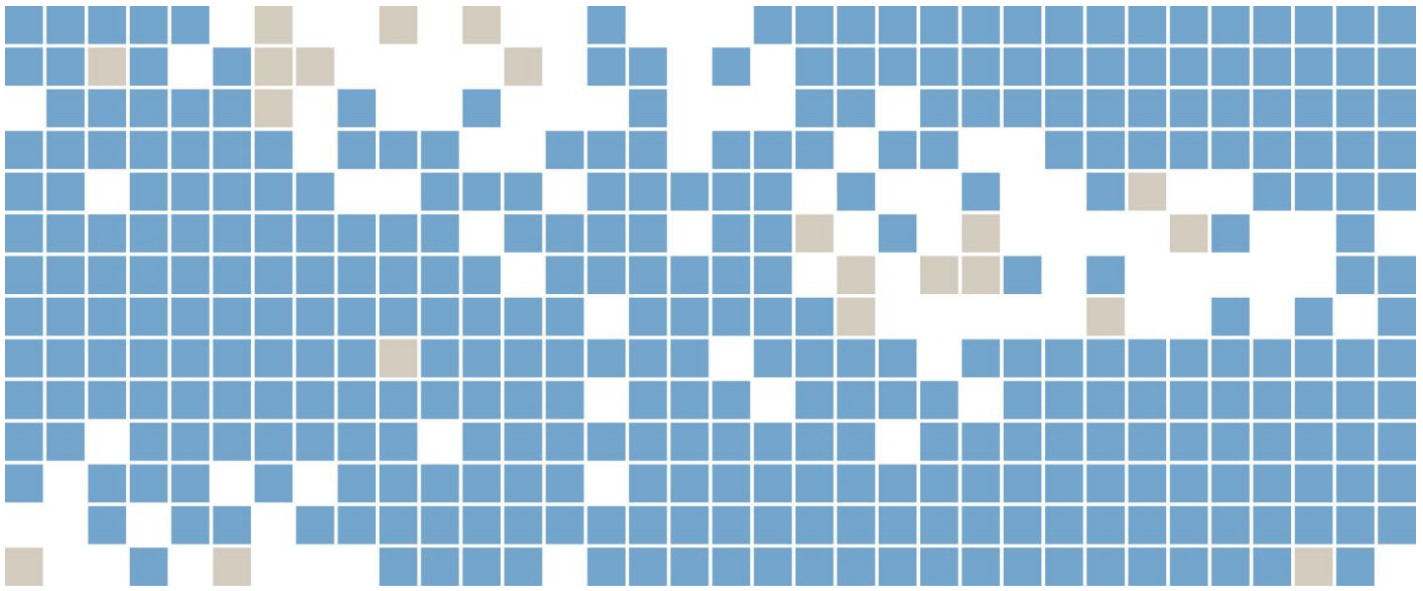


APPENDIX 13B
R755 PAVEMENT CONDITION SURVEY
AND GEOMETRIC ALIGNMENT REPORT

For presentation purposes only.
Consent of copyright owner required for any other use.



Planning Reference 08/1650: Response to Request for Further Information – Roads Issues

Roadstone Dublin Ltd.

Calary Quarry, Killough Upper, Kilmacanogue,
Co. Wicklow

March 2009

*For inspection purposes only.
Consent of copyright owner required for any other use.*

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft	Draft		
Date	19th March 2008	28 th April 2008		
Prepared by	MC PC	MC PC		
Signature				
Checked by	AA	AA		
Signature				
Authorised by	AA	AA		
Signature				
Project number	20010186	20010186		
File reference				

For inspection purposes only.
Consent of copyright owner required for any other use.

WSP Ireland
Floor 2, Merchants House,
27-30 Merchants Quay
Dublin 8

Tel: +353 (0)1 8994020
Fax: +353 (0)1 8994021
<http://www.wspgroup.com>

Reg. No: 347522



Contents

- 1 Introduction**
- 2 Request for Further Information**
- 3 Pavement Condition Survey**
- 4 Alignment Analysis**
- 5 Mitigation Measures**
- 6 Costs**
- 7 Conclusion**

- Appendix A Drawings and Mappings**
- Appendix B Pavement Condition Details**
- Appendix C Pavement Condition Photographs**
- Appendix D NRA tables**
- Appendix E R755 Road widths**

*For information purposes only.
Consent of copyright owner required for any other use.*



1 Introduction

This report has been prepared by WSP Ireland in response to Wicklow County Council's Request for Further Information in relation to a planning application prepared by SLR Consulting (formerly known as John Barnett & Associates Ltd.) for Roadstone Dublin Ltd.'s existing quarry at Calary, Upper Kilmacanogue, Co. Wicklow (Planning Register Reference 08/1650).

This report addresses Item 3 of the Request for Further Information. It examines the existing condition of the regional road, R755, between the existing quarry site and the N11 in terms of its carriageway width, its vertical and horizontal alignment and its pavement condition.

Arising from the evaluation of the existing road, a number of mitigation measures have been proposed to improve the road condition of the R755 between the existing site entrance and the N11 and to improve the general operation and safety of this section of road.

*For inspection purposes only.
Consent of copyright owner required for any other use.*



2 Request for Further Information

The section of the R755 road between the site entrance and the N11 (R755) is currently utilised as the primary access route for the transportation of materials to and from the existing quarry site. While this is a regional road in close proximity to a national primary road, the Planning Authority has requested some further information in relation to this section of road.

The items of information requested by the Planning Authority are;

(a) "A comprehensive and complete evaluation of the full length of the regional road from the site entrance to the N11 in terms of road carriageway width (cross sections required), alignment (long sections) and structural conditions / stability".

(b) "Where deficiencies are revealed by (a) above, details of proposals / mitigation measures required to address same and confirmation that any necessary works identified will either be carried out by the applicant or that the applicant will make a special contribution towards to the carrying out of such works".

*For inspection purposes only.
Consent of copyright owner required for any other use.*

3 Pavement Condition Survey

In order to evaluate the existing road condition of the R755 a road condition survey was undertaken by WSP Ireland on 12th March 2009. The procedure and results of this survey are outlined below.

3.1 PROCEDURE FOR THE ROAD CONDITION SURVEY AND DATA COLLECTION

The method used to carry out the road condition survey was in compliance with NRA RC.337 "Guidelines on Inventory and Condition Rating of Regional and County Roads" by E. Mulkeen, June 1988.

As recommended within the above guidelines a two person team, consisting of two Engineers from WSP Ireland, travelled the route on foot on Thursday 12th March 2009 between the hours of 11:00 am and 3.00 pm, assessing and recording defects and taking the relevant measurements where appropriate. The route was also driven along several times in each direction to identify any other defects; i.e., surface degradation, overgrown foliage, tight corners etc.

The road network was then divided into different sections based upon the condition of the pavement. The full trafficked width of each carriageway section was assessed. Areas off the carriageway, such as on-road parking were not considered within the survey.

For each of the above sections the following pavement defects were studied and recorded in intervals of 100 metres:

- Surface related defects: ravelling (loss of blacktop) and bleeding (fatting up).
- Structurally related surface defects: crocodile cracking, rutting >20mm. and rutting <20mm.
- Pavement edge deterioration: left and right hand sides.
- Stability of surface materials: slippage cracks and shoving.
- Stability of pavement or soil: heaving.
- Other pavement defects: Reflection cracking and potholes.

In addition other features of the road were assessed such as the sight lines and road signing and lining.

All substantial defects were recorded using a digital camera. These photographs are included in Appendix C, while Appendix B includes all the inspection sheets which show the data collected for all the defects listed above.

3.2 DATA PROCESSING

The data collected during the pavement condition survey is categorised for each section as follows:

- Yes/No responses which count number of defect instances.
- Percentage length over which the defect occurs.
- Percentage area over which the defect occurs.

For each of the defects an average figure for the road section is obtained. The rating of the road section is calculated by multiplying the incidence of each defect by a factor related to the difficulty of repairing that type of defect. The sum of defect incidences multiplied by the factors and divided by the length of the road gives the rating per metre length for each section. The higher the rating, the poorer the condition of the road.

To divide the road sections into condition categories the following threshold levels have been taken from the guidance documents:

- Good roads: Rating less than 1.
- Deficient roads: Rating between 1 and 3.
- Poor roads: Rating between 3 and 4.
- Bad roads: Rating greater than 4.

The factors used to calculate the difficulty of repairing a defect were obtained from RC 337.

1. Factors per square metre:

- Ravelling... 3.0
- Bleeding... 1.5

2. Factors per metre run:

- Crocodile cracking... 2.5
- Rutting >20mm... 2.5
- Rutting <20mm... 1.5
- Pavement edge deterioration... 2.5

3. Factors per Yes/No responses:

- Slippage cracks... 2.5
- Shoving... 2.5
- Heaving... 2.5
- Reflection cracking... 1.0
- Potholes... 0.5
- Drainage maintenance... 0.4
- Drainage minor improvement... 0.4



- Drainage major improvement...25.0
- Lines required...0.75

All the calculations required were processed in an Excel spreadsheet. The results are illustrated together with the inspection sheet data in Appendix B. An outline of the results obtained for each section is given in Section 3.3 below and full details of the results are contained Appendix B. As no defects were recorded from Chainage 3000m to Chainage 3660m (at the N11) the inspection sheet for this section has not been included.

3.3 RESULTS OF ROAD CONDITION SURVEY ALONG R755 FROM CALARY QUARRY TO N11 AT KILMACANOGUE

In general, the results of the pavement condition survey indicate that there are very few surface defects and that the road pavement is in a good condition for its entire length. This is to be expected as Wicklow County Council has recently undertaken extensive resurfacing works on the R755.

Notwithstanding the above, the Table 3.1 indicates some small localised defects which should be addressed. For Chainage locations refer to Drawings 0186-001-007 in Appendix A.

*For inspection purposes only.
Consent of copyright owner required for any other use.*



Location	Road	Pavement Defect	Photograph Reference (See Appendix C)
Ch 50m	R755	Drainage – needs minor improvement	50
Ch 300m	R755	Shoving	60
Ch 400m	R755	Drainage – needs maintenance	63
Ch 600m	R755	Road Edge Deterioration	68
Ch 650m	R755	Ravelling/Loss of Blacktop	70
Ch 700m	R755	Road Edge Deterioration	72
Ch 850m	R755	Crocodile Cracking	76
Ch 1100m	R755	Road Edge Deterioration	83
Ch 1350m	R755	Drainage – needs maintenance	89
Ch 1350m	R755	Drainage – needs maintenance	90
Ch 1400m	R755	Bleeding / Fattening Up	92
Ch 2150m	R755	Road Edge Deterioration	109
Ch 2150m	R755	Drainage – needs maintenance	110
Ch 2150m	R755	Pothole round Gully	111
Ch 2200m	R755	Road Edge Deterioration	112
Ch 2250m	R755	Drainage – needs maintenance	116
Ch 2400m	R755	Drainage – needs maintenance	120
Ch 2450m	R755	Drainage – needs maintenance	121
Ch 2500m	R755	Inconsistent Road Layer Build Up	124
Ch 2700	R755	Road Edge Deterioration	131

Table 3.1 Location of surface defects on the R755 – N11 Road

4 Alignment Analysis

4.1 GENERAL

In response to Item Three of the Request for Further Information, this section of the report details a complete evaluation of the R755 Regional road from the quarry entrance to the N11, in terms of its carriageway width and its vertical and horizontal alignment.

Following the design principles set out in the NRA's Road Geometry Handbook ref TD 9/00, the methodology for assessing the road is as follows:

1. Determine the design speed of the road based on the existing alignment and layout constraints.
2. Determine the visibility requirements for the road based on the calculated design speed
3. Identify areas of the road which do not satisfy the visibility requirements and determine appropriate remedial solutions

Prior to the commencement of the alignment evaluation, a full topographical survey was carried out on the R755 Regional Road between the quarry site entrance and the N11. Supported by on site inspections, this survey forms the basis of the evaluation of the road alignment. A road modelling software package was used to create a best fit replica of the roads' horizontal and vertical alignment. The full Horizontal and Vertical alignments for the R755 is illustrated in Drawings No 20010186-001 to 20010186-007 contained within Appendix A.

4.2 DESIGN SPEED OF THE ROAD

Whilst the general speed limit on all regional roads in the rural environment is 80km/h, the design speed of the road is a factor of the roads alignment and layout. A relatively straight alignment in flat country will generate higher speeds, and thus a higher design speed than a more sinuous alignment in hilly terrain.

The three factors which constraint the speed of vehicles on roads are its alignment, its layout and the mandatory speed limit. Following the standards set out in TD 9/00, 'Road Link Design', the design speed of the road can be derived from the relation of these three factors. The calculation of the design speed of the R755 from the quarry entrance to the N11 is detailed below:

4.2.1 Alignment Constraint

The alignment constraint (A_c), (NRA DMRB TD 9/00) is a measure of the bendiness and forward sight visibility of a road. For single carriageways the Alignment constraint is:

$$A_c = 12 - \text{Visi}/60 + 2B/45$$

where, B = Bendiness (total angle the road turns through), degrees/km;

and Visi = Harmonic Mean Visibility, m.

For the R755 from the quarry entrance to the N11, a distance of 3660metres, the Bendiness of the road is 236 degrees/km, whilst the Harmonic Mean visibility is 92.3m. This equates to an Alignment Constraint value of 21.



Layout Constraint

The layout constraint is a measure of constraint imparted by the road cross section, verge width and frequency of junctions and accesses. This is measured in km/h. Table 1 of TD 9/00, 'Road Link Design' lists Layout Constraint values based on the road type, the carriageway width, the degree of access and junctions, and the verge width. A copy of this table is contained in Appendix D.

With regards to the R755, the Road type is classified as S2 (Reduced or Standard Single Carriageway) and the mean carriageway width is in the region of 6.0 to 7.0metres. There are 25 entrances within the 3660metre length, giving a 'medium access numbering'. The average verge width between the quarry and the N11 is between 1.5metres to 3.0 metres. Given the above measurements, the Layout constraint value for the R755 is 28 km/h.

4.2.2 General Speed Limits

Whilst the Alignment Constraint and the Layout Constraint physically impress upon the speed at which motorists drive, the general speed limit provides a prohibitive constraint on the drivers speed. The general speed limit on this section of the R755 is 80kph.

4.2.3 Selection of Design Speed

Arising from the calculation of the above constraint factors, the design speed of the road can be derived from table 1 of TD 9/00, 'Road Link Design'. A copy of this table is contained in Appendix D. Given an Ac value of 21 and an Lc value of 28, the Design Speed of the R755 from the quarry entrance to the N11 is 70km/h.

4.3 VISIBILITY REQUIREMENTS

The design speed parameters relating to the various design speed bands are detailed in Table 3 of TD 9/00, 'Road Link Design'. A copy of this table is contained in Appendix D. On examination of this table it can be seen that the Desirable Minimum Stopping Sight Distance for a road with a 70km/h design speed is 120metres.

Relaxations below Desirable Minimum can be applied to the Stopping Sight Distance in specific circumstances at the designer's discretion. The maximum permissible relaxation for the Stopping Distance at two steps below the Desirable Minimum is 70 metres for a design speed of 70kph. Distances below this 70 metre distance are considered Departures from Standard.

4.4 GEOMETRIC ANALYSIS

Drawing No's 20010186-001 to 20010186-007 contained within Appendix A, indicate locations along the R755 where the Desirable Minimum Sight Distance of 120metres cannot be achieved. These drawings also indicate locations where the Stopping Sight Distance at two steps below desirable minimum of 70metres cannot be achieved. Table 4.1 below lists the locations at which the 120metre, Desirable Minimum Stopping Sight Distance cannot be achieved and Table 4.2 lists the locations at which the 70metres two steps below Desirable Minimum Stopping Sight Distance cannot be achieved. Each table lists the prevailing carriageway width along these sections. Table 1 Appendix E, lists the width of the R755 from the N11 to the quarry entrance at 75 metre intervals.

