North Yorkshire County Council
Business and Environmental Services

PROPOSALS FOR THE ALLEVATION OF DAMAGE TO THE BRIDGE AND CAUSEWAY BY LOOKING AT THE USE OF THE EXISTING CARRIAGEWAY USING TRAFFIC SIGNALS OR WIDENING OF THE A65 AND OPTIONS FOR A NEW CONISTON AIRE CAUSEWAY

A65 CONISTON NORTH YORKSHIRE

BRIDGE NO. 4322

North
Yorkshire County Council
Business and Environmental Services

OPTIONS

JULY 2017

Summary

Coniston Causeway is a Grade II listed structure that carries the A65 over the River Aire. The 8-span masonry causeway was originally constructed in 1763 by the architect and bridge designer John Carr and it now carries the A65 road from Skipton through the Parish of Coniston Cold to Kirby Lonsdale in Cumbria. OS grid reference 380859, 454991. See location plan page 10.

The existing Grade II listed causeway and bridge crosses the heavily meandering course of the River Aire, set within an area of open and rural river valley floodplain to the east of the small village of Coniston Cold and west of Gargrave. An elevated length of the Leeds – Morecambe railway runs along the eastern edge of the valley and parallel with the river, crossing the A65 in close vicinity to the east of the bridge crossing. The Aire Valley bounds the southern fringes of the Yorkshire Dales National Park.

During this study we also looked at on line solutions, the use of traffic management with traffic signals. Unfortunately this very reasonable priced traffic management solution could not be implemented because the modelling indicates that there would be excessive queuing of traffic backing up into the nearby village. The details of this option are in the appendices.

The causeway forms an attractive and historic feature of the immediate landscape, although visual receptors (properties and facilities) with a view of the bridge are limited. Most properties within Coniston Cold have no direct view of the bridge but would be influenced by any modification of the A65 to the east of the village. Views would also be experienced by users of the railway and potentially (and at greater distance) from the public footpath extending south-east of Coniston Cold. Changing the existing causeway would unfortunately change the character of the bridge; it is unlikely that the character of the river valley context would be significantly altered by the introduction of a new bridge crossing, although the setting of the existing Grade II listed bridge structure would be influenced.

The reason for the consideration of this scheme is the frequent accident damage which is caused to the bridge resulting in long traffic delays. The bridge is too narrow for the vehicular traffic of today. Each accident costs approximately £30,000 to repair and £350,000 to the economy. These works are required to bring the bridge into the 21st century and bring to and end the considerable disruption to the lives of the people living and working in Coniston and other users of this major route into and out of North Yorkshire while the causeway is out of commission. The bridge at the centre of the causeway is currently too narrow for footways and has a constriction at the west end which only just allows two-way traffic flow with care.

The cost of widening the causeway by constructing stone masonry arches to match the existing construction would be prohibitive due to the cost of masonry and extensive works, and has not been considered as a viable option. The options considered would cost between £6m for widening extensions to the north side of the bridge. The overall construction programme would be considerable and would need to remain closed for a period of two years unless a temporary road and bridge crossing is provided. There will be significant disruption to traffic and local residents during these works.

The recommended solution for the existing causeway would be an extension by means of precast cantilevered concrete slabs sitting symmetrically about the centreline of the existing bridge and causeway. Other slab arrangements have been considered but they would require the removal of stone in the bridges walls.

However, the optimum solution for this project would be the construction of a new carriageway off-line to the north of the existing A65 and to leave the existing causeway closed to traffic allowing access only to the farm land as it does now and the statutory bodies' apparatus in the causeway.

Contents

1 Introduction

Coniston Causeway is a Grade II listed 3-span masonry causeway structure with 5 flood arches and a 3 arched bridge that carries the A659 over the River Aire. The causeway is located immediately North of Coniston Cold in North Yorkshire at OS grid reference 380859, 454991. The road runs approximately east to west over the bridge and the river flows approximately north to south below.

The bridge at the centre of the causeway is currently too narrow for normal modern day two-way traffic flow as the pinch point at the west end of the bridge makes it difficult for large vehicles to pass each other without damaging the walls of the bridge. North Yorkshire County Council are looking at various methods and proposals to widen the bridge to allow unrestricted two-way traffic flow and a safety margin either side of the carriageway, or if these do not prove to be either aesthetically or financial viable provide a new crossing of the river.

