
Project: One Bedford Avenue

Location: Northern Line

Survey Description: Gauge Measurement & Analysis

Sal Reference: SAL-1436-01 – Report 1

Report Date: 12th November 2014

REPORT BY SURVEY ASSOCIATES LTD



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Title: One Bedford Avenue Northern Line Gauge Measurement

Client: Bedford Avenue Trustees Ltd and Bedford Avenue Trustees Two Ltd as Trustees of One Bedford Avenue

Customer reference: SAL 1436-01 Report 01

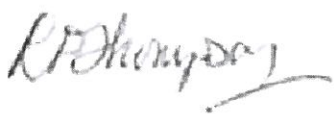
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Our reference: 1436-01 Report 1


File reference: SAL-1436-01_One Bedford Avenue_Gauging Survey_Report 01_R0

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8 Bell Lane
Uckfield
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Approved by:	Grant Little		12 th November 2014
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Date of Issue: 13th November 2014



Document History

Issue	Date	Description	Author
1	13 th November 2014	First Issue	RT

Distribution List

Copy No.	Name	Company
1	Richard Whitehead	Waterman Structures Limited
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3	Edward Thomson	GCA Second London Wall
	File	Survey Associates Ltd

Abbreviations and Acronyms

ARL	Above Rail Level
ELR	Engineers Line Reference
HSE	Health and Safety Executive
HMRI	Her Majesty's Rail Inspectorate
ORR	Office of the Rail Regulator
RGS	Railway Group Standards
RGGN	Railway Group Guidance Note
RSSB	Rail Safety and Standards Board
SAL	Survey Associates Ltd

Definitions

AutoCAD	2D and 3D Computer Aided Design Software
ClearRoute™	Software tool used to perform a full range of Railway Gauging calculations.
LaserSweep™	Laser based portable infrastructure measurement.
Passing Clearance	The calculated distance between swept envelopes of trains passing on adjacent tracks
Sixfoot	Interval spacing between two adjacent tracks.
Speed Restriction	Speed restriction required at a specific location or section of track.
Structure Clearance	The calculated clearance between lineside structure and vehicle swept envelope taking account of appropriate track tolerances and accuracy of survey measurement.
Swept Envelope	A Cross Sectional profile, taken at right angles to the track, enclosing all dynamic movement*, static deflections and overthrows of all points along the surface of the vehicle, that can be reasonable expected to occur under the appropriate range of operating conditions.

Executive Summary

The Client requested gauging analysis to be undertaken for One Bedford Avenue. This report relates to the clearance analysis of the LUL C3 Gauge at One Bedford Avenue on the Northern Line (the Project) as requested by Waterman Structures Limited on behalf of Bedford Avenue Trustees Ltd and Bedford Avenue Trustees Two Ltd as Trustees of One Bedford Avenue (the Client)

SAL attended site 23rd October 2014 and 24th October 2014 and surveyed the structure profiles (*.sc0) for gauging analysis.

Summary

The following conclusions are drawn based upon the investigations undertaken for the Project:

- The C1 Gauge and C3 Gauge both report Normal clearances at One Bedford Avenue at a total of 18 out of the 23 measured profiles,
- The substandard clearances are situated towards the high mileage end and where the track curvature becomes tighter. Four profiles report a clearance of less than 25mm at between 1000mm and 2250mm ARL or above 2250mm ARL,
- The tightest clearance occurs at Ring 758 (386.9m) with a clearance of 12.6mm to the C3 Gauge and 8.8mm to the C1 Gauge at below 500mm ARL. Clearances to the C1 and C3 Gauges should be considered when installing equipment in tunnels or when undertaking remedial works.
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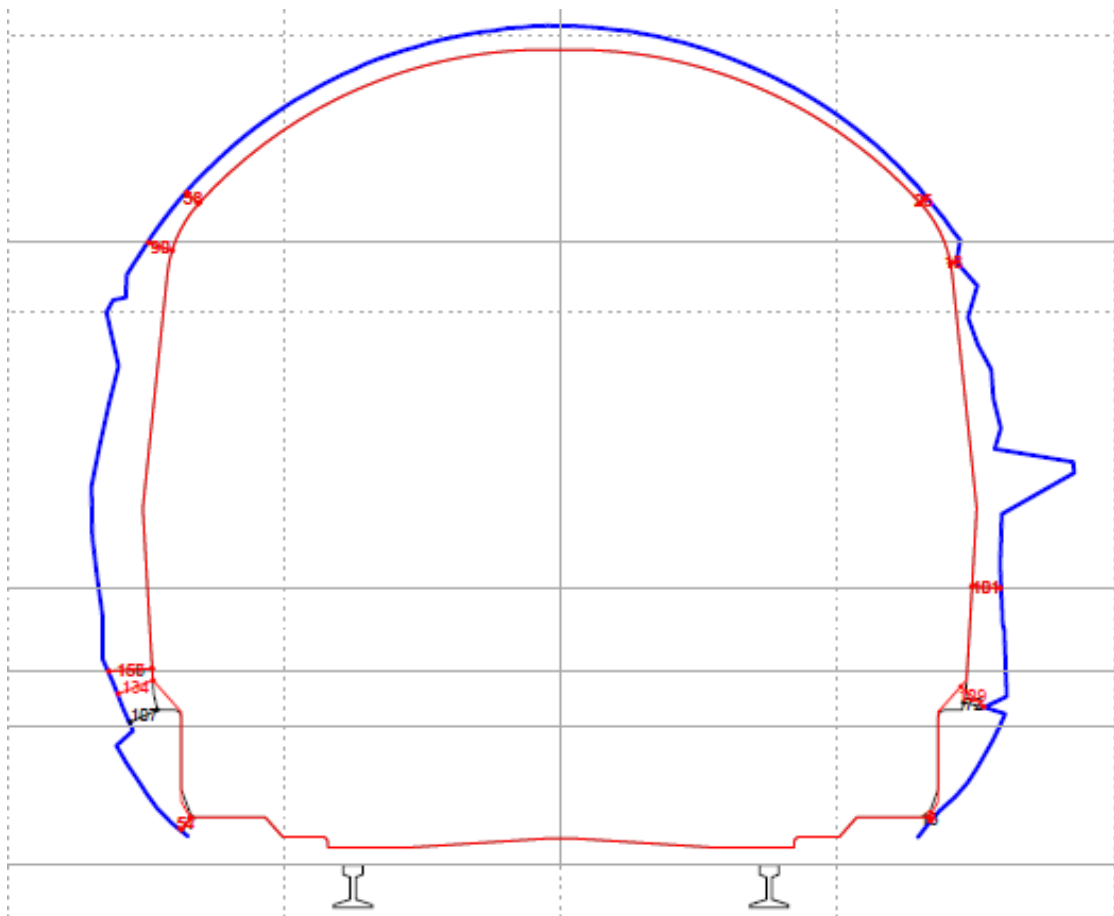


Figure 1 – Ring 758 @ 386.9m Tightest Clearance Location (C1 Red, C3 Black)

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1 Introduction

The Client requested a Gauging Survey & Analysis to be undertaken for the site on the Northern Line; namely at One Bedford Avenue. This report relates to the clearance analysis of the LUL C3 Gauge at One Bedford Avenue on the Northern Line (the Project) as requested by Bedford Avenue Trustees Ltd and Bedford Avenue Trustees Two Ltd as Trustees of One Bedford Avenue (the Client)[1].

2 Background

SAL attended site 23rd October 2014 and 24th October 2014 and surveyed the structure profiles (*.sc0) for gauging analysis.

Passing clearance and stepping distance analysis were not included in the scope.

3 Methodology

This section of the report describes the methodology that was followed in order to achieve the project deliverables.

3.1 Vehicles Models

LUL Standard S1156 indicated that Maintenance Diagram C3 applied at this location, hence the following ClearRoute™ models were analysed:

- LUL C1 Gauge (LV-LULC1_B-3) (for information purposes),
- LUL C3 Gauge (LV-LULC3_B-3)

3.2 Structure Clearance files

A total of 23 profiles were surveyed during site visits of 23rd October 2014 and 24th October 2014 for One Bedford Avenue.

SAL converted the LaserSweep profiles into ClearRoute compatible structure profiles (*.sc0) for the purpose of gauging analysis:

- Hand of curve was applied as 'direction of travel',
 - Track cant and curvature was applied based upon the Client-supplied drawings,
 - A 4mm tolerance was applied in accordance with the measuring system (LaserSweep),
 - No linespeed was applied as the ClearRoute models are static gauges,
 - 1435mm track gauge was applied.
-

3.3 Structure Clearance Analysis

Gauging analysis was undertaken in accordance with the specification detailed in Appendix A. The assessment identifies the structural clearance between the swept envelope of the C1 and the C3 Gauge models and the infrastructure profile data.

Clearances were categorised in accordance with LUL Standard S1156 Gauging and Clearances (February 2011) as per the figures presented below:

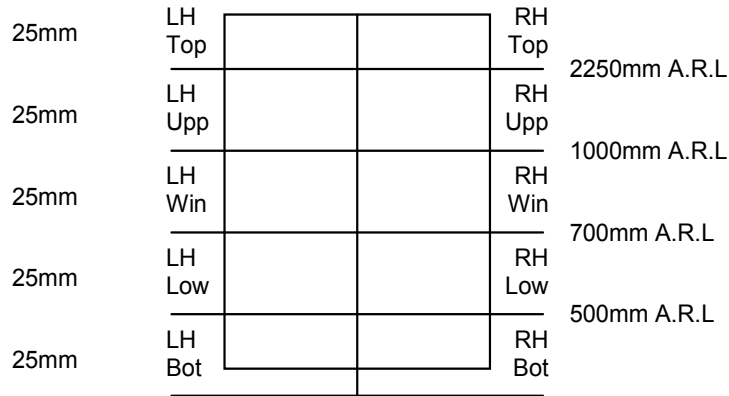


Figure 2 – Clearance Categories

4 Results

The results of the structure clearance analysis are presented below on a by-profile basis:

Filename	Structure Name	Cant	Radius	C1 Gauge	C3 Gauge
000000AK.SCO	One Bedford Ave: 1436 Ring 558 @284.3m	-2.1	-2,237	58.0	61.9
000005AK.SCO	One Bedford Ave: 1436 Ring 568 @289.4m	-3.3	-2,237	37.4	37.4
000010AK.SCO	One Bedford Ave: 1436 Ring 578 @294.5m	2.5	-7,438	42.1	42.1
000015AK.SCO	One Bedford Ave: 1436 Ring 588 @299.7m	-0.5	-5,908	57.6	57.6
000020AK.SCO	One Bedford Ave: 1436 Ring 598 @304.8m	2.7	-111,538	44.4	48.2
000026AK.SCO	One Bedford Ave: 1436 Ring 608 @309.8m	-6.9	-8,329	46.2	50.1
000031AK.SCO	One Bedford Ave: 1436 Ring 618 @315.0m	4.9	-19,441	65.7	69.4
000036AK.SCO	One Bedford Ave: 1436 Ring 628 @320.1m	1.3	-28,210	55.2	55.2
000041AK.SCO	One Bedford Ave: 1436 Ring 638 @325.3m	-1.7	-34,445	53.1	57.0
000046AK.SCO	One Bedford Ave: 1436 Ring 648 @330.4m	-2.4	-8,265	37.6	37.6
000051AK.SCO	One Bedford Ave: 1436 Ring 658 @335.6m	-3.5	-24,918	47.1	47.1
000056AK.SCO	One Bedford Ave: 1436 Ring 668 @340.7m	3.5	-5,698	41.7	41.7
000062AK.SCO	One Bedford Ave: 1436 Ring 678 @345.9m	2.4	-18,612	42.3	42.3
000067AK.SCO	One Bedford Ave: 1436 Ring 688 @351.0m	-4.0	-17,787	37.9	41.8
000072AK.SCO	One Bedford Ave: 1436 Ring 698 @356.1m	-2.7	-5,393	18.0	21.9
000077AK.SCO	One Bedford Ave: 1436 Ring 708 @361.2m	-1.9	-3,280	29.0	32.9
000082AK.SCO	One Bedford Ave: 1436 Ring 718 @366.3m	-4.8	-1,873	40.1	40.1
000087AK.SCO	One Bedford Ave: 1436 Ring 728 @371.5m	-23.9	-889	42.3	42.3
000092AK.SCO	One Bedford Ave: 1436 Ring 738 @376.6m	-41.2	-563	15.1	15.1
000098AK.SCO	One Bedford Ave: 1436 Ring 748 @381.7m	-54.7	-439	14.5	14.5
000103AK.SCO	One Bedford Ave: 1436 Ring 758 @386.9m	-61.2	-394	8.8	12.6
000108AK.SCO	One Bedford Ave: 1436 Ring 768 @392.1m	-58.9	-379	35.9	35.9
000113AK.SCO	One Bedford Ave: 1436 Ring 778 @397.2m	-59.7	-379	15.5	15.5

Table 1: Structure Clearance Classification Summary

A set of clearance plots for the C1 and C3 Gauge are provided in Appendix B.

A clearance compendium is provided in Excel format in Appendix C.

5 Conclusions

- The following conclusions are drawn based upon the investigations undertaken for the Project:
- The C1 Gauge and C3 Gauge both report Normal clearances at One Bedford Avenue at a total of 18 out of the 23 measured profiles,
- The substandard clearances are situated towards the high mileage end and where the track curvature becomes tighter. Four profiles report a clearance of less than 25mm at between 1000mm and 2250mm ARL or above 2250mm ARL,
- The tightest clearance occurs at Ring 758 (386.9m) with a clearance of 12.6mm to the C3 Gauge and 8.8mm to the C1 Gauge at below 500mm ARL. Clearances to the C1 and C3 Gauges should be considered when installing equipment in tunnels or when undertaking remedial works.