Location	Chainage	Length over which the 120metres: Desirable Minimum Stopping Sight Distances cannot be achieved:	Prevailing Road Width over this section (m)	Remarks
150m West of R755 Roundabout	150-300	150	7.6	
425m West of R755 Roundabout	425-730	305	7.0	
Series of Bends between R755 Roundabout and Junction with R760	775-1240	465	7.6	
Junction with R670	1500-1725	225	7.0	
Bend at Chainage 1810	1750-1875	125	6.5	
Bend at Chainage 2020	1950-2075	125	6.1	
Bend at Chainage 2200	2125-2240	115	6.2	
Bend at Chainage 2350	2260-2575	315	6.1	At Chainage 2400 road narrows to between 5.7 and 6.0 metres for a distance of 27m
Bend at Chainage 2725	2625-2820	195	6.1	
Bend at Chainage 3075	3000-3170	170	6.3	
100m South of Site Entrance	3460-3660	215	6.0	

Table 4.1 Locations at which the Desirable Minimum Stopping Sight Distance of 120metres cannot be achieved

Location	Chainage	Length over which the 70metres: two steps below Desirable Minimum (Maximum Relaxation) cannot be achieved	Prevailing Road Width over this section (m)	Remarks
Series of Bends between R755 Roundabout and Junction with R760	900-965	65	7.4	
	980-1075	95		
	1125-1175	50		
Bend at Chainage 2200	2180-2225	45	6.0	
Bend at Chainage 2725	2675-2775	50	6.1	
Bend at Chainage 3075	3030-3125	95	6.5	

Table 4.2 Locations at which the Two Steps Below Desirable Minimum Stopping Sight Distance of 70metres cannot be achieved.



4.5 REMEDIAL SOLUTIONS

The above tables indicates a number of sections along the route where the stopping sight distances and horizontal alignment are sub standard for a road with a design speed of 70km/h. At locations where the stopping sight distances are sub standard but the prevailing width of the road is greater than 6.0metres no widening or realignment measures are proposed as sufficient road width exists for the safe passage of commercial and local traffic. Notwithstanding this, mitigation measures such as the erection of chevron signage at bends can be implemented.

At locations where the stopping sight distance cannot be achieved and the prevailing road width is less than 6.0metres, it is recommended that the road be locally widened to achieve satisfactory road widths. It can be seen from examination of Drawing 20010186/005 and the above table that this occurs at Chainage 2400 where the road narrows briefly to between 5.7 and 6.0 metres for a distance of approximately 27 metres. In order to insure quarry traffic can pass at this point and in the interest of increased safety along the road, this short section should be widened to 6 metres if sufficient lands are available.

The above assessment for calculating the design speed of the road and the associated alignment and sight distance parameters is based on the NRA requirements for new road design. With regards to the existing alignment deficiencies of the road, it is evident that these are in the main created by the necessity for the road to integrate with the existing topography. To provide improvements at all these locations would necessitate improvements to the mainline horizontal alignment of the road to such an extent that it would require significant earthworks and land acquisition.

As this planning application is for an extension to the existing quarry operation it is considered that the areas which would need to be addressed are where the road is too narrow to accommodate the safe passage of local and quarry traffic. The provision of such improvements would be sufficient and wholly appropriate for the safe and proper operation of the Calary Quarry traffic and indeed all road users on the R755.

Whilst the remaining areas may benefit from the realignment of the road, the benefit would primarily be to the net journey time for all road users and would need to be undertaken as part of a realistic improvement strategy for the entire length of the R755.



5 Mitigation Measures

As outlined within this report there are a number of mitigation measures which could be adopted along the length of the R755 to improve the safety of road users.

5.1.1 Localised widening

At locations where the requisite forward sight visibility cannot be achieved and the width of the road is insufficient for the safe passage of quarry traffic, localised road widening should be undertaken. This occurs at chainage 2400 as outlined within Section 4.5 of this report.

5.1.2 Repairs to Localised Pavement defects

Whilst the pavement of the R755 from the site entrance to the N11 is in good condition, a small number of localised pavement defects have been identified in Table 3.1 which could be repaired.

5.1.3 Signs

Strategically placed signage could be placed at the approaches to sharp bends and concealed junctions to improve driver awareness of the potential danger of slow moving traffic.

5.1.4 Trimming of Vegetation

Regular trimming of vegetation at bends which impede driver visibility will help improve stopping sight distances and road safety in general.



6 Costs

6.1.1 Improvements to the R755

Roadstone Dublin Ltd is willing to make a reasonable financial contribution in the form of a Special Contribution for the improvements to the section of the R755 as detailed within Section 5 of this report. The amount of this financial contribution would be in direct proportion of the traffic generated by the quarry in relation to the total volume of traffic on this section of the R755, and would be agreed with the Roads Section, Wicklow Co. Council.

*For inspection purposes only.
Consent of copyright owner required for any other use.*



7 Conclusion

The main conclusions of this report are summarised as follows:

R755 Regional Road Conditions

- A pavement condition survey was undertaken along the R755 from the quarry entrance to the N11 junction at Kilmacanogue. In general, the results of the pavement condition survey indicate that there are very few surface defects and that the road pavement is in a good condition for its entire length.
- A comprehensive assessment of the vertical and horizontal alignment of the R755 has been undertaken. At the location (Chainage 2,400) where the 70 metre stopping sight distance cannot be achieved and the prevailing road width is less than 6.0metres, it is recommended that the road be locally widened to achieve satisfactory road width.
- A number of mitigation measures have been recommended on the R755 to improve the safety of road users. These measures include localised widening, repairs to localised pavement defects, erection of signs and trimming of roadside vegetation.
- Roadstone Dublin Ltd is willing to make a reasonable financial contribution under item 4.7 of the Wicklow Development Contribution Scheme for the localized widening or other repairs to the R755 from the quarry entrance to the N11 at Kilmacanogue as outlined in this report. This financial contribution would be in direct proportion to the traffic generated by the quarry in relation to the total volume of traffic on this section of the R755.

For inspection purposes only.
Consent of copyright owner required for any other use.



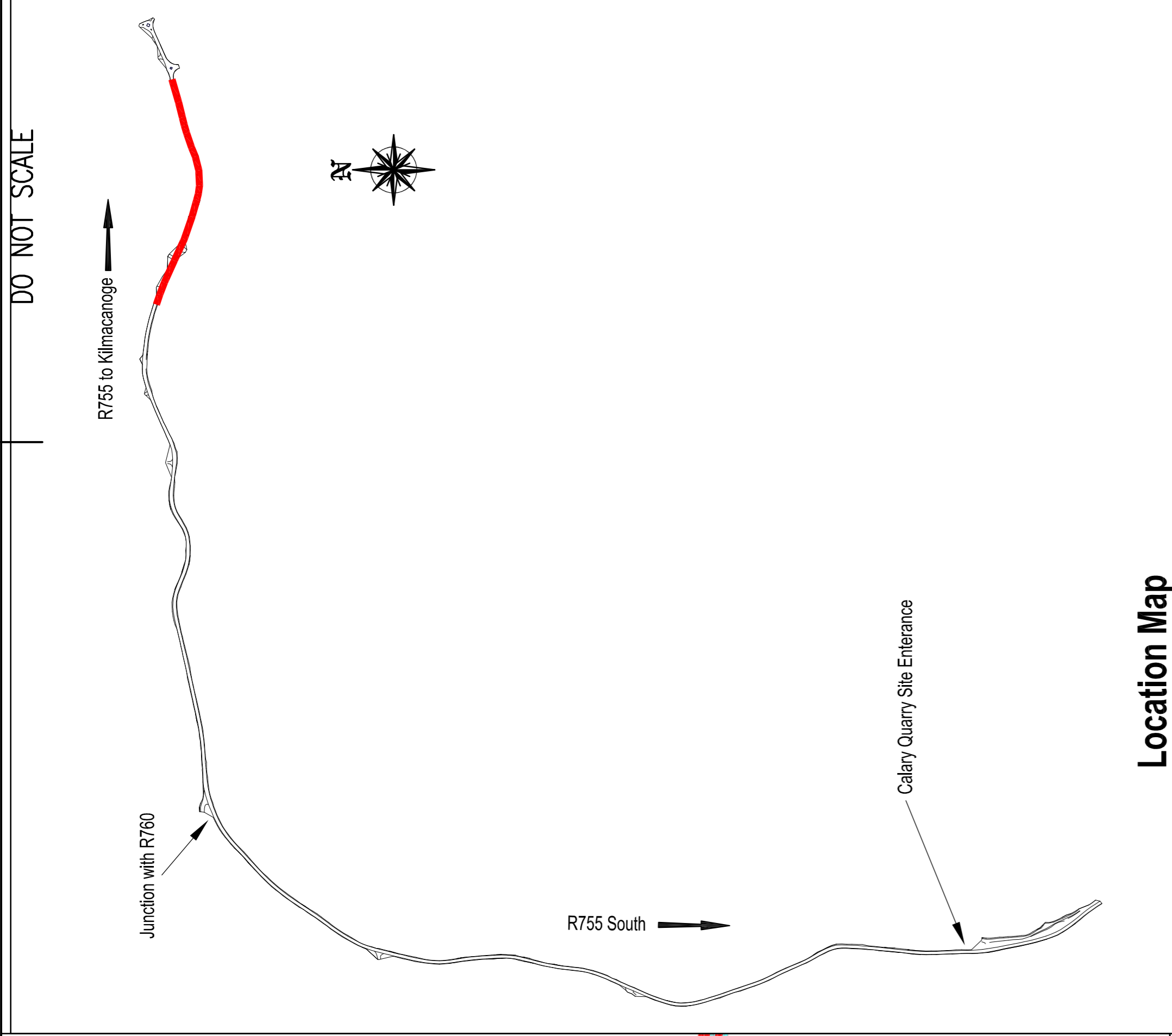
Appendices, Figures & Tables

For inspection purposes only.
Consent of copyright owner required for any other use.



Appendix A Drawings and Mapping

*For inspection purposes only.
Consent of copyright owner required for any other use.*



Location Map
Not to Scale

Key
█ Road Section Shown in Horizontal & Vertical Section

REV	DATE	BY	DESCRIPTION	CHK	APP

For Information

Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT: Roadstone Dublin Ltd
ARCHITECT: Calary Quarry

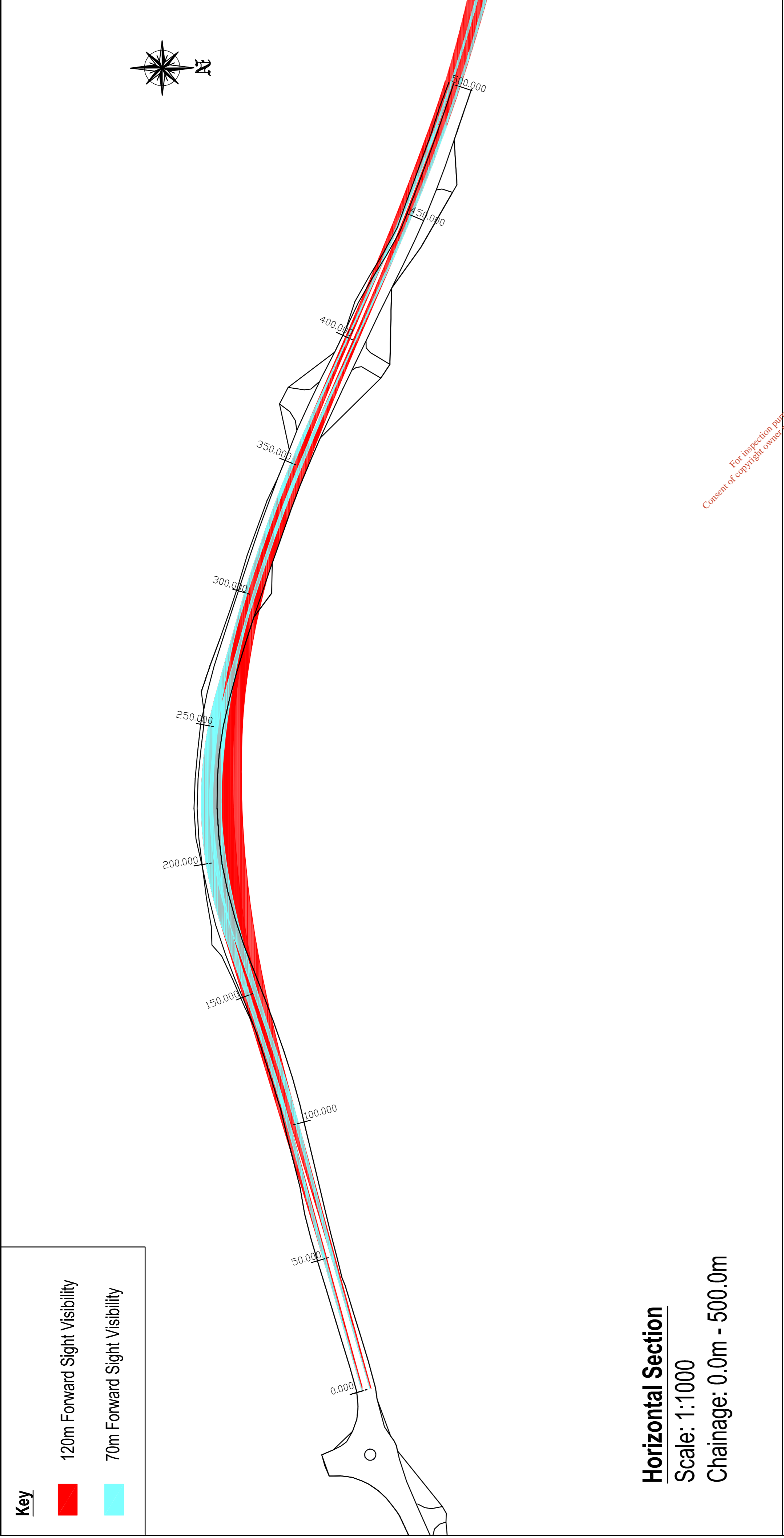
PROJECT: Calary Quarry
Horizontal & Vertical Alignment
From Kilmacnagoe to Calary Quarry