Any widening works and changes to the causeway will be subject to listed building consent which will have to be applied for before the designs can be completed.

Traffic management of the causeway has been modelled to see if there is a solution to this problem which does not involve reconstruction. A traffic study was carried out by the Highways Agency before the road was de-trunked unfortunately the study and its results was not been passed on so we have modelled the flows again.

Existing carriageway looking West across the bridge

Existing carriageway looking East across the bridge

Westside of Causeway looking East along the preferred road alignment

North side of causeway looking East towards the position where the new causeway will re-enter the existing carriageway.

2 Scope

The purpose of this report is to identify and assess options for;

Utilising the causeway as it is with traffic signals,
Widening the existing structure to accommodate two-way traffic flow within the site constraints and to also investigate the possibility of constructing a new causeway.

The scope of this report includes:

- Study using Traffic signals to control the vehicles through the causeway;
- Identification of widening options for the existing causeway
- The feasibility of building a new causeway to the North of the A65 and making the existing structure redundant.
- Assessment of practicability and outline budget costs
- Assessment of required traffic management and road closures required to allow construction.

3 Environmental Impact

CONISTON AIRE BRIDGE FEASIBILITY
Landscape /Heritage Considerations

The existing Grade II causeway (situated on the A65 Skipton to Settle) crosses the heavily meandering course of the River Aire, set within an area of open and rural river valley floodplain to the east of the small village of Coniston Cold and west of Gargrave. An elevated length of the Leeds – Morecambe railway runs along the eastern edge of the valley and parallel with the river, crossing the A65 in close vicinity to the east of the bridge crossing. The Aire Valley bounds the southern fringes of the Yorkshire Dales National Park.

The bridge within the causeway forms an attractive and historic feature of the immediate landscape, although visual receptors (properties and facilities) with a view of the bridge are limited. Most properties within Coniston Cold have no direct view of the bridge but would potentially be influenced by any modification of the A65 to the east of the village. Views would also be experienced by users of the railway and potentially (all be it at greater distance) from the public footpath extending south-east of Coniston Cold.
It is unlikely that the character of the river valley context would be significantly altered by the introduction of a new bridge crossing, although the setting of the existing Grade II listed bridge structure would be influenced.

Several years ago Highways England looked at the use of Traffic Signals as a method of regulating the volume of traffic over the bridge. This option would require no alteration to the Listed Causeway. It does however, indirectly cause harm to the environment as long queues of vehicles with their engines running will unfortunately add pollutants into the surroundings The then Highways Agency asked their Agents the County Council to commission JBH Consulting Ltd to model the effects of positioning traffic lights on the bridge's east and west approaches. This would enable single file traffic to cross the bridge and mimimise the likelihood of future collsions with the stone parapets.

No environmental study has been carried out for flora and fauna. This will follow when an option has been chosen. A preliminary study has not unearthed any cause to be concerned.

Relationship of the new causeway to existing causeway and landscape context:

- The new structure needs to have an “identity”, recognisable as a distinct and identifiable as a modern construction.
- The causeway will need to fit the landscape and have as small a footprint as is practical to allow the river and the flood plain remain as unchanged as is possible and its relationship to the adjacent older causeway.
- The existing bridge has a sense of balance, appropriate proportion and scale over and above its obvious appeal as an historic structure. It ultimately has a good “fit” with, and relationship to the river valley landscape.
- Embankments would be visually preferable to retaining walls along the bridge approaches; also keeping the road height as low as practical would reduce the necessary extent of embankment and in consequence help minimise the footprint (less displacement of flood water capacity)

Visual relationship between bridges:

- One of the benefits of the new causeway approach is that the existing bridge would become a much more a visible part of the landscape when viewed from the new bridge/road alignment. Conversely the new bridge would be seen in elevation and in context with the surrounding landscape from the existing bridge and approach.
- This sense of visual relationship is an opportunity. It would add weight to a design philosophy for the new bridge that enables clear and unrestricted views of the landscape, treating the visual relationship between the two bridge routes as an integral part of design consideration. This approach may well be viewed favourably from a heritage perspective.

Parapet detail:

- On the new causeway the parapets should be open.
- Open parapets would relate to a lighter causeway form and appearance, potentially allowing more open views from the bridge itself (and opening up views toward traffic on the causeway).

Design considerations:

The extent of cantilever will determine how much the appearance of the bridge is affected; obviously the more cantilever, the greater the negative impact on the bridge aesthetic.