6 References

- [1] SAL Quotation Reference Q3447-14/0
- [2] Current Railway Group Standards, <http://www.rgsonline.co.uk/>

Appendix A

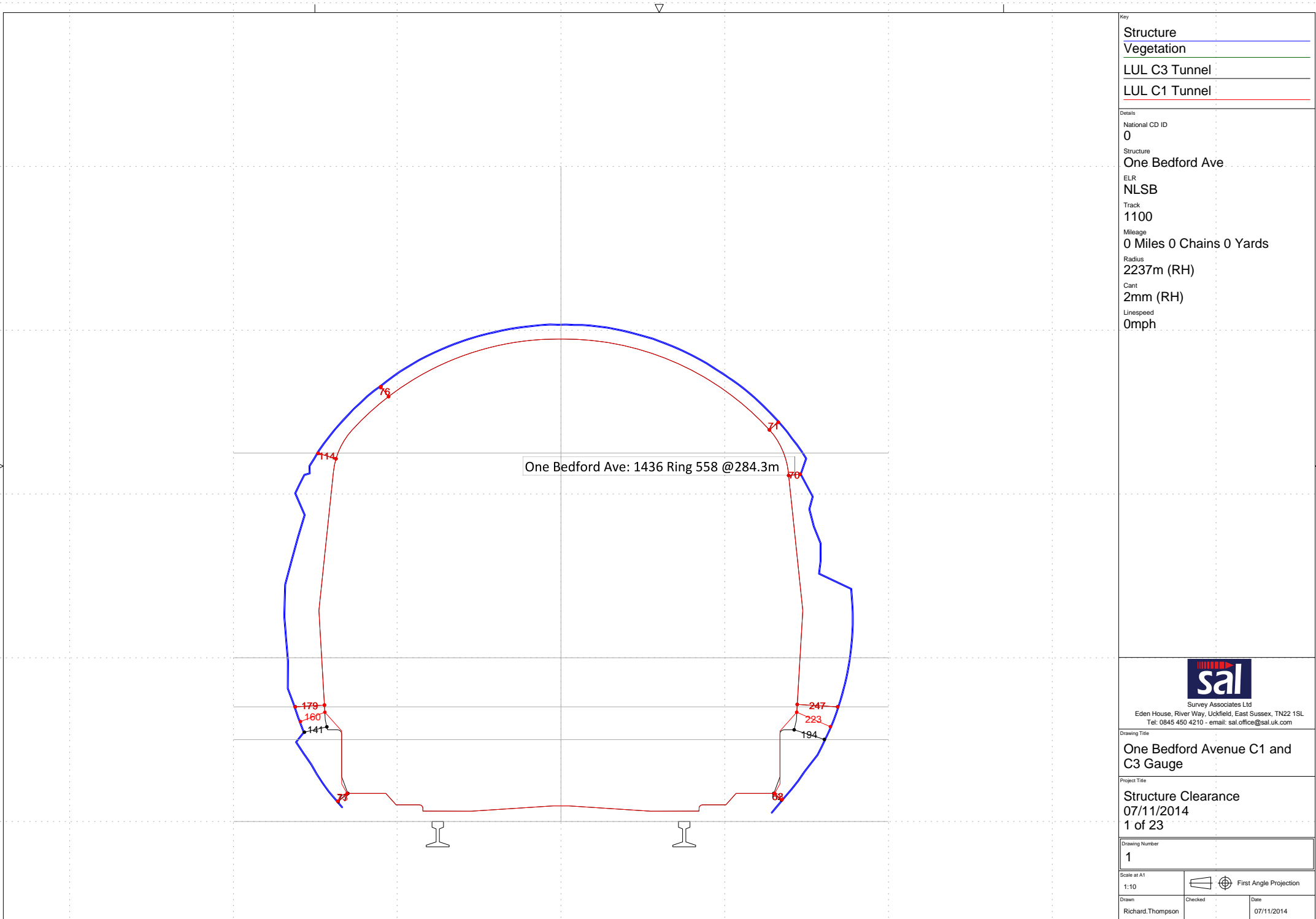
Clearance Specification

Appendix A – Clearance Specification

Software	HyperRoute Version 2.60.587.0																														
Infrastructure Data	Based on Client-supplied LaserSweep profiles.																														
Vehicle Models	C1 Gauge B (BBRT Optimised) (LV-LULC1_B-3), C3 Gauge B (BBRT Optimised) (LV-LULC3_B-3)																														
Suspension Conditions	N/A – Static Model																														
Speed	N/A																														
Transition Length	10m																														
Cant Deficiency Peg	N/A																														
Track Tolerances <small>Error! Reference source not found.</small>	Assumed High Fixity: <ul style="list-style-type: none"> • 0mm Track Alignment, • 0mm Cross Level Error, • 0mm Track Lift, • 0mm Track Lower. 																														
Vehicle Tolerances	N/A																														
Measurement Accuracy	Applied in accordance with Measuring System as per Network Rail standard NR/L2/TRK/3202. Accuracy of LaserSweep is +/-14mm																														
Frequency of Monitoring	N/A																														
Structure Clearance Criteria <small>Error! Reference source not found.</small>	<table border="1"> <tr> <td>25mm</td> <td>LH Top</td> <td></td> <td></td> <td>RH Top</td> <td>2250mm A.R.L</td> </tr> <tr> <td>25mm</td> <td>LH Upp</td> <td></td> <td></td> <td>RH Upp</td> <td>1000mm A.R.L</td> </tr> <tr> <td>25mm</td> <td>LH Win</td> <td></td> <td></td> <td>RH Win</td> <td>700mm A.R.L</td> </tr> <tr> <td>25mm</td> <td>LH Low</td> <td></td> <td></td> <td>RH Low</td> <td>500mm A.R.L</td> </tr> <tr> <td>25mm</td> <td>LH Bot</td> <td></td> <td></td> <td>RH Bot</td> <td></td> </tr> </table>	25mm	LH Top			RH Top	2250mm A.R.L	25mm	LH Upp			RH Upp	1000mm A.R.L	25mm	LH Win			RH Win	700mm A.R.L	25mm	LH Low			RH Low	500mm A.R.L	25mm	LH Bot			RH Bot	
25mm	LH Top			RH Top	2250mm A.R.L																										
25mm	LH Upp			RH Upp	1000mm A.R.L																										
25mm	LH Win			RH Win	700mm A.R.L																										
25mm	LH Low			RH Low	500mm A.R.L																										
25mm	LH Bot			RH Bot																											

Appendix B

Clearance Plots



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 0 Chains 0 Yards
Radius	2237m (RH)
Cant	2mm (RH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 558 @284.3m



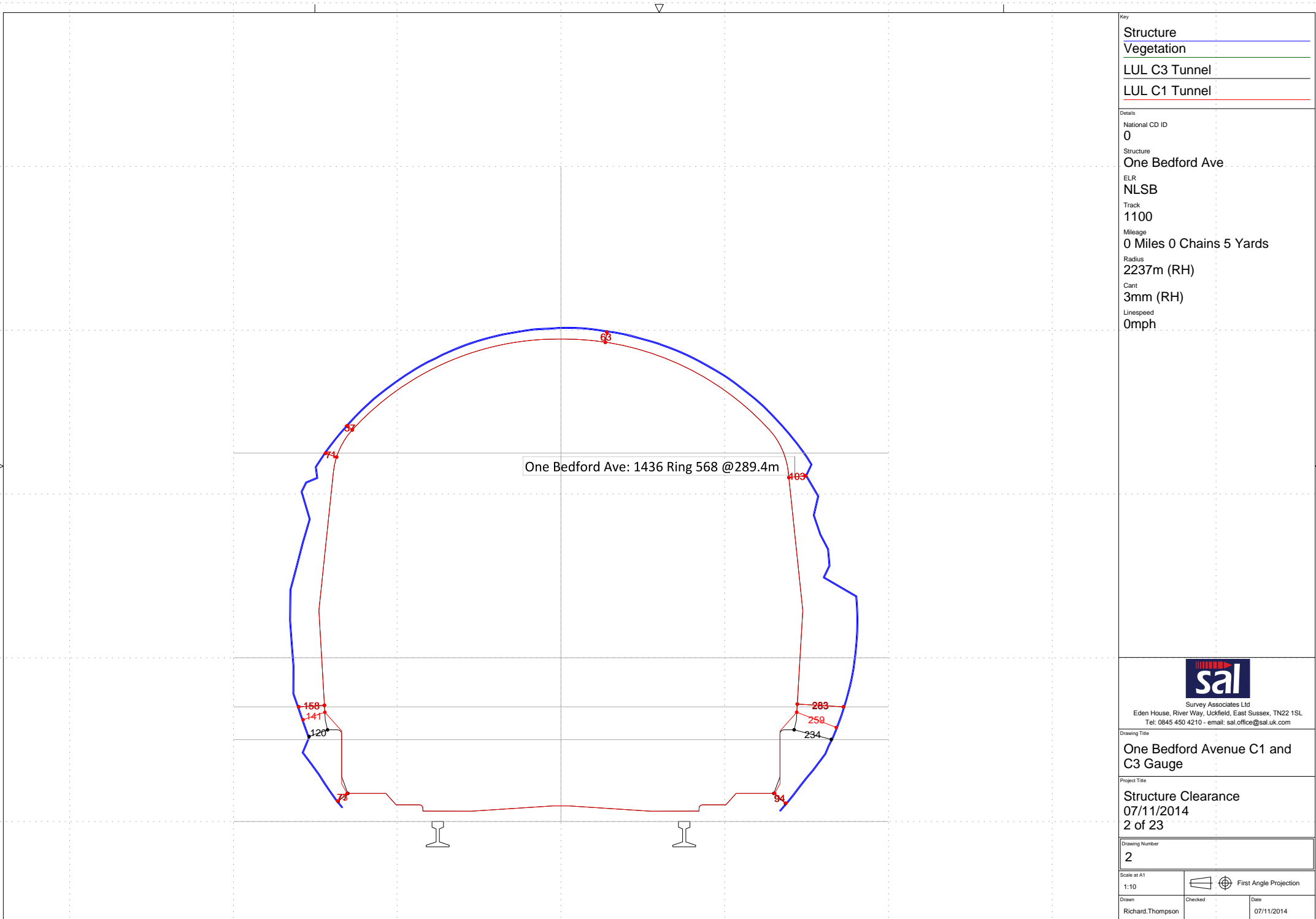
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Tel: 0845 450 4210 - email: sal.office@sal.uk.com

Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
1 of 23

Drawing Number
1

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel


Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 0 Chains 5 Yards
Radius	2237m (RH)
Cant	3mm (RH)
Linespeed	0mph

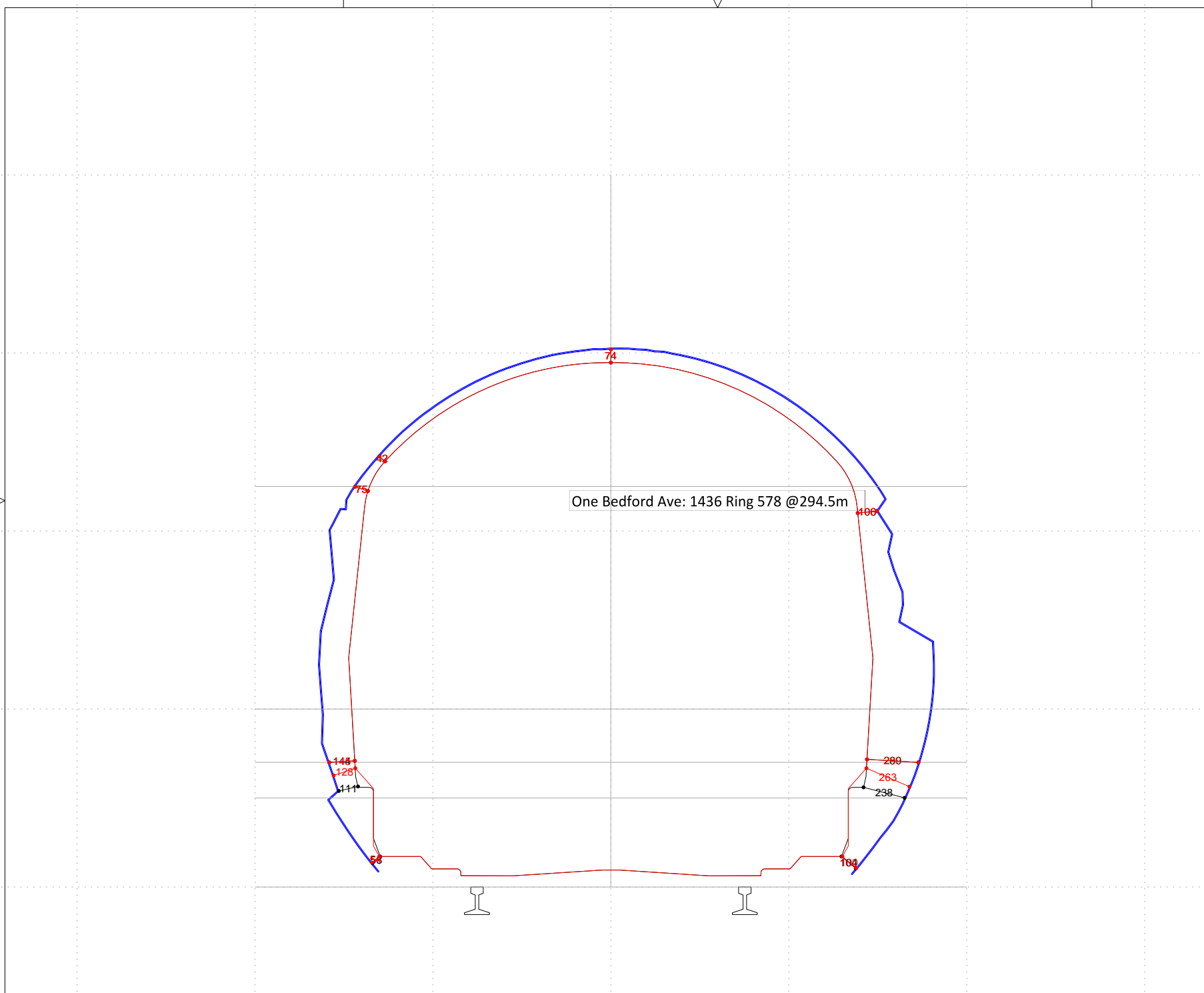

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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 2 of 23

Drawing Number
2

Scale at A1 1:10	 First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details
 National CD ID
 0
 Structure
 One Bedford Ave
 ELR
 NLSB
 Track
 1100
 Mileage
 0 Miles 0 Chains 11 Yards
 Radius
 7438m (RH)
 Cant
 3mm (LH)
 Linespeed
 0mph

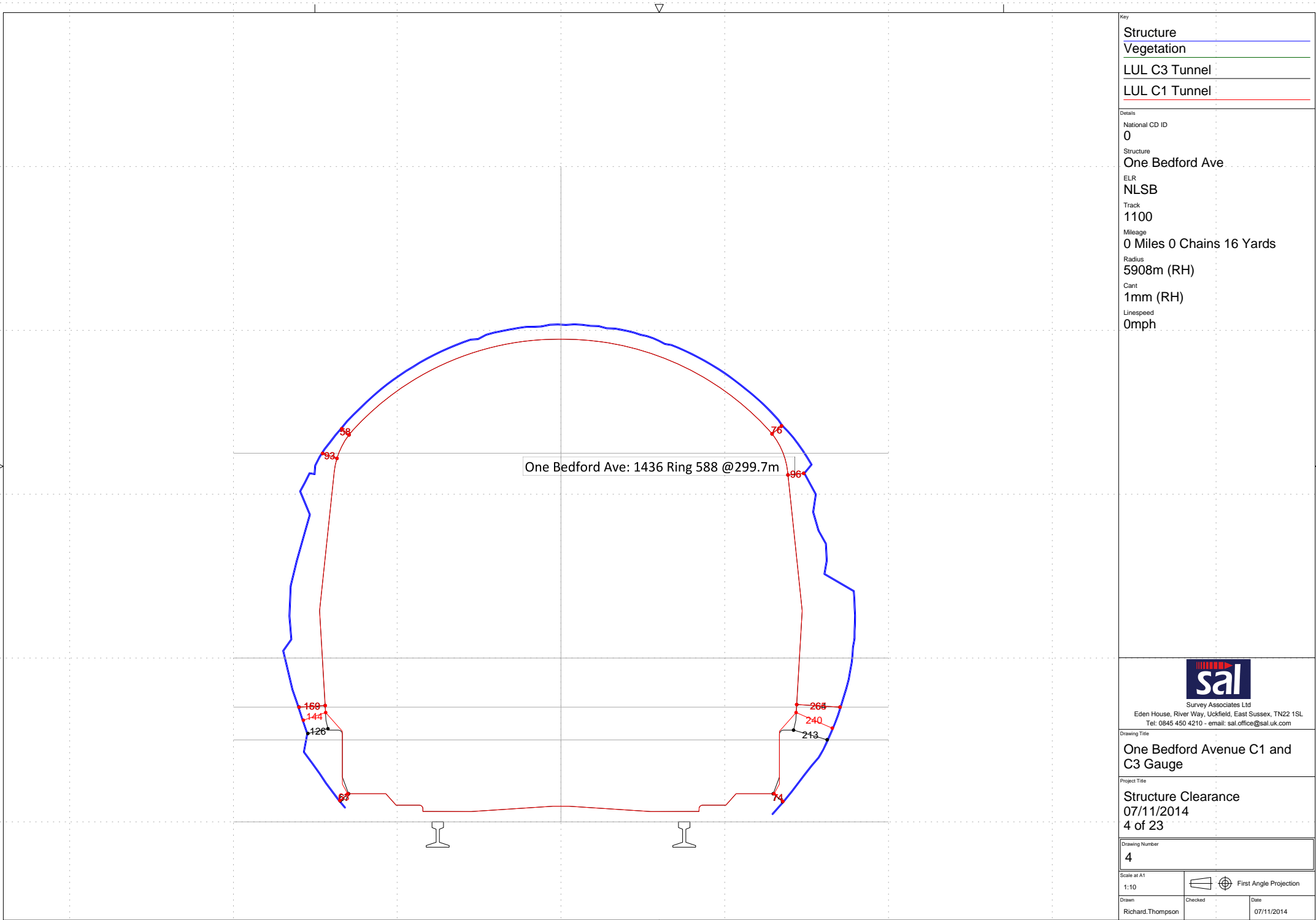


Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 3 of 23

Drawing Number
3

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 0 Chains 16 Yards
Radius	5908m (RH)
Cant	1mm (RH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 588 @299.7m



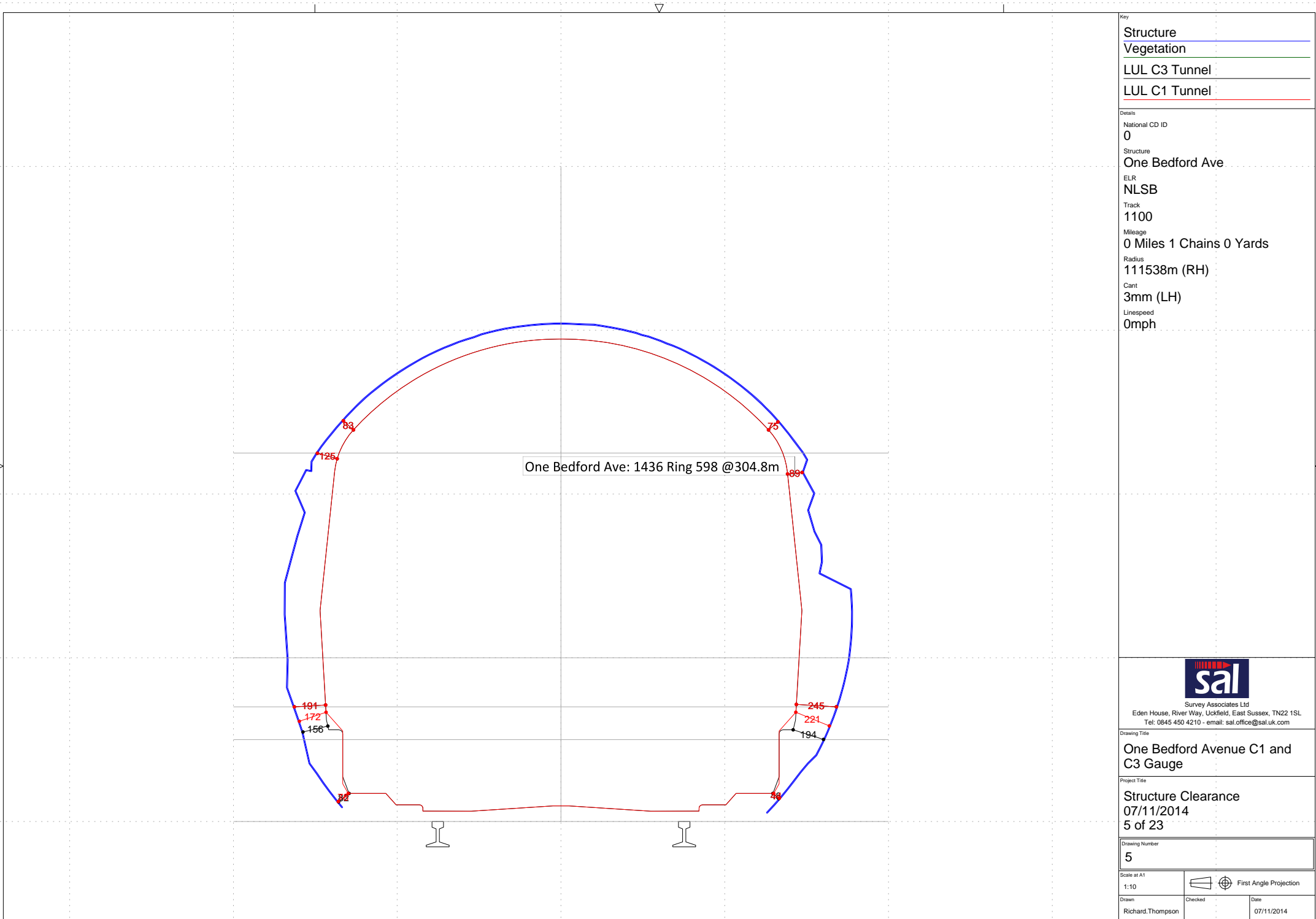
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
4 of 23

Drawing Number
4

Scale at A1	1:10	First Angle Projection
Drawn	Richard.Thompson	Date
Checked		07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel


Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 1 Chains 0 Yards
Radius	111538m (RH)
Cant	3mm (LH)
Linespeed	0mph

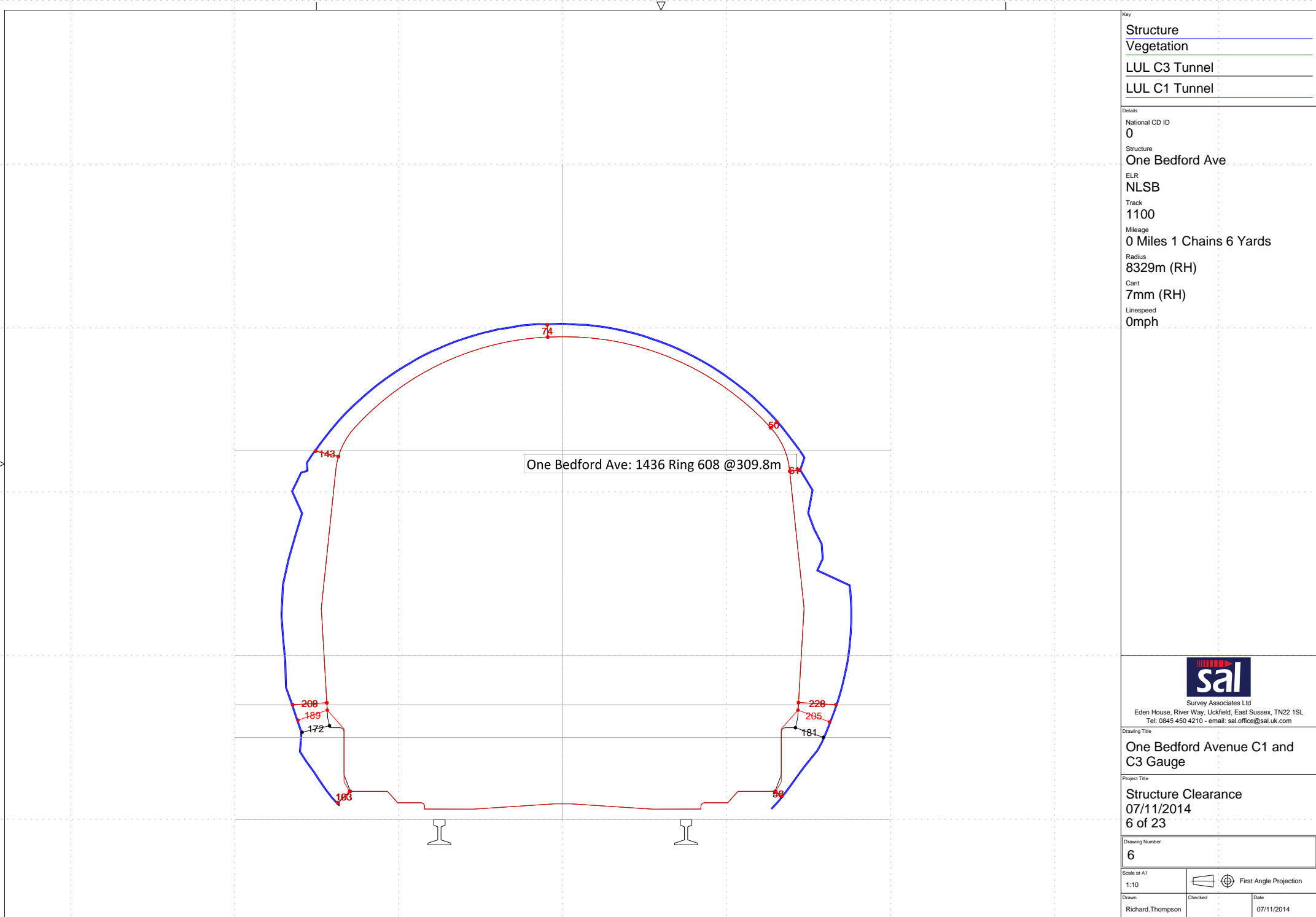

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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 5 of 23

Drawing Number
5

Scale at A1 1:10	 First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel


Details
 National CD ID
 0
 Structure
 One Bedford Ave
 ELR
 NLSB
 Track
 1100
 Mileage
 0 Miles 1 Chains 6 Yards
 Radius
 8329m (RH)
 Cant
 7mm (RH)
 Linespeed
 0mph

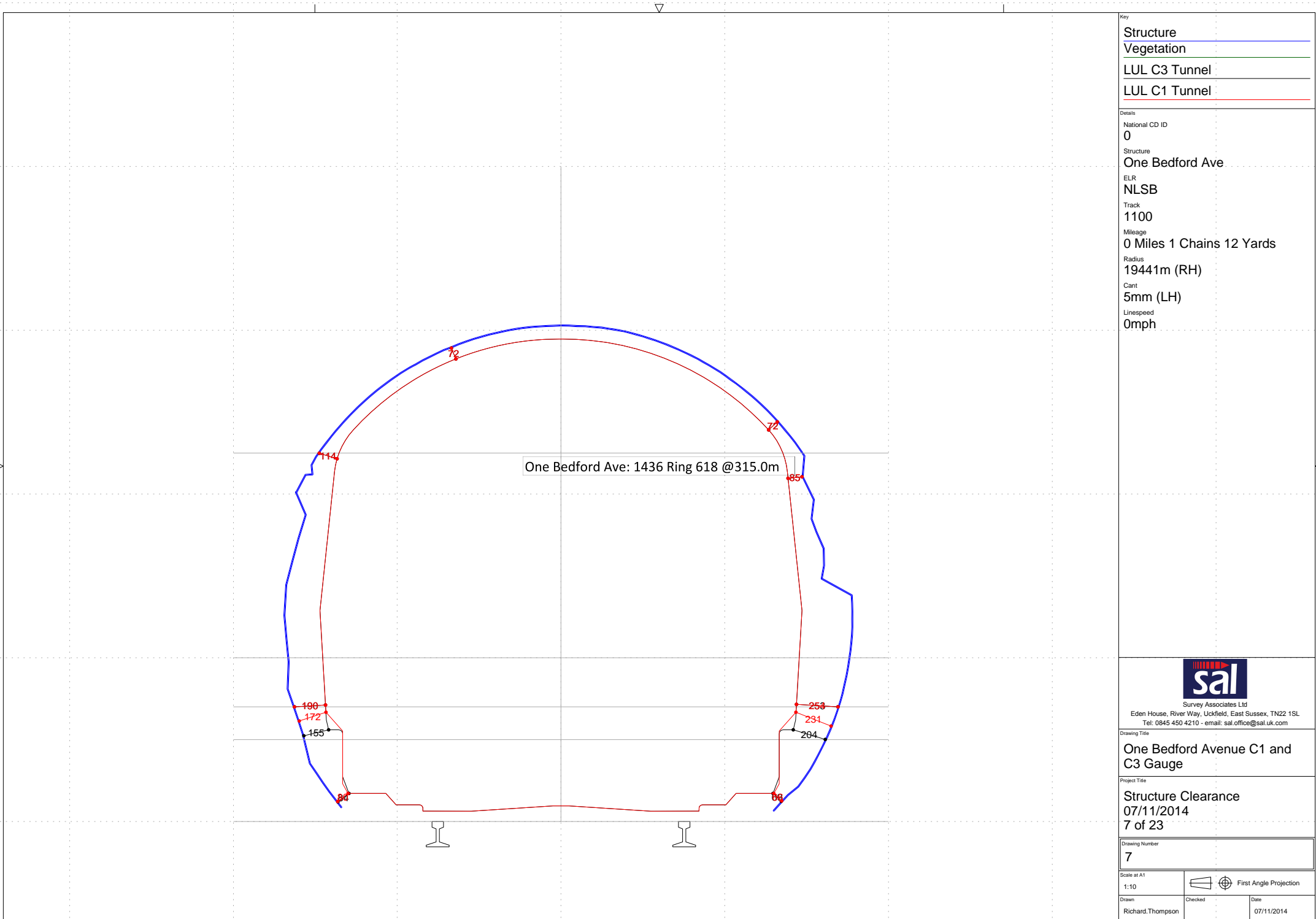

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One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 6 of 23