SCALE & SIZE: As Shown
CHECKED: AA
APPROVED: KB

CAD FILE: [Blank]
DESIGN/DRAWN: [Blank]
DATE: April 2007

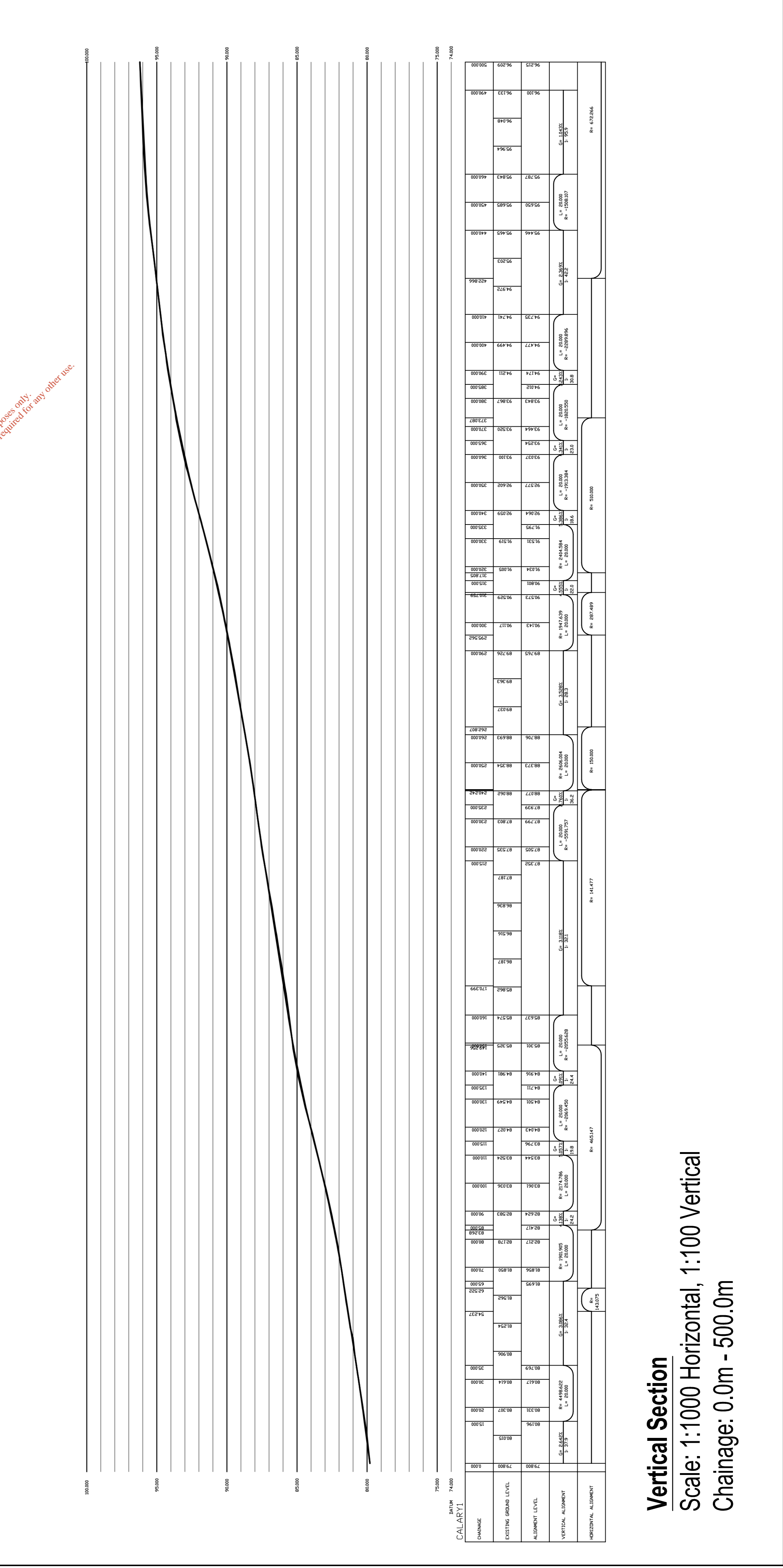
PROJECT No: 20010186
DRAWING No: 0186/001
REF: A

© WSP Group plc



Horizontal Section
Scale: 1:1000
Chainage: 0.0m - 500.0m

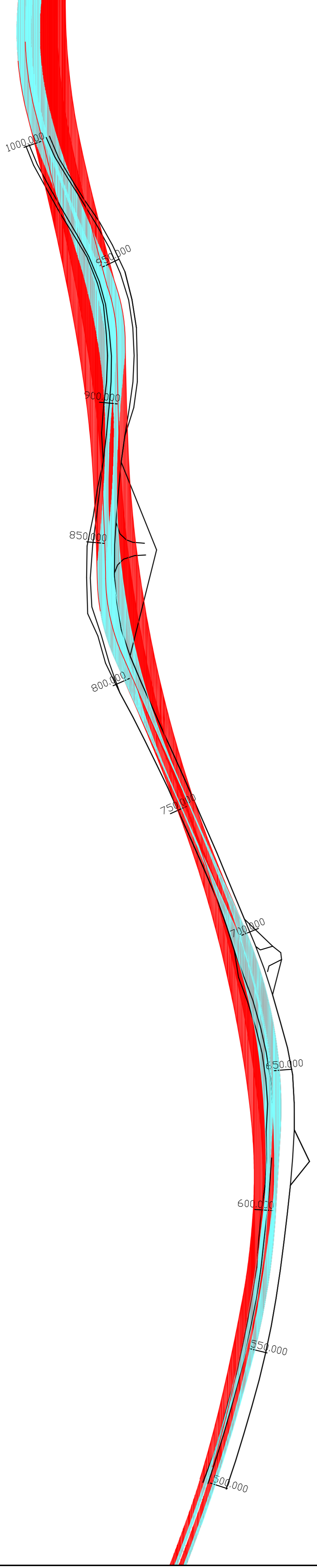
For inspection purposes only.
Consent of copyright owner required for any other use.



Vertical Section
Scale: 1:1000 Horizontal, 1:100 Vertical
Chainage: 0.0m - 500.0m

Key

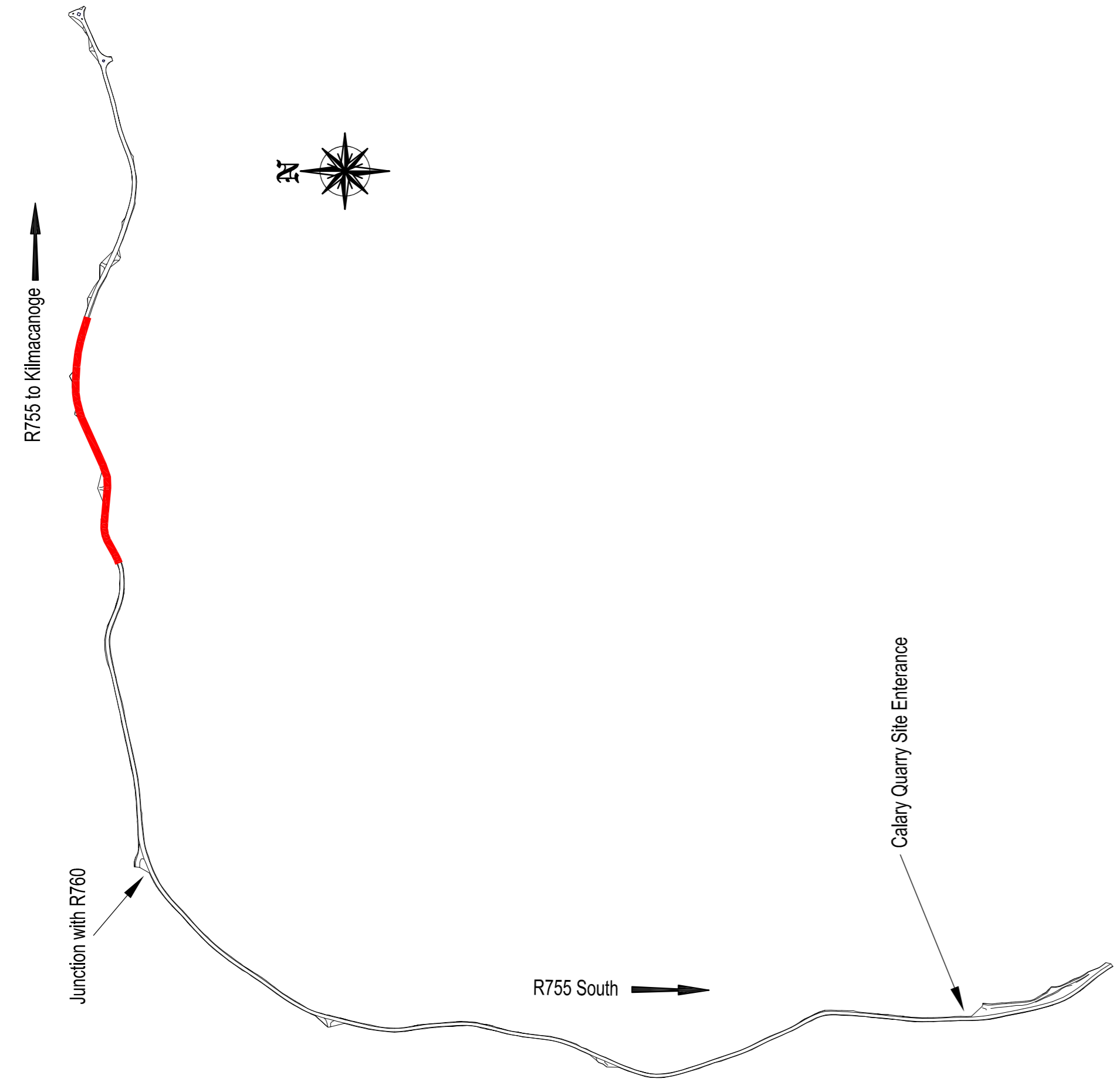
- 120m Forward Sight Visibility
- 70m Forward Sight Visibility



Horizontal Section
 Scale: 1:1000
 Chainage: 500.0m - 1000.0m

For information purposes only.
 Consent of copyright owner required for any other use.

DO NOT SCALE



Location Map
 Not to Scale

Key
 Road Section Shown in Horizontal & Vertical Section

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
For Information

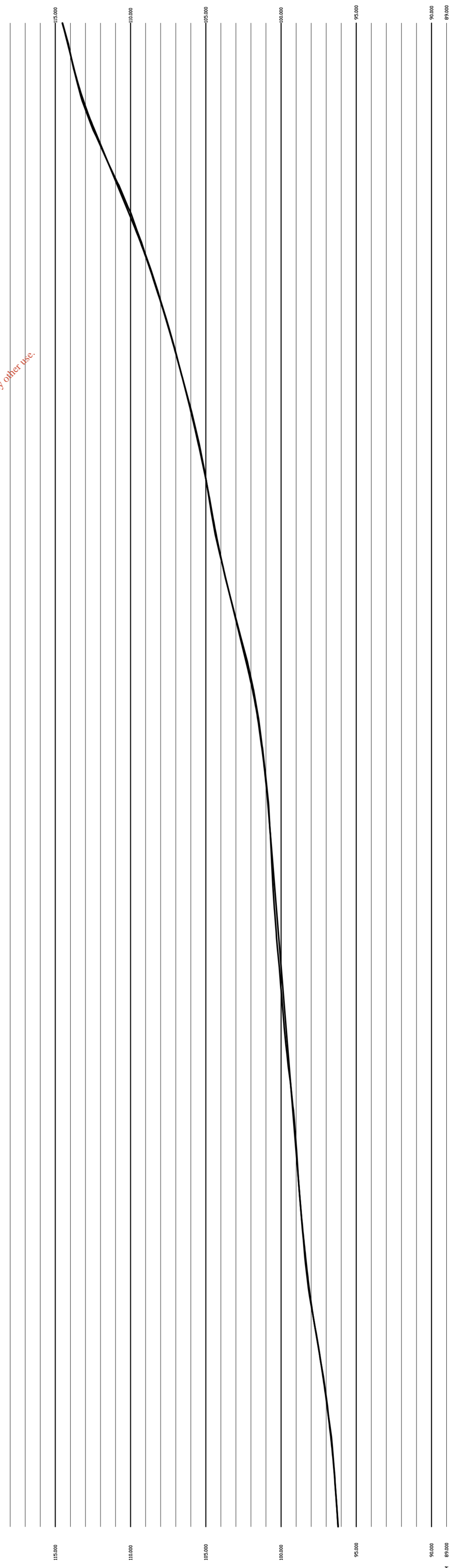
Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
 Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT: Roadstone Dublin Ltd
 ARCHITECT:

PROJECT: Calary Quarry
 TITLE: Horizontal & Vertical Alignment
 From Kilmacnoge to Calary Quarry

SCALE & SIZE: As Shown	CHECKED: AA	APPROVED: KB
CAD FILE:	DESIGN/BRANCH: NM	DATE: April 2007
PROJECT No: 20010186	DRAWING No: 0186/002	REV: A

© WSP Group plc

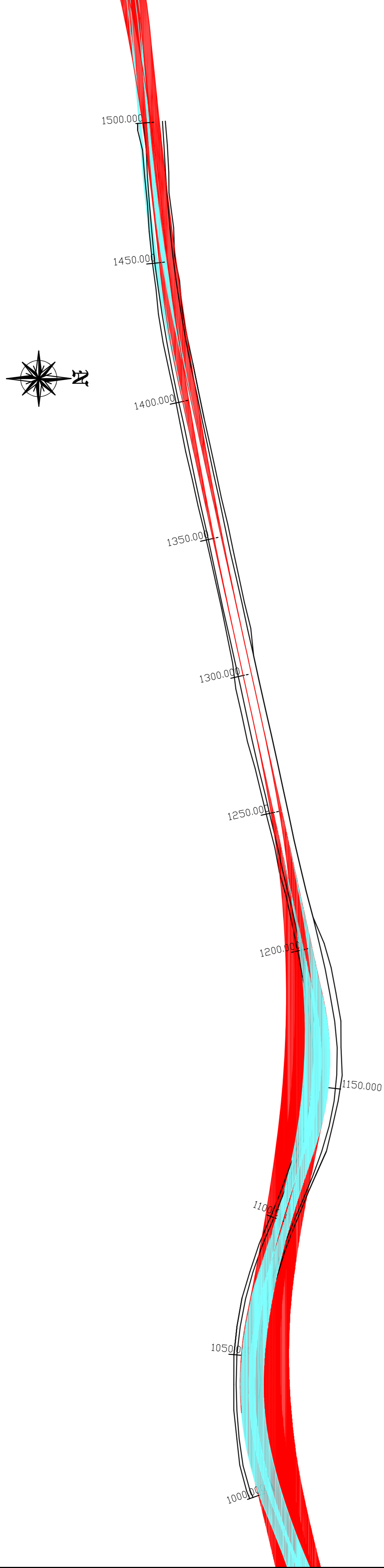


CHAINAGE	EXISTING GRADE LEVEL	PROPOSED GRADE LEVEL	VERTICAL ALIGNMENT	VERTICAL ALIGNMENT
500.000	52.74	52.74	1:100	1:100
510.000	52.74	52.74	1:100	1:100
520.000	52.74	52.74	1:100	1:100
530.000	52.74	52.74	1:100	1:100
540.000	52.74	52.74	1:100	1:100
550.000	52.74	52.74	1:100	1:100
560.000	52.74	52.74	1:100	1:100
570.000	52.74	52.74	1:100	1:100
580.000	52.74	52.74	1:100	1:100
590.000	52.74	52.74	1:100	1:100
600.000	52.74	52.74	1:100	1:100
610.000	52.74	52.74	1:100	1:100
620.000	52.74	52.74	1:100	1:100
630.000	52.74	52.74	1:100	1:100
640.000	52.74	52.74	1:100	1:100
650.000	52.74	52.74	1:100	1:100
660.000	52.74	52.74	1:100	1:100
670.000	52.74	52.74	1:100	1:100
680.000	52.74	52.74	1:100	1:100
690.000	52.74	52.74	1:100	1:100
700.000	52.74	52.74	1:100	1:100
710.000	52.74	52.74	1:100	1:100
720.000	52.74	52.74	1:100	1:100
730.000	52.74	52.74	1:100	1:100
740.000	52.74	52.74	1:100	1:100
750.000	52.74	52.74	1:100	1:100
760.000	52.74	52.74	1:100	1:100
770.000	52.74	52.74	1:100	1:100
780.000	52.74	52.74	1:100	1:100
790.000	52.74	52.74	1:100	1:100
800.000	52.74	52.74	1:100	1:100
810.000	52.74	52.74	1:100	1:100
820.000	52.74	52.74	1:100	1:100
830.000	52.74	52.74	1:100	1:100
840.000	52.74	52.74	1:100	1:100
850.000	52.74	52.74	1:100	1:100
860.000	52.74	52.74	1:100	1:100
870.000	52.74	52.74	1:100	1:100
880.000	52.74	52.74	1:100	1:100
890.000	52.74	52.74	1:100	1:100
900.000	52.74	52.74	1:100	1:100
910.000	52.74	52.74	1:100	1:100
920.000	52.74	52.74	1:100	1:100
930.000	52.74	52.74	1:100	1:100
940.000	52.74	52.74	1:100	1:100
950.000	52.74	52.74	1:100	1:100
960.000	52.74	52.74	1:100	1:100
970.000	52.74	52.74	1:100	1:100
980.000	52.74	52.74	1:100	1:100
990.000	52.74	52.74	1:100	1:100
1000.000	52.74	52.74	1:100	1:100