The extent of road widening, should it need to continue along part of the causeway, would add to the overall impact on the listed structure. The widening of just the bridge would not solve the problem of vehicles passing too close to the causeway walls.

Widening of bridge by building out on one side would have a very negative impact on the bridge in terms of the loss of visual integrity.

Other alternatives

Widening the existing causeway to both sides by dismantling of the walls facing stonework, structural widening and re-facing with the original stonework.

New bridge and single carriageway re-alignment (single lane dual) to the North or South side of the carriageway:

North versus South Alignment:

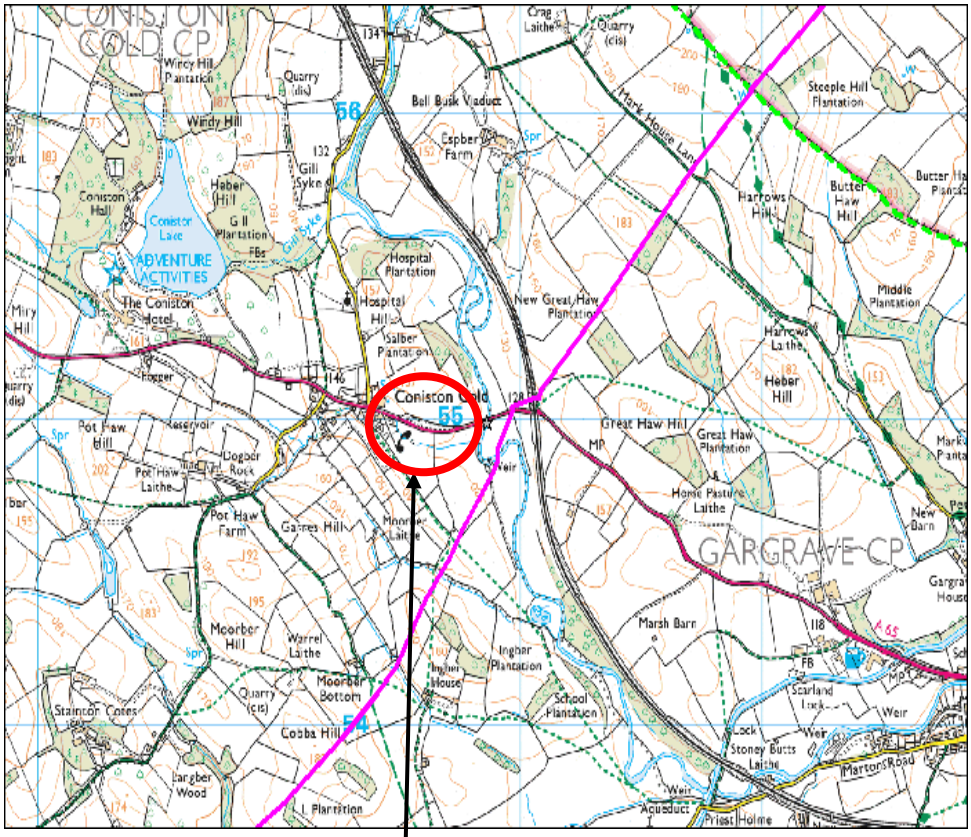
With regards to the Heritage point of view, the “new causeway” approach is seen as preferable to the harm the structural alteration of the existing causeway would do to the fabric of the existing structure, there is also the great amount of time that this major road would be have to be completely closed to allow this work to be completed.

Although the perceived influence of a new causeway alignment on either side of the existing bridge setting would be broadly similar, the northern alignment option would introduce significant sidelong cutting along the re-aligned A65 section between Coniston Cold village and the river, along with the loss of associated vegetation likely to include one isolated mature tree of prominence.

The southern alignment option would be less intrusive in terms of the tie-ins at either end of the causeway and require less net loss of vegetation, so this would be preferable from a landscape perspective.

