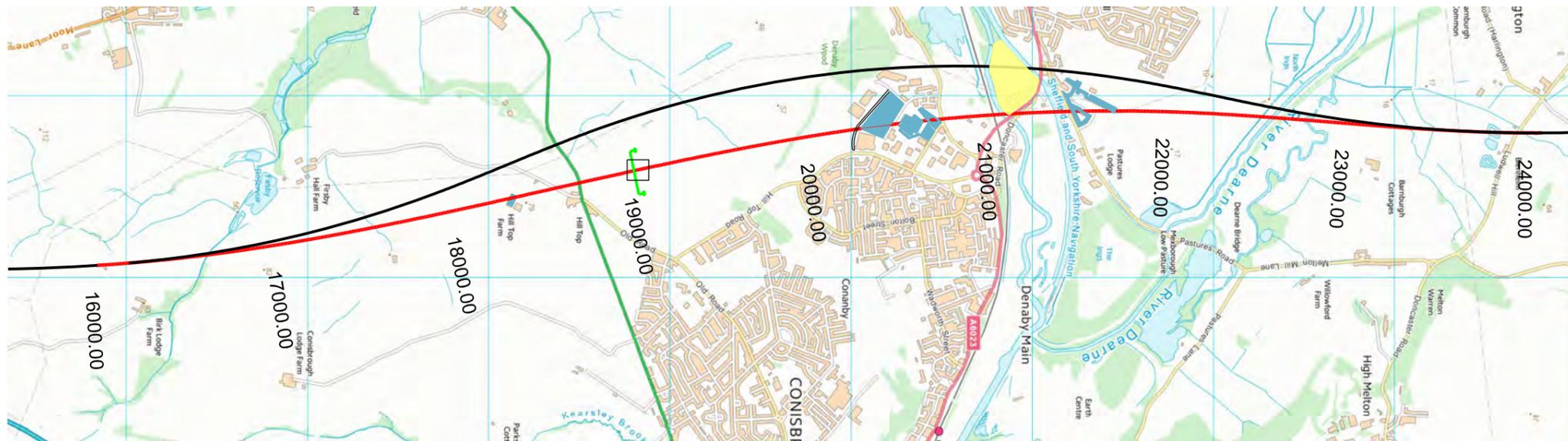
DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p>Legend/Notes</p> <p>1. All Dimensions are in mm unless otherwise stated.</p> <p>2. The level of the road was calculated from the existing level of Sandy Lane Road and the standard clearance of 6.1 meters between roadway and overbridge.</p> <p>3. Existing levels and proposed levels are taken from drawing C321-MMD-RT-DPP-120-581403</p> <p>4. The proposed track level is following the vertical alignment of the adjacent motorway.</p> <p>5. Assumed 10m working room at WP of retaining wall.</p> <p>6. Assumed 22m HS2 corridor.</p>			
Designed	-	Signed	-
Drawn	-	Signed	-
Checked	-	Signed	-
Approved	-	Signed	-

<p>Contractor(s)</p>		<p>Project</p> <p style="text-align: center;"><b>HS2 ROUTE VALIDATION</b></p>	
<p>Client</p> <p style="text-align: center;"><b>SHEFFIELD CITY REGION</b></p>		<p>Drawing Title</p> <p style="text-align: center;"><b>LOCATION 4 - BRAMLEY CROSS SECTION</b></p>	

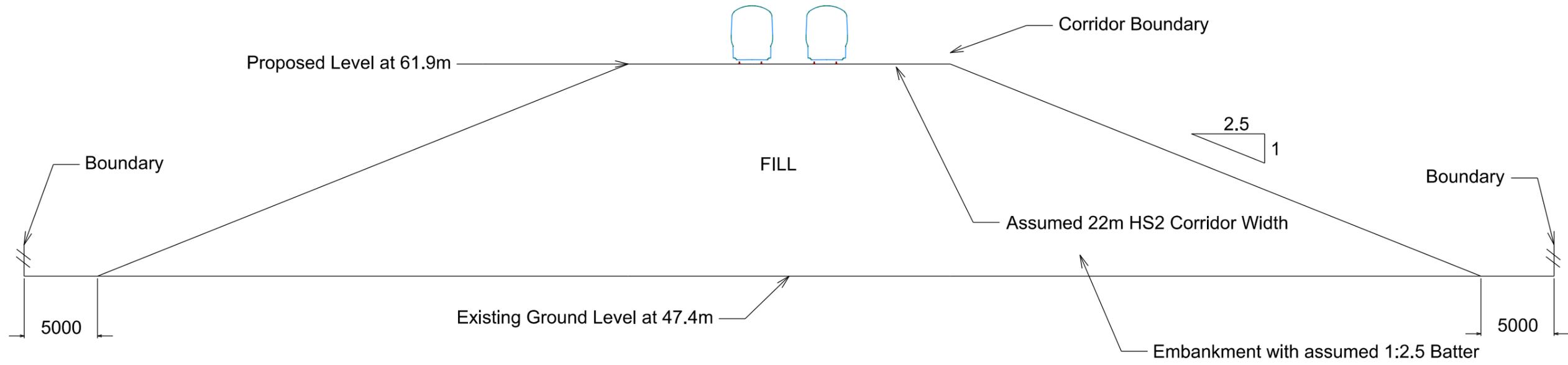
2	22/02	General Update	-	-	-
1	14/2	General Update	-	-	-
Rev	Date	Description of Revisions	Drawn	Chkd	Appr

<p>Scale(s)</p> <p style="text-align: center;"><b>1:200</b></p>		<p>Sheet</p> <p style="text-align: center;"><b>2 of 2</b></p>
<p>Drawing Number</p> <p style="text-align: center;"><b>SNC-T39183-HS2-P-SHT-CV-000003</b></p>		<p>Revision</p> <p style="text-align: center;"><b>2</b></p>



**KEY:**  
 — Proposed Existing Alignment  
 — Suggested Alternative  
 — Cross Section

PLAN Contains OS data © Crown copyright and database right (2017)



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

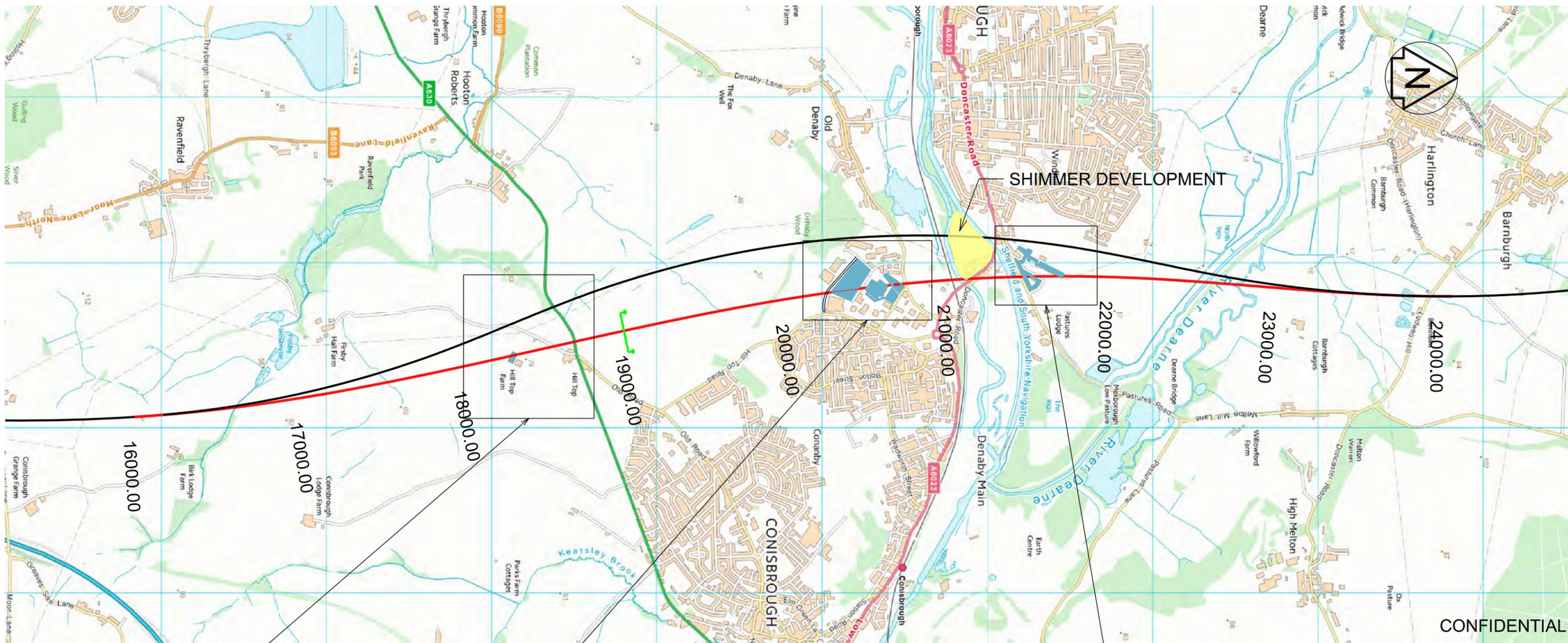
Legend/Notes  
 For property impact see drawings:  
 1) SNC-T39183-HS2-P-SHT-CV-000006  
 2) SNC-T39183-HS2-P-SHT-CV-000007  
 3) SNC-T39183-HS2-P-SHT-CV-000012

Designed	-	Signed	-
Drawn	-	Signed	-
Checked	-	Signed	-
Approved	-	Signed	-

<b>HS2 ROUTE VALIDATION</b>	
<b>ALTERNATIVE ALIGNMENT</b> <b>LOCATION 5 EMBANKMENT OPTION</b>	

2	22/2	General Update	-	-	-
1	14/2	General Update	-	-	-
Rev	Date	Description of Revisions	Drawn	Chkd	Appr

<b>SHEFFIELD CITY REGION</b>	
Scale(s)	1:200
Sheet	1 of 1
Drawing Number	SNC-T39183-HS2-P-SHT-CV-000004
Revision	2



PLAN

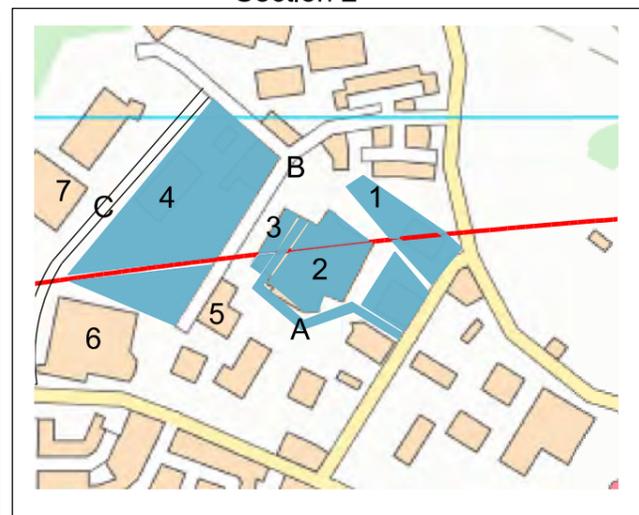
Contains OS data © Crown copyright and database right (2017)

CONFIDENTIAL

Section 1

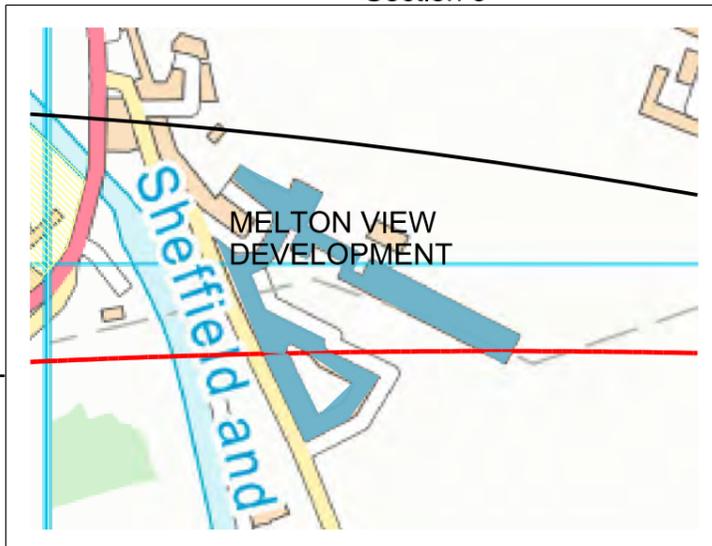


Section 2



- Major Impact (Commerical) -  
 1 -EXTRUDAKERB  
 2 -MONOCON REFRACTORIES  
 3 -TRANSITION GLASS
- Minor Impact (Commercial) -  
 4 -M & J POLYMERS  
 5 -CLI FABRICATIONS  
 6 -SENIOR ARCHITECTURAL SYSTEMS
- A -DAVY ROAD  
 B -COALPIT ROAD  
 C -ELAND ROAD

Section 3



For Impact See Drawings:  
 SNC-T39138-HS2-P-SHT-CV-000006  
 SNC-T39138-HS2-P-SHT-CV-000007

Legend/Notes

- Proposed Existing Alignment
- Suggested Alternative
- Cross Section
- Property Impact

Contractor(s)

**SNC-LAVALIN**

Designed	Drawn	Checked	Approved	Signed	Date
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Project

**HS2 ROUTE VALIDATION**

Drawing Title

**LOCATION 5  
PROPERTY IMPACT**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
2	22/2	General Update	-	-	-
1	14/2	General Update	-	-	-

Client

**SHEFFIELD CITY REGION**

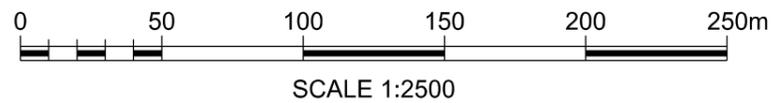
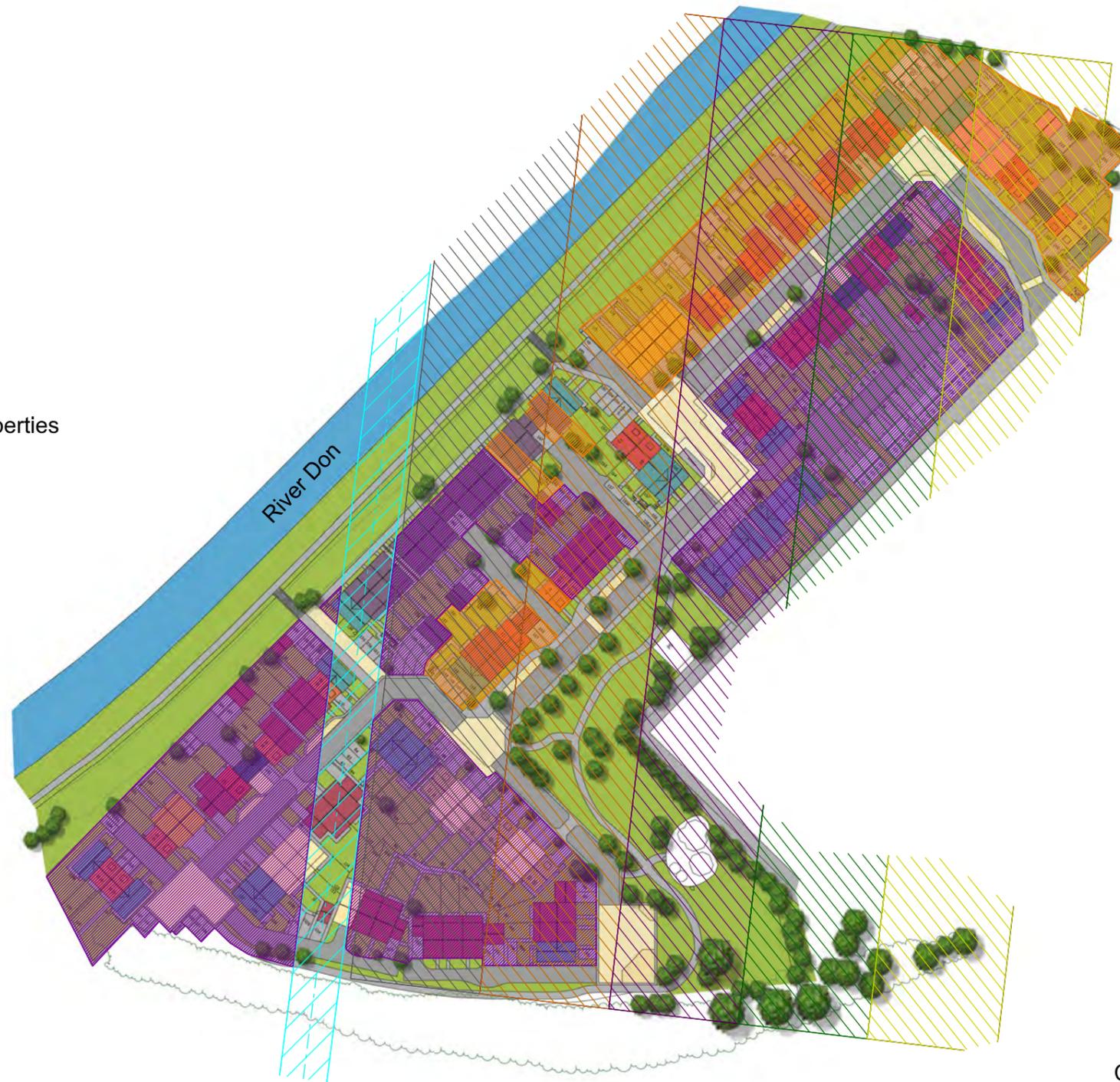
Scale(s)	Sheet
-	1
Drawing Number	Revision
SNC-T39183-HS2-P-SHT-CV-000005	2



- Key:**
- HS2 Indicative Proposed Route
  - Existing Properties
  - Under Construction/Proposed Property
  - Viaduct Centreline

**Property Impact**

- Within Viaduct Bounday - 14 Properties
- Within 100m Buffer - 56 Properties
- Within 250m Buffer - 87 Properties
- Unfinished/Construction Uninitiated - 53 Properties



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p>Legend/Notes</p> <p>1) Underlay obtained from Strata Homes development plan.</p>		<p><b>Project</b></p> <p>HS2 ROUTE VALIDATION</p> <hr/> <p><b>Drawing Title</b></p> <p>LOCATION 5 SHIMMER ESTATE POTENTIAL PROPERTY IMPACT HS2 INDICATIVE PROPOSED ROUTE</p>	<p><b>Client</b></p> <p>SHEFFIELD CITY REGION</p>																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Designed</td> <td style="width: 25%;">Signed</td> <td style="width: 25%;">Date</td> <td style="width: 25%;"></td> </tr> <tr> <td>Drawn</td> <td>Signed</td> <td>Date</td> <td></td> </tr> <tr> <td>Checked</td> <td>Signed</td> <td>Date</td> <td></td> </tr> <tr> <td>Approved</td> <td>Signed</td> <td>Date</td> <td></td> </tr> </table>	Designed	Signed	Date		Drawn	Signed	Date		Checked	Signed	Date		Approved	Signed	Date		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Scale(s)</td> <td style="width: 25%;">1:2500</td> <td style="width: 25%;">Sheet</td> <td style="width: 25%;">1</td> </tr> <tr> <td>Drawing Number</td> <td>SNC-T39183-HS2-P-SHT-CV-000012</td> <td>Revision</td> <td>1</td> </tr> </table>	Scale(s)	1:2500	Sheet	1	Drawing Number	SNC-T39183-HS2-P-SHT-CV-000012	Revision	1
Designed	Signed	Date																							
Drawn	Signed	Date																							
Checked	Signed	Date																							
Approved	Signed	Date																							
Scale(s)	1:2500	Sheet	1																						
Drawing Number	SNC-T39183-HS2-P-SHT-CV-000012	Revision	1																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Rev</th> <th>Date</th> <th>Description of Revisions</th> <th>Drawn</th> <th>Chkd</th> <th>Appr</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>		Rev	Date	Description of Revisions	Drawn	Chkd	Appr																		
Rev	Date	Description of Revisions	Drawn	Chkd	Appr																				



**Key:**

- Indicative Viaduct
- Current Developments
- Future Developments
- Sold Developments
- Open Space
- Viaduct Centerline



**Properties Affected:**

Existing: 0  
 Future: 10  
 Sold: 0

**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p><small>Legend/Notes</small></p> <p>1 - Viaduct is assumed to be 22 meters in width.          2 - Underlay obtained from Advant Homes Melton View development plan.          3 - Future Development Plots Effected: Plots 213 - 222.          4 - Drawing shows the worst case property impact for Melton View Housing Development.</p>		<p><b>Project</b></p> <p>HS2 ROUTE VALIDATION</p> <hr/> <p><small>Drawing Title</small></p> <p>LOCATION 5 - MELTON VIEW PROPERTY IMPACT</p>	<p><b>Client</b></p> <p>SHEFFIELD CITY REGION</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;"><small>Scale(s)</small></td> <td style="text-align: center;">NOT TO SCALE</td> <td style="width: 5%;"><small>Sheet</small></td> <td style="text-align: center;">1</td> </tr> <tr> <td><small>Drawing Number</small></td> <td style="text-align: center;">SNC-T39183-HS2-P-SHT-CV-000006</td> <td><small>Revision</small></td> <td style="text-align: center;">1</td> </tr> </table>	<small>Scale(s)</small>	NOT TO SCALE	<small>Sheet</small>	1	<small>Drawing Number</small>	SNC-T39183-HS2-P-SHT-CV-000006	<small>Revision</small>	1																				
<small>Scale(s)</small>	NOT TO SCALE	<small>Sheet</small>	1																													
<small>Drawing Number</small>	SNC-T39183-HS2-P-SHT-CV-000006	<small>Revision</small>	1																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"><small>Designed</small></td> <td style="width: 25%; text-align: center;">-</td> <td style="width: 25%;"><small>Signed</small></td> <td style="width: 25%; text-align: center;">-</td> </tr> <tr> <td><small>Drawn</small></td> <td style="text-align: center;">-</td> <td><small>Signed</small></td> <td style="text-align: center;">-</td> </tr> <tr> <td><small>Checked</small></td> <td style="text-align: center;">-</td> <td><small>Signed</small></td> <td style="text-align: center;">-</td> </tr> <tr> <td><small>Approved</small></td> <td style="text-align: center;">-</td> <td><small>Signed</small></td> <td style="text-align: center;">-</td> </tr> </table>		<small>Designed</small>	-	<small>Signed</small>	-	<small>Drawn</small>	-	<small>Signed</small>	-	<small>Checked</small>	-	<small>Signed</small>	-	<small>Approved</small>	-	<small>Signed</small>	-	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;"><small>Rev</small></td> <td style="width: 10%;"><small>Date</small></td> <td style="width: 60%;"><small>Description of Revisions</small></td> <td style="width: 10%;"><small>Drawn</small></td> <td style="width: 10%;"><small>Chkd</small></td> <td style="width: 10%;"><small>Appr</small></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">22/10</td> <td style="text-align: center;">General Update</td> <td></td> <td></td> <td></td> </tr> </table>			<small>Rev</small>	<small>Date</small>	<small>Description of Revisions</small>	<small>Drawn</small>	<small>Chkd</small>	<small>Appr</small>	1	22/10	General Update			
<small>Designed</small>	-	<small>Signed</small>	-																													
<small>Drawn</small>	-	<small>Signed</small>	-																													
<small>Checked</small>	-	<small>Signed</small>	-																													
<small>Approved</small>	-	<small>Signed</small>	-																													
<small>Rev</small>	<small>Date</small>	<small>Description of Revisions</small>	<small>Drawn</small>	<small>Chkd</small>	<small>Appr</small>																											
1	22/10	General Update																														



KEY:

- Residential Development
- Commercial/Other Development
- Track Centerline

Residential Development Property Impact:

- 9 Properties

Commercial/Other Development Impact:

- 1 Property

Transport Impact:

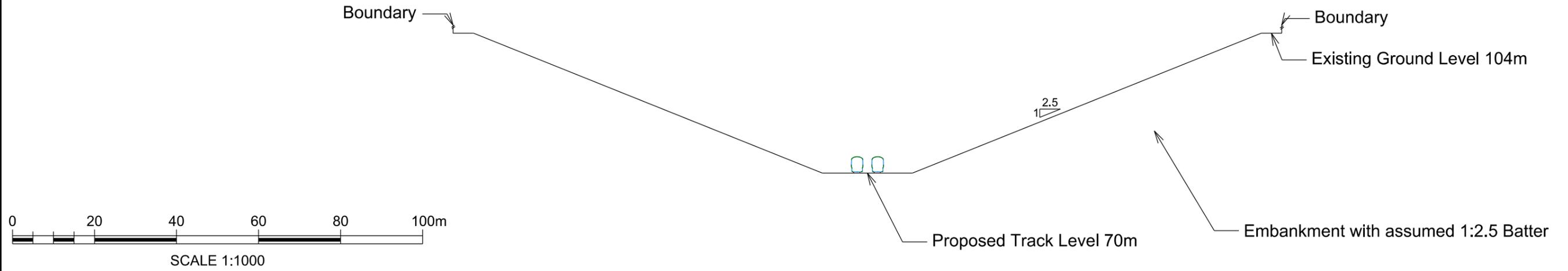
- 4 Roads

CONFIDENTIAL

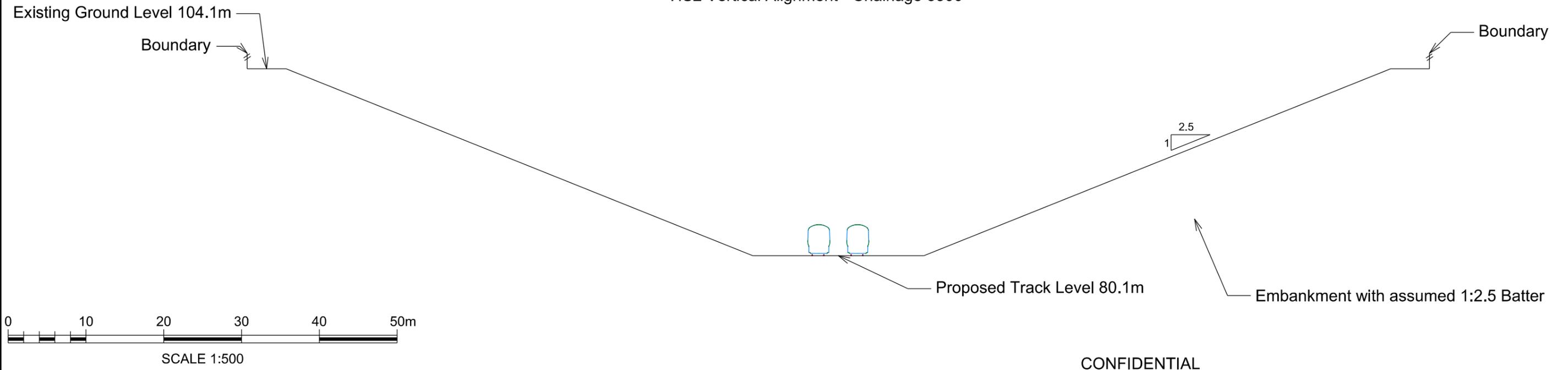
DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

<p>Legend/Notes</p> <p>-</p>	 <p><b>SNC • LAVALIN</b></p>	<p>Project</p> <p><b>HS2 ROUTE VALIDATION</b></p> <hr/> <p>Drawing Title</p> <p><b>MELTON VIEW PROPERTY IMPACT</b></p>	<p>Client</p> <p><b>SHEFFIELD CITY REGION</b></p> <hr/> <p>Scale(s)</p> <p><b>NOT TO SCALE</b></p> <hr/> <p>Drawing Number</p> <p><b>SNC-T391830-HS2-P-SHT-CV-000007</b></p>																												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Designed</td><td>-</td><td>Signed</td><td>-</td><td>Date</td><td>-</td></tr> <tr> <td>Drawn</td><td>-</td><td>Signed</td><td>-</td><td>Date</td><td>-</td></tr> <tr> <td>Checked</td><td>-</td><td>Signed</td><td>-</td><td>Date</td><td>-</td></tr> <tr> <td>Approved</td><td>-</td><td>Signed</td><td>-</td><td>Date</td><td>-</td></tr> </table>	Designed	-	Signed	-	Date	-	Drawn	-	Signed	-	Date	-	Checked	-	Signed	-	Date	-	Approved	-	Signed	-	Date	-		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Sheet</td><td style="text-align: center;">1</td></tr> <tr> <td>Revision</td><td style="text-align: center;">1</td></tr> </table>	Sheet	1	Revision	1
Designed	-	Signed	-	Date	-																										
Drawn	-	Signed	-	Date	-																										
Checked	-	Signed	-	Date	-																										
Approved	-	Signed	-	Date	-																										
Sheet	1																														
Revision	1																														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rev</th><th>Date</th><th>Description of Revisions</th><th>Drawn</th><th>Chkd</th><th>Appr</th></tr> </thead> <tbody> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Rev	Date	Description of Revisions	Drawn	Chkd	Appr																							
Rev	Date	Description of Revisions	Drawn	Chkd	Appr																										

SNC-Lavalin Suggested Vertical Alignment - Chainage 8500



HS2 Vertical Alignment - Chainage 8500



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

- Legend/Notes
- All Dimension are in mm unless otherwise stated.
  - Existing levels, HS2 proposed levels and chainages are taken from drawing C321-MMD-RT-DPP-130-581602.
  - Assumed 22m HS2 corridor.

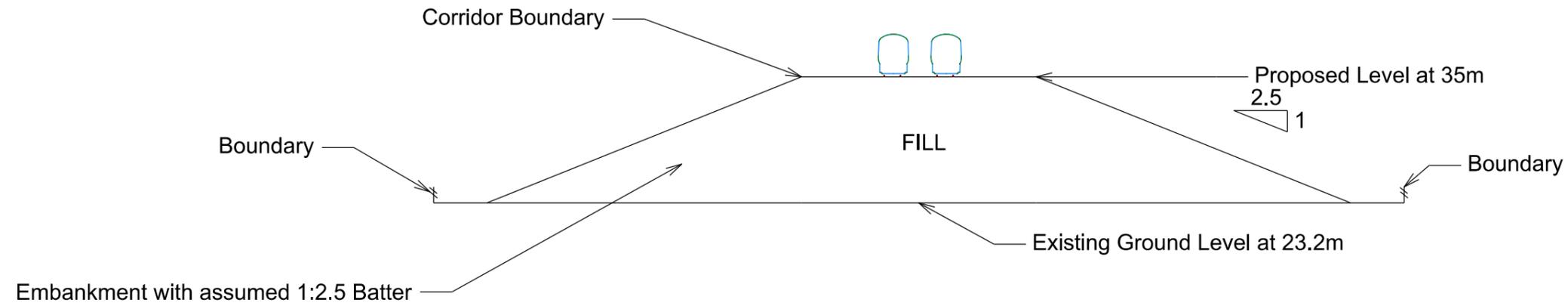
 <b>SNC • LAVALIN</b>			
Designed	-	Signed	-
Drawn	-	Signed	-
Checked	-	Signed	-
Approved	-	Signed	-

<b>HS2 ROUTE VALIDATION</b>	
Drawing Title <b>LOCATION 6 - BARNBURGH VERTICAL</b>	
<b>ALIGNMENT EMBANKMENT CROSS SECTION</b>	

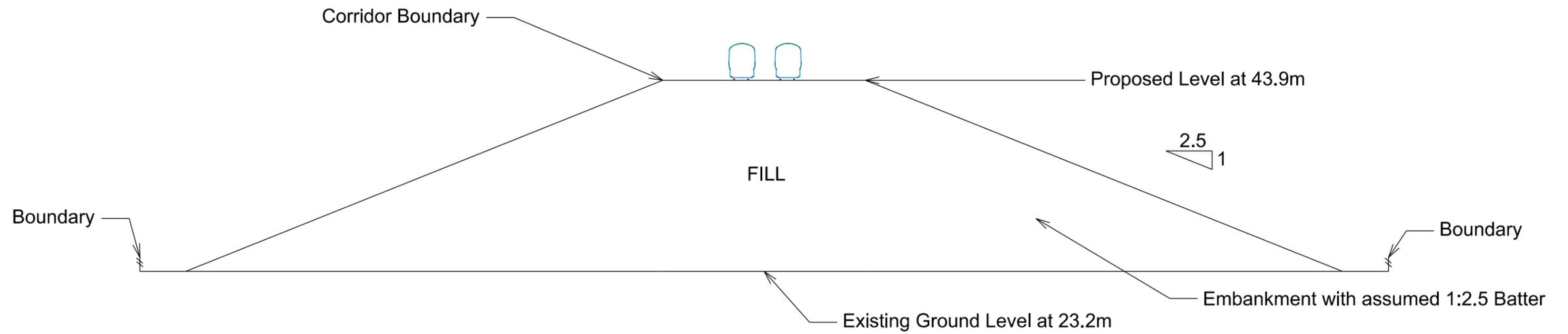
Rev	Date	Description of Revisions	Drawn	Chkd	Appr

<b>CITY SHEFFIELD REGION</b>	
Scale(s)	1:500, 1:1000
Sheet	1
Drawing Number	SNC-T391830-HS2-P-SHT-CV-000008
Revision	1

SNC-Lavalin Suggested Vertical Alignment - Chainage 7000

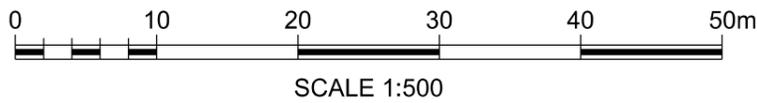


HS2 Proposed Vertical Alignment - Chainage 7000



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.



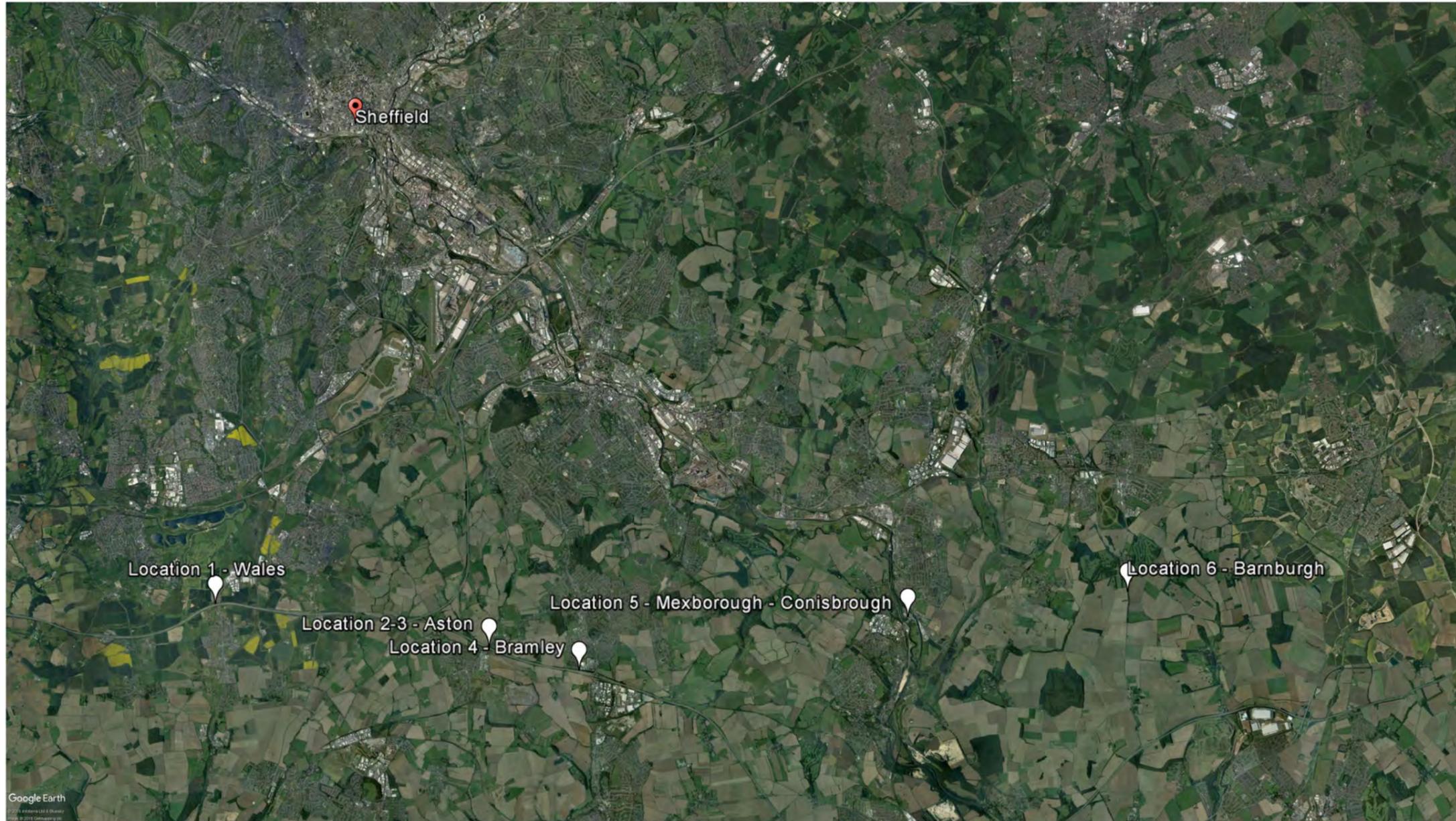
- Legend/Notes
1. All Dimension are in mm unless otherwise stated.
  2. Existing levels and HS2 proposed levels are taken from drawing C321-MMD-RT-DPP-130-581602.
  3. Assumed 10m working room at WP of retaining wall.
  4. Assumed 22m HS2 corridor.

Designed	-	Signed	-
Drawn	-	Signed	-
Checked	-	Signed	-
Approved	-	Signed	-

Project		HS2 ROUTE VALIDATION	
Drawing Title		LOCATION 6 - BARNBURGH VERTICAL ALIGNMENT EMBANKMENT CROSS SECTION	
Rev	Date	Description of Revisions	Drawn

Client			SHEFFIELD CITY REGION		
Scale(s)			1:500		
Drawing Number			SNC-T391830-HS2-P-SHT-CV-000009		
Revision			1		

Sheet		1	
Revision		1	

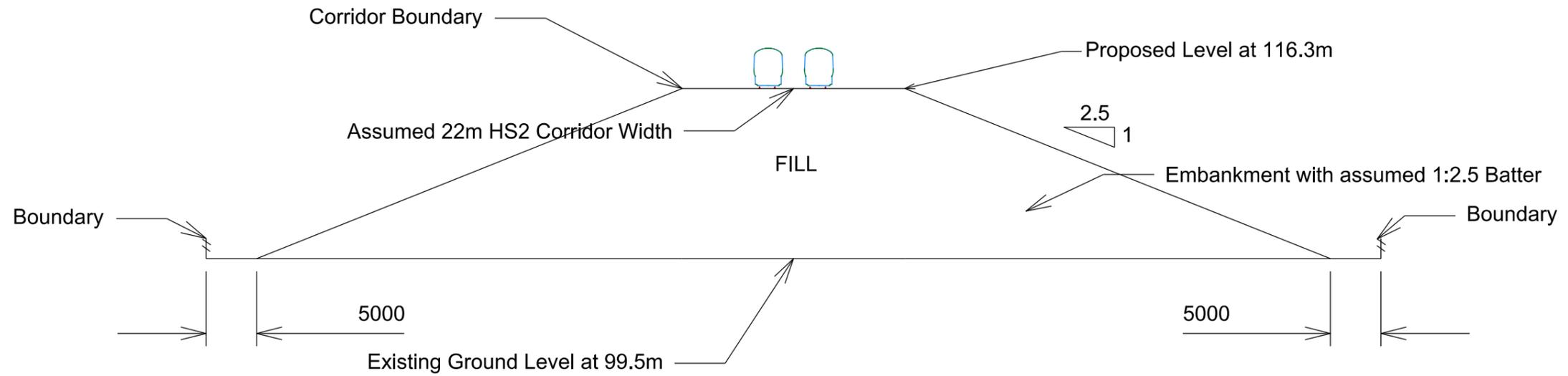


**CONFIDENTIAL**

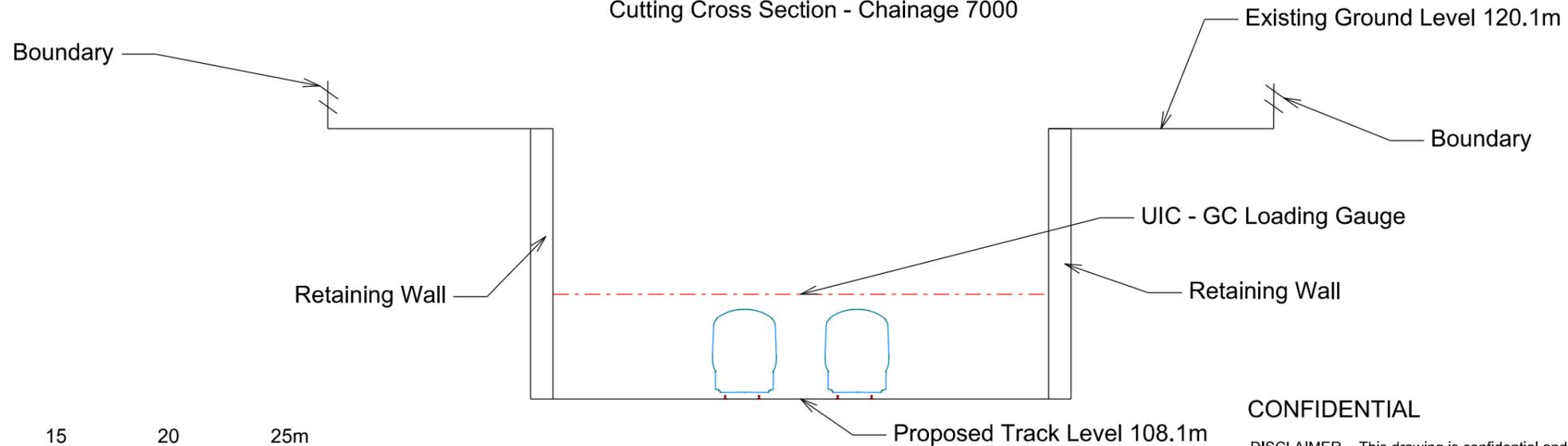
DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative.

Legend/Notes	Contractor(s)			Project			Client				
	 <b>SNC • LAVALIN</b>			<b>HS2 ROUTE VALIDATION</b>			<b>SHEFFIELD CITY REGION</b>				
	Designed	-	Signed	-	Date	-	Scale(s) <b>NOT TO SCALE</b>		Sheet	1	
	Drawn	-	Signed	-	Date	-			Drawing Number <b>SNC-T391830-HS2-P-SHT-CV-000010</b>	Revision	1
	Checked	-	Signed	-	Date	-					
	Approved	-	Signed	-	Date	-					
	Drawing Title										
	<b>LOCATIONS CONSIDERED</b>										
	Rev	Date	Description of Revisions			Drawn	Chkd	Appr			

Embankment Cross Section - Chainage 8000



Cutting Cross Section - Chainage 7000



**CONFIDENTIAL**

DISCLAIMER - This drawing is confidential and only for use of Sheffield City Region and its constituent partners. This drawing has been produced for the evaluation and discussion of potential route alternatives and impacts. It is indicative only and does not purport to represent a fully engineered route alternative or to confirm the impacts from such an alternative

Legend/Notes

1. All Dimension are in mm unless otherwise stated.
2. Existing levels and HS2 proposed levels are taken from drawing C321-MMD-RT-DPP-120-581402.
3. Assumed 10m working room at WP of retaining wall.
4. Assumed 22m HS2 corridor.

			
Designed		Signed	Date
Drawn		Signed	Date
Checked		Signed	Date
Approved		Signed	Date

<p>Project</p> <p><b>HS2 ROUTE VALIDATION</b></p>
<p>Drawing Title</p> <p><b>LOCATION 2-3 - ASTON WORST CASE CROSS SECTION</b></p>

Client	<b>SHEFFIELD CITY REGION</b>				
Scale(s)	1:250, 1:500		Sheet	1	
Drawing Number	SNC-T391830-HS2-P-SHT-CV-000011		Revision	1	
Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Client	<b>SHEFFIELD CITY REGION</b>				
Scale(s)	1:250, 1:500		Sheet	1	
Drawing Number	SNC-T391830-HS2-P-SHT-CV-000011		Revision	1	
Rev	Date	Description of Revisions	Drawn	Chkd	Appr

## Appendix C Basis of Cost Estimation

The model utilised by SNC-Lavalin Rail and Transit to cost the existing proposed HS2 alignments, and the alternative alignments proposed by SNC-Lavalin Rail and Transit is an existing model previously created and employed by SNC-Lavalin Rail and Transit to price HS2 alignments.

The model utilises high speed rail infrastructure unit rates taken from HS2 Cost and Risk Model Report: A Report to Government by HS2 Ltd, March 2012, Appendix A – the scope of the individual unit rates includes all components of construction, including but not limited to: labour used for construction, material and plant purchasing costs and transport costs. These unit rates are defined by year- they are then corrected using an inflation indices to account for general increases in price of all components of construction. These unit rates are then fed into an alignment sheet where their costs for an interval of chainage (100m) are calculated and summed for the entire alignment.

The Tender Price Index (TPI) has been adopted by HS2 in their documents; however, the definition of TPI states that it does not include contracts for civil engineering, mechanical engineering, electrical engineering, minor alteration projects or for repair and maintenance work. Nevertheless, the Tender Price Index has been adopted in the costing model to remain consistent with HS2 documents.

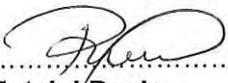
In addition, the model accounts for contractor, design and client costs as a percentage of base construction cost. These include contract preliminaries (8%), contractor site supervision (4%), design costs (7%) and client costs (5%). Furthermore, additional costs have been included such as surveys (£150/m), rail possession/isolation/safety management (2%) and train operation compensation (8%). Likewise, Risk and optimism bias for both phase 1a (23% and 34%) and phase 2 (21% and 33%) as a percentage of base construction have been included in the final estimation. The percentages provided are given by HS2 Cost and Risk Model Report: A Report to Government by HS2 Ltd, March 2012, Table 2, Page 12 for Contractor & Design, Section 2.5 for Other Costs & Section 2.8 for Risk/Optimism Bias.

Furthermore, significant assumptions have been made in calculating the final estimate for each route alignment. It is assumed that the width of the HS2 corridor is 22 meters, and that viaducts narrow to 12.4 meters in addition to being between 0 and 10 meters high. The quantity and cost of embankments and cuttings are reliant on a conservative estimate of 1:25 batter to ensure slope stability. This batter ratio is subject to change depending on soil conditions along the alignment. As a result, the quantities of embankments and cuttings will change together with their associated costs. Moreover, the unit rate for embankments and cuttings have been averaged across four different heights.

## Amendment Record

Issue	Description	Distribution	Date
1	First Issue	Sheffield City Region	17/02/2017
2	Second Issue	Sheffield City Region	22/02/2017
3	Third Issue	Sheffield City Region	02 /03/2017
4	Final Issue with issue 3 comments addressed	Sheffield City Region	10/03/2017
5	Issue 4 comments addressed	Sheffield City Region	13/03/2017
6	Issue 5 comments addressed	Sheffield City Region	23/03/2017
7	Issue 6 comments addressed	Sheffield City Region	27/03/2017
8	Final Issue	Sheffield City Region	27/03/2017
9	Final Issue	Sheffield City Region	29/03/2017

For more information please contact:

<b>Originator</b> :	 ..... <b>Date:</b> 29/03/2017 <b>Sebastian Gray</b> <b>Graduate Engineer</b> +44 02071053700 <a href="mailto:sebastian.gray@snclavalin.com">sebastian.gray@snclavalin.com</a>
<b>Checked By</b> :	 ..... <b>Date:</b> 29/03/2017 <b>Jon Hall</b> <b>Principal Consultant</b> +44 20 7105 3730 <a href="mailto:jon.hall@snclavalin.com">jon.hall@snclavalin.com</a>
<b>Approved By</b> :	 ..... <b>Date:</b> 29/03/2017 <b>Foteini Ragia</b> <b>Senior Consultant</b> +44 20 8681 4250 x56832 <a href="mailto:foteini.ragia@snclavalin.com">foteini.ragia@snclavalin.com</a>