Vertical Section
 Scale: 1:1000 Horizontal, 1:100 Vertical
 Chainage: 500.0m - 1000.0m

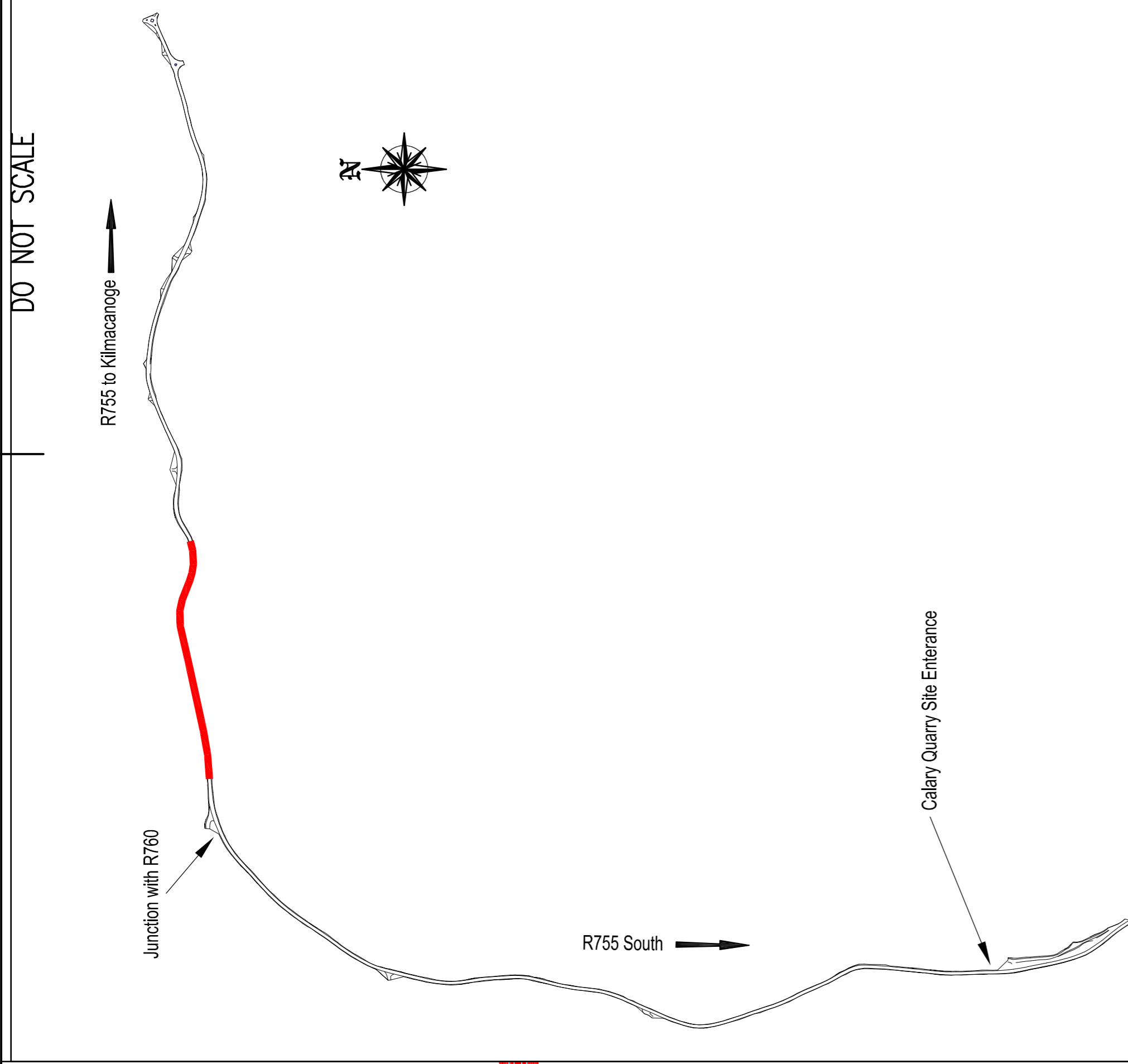
Key

- █ 120m Forward Sight Visibility
- █ 70m Forward Sight Visibility



Horizontal Section
 Scale: 1:1000
 Chainage: 1000.0m - 1500.0m

For inspection purposes only.
 Consent of copyright owner required for any other use.



Location Map
 Not to Scale

Key

- █ Road Section Shown in Horizontal & Vertical Section

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
For Information

Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
 Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

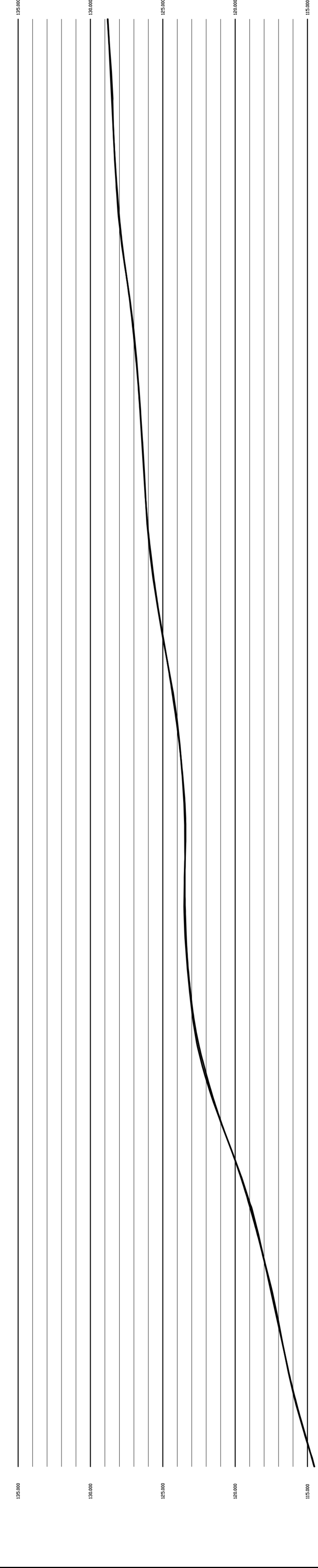
CLIENT:
 ARCHITECT:

PROJECT:
 Calary Quarry

TITLE:
 Horizontal & Vertical Alignment
 From Kilmacanoge to Calary Quarry

SCALE & SIZE: As Shown	CHECKED: AA	APPROVED: KB
CAD FILE:	DESIGN/DRAWN: NM	DATE: April 2007
PROJECT No: 20010186	DRAWING No: 0186/003	REP: A

© WSP Group plc

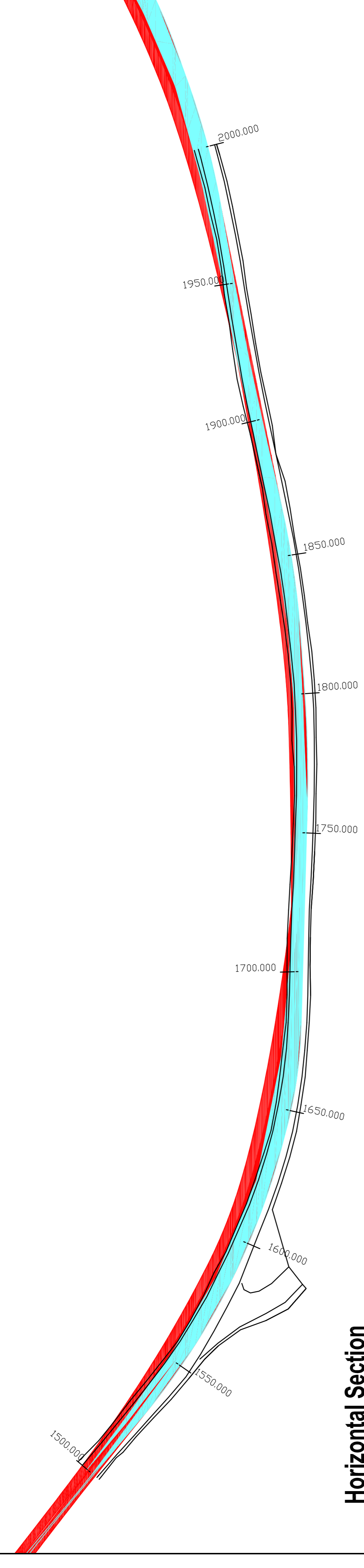


CHAINAGE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT
1000.00	1150.00	1150.00	1150.00	1150.00
1010.00	1145.00	1145.00	1145.00	1145.00
1020.00	1140.00	1140.00	1140.00	1140.00
1030.00	1135.00	1135.00	1135.00	1135.00
1040.00	1130.00	1130.00	1130.00	1130.00
1050.00	1125.00	1125.00	1125.00	1125.00
1060.00	1120.00	1120.00	1120.00	1120.00
1070.00	1115.00	1115.00	1115.00	1115.00
1080.00	1110.00	1110.00	1110.00	1110.00
1090.00	1105.00	1105.00	1105.00	1105.00
1100.00	1100.00	1100.00	1100.00	1100.00
1110.00	1095.00	1095.00	1095.00	1095.00
1120.00	1090.00	1090.00	1090.00	1090.00
1130.00	1085.00	1085.00	1085.00	1085.00
1140.00	1080.00	1080.00	1080.00	1080.00
1150.00	1075.00	1075.00	1075.00	1075.00
1160.00	1070.00	1070.00	1070.00	1070.00
1170.00	1065.00	1065.00	1065.00	1065.00
1180.00	1060.00	1060.00	1060.00	1060.00
1190.00	1055.00	1055.00	1055.00	1055.00
1200.00	1050.00	1050.00	1050.00	1050.00
1210.00	1045.00	1045.00	1045.00	1045.00
1220.00	1040.00	1040.00	1040.00	1040.00
1230.00	1035.00	1035.00	1035.00	1035.00
1240.00	1030.00	1030.00	1030.00	1030.00
1250.00	1025.00	1025.00	1025.00	1025.00
1260.00	1020.00	1020.00	1020.00	1020.00
1270.00	1015.00	1015.00	1015.00	1015.00
1280.00	1010.00	1010.00	1010.00	1010.00
1290.00	1005.00	1005.00	1005.00	1005.00
1300.00	1000.00	1000.00	1000.00	1000.00
1310.00	1000.00	1000.00	1000.00	1000.00
1320.00	1000.00	1000.00	1000.00	1000.00
1330.00	1000.00	1000.00	1000.00	1000.00
1340.00	1000.00	1000.00	1000.00	1000.00
1350.00	1000.00	1000.00	1000.00	1000.00
1360.00	1000.00	1000.00	1000.00	1000.00
1370.00	1000.00	1000.00	1000.00	1000.00
1380.00	1000.00	1000.00	1000.00	1000.00
1390.00	1000.00	1000.00	1000.00	1000.00
1400.00	1000.00	1000.00	1000.00	1000.00
1410.00	1000.00	1000.00	1000.00	1000.00
1420.00	1000.00	1000.00	1000.00	1000.00
1430.00	1000.00	1000.00	1000.00	1000.00
1440.00	1000.00	1000.00	1000.00	1000.00
1450.00	1000.00	1000.00	1000.00	1000.00
1460.00	1000.00	1000.00	1000.00	1000.00
1470.00	1000.00	1000.00	1000.00	1000.00
1480.00	1000.00	1000.00	1000.00	1000.00
1490.00	1000.00	1000.00	1000.00	1000.00
1500.00	1000.00	1000.00	1000.00	1000.00

Vertical Section
 Scale: 1:1000 Horizontal, 1:100 Vertical
 Chainage: 1000.0m - 1500.0m

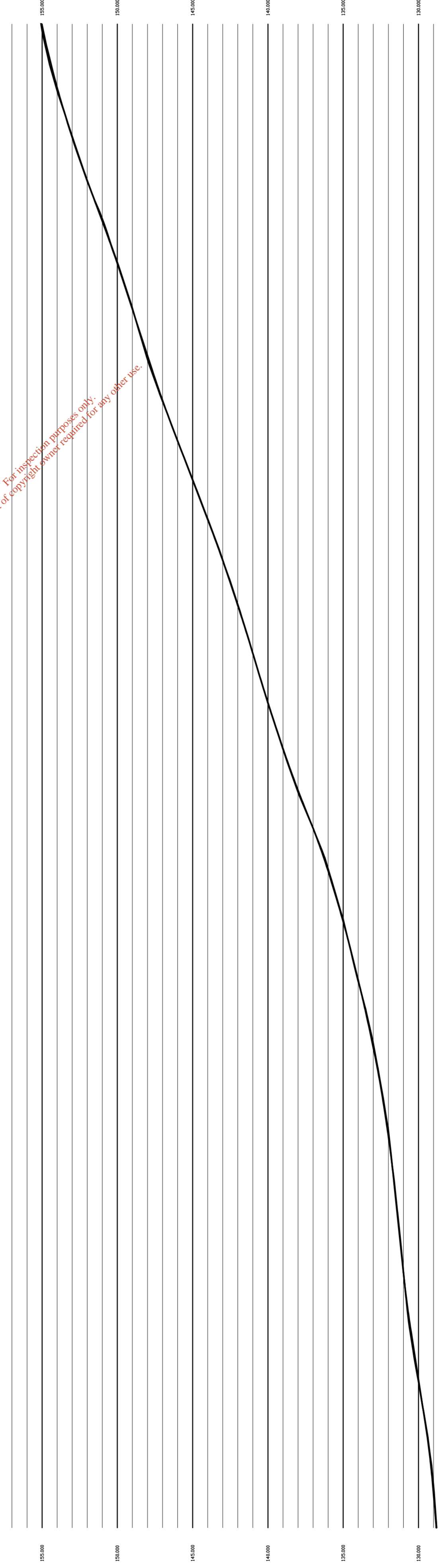
Key

- █ 120m Forward Sight Visibility
- █ 70m Forward Sight Visibility



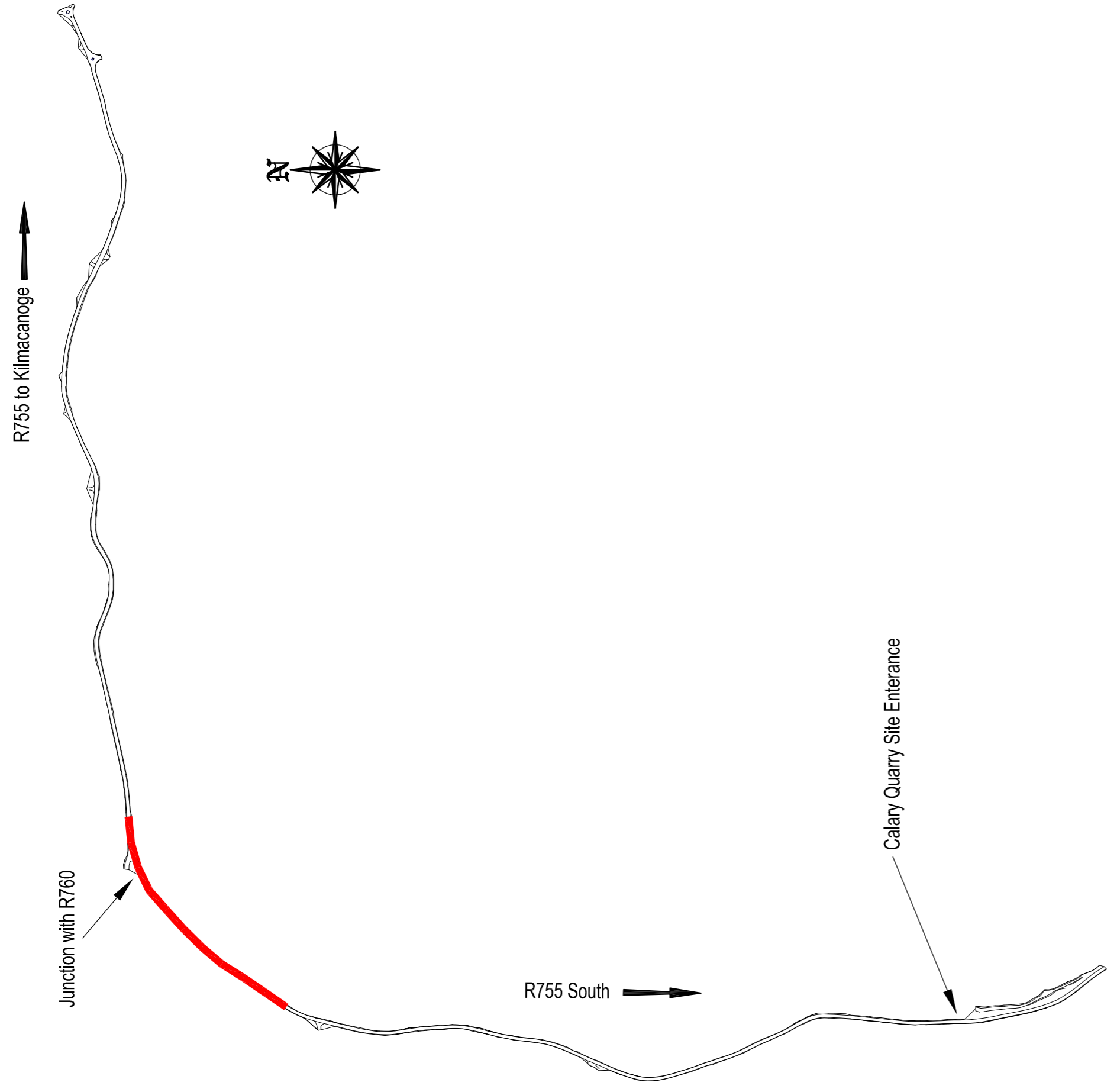
Horizontal Section
 Scale: 1:1000
 Chainage: 1500.0m - 2000.0m

For use only to reproduce only.
 Consent of copyright owner required for any other use.



Vertical Section
 Scale: 1:1000 Horizontal, 1:100 Vertical
 Chainage: 1500.0m - 2000.0m

DO NOT SCALE



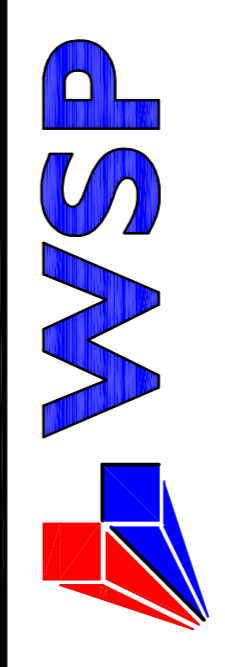
Location Map
 Not to Scale

Key

█ Road Section Shown in Horizontal & Vertical Section

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
For Information



Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
 Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT:
 Roadstone Dublin Ltd

ARCHITECT:

PROJECT:
 Calary Quarry

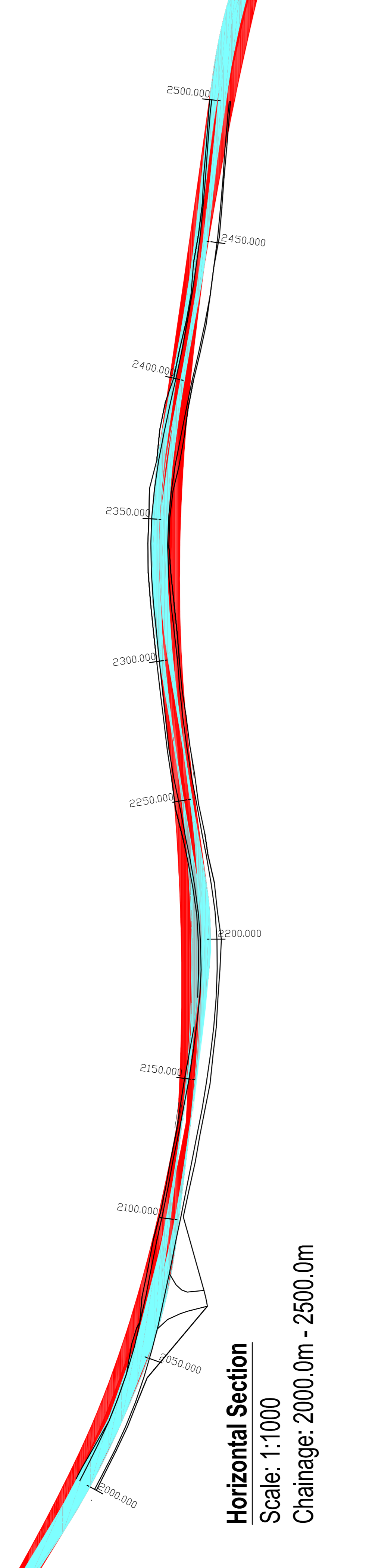
TITLE:
 Horizontal & Vertical Alignment
 From Kilmacragga to Calary Quarry

SCALE & SIZE: As Shown	CHECKED: AA	APPROVED: KB
CAD FILE:	DESIGN/DRAWN: NM	DATE: April 2007
PROJECT No: 20010186	DRAWING No: 0186/004	REP: A

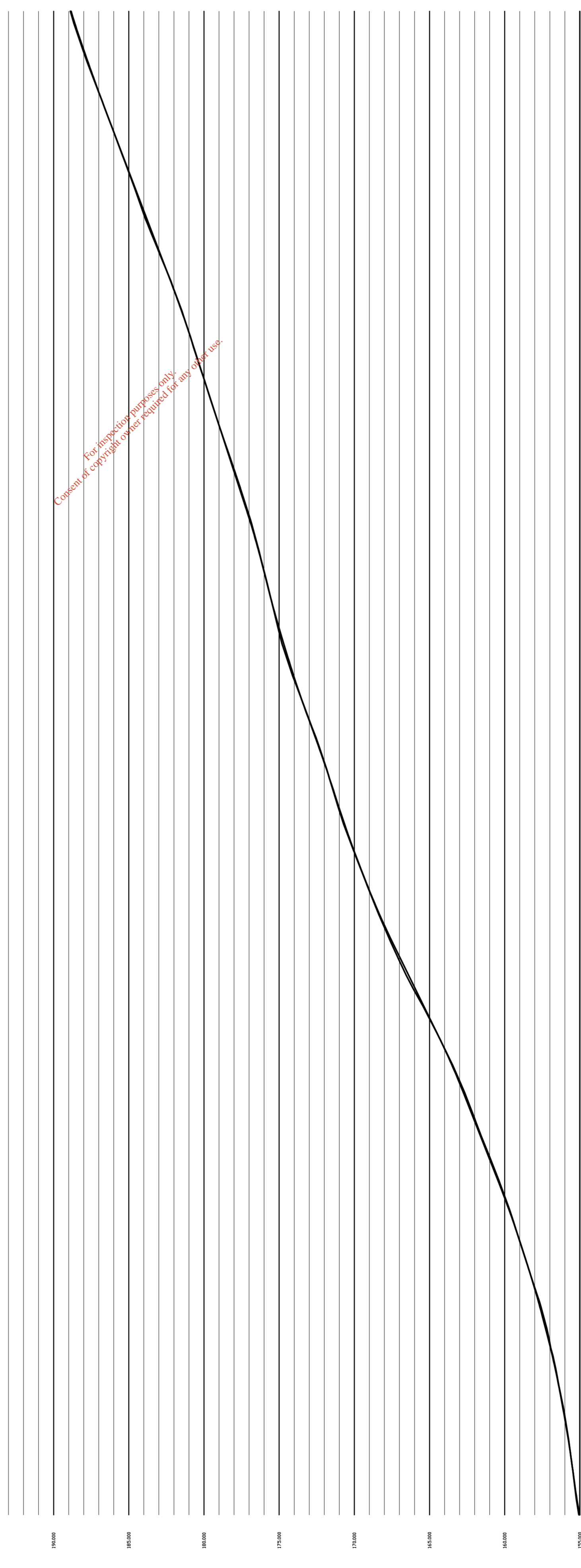
© WSP Group plc

CHAINAGE	VERTICAL CURVE LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT
1500.000	148.000	148.000	0.000	R= 25000
1505.000	148.000	148.000	0.000	R= 25000
1510.000	148.000	148.000	0.000	R= 25000
1515.000	148.000	148.000	0.000	R= 25000
1520.000	148.000	148.000	0.000	R= 25000
1525.000	148.000	148.000	0.000	R= 25000
1530.000	148.000	148.000	0.000	R= 25000
1535.000	148.000	148.000	0.000	R= 25000
1540.000	148.000	148.000	0.000	R= 25000
1545.000	148.000	148.000	0.000	R= 25000
1550.000	148.000	148.000	0.000	R= 25000
1555.000	148.000	148.000	0.000	R= 25000
1560.000	148.000	148.000	0.000	R= 25000
1565.000	148.000	148.000	0.000	R= 25000
1570.000	148.000	148.000	0.000	R= 25000
1575.000	148.000	148.000	0.000	R= 25000
1580.000	148.000	148.000	0.000	R= 25000
1585.000	148.000	148.000	0.000	R= 25000
1590.000	148.000	148.000	0.000	R= 25000
1595.000	148.000	148.000	0.000	R= 25000
1600.000	148.000	148.000	0.000	R= 25000
1605.000	148.000	148.000	0.000	R= 25000
1610.000	148.000	148.000	0.000	R= 25000
1615.000	148.000	148.000	0.000	R= 25000
1620.000	148.000	148.000	0.000	R= 25000
1625.000	148.000	148.000	0.000	R= 25000
1630.000	148.000	148.000	0.000	R= 25000
1635.000	148.000	148.000	0.000	R= 25000
1640.000	148.000	148.000	0.000	R= 25000
1645.000	148.000	148.000	0.000	R= 25000
1650.000	148.000	148.000	0.000	R= 25000
1655.000	148.000	148.000	0.000	R= 25000
1660.000	148.000	148.000	0.000	R= 25000
1665.000	148.000	148.000	0.000	R= 25000
1670.000	148.000	148.000	0.000	R= 25000
1675.000	148.000	148.000	0.000	R= 25000
1680.000	148.000	148.000	0.000	R= 25000
1685.000	148.000	148.000	0.000	R= 25000
1690.000	148.000	148.000	0.000	R= 25000
1695.000	148.000	148.000	0.000	R= 25000
1700.000	148.000	148.000	0.000	R= 25000
1705.000	148.000	148.000	0.000	R= 25000
1710.000	148.000	148.000	0.000	R= 25000
1715.000	148.000	148.000	0.000	R= 25000
1720.000	148.000	148.000	0.000	R= 25000
1725.000	148.000	148.000	0.000	R= 25000
1730.000	148.000	148.000	0.000	R= 25000
1735.000	148.000	148.000	0.000	R= 25000
1740.000	148.000	148.000	0.000	R= 25000
1745.000	148.000	148.000	0.000	R= 25000
1750.000	148.000	148.000	0.000	R= 25000
1755.000	148.000	148.000	0.000	R= 25000
1760.000	148.000	148.000	0.000	R= 25000
1765.000	148.000	148.000	0.000	R= 25000
1770.000	148.000	148.000	0.000	R= 25000
1775.000	148.000	148.000	0.000	R= 25000
1780.000	148.000	148.000	0.000	R= 25000
1785.000	148.000	148.000	0.000	R= 25000
1790.000	148.000	148.000	0.000	R= 25000
1795.000	148.000	148.000	0.000	R= 25000
1800.000	148.000	148.000	0.000	R= 25000
1805.000	148.000	148.000	0.000	R= 25000
1810.000	148.000	148.000	0.000	R= 25000
1815.000	148.000	148.000	0.000	R= 25000
1820.000	148.000	148.000	0.000	R= 25000
1825.000	148.000	148.000	0.000	R= 25000
1830.000	148.000	148.000	0.000	R= 25000
1835.000	148.000	148.000	0.000	R= 25000
1840.000	148.000	148.000	0.000	R= 25000
1845.000	148.000	148.000	0.000	R= 25000
1850.000	148.000	148.000	0.000	R= 25000
1855.000	148.000	148.000	0.000	R= 25000
1860.000	148.000	148.000	0.000	R= 25000
1865.000	148.000	148.000	0.000	R= 25000
1870.000	148.000	148.000	0.000	R= 25000
1875.000	148.000	148.000	0.000	R= 25000
1880.000	148.000	148.000	0.000	R= 25000
1885.000	148.000	148.000	0.000	R= 25000
1890.000	148.000	148.000	0.000	R= 25000
1895.000	148.000	148.000	0.000	R= 25000
1900.000	148.000	148.000	0.000	R= 25000
1905.000	148.000	148.000	0.000	R= 25000
1910.000	148.000	148.000	0.000	R= 25000
1915.000	148.000	148.000	0.000	R= 25000
1920.000	148.000	148.000	0.000	R= 25000
1925.000	148.000	148.000	0.000	R= 25000
1930.000	148.000	148.000	0.000	R= 25000
1935.000	148.000	148.000	0.000	R= 25000
1940.000	148.000	148.000	0.000	R= 25000
1945.000	148.000	148.000	0.000	R= 25000
1950.000	148.000	148.000	0.000	R= 25000
1955.000	148.000	148.000	0.000	R= 25000
1960.000	148.000	148.000	0.000	R= 25000
1965.000	148.000	148.000	0.000	R= 25000
1970.000	148.000	148.000	0.000	R= 25000
1975.000	148.000	148.000	0.000	R= 25000
1980.000	148.000	148.000	0.000	R= 25000
1985.000	148.000	148.000	0.000	R= 25000
1990.000	148.000	148.000	0.000	R= 25000
1995.000	148.000	148.000	0.000	R= 25000
2000.000	148.000	148.000	0.000	R= 25000

Key	
█	120m Forward Sight Visibility
█	70m Forward Sight Visibility

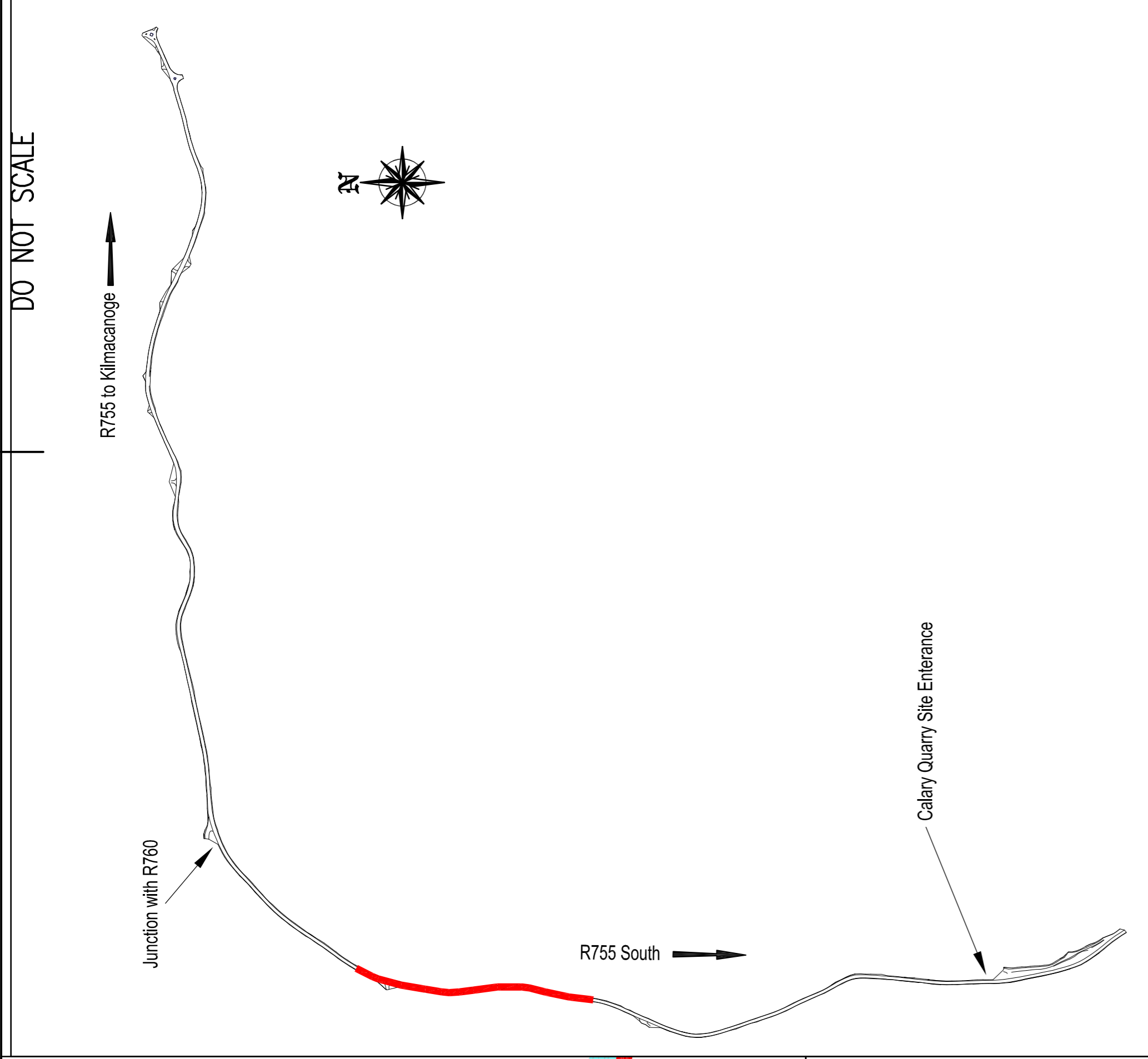


Horizontal Section
 Scale: 1:1000
 Chainage: 2000.0m - 2500.0m



CHAINAGE	EXTREME GRADE LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT
2000.000	173.24	173.24	173.24	173.24
2005.000	173.24	173.24	173.24	173.24
2010.000	173.24	173.24	173.24	173.24
2015.000	173.24	173.24	173.24	173.24
2020.000	173.24	173.24	173.24	173.24
2025.000	173.24	173.24	173.24	173.24
2030.000	173.24	173.24	173.24	173.24
2035.000	173.24	173.24	173.24	173.24
2040.000	173.24	173.24	173.24	173.24
2045.000	173.24	173.24	173.24	173.24
2050.000	173.24	173.24	173.24	173.24
2055.000	173.24	173.24	173.24	173.24
2060.000	173.24	173.24	173.24	173.24
2065.000	173.24	173.24	173.24	173.24
2070.000	173.24	173.24	173.24	173.24
2075.000	173.24	173.24	173.24	173.24
2080.000	173.24	173.24	173.24	173.24
2085.000	173.24	173.24	173.24	173.24
2090.000	173.24	173.24	173.24	173.24
2095.000	173.24	173.24	173.24	173.24
2100.000	173.24	173.24	173.24	173.24
2105.000	173.24	173.24	173.24	173.24
2110.000	173.24	173.24	173.24	173.24
2115.000	173.24	173.24	173.24	173.24
2120.000	173.24	173.24	173.24	173.24
2125.000	173.24	173.24	173.24	173.24
2130.000	173.24	173.24	173.24	173.24
2135.000	173.24	173.24	173.24	173.24
2140.000	173.24	173.24	173.24	173.24
2145.000	173.24	173.24	173.24	173.24
2150.000	173.24	173.24	173.24	173.24
2155.000	173.24	173.24	173.24	173.24
2160.000	173.24	173.24	173.24	173.24
2165.000	173.24	173.24	173.24	173.24
2170.000	173.24	173.24	173.24	173.24
2175.000	173.24	173.24	173.24	173.24
2180.000	173.24	173.24	173.24	173.24
2185.000	173.24	173.24	173.24	173.24
2190.000	173.24	173.24	173.24	173.24
2195.000	173.24	173.24	173.24	173.24
2200.000	173.24	173.24	173.24	173.24
2205.000	173.24	173.24	173.24	173.24
2210.000	173.24	173.24	173.24	173.24
2215.000	173.24	173.24	173.24	173.24
2220.000	173.24	173.24	173.24	173.24
2225.000	173.24	173.24	173.24	173.24
2230.000	173.24	173.24	173.24	173.24
2235.000	173.24	173.24	173.24	173.24
2240.000	173.24	173.24	173.24	173.24
2245.000	173.24	173.24	173.24	173.24
2250.000	173.24	173.24	173.24	173.24
2255.000	173.24	173.24	173.24	173.24
2260.000	173.24	173.24	173.24	173.24
2265.000	173.24	173.24	173.24	173.24
2270.000	173.24	173.24	173.24	173.24
2275.000	173.24	173.24	173.24	173.24
2280.000	173.24	173.24	173.24	173.24
2285.000	173.24	173.24	173.24	173.24
2290.000	173.24	173.24	173.24	173.24
2295.000	173.24	173.24	173.24	173.24
2300.000	173.24	173.24	173.24	173.24
2305.000	173.24	173.24	173.24	173.24
2310.000	173.24	173.24	173.24	173.24
2315.000	173.24	173.24	173.24	173.24
2320.000	173.24	173.24	173.24	173.24
2325.000	173.24	173.24	173.24	173.24
2330.000	173.24	173.24	173.24	173.24
2335.000	173.24	173.24	173.24	173.24
2340.000	173.24	173.24	173.24	173.24
2345.000	173.24	173.24	173.24	173.24
2350.000	173.24	173.24	173.24	173.24
2355.000	173.24	173.24	173.24	173.24
2360.000	173.24	173.24	173.24	173.24
2365.000	173.24	173.24	173.24	173.24
2370.000	173.24	173.24	173.24	173.24
2375.000	173.24	173.24	173.24	173.24
2380.000	173.24	173.24	173.24	173.24
2385.000	173.24	173.24	173.24	173.24
2390.000	173.24	173.24	173.24	173.24
2395.000	173.24	173.24	173.24	173.24
2400.000	173.24	173.24	173.24	173.24
2405.000	173.24	173.24	173.24	173.24
2410.000	173.24	173.24	173.24	173.24
2415.000	173.24	173.24	173.24	173.24
2420.000	173.24	173.24	173.24	173.24
2425.000	173.24	173.24	173.24	173.24
2430.000	173.24	173.24	173.24	173.24
2435.000	173.24	173.24	173.24	173.24
2440.000	173.24	173.24	173.24	173.24
2445.000	173.24	173.24	173.24	173.24
2450.000	173.24	173.24	173.24	173.24
2455.000	173.24	173.24	173.24	173.24
2460.000	173.24	173.24	173.24	173.24
2465.000	173.24	173.24	173.24	173.24
2470.000	173.24	173.24	173.24	173.24
2475.000	173.24	173.24	173.24	173.24
2480.000	173.24	173.24	173.24	173.24
2485.000	173.24	173.24	173.24	173.24
2490.000	173.24	173.24	173.24	173.24
2495.000	173.24	173.24	173.24	173.24
2500.000	173.24	173.24	173.24	173.24

Vertical Section
 Scale: 1:1000 Horizontal, 1:100 Vertical
 Chainage: 2000.0m - 2500.0m



Location Map
 Not to Scale

Key
█ Road Section Shown in Horizontal & Vertical Section

REV	DWE	BY	DESCRIPTION	CHK	APP

For Information

Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
 Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT: Roadstone Dublin Ltd

PROJECT: Calary Quarry

TITLE: Horizontal & Vertical Alignment
 From Kilmacnagoe to Calary Quarry

SCALE & SIZE: As Shown
CHECKED: AA
APPROVED: KB

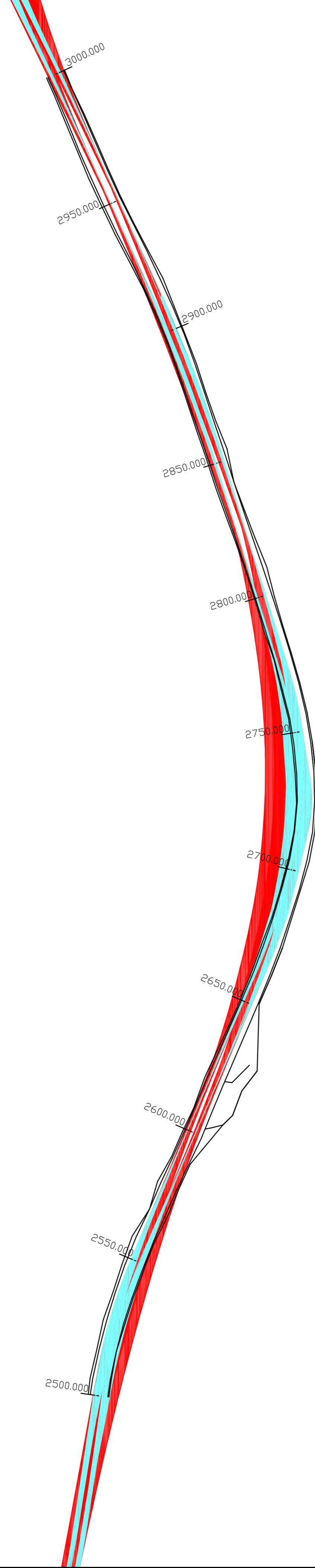
CAD FILE: **DESIGN/BRANCH:** NM
DATE: April 2007

PROJECT No: 20010186
DRAWING No: 0186/005
REP: A

© WSP Group plc

Key

- █ 120m Forward Sight Visibility
- █ 70m Forward Sight Visibility

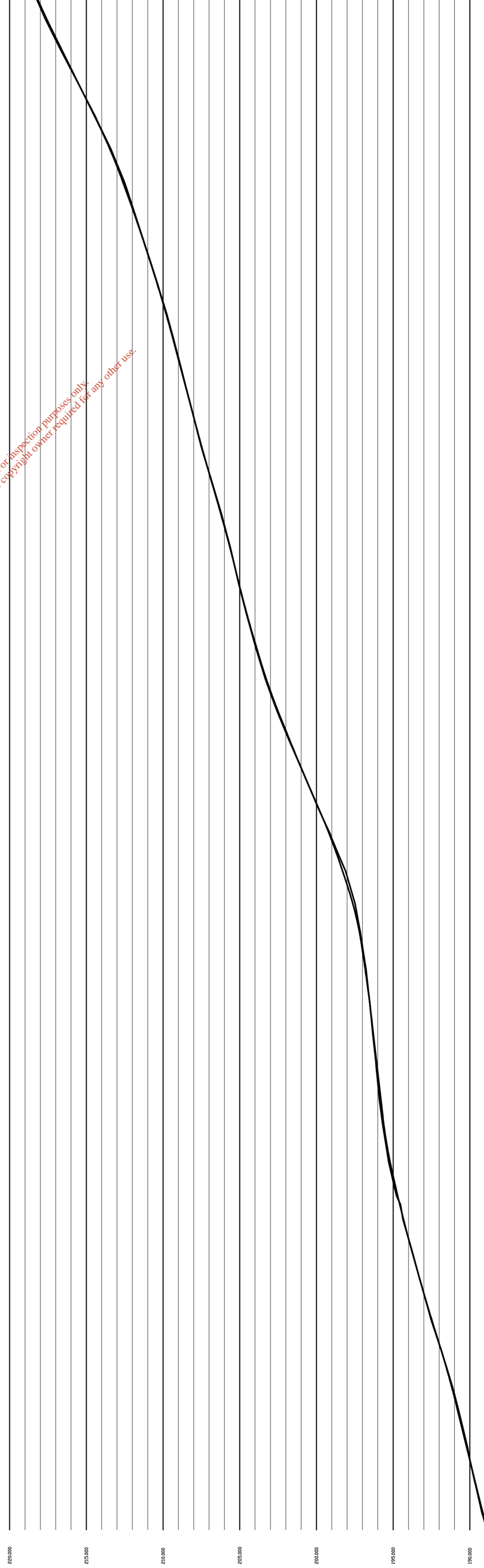


Horizontal Section

Scale: 1:1000

Chainage: 2500.0m - 3000.0m

For comparison purposes only.
Consent of copyright owner required for any other use.

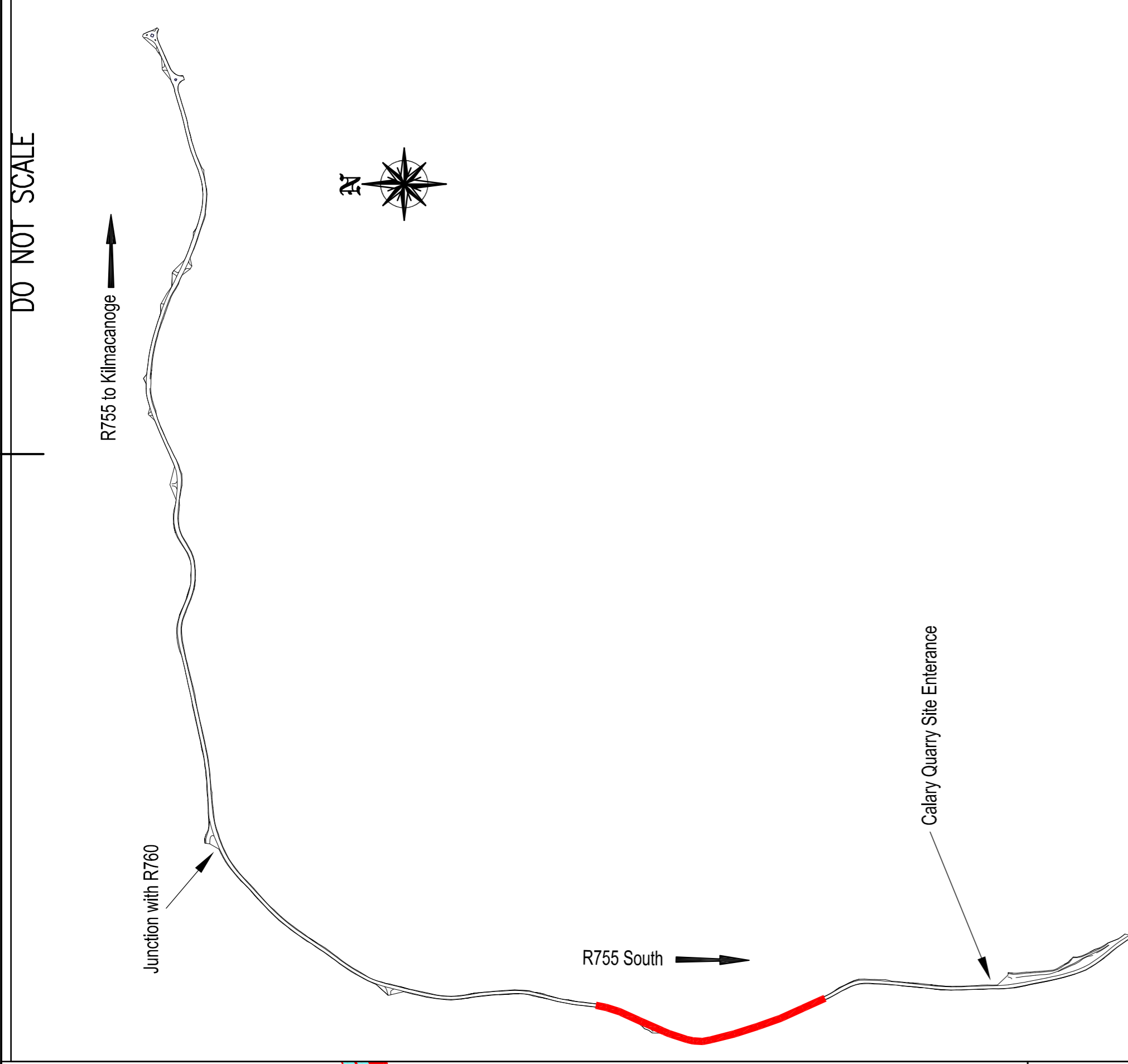


CHAINAGE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT
2500.000	195.000	195.000		
2510.000	195.500	195.500		
2520.000	196.000	196.000		
2530.000	196.500	196.500		
2540.000	197.000	197.000		
2550.000	197.500	197.500		
2560.000	198.000	198.000		
2570.000	198.500	198.500		
2580.000	199.000	199.000		
2590.000	199.500	199.500		
2600.000	200.000	200.000		
2610.000	200.500	200.500		
2620.000	201.000	201.000		
2630.000	201.500	201.500		
2640.000	202.000	202.000		
2650.000	202.500	202.500		
2660.000	203.000	203.000		
2670.000	203.500	203.500		
2680.000	204.000	204.000		
2690.000	204.500	204.500		
2700.000	205.000	205.000		
2710.000	205.500	205.500		
2720.000	206.000	206.000		
2730.000	206.500	206.500		
2740.000	207.000	207.000		
2750.000	207.500	207.500		
2760.000	208.000	208.000		
2770.000	208.500	208.500		
2780.000	209.000	209.000		
2790.000	209.500	209.500		
2800.000	210.000	210.000		
2810.000	210.500	210.500		
2820.000	211.000	211.000		
2830.000	211.500	211.500		
2840.000	212.000	212.000		
2850.000	212.500	212.500		
2860.000	213.000	213.000		
2870.000	213.500	213.500		
2880.000	214.000	214.000		
2890.000	214.500	214.500		
2900.000	215.000	215.000		
2910.000	215.500	215.500		
2920.000	216.000	216.000		
2930.000	216.500	216.500		
2940.000	217.000	217.000		
2950.000	217.500	217.500		
2960.000	218.000	218.000		
2970.000	218.500	218.500		
2980.000	219.000	219.000		
2990.000	219.500	219.500		
3000.000	220.000	220.000		