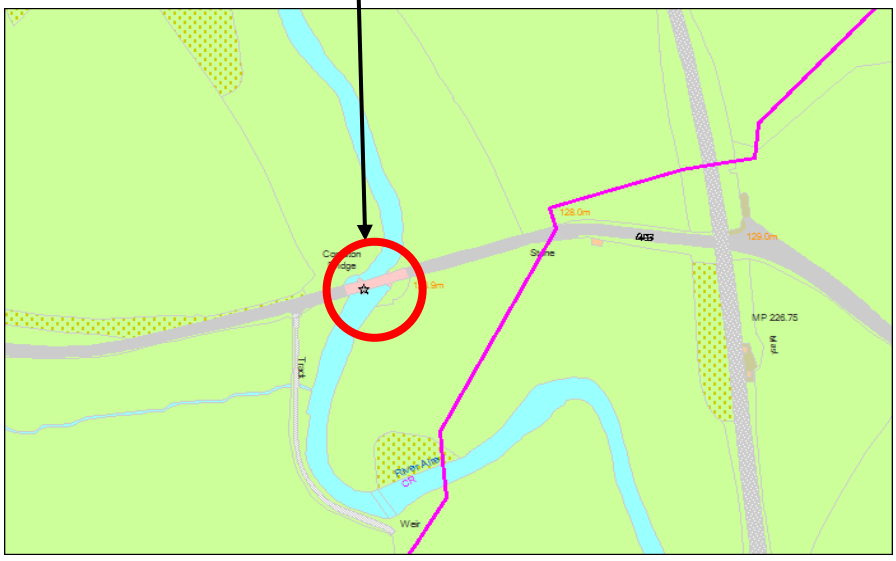
As previously mentioned, the new causeway would be located at greater distance from the existing bridge (within highway design parameters) and would contribute to the conservation of setting and would likely be considered favourably by Historic England as it would combine the principles of the new or of its time near the existing structure. The southern alignment option would provide slightly more visual distinction between old and new bridges, due to the existing tree cover which can remain in close vicinity of the existing bridge. However, the optimum line for the new causeway would be to the north of the existing A65.

4 Location Plan



CONISTON BRIDGE

OS Grid Reference: 390857, 454991



Purple Line is the Trans Pennine Gas Pipeline

5.0 Existing Structure

Coniston Bridge and Causeway are listed as a Grade II (NHLE 1132471).[1]
8-span, masonry arch structure of coursed and dressed sandstone bridge. The A65 passes through Coniston Cold to the north of the bridge and the bridge which carries the A65. Coniston forms part of the modern administrative county of North Yorkshire, but until 1974 the town lay within the historic West Riding.

The causeway and the bridge was designed by John Carr and constructed in 1763.

The overall length of the causeway and bridge is approximately 110m. There are three arches across the main river channel and 5 flood relief arches. The three main river spans are approximately 10.5 metres wide. The spans of the flood relief arches are 3.0m, 4.25m and 5.75m, 5.25m and 3.5m, east to west respectively.

The river piers have pointed cutwaters extending to three quarters of the height of the upstream elevation. The downstream elevation has point brow type cutwaters.

The clear width between parapets across the main river spans is 5.30 m. The carriageway is 5.3 m wide with no footways. The carriageway widens out off the bridge to a maximum width of approximately 6.6 m.

Apart from the constant damage repairs the bridge is in reasonable condition considering how old the masonry is.

Centre span upstream elevation recent parapet damage which has been repaired with a red stone.

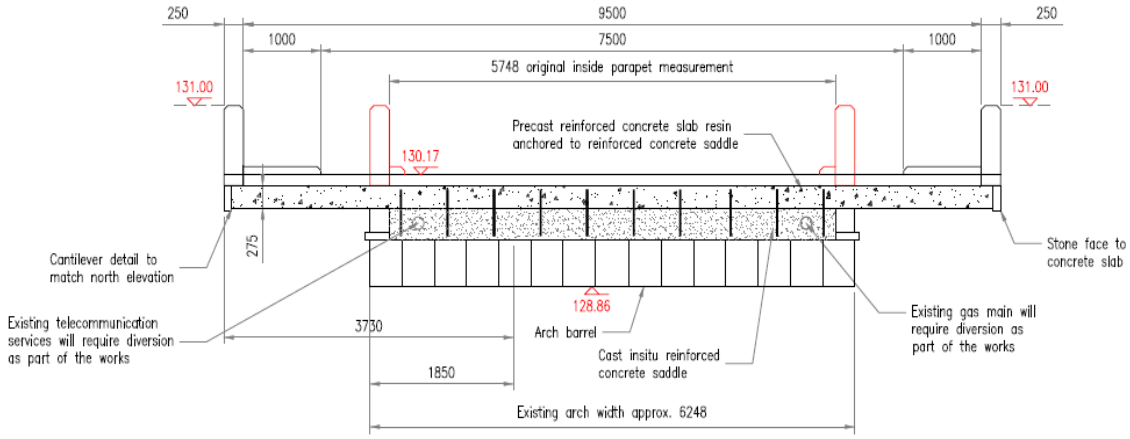
6 Causeway Widening Options

Alternative widening options have been identified that will allow improvements to the carriageway width across the bridge sufficient for 2-way traffic. Each option is based on widening the carriageway to 7.3 m with 1.5 m margins either side of the carriageway for safety.

6.2.1 Option 1

Construction of a concrete overlay slab cantilever over the existing causeway.

Estimated Cost - £3.5m



CROSS SECTION A-A, Scale NTS

(Section through arch on bridge this cross section will continue on the causeway)

What is involved?

A number of precast concrete slabs 12.3 m long by 1.5 m wide would be cast as metre wide concrete slabs to be constructed and laid over the existing causeway. The new structure would be detailed to minimise the visual impact on the original bridge but there will still be a change to both the bridge elevations. The new design would not adversely affect the flow area of the river through the flood plain or mask the original elevation. See drawing number NYCC/1077163/FEA/TBR/003 for section through arch of proposed widening in Appendix A.

Advantages

- The bridge and causeway remain on the existing footprint and only airspace rights would be required.
- No planning consent required as the widening is on highway land

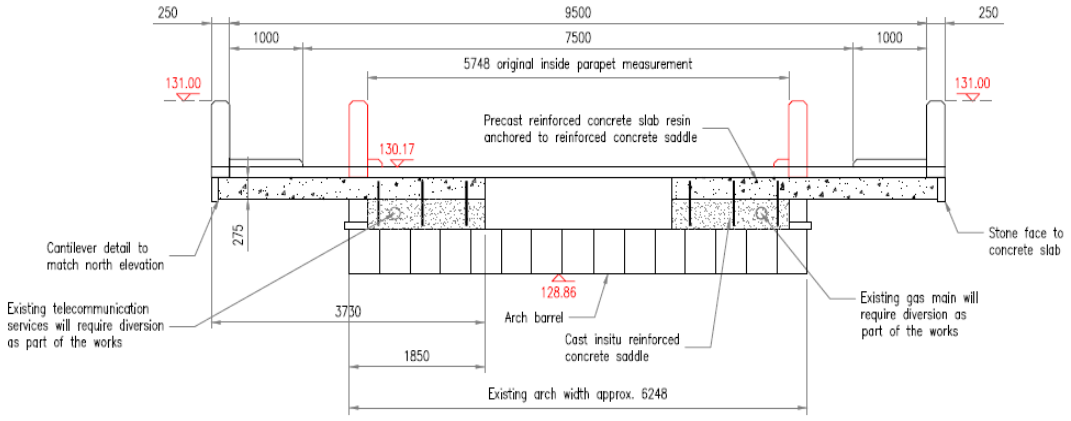
Disadvantages

- This option will not be acceptable to Historic England; they will consider that it causes too much harm to the existing bridge.
- This is an expensive option, if the cost of diverting the A65 is factored in to the cost.
- This option may require purchase of air space as the bridge will be three metres wider on each elevation than the existing causeway.

- Works will be predominantly on the existing bridge. Statutory Undertakers' equipment will have to be re-sited as the work proceeds which would be expensive.
- The bridge remains closed until the extension is completed. If a temporary road and bridge was added the estimated cost would be £1 million

6.2.2 Option 2

Construction of two concrete cantilever slabs one each side of the causeway and the existing bridge.



CROSS SECTION A-A, Scale NTS

Estimated cost £3.5 to £4.5 million (Stats diversion, temporary road and bridge, land charges would be circa £1million)

Advantages

- The bridge and causeway remain on the existing footprint and only airspace rights would be required.
- No planning consent required as the widening is on highway land.

Disadvantages

- This option will not be acceptable to Historic England; they will consider that it causes too much harm to the fabric of the existing causeway.
- The causeway will look unbalanced.
- This is an expensive option if the cost of diverting the A65 is factored in to the cost. The causeway would be shut for the full length of the contract.
- Will take longer to construct than the precast option.
- This option may require purchase of air space as the bridge will be three metres wider on each elevation than the existing causeway.
- Works will be predominantly on the existing bridge. Statutory Undertakers' equipment will have to be re-sited as the work proceeds which would be expensive and difficult to access in the future.
- The existing bridge and retaining walls may require strengthening so that they can carry the new loads.

6.2.3 Option 3

Construction of a concrete cantilever slabs one side of the causeway and the existing bridge.

As Option 2 cross section on page 13 but with only one slab extending out to the north side of the bridge.

Advantages

- The bridge and causeway remain on the existing footprint and only airspace rights would be required.
- No planning consent required as the widening is on highway land.

Disadvantages

- This option will not be acceptable to Historic England; they will consider that it causes too much harm to the historic fabric of the existing bridge.
- This is an expensive option if the cost of diverting the A65 is factored in to the cost. The road would be closed for the full length of the contract.
- This option may require purchase of air space as the bridge will be 2.5 m wider on one elevation than the existing bridge than bridge and causeways
- Works will be predominantly on the causeway. Statutory Undertakers' equipment will have to be re-sited as the work proceeds which would be expensive.

6.2.4 Option 4

Widening one side of the causeway and the existing bridge for the full length of the causeway.

Advantages

- The bridge and causeway remain on the same line and land would need to be purchased
- The look of the causeway could be preserved.

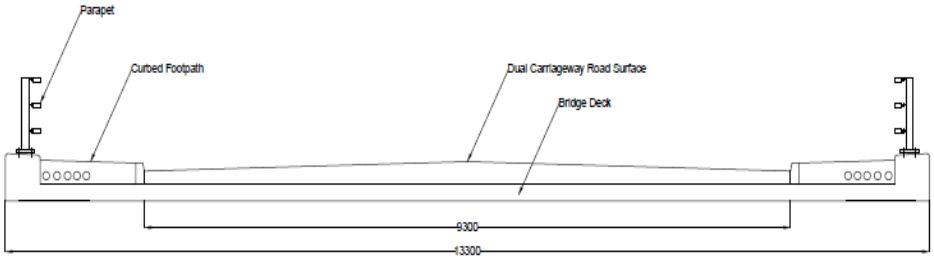
Disadvantages

- This option will not be acceptable to Historic England; they will consider that it causes too much harm to the historic fabric of the existing bridge.
- This is an expensive option if the cost of diverting the A65 is factored in to the cost. The road would be closed for the full length of the contract.
- This option may require purchase of land as the bridge will be 4.0 m wider on one elevation than the existing bridge than bridge and causeway.

The widening of the causeway on the north or south elevations would be extremely expensive this solution has not be considered as viable and will only be priced, if the idea can become a practical solution as it is unlikely to get listed consent.

6.2.5 Option 5 THE NEW CAUSEWAY

Construction of a new multi span causeway Estimated Cost - £9.5 m



Cross-Section - Two Way Carriageway

Estimated Cost - £9.5 million (including land purchase, prelims etc.)

What is involved?

A 13 m wide, multi span causeway would be constructed to the north or south of the existing causeway adjacent to the upstream face of the existing bridge. The alignment of the new road to the north of the existing carriageway would be the preferred option. The new structure would need to be detailed to match the height of the upstream elevation of the existing bridge elevations to minimise the visual and flood impact of the works and maintain the older bridge's character.

This option will require piers across the river and the land to form a new causeway over the valley as John Carr did in his day.

Advantages

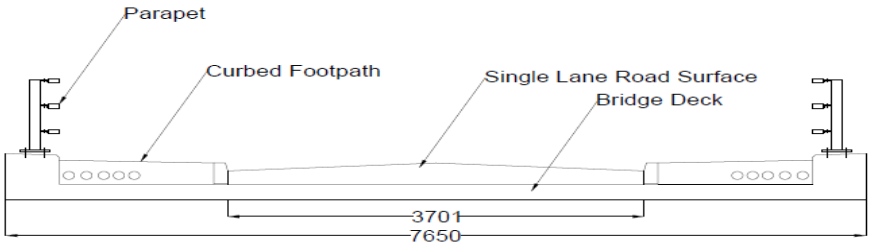
- This option does not impact upon the existing causeway and will not require Listed Building Consent due to the fact that the existing bridge and causeway would be untouched and would become redundant supporting only the services which are currently in the bridge.
- During the construction of this option the A65 will remain open to traffic and there will be no long term diversion costs.
- Extensive site investigation for the foundation designs has been done.

Disadvantages

- This is an expensive option. Abutments and piers would have to be constructed.
- Land would have to be purchased for construction for the permanent solution
- Lengthy construction period.
- The cost of widening the causeway by constructing stone masonry arches to match the existing construction would be prohibitive due to the cost of masonry and extensive works, and have not been considered as a viable option.
- This option would be detailed to match the levels of the existing structure as much as possible.
- Whole life maintenance costs would increase as there would be two structures to maintain.

6.2.5 Option 5.1

Construction of a new causeway 7.65m wide with a 3.7m carriageway upstream or downstream of the bridge. Estimated Cost - £5.4



Cross-Sections - Single Lane Carriageway Deck Details

What is involved?

- This option would require construction of a new causeway bridge. This bridge and causeway would be of its time, i.e., built in concrete or steel.

Advantages

- Works can be carried out offline of the existing bridge which allows the road to remain open for much of the construction period. Statutory Undertakers' equipment can continue to use the existing bridge.
- The causeway can be 3.70 m carriageway with a safety margin on each side of the carriageway.

Disadvantages

- This option is expensive and it would resolve the complex issue that the narrow causeway causes when the bridge is damaged by vehicles.
- If maintenance on this single carriageway causeway was required all the traffic would have to go back onto the original bridge. However, constructing the new causeway so narrow would cause problems if the old bridge suffered damage the diverted traffic would not fit on the single way carriageway.
- Planning consent will be required as the land is not within the highway boundary.
- There will be land take that may require compulsory purchase orders increasing the cost and timescale of the project.
- Drivers could mistake the single carriageway and travel against oncoming traffic.
- Whole life maintenance costs would increase as there would be two structures to maintain.

7 Option 6 Traffic Signals

Several years ago Highways England looked at this method of regulating the volume of traffic over the bridge. The then Highways Agency asked their Agents the County Council to commission JBH Consulting Ltd to model the effects of positioning traffic

lights on the bridge's east and west approaches. This would enable single file traffic to cross the bridge and mimimise the likelihood of future collsions with the stone parapets.

The traffic was modelled with stop lines positioned 170m apart at each side of the causeway based on suitable locations to site equipment and the locations at which large vehicles currently stop to give way to each other. This configuration yielded a capacity of approximately 1000 vehicles per hour. It can be seen that for 8712 hours of the year it will operate within capacity, but for 48 hours of the year it will be over capacity. On specific weekends, for example the bank holiday weekend in August, there are flows for 5-6 consecutive hours over 1000 vehicles which would create large queues in both directions.

A further option was modelled with stop lines 80m apart that showed a significant improvement in capacity to 1200 vehicles per hour. However, this option would still be over capacity during bank holiday peak flows creating long queues in both directions.

The people living in the locality perceive this method as unusable as their experience of traffic signals has been far worse than the model suggests and they have been disrupted by traffic queues through the villages, air pollution and the inability to access properties along the A65.

Estimated cost for both options £200,000 but this figure does not include the provision of power to the lights and the on-going maintenance as both power and telephone cables will need to be run from Coniston Cold.

The full report is included in Appendix B.

8 Recommendations

It is recommended that the installation of traffic signals is not pursued. This is the cheapest option but it has several issues which make the solution unpopular with the users and the populations of the nearest villages where at busy times traffic will be stationary with engines running causing noise and pollution while waiting for the signals. Due to this road being busy it is foreseeable that drivers will jump the lights and there would still be the possibility of damage to the bridge which would negate the reason for doing the works. The use of traffic signals would slow the flow across the causeway and make journey times longer.

It is recommended that a new causeway (Option 5 page15) with a 9.3 m carriageway should be built off line to the north of the existing causeway. This will provide the most cost effective solution as it ties in with the existing carriageway to the east and west. This solution has the shortest construction period. Making the carriageway for two way traffic rather than the single track is sensible because as has been demonstrated the existing bridge cannot cope with two way traffic, in as much as we would route the traffic onto two different bridges when maintenance is needed we would be back at square one with structures that cannot cope with the volume of traffic. Making the carriageway 9.3 m wider will also allow for easier future maintenance traffic management.

The building of a new causeway will leave the old bridge and causeway standing and the council will be required to maintain the structure but the carriageway would be stopped up and the carriageway gated to allow for access to the existing statutory bodies apparatus through the causeway and the local land owners to access the fields. It will also avoid the closure of the A65 and the long diversion of the road that is required to route the traffic east and west.

Construction of new causeway is expensive but it is considered that this option will provide a cost benefit to the highