

A1 Birtley to Coal House

Scheme Number: TR010031

Applicant's Responses to ExA's Second Written Questions - Appendix 2.01 - Structure Options Report 7 - North Dene Footbridge

Planning Act 2008

Rule 8(1)(b)

Infrastructure Planning (Examination Procedure Rules) 2010



Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Examination Procedure Rules)
2010**

A1 Birtley to Coal House
Development Consent Order 20[xx]

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- Appendix 2.0I - Structure Options Report 7 - North Dene
Footbridge**

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Structure Option Report 7

North Dene Footbridge

Structure no. A1//440.30

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A1 BIRTLEY TO COAL HOUSE IMPROVEMENT SCHEME

STRUCTURE OPTION REPORT 7 NORTH DENE FOOTBRIDGE

Highways England



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TABLE OF CONTENTS

EXECUTIVE SUMMARY	7
1. INTRODUCTION.....	8
2. EXISTING STRUCTURE	10
3. DESIGN CONSTRAINTS/PARAMETERS.....	12
4. DEVELOPMENT OF THE NEW BRIDGE STRUCTURAL FORM	16
5. GROUND INVESTIGATION	21
6. CONCLUSION & RECOMMENDATIONS	25

APPENDICES

A P P E N D I X A INDICATIVE SCHEMATIC PLANS OF THE PREFERRED ROUTE

APPENDIX A-1 INDICATIVE SCHEMATIC PLANS OF THE PREFERRED ROUTE

A P P E N D I X B AS BUILT INFORMATION

APPENDIX B-1 AS BUILT INFORMATION ORIGINAL CONSTRUCTION 1972

APPENDIX B-2 AS BUILT INFORMATION IMPROVEMENT WORKS

APPENDIX B-3 EXISTING STRUCTURE PHOTOGRAPH RECORD, DATED SEPTEMBER 2017

A P P E N D I X C STATUTORY UNDERTAKER'S INFORMATION

APPENDIX C-1 STATUTORY UNDERTAKER'S DRAWINGS

A P P E N D I X D PROPOSED GENERAL ARRANGEMENT DRAWINGS

APPENDIX D-1 OUTLINE GENERAL ARRANGEMENT BOW TRUSS FOOTBRIDGE OPTION

APPENDIX D-2 OUTLINE GENERAL ARRANGEMENT TIED ARCH FOOTBRIDGE OPTION

A P P E N D I X E DESIGNER'S RISK ASSESSMENT

APPENDIX E-1 DESIGNER'S RISK ASSESSMENT

A P P E N D I X F WSP/HE KEY CORRESPONDENCE

APPENDIX F-1 WSP/HE KEY CORRESPONDENCE

EXECUTIVE SUMMARY

WSP have been commissioned under the CDF contract to progress the Stage 3 Preliminary Design works to increase the capacity of the route between A1 Junction 65 (Birtley) to Junction 67 (Coal House). The scheme involves upgrading from the existing Dual 2-Lane All-Purpose provision to a Dual 3-Lane All-Purpose Provision for this section of the road.

The existing North Dene Footbridge, located south of the A1 Junction 66 Eighton Lodge, is one of the many existing structures affected by the proposed improvements to the A1 alignment. This Structures Options Report has been prepared to assess the constraints/challenges associated with the structural works at North Dene Footbridge.

The study has shown that the existing North Dene footbridge (including ramps) would need to be replaced in its entirety. The new structure shall comprise a single clear span over the mainline with a 3.5m clear width throughout and a new 1 in 12 ramp provision to the west side.

The preferred structural form for the replacement bridge would comprise a structural steel bow truss footbridge structure with a simple steel beam ramp supported on steel trestles/columns on the west (northbound carriageway) side. A bow truss footbridge would provide a structure with enhanced aesthetic value whilst remaining a simple cost effective structural form for construction.

On the east (southbound carriageway) side the end of the main bridge will be supported on either a reinforced concrete trough or a reinforced concrete bankseat on reinforced earth embankment.

The estimated construction cost for the replacement structure is provided below.

- Steel Bow Truss Main Span support via a RC trough on the east side – Estimated Construction Cost £1.5-2.0 million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side).
- Steel Bow Truss Main Span supported via RC bankseat on Reinforced Earth embankments on the east side – Estimated Cost £1.2-1.5 million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side).

It is recommended that North Dene Footbridge be replaced with the following structure:

- Structural steel bow truss footbridge with a simple steel beam ramp structure supported on steel trestles/columns on the west (northbound carriageway) side. On the east (southbound carriageway) side, the end of the main bridge will be supported on a reinforced concrete bankseat supported on a reinforced earth embankment.

The following should be undertaken to verify the findings of this report and provide clarity on the works to be developed at detailed design.

- Liaison with key stakeholders to confirm acceptance of the proposed new bridge structural form and ramp provision.
- Review of the proposed sub structure/foundation options upon receipt of site investigation information.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

- 1.1.1 WSP has been commissioned by Highways England to develop a scheme proposal for the A1 Birtley to Coal House Improvement Scheme.
- 1.1.2 The scheme development forms part of the Newcastle/Gateshead Western Bypass (NGWB) and is located on the A1 between Junction 65 (Birtley) to Junction 80 (Seaton Burn). The scheme is part of Highway England's Strategic Road Network serving the metropolitan area of Tyne and Wear.
- 1.1.3 The project is located between Junction 65 and Junction 67 on the NGWB and is 4.2km in length. The existing carriageway layout is:
- Southbound: Two lanes between Junction 67 (Coal House) and Junction 66 (Eighton Lodge) with an additional approaching lane between North Side Overbridge and Junction 66. Three Lanes between Junction 66 (Eighton Lodge) and Junction 65 (Birtley). The existing speed limit is 50mph between Junction 67 (Coal House) and North Side Overbridge and 70 mph thereafter.
 - Northbound: Two lanes with a lane gain/drop between Junction 65 (Birtley) and Junction 66 (Eighton Lodge) and two lanes between Junction 66 (Eighton Lodge) and Junction 67 (Coal House). The existing speed limit is 50mph throughout.
- 1.1.4 The A1 NGWB is one of the most congested highway links in the North- East region with more than 110,000 vehicles using the route every day on the busiest section. Therefore, the junction has been identified as requiring the improvement to its existing layout in order to achieve the scheme objective.
- 1.1.5 At present, the junction has a significant adverse impact on; journey time reliability at peak time, route resilience, safety and environmental impacts.
- 1.1.6 The scheme objectives for the Junction improvement are structured around the Government's main objectives for transport, being
- To increase the capacity of the A1 between Junction 65 (Birtley) and Junction 67 (Coal House) from existing two lanes to three full standard lanes – to improve the safety for all road users and contribute to the Government's current safety strategy targets.
 - Lane gain/drop between the Junctions
 - Replacement of Allerdene Bridge achieving optimum whole life costs whilst taking into account future maintenance and operation, and disruption to users.
 - New Junction layout at Coal House
- 1.1.7 The existing Allerdene Railway Bridge has a number of inherent design/construction deficiencies which cannot be easily resolved due to the complex structural form (half joints) and site constraints. The intention is for the existing Allerdene Bridge to be replaced as part of the A1 Birtley to Coal House Improvement Scheme.

- 1.1.8 Two alignment options were assessed for the replacement of Allerdene Bridge. These are:
- Option 1A - Replacement of Allerdene Railway Bridge as close as possible to the existing structure to enable the retention of Coal House interchange.
 - Option 1B - Widening/Replacement of Allerdene Railway Bridge with a wider structure in its existing location and retention of Coal House Interchange and the existing alignment as far as is possible.
- 1.1.9 Works undertaken during PCF Stage 2 – Route Selection, confirmed Option 1A was the preferred option to be progressed onto the next stage and beyond. Refer to Appendix A for schematic plans of the preferred route.
- 1.1.10 The scheme is currently progressing within PCF Stage 3: Preliminary Design. The existing North Dene Footbridge, located south of Junction 66 Eighton Lodge of the A1, is one of the many existing structures affected by the proposed improvements to the A1 alignment.
- 1.1.11 Studies to date show that North Dene Footbridge would need to be modified to accommodate the new A1 highway alignment.

1.2 REPORT OBJECTIVES

- 1.2.1 This Structures Options Report has been prepared to assess the constraints/challenges associated with the structural works at North Dene Footbridge.
- 1.2.2 The report shall confirm the structural works to be further developed at PCF Stage 5 (Detailed Design).
- 1.2.3 Upon completion and sign off, this report shall provide Highways England with sufficient information/justification for seeking approval/funding to progress the scheme within the next stage of development.

2. EXISTING STRUCTURE

2.1 GENERAL DESCRIPTION

2.1.1 North Dene Footbridge (commissioned in the 1970s) is defined in SMIS with the following discrete structure number and structure key:

- /A1//440.30//
- STKEY 8886

2.1.2 The footbridge is located at OS Grid Reference 427538E, 557089N.

2.2 ORIGINAL STRUCTURE

2.2.1 The original North Dene Footbridge carried a footpath over the A1. The structure was built in 1972 and comprised three main spans consisting of concrete deck and steel beam composite construction. Each span was simply supported on piers which comprise steel tubular columns mounted on reinforced concrete plinths with spread footing foundations.

2.2.2 Two of the three main spans cross the northbound and southbound carriageway of the A1. The third span crossed the east verge/embankment and was supported on a reinforced concrete bank seat. Two additional spans, of similar construction, form stepped access ramps at the west end of the structure and are supported on reinforced concrete piers clad with artificial stonework.

2.2.3 Refer to Appendix B-1 for records drawings of the original structure.

2.3 STRUCTURE MODIFICATIONS IN 2017

2.3.1 In 2017, works were completed to replace the three main spans (spans 1-3) over the carriageway and east verge of the A1 with minimal alterations to the existing piers and bank seat. The reason for this was due to the major safety implications associated with excessive spalling concrete from the existing deck soffit falling onto the carriageway below. The upper access ramp (span 4), which is connected to span 3 was also replaced to avoid the requirement for temporary propping during the works.

2.3.2 All the new spans are simply supported and comprise twin stringer construction with 2No. main RHS members, laterally braced with a steel deck plate. The new replacement upper access ramp is of similar construction to the main spans but with a stepped ramp surface as per existing.

2.3.3 The clear width of the deck/ramps is 2.0m and the ramp approaches to the west end have a 1 in 6 gradient which is considered to be non-complaint in accordance with the ramp requirements as specified in BD29/17 Design Criteria for Footbridges.

2.3.4 Refer to Appendix B-2 for records drawings of the works undertaken in 2017.

2.3.5 Refer to Appendix B-3 for site photographs (taken September 2017) of the current North Dene footbridge provision. Based on the recently completed works to the main deck spans, the superstructure elements spanning the A1 are in good condition, however the existing ramps show signs of deterioration which would be expected of 50 year old structural elements.

2.4 STATUTORY UNDERTAKERS INFORMATION

2.4.1 Details of existing services within the scheme boundary are shown on the following service information plans provided in Appendix C:

- HE551462-WSP-VUT-BCH-DR-D-00001
- HE551462-WSP-VUT-BCH-DR-D-00002
- HE551462-WSP-VUT-BCH-DR-D-00003

2.4.2 The above information indicates the following services are located within the vicinity of North Dene footbridge and may potentially be affected by the works;

- British Telecom (BT108) – Located approximately 20m north of the existing footbridge. This route may potentially be diverted across the bridge as part of the scheme works.
- Northern Power Grid Services (NP109) – Crosses the carriageway just south of the existing footbridge location. Current proposals include the diversion of the existing LV underground mains cable to facilitate earthworks along the new A1 alignment.

2.4.3 At this stage it is assumed that all services which are found to affect the proposed bridge works shall be diverted/ protected accordingly to progress the works on site.

3. DESIGN CONSTRAINTS/PARAMETERS

3.1 PROPOSED NEW HIGHWAY ALIGNMENT

3.1.1 Preliminary design of the alignment to date indicates the highway cross section (comprising verge/mainline carriageway/central reserve/hard shoulder) would increase from 28m to circa 39m. The design of the new highway also requires a translation in the alignment towards the east side.

3.1.2 The increase in the highway cross section is attributed to the following key features;

- Increase in mainline capacity 4 lanes in both directions
- Provision of a developing hard shoulder on the east verge side
- Provision of raised verges, relative to the mainline carriageway, on both sides

3.1.3 The new highway design geometry cannot be accommodated by the existing arrangement of piers at North Dene footbridge leading to a requirement to replace the footbridge. However, the condition of the recently installed new mainline superstructure is good and it is anticipated that the three new spans could be carefully removed and set aside for re-use elsewhere on the network subject to geometric compatibility.

3.2 CLEAR SPAN MAINLINE STRUCTURE

3.2.1 It has been proposed that the new main line structure spanning the A1 should comprise a single clear span structure located on the same alignment as the original structure.

3.2.2 This would future proof the structure for potential alignment modifications. In addition a clear span structure would avoid obstructing the A1 and eliminate long term access and maintenance issues associated with intermediate supports.

3.2.3 The proposal for a clear span structure has been discussed with the Highways England's Safety Engineering and Standards (SES) who have confirmed this provision would be acceptable for further development.

3.3 CLEARANCE AND RAMP REQUIREMENTS

3.3.1 The requirements for the footbridge clearance and ramp provision have been subject to on-going discussion with key stakeholders and the NMU survey results which are summarised below.

3.3.2 The 24hr NMU surveys conducted in November 2017, demonstrated that on:

- Thursday 9th November 2017 the 24 hour two-way flow over the bridge was 59 movements (consisting of 38 pedestrians and 21 cyclists). Within that period, the peak hour (08:00-09:00) two-way flow over the bridge consisted of 7 movements (5 pedestrians and 2 cyclists)
- Saturday 11th November 2017 the 24 hour two-way flow over the bridge was 52 movements (consisting of 49 pedestrians and 3 cyclists). Within that period, the peak hour (11:00-12:00) two-way flow over the bridge consisted of 10 movements (10 pedestrians and 0 cyclists)

3.3.3 A review of the Local Authority development aspirations for the area, was set out within 'Planning for the future – Core Strategy and Urban Core Plan for Gateshead and Newcastle upon Tyne 2010-2030'. This showed parcels of land immediately to the north of the A1 (adjacent to North Dene footbridge) currently form part of the existing green-belt and have not been identified for development purposes prior to 2030.

3.3.4 Conversations between WSP and representatives of the Spatial Planning and Environment team at Gateshead Council have confirmed that,

“as housing need no longer provides exceptional circumstances for greenfield Green Belt land to be allocated for residential use in Gateshead, our emerging Land Allocations and DM policies document (MSGP) is not considering the development potential of such sites”.

3.3.5 Therefore, it is not envisaged that NMU movements over North Dene footbridge will materially increase from existing usage levels recorded during the survey period.

3.3.6 With regards the required width of the North Dene footbridge, the survey results highlighted that the existing bridge is used by a combination of pedestrians and cyclists (although the maximum flow equated to 1 trip every 6 minutes on average during the peak period of usage between 08:00-09:00 on a weekday).

3.3.7 Reference has been made to the guidelines associated with the requirements for combined use by pedestrians and cyclists and Clause 12 of BD29/17 Design Criteria for Footbridge states the following:

The minimum widths for a footpath (or footway) and a cycle track on a bridge and ramps shall be:

	Pedestrian Path	Cycle Path	Total Width
When segregated by kerb not less than 50mm high	2.0m	2.7m	4.7m
When segregated by railings not less than 900mm high	2.0m	3.0m	5.0m
When segregated by a white line, colour contrast or surface texture	1.5m	2.5m	4.0m
Unsegregated	–	–	3.5m

3.3.8 In order to meet these requirements, an unsegregated bridge deck with a width of 3.5m should be provided. The increased width would provide adequate room for a pedestrian and cyclist or two cyclists to pass each other comfortably. This is also consistent with advice contained within TA 90/05, The Geometric Design of Pedestrian, Cycle and Equestrian Routes, which advises that the acceptable minimum width for a shared pedestrian/cycle route is 3.0m + at least 0.25m on either side (if bounded on both sides by a barrier or kerb).

3.3.9 The Highways England Project Management Team and the SES have both confirmed that a new 3.5m width footbridge provision would be acceptable for further development.

3.3.10 With regards to the required gradient of the access ramp on the west side, Clause 6.6 of BD 29/17 Design Criteria for Footbridges states that:

Ramps for pedestrians, cyclists and equestrians shall not be steeper than 1 in 20. Where compliance with this would create difficulties in keeping the access on the desired line, avoiding long diversions, minimising environmental impact, or making best use of available space, a relaxation in ramp steepness may be considered to 1 in 15. In cases of extreme difficulty the gradient may be increase up to 1 in 12. However, no ramp shall be steeper than 1 in 12. Where a ramp steeper than 1 in 20 is adopted then the reason for accepting this must be clearly documented and recorded, together with evidence of acceptance by the Overseeing Organisation.

3.3.11 The current gradient of the shallow-stepped ramp is 1 in 6 which is substandard even considering the possible relaxations noted above. Based on the information available to date it is considered that the existing ramp should be replaced with a 1 in 12 provision that is 3.5m wide to ensure compatibility with the new bridge structure over the mainline. The 1 in 12 ramp provision is preferred in comparison with a 1 in 20 ramp based on the following key benefits;

- Avoids extended diversions associated with navigation/climbing of long ramp sections
- Minimises the environmental impact associated with the removal and replacement of surrounding trees.
- Minimises the visual impact on neighbouring housing
- Provision of a more accessible ramp (including landings) for both cyclist and disabled users in comparison to the current 1 in 6 ramp provision.
- The cost of the new 1 in 12 ramp based on the site levels and a length of approximately 97m would be £272k* whereas the cost of a 1 in 20 ramp of approximately 150m would be £420k*.

*cost estimates for the ramps is based on previous similar type works

3.3.12 The Highways England Project Management Team and the SES have both confirmed that based on the anticipated benefits above and considering the limited usage of the structure, the replacement of the existing ramp with a new 3.5m width and 1 in 12 gradient would provide a cost effective improvement to the existing substandard ramp.

3.3.13 It is important to note that whilst the 1 in 12 ramp has been endorsed by the Highways England SES, a Departure from Standard will be required to be submitted for the relaxation from the fully compliant 1 in 20 gradient. The Highways England SES has agreed in principle to support this departure submission based on the benefits documented above.

3.4 OUTSTANDING ASSUMPTIONS

3.4.1 The report has provided justification for the proposed replacement of the existing North Dene Footbridge (including ramps) in its entirety. The new structure shall comprise a clear span structure over the mainline with a 3.5m clear width and a new 1 in 12 ramp provision to the west side.

3.4.2 In addition, the following assumptions have also been considered during development of the structural form for the new replacement structure;

- The grade separated crossing over the A1 will provide a cost effective functional solution that also has some aesthetic value. It is assumed the bridge crossing will have a simple, un-obstructive lightweight structural form to enhance the visual appearance whilst avoiding complex buildability issues on site.
- The proposed footbridge structure over the main line shall satisfy the 5.7m + S (allowance for sag curve) headroom requirements as stipulated in TD27/05 Cross Section and Headroom. This minimum headroom requirement shall also extend beyond the mainline carriageway over the verges within the designated structure free zone. This would avoid designing the bridge superstructure to sustain impact loading which would be particularly onerous on a light footbridge structure.
- The footprint of the structure, particularly on the west side, shall be such that additional land take for construction and maintenance is minimised as much as reasonably practical. In addition visual intrusion to neighbouring properties due to the extended ramps, should also be minimised.

- In accordance with BD29/17, the following requirements shall also be incorporated in the preliminary design/development of any new replacement footbridge (including ramps) structure.
 - Whilst the ramps shall not be steeper than 1 in 12. Horizontal landings shall be provided at intervals producing a rise of no more than 650mm between landings. The length of landings shall also not be less than 2m
 - The new footbridge/ramp with combined pedestrian and cycle facilities, shall incorporate parapets with a minimum height of 1.4m
 - All supports to the bridge and the ramp shall be located at least 4.5m from the edge of the carriageway thereby minimising the risk associated with vehicle impact

4. DEVELOPMENT OF THE NEW BRIDGE STRUCTURAL FORM

4.1 GENERAL

4.1.1 Taking into consideration the requirements/constraints highlighted in Section 3, it is expected that that main bridge/ramp superstructure shall comprise structural steelwork as opposed to reinforced concrete construction.

4.1.2 The reasons/advantages for developing a replacement structure that primarily constitutes steel elements are set out below;

- High Strength to Weight Ratio – The light weight nature of steel construction combined with its strength is particularly advantageous in moderate to long span bridges (greater than 30m) where dead load is crucial. The reduced weight of the bridge spans minimises the substructure size and foundation costs. The reduced dead load of spans will also improve buildability due to less onerous lifting requirements.
- Reduced Construction Depth – The high strength of steel allows construction depths to be reduced, which assists in overcoming the headroom constraints (5.7m minimum clearance). The reduced construction depth also minimises the length and height of the approach ramps. This would reduce the structural footprint of the new structure whilst also reducing associated material/construction costs.
- Speed of Erection – Construction time on site is minimised due to pre-fabrication of major structural elements resulting in economic and safety benefits. The lightweight nature of steel permits the speedy erection of large components. This would assist in minimising disruption to traffic where special closures are required. It is expected that the fabrication and trial erection of the bridge/ramp spans could be undertaken in factory conditions away from adverse weather and restricted site conditions. The structural elements could then be delivered assembled and erected. Time associated with waiting for in-situ concrete elements to cure and achieve a certain level of strength prior to the next phase of works is avoided.
- Versatility – slender profiles with either constant or varying depth can be incorporated into the bridge design. Modern fabrication methods remove many restrictions on curvature, and creating the curved bends at the footbridge/ramp junction is entirely feasible. The high surface quality of steel creates sharp lines, uniform colouring of surfaces and avoids blemishes which improve aesthetics. The painting of steelwork introduces colour and contrast, whilst repainting can change or refresh the appearance of the bridge.
- Durability – Unlike concrete, the use of steel introduces a need to carry out maintenance painting to protect steel elements from corrosion, however modern paint systems today provide a reliable extended corrosion protection system in excess of 30 years to minimise life cycle costs. From a maintenance perspective, one of the main advantages of steel over concrete is the structural elements and associated defects are more readily visible. Therefore signs of deterioration can be readily recorded without extensive investigations and can be easily addressed by repainting/localised repairs.

4.1.3 In summary structural steel is preferred over concrete on the basis that a clean, functional, lightweight bridge can be constructed that is cost effective and easy to construct due to the pre-fabrication of major elements. The use of steel as the primary structural material will also promote the development of a new bridge design with enhanced aesthetics.

4.2 STRUCTURAL FORM FOR THE RAMPS/MAIN BRIDGE SPAN

4.2.1 The proposed configuration of the ramp with regular supports at intermediate landing positions results in the span of discrete ramp sections being limited to less than 10m. This inclines towards the ramp structure comprising simple steel beam construction with twin stringers (2No. main RHS members) laterally braced with a steel deck plate. This would provide a clean, cost effective solution that can be readily lifted into position.

4.2.2 The main bridge span over the A1 is anticipated to be up to 45m clear span. The large span requirements with no intermediate supports means a similar structural form to the ramps sections (simple steel beam structure) would not be feasible.

4.2.3 Other structural forms considered and ultimately discounted include:

- Composite Steel Beam and Concrete Deck – This option is discounted on the basis that it produces a much heavier structure than an all steel footbridge with the dead load accounting for more than half the total load. Buildability would be made more difficult due to the weight. The associated cost/construction programme would also significantly increase in comparison to predominantly steel based footbridges.
- Steel Box Girder Footbridge - This form of construction would comprise a pair of structural steel girders (fabricated or rolled) braced together for stability and acting as beams in bending. The floor would be formed by steel plates (8-10mm thick) suitably stiffened to carry loads. Parapets would be fixed on top of the steel plates. This option is discounted due to the large construction depth (expected to be in excess of 1m) resulting in the requirement for higher and longer ramps further increasing the overall cost and extending the construction programme. In addition this form of structure would fail to provide the appearance of a light weight/open structure.

4.2.4 It is considered that a truss (warren type) structure would provide the optimum solution for the main bridge span. Generally truss type footbridges, circa 45m in span, comprise a main top and bottom chord with a series of diagonal members formed using hollow type sections where the deck is at the level of bottom chord in a through type construction for enhanced stability.

4.2.5 The truss type footbridge would provide a light, economical form of construction, due to the reduced steelwork required, in comparison to a box girder type structure.

4.2.6 The deck construction depth is significantly reduced in comparison with other conventional beam type structures and would be limited to the footway surface to the underside of the bottom chord (not more than the depth of the chord member). This would contribute to the light appearance whilst also enabling the clearance over the mainline A1 to be readily achieved. This would also reduce the height and lengths of ramps required resulting in further cost and programme savings.

4.2.7 The appearance of the truss type structure could be enhanced significantly with minimal cost and construction complication via the introduction of an arch profile to the top chord thereby forming a bow truss type structure. A bow truss provides an elegant appearance due to the arch formation and could provide visual landmark for the scheme without a significant impact on cost and construction (structural elements can still be prefabricated and readily transported/assembled and lifted in place as with a conventional truss). Refer to Figure 4.1 for a typical bow truss footbridge.



Figure 4.1: Typical Bow Truss Type Footbridge

4.3 SUBSTRUCTURE/FOUNDATION REQUIREMENTS

- 4.3.1 Irrespective of the structural form, the main bridge/ramp structure on the east side will be supported on steel columns/trestles which are assumed would be founded on concrete pad foundations (refer to Section 5 for further details relating to foundations). The position of the ramps/supports is such that they would be at least 4.5m from the edge of the carriageway thereby minimising risk associated with impact load due to errant vehicles.
- 4.3.2 At the west end of the structure, two alternative sub structure options have been considered:
- Substructure Option 1: Reinforced concrete trough
 - Substructure Option 2: Reinforced concrete bankseat supported on a reinforced earth embankment
- 4.3.3 For both substructure options, the position is such that the 4.5m lateral clearance to the edge of the carriageway is provided. However the setback of the substructure is restricted such that the overall clear span of the main bridge structure is limited to circa 45m, thereby keeping the span and associated cost of the superstructure to a minimum.
- 4.3.4 Substructure Option 2 is expected to provide a more cost effective/simplified solution, reasons for this are provided below.
- In situ reinforced concrete works is limited to the construction of a small bank seat. In comparison the reinforced concrete operations are significantly greater for the Substructure Option 1 thereby having adverse effects on site risks, cost and programme.
 - The reinforced earth embankments can be optimised to provide maximum cost effectiveness. The simple repetitive construction techniques simplify control and management which helps to minimise wastage. Most importantly the rapid, fast track construction techniques would result in a reduced construction programme in comparison with Substructure Option 1.

4.4 PREFERRED STRUCTURAL FORM

4.4.1 The study to date inclines towards the new replacement structure comprising the following:

- Structural steel bow truss footbridge structure with a simple steel beam ramp structure supported on steel trestles/columns on the west (northbound carriageway) side. On the east (southbound carriageway) side the end of the main bridge will be supported on either of the following substructure options:
 - Substructure Option 1: Reinforced Concrete trough
 - Substructure Option 2: Reinforced Concrete bankseat supported on a reinforced earth embankment

4.4.2 A bow truss form for the main footbridge would provide a structure with enhanced aesthetic value whilst providing a simple cost effective structural form for construction. The estimated construction cost for the replacement structure is provided below.

- Steel Bow Truss Main Span support via a RC trough on the east side – Estimated Construction Cost £1.5-2.0million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side). Refer to Appendix D-1 for an outline General Arrangement Drawing
- Steel Bow Truss Main Span supported via RC bankseat on reinforced earth embankments on the east side – Estimated Cost £1.2-1.5 million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side).

4.4.3 The indicative construction costs are based on previous similar type schemes and shall be verified, subject to detailed design. The Highways England cost estimating team has not been consulted for any construction costing information for this study.

4.4.4 Subject to the Highways England Project Management team aspirations, there is a potential opportunity to provide an alternative tied arch type footbridge over the A1, comprising vertical hangers within the arches as opposed to diagonal truss members. This would provide a structure with an iconic visual appearance that complements the tied arch structures currently spanning the River Tyne in the centre of Newcastle. See Figure 4.2 below.

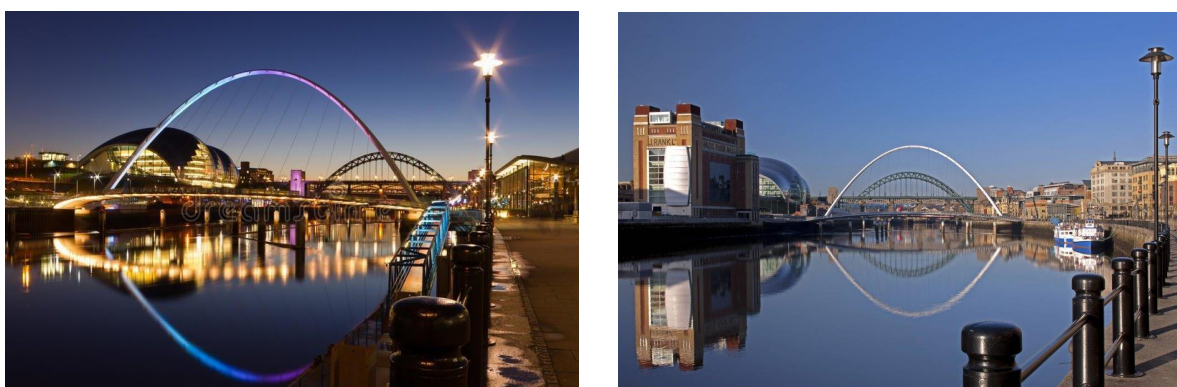


Figure 4.2: Night and day photographs of the tied arch type structures spanning the River Tyne

- 4.4.5 Refer to Appendix D-2 for the outline General Arrangement Drawing of a Tied Arch Structure. Whilst not reviewed in detail, the cost associated with the construction of a tied arch footbridge is expected to be circa £1.5-2.0million (this includes for the ramps and trestle/column support to the west side and RC bankseat and RE walls to the east side). However, the maintenance liabilities for a tied arch are expected to be greater than the Bow Truss option due to complexities associated with access and maintenance of the hangers/connections.

5. GROUND INVESTIGATION

5.1 EXISTING GROUND CONDITIONS

- 5.1.1 A Geotechnical Design Report is not yet available for the project and will be prepared to define suitable parameters for the design of acceptable foundations following completion of a ground investigation at the site. The preliminary choice of foundation solution has been considered appropriate based on the records and findings at the site location taken from the Preliminary Sources Study Report (PSSR) for the wider Birtley to Coalhouse Scheme (HA544664-WSP-HGT-S01-RP-GE-0600-P-01).
- 5.1.2 Historical ground investigation data from the British Geological Survey (BGS) and Highways Agency Geotechnical Data Management System (HA GDMS) is available within the vicinity of North Dene Footbridge. The following ground conditions are anticipated at the footbridge location:
- Topsoil over Glacial Till (not present in all locations): up to 3.2 m thick and consisting stiff to very stiff orange brown mottled grey brown sandy slightly gravelly clay, gravel is sandstone and coal; over,
 - Weathered Pennine Middle Coal Measures: encountered from between 0.25 m and 3.2 m below ground level and recorded between 0. m and 4.25 m thick and consisting of orange brown clayey sand and gravel with occasional cobbles of sandstone and ironstone and red brown clayey sand; over,
 - Pennine Middle Coal Measures bedrock: rock encountered at depths of between 2.1 m and 5.9 m below ground level.
- 5.1.3 Made ground may be present beneath the foundation locations, likely associated with previous site uses and the construction of the A1.
- 5.1.4 Coal seams have been encountered beneath the footbridge location, which are recorded as having been worked. The shallowest coal seams are the High Main (approximately 65 m AOD, 21 m BGL), Metal seam (approximately 60 m AOD, 26 m BGL), Five Quarter (approximately 50 m AOD, 36 m BGL) and Main seam (approximately 25 m AOD, 61 m BGL), all of which are recorded to have been worked.
- 5.1.5 No groundwater strikes were recorded on the available historical borehole records in the vicinity of the North Dene Footbridge and no historical groundwater monitoring results have been obtained. Groundwater monitoring is to be undertaken a part of the proposed ground investigation.
- 5.1.6 Groundwater bodies should be anticipated in the following strata. Following completion of the additional ground investigation, structure-specific groundwater information will be available:
- At shallow depths within the glacial till; and,
 - At a greater depth within the Pennine Middle Coal Measures.

5.2 RISK ASSOCIATED WITH FOUNDATION WORK

5.2.1 The geotechnical risks for the wider site are presented within the PSSR. These risks have been reviewed and further assessed in the 'Live' Project Risk Registers. Pertinent geotechnical risks in relation to the proposed footbridge foundations are summarised in Table 5-1.

Table 5-1 Geotechnical risks of proposed Longbank Underpass foundations

RISK CAUSE	RISK EVENT	PRIMARY RISK IMPACT	RISK RATING
Engineering Properties of the Ground	There is a risk that the ground model, and the behaviour of the ground, is different (worse) from that assumed at this stage.	Construction delays and remedial design requirements, and potential cost and programme implications.	Medium
Instability of Existing Underpass	There is a risk that the proposed works may undermine/destabilise the existing underpass structure.		Medium
Instability of Existing Earthworks	There is a risk that the existing earthworks at the site are not as stable as assumed at this stage.		Medium
Instability caused by shallow mine workings	There is a risk that the structure will be adversely impacted by collapse of shallow coal mine workings, which may require grouting during construction		Medium
Groundwater	There is a risk that the groundwater is different (worse) from the groundwater model assumed at this stage.		Medium
Contaminated Soils	There is a risk that the assessment of contaminated soils undertaken at this stage is not accurate.		Medium
Unexploded Ordnance (UXO)	The site is located within an area of low bomb risk; there is a risk that UXO might be encountered beneath the site.	Construction delays and requirement for safe deactivation / disposal.	Low
Buried Services	There is a risk that buried services might be encountered during excavation of proposed foundations.	Construction delays and potential cost and programme implications.	Medium

5.3 DETAILS OF ADDITIONAL GROUND INVESTIGATION REQUIRED TO INFORM THE DETAILED DESIGN PROCESS

- 5.3.1 Additional ground investigation has been scoped and is currently being undertaken. Drawings HE551462-WSP-HGT-BCH-DR-GE-00023 to HE551462-WSP-HGT-BCH-DR-GE-00033 shows the exploratory hole locations of the proposed ground investigation required to inform the detailed design. The proposed ground investigation includes the following:
- Cable percussion boreholes to rock head to identify ground conditions within the superficial deposits and confirm rockhead levels;
 - Rotary cored boreholes to determine rock quality and strength to 9 m below rock head;
 - Rotary open hole boreholes, for an additional 8 m to investigate the presence of coal seams and historical mining; and,
 - Groundwater monitoring to be undertaken.
- 5.3.2 Each of the above ground investigation methodologies may be undertaken at the same location / exploratory hole through follow-on methods, i.e. cable percussion to rockhead; follow-on with rotary core from rock head; and follow-on with open hole to proposed borehole depth. The current proposed ground investigation at the location of the North Dene Footbridge includes 2 (two) cable percussive and rotary cored exploratory holes.
- 5.3.3 The results of the ground investigation shall be reported in a Ground Investigation Report (in line with HD 22/08) once completed.

5.4 REVIEW OF FOUNDATION REQUIREMENTS FOR THE EXTENSION WORK

- 5.4.1 The final footbridge foundation solution shall be determined through assessment of the bearing capacity of the founding materials (influenced by the ultimate limit state), settlement analysis of the foundations (influenced by serviceability limit state) and interaction with the existing earthworks/structures. Space constraints around the foundation locations shall also be taken into account when determining the most appropriate foundation solution.
- 5.4.2 The current proposed development is for a replacement of the existing footbridge, with a single span footbridge, including the lengthening of the ramp on the west (northbound carriageway) side of the bridge (to create a shallower gradient ramp) and retaining wall supporting the footpath on the east (southbound carriageway) side of the bridge. To allow for the construction of the proposed footbridge, the existing footbridge is to be dismantled and removed.
- 5.4.3 The proposed ramp structure is anticipated to be founded on spread foundations founded on either a thin layer of glacial till, or directly onto shallow bedrock similar to the existing footbridge. Should the ground investigation indicate that suitable founding strata is at a greater than anticipated depth, a piled foundation solution may be required. The final foundation solution shall be assessed following the proposed ground investigation.
- 5.4.4 There are currently two options being considered for the support of the main bridge span at the east end (southbound carriageway) side of the bridge. Option 1 is the installation of reinforced concrete "U" shaped retaining wall, filled with 6N material. The use of the reinforced concrete would enable to faces of the retaining wall to be vertical and minimise the structure footprint for the new bridge.
- 5.4.5 Option 2 utilises a reinforced concrete bankseat on reinforced earth embankments. In order to accommodate the anticipated length of the polymer geo-straps the structure wing walls are required to be splayed. However the structure footprint although greater than with Option 1 is still within the red line boundary for the scheme.

5.4.6 There are two methods of construction which could be used for the reinforced earth support:

- Near vertical embankment sides - the use of polymer geo-straps/geogrids and 6I / 6J material with concrete panels or block facing. The use of this method would enable the faces of the retaining wall to be vertical or near vertical and minimise the space required for the footpath.
- Sloping embankment sides - the use of polymer geo-straps/geogrids and 6I / 6J material with a soft facing/seeded mat facing to create green/vegetated slopes. However, given the northwest facing aspect and the lack of sun light to the reinforced earth embankment, it may be difficult to suitably vegetate the slopes.

5.4.7 Given the potential for shallow coal mine workings beneath the site, it is considered that grouting of these workings may be required during construction. No records have been obtained to suggest that the workings were treated as part of the original construction of the footbridge. The extent of such workings (and possibly previous grouting works) will be assessed as part of the proposed ground investigation.

6. CONCLUSION & RECOMMENDATIONS

6.1 CONCLUSION

- 6.1.1 The existing North Dene Footbridge, located south of Junction 66 Eighton Lodge of the A1, is one of the many existing structures affected by the proposed improvements to the A1 alignment.
- 6.1.2 The study has shown that the existing North Dene footbridge (including ramps) would need to be replaced in its entirety. The new structure shall comprise a clear span structure over the mainline with a 3.5m clear width throughout and a new 1 in 12 ramp provision to the west side.
- 6.1.3 Structural steel is preferred over concrete on the basis that a clean, functional, lightweight bridge can be constructed that is cost effective and easy to construct due to the pre-fabrication of major elements. The use of steel as the primary structural material will also promote the development of a new bridge design with enhanced aesthetics.
- 6.1.4 The preferred structural form for the new replacement bridge would comprise a structural steel bow truss footbridge structure with a simple steel beam ramp structure supported on steel trestles/columns on the west (northbound carriageway) side. A bow truss main footbridge would provide a structure with enhanced aesthetic value whilst providing a simple cost effective structural form for construction.
- 6.1.5 On the east (southbound carriageway) side the end of the main bridge will be supported on either Reinforced Concrete trough or a Reinforced Concrete bankseat on Reinforced Earth embankment.
- 6.1.6 The estimated construction cost for the replacement structure is provided below.
- Steel Bow Truss Main Span support via a RC trough on the east side – Estimated Construction Cost £2.0 million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side).
 - Steel Bow Truss Main Span supported via RC bankseat on Reinforced Earth embankments on the east side – Estimated Cost £1.5 million (this includes for the demolition of the existing structure and construction of the new steel ramp to the west side).

6.1.7 Subject to the Highways England Project Management team aspirations, there is a potential opportunity to provide an alternative more complex tied arch type footbridge over the mainline. This would provide a structure with an iconic visual appearance that complements the tied arch structures currently spanning the River Tyne in the centre of Newcastle. The cost associated with the construction of a tied arch footbridge is expected to be circa £2.0million (this includes for the ramps and trestle/column support to the west side and RC bankseat and RE walls to the east side). However, the maintenance liabilities for a tied arch are expected to be greater than the Bow Truss option due to complexities associated with access and maintenance of the hangers/connections.

6.2 RECOMMENDATION

6.2.1 Based on the study to date, it is recommended that North Dene Footbridge be replaced with the following structure:

- Structural steel bow truss footbridge structure with a simple steel beam ramp structure supported on steel trestles/columns on the west (northbound carriageway) side. On the east (southbound carriageway) side, the end of the main bridge will be supported on a reinforced concrete bankseat supported on a reinforced earth embankment.

6.2.2 The following should be undertaken to verify the finding of this report and provide clarity on the works to be developed at detailed design.

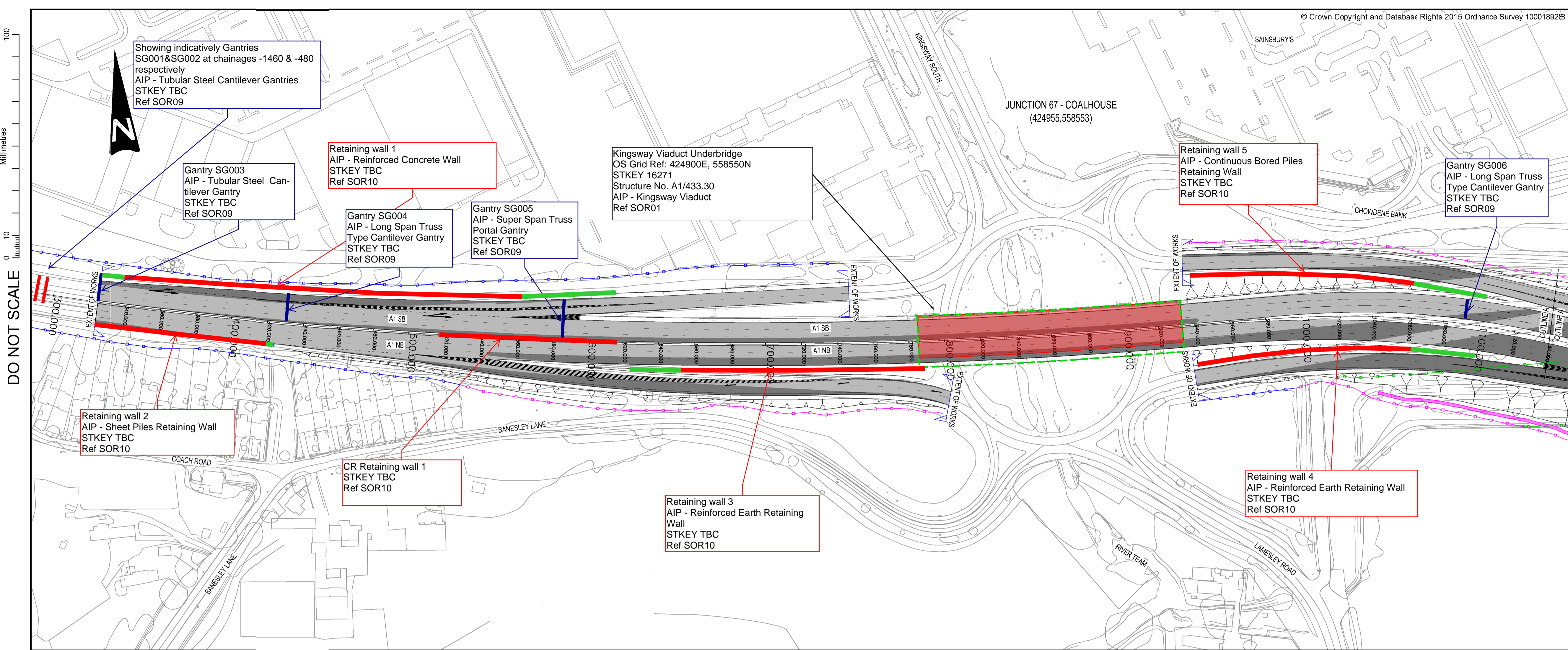
- Liaison with key stakeholders to confirm acceptance of the proposed new bridge structural form and ramp provision.
- Review of the proposed sub structure/foundation options upon receipt of site investigation information.

Appendix A

INDICATIVE SCHEMATIC PLANS OF THE PREFERRED ROUTE

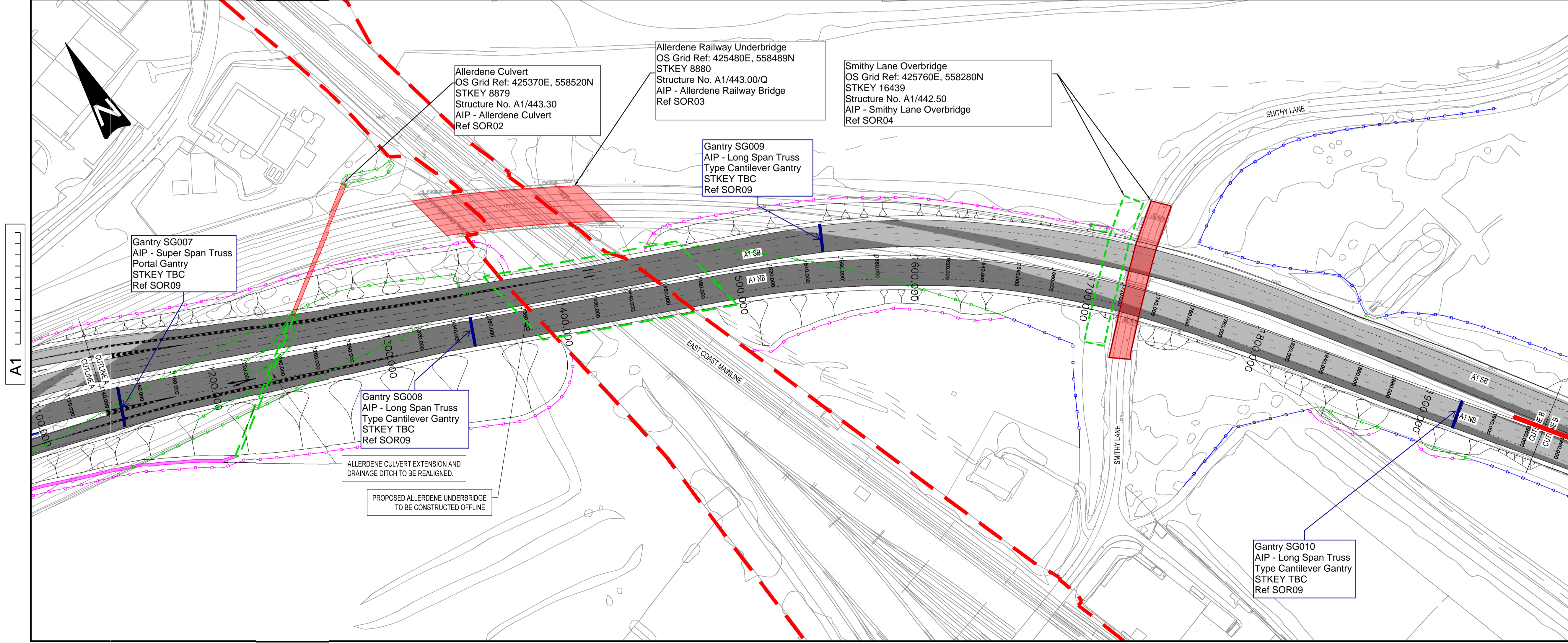
APPENDIX A-1

**INDICATIVE SCHEMATIC PLANS OF THE PREFERRED
ROUTE**



KEY

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED HIGHWAYS FENCE LINE
- RETAINED EXISTING HIGHWAYS FENCE LINE
- REMOVED EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED DRAINAGE DITCH
- NETWORK RAIL LAND BOUNDARY



P01	05/09/16	FOR INFORMATION	JAC		
P02	07/09/16	MINOR AMENDMENTS TO BMS & STRUCTURES CHANGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR

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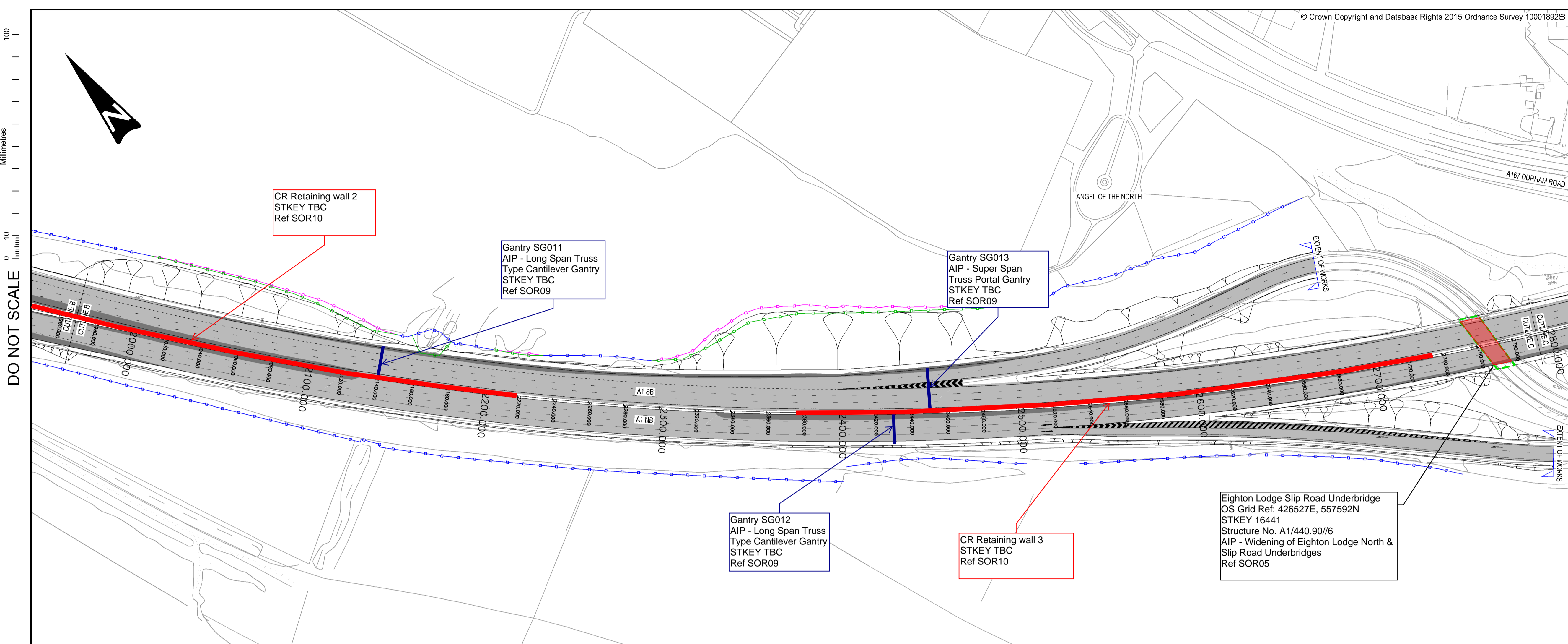
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Original Size	A1	Date	10/02/17	Date	10/02/17	Date	10/02/17	Date	---

Drawing Status **INITIAL STATUS OR WIP** Suitability **S0**

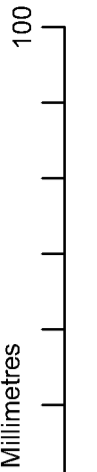
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Location	DR	Type	D	Role	10004	Number		Revision	P04



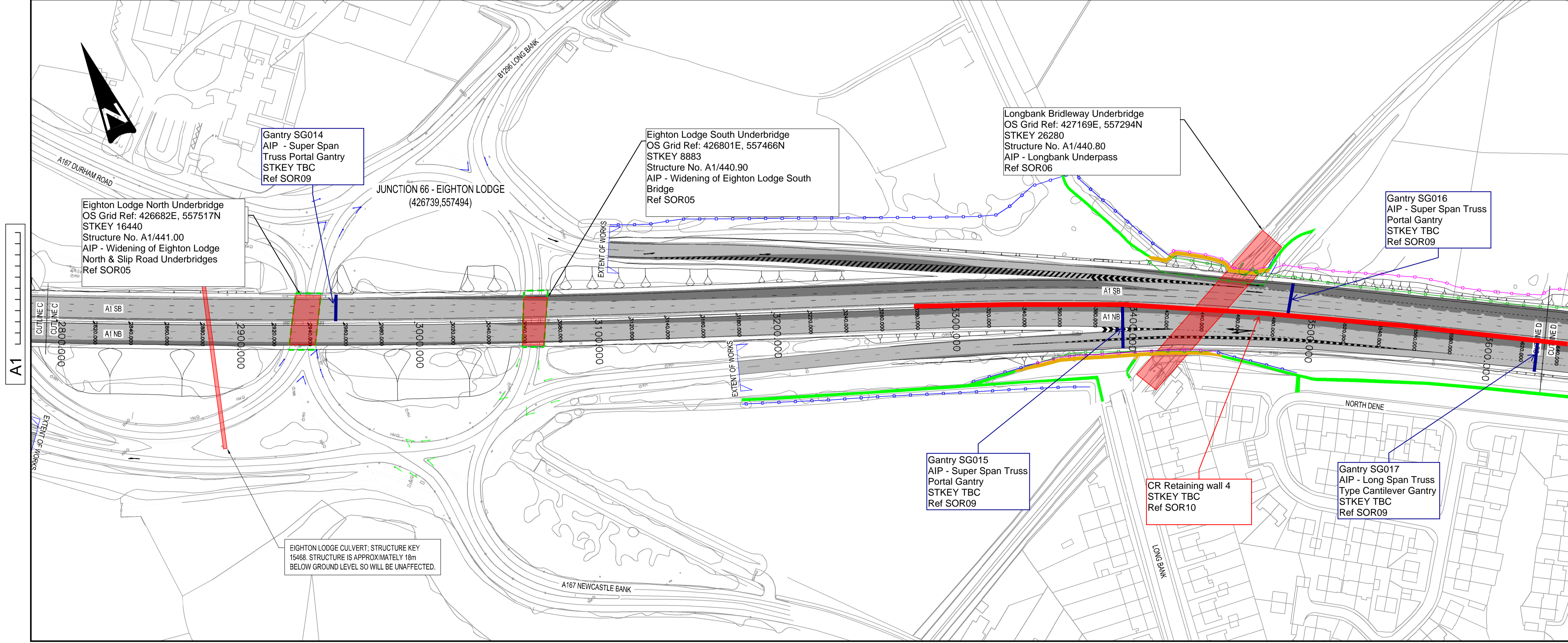
KEY

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- PROPOSED STRUCTURE
- PROPOSED HIGHWAYS FENCE LINE
- EXISTING HIGHWAYS FENCE LINE
- REMOVED EXISTING HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED FOOTPATH DIVERSION
- EXISTING FOOTPATH
- PROPOSED SIGNAL
- EXISTING SIGNAL

DO NOT SCALE



A1



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P02	07/09/16	MINOR AMENDMENTS TO DWGS & STRUCTURES CHANGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR
Rev.	Date	Description	By	Chkd	Appd

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Project Title **A1 BIRTLEY TO COALHOUSE**

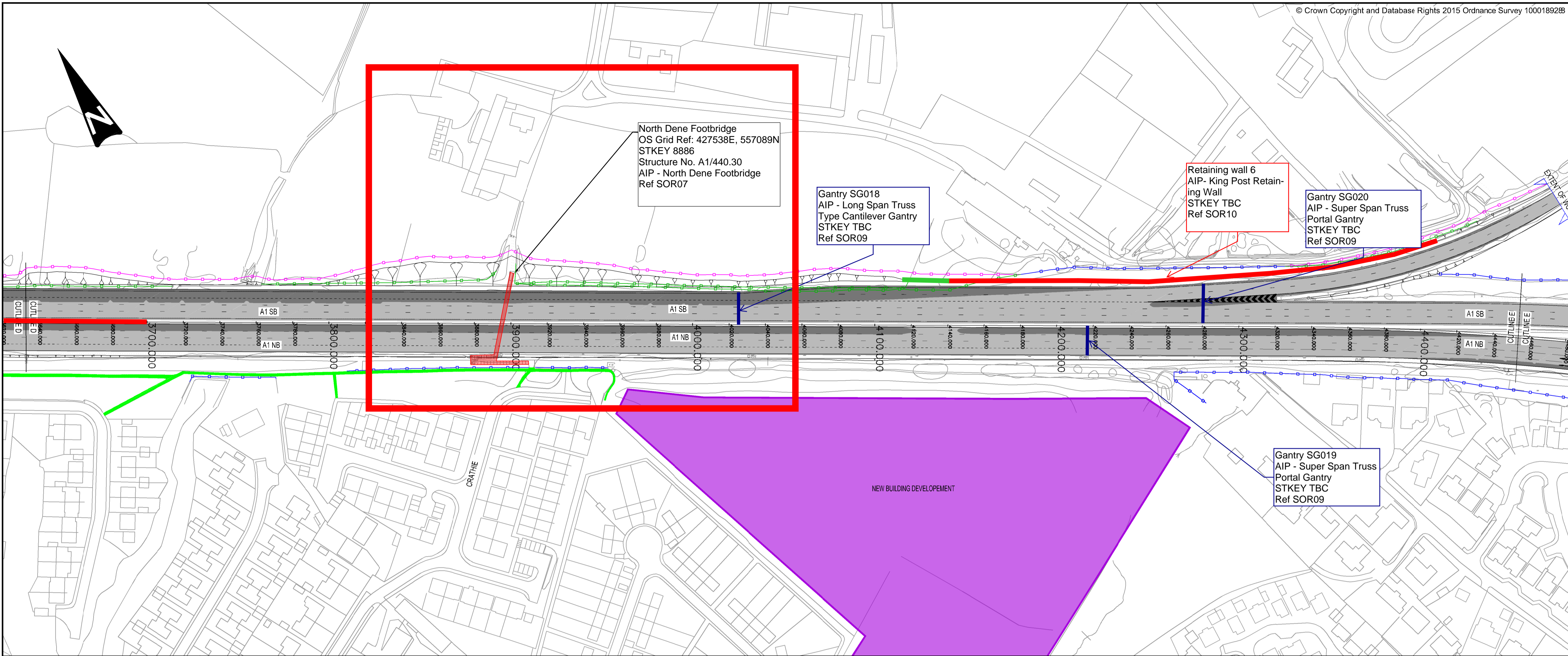
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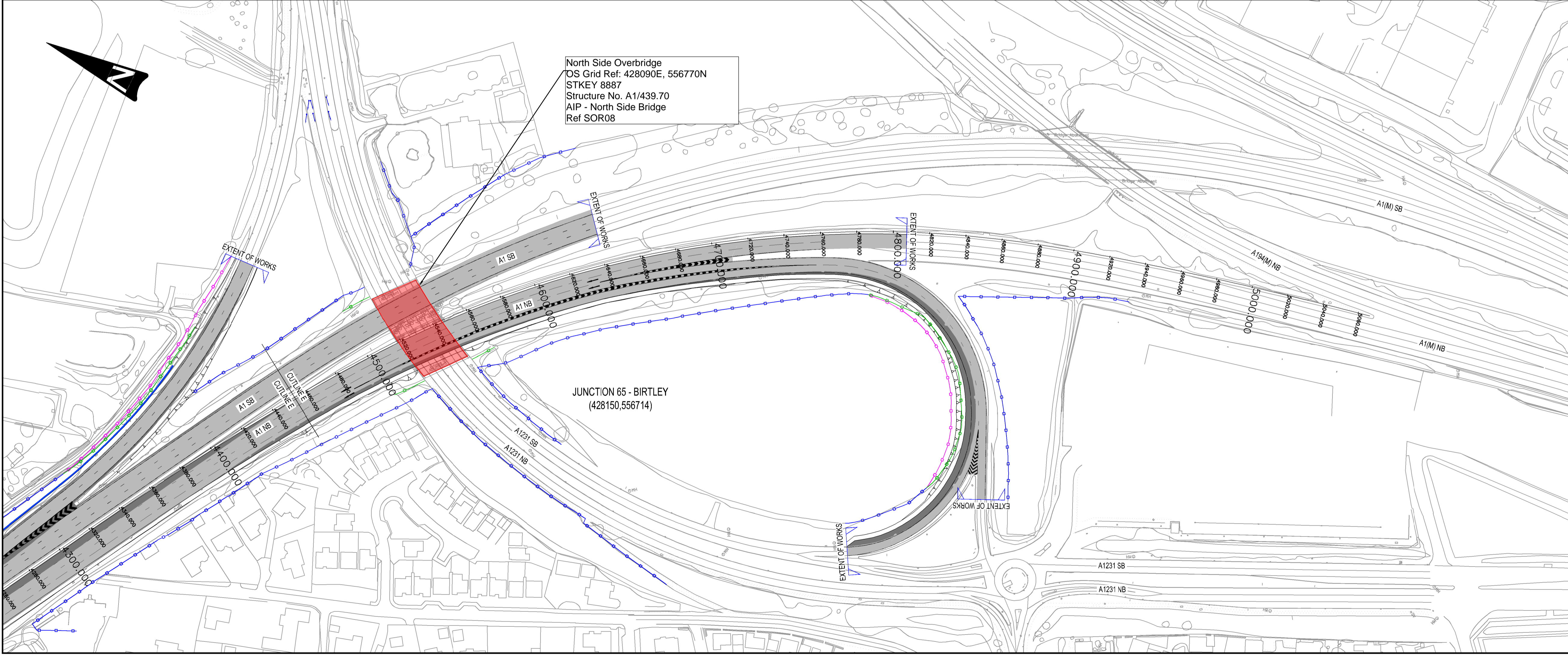
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Location	DR	Type	D	Role	10005	Number		Revision	P04

DO NOT SCALE

Millimetres
0 10 100



A1



KEY

	EXISTING STRUCTURE
	PROPOSED RETAINING WALL
	PROPOSED HIGHWAYS FENCE LINE
	EXISTING HIGHWAYS FENCE LINE
	REMOVED EXISTING HIGHWAYS FENCE LINE
	NEW CARRIAGEWAY CONSTRUCTION
	EXISTING CARRIAGEWAY TO BE RETAINED
	PROPOSED FOOTPATH DIVERSION
	EXISTING FOOTPATH
	PROPOSED SIGNAL
	EXISTING SIGNAL

Rev.	Date	Description	By	Chkd	Appd
P01	05/09/16	FOR INFORMATION	JAC		
P02	07/09/16	MINOR AMENDMENTS TO DIMS & STRUCTURES CHANGE ADDED	JWL	CP	NGR
P03	07/09/16	ISSUED FOR PUBLIC CONSULTATION	JWL	SG	NGR
P04	10/02/17	DESIGN DEVELOPMENT POST PUBLIC CONSULTATION	JWL	SG	NGR

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Project Title
A1 BIRTLEY TO COALHOUSE

Drawing Title
OPTION 1A - OFFLINE REPLACEMENT OF ALLERDENE RAILWAY BRIDGE WITH RETENTION OF COAL HOUSE JCT GENERAL ARRANGEMENT SHEET 3 OF 3

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Original Size A1	Date 10/02/17	Date 10/02/17	Date 10/02/17	Date ---

Drawing Status
INITIAL STATUS OR WIP

Suitability
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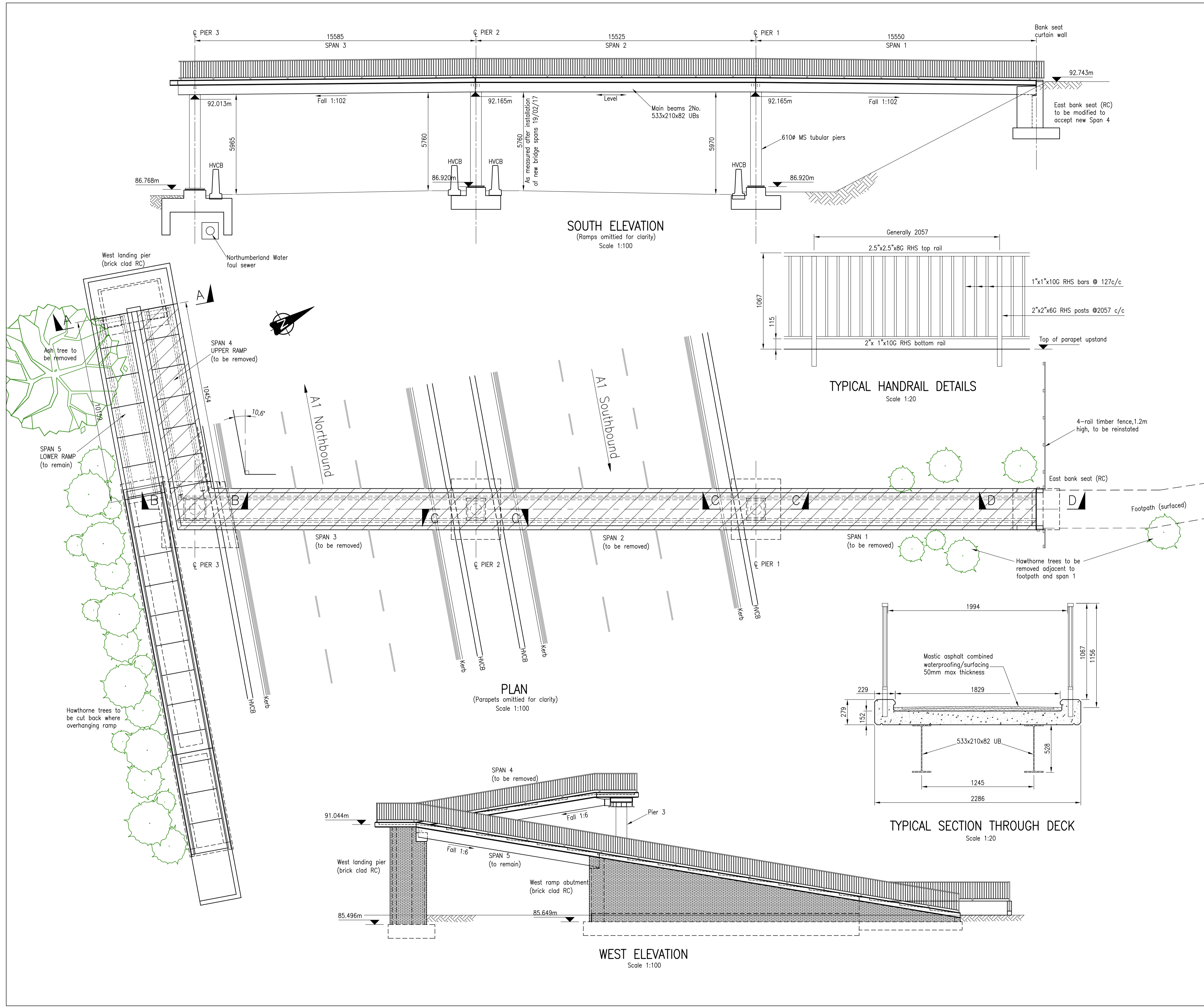
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Location DR	Type D	Role 10006	Number P04	Revision ---

Appendix B

AS BUILT INFORMATION

APPENDIX B-1

AS BUILT INFORMATION ORIGINAL CONSTRUCTION 1972



- Notes:**
- All dimensions are in millimetres (mm) unless stated otherwise.
 - All levels are in metres (m) AOD.
 - For Sections A, B, C and D refer to drawing number HE547323-AONE-SBR-8886-DE-C-002.
 - Span 3 is fixed at Pier 3 by 2No dowels located in the 2No holes in the top plate of the pier crosshead. All other bearing are free to move laterally in all directions.
 - All spans are supported on 140x140 square elastomeric bearings of varying thicknesses.
 - Mastic asphalt surfacing is continuous over Span 1, 2 and 3. Gaps between concrete faces of adjacent spans are sealed with polysulphide sealant.
 - The hatched area shows the extent of Spans 1, 2, 3 and 4, which are to be structurally dismantled in accordance with App 2/70 and removed to tips off site. Replacement Spans 1, 2, 3 and 4 to be fabricated, delivered and installed as App18/1.
 - Bicycle wheeling channels are to be fitted to upper and lower access ramps after new superstructure has been installed, as App 18/2 (See drawing HE547323-AONE-SBR-8886-DE-C-002 for location and fabrication drawings for details).
 - Approximate weights of existing spans are as follows:
Span 1: 22.0 Tonnes
Span 2: 22.0 Tonnes
Span 3: 23.5 Tonnes
Span 4: 15.0 Tonnes
 - Headroom clearance measured after installation of new bridge spans 19/02/17. New minimum clearance 5.760m over both northbound and southbound carriageways.
 - For details of replacement superstructure (Spans 1, 2, 3 & 4) see Nusteel Structures Ltd fabrication drawings F16026-001 to 050.

Rev	By	Chk	App	Date	Description
AB	DAS	DBS	DBS	09/03/17	As built.

AS BUILT

Client

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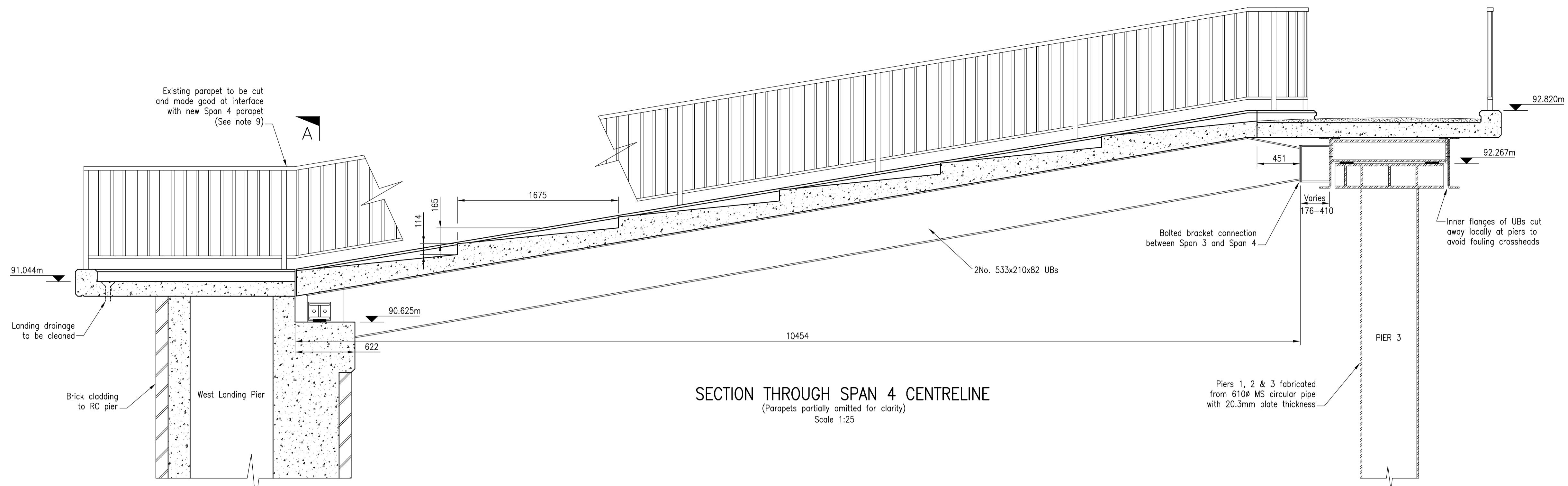
Integrated Highway Services
A ONE+ COLAS COSTAN COMPANY

Project
A1 NORTH DENE FOOTBRIDGE

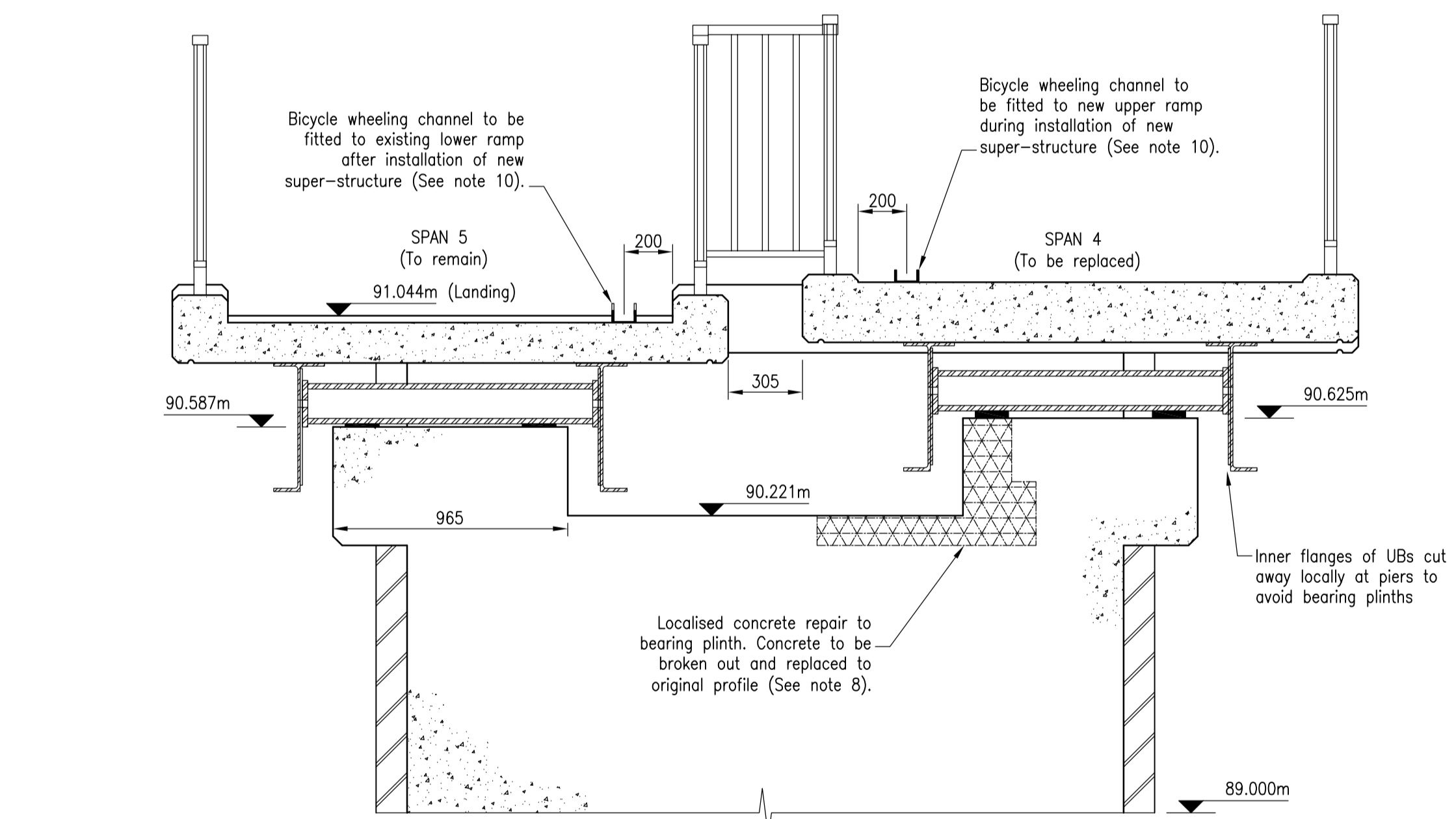
Project Ref **220205**

EXISTING GENERAL ARRANGEMENT

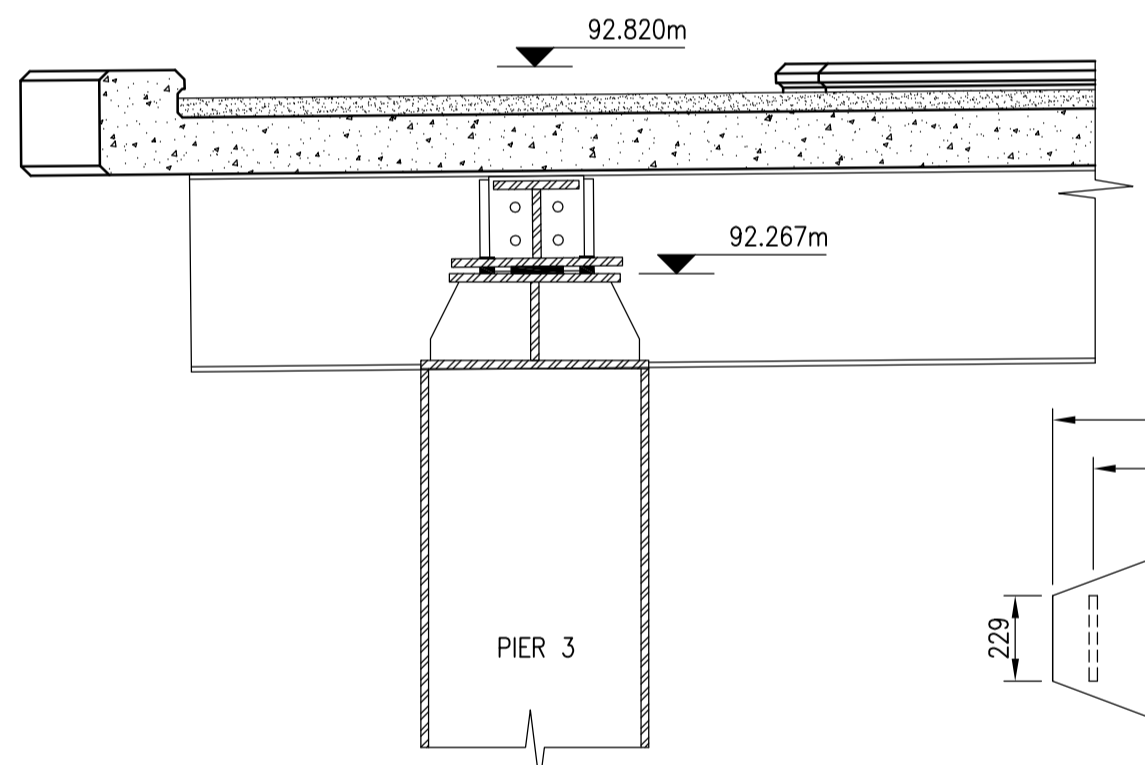
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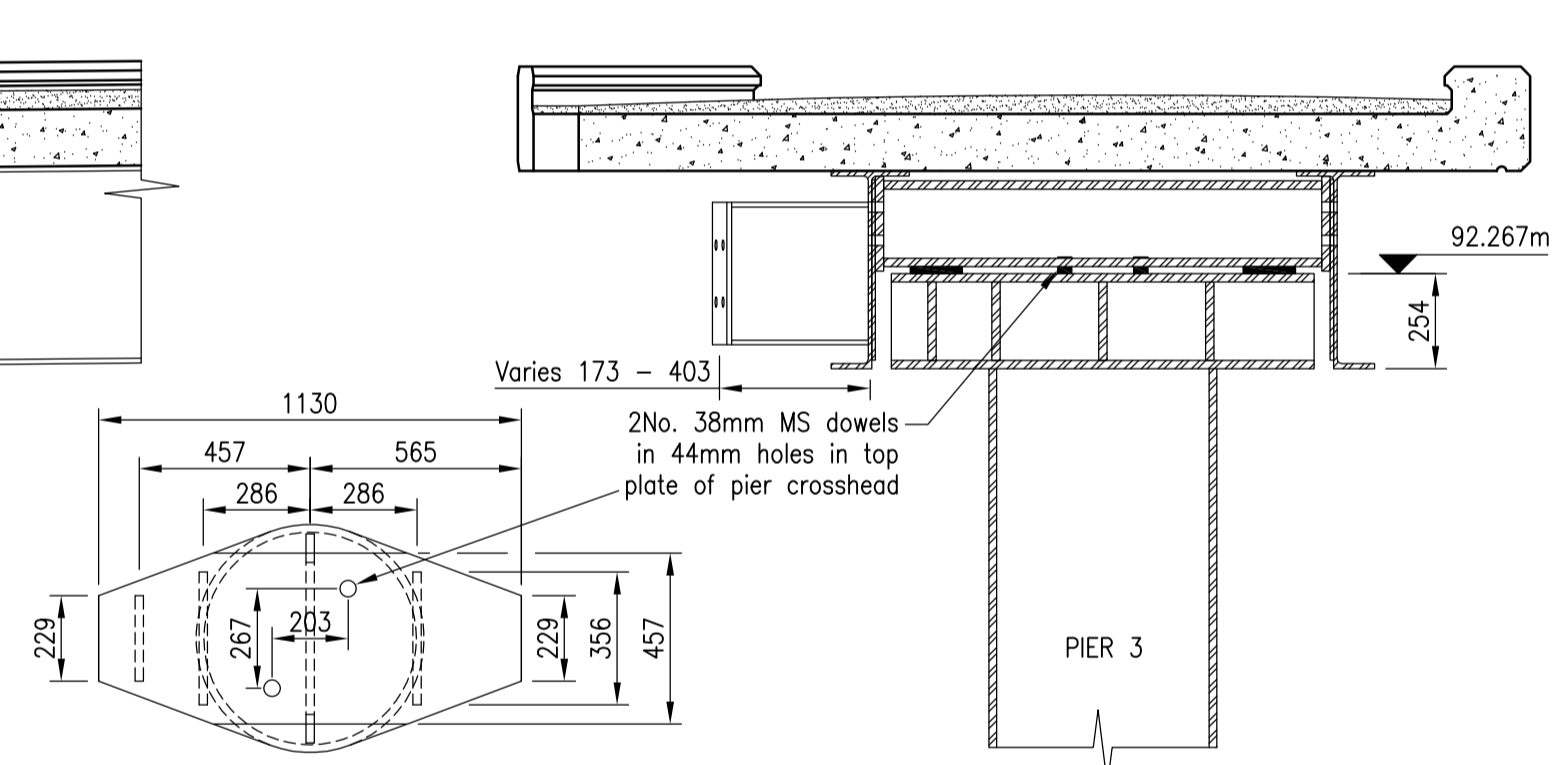
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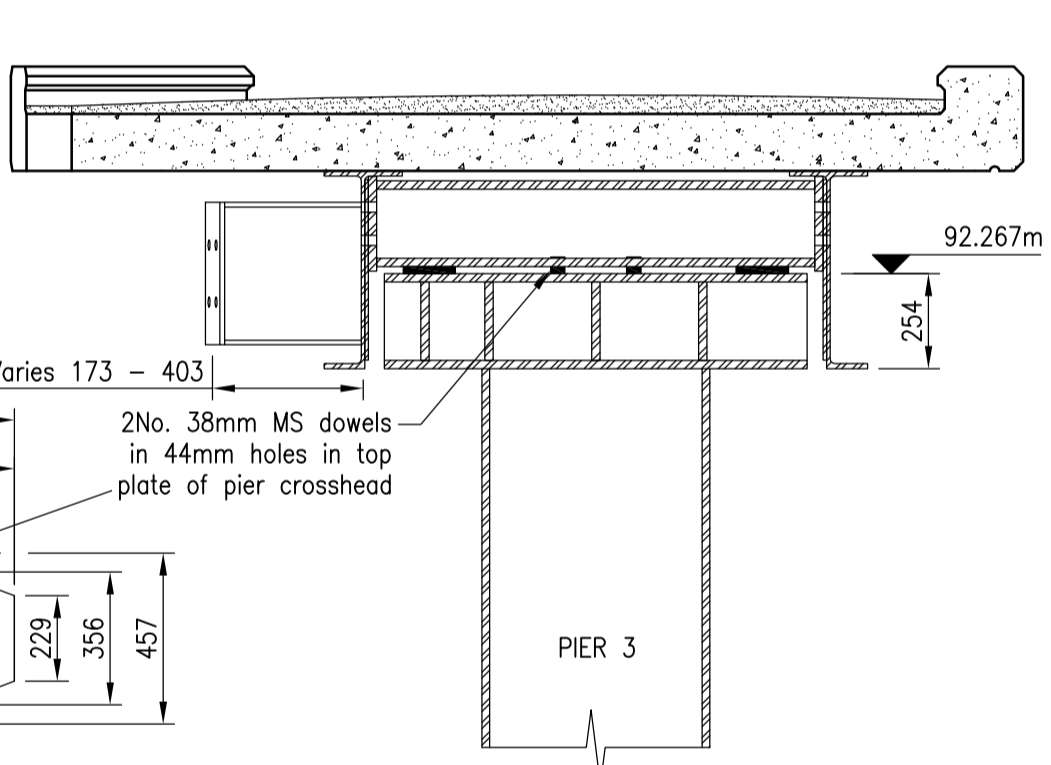
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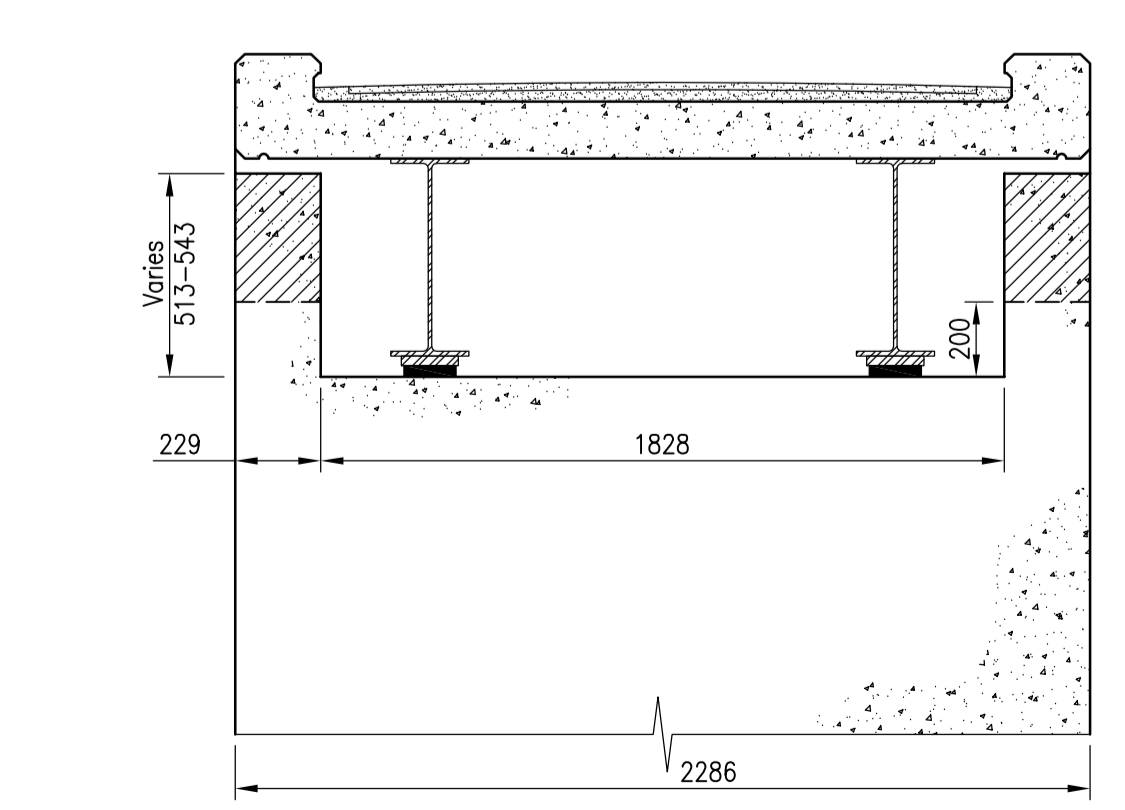
SECTION B-B
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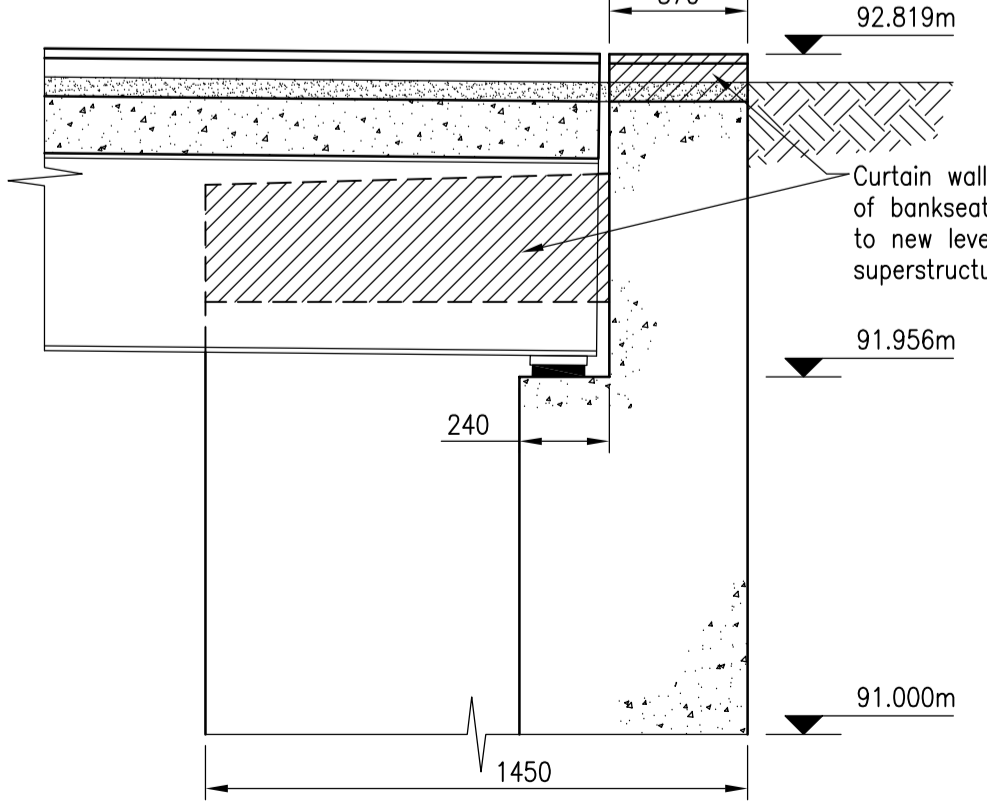
PLAN ON PIER 3 CROSSHEAD
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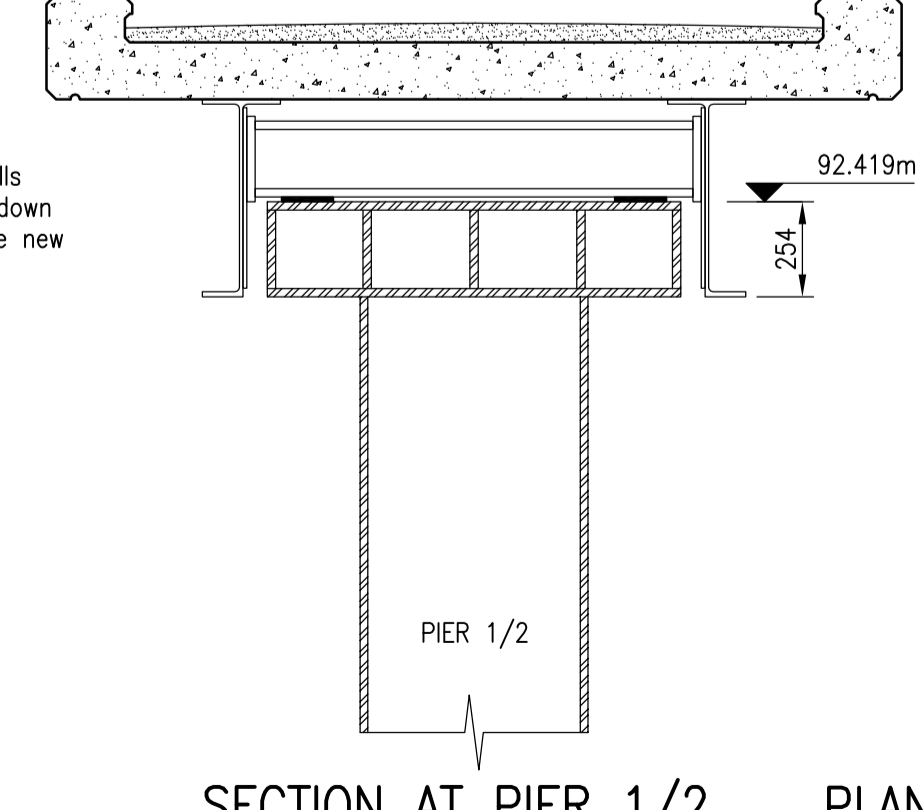
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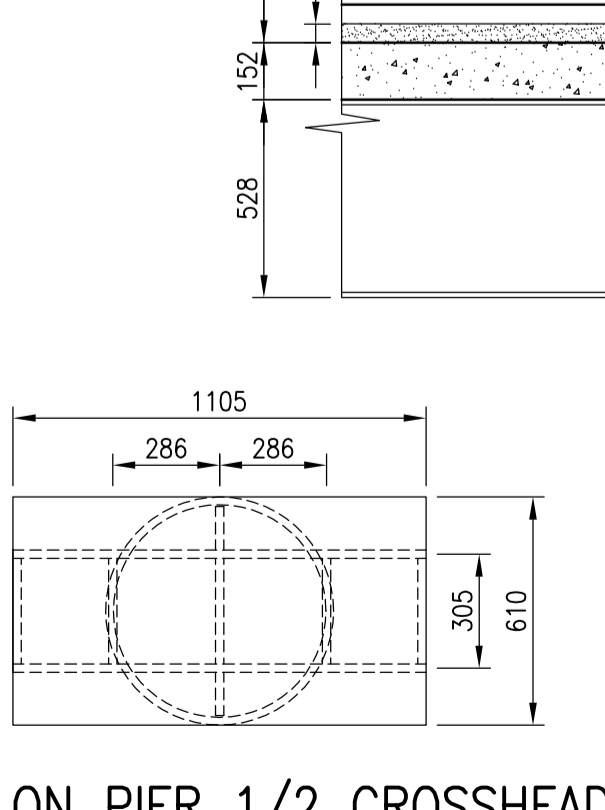
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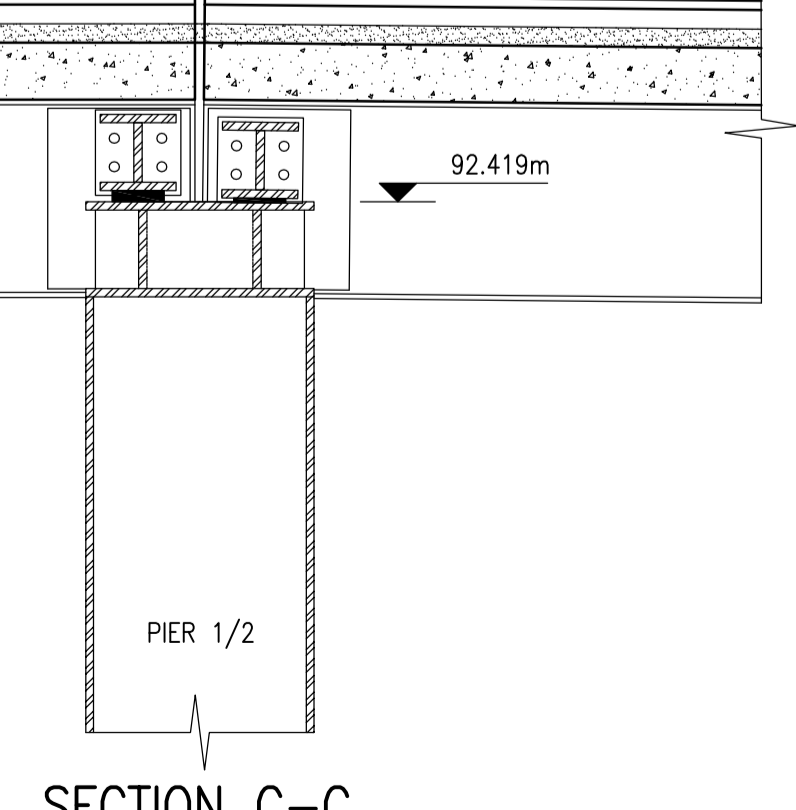
SECTION D-D
Scale 1:20



SECTION AT PIER 1/2
Scale 1:20



PLAN ON PIER 1/2 CROSSHEAD
Scale 1:20



SECTION C-C
Scale 1:20

Notes:

- All dimensions are in millimetres (mm) unless stated otherwise.
- All levels are in metres (m) AOD.
- For position of sections refer to drawing number HE547323-AONE-SBR-8886-DE-C-001.
- Span 3 is fixed at Pier 3 by 2No dowels located in the 2No holes in the top plate of the pier crosshead. All other bearing are free to move laterally in all directions.
- All spans are supported on 140x140 square elastomeric bearings of varying thicknesses.
- Mastic asphalt surfacing is continuous over Span 1, 2 and 3. Gaps between concrete faces of adjacent spans are sealed with polysulphide sealant.
- Approximate weights of each span are as follows:
Span 1: 22.0 Tonnes
Span 2: 22.0 Tonnes
Span 3: 23.5 Tonnes
Span 4: 15.0 Tonnes
- Localised concrete repairs are to be in accordance with the Specification, AR clauses 1770 to 1773.
- Steelwork repairs to existing parapets to be in accordance with App18/1.
- Bicycle wheeling channels consisting 100x50 steel channels are to be fitted to upper and lower access ramps after new superstructure has been installed, as App 18/1 and fabrication drawings.
- For details of replacement superstructure (Spans 1, 2, 3 & 4) see Nusteel Structures Ltd fabrication drawings F16026-001 to 050.

Rev	By	Chk	App	Date	Description
AB	DAS	DBS	DBS	09/03/17	As built.

AS BUILT

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Project
A1 NORTH DENE FOOTBRIDGE

Project Ref **220205**

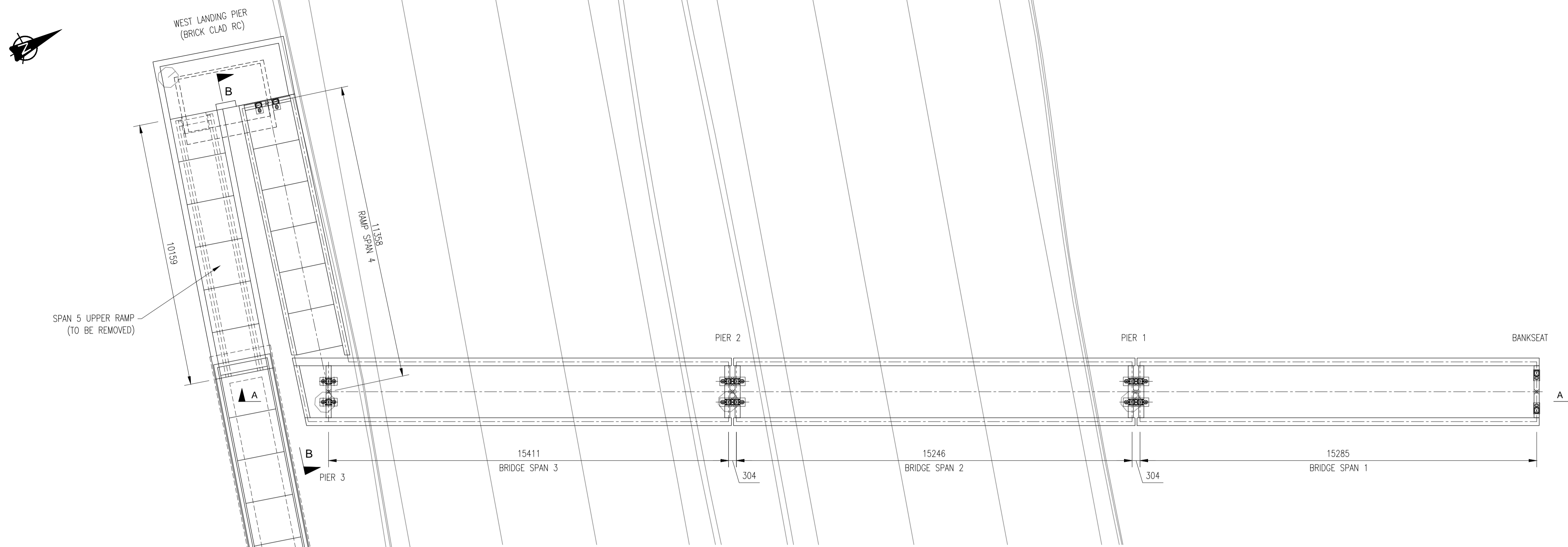
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Designed : DAS	Date: 07/10/2016		
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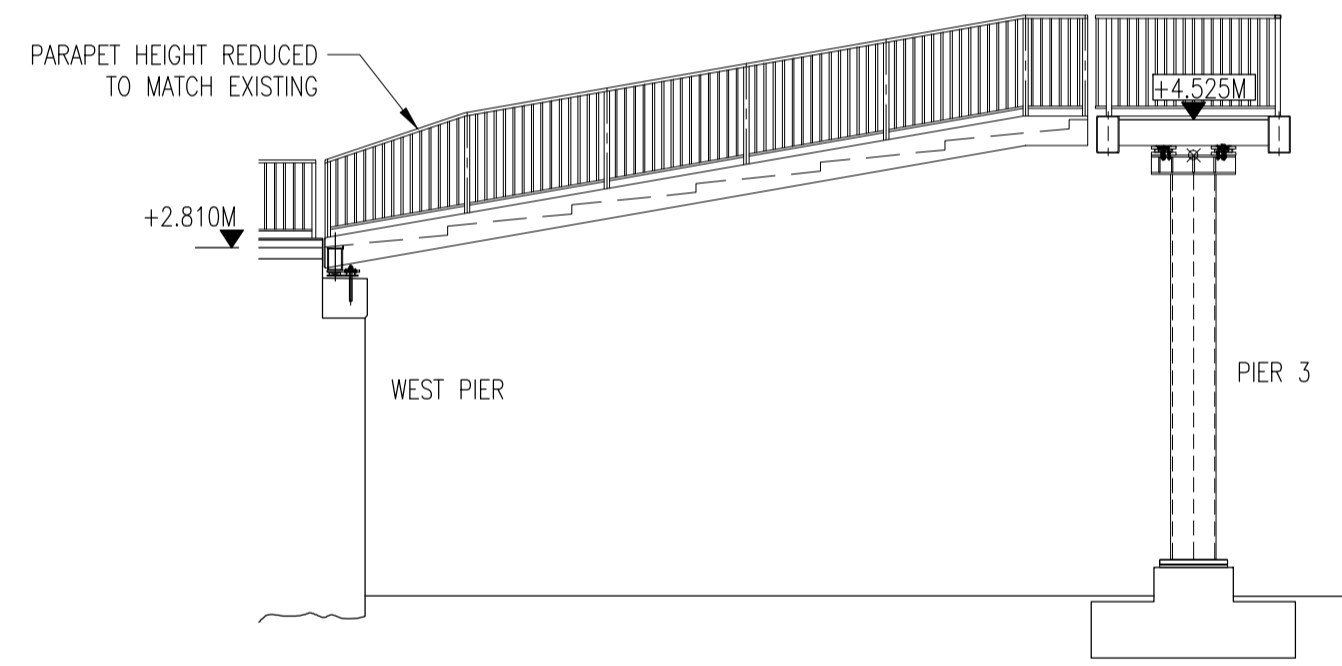
APPENDIX B-2

AS BUILT INFORMATION IMPROVEMENT WORKS

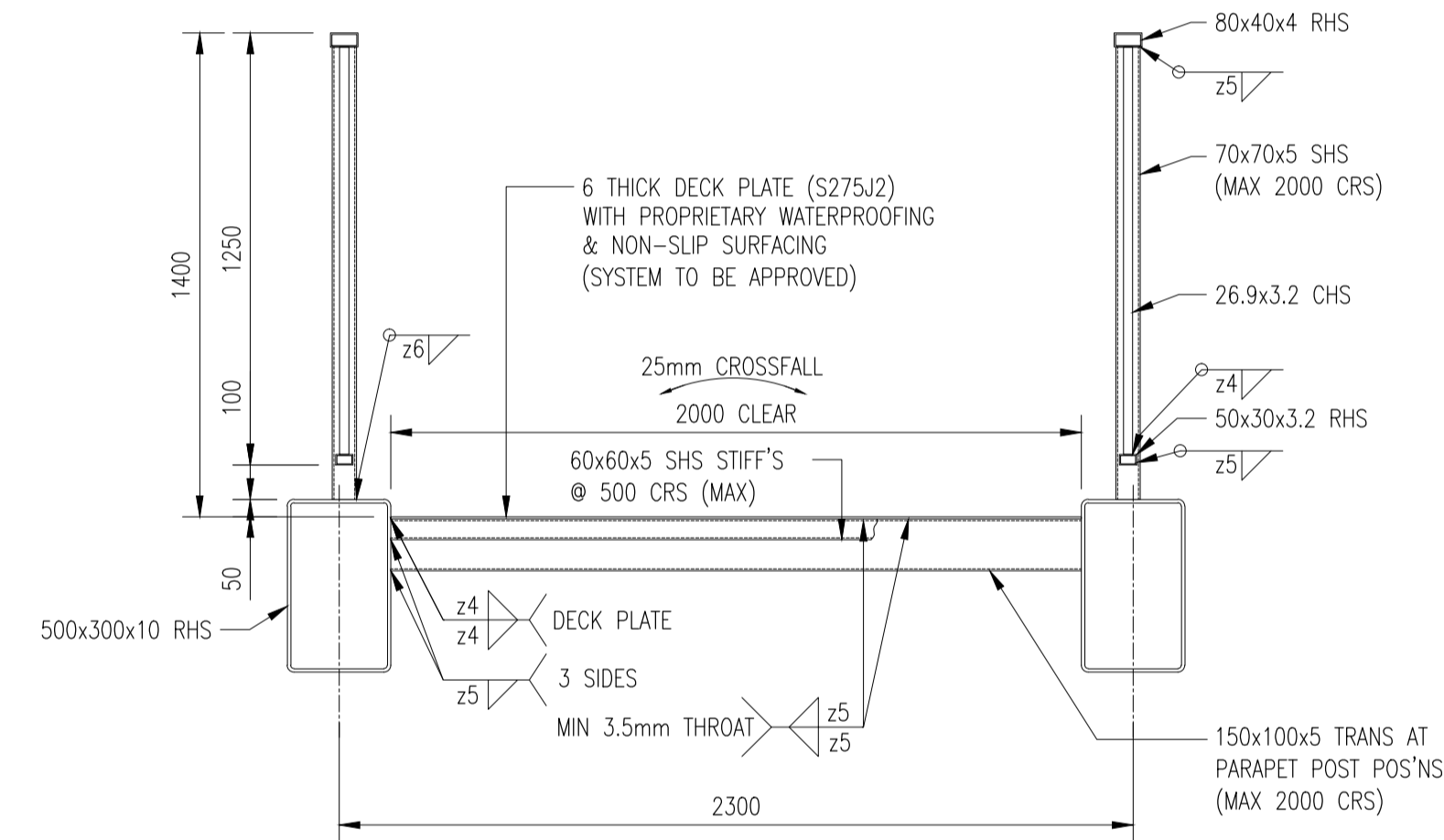
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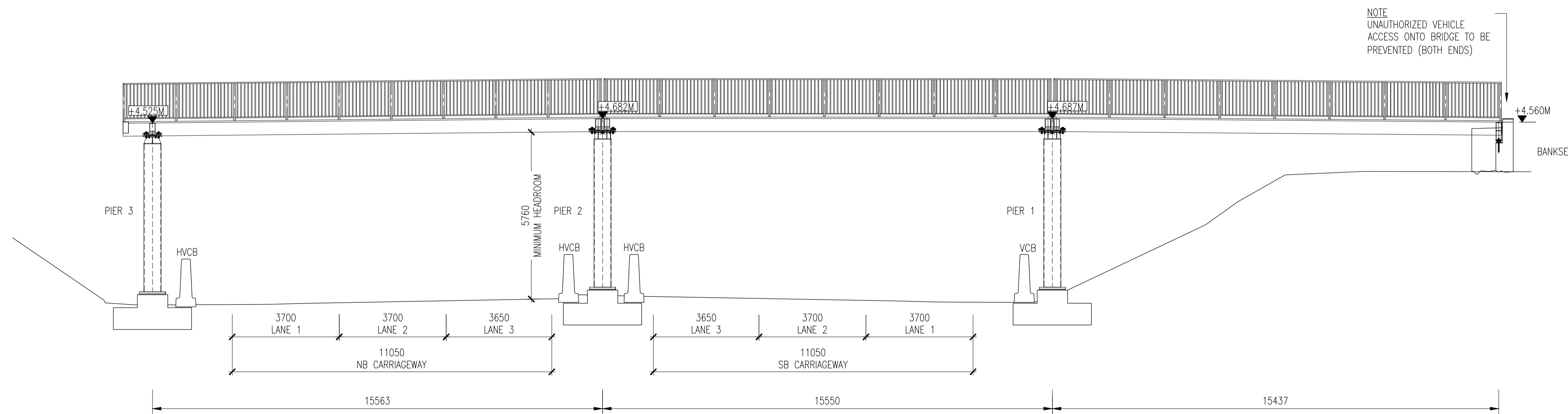
PLAN ON BRIDGE SPANS AND RAMP
SCALE 1:100



SECTION B-B
SCALE 1:100



TYPICAL SECTION THROUGH DECK
SCALE 1:20



SECTION A-A
SCALE 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRE (m) AOD..
3. THIS GA HAS BEEN PREPARED BASED ON REFERENCE TO ARCHIVE DRAWINGS.

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: **PRELIMINARY**



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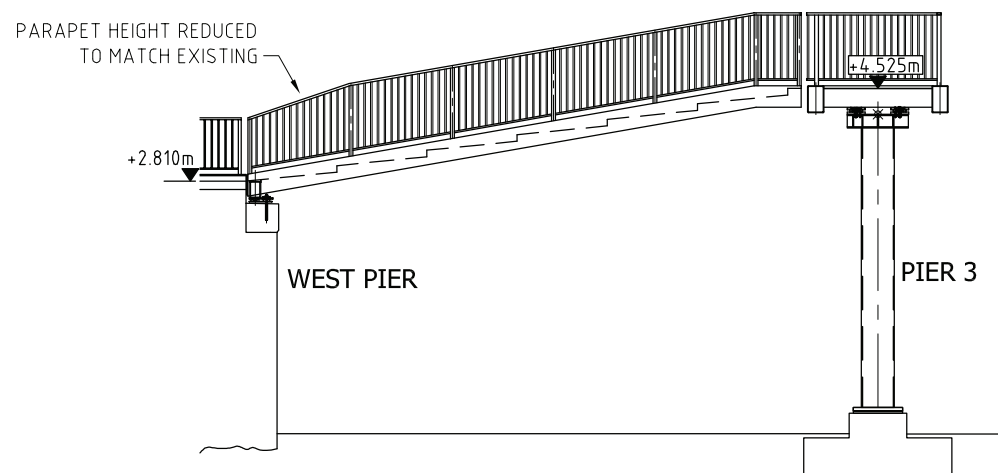
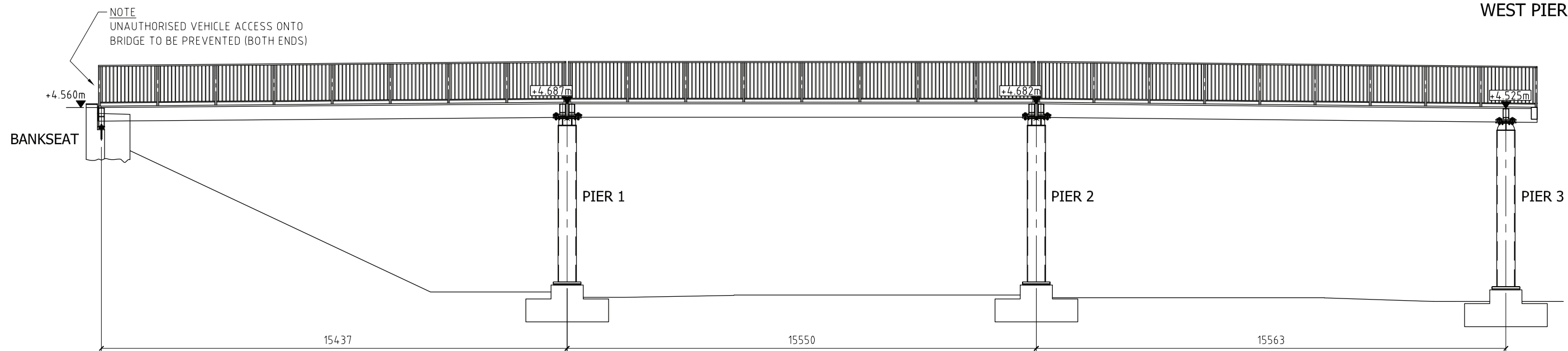
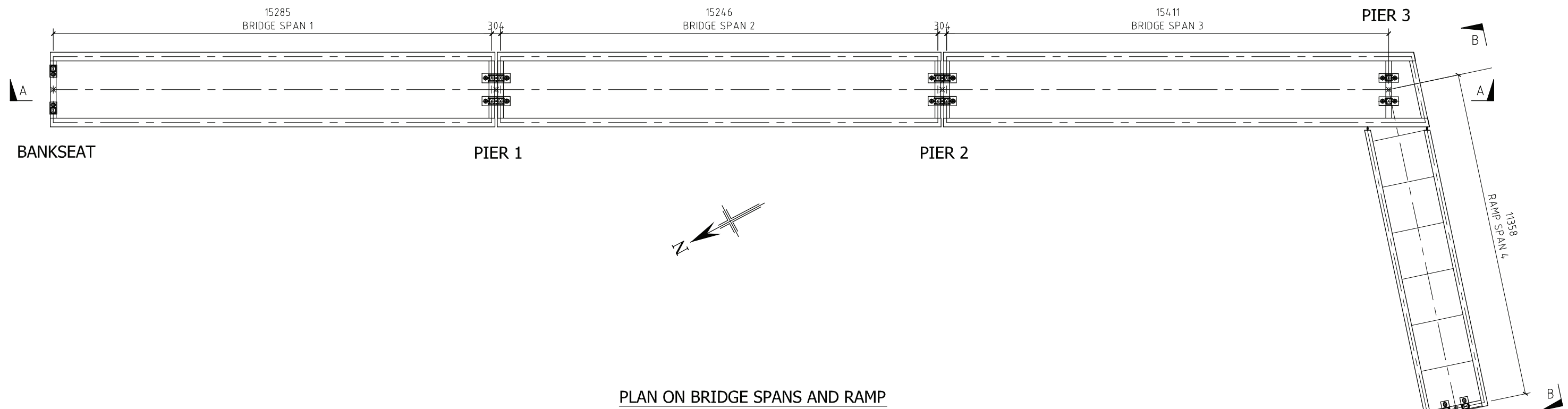


PROJECT: **A1 BIRLEY TO COALHOUSE**

TITLE: **NORTH DENE FOOTBRIDGE EXISTING GENERAL ARRANGEMENT**

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CAD FILE:	DESIGN-DRAWN: RM-SJ	DATE: JANUARY 2018
PROJECT No: 70113262	DRAWING No: HE551482-WSP-SBR-BR008-DR-S-00001	REV: -

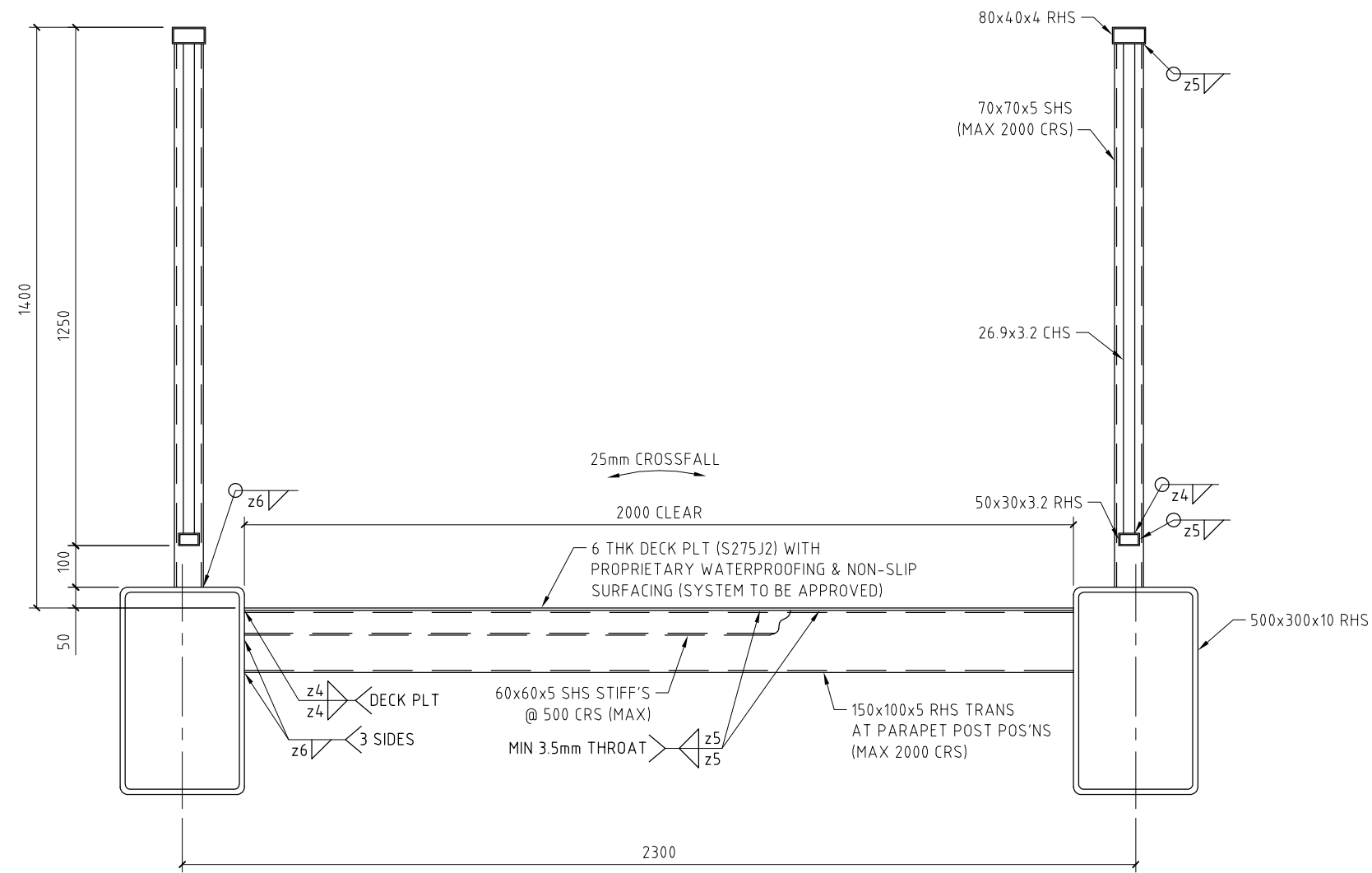
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NOTES

- ALL RHS/SHS/CHS SECTIONS GRADE S355J2H TO BS EN 10210 (U.N.O.)
 ALL OTHER STRUCTURAL ROLLED SECTIONS GRADE S355J2 TO BS EN 10025 (U.N.O.)
 ALL PLATES GRADE S355J2 TO BS EN 10025 (U.N.O.)
 (NON-STRUCTURAL ITEMS GRADE S275)
- ALL DIMENSIONS AND DETAILS ARE INTENDED TO SHOW DESIGN INTENT ONLY, AND ARE SUBJECT TO MINOR AMENDMENT DURING DETAILING
- THE STRUCTURE IS EXECUTION CLASS EXC3 TO BS EN 1090-2


<p>LYMPNE, HYTHE, KENT. HYTHE STD 01303 268112 (6 LINES) FAX :01303 266098</p>	Scale 1:140	NORTH DENE FOOTBRIDGE DESIGN (J16148) – FULL STRUCTURE GENERAL ARRANGEMENT	Contract No.
	Designed IB		F16026
	Drawn IB		Drawing No.
	Checked		Rev.
Date OCT 16		DES/01	COPYRIGHT RESERVED

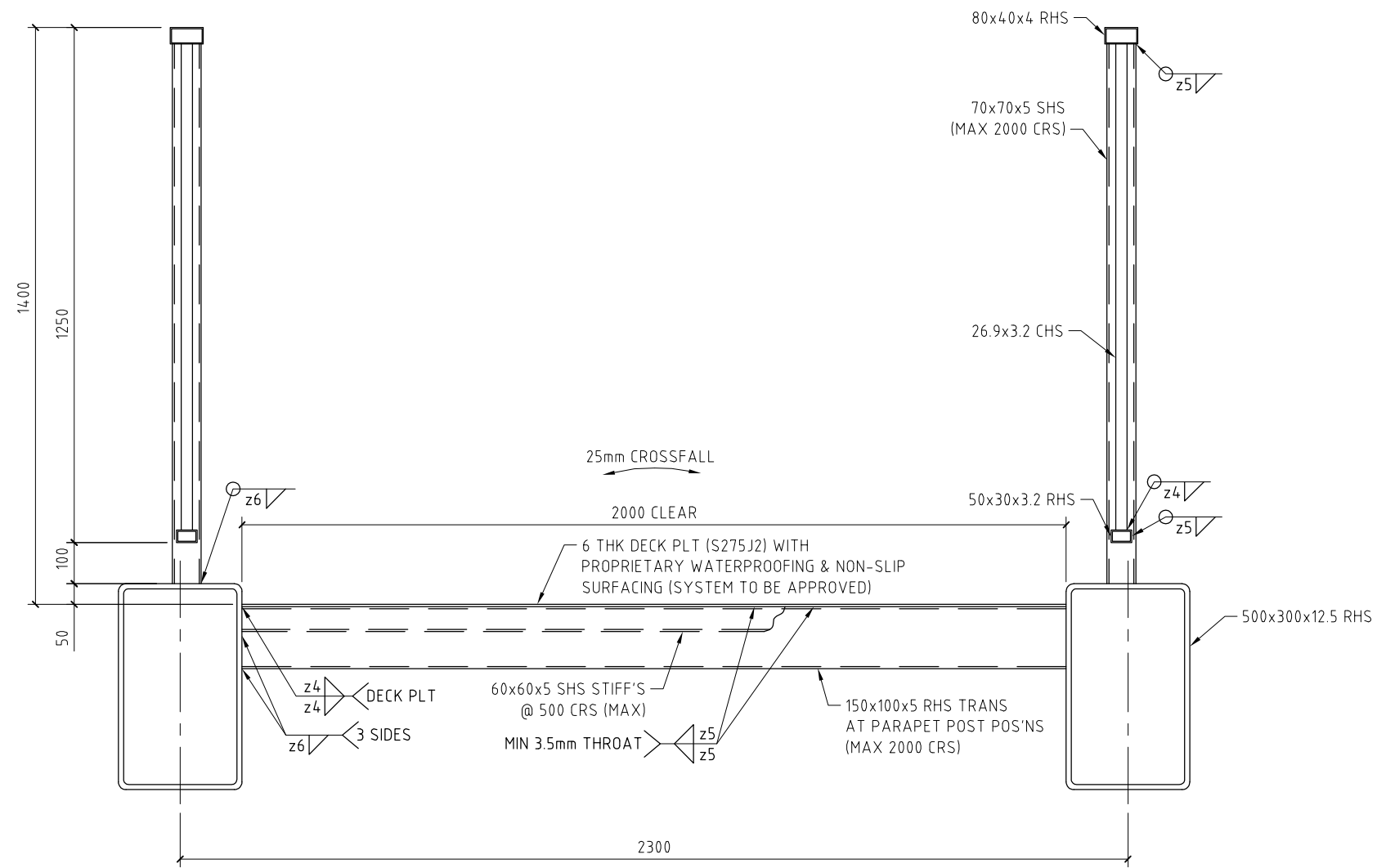


TYPICAL SECTION THROUGH BRIDGE SPANS 1 & 2

NOTES

- ALL RHS/SHS/CHS SECTIONS GRADE S355J2H TO BS EN 10210 (U.N.O.)
ALL OTHER STRUCTURAL ROLLED SECTIONS GRADE S355J2 TO BS EN 10025 (U.N.O.)
ALL PLATES GRADE S355J2 TO BS EN 10025 (U.N.O.)
(NON-STRUCTURAL ITEMS GRADE S275)
- ALL DIMENSIONS AND DETAILS ARE INTENDED TO SHOW DESIGN INTENT ONLY, AND ARE SUBJECT TO MINOR AMENDMENT DURING DETAILING
- THE STRUCTURE IS EXECUTION CLASS EXC3 TO BS EN 1090-2


 LYMPNE, HYPHE, KENT. HYTHE STD 01303 268112 (6 LINES) FAX :01303 266098	Scale 1:15	NORTH DENE FOOTBRIDGE DESIGN (J16148) – DETAILS	Contract No.	
	Designed IB		F16026	
	Drawn IB		Drawing No.	Rev.
	Checked		DES/02	A
	Date OCT 16		COPYRIGHT RESERVED	



TYPICAL SECTION THROUGH BRIDGE SPAN 3

NOTES

- ALL RHS/SHS/CHS SECTIONS GRADE S355J2H TO BS EN 10210 (U.N.O.)
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ALL PLATES GRADE S355J2 TO BS EN 10025 (U.N.O.)
(NON-STRUCTURAL ITEMS GRADE S275)
- ALL DIMENSIONS AND DETAILS ARE INTENDED TO SHOW DESIGN INTENT ONLY, AND ARE SUBJECT TO MINOR AMENDMENT DURING DETAILING
- THE STRUCTURE IS EXECUTION CLASS EXC3 TO BS EN 1090-2


 LYPNE, HYTHE, KENT.
 HYTHE STD 01303 268112 (6 LINES)
 FAX :01303 266098

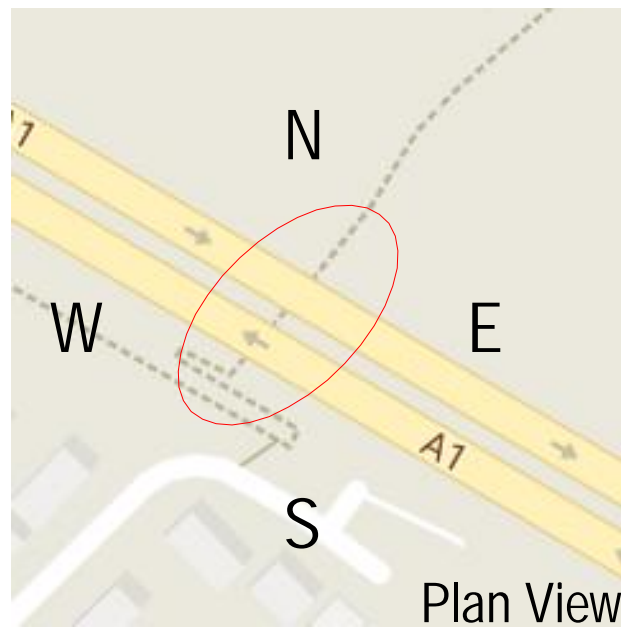
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Drawn IB
Checked
Date OCT 16

NORTH DENE FOOTBRIDGE	
DESIGN (J16148) - DETAILS	

Contract No.	
F16026	
Drawing No.	Rev.
DES/03	A
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APPENDIX B-3

**EXISTING STRUCTURE PHOTOGRAPH RECORD, DATED
SEPTEMBER 2017**



Plan View



Photograph 1
Typical corrosion to parapet elements across the ramp



Photograph 2
Staining due to water leakage



Photograph 3
Deterioration of bridge joint



Photograph 4
Overgrown vegetation



Photograph 5
View of surfacing on bridge deck



Photograph 6
Bridge Soffit- Connection details between pier and deck



Photograph 7
View of the ramp



Photograph 8
South elevation of the ramp



Photograph 9
South elevation of the footbridge



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Project:
A1 BIRTLEY TO COAL HOUSE IMPROVEMENT SCHEME

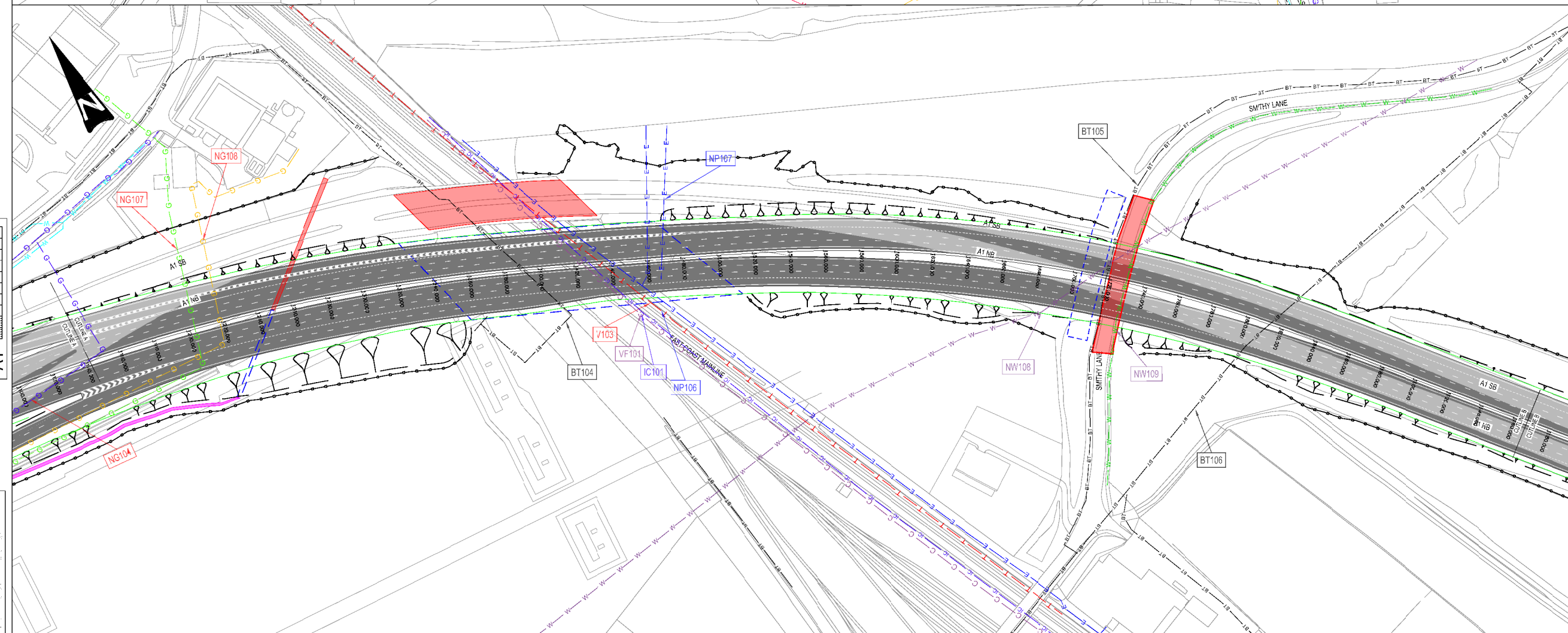
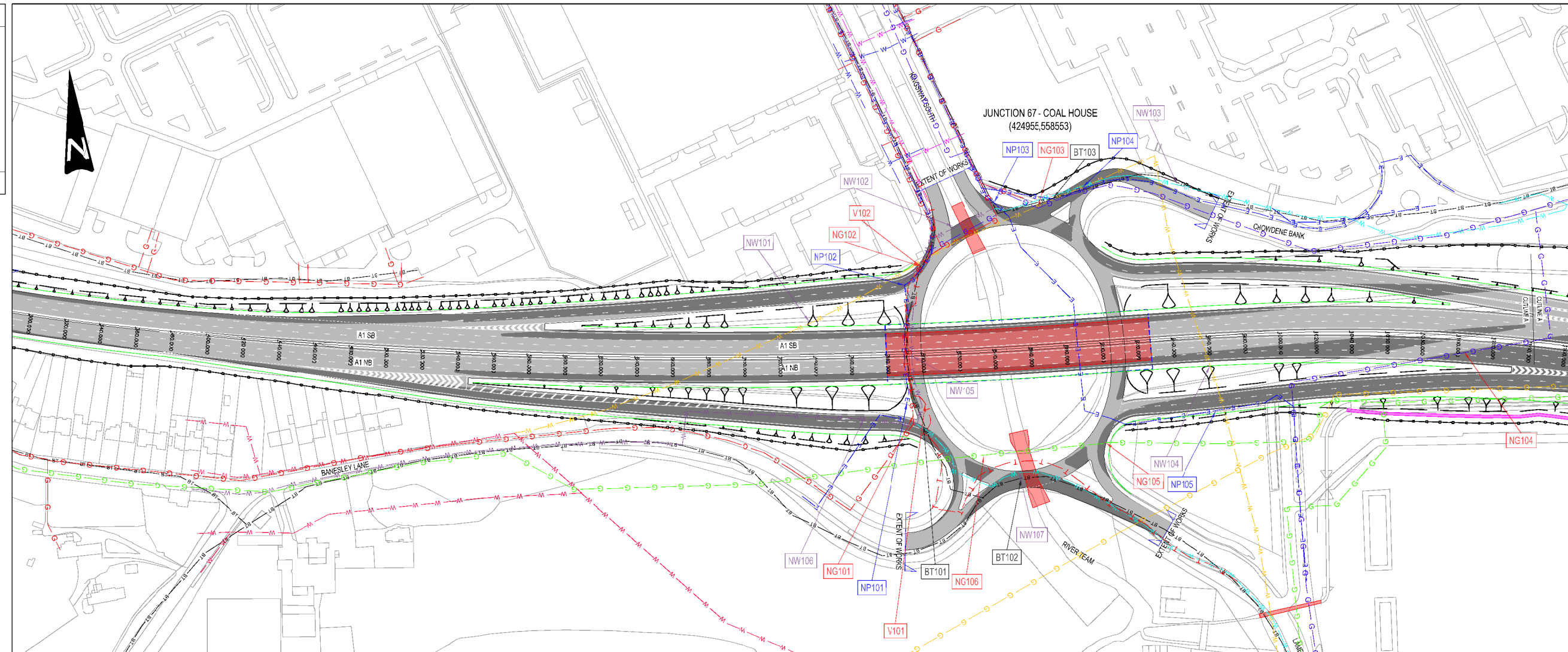
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North Dene Footbridge

Appendix C

STATUTORY UNDERTAKER'S INFORMATION

APPENDIX C-1

STATUTORY UNDERTAKER'S DRAWINGS



NOTES

- LOCATION OF SERVICE PLANT SHOWN ON THIS DRAWING HAS BEEN OBTAINED FROM C2 STATUTORY UNDERTAKERS RETURNS AND IS SHOWN INDICATIVELY. THE STATUTORY UNDERTAKERS ARE TO SATISFY THEMSELVES OF THE LOCATION AND EXTENTS OF SERVICE PLANT.
- REFER TO SECTION 3.10 OF THE TECHNICAL APPRAISAL REPORT FOR DETAILS OF THE DIVERSION WORKS PROPOSED.

KEY

- BT — BT — BT DUCT
- IC — INSTALCOM
- W — W — NORTHUMBRIAN WATER COMBINED
- W — W — NORTHUMBRIAN WATER FOUL
- W — W — NORTHUMBRIAN WATER ABANDONED
- W — W — NORTHUMBRIAN WATER SURFACE
- W — W — NORTHUMBRIAN WATER TREATED
- W — W — NORTHUMBRIAN WATER DISTRIBUTION
- W — W — NON NORTHUMBRIAN WATER PRIVATE
- G — G — NORTHERN GAS LOW PRESSURE
- G — G — NORTHERN GAS MEDIUM PRESSURE
- G — G — NORTHERN GAS INTERMEDIATE PRESSURE
- G — G — NORTHERN GAS REGIONAL HIGH PRESSURE
- T — T — VIRGIN MEDIA CABLE
- E — E — NORTHERN POWER GRID CABLE
- C — C — VODAFONE CABLE
- IC01 — UTILITY REFERENCE
- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- PROPOSED HIGHWAYS FENCE LINE
- NEW CARRIAGEWAY CONSTRUCTION
- EXISTING CARRIAGEWAY TO BE RETAINED
- PROPOSED DRAINAGE DITCH
- PROPOSED SIGNAL
- EXISTING SIGNAL

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INDICATES A RESIDUAL RISK AS A WARNING

Scale	1:1250	Drawn	LCB	Designed	IAK	Checked	COP	Approved	NGR	CR CODE
Date	06/01/2016	Date	06/01/2016	Date	06/01/2016	Date	06/01/2016	Date	06/01/2016	
Status	FOR INFORMATION									Subsidiary
Drawing Number	HA551462 - WSP - VUT - BCH - DR - D - 2700_026									Revision
										S2
										P1.0

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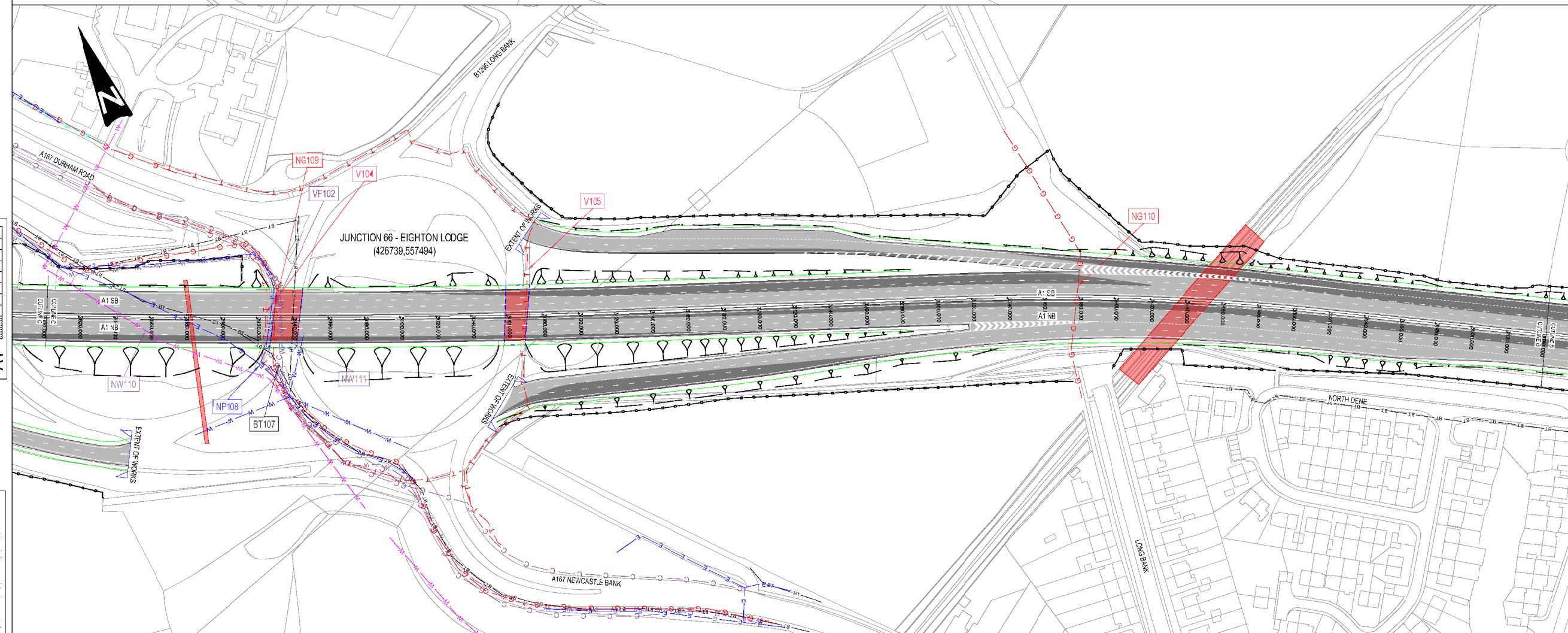
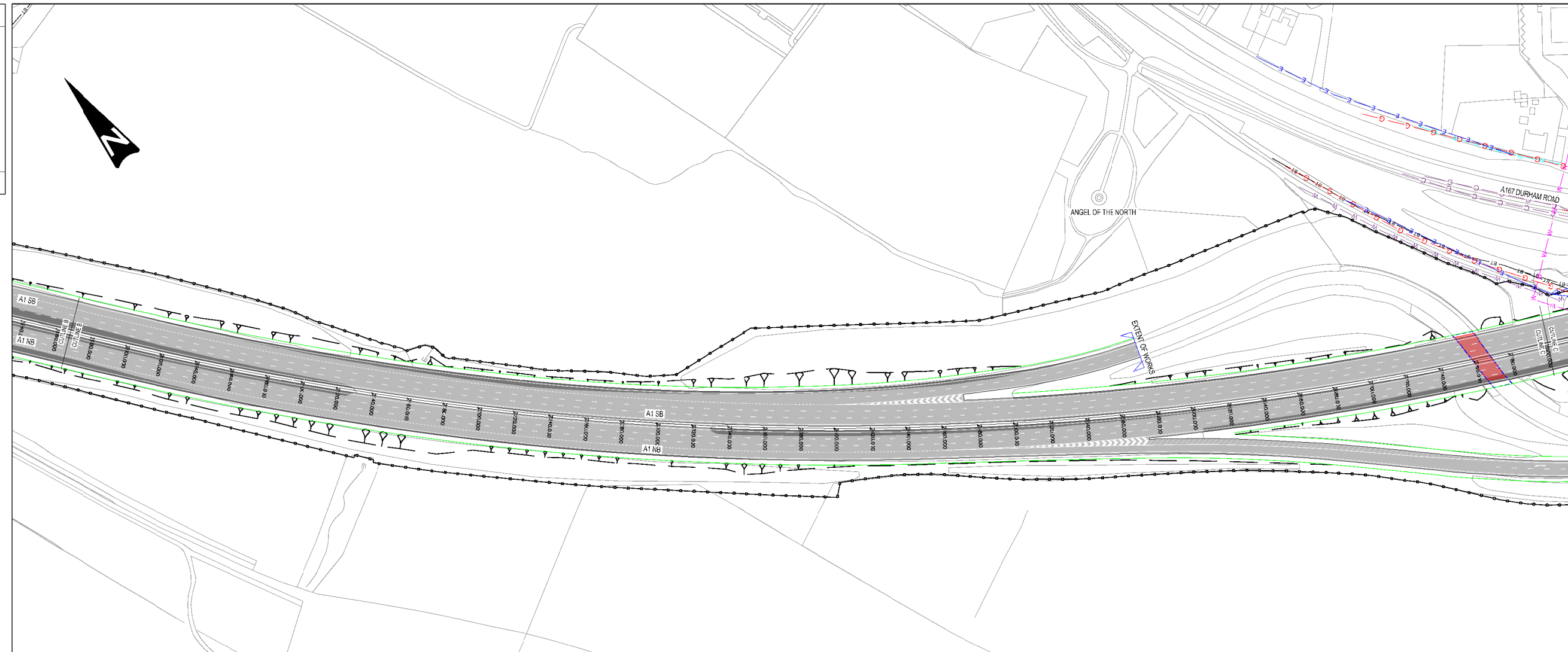
Client: highways england

Project Title: A1 BIRTLEY TO COAL HOUSE

Drawing Title: STATUTORY UNDERTAKERS OPTION 2 SHEET 1 OF 3

A1

DO NOT SCALE



- NOTES**
- LOCATION OF SERVICE PLANT SHOWN ON THIS DRAWING HAS BEEN OBTAINED FROM CC STATUTORY UNDERTAKERS RETURNS AND IS SHOWN INDICATIVELY. THE STATUTORY UNDERTAKERS ARE TO SATISFY THEMSELVES OF THE LOCATION AND EXTENTS OF SERVICE PLANT.
 - REFER TO SECTION 3.10 OF THE TECHNICAL APPRAISAL REPORT FOR DETAILS OF THE DIVERSION WORKS PROPOSED.
- KEY**
- BT BT DUCT
 - IC INSTAL.COM
 - W W NORTHUMBRIAN WATER COMBINED
 - W W NORTHUMBRIAN WATER FOUL
 - W W NORTHUMBRIAN WATER ABANDONED
 - W W NORTHUMBRIAN WATER SURFACE
 - W W NORTHUMBRIAN WATER TREATED
 - W W NORTHUMBRIAN WATER DISTRIBUTION
 - W W NON NORTHUMBRIAN WATER PRIVATE
 - G G NORTHERN GAS LOW PRESSURE
 - G G NORTHERN GAS MEDIUM PRESSURE
 - G G NORTHERN GAS INTERMEDIATE PRESSURE
 - G G NORTHERN GAS REGIONAL HIGH PRESSURE
 - T T VIRGIN MEDIA CABLE
 - E E NORTHERN POWER GRID CABLE
 - C C VODAFONE CABLE
 - IC01 UTILITY REFERENCE
 - EXISTING STRUCTURE
 - PROPOSED STRUCTURE
 - PROPOSED HIGHWAYS FENCE LINE
 - NEW CARRIAGEWAY CONSTRUCTION
 - EXISTING CARRIAGEWAY TO BE RETAINED
 - PROPOSED DRAINAGE DITCH
 - PROPOSED SIGNAL
 - EXISTING SIGNAL

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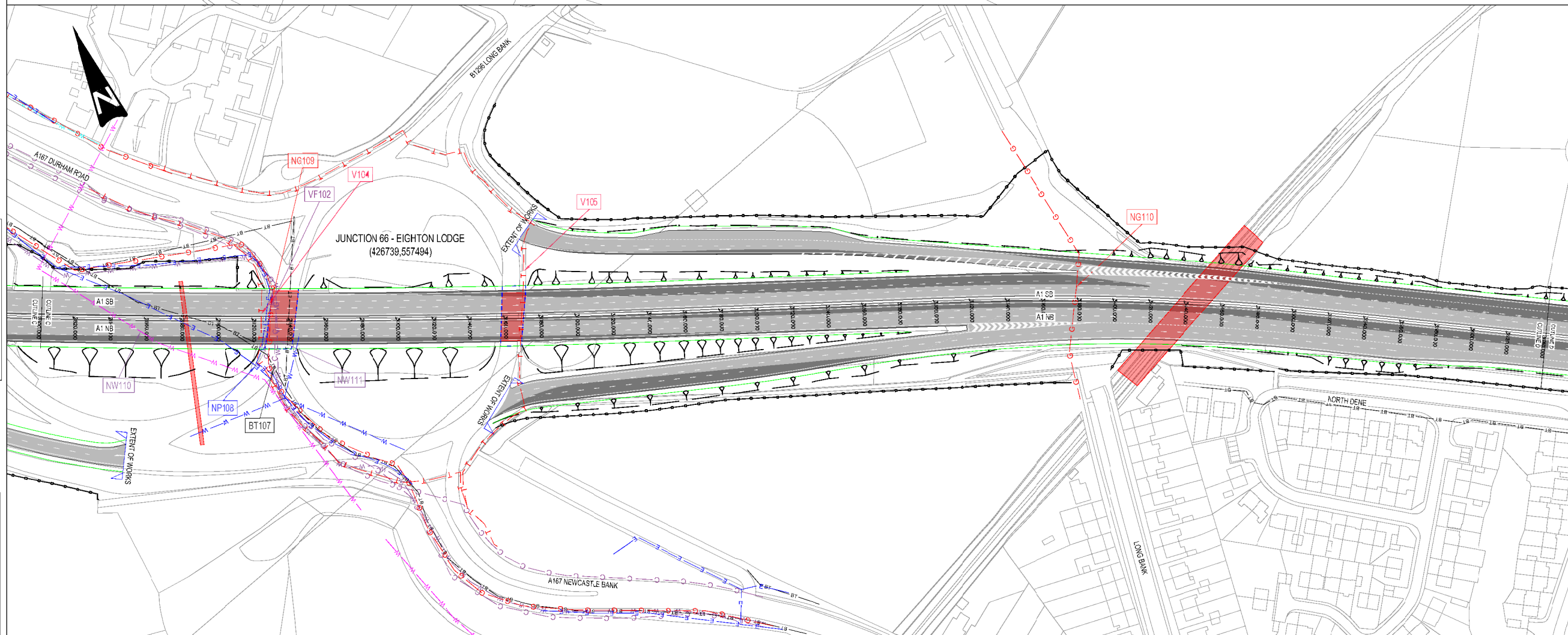
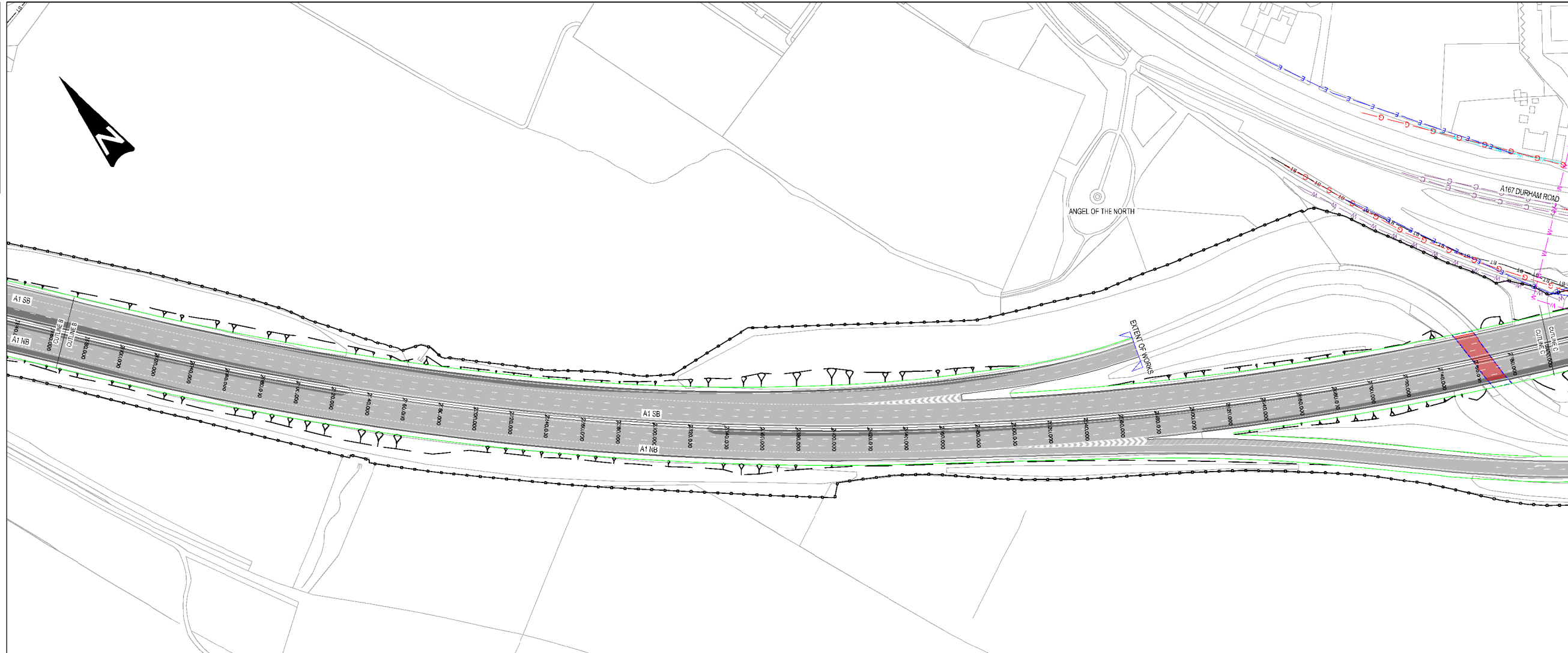
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Drawing Title: **STATUTORY UNDERTAKERS OPTION 2 SHEET 2 OF 3**

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Status	FOR INFORMATION				Suitability S2
Drawing Number	HA551462 - WSP - VUT - BCH - DR - D - 2700_027				Revision P1.0

A1

DO NOT SCALE



- NOTES**
- LOCATION OF SERVICE PLANT SHOWN ON THIS DRAWING HAS BEEN OBTAINED FROM CC STATUTORY UNDERTAKERS RETURNS AND IS SHOWN INDICATIVELY. THE STATUTORY UNDERTAKERS ARE TO SATISFY THEMSELVES OF THE LOCATION AND EXTENTS OF SERVICE PLANT.
 - REFER TO SECTION 3.10 OF THE TECHNICAL APPRAISAL REPORT FOR DETAILS OF THE DIVERSION WORKS PROPOSED.
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 - IC INSTAL.COM
 - W W NORTHUMBRIAN WATER COMBINED
 - W W NORTHUMBRIAN WATER FOUL
 - W W NORTHUMBRIAN WATER ABANDONED
 - W W NORTHUMBRIAN WATER SURFACE
 - W W NORTHUMBRIAN WATER TREATED
 - W W NORTHUMBRIAN WATER DISTRIBUTION
 - W W NON NORTHUMBRIAN WATER PRIVATE
 - G G NORTHERN GAS LOW PRESSURE
 - G G NORTHERN GAS MEDIUM PRESSURE
 - G G NORTHERN GAS INTERMEDIATE PRESSURE
 - G G NORTHERN GAS REGIONAL HIGH PRESSURE
 - T T VIRGIN MEDIA CABLE
 - E E NORTHERN POWER GRID CABLE
 - C C VODAFONE CABLE
 - IC01 UTILITY REFERENCE
 - EXISTING STRUCTURE
 - PROPOSED STRUCTURE
 - PROPOSED HIGHWAYS FENCE LINE
 - NEW CARRIAGEWAY CONSTRUCTION
 - EXISTING CARRIAGEWAY TO BE RETAINED
 - PROPOSED DRAINAGE DITCH
 - PROPOSED SIGNAL
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Project Title: **A1 BIRTLEY TO COAL HOUSE**

Drawing Title: **STATUTORY UNDERTAKERS OPTION 2 SHEET 2 OF 3**

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Size	Date	Date	Date	Date	Status
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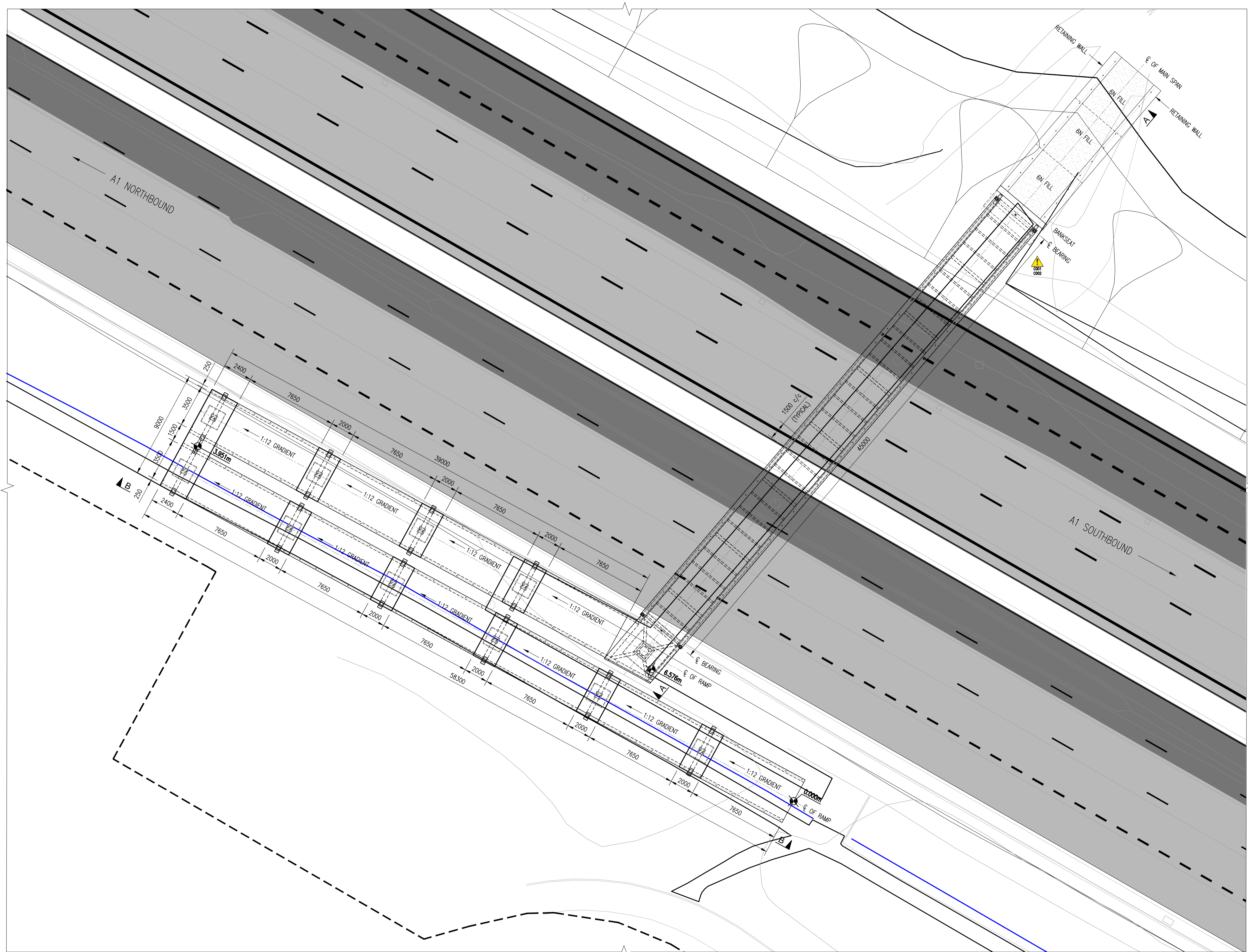
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Appendix D

PROPOSED GENERAL ARRANGEMENT DRAWINGS

APPENDIX D-1

**OUTLINE GENERAL ARRANGEMENT BOW TRUSS
FOOTBRIDGE OPTION**



PLAN ON NORTH DENE FOOTBRIDGE (GRADIENT 1:12)
SCALE 1:150

- GENERAL NOTES
- 1) STRUCTURAL BRIDGE DETAILS PROVIDED ON THIS DRAWING IS INDICATIVE ONLY BASED ON LIMITED INFORMATION AVAILABLE TO DATE
 - 2) THE SIZE OF STRUCTURAL ELEMENTS ARE BASED PRELIMINARY CALCULATION AND PREVIOUS SIMILAR TYPE WORKS. ALL INFORMATION IS SUBJECT TO DETAILED DESIGN PRIOR TO FINAL CONFIRMATION
 - 3) DETAILS PROVIDED ARE FOR INFORMATION ONLY. INDICATIVE CONSTRUCTION COST ESTIMATES ARE BASED ON PREVIOUS SIMILAR TYPE WORKS
 - 4) THE FOLLOWING CRITICAL INFORMATION IS REQUIRED TO VERIFY THE FEASIBILITY OF THE PROPOSED OPTION AND DEVELOPED THIS FURTHER AT DETAILED DESIGN (IF PREFERRED)
 - TOPOGRAPHICAL SURVEY - CONFIRM GEOMETRIC PARAMETERS AND SITE CONSTRAINTS
 - SITE INVESTIGATION INFORMATION - CONFIRM FOUNDATION PARAMETERS
 - LIAISON WITH HIGHWAY ENGLAND - CONFIRM STRUCTURAL REQUIREMENTS
 - LIAISON WITH STATUTORY UNDERTAKERS - CONFIRM EXISTING/NEW SERVICES IMPACTED BY THE WORKS
 - 5) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
 - 6) ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE
 - 7) DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS SEEK CLARIFICATION FROM THE DESIGNER

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND
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IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

CONSTRUCTION:
REF C001 - LIFTING OF HEAVY/LARGE BRIDGE COMPONENTS
REF C002 - TRANSPORT LARGE STEEL COMPONENTS

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: **PRELIMINARY**

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CLIENT: **Working on behalf of**
highways england

PROJECT: **A1 BIRTLEY TO COALHOUSE**

TITLE: **NORTH DENE FOOTBRIDGE BOW TRUSS OPTION
1:12 RAMP PROVISION
(SHEET 1 OF 2)**

SCALE @ A1: AS SHOWN	CHECKED: HM	APPROVED: HM
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CAD FILE:	DESIGN/DRAWN: RM-SJ	DATE: JANUARY 2018
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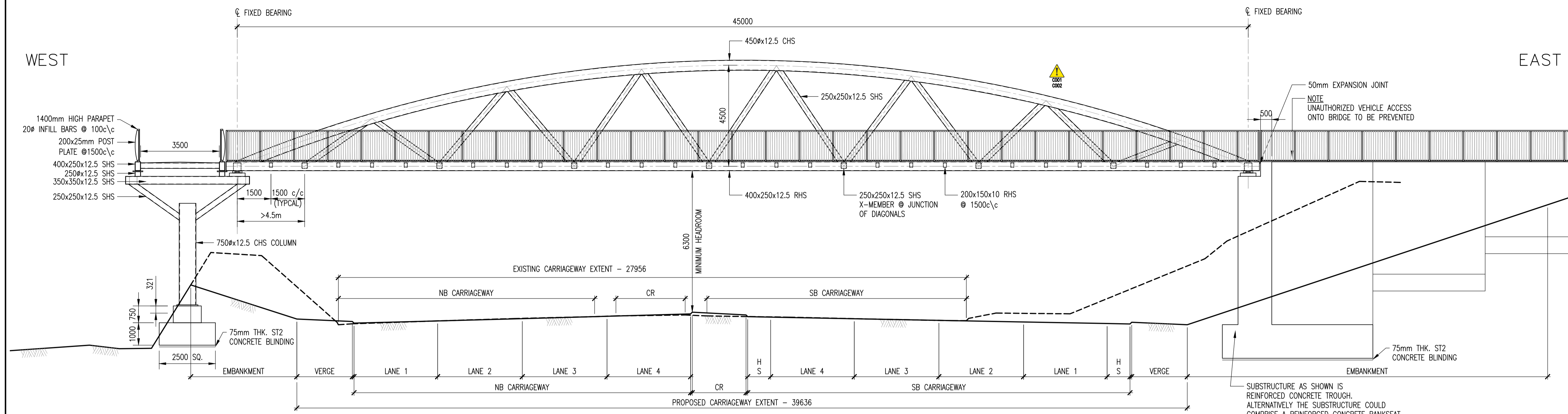
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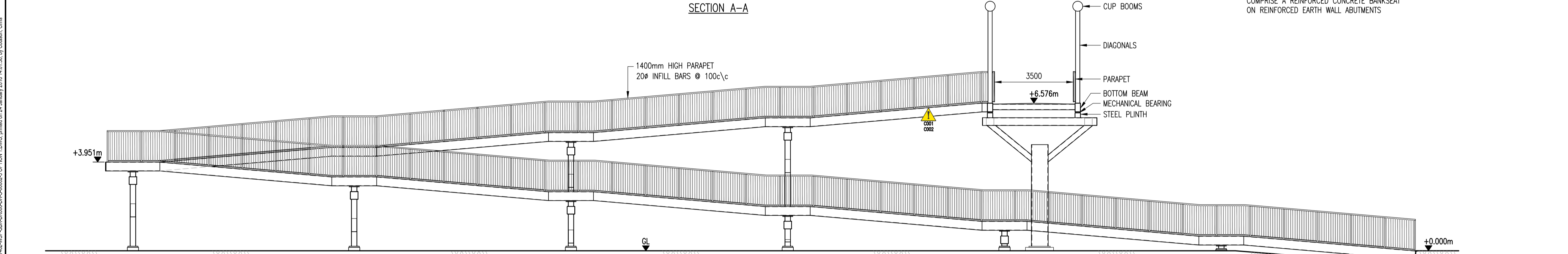
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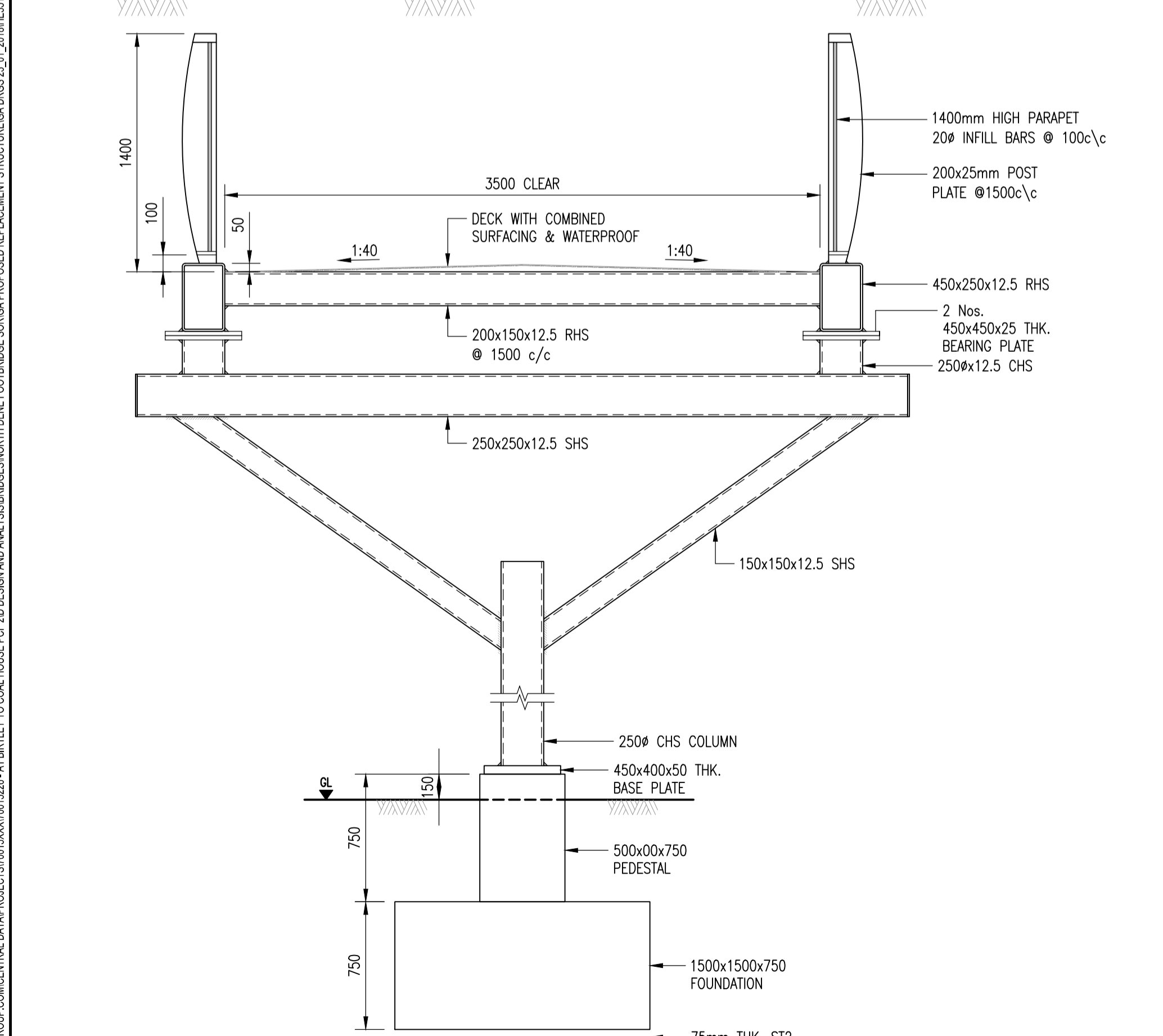
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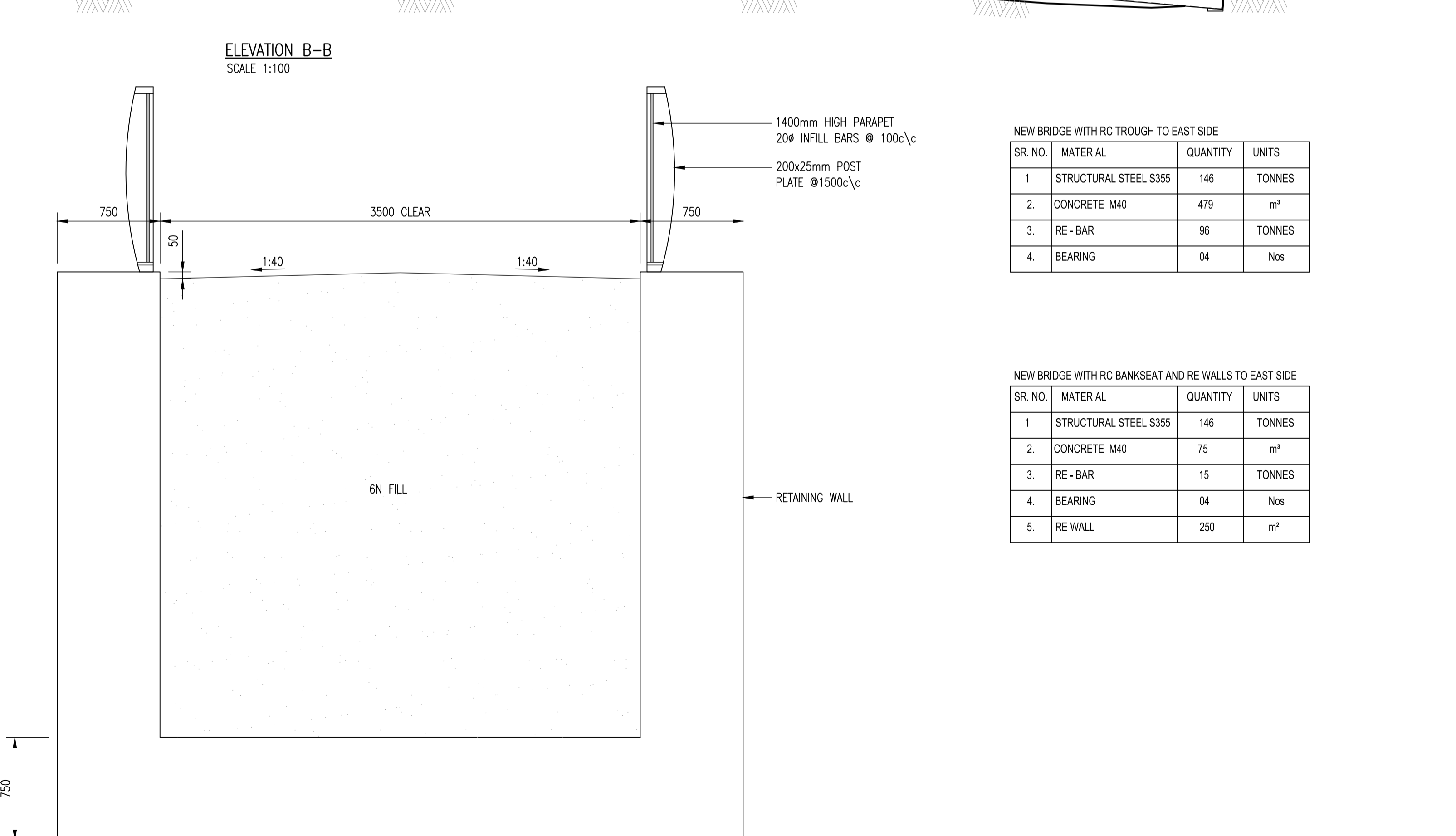
SECTION A-A



ELEVATION B-B
SCALE 1:100



TYPICAL SECTION THROUGH RAMP
SCALE 1:25



X-SECTION THROUGH RETAINING WALL
SCALE 1:25

NEW BRIDGE WITH RC TROUGH TO EAST SIDE

SR. NO.	MATERIAL	QUANTITY	UNITS
1.	STRUCTURAL STEEL S355	146	TONNES
2.	CONCRETE M40	479	m³
3.	RE - BAR	96	TONNES
4.	BEARING	04	Nos

NEW BRIDGE WITH RC BANKSEAT AND RE WALLS TO EAST SIDE

SR. NO.	MATERIAL	QUANTITY	UNITS
1.	STRUCTURAL STEEL S355	146	TONNES
2.	CONCRETE M40	75	m³
3.	RE - BAR	15	TONNES
4.	BEARING	04	Nos
5.	RE WALL	250	m²

- NOTES:
- OPTION 1: COMPRISES THE DEMOLITION AND REMOVAL OF THE BRIDGE AND CONSTRUCTION OF NEW 3.5 M WIDE COMBINED CYCLEWAY/PEDESTRIAN FOOTBRIDGE AND RAMP
 - THE OPTION HAS BEEN DEVELOPED BASED ON THE FOLLOWING ASSUMPTIONS
 - DESIGN LOADING: LM4 AND SERVICE VEHICLE
 - HIGHWAY CROSS SECTION BASED ON PRELIMINARY ALIGNMENT DESIGN BY WSP HIGHWAYS
 - DESIGN LIFE FOR THE NEW ELEMENTS: 120 YEARS
 - ITS IS ACCEPTABLE FOR THE NEW BRIDGE WORKS TO BE CONSTRUCTED ON THE SAME ALIGNMENT/FOOTBRIDGE AS THE EXISTING.
 - FOR DETAILS OF THE EXISTING STRUCTURE REFER RECORD DRAWINGS
 - KEY MATERIALS (GRADE/STRENGTH)
 - ALL STRUCTURAL STEEL TO BE GRADE OF S355 TO BS 10025.
 - RETAINING WALL AND FOUNDATION CONCRETE TO BE MINIMUM STRENGTH CLASS C40/50 TO BE 8500 UNLESS NOTED OTHERWISE
 - ALL REINFORCEMENT TO BE GRADE B500B TO BS 4449:2005

- INDICATIVE CONSTRUCTION SEQUENCE
- DISCUSS TRAFFIC MANAGEMENT REQUIREMENT AND GET APPROVAL FROM HIGHWAY ENGLAND FOR DEMOLITION
 - ESTABLISH SITE COMPOUND
 - REMOVE EXISTING BRIDGE
 - CONSTRUCT FOUNDATION, SUBSTRUCTURE AND ABUTMENT
 - INSTALL THE MECHANICAL BEARING OVER THE ABUTMENT AND MAIN COLUMN FOR TRUSS
 - INSTALL THE PRE FABRICATED RAMP AND TRUSS
 - INSTALL COMBINED WATERPROOFING SURFACING, DECK JOINT & PARAPET OVER RETAINING WALL ETC
 - CLEAR THE SITE

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND
 INDICATES A RESIDUAL RISK AS A WARNING

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

CONSTRUCTION:

REF C001	LIFTING OF HEAVY/LARGE BRIDGE COMPONENTS
REF C002	TRANSPORT LARGE STEEL COMPONENTS

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: **PRELIMINARY**

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<http://www.wspgroup.com>

CLIENT: **Working on behalf of**

PROJECT: **A1 BIRTLEY TO COALHOUSE**

TITLE: **NORTH DENE FOOTBRIDGE BOW TRUSS OPTION
 1:12 RAMP PROVISION
 (SHEET 2 OF 2)**

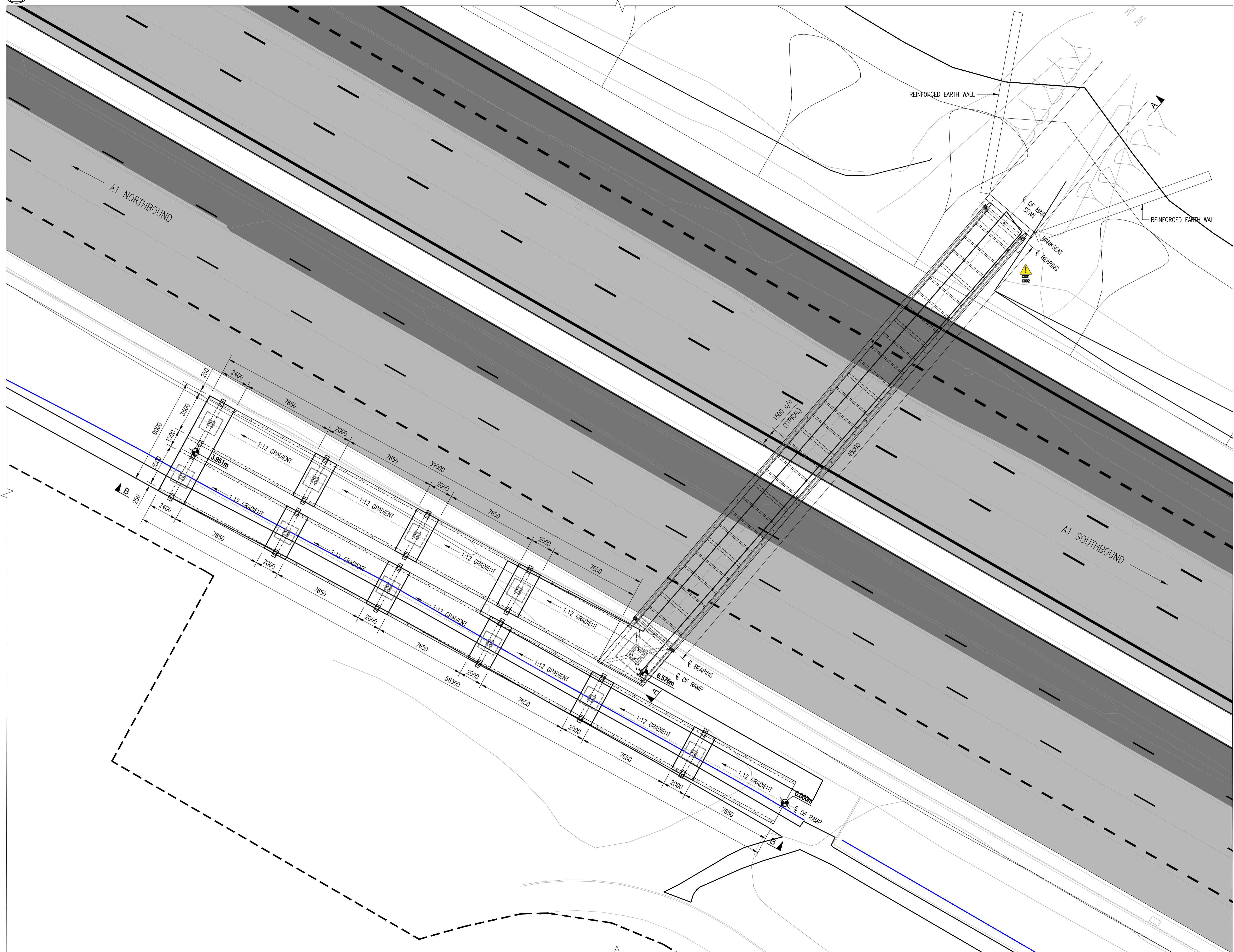
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AS SHOWN	HM	HM
CAD FILE:	DESIGN/DRAWN:	DATE:
	RM- SJ	JANUARY 2018
PROJECT No:	DRAWING No:	REV:
70113262	HE551462-WSP-SBR-BR008-DR-S-00003	-

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File name: I:\UK\WSP\GROUP\CENTRAL DATA\PROJECTS\70113262 - A1 BIRTLEY TO COALHOUSE\PROPOSED REPLACEMENT STRUCTURE\DRGAS 20_11_2018\HE551462-WSP-SBR-BR008-DR-S-00003-OPTION 1.DWG, printed on 24 January 2018 14:01:38, by Colabor, Chris

APPENDIX D-2

**OUTLINE GENERAL ARRANGEMENT TIED ARCH
FOOTBRIDGE OPTION**



- GENERAL NOTES
- 1) STRUCTURAL BRIDGE DETAILS PROVIDED ON THIS DRAWING IS INDICATIVE ONLY BASED ON LIMITED INFORMATION AVAILABLE TO DATE
 - 2) THE SIZE OF STRUCTURAL ELEMENTS ARE BASED PRELIMINARY CALCULATION AND PREVIOUS SIMILAR TYPE WORKS. ALL INFORMATION IS SUBJECT TO DETAILED DESIGN PRIOR TO FINAL CONFIRMATION
 - 3) DETAILS PROVIDED ARE FOR INFORMATION ONLY. INDICATIVE CONSTRUCTION COST ESTIMATES ARE BASED ON PREVIOUS SIMILAR TYPE WORKS
 - 4) THE FOLLOWING CRITICAL INFORMATION IS REQUIRED TO VERIFY THE FEASIBILITY OF THE PROPOSED OPTION AND DEVELOPED THIS FURTHER AT DETAILED DESIGN (IF PREFERRED)
 - TOPOGRAPHICAL SURVEY - CONFIRM GEOMETRIC PARAMETERS AND SITE CONSTRAINTS
 - SITE INVESTIGATION INFORMATION - CONFIRM FOUNDATION PARAMETERS
 - LIAISON WITH HIGHWAY ENGLAND - CONFIRM STRUCTURAL REQUIREMENTS
 - LIAISON WITH STATUTORY UNDERTAKERS - CONFIRM EXISTING/NEW SERVICES IMPACTED BY THE WORKS
 - 5) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
 - 6) ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE
 - 7) DO NOT SCALE IN CASE OF ANY DOUBTS, OMISSIONS OR ERRORS SEEK CLARIFICATION FROM THE DESIGNER

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND
 INDICATES A RESIDUAL RISK AS A WARNING

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILLED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

CONSTRUCTION:
 REF C001 - LIFTING OF HEAVY/LARGE BRIDGE COMPONENTS
 REF C002 - TRANSPORT LARGE STEEL COMPONENTS

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: **PRELIMINARY**

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<http://www.wspgroup.com>

CLIENT: **Working on behalf of**

PROJECT: **A1 BIRTLEY TO COALHOUSE**

TITLE: **NORTH DENE FOOTBRIDGE TIED ARCH OPTION
 1:12 RAMP PROVISION
 (SHEET 1 OF 2)**

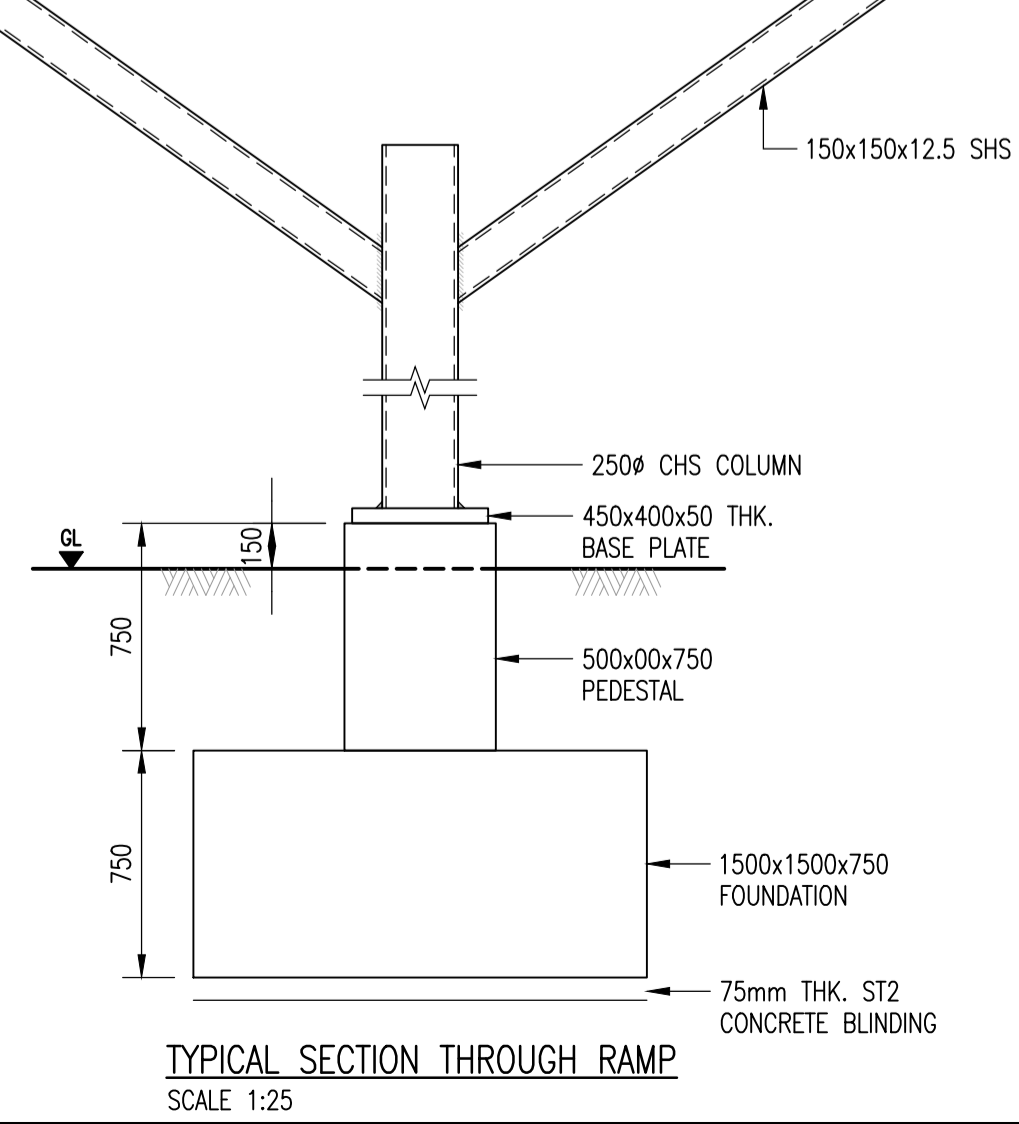
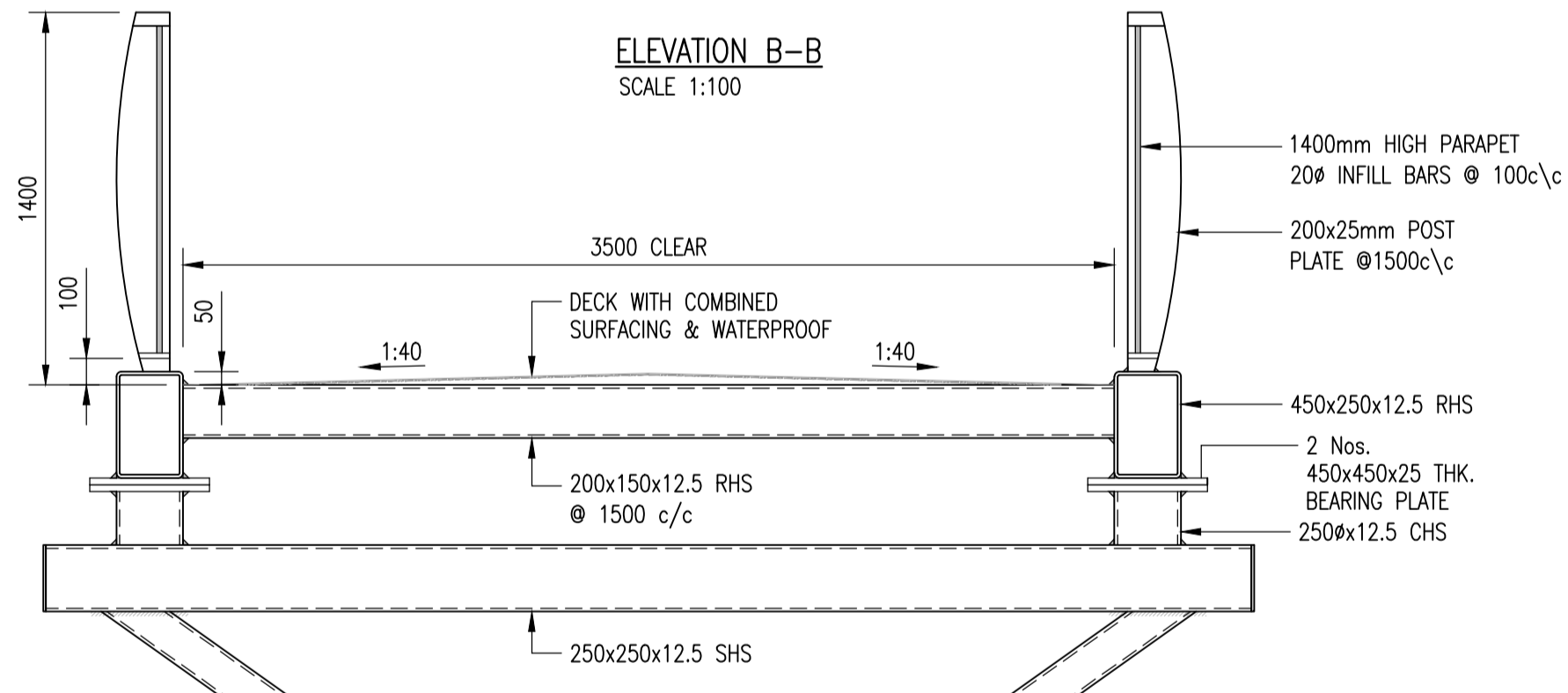
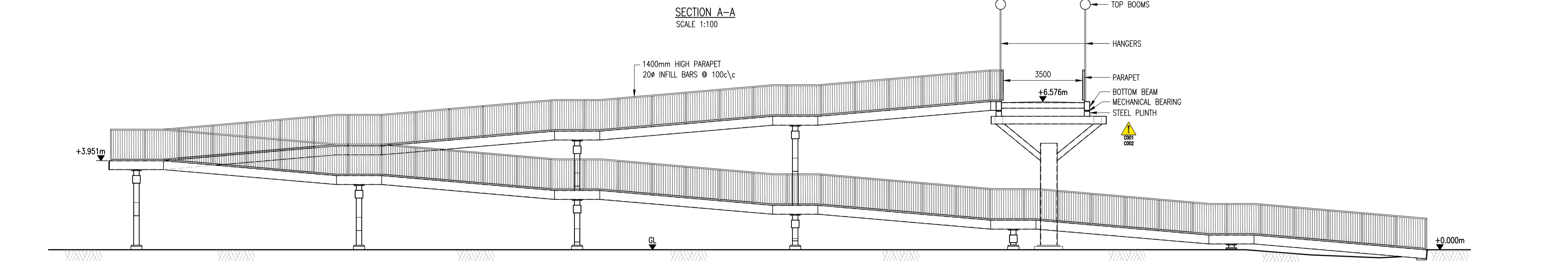
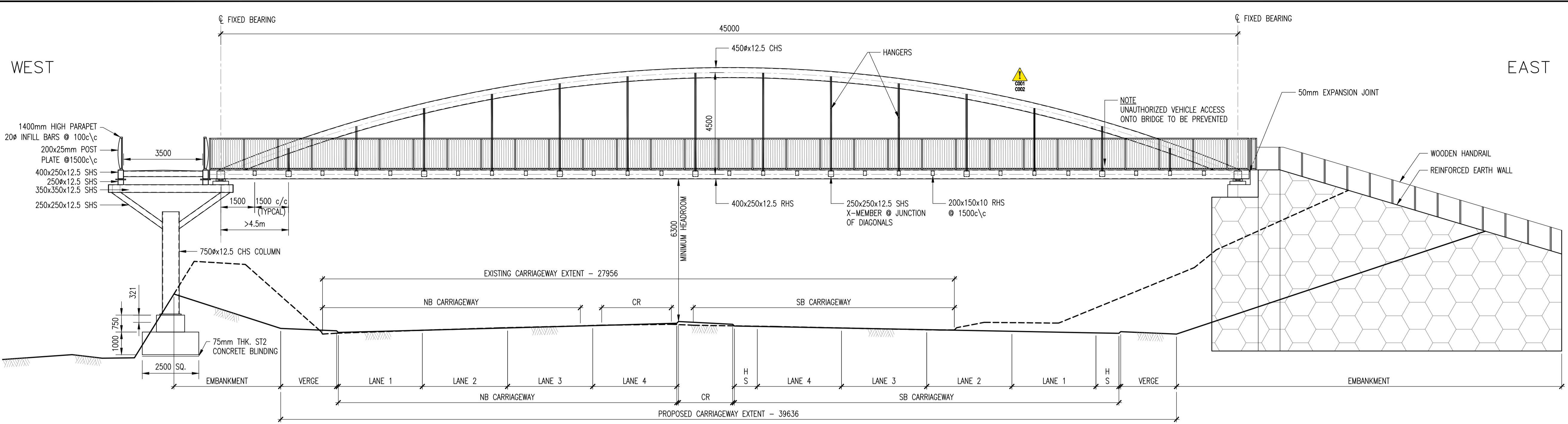
SCALE @ A1: AS SHOWN	CHECKED: HM	APPROVED: HM
CAD FILE:	DESIGN/DRAWN: RM-SJ	DATE: JANUARY 2018
PROJECT No: 70113262	DRAWING No: HE551462-WSP-SBR-BR008-DR-S-00004	REV: -

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PLAN ON NORTH DENE FOOTBRIDGE (GRADIENT 1:12)
 SCALE 1:150

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File name: I:\UK\WSPGROUP\CENTRAL DATA\PROJECTS\1010000\7010206 - A1 BIRTLEY TO COALHOUSE PCF 2D DESIGN AND ANALYSIS\BRIDGES\NORTH DENE FOOTBRIDGE\PROPOSED REPLACEMENT STRUCTURE\DWGS 2D_01_2018\HE551462-WSP-SBR-BR008-DR-S-00004-OPTION 1.DWG, printed on 24 January 2018 14:02:28, by Colabor, Chis



NEW BRIDGE WITH RC BANKSEAT AND RE WALLS TO EAST SIDE

SR. NO.	MATERIAL	QUANTITY	UNITS
1.	STRUCTURAL STEEL S355	135	TONNES
2.	CONCRETE M40	75	m³
3.	RE - BAR	15	TONNES
4.	BEARING	04	Nos
5.	HANGERS	40	m
6.	RE WALL	250	m²

- NOTES:**
- OPTION 1: COMPRISES THE DEMOLITION AND REMOVAL OF THE BRIDGE AND CONSTRUCTION OF NEW 3.5 M WIDE COMBINED CYCLEWAY/PEDESTRIAN FOOTBRIDGE AND RAMP
 - THE OPTION HAS BEEN DEVELOPED BASED ON THE FOLLOWING ASSUMPTIONS
 - DESIGN LOADING: LHM AND SERVICE VEHICLE
 - HIGHWAY CROSS SECTION BASED ON PRELIMINARY ALIGNMENT DESIGN BY WSP HIGHWAYS
 - DESIGN LIFE FOR THE NEW ELEMENTS: 120 YEARS
 - ITS IS ACCEPTABLE FOR THE NEW BRIDGE WORKS TO BE CONSTRUCTED ON THE SAME ALIGNMENT/FOOTBRIDGE AS THE EXISTING.
 - FOR DETAILS OF THE EXISTING STRUCTURE REFER RECORD DRAWINGS
 - KEY MATERIALS (GRADE/STRENGTH)
 - ALL STRUCTURAL STEEL TO BE GRADE OF S355 TO BS 10025.
 - RETAINING WALL AND FOUNDATION CONCRETE TO BE MINIMUM STRENGTH CLASS C40/50 TO BE 8500 UNLESS NOTED OTHERWISE
 - ALL REINFORCEMENT TO BE GRADE B500B TO BS 4449:2005

- INDICATIVE CONSTRUCTION SEQUENCE**
- DISCUSS TRAFFIC MANAGEMENT REQUIREMENT AND GET APPROVAL FROM HIGHWAY ENGLAND FOR DEMOLITION
 - ESTABLISH SITE COMPOUND
 - REMOVE EXISTING BRIDGE
 - CONSTRUCT FOUNDATION, SUBSTRUCTURE, ABUTMENT AND REINFORCED EARTH WALL
 - INSTALL THE MECHANICAL BEARING OVER THE ABUTMENT AND MAIN COLUMN FOR TRUSS
 - INSTALL THE PRE FABRICATED RAMP AND TRUSS
 - INSTALL COMBINED WATERPROOFING SURFACING, DECK JOINT & PARAPET OVER RETAINING WALL ETC
 - CLEAR THE SITE

SAFETY, HEALTH AND ENVIRONMENTAL SYMBOL LEGEND

INDICATES A RESIDUAL RISK AS A WARNING

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

- CONSTRUCTION:**
- REF C001 - LIFTING OF HEAVY/LARGE BRIDGE COMPONENTS
 - REF C002 - TRANSPORT LARGE STEEL COMPONENTS

REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: **PRELIMINARY**

Three White Rose Office Park, Millshaw Park Lane, Leeds, LS11 0DL
Tel: +44 (0)113 395 6200, Fax: +44 (0)113 395 6201
http://www.wspgroup.com

CLIENT: **Working on behalf of**

PROJECT: **A1 BIRTLEY TO COALHOUSE**

TITLE: **NORTH DENE FOOTBRIDGE TIED ARCH OPTION
1:12 RAMP PROVISION
(SHEET 2 OF 2)**

SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	HM	HM
CAD FILE:	DESIGN/DRAWN:	DATE:
	RM-SJ	JANUARY 2018
PROJECT No:	DRAWING No:	REV:
70113262	HE551462-WSP-SBR-BR008-DR-S-00005	-

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Appendix E

DESIGNER'S RISK ASSESSMENT

APPENDIX E-1

DESIGNER'S RISK ASSESSMENT



Ref	Risk Category* (and Phase where appropriate, e.g. location/environment, construction, operation, maintenance, alteration/demolition)	Work Element/Location (where appropriate)	Hazard or Risk Issue Identified	Risk Management Owner	Design ERIC Action Required (e.g. hazard elimination/risk mitigation action, information to be provided to others)	Significant Temporary Works Requirements/Management Arrangements and/or any Special Erection/Installation Sequences or Requirements	Design Action Status/Final Resolution Notes (e.g. traceability of ERIC action, communication of significant residual risk, critical design criteria, etc.)	Significant Residual Risk ³ (Y/N)	Date Logged/Reviewed	Raised By
001	Construction	Proposed North Dene Footbridge	Lifting of heavy bridge elements into positions	Contractor	Proposed crossing to comprise structural steel form footbridges. This would allow for a bridge structure to be provided with a high strength to weight ratio (in comparison to concrete) with improved buildability due to less onerous crane lifting requirements.	Appropriate craneage to be used with a lifting plan. Contractor will need to ensure cranes are adequately sized and located. A1 traffic to be closed during lifting.	Footbridge segments could be fabricated off site and then delivered and assembled on site to limit in situ works.	Y	23/01/2018	Rakesh Mehta
002	Construction	Proposed North Dene Footbridge	Transport of large steel components - potential risks associated with the movement of large abnormal loads	Contractor	Detailed design to ensure the fabricated sections of truss are manageable (not excessively long etc.) to ensure they can be delivered to site with minimal potential logistical risks.	Contractor to provide assembly area as part of site compound.	By ensuring the length of truss segments are not excessively large, would reduce risk associated with transport and assembly on site.	N	23/01/2018	Rakesh Mehta
003	Construction	Proposed North Dene Footbridge	Workforce exposed to site based construction risks due to intensive in-situ works.	Designer	Proposed crossings comprise structural form (including precast parapets) that can be predominantly prefabricated/assembled off site reducing the extent and complexity of site based operations. The proposed main bridge is a single span without having any intermediate support, thereby further reducing the workforce exposure to site based construction risks.	Contractor to ensure S50W in place for all site based activities.	Structural steel bridge form has an advantage that in-situ operation (associated risks) are limited. Site based construction risks further reduced by ensuring steel elements are pre-painted before arriving on site. Provision of complete truss avoids risk of falling from height for finishing works, i.e. parapet in place	N	23/01/2018	Rakesh Mehta
004	Construction	Proposed North Dene Footbridge	Live road (A1 carriageway) at risk of falling debris during lifting operation of structural elements.	Contractor	Assumed A1 carriageway to be closed during lifting operations	TM to be in place during works with the crane. Contractor to ensure TM details to be approved prior to undertaking site based operations.	Note on drawings to be provided highlighting the need for road closures during lifting operations.	Y	23/01/2018	Rakesh Mehta
005	Construction	Proposed North Dene Footbridge	Risk associated with working at height	Designer	Design to consider method of construction that reduces the risk of working at height inc. surfacing, fixings etc. Pre-fabricated steel truss sections proposed to avoid in-situ construction at height.	Truss to be installed in modular sections with parapets already fixed to provide edge protection.	Prefabrication requirements to be defined in the works information.	N	23/01/2018	Rakesh Mehta
006	Construction	Proposed North Dene Footbridge	Delivery material/structural components on site cause obstruction lead to accidents (collision etc.)	Contractor	Contractor to consider suitable holding areas on site in close proximity to the works	Contractor to provide a suitable holding area as part of the site compound.	No further action	N	23/01/2018	Rakesh Mehta
007	Construction	Proposed North Dene Footbridge	Deep excavations associated with foundations to the bridge	Designer	The lightweight steel superstructure (in comparison to concrete) results in reduced imposed bearing pressures at ground level which subsequently reduces the depth and size of the proposed spread footing foundations.	Contractor to develop S50W for excavation of foundations	Simple and lighter form of superstructure proposed to reduce the weight of structure	N	23/01/2018	Rakesh Mehta
008	Construction	Proposed North Dene Footbridge	Damage to existing services, electrocution	Contractor	statutory undertakers information indicate that British telecom (BT108) and Northern Power Grid Services (NP109) services are located within the vicinity of North Dene Footbridge and may potentially be impacted by the works.	At this stage it is assumed that all services found impacting the proposed bridge works shall be diverted/ protected accordingly to progress the bridge works on site. During construction, areas to be scanned by trained and competent contractor to confirm no presence of services prior to works. Contractor to locate all services (if any) using hand tools before mechanical excavation can commence. Contractor to also liaise with the statutory undertakers/local authorities and the HA maintenance service providers to locate all services prior to piling or excavation works. Contractor to implement safe system. All excavation to be examined prior to use	Appropriate note/reference to be put on drawings relating to service location	N	23/01/2018	Rakesh Mehta
009	Design	Proposed North Dene Footbridge	Restriction to the A1 carriageway widening due to intermediate piers	Designer	the proposed structure is a clear span replacement bridge with no intermediate supports to avoid obstruction to the A1 and provide different maintenance access in the future.	-	No Action	N	23/01/2018	Rakesh Mehta
010	Construction	Proposed North Dene Footbridge	Interested members of the public watching the lifting of the bridge segments from dangerous/unauthorised viewing points.	Contractor	Consideration should be given to the provision of safe designated observation areas, within which members of the public can congregate to observe lifting operations being undertaken.	Temporary works to include TM and control of vehicle and pedestrian movements	Details for safe viewing areas to be detailed in the specification	N	23/01/2018	Rakesh Mehta
011	Maintenance	Proposed North Dene Footbridge	Maintenance painting - working at height risk of vehicle impact/falls etc.	Operator	Design to ensure specification of paint system to comprise a robust corrosion protection system with an increase life cycle (greater than 30 years). This would limit the frequency at which the paint system renewal works will be required over the design life of the structure. In addition the design of the structure shall comprise uncomplicated details/fixings which could create a water trap and lead to accelerated rates of corrosion.	TM (closure of the A1) - will be required during future maintenance painting works.	Maintenance manual to detail the need for TM (A1 road closure/diversion) and potential encapsulation (if grit blasting preparation prior to painting) provision to undertake maintenance painting. To avoid the requirement for encapsulation and grit blasting, the maintenance manual shall include details of paint systems (Corroless® system etc.) that can be applied without the need for a grit blast surface preparation. Design to include appropriate paint system requirements.	N	23/01/2018	Rakesh Mehta
012	Maintenance	Proposed North Dene Footbridge	Corrosion of deck plate and general maintenance	Operator	The deck is given camber in both the transverse and longitudinal directions so as to ensure that the water drains off quickly to the bank seats from where it will be collected by drainage channels and pipes.	-	No action	N	23/01/2018	Rakesh Mehta
013	Operation	Proposed North Dene Footbridge	Vehicle impact on slender columns supporting the bridge initiates total collapse.	Designer	The bridge alignment as well as the support configuration is proposed in such a way that the supports are located as far as practicable from the edge of the carriageway. Supports are away from the edge of the carriageway by more than 4.5m to minimise risk of impact damage from road vehicles/ users.	-	No action	N	23/01/2018	Rakesh Mehta
014	Operation	Proposed North Dene Footbridge	Vehicle impact with the soffit of the footbridge spanning the slip roads, lead to fatal collapse.	Designer	The proposed footbridge structure over the main line shall satisfy the 5.7m + S (allowance for sag curve) headroom requirements as stipulated in TD27/05 Cross Section and Headroom. This minimum headroom requirement shall also extend beyond the mainline carriageway over the verges within the designated structure free zone. This would avoid designing the bridge superstructure to sustain impact loading which would be particularly onerous on a light footbridge structure.	-	No action	N	23/01/2018	Rakesh Mehta
015	Operation	Proposed North Dene Footbridge	Long and overly steep approach ramps make it difficult for cyclist and disabled people to use crossing, risk of fatigue and loss of breath	Designer	The new structure to incorporate a new 1 in 12 ramp provision that is 3.5m wide to ensure compatibility with the new bridge structure over the mainline. This will allow provision of a more accessible ramp (including landings) for both cyclist and disabled users in comparison to the current 1 in 6 ramp provision. Horizontal landings shall be provided at intervals producing a rise of no more than 650mm between landings. The length of landings shall also not be less than 2m	-	No action	N	23/01/2018	Rakesh Mehta
016	Operation	Proposed North Dene Footbridge	Risk of cyclist falling over the standard pedestrian parapet provision	Designer	The proposed bridge crossings shall be provided with a 1.4m parapet height (not standard 1.2m pedestrian parapet) to provide further containment to cyclist.	-	No action	N	23/01/2018	Rakesh Mehta
017	Operation	Proposed North Dene Footbridge	At grade crossing of the A1 would increase the risk of traffic related accidents	Designer	Bridge type crossings over the A1 has been proposed to eliminate risk of traffic accidents. Bridge crossing would also provide unrestricted access over the A1 with out impeding traffic flows, improving safety for traffic.	-	No action	N	23/01/2018	Rakesh Mehta
018	Demolition	Proposed North Dene Footbridge	Live road (A1) at risk of falling debris during removal lifting operation of structural elements.	Contractor	Assumed A1 carriageway to be closed during removal lifting operations	TM to be in place during works with the crane. Contractor to ensure TM details to be approved prior to undertaking site based operations. North Dene crossing to be closed during lifting operations	Highlight risk and mitigation on drawings	Y	23/01/2018	Rakesh Mehta
019	Operations	Proposed North Dene Footbridge	Risk of motorized vehicles (service vehicles using the footbridge and approaches	Designer	Consideration to be given for a Vehicle Restraint System comprising Bollards to provided at the entrance of bridge.	-	No action	N	23/01/2018	Rakesh Mehta
020	Operations	Proposed North Dene Footbridge	Open type foot bridge - Exposure of Pedestrians/cyclists to inclement weather and associated slips and falls.	Designer	Adequate drainage is provided on the bridge by giving good transverse and longitudinal falls to the deck. Anti skid and water proofing membranes surfacing to also specified. Pedestrian/cyclist restraint system with a height of 1.4m is provided	-	No action	N	23/01/2018	Rakesh Mehta

Copy rows then insert above this line to ensure formulae are copied

Appendix F

WSP/HE KEY CORRESPONDENCE

APPENDIX F-1

WSP/HE KEY CORRESPONDENCE

Brunetti Barchetta, Giovanna

From: Sunderland, Martin <Martin.Sunderland@highwaysengland.co.uk>
Sent: 05 February 2018 13:22
To: Mistry, Hitan
Cc: Al-Shalechy, Shehed; Mulla, Imtiaz; Gladstone, Peter; Akram, Irfan; Mehta, Rakesh; Wilkes, Nicola; Dennis, Stephen; Meikle, Jessica; Rawcliffe, Nigel; Pratt, Simon; Tziolas, Michail
Subject: RE: A1B2CH - Issue of the North Dene FB SOR for HE SES comment/approval. Progress to date 15-01-18

Hitan

Thank you for your submission of the A1B2CH North Dene Footbridge SOR.

I confirm acceptance of the recommendations and conclusions of this report.

As stated in the report and previously discussed, one of the challenges for a new footbridge at this location is the ramp that will be required at the west side.

To reiterate what is stated in the report, a Departure from Standard will be required for the proposed 1 in 12 ramp provision which is the preferred option.

I confirm that I do agree with this in Principle and will support the DfS submission, but the Highways England Policy Advisor will still require a robust case to be presented as part of the departure submission.

If constructed the proposed Bow Truss Option and 1 in 12 ramps has the potential to be very aesthetically pleasing, especially compared to the existing footbridge, and hopefully this will allay some of the reservations by the local householders, and may even increase usage across the bridge.

Regards

Martin Sunderland
Safety, Engineering & Standards
Senior Structures Advisor
Highways England | Lateral | 8 City Walk | Leeds | LS11 9AT
Tel: 0300 470 6165 | [REDACTED]
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Learn more about Structures Delivery by visiting our [Portal Homepage](#)
A web version of this Homepage is currently unavailable.



From: Mistry, Hitan [mailto:Hitan.Mistry@wsp.com]
Sent: 24 January 2018 17:25
To: Sunderland, Martin
Cc: Al-Shalechy, Shehed; Mulla, Imtiaz; Gladstone, Peter; Akram, Irfan; Mehta, Rakesh; Wilkes, Nicola; Dennis,



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