Vertical Section

Scale: 1:1000 Horizontal, 1:100 Vertical

Chainage: 2500.0m - 3000.0m



Location Map
Not to Scale

Key

- █ Road Section Shown in Horizontal & Vertical Section

REV	DATE	BY	DESCRIPTION	CHK	APP

For Information

WSP

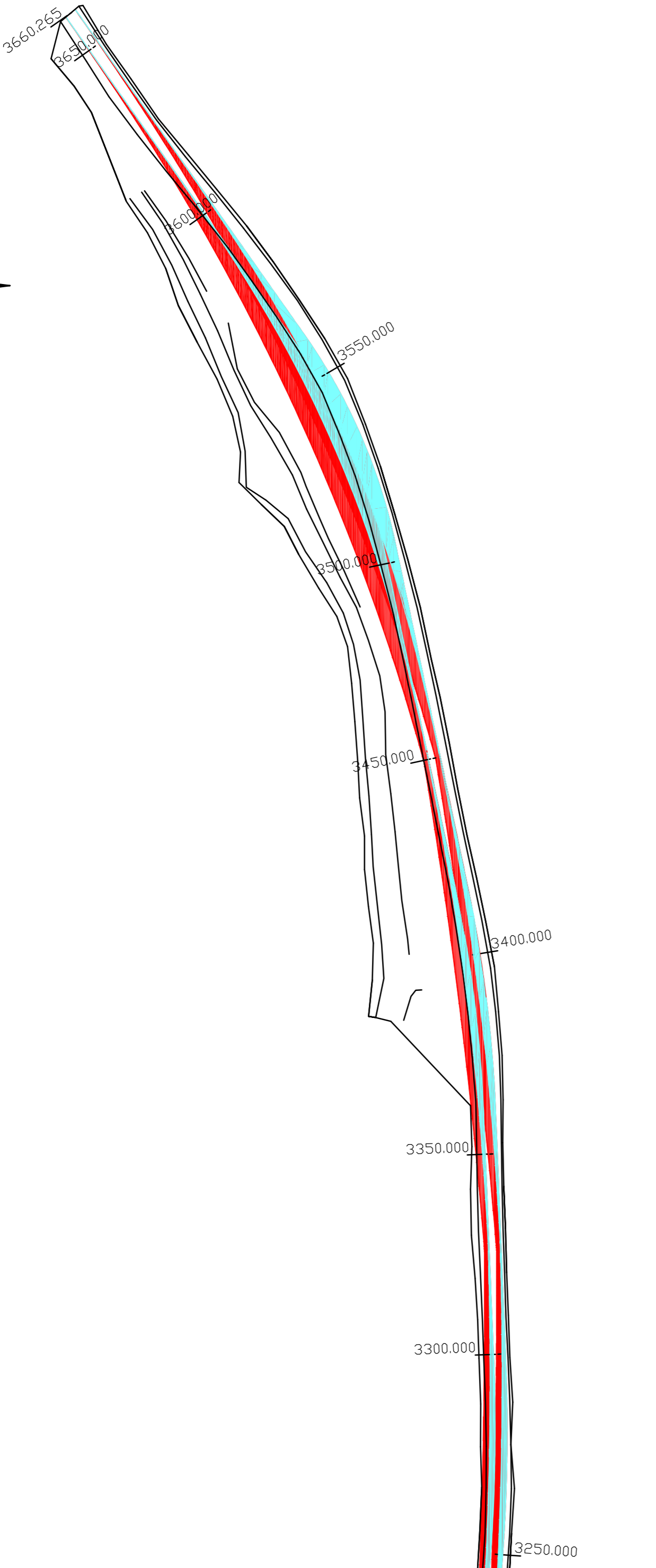
Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT: Roadstone Dublin Ltd
ARCHITECT:
PROJECT: Calary Quarry
TITLE: Horizontal & Vertical Alignment From Kilmacanogue to Calary Quarry

SCALE & SIZE: As Shown
CHECKED: AA
APPROVED: KB
CAD FILE:
DESIGN/DRAWN: NM
DATE: April 2007
PROJECT No: 20010186
DRAWING No: 0186/006
REF: A

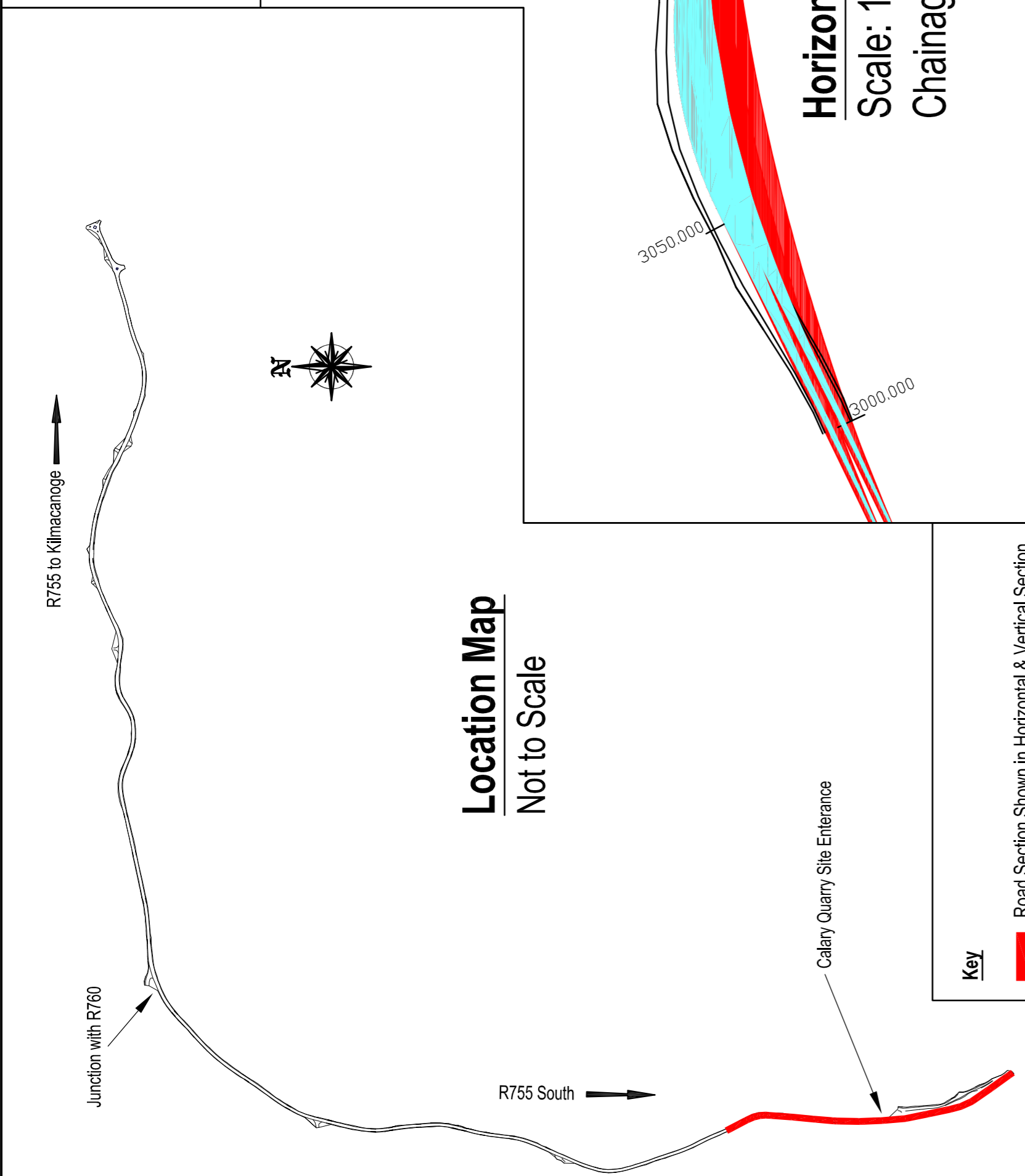
© WSP Group plc

DO NOT SCALE

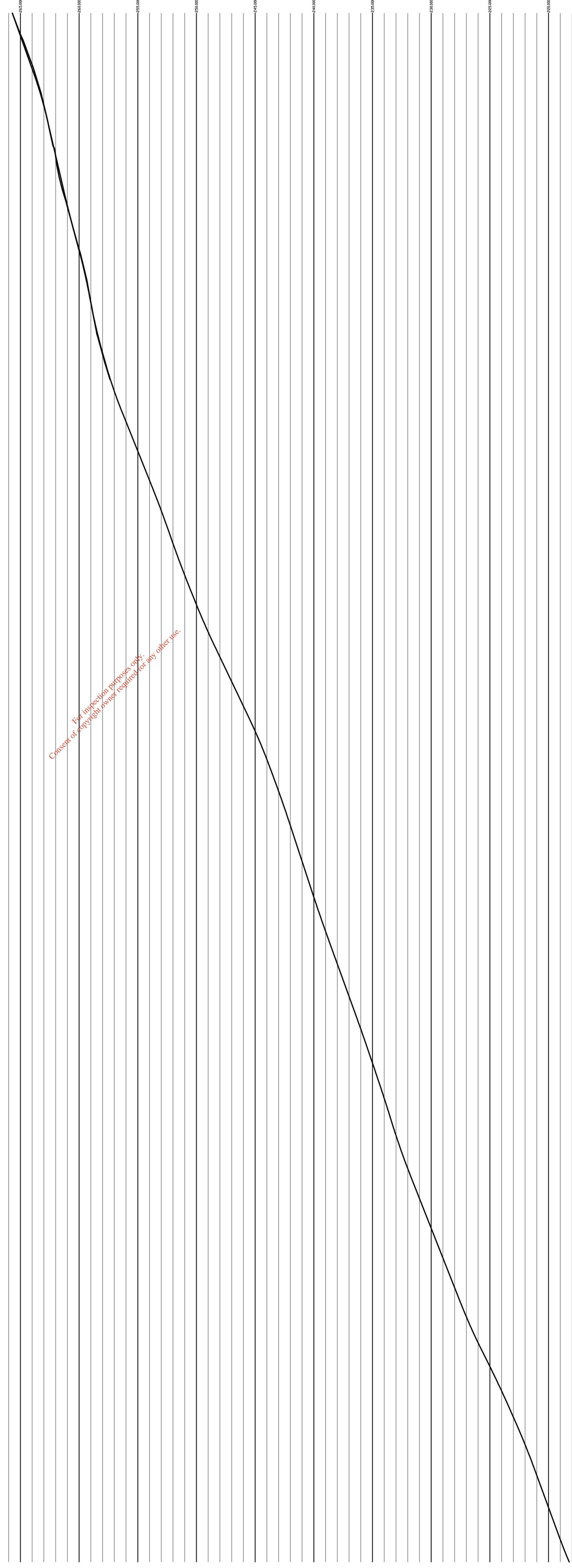


Key

- 120m Forward Sight Visibility
- 70m Forward Sight Visibility

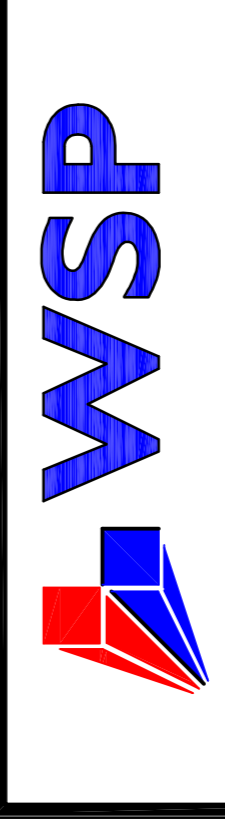


Vertical Section
Scale: 1:1000 Horizontal,
1:100 Vertical
Chainage: 3000.0m - 3660.0m



REV	DATE	BY	DESCRIPTION	CHK	APPD

FOR INFORMATION



Floor 4, Harcourt Centre, Block 3, Harcourt Road, Dublin 2
Tel: +353 (0)1 418 2224 Fax: +353 (0)1 418 2248
<http://www.wspgroup.com>

CLIENT: Roadstone Dublin Ltd
ARCHITECT:

PROJECT: Calary Quarry

TITLE: Horizontal & Vertical Alignment
From Kilmacanogue to Calary Quarry

SCALE & SIZE	CHECKED: AA	APPROVED: KB
CAD FILE	DESIGN/WORK: NM	DATE: April 2007
PROJECT No:	DRAWING No:	REV:
20010186	0186/007	A

© WSP Group plc

CHAINAGE	EXISTING GROUND LEVEL	VERTICAL ALIGNMENT	PROPOSED GROUND LEVEL	VERTICAL ALIGNMENT	PROPOSED GROUND LEVEL
3000.000	200.000	200.000	200.000	200.000	200.000
3010.000	200.000	200.000	200.000	200.000	200.000
3020.000	200.000	200.000	200.000	200.000	200.000
3030.000	200.000	200.000	200.000	200.000	200.000
3040.000	200.000	200.000	200.000	200.000	200.000
3050.000	200.000	200.000	200.000	200.000	200.000
3060.000	200.000	200.000	200.000	200.000	200.000
3070.000	200.000	200.000	200.000	200.000	200.000
3080.000	200.000	200.000	200.000	200.000	200.000
3090.000	200.000	200.000	200.000	200.000	200.000
3100.000	200.000	200.000	200.000	200.000	200.000
3110.000	200.000	200.000	200.000	200.000	200.000
3120.000	200.000	200.000	200.000	200.000	200.000
3130.000	200.000	200.000	200.000	200.000	200.000
3140.000	200.000	200.000	200.000	200.000	200.000
3150.000	200.000	200.000	200.000	200.000	200.000
3160.000	200.000	200.000	200.000	200.000	200.000
3170.000	200.000	200.000	200.000	200.000	200.000
3180.000	200.000	200.000	200.000	200.000	200.000
3190.000	200.000	200.000	200.000	200.000	200.000
3200.000	200.000	200.000	200.000	200.000	200.000
3210.000	200.000	200.000	200.000	200.000	200.000
3220.000	200.000	200.000	200.000	200.000	200.000
3230.000	200.000	200.000	200.000	200.000	200.000
3240.000	200.000	200.000	200.000	200.000	200.000
3250.000	200.000	200.000	200.000	200.000	200.000
3260.000	200.000	200.000	200.000	200.000	200.000
3270.000	200.000	200.000	200.000	200.000	200.000
3280.000	200.000	200.000	200.000	200.000	200.000
3290.000	200.000	200.000	200.000	200.000	200.000
3300.000	200.000	200.000	200.000	200.000	200.000
3310.000	200.000	200.000	200.000	200.000	200.000
3320.000	200.000	200.000	200.000	200.000	200.000
3330.000	200.000	200.000	200.000	200.000	200.000
3340.000	200.000	200.000	200.000	200.000	200.000
3350.000	200.000	200.000	200.000	200.000	200.000
3360.000	200.000	200.000	200.000	200.000	200.000
3370.000	200.000	200.000	200.000	200.000	200.000
3380.000	200.000	200.000	200.000	200.000	200.000
3390.000	200.000	200.000	200.000	200.000	200.000
3400.000	200.000	200.000	200.000	200.000	200.000
3410.000	200.000	200.000	200.000	200.000	200.000
3420.000	200.000	200.000	200.000	200.000	200.000
3430.000	200.000	200.000	200.000	200.000	200.000
3440.000	200.000	200.000	200.000	200.000	200.000
3450.000	200.000	200.000	200.000	200.000	200.000
3460.000	200.000	200.000	200.000	200.000	200.000
3470.000	200.000	200.000	200.000	200.000	200.000
3480.000	200.000	200.000	200.000	200.000	200.000
3490.000	200.000	200.000	200.000	200.000	200.000
3500.000	200.000	200.000	200.000	200.000	200.000
3510.000	200.000	200.000	200.000	200.000	200.000
3520.000	200.000	200.000	200.000	200.000	200.000
3530.000	200.000	200.000	200.000	200.000	200.000
3540.000	200.000	200.000	200.000	200.000	200.000
3550.000	200.000	200.000	200.000	200.000	200.000
3560.000	200.000	200.000	200.000	200.000	200.000
3570.000	200.000	200.000	200.000	200.000	200.000
3580.000	200.000	200.000	200.000	200.000	200.000
3590.000	200.000	200.000	200.000	200.000	200.000
3600.000	200.000	200.000	200.000	200.000	200.000
3610.000	200.000	200.000	200.000	200.000	200.000
3620.000	200.000	200.000	200.000	200.000	200.000
3630.000	200.000	200.000	200.000	200.000	200.000
3640.000	200.000	200.000	200.000	200.000	200.000
3650.000	200.000	200.000	200.000	200.000	200.000
3660.000	200.000	200.000	200.000	200.000	200.000



Appendix B Pavement Condition Details

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Road No	R755	Starting at:	Chainage	0m
Inspection Date	12/03/2009	Finishing at:	Chainage	1500m

Chainage (metres)		50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	No. Yes	No. Sections	% Length Affected	Road Rating Calculation						
Sight lines	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0						
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0						
Width of carriageway (m)		7	7	7.3	7.2	7.1	8.5	8.7	8.8	6.6	6.8	6.9	7.3	7.3	7.3	6.7	7.6	8.6	7.3	7.4	7.6	7.9	7.6	7.2	6.9	7	7.1	6.8	6.8	6.7	6.8	Average Width			7.33						
Surfacing Type																																								7.33	
Surface Related Defects	Loss of chippings (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0.00					
	Ravelling / Lost of Blacktop (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0.07					
	Bleeding/Fatting up (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0.06					
Structurally Related Surface Defects	Cocodril cracking (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				2.33						
	Rutting >20mm (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0						
	Rutting <20mm (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0						
Pavement Edge deterioration	LHS (% length)	0	0	0	0	0	0	0	0	0	0	0	10	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0.67						
	RHS (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	5				0.33						
Stability of surface materials	Slipage cracks Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
	Shoving Yes/No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	1	30	3.33							
Stability of pavement or soil	Heaving Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
																																								0	
Other Pavement Defects	Reflection cracking Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
	Potholes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
Drainage	Need Maintenance Yes/No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	2	30	6.67							
	Need Minor Improvement Yes/No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	1	30	3.33							
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
Road Signs	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
Road Lines	Lines - poor condition Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
	Lines required Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
Delineator posts	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0							

Rating 0.111267

Ratings
 Good= <1
 Deficient= >1 & <3
 Poor= >3

For inspection purposes only. Consent of copyright owner required for other use.

Road No	R755	Starting at:	Chainage	1550	m
Inspection Date	12/03/2009	Finishing at:	Chainage	3000	m

Chainage (metres)		1550	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000	No. Yes	No. Sections	% Length Affected	Road Rating Calculation		
Sight lines	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0			
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	0	30	0			
Width of carriageway (m)		7.5	8.2	6.9	6.5	6.2	6.5	6.5	6.5	6.1	6.2	6.2	6.6	6.3	5.9	6.1	6.1	6.1	5.7	5.9	6.2	6.5	6.3	6.2	6.1	6.1	6.1	6.2	6.4	6.5	6	Average Width		6.35			
Surfacing Type																																					
Surface Related Defects	Loss of chippings (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0.00	0		
	Ravelling / Lost of Blacktop (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0.00	0		
	Bleeding/Fatting up (% area)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0			0.07	0		
Structurally Related Surface Defects	Cocodril cracking (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0			
	Rutting >20mm (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0			
	Rutting <20mm (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0		
Pavement Edge deterioration	LHS (% length)	0	0	10	0	5	0	0	0	0	0	0	0	10	2	5	0	0	0	0	0	0	0	0	20	0	0	0	0	0			1.33	50			
	RHS (% length)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	20	0	0	10	0	5			1.33	50			
Stability of surface materials	Slipage cracks Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Shoving Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
Stability of pavement or soil	Heaving Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
Other Pavement Defects	Reflection cracking Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Potholes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			1	30	3.33		
Drainage	Need Maintenance Yes/No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No			4	30	13.33		
	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
Road Signs	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
Road Lines	Lines - poor condition Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Lines required Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
Delineator posts	Need Minor Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		
	Need Major Improvement Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No			0	30	0		

Rating 0.316667

Ratings
 Good= <1
 Deficient= >1 & <3
 Poor= >3

For inspection purposes only. Consent of copyright owner required.



Chainage	50m
Photo No.	50

Chainage	300m
Photo No.	60



Chainage	400m
Photo No.	63

Chainage	600m
Photo No.	68



Chainage	650m
Photo No.	70

Chainage	700m
Photo No.	72

For inspection purposes only
Consent of copyright owner required for any other use



Chainage	850m
Photo No.	76

Chainage	1100m
Photo No.	83



Chainage	1350m
Photo No.	89

Chainage	1350m
Photo No.	90



Chainage	1400m
Photo No.	92

Chainage	2150m
Photo No.	109

For inspection purposes only
Consent of copyright owner required for any other use



Chainage	2150m
Photo No.	110

Chainage	2150m
Photo No.	111



Chainage	2220m
Photo No.	112

Chainage	2250m
Photo No.	116

For inspection purposes only.
 Consent of copyright owner required for any other use.



Chainage	2400m
Photo No.	120

Chainage	2450m
Photo No.	121



Chainage	2500m
Photo No.	124

Chainage	2700m
Photo No.	131

For inspection purposes only.
Consent of copyright owner required for any other use.



Appendix D NRA Tables

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Road Type	S2			WS2	D2AP		D3AP	D2M		D3M
	6m	7.0m	7.3m		Dual 7.0m	Dual 7.5m		Dual 7.0m	Dual 7.5m	
Carriageway Width (ex. hard strips)				10m			Dual 10.5m or 11.25m			Dual 10.5m or 11.25m
Degree of Access and Junctions	H	M	L	M	L	M	L	L	L	L
With hard shoulders			21	17	15	10	8	7	5	4
Without hard shoulders:										
With 3.0m Verge	(29)	(26)	(23)	(21)	(19)	(17)	(10)	(9)	(6)	
With 1.5m Verge	(31)	(28)	(25)	(23)	(21)	(19)	(17)	(15)	(13)	(11)
With 0.5m Verge	(33)	(30)	(27)	(25)	(23)	(21)	(19)	(17)	(15)	(13)

() : Non-standard cross-section

There is no research data available for 4 lane Single Carriageway roads between 12 and 15m width (S4). In the limited circumstances for their use described in this document, Design Speed should be estimated assuming a normal D2AP with a Layout Constraint of 15 - 13km/h

Table 1 : Layout Constraint, Lc km/h

DESIGN SPEED (km/h)	120	100	85	70	60	50	V ² /R
STOPPING SIGHT DISTANCE m							
Desirable Minimum	295	215	160	120	90	70	
One Step below Desirable Minimum	215	160	120	90	70	50	
Two Steps below Desirable Minimum	160	120	90	70	50	50	
HORIZONTAL CURVATURE m							
Minimum R* without elimination of Adverse Camber and Transitions	2880	2040	1440	1020	720	510	5
Minimum R* with Superelevation of 2.5%	2040	1440	1020	720	510	360	7.07
Minimum R with Superelevation of 3.5%	1440	1020	720	510	360	255	10
Desirable Minimum R with Superelevation of 5%	1020	720	510	360	255	180	14.14
One Step below Desirable Min R with Superelevation of 7%	720	510	360	255	180	127	20
Two Steps below Desirable Min R with Superelevation of 7%	510	360	255	180	127	90	28.28
VERTICAL CURVATURE - CREST							
Desirable Minimum* Crest K Value	182	100	55	30	17	10	
One Step below Desirable Min Crest K Value	100	55	30	17	10	6.5	
Two Steps below Desirable Min Crest K Value	55	30	17	10	6.5	6.5	
VERTICAL CURVATURE - SAG							
Desirable Minimum Sag K Value	53	37	26	20	13	9	
One Step below Desirable Min Sag K Value	37	26	20	13	9	6.5	
Two Steps below Desirable Min Sag K Value	26	20	13	9	6.5	6.5	
OVERTAKING SIGHT DISTANCES							
Full Overtaking Sight Distance FOSD m.	N/A	580	490	410	345	290	
FOSD Overtaking Crest K Value	N/A	400	285	200	142	100	

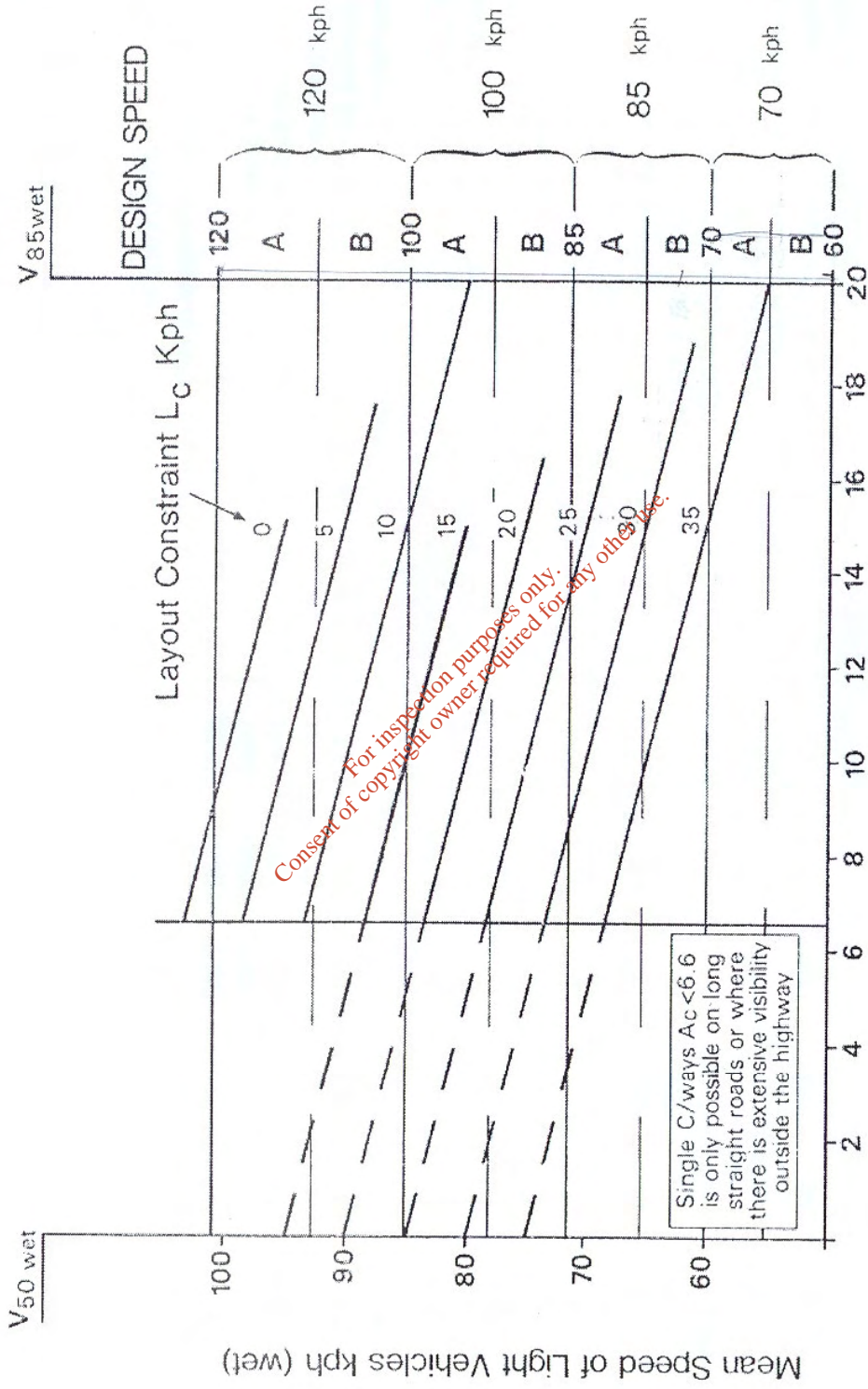
Notes

* Not to be used in the design of single carriageways (see Paragraphs 7.25 to 7.30)

The V²/R values simply represent a convenient means of identifying the relative levels of design parameters, irrespective of Design Speed.

K Value = Curve length divided by algebraic change of gradient %. See Paragraph 4.5.

Table 3 : Design Speed Related Parameters



ALIGNMENT CONSTRAINT A_c kph for Dual C/ways = $6.6 + B/10$
 Single C/ways = $12 - V_{SI}/60 + 2B/45$

Figure 1 : Selection of Design Speed (Rural Roads)



Appendix E R755 Road widths

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Appendix E R755 Road Widths

Chainage (m)	Road Width (m)	Chainage (m)	Road Width (m)
0.0	7.0	1875.0	6.5
75.0	7.0	1950.0	6.1
150.0	7.3	2025.0	6.2
225.0	7.1	2100.0	6.6
300.0	8.5	2175.0	5.9
375.0	8.8	2250.0	6.1
450.0	6.6	2325.0	6.1
525.0	6.9	2400.0	5.70
600.0	7.3	2475.0	6.2
675.0	7.3	2550.0	6.5
750.0	6.7	2625.0	6.2
825.0	8.6	2700.0	6.1
900.0	7.3	2775.0	6.1
975.0	7.6	2850.0	6.2
1050.0	7.9	2925.0	6.5
1125.0	7.2	3000.0	6.0
1200.0	6.9	3075.0	7.0
1275.0	7.1	3150.0	6.0
1350.0	6.8	3225.0	6.0
1425.0	6.7	3300.0	6.0
1500.0	6.8	3375.0	6.8
1575.0	8.2	3450.0	6.2
1650.0	6.9	3525.0	6.1
1725.0	6.2	3600.0	6.00
1800.0	6.5	3675.0	6.00

Table E.1: Road Widths along the R755

Note: Chainage runs from 115m after the Roundabout at the N11 towards the quarry to an end chainage of 3675m.