Drawing Number
6

Scale at A1 1:10	 First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel


Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 1 Chains 12 Yards
Radius	19441m (RH)
Cant	5mm (LH)
Linespeed	0mph

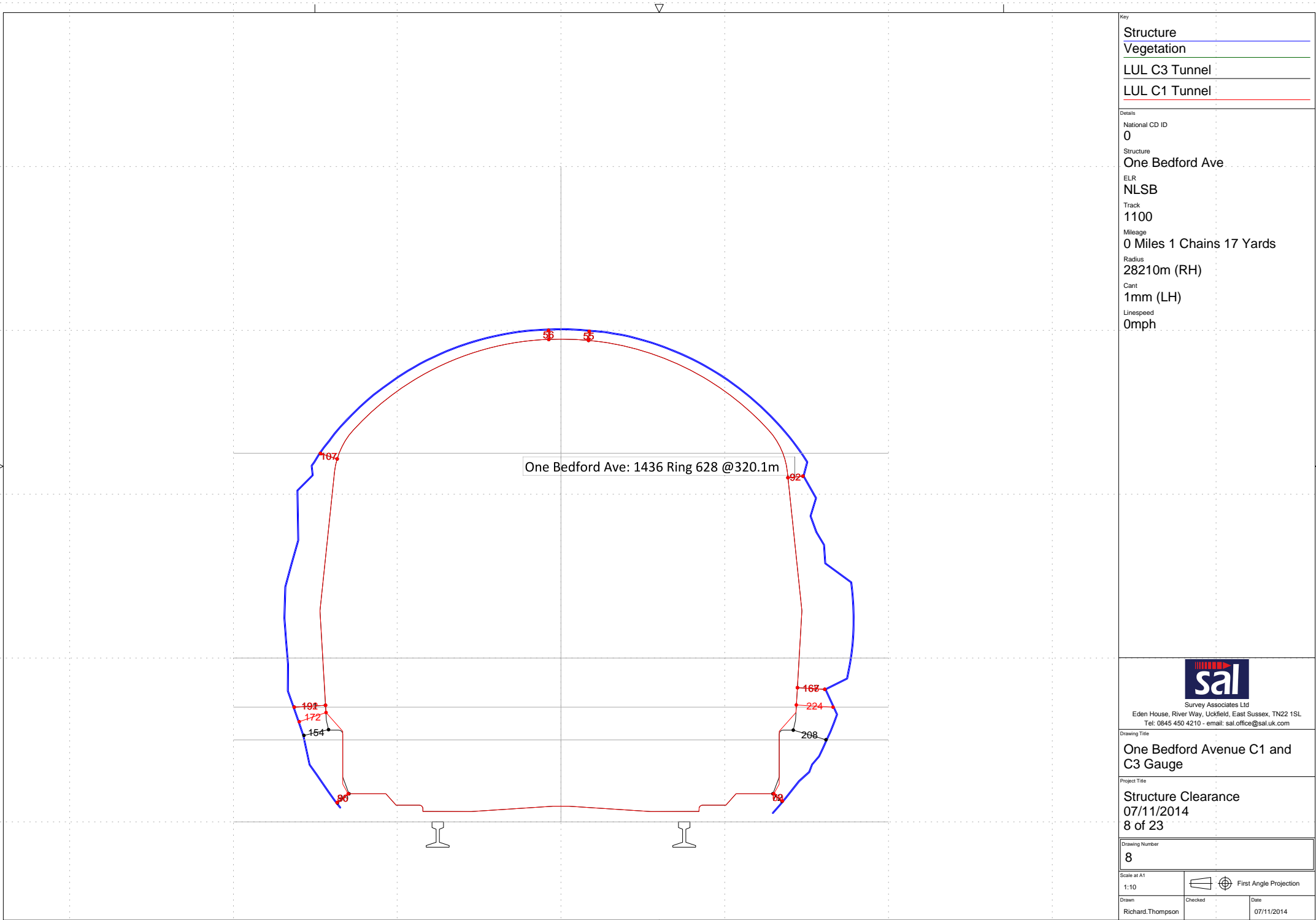

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Project Title
Structure Clearance
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 7 of 23

Drawing Number
7

Scale at A1 1:10	 First Angle Projection
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Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details
National CD ID
0
Structure
One Bedford Ave
ELR
NLSB
Track
1100
Mileage
0 Miles 1 Chains 17 Yards
Radius
28210m (RH)
Cant
1mm (LH)
Linespeed
0mph

One Bedford Ave: 1436 Ring 628 @320.1m



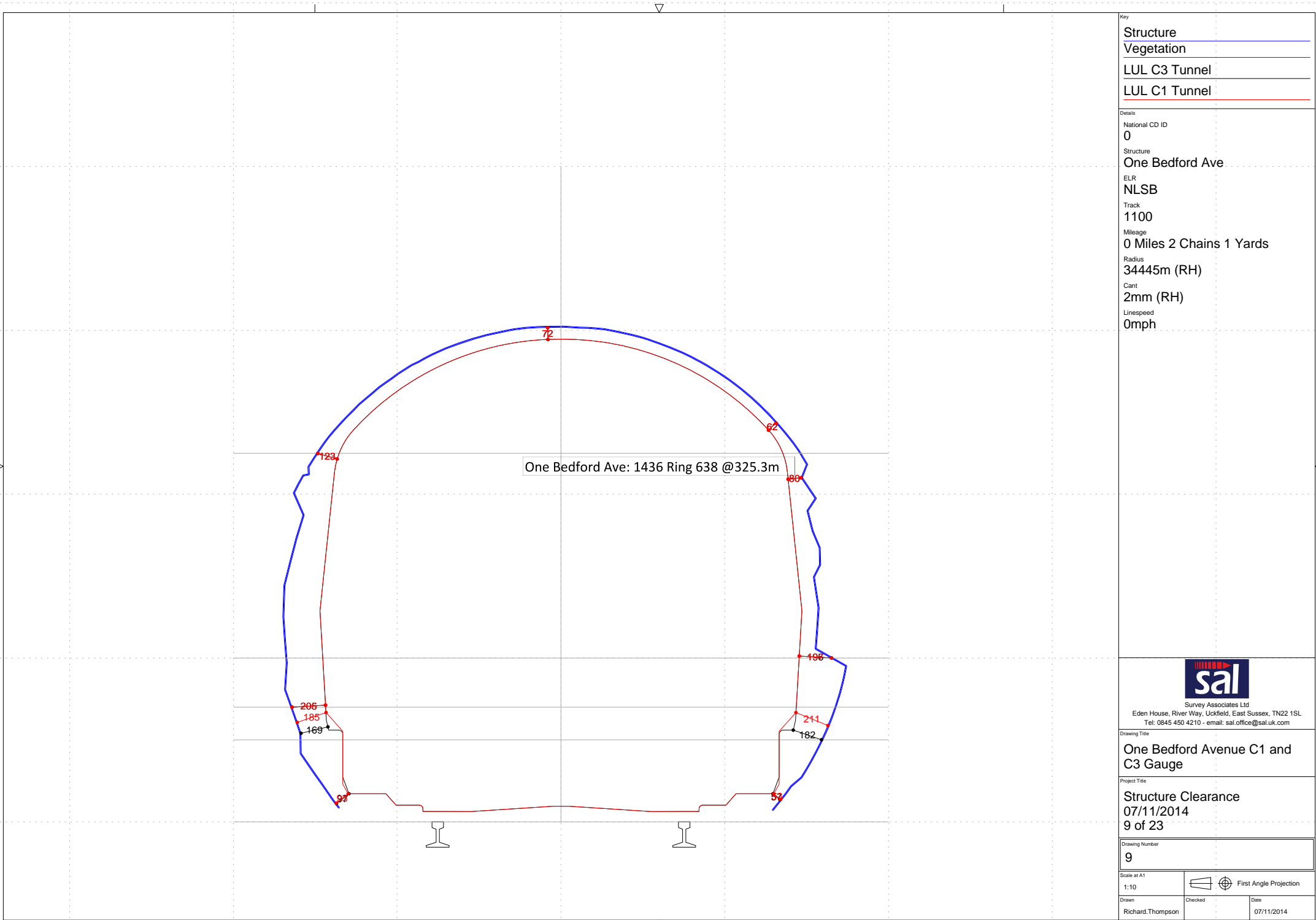
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Project Title
Structure Clearance
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 8 of 23

Drawing Number
8

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel


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National CD ID
0
Structure
One Bedford Ave
ELR
NLSB
Track
1100
Mileage
0 Miles 2 Chains 1 Yards
Radius
34445m (RH)
Cant
2mm (RH)
Linespeed
0mph

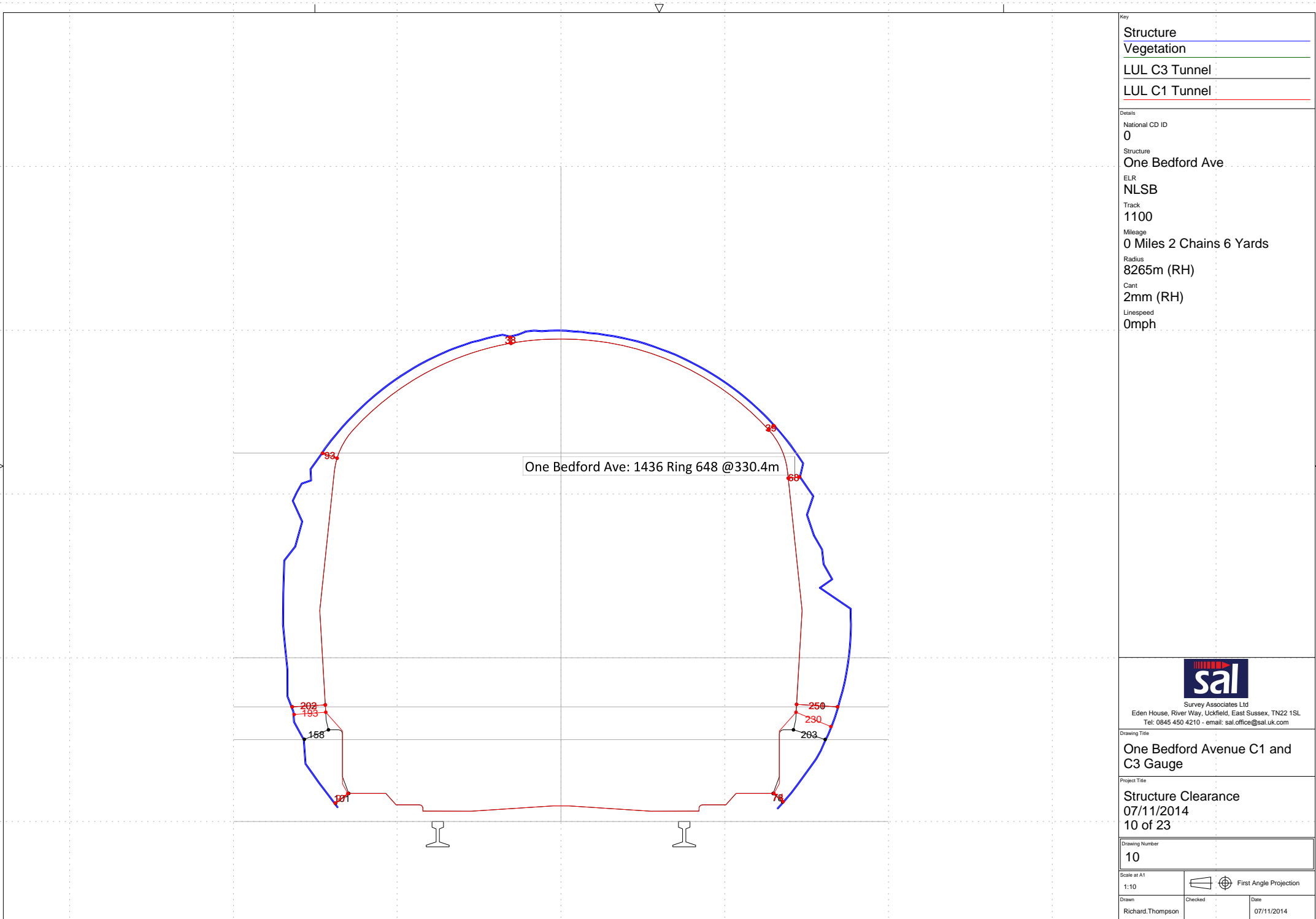

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One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 9 of 23

Drawing Number
9

Scale at A1 1:10	 First Angle Projection
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Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details

National CD ID
0

Structure
One Bedford Ave

ELR
NLSB

Track
1100

Mileage
0 Miles 2 Chains 6 Yards

Radius
8265m (RH)

Cant
2mm (RH)

Linespeed
0mph

One Bedford Ave: 1436 Ring 648 @330.4m



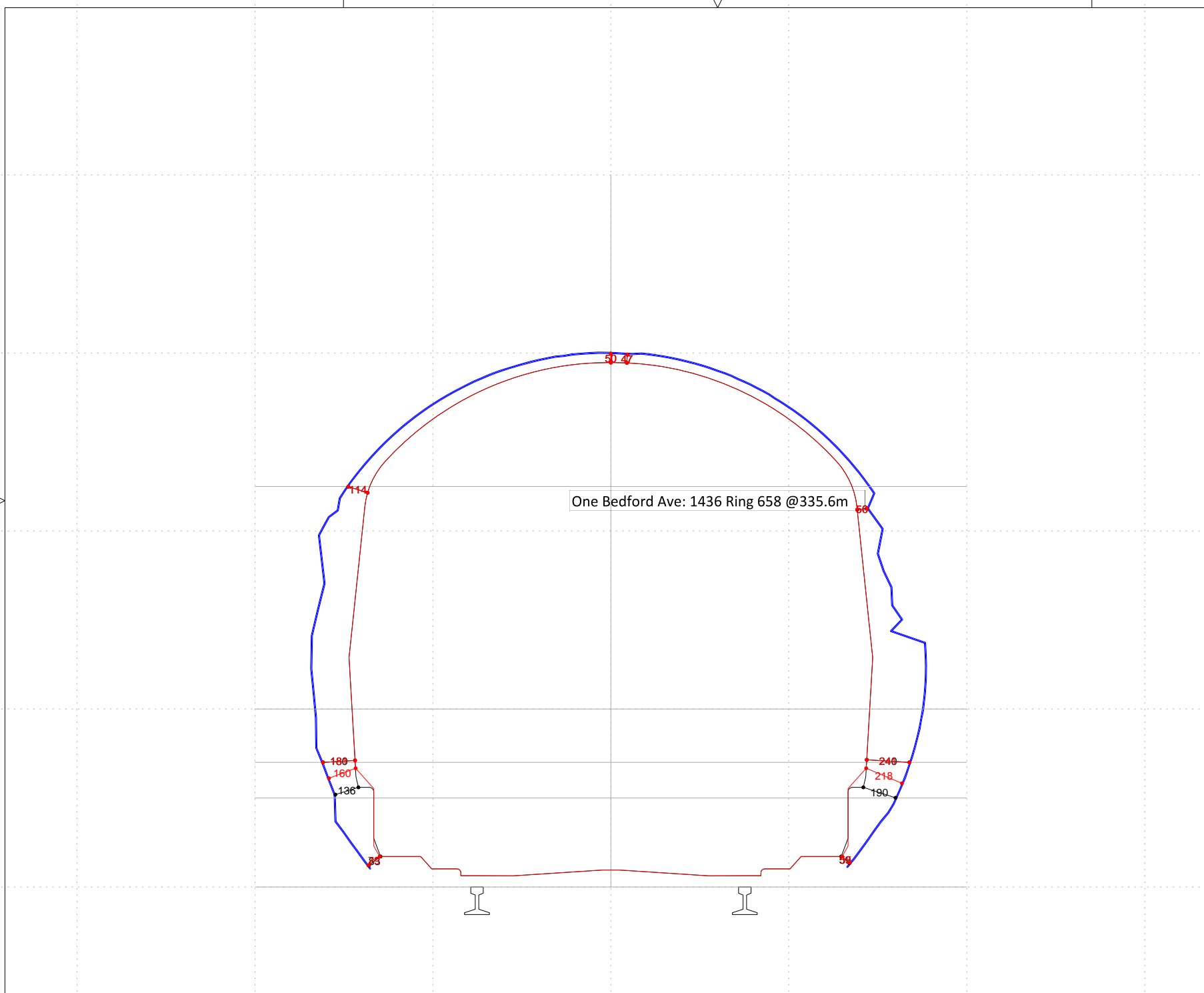
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Project Title
**Structure Clearance
07/11/2014
10 of 23**

Drawing Number
10

Scale at A1 1:10	First Angle Projection
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One Bedford Ave: 1436 Ring 658 @335.6m

Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 2 Chains 12 Yards
Radius	24918m (RH)
Cant	3mm (RH)
Linespeed	0mph



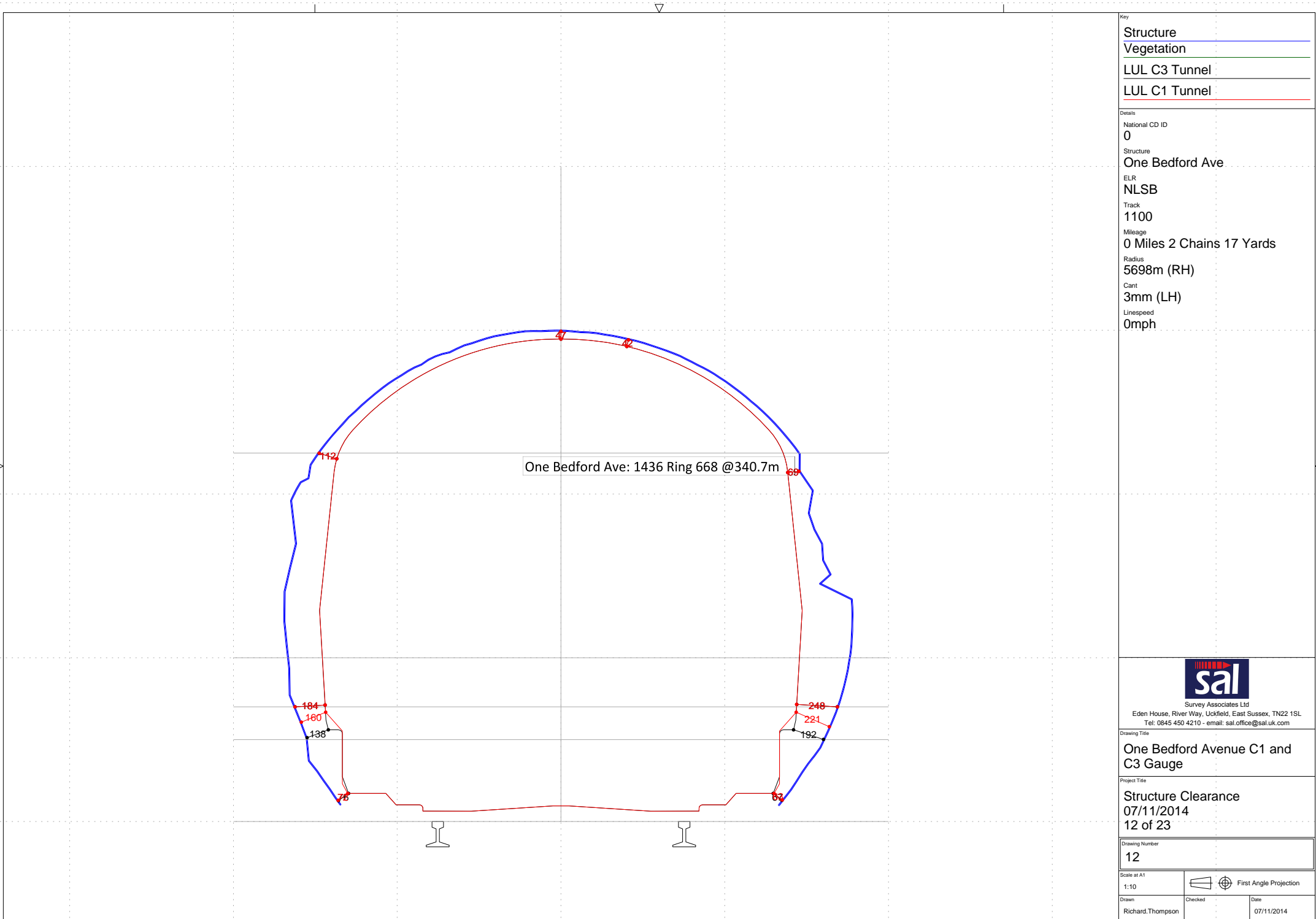
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
11 of 23

Drawing Number
11

Scale at A1	1:10	First Angle Projection
Drawn	Richard.Thompson	



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

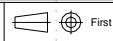
Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 2 Chains 17 Yards
Radius	5698m (RH)
Cant	3mm (LH)
Linespeed	0mph

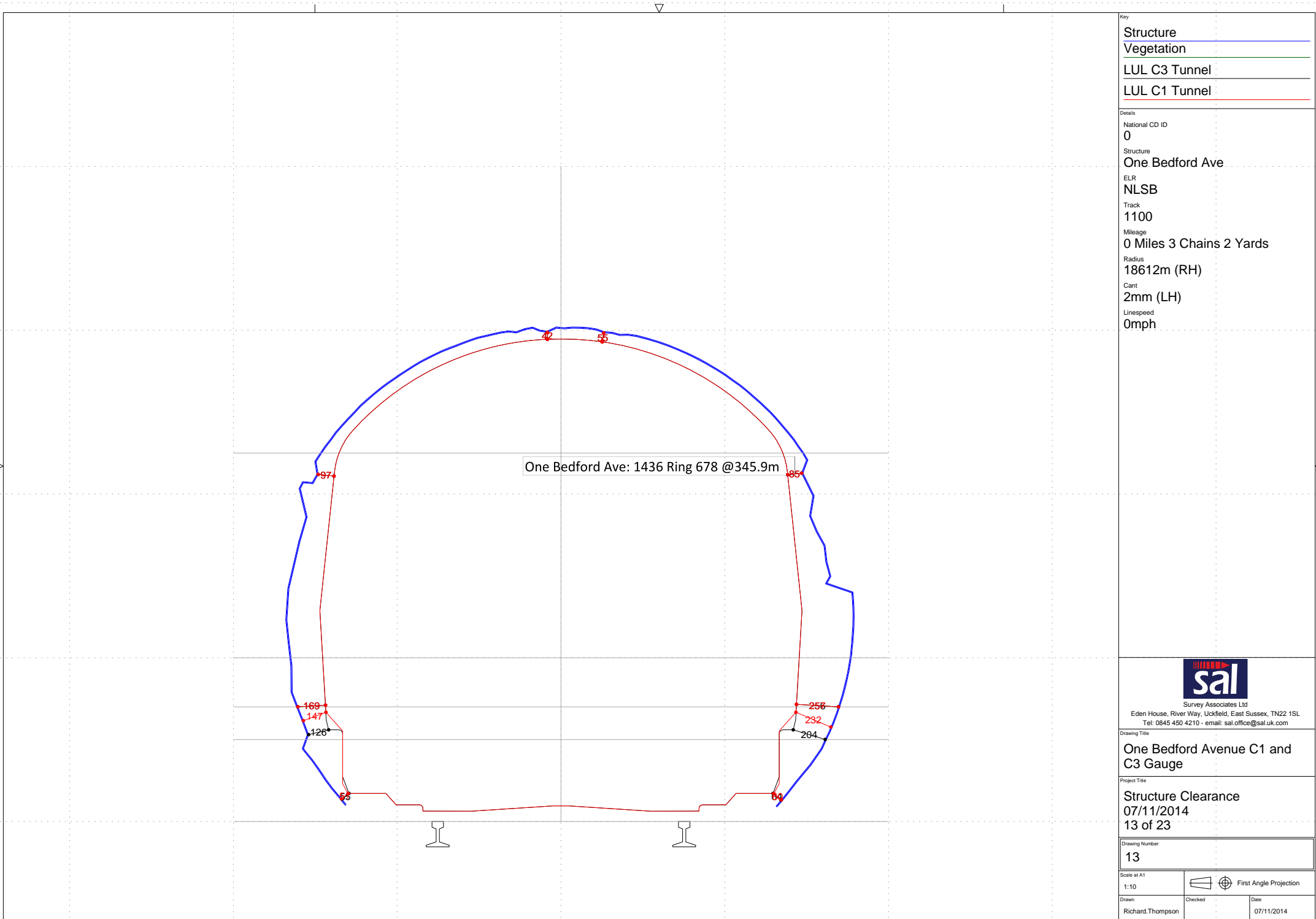

 Survey Associates Ltd
 Eden House, River Way, Uckfield, East Sussex, TN22 1SL
 Tel: 0845 450 4210 - email: sal.office@sal.uk.com

Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
 07/11/2014
 12 of 23

Drawing Number
12

Scale at A1 1:10	 First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 3 Chains 2 Yards
Radius	18612m (RH)
Cant	2mm (LH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 678 @345.9m



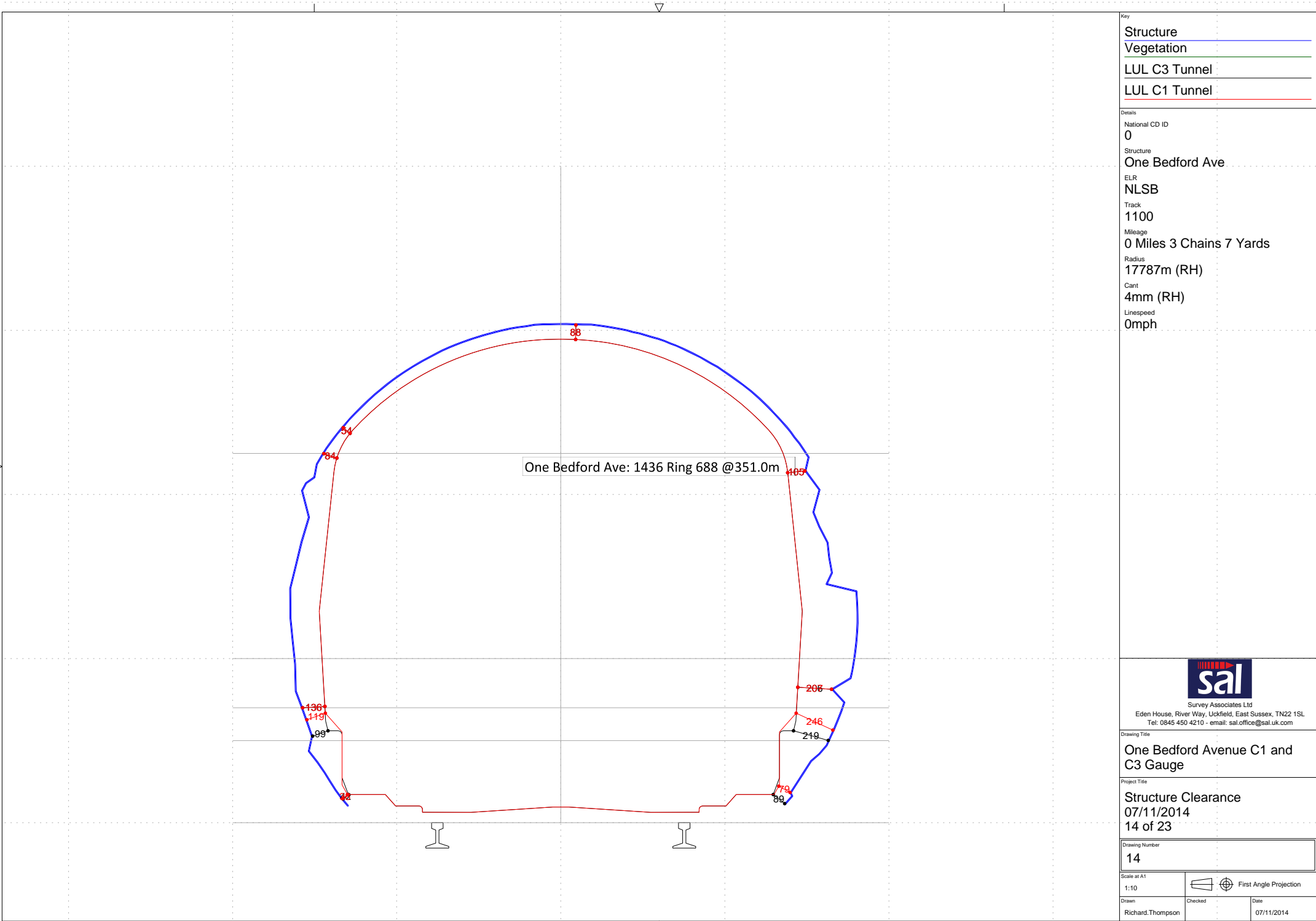
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
13 of 23

Drawing Number
13

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 3 Chains 7 Yards
Radius	17787m (RH)
Cant	4mm (RH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 688 @351.0m



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Drawing Title
One Bedford Avenue C1 and C3 Gauge

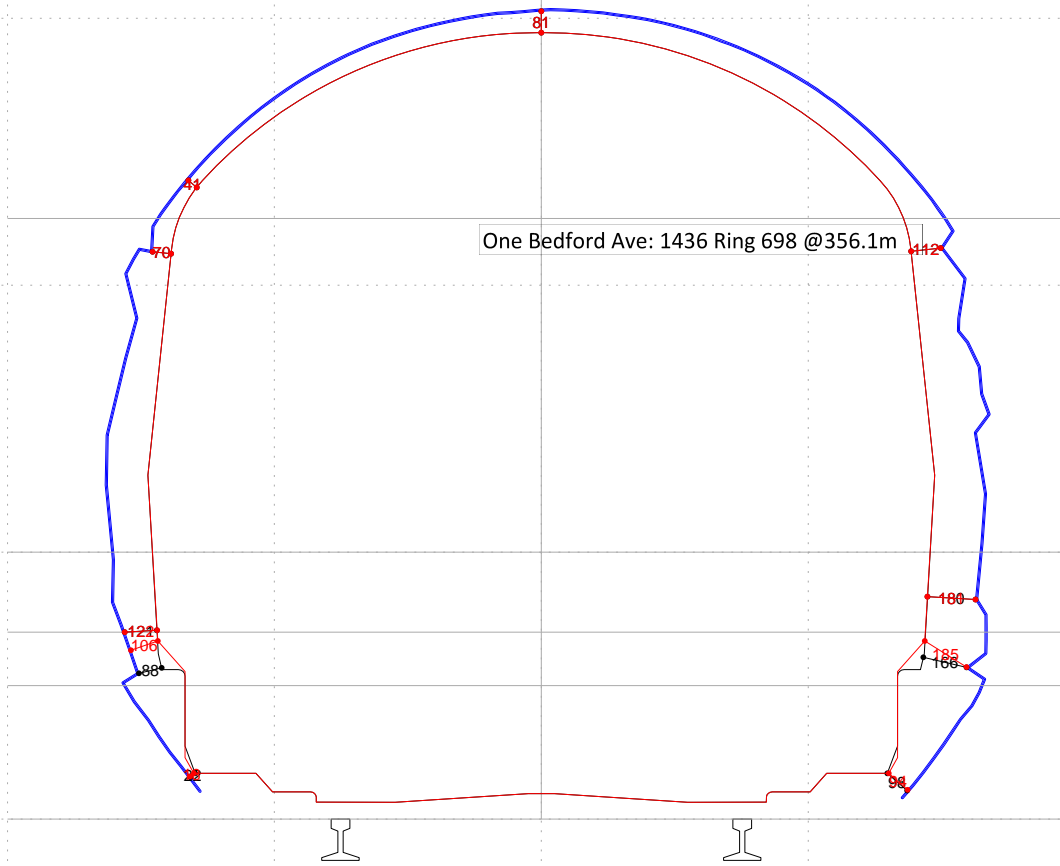
Project Title
Structure Clearance
 07/11/2014
 14 of 23

Drawing Number
14

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014

Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details
National CD ID
0
Structure
One Bedford Ave
ELR
NLSB
Track
1100
Mileage
0 Miles 3 Chains 13 Yards
Radius
5393m (RH)
Cant
3mm (RH)
Linespeed
0mph



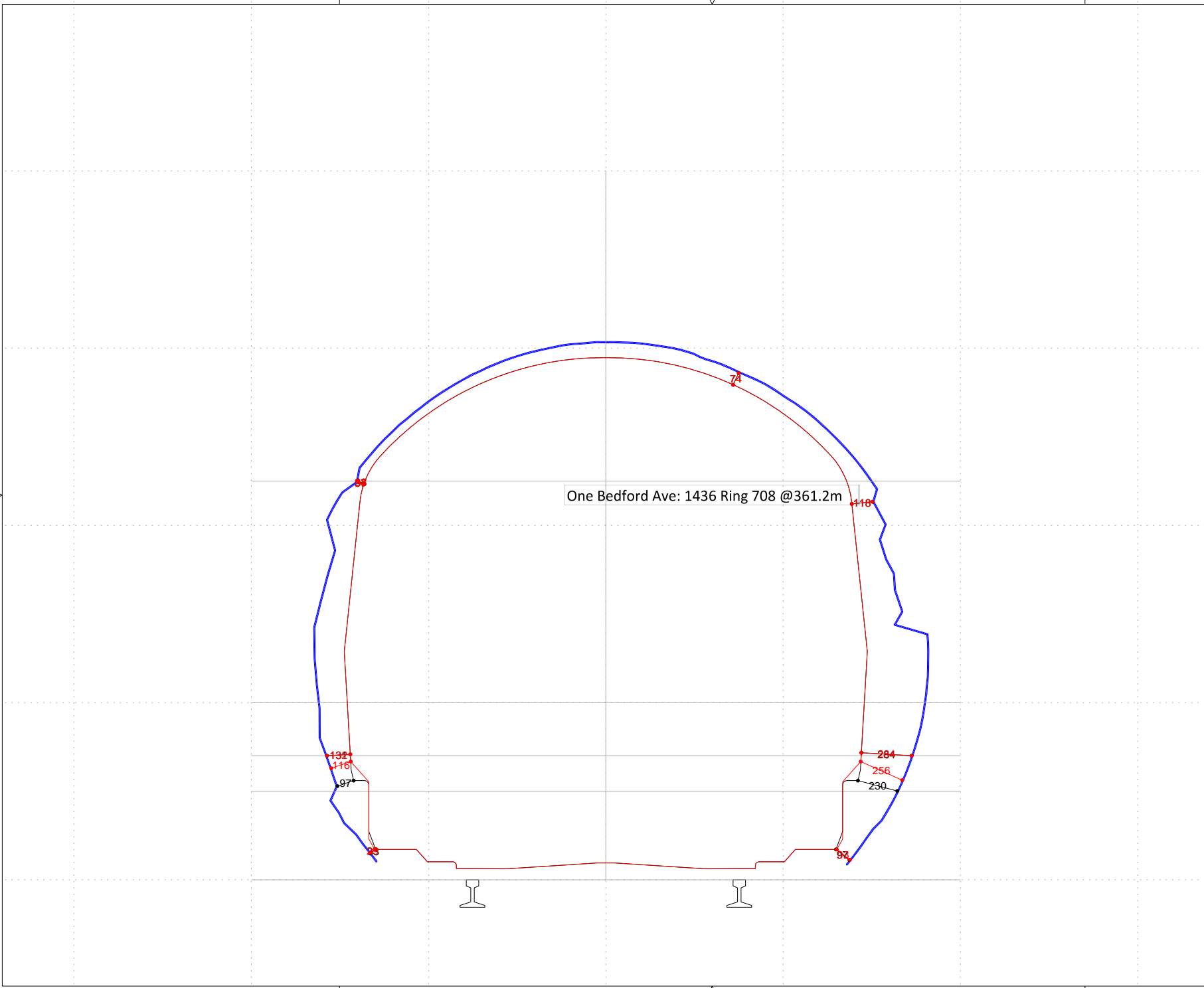
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
15 of 23

Drawing Number
15

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details

National CD ID
0

Structure
One Bedford Ave

ELR
NLSB

Track
1100

Mileage
0 Miles 3 Chains 18 Yards

Radius
3280m (RH)

Cant
2mm (RH)

Linespeed
0mph

One Bedford Ave: 1436 Ring 708 @361.2m



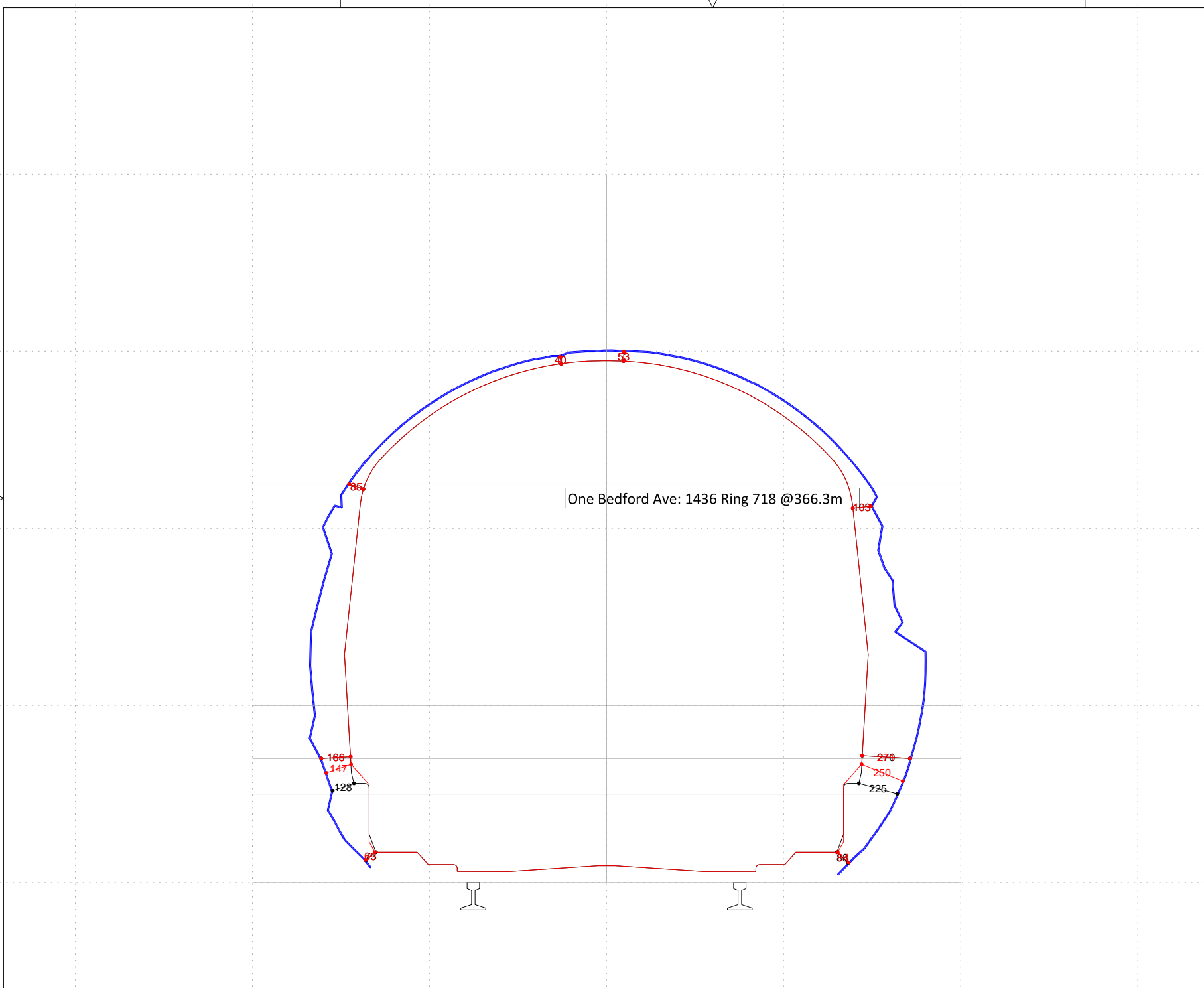
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
16 of 23

Drawing Number
16

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details

National CD ID
0

Structure
One Bedford Ave

ELR
NLSB

Track
1100


Mileage
0 Miles 4 Chains 2 Yards

Radius
1873m (RH)

Cant
5mm (RH)

Linespeed
0mph

One Bedford Ave: 1436 Ring 718 @366.3m




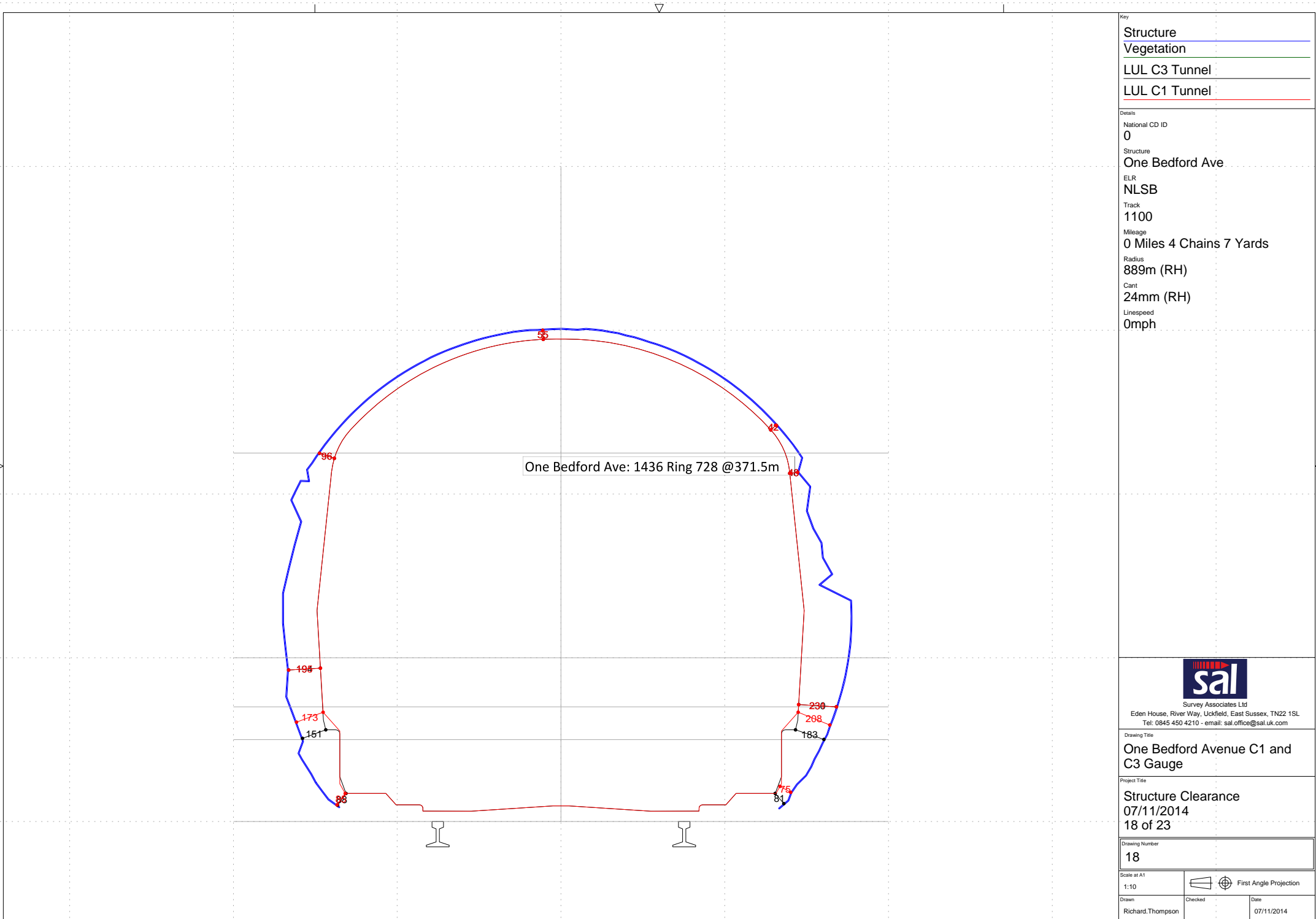
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
17 of 23

Drawing Number
17

Scale at A1 1:10	 First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 4 Chains 7 Yards
Radius	889m (RH)
Cant	24mm (RH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 728 @371.5m



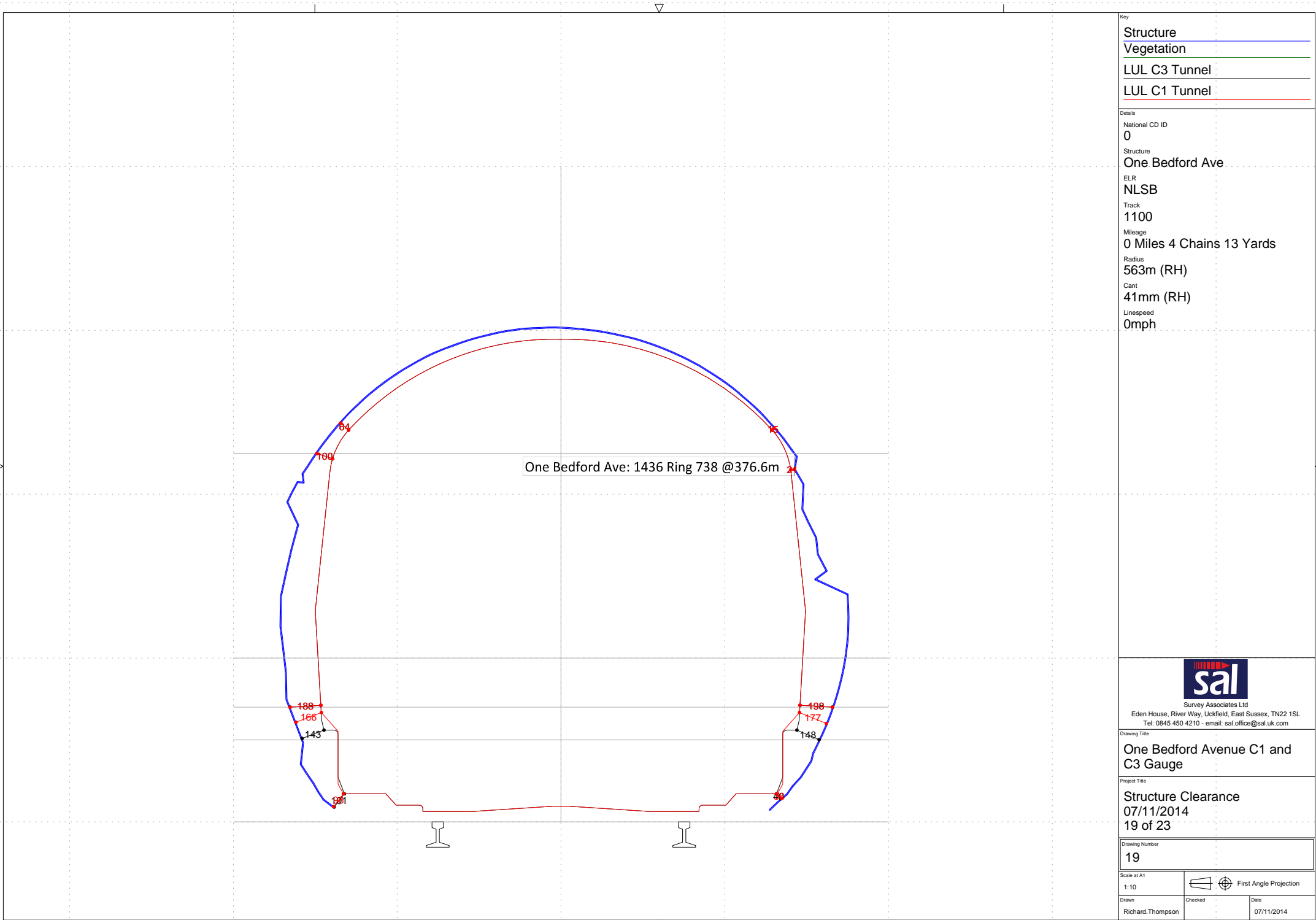
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
18 of 23

Drawing Number
18

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 4 Chains 13 Yards
Radius	563m (RH)
Cant	41mm (RH)
Linespeed	0mph



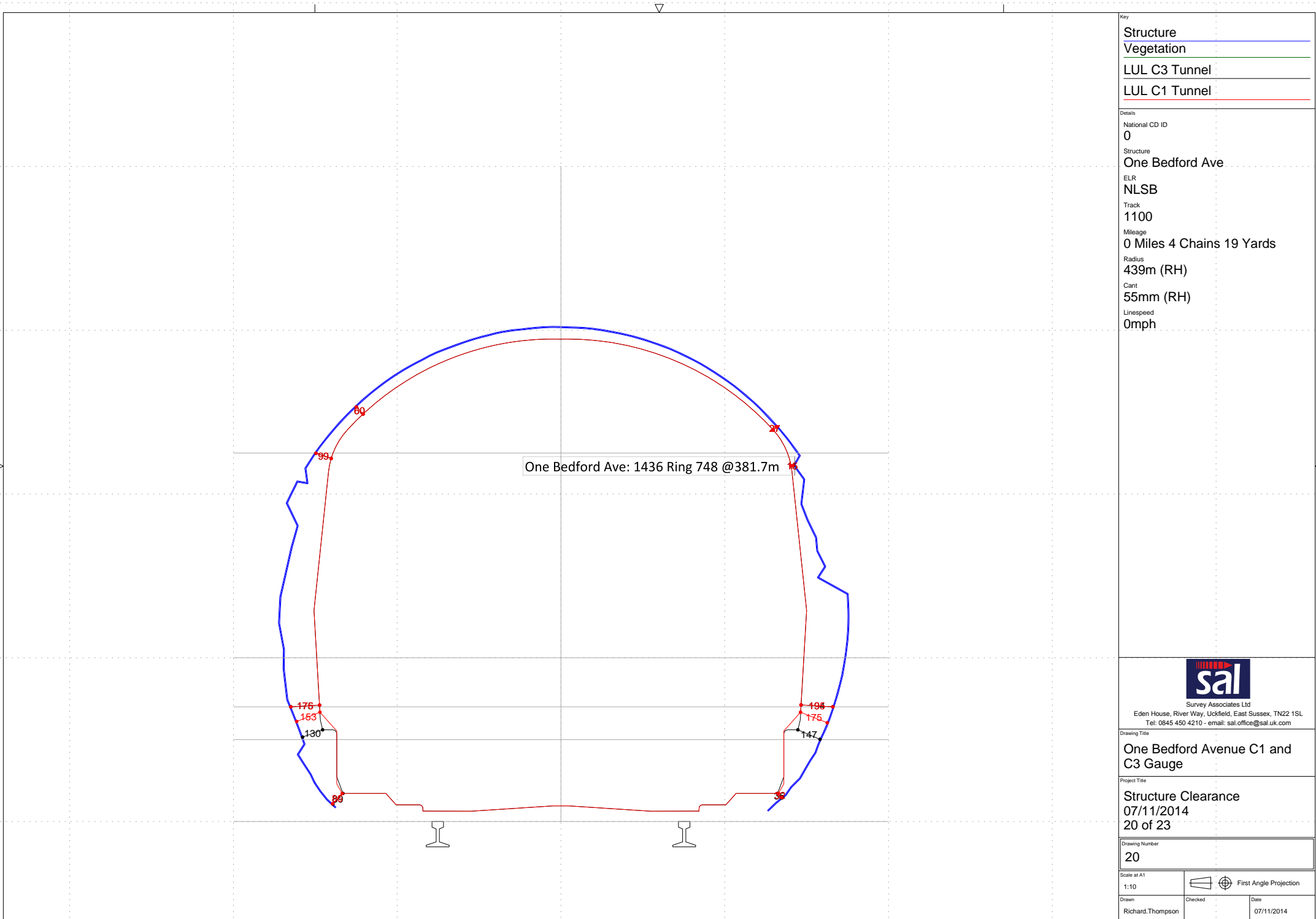
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
19 of 23

Drawing Number
19

Scale at A1	1:10	First Angle Projection
Drawn	Richard.Thompson	



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details	
National CD ID	0
Structure	One Bedford Ave
ELR	NLSB
Track	1100
Mileage	0 Miles 4 Chains 19 Yards
Radius	439m (RH)
Cant	55mm (RH)
Linespeed	0mph

One Bedford Ave: 1436 Ring 748 @381.7m



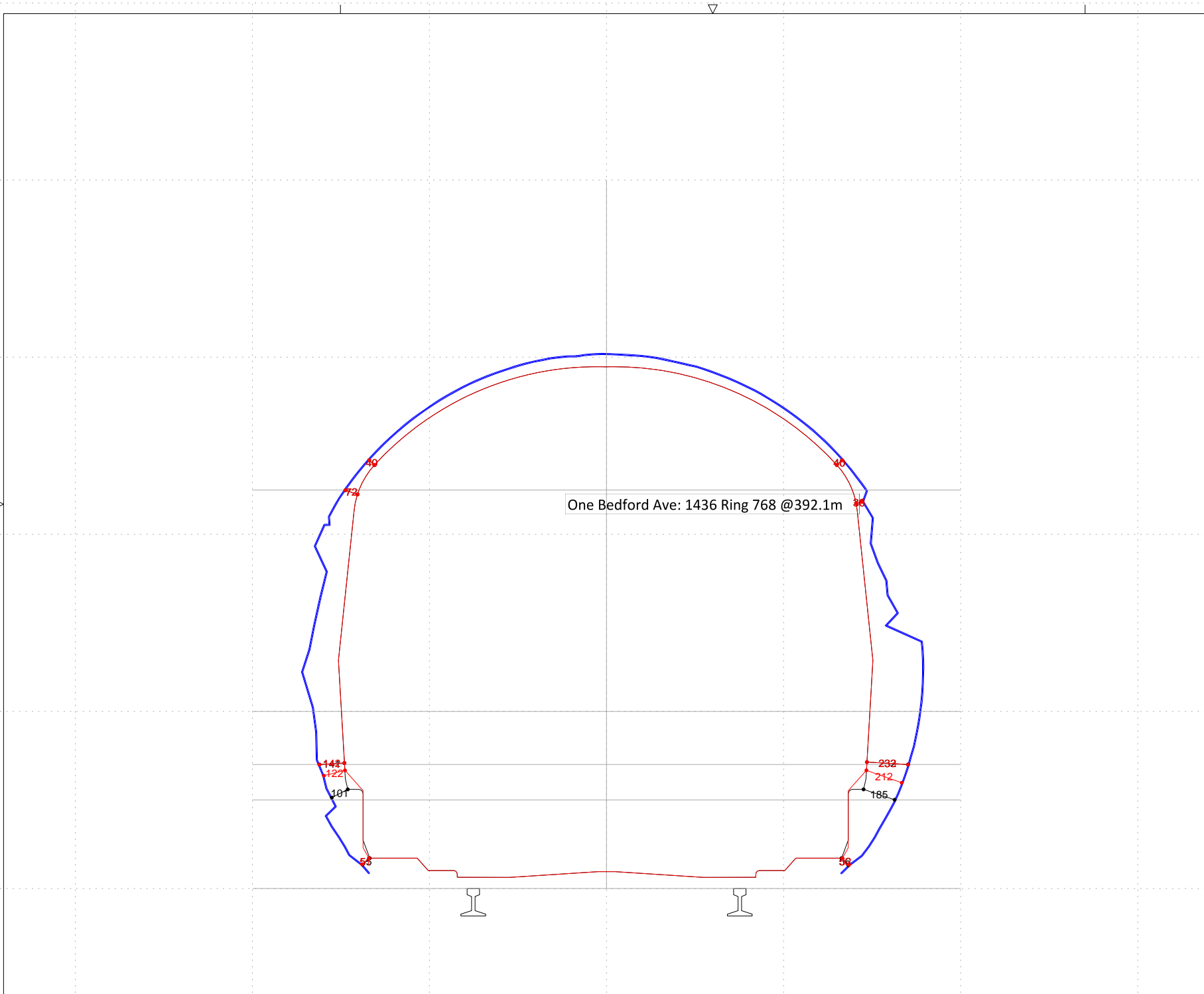
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
20 of 23

Drawing Number
20

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details
National CD ID
0
Structure
One Bedford Ave
ELR
NLSB
Track
1100
Mileage
0 Miles 5 Chains 8 Yards
Radius
379m (RH)
Cant
59mm (RH)
Linespeed
0mph

One Bedford Ave: 1436 Ring 768 @392.1m



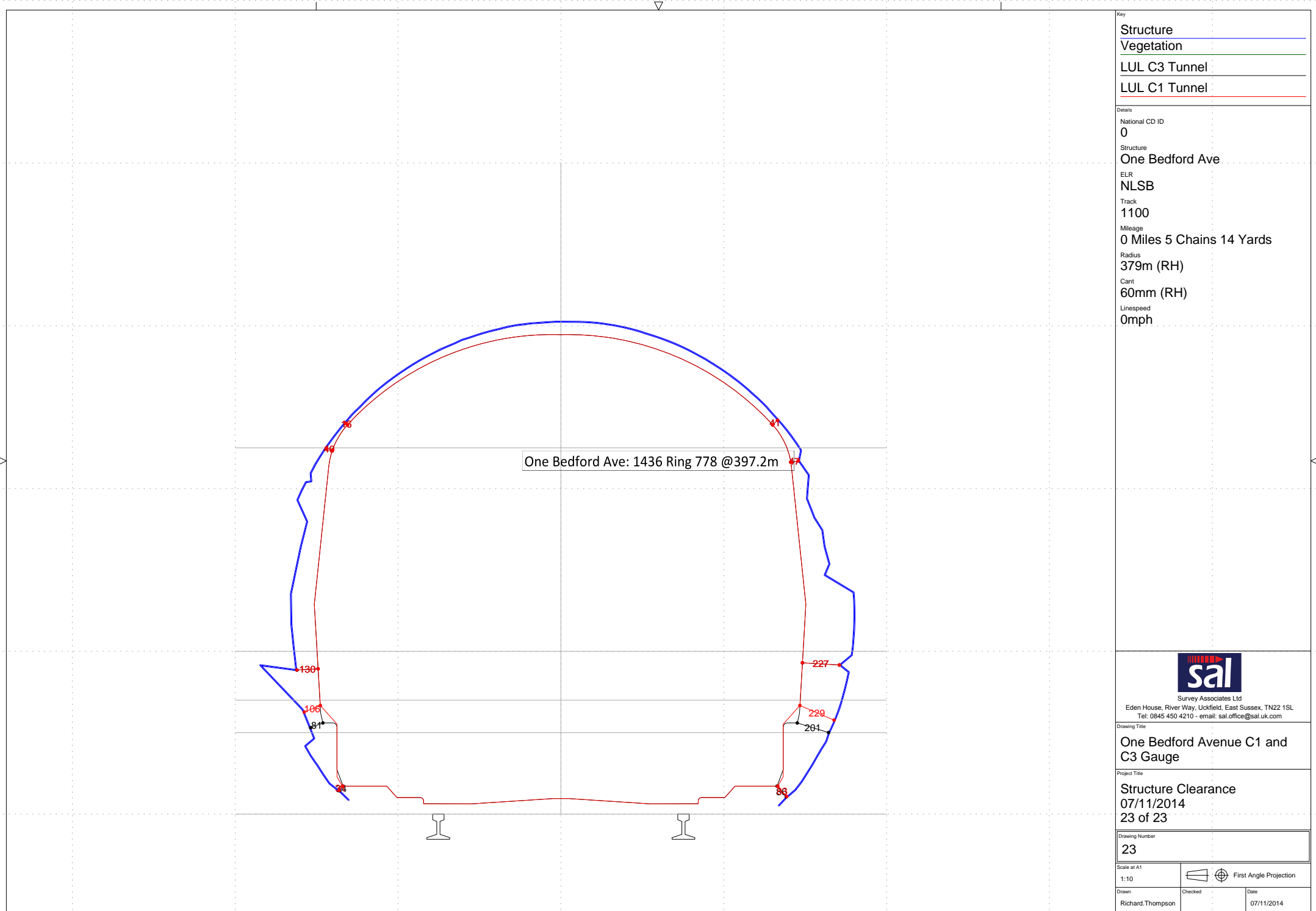
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Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
22 of 23

Drawing Number
22

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014



Key
Structure
Vegetation
LUL C3 Tunnel
LUL C1 Tunnel

Details

National CD ID
0

Structure
One Bedford Ave

ELR
NLSB

Track
1100

Mileage
0 Miles 5 Chains 14 Yards

Radius
379m (RH)

Cant
60mm (RH)

Linespeed
0mph



Survey Associates Ltd
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Tel: 0845 450 4210 - email: sal.office@sal.uk.com

Drawing Title
One Bedford Avenue C1 and C3 Gauge

Project Title
Structure Clearance
07/11/2014
23 of 23

Drawing Number
23

Scale at A1 1:10	First Angle Projection
Drawn Richard.Thompson	Checked Date 07/11/2014

Appendix C

Clearance Compendium

											C3 Gauge									
Plot	Original Filename	ELR	Line	Structure Name	SurveyMethod	SurveyDate	Cant	Radius	Line Speed	Track Fixity	LH <500	LH 500-700	LH 700-1000	LH 1000-2250	LH >2250	RH >2250	RH 1000-2250	RH 700-1000	RH 500-700	RH <500
1	000000AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 558 @284.3m	BB Lasersweep_4mm	25/10/2014	-2.1	-2237	0	High	77.3	140.7	178.5	114.5	76.4	70.7	70.3	246.6	194.2	61.9
2	000005AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 568 @289.4m	BB Lasersweep_4mm	25/10/2014	-3.3	-2237	0	High	76.6	120.1	157.6	71.3	37.4	62.5	102.5	282.5	234.1	94.4
3	000010AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 578 @294.5m	BB Lasersweep_4mm	25/10/2014	2.5	-7438	0	High	57.5	110.6	143.9	75.3	42.1	74.3	106.4	289.1	238.3	104.3
4	000015AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 588 @299.7m	BB Lasersweep_4mm	25/10/2014	-0.5	-5908	0	High	66.8	125.9	159.4	92.7	57.6	76.1	96.5	264.3	213.3	74.5
5	000020AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 598 @304.8m	BB Lasersweep_4mm	25/10/2014	2.7	-111538	0	High	82.0	155.9	190.6	125.1	83.1	75.4	89.4	244.6	194.3	48.2
6	000026AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 608 @309.8m	BB Lasersweep_4mm	25/10/2014	-6.9	-8329	0	High	103.4	171.8	207.9	142.6	74.3	50.4	60.7	228.5	180.5	50.1
7	000031AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 618 @315.0m	BB Lasersweep_4mm	25/10/2014	4.9	-19441	0	High	84.2	155.3	189.5	113.8	71.9	71.9	85.3	253.4	203.9	69.4
8	000036AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 628 @320.1m	BB Lasersweep_4mm	25/10/2014	1.3	-28210	0	High	89.9	154.2	191.3	107.2	55.6	55.2	91.6	167.3	208.3	72.4
9	000041AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 638 @325.3m	BB Lasersweep_4mm	25/10/2014	-1.7	-34445	0	High	96.6	168.6	204.8	122.6	72.1	62.0	79.6	196.5	182.3	57.0
10	000046AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 648 @330.4m	BB Lasersweep_4mm	25/10/2014	-2.4	-8265	0	High	101.3	158.3	202.3	93.1	37.6	38.6	68.2	250.1	202.6	77.9
11	000051AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 658 @335.6m	BB Lasersweep_4mm	25/10/2014	-3.5	-24918	0	High	83.3	135.9	180.4	113.8	50.1	47.1	55.8	240.0	190.4	59.4
12	000056AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 668 @340.7m	BB Lasersweep_4mm	25/10/2014	3.5	-5698	0	High	76.1	137.7	183.7	112.4	47.2	41.7	68.9	248.3	192.0	67.4
13	000062AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 678 @345.9m	BB Lasersweep_4mm	25/10/2014	2.4	-18612	0	High	55.2	125.9	168.7	97.2	42.3	55.4	85.1	256.3	203.6	63.9
14	000067AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 688 @351.0m	BB Lasersweep_4mm	25/10/2014	-4.0	-17787	0	High	41.8	99.0	135.5	83.6	53.8	88.4	104.9	206.1	219.2	89.0
15	000072AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 698 @356.1m	BB Lasersweep_4mm	25/10/2014	-2.7	-5393	0	High	21.9	87.7	121.1	69.7	40.8	80.6	111.9	180.2	165.9	97.9
16	000077AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 708 @361.2m	BB Lasersweep_4mm	25/10/2014	-1.9	-3280	0	High	32.9	96.6	131.4	36.7	37.5	73.6	117.9	283.6	230.0	97.1
17	000082AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 718 @366.3m	BB Lasersweep_4mm	25/10/2014	-4.8	-1873	0	High	72.8	127.5	165.5	85.2	40.1	52.9	102.9	269.8	224.6	88.0
18	000087AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 728 @371.5m	BB Lasersweep_4mm	25/10/2014	-23.9	-889	0	High	88.4	151.0	194.2	95.8	55.4	42.3	47.8	230.4	182.9	81.2
19	000092AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 738 @376.6m	BB Lasersweep_4mm	25/10/2014	-41.2	-563	0	High	101.2	143.1	188.2	100.3	64.3	15.1	21.3	198.0	147.6	39.7
20	000098AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 748 @381.7m	BB Lasersweep_4mm	25/10/2014	-54.7	-439	0	High	89.4	130.2	175.3	98.7	59.8	26.7	14.5	194.0	146.7	34.8
21	000103AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 758 @386.9m	BB Lasersweep_4mm	25/10/2014	-61.2	-394	0	High	57.3	107.3	155.8	89.6	58.1	26.1	17.9	100.8	72.3	12.6
22	000108AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 768 @392.1m	BB Lasersweep_4mm	25/10/2014	-58.9	-379	0	High	54.8	101.3	141.3	71.6	40.0	39.8	35.9	232.2	185.4	55.7
23	000113AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 778 @397.2m	BB Lasersweep_4mm	25/10/2014	-59.7	-379	0	High	34.4	81.1	129.7	40.2	15.5	40.6	46.7	226.6	200.9	86.2

											C1 Gauge									
Plot	Original Filename	ELR	Line	Structure Name	SurveyMethod	SurveyDate	Cant	Radius	Line Speed	Track Fixity	LH <500	LH 500-700	LH 700-1000	LH 1000-2250	LH >2250	RH >2250	RH 1000-2250	RH 700-1000	RH 500-700	RH <500
1	000000AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 558 @284.3m	BB Lasersweep_4mm	25/10/2014	-2.1	-2237	0	High	73.5	160.0	179.2	114.5	76.4	70.7	70.3	247.3	223.3	58.0
2	000005AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 568 @289.4m	BB Lasersweep_4mm	25/10/2014	-3.3	-2237	0	High	72.7	141.0	158.3	71.3	37.4	62.5	102.5	283.2	258.7	90.6
3	000010AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 578 @294.5m	BB Lasersweep_4mm	25/10/2014	2.5	-7438	0	High	53.6	128.0	144.6	75.3	42.1	74.3	106.4	289.8	263.0	100.5
4	000015AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 588 @299.7m	BB Lasersweep_4mm	25/10/2014	-0.5	-5908	0	High	63.0	144.0	160.2	92.7	57.6	76.1	96.5	265.1	240.0	70.7
5	000020AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 598 @304.8m	BB Lasersweep_4mm	25/10/2014	2.7	-111538	0	High	78.1	172.1	191.3	125.1	83.1	75.4	89.4	245.3	220.6	44.4
6	000026AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 608 @309.8m	BB Lasersweep_4mm	25/10/2014	-6.9	-8329	0	High	99.7	189.5	208.7	142.6	74.3	50.4	60.7	229.2	205.3	46.2
7	000031AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 618 @315.0m	BB Lasersweep_4mm	25/10/2014	4.9	-19441	0	High	80.2	171.9	190.3	113.8	71.9	71.9	85.3	254.2	230.7	65.7
8	000036AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 628 @320.1m	BB Lasersweep_4mm	25/10/2014	1.3	-28210	0	High	86.0	172.5	192.0	107.2	55.6	55.2	91.6	167.9	224.4	68.5
9	000041AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 638 @325.3m	BB Lasersweep_4mm	25/10/2014	-1.7	-34445	0	High	92.6	185.2	205.6	122.6	72.1	62.0	79.6	196.8	211.2	53.1
10	000046AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 648 @330.4m	BB Lasersweep_4mm	25/10/2014	-2.4	-8265	0	High	97.3	193.5	203.0	93.1	37.6	38.6	68.2	250.8	229.6	74.1
11	000051AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 658 @335.6m	BB Lasersweep_4mm	25/10/2014	-3.5	-24918	0	High	79.3	159.8	181.1	113.8	50.1	47.1	55.8	240.7	217.7	55.5
12	000056AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 668 @340.7m	BB Lasersweep_4mm	25/10/2014	3.5	-5698	0	High	72.0	160.4	184.5	112.4	47.2	41.7	68.9	249.1	220.7	63.5
13	000062AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 678 @345.9m	BB Lasersweep_4mm	25/10/2014	2.4	-18612	0	High	51.4	147.4	169.4	97.2	42.3	55.4	85.1	257.0	231.7	60.0
14	000067AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 688 @351.0m	BB Lasersweep_4mm	25/10/2014	-4.0	-17787	0	High	37.9	119.3	136.2	83.6	53.8	88.4	104.9	206.7	246.4	78.9
15	000072AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 698 @356.1m	BB Lasersweep_4mm	25/10/2014	-2.7	-5393	0	High	18.0	106.2	121.9	69.7	40.8	80.6	111.9	180.8	184.9	94.1
16	000077AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 708 @361.2m	BB Lasersweep_4mm	25/10/2014	-1.9	-3280	0	High	29.0	116.0	132.1	36.7	37.5	73.6	117.9	284.4	256.1	93.2
17	000082AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 718 @366.3m	BB Lasersweep_4mm	25/10/2014	-4.8	-1873	0	High	68.8	147.4	166.2	85.2	40.1	52.9	102.9	270.5	250.2	84.3
18	000087AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 728 @371.5m	BB Lasersweep_4mm	25/10/2014	-23.9	-889	0	High	85.5	173.2	194.7	95.8	55.4	42.3	47.8	231.1	208.4	75.0
19	000092AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 738 @376.6m	BB Lasersweep_4mm	25/10/2014	-41.2	-563	0	High	98.2	166.4	188.9	100.3	64.3	15.1	21.3	198.7	177.3	36.4
20	000098AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 748 @381.7m	BB Lasersweep_4mm	25/10/2014	-54.7	-439	0	High	86.0	152.9	176.0	98.7	59.8	26.7	14.5	194.7	175.1	31.6
21	000103AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 758 @386.9m	BB Lasersweep_4mm	25/10/2014	-61.2	-394	0	High	54.2	133.8	156.6	89.6	58.1	26.1	17.9	101.2	109.2	8.8
22	000108AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 768 @392.1m	BB Lasersweep_4mm	25/10/2014	-58.9	-379	0	High	51.0	122.4	142.1	71.6	40.0	39.8	35.9	232.9	211.8	52.2
23	000113AK.SCO	NLSB	1100	One Bedford Ave: 1436 Ring 778 @397.2m	BB Lasersweep_4mm	25/10/2014	-59.7	-379	0	High	31.3	106.4	130.2	40.2	15.5	40.6	46.7	227.1	228.5	83.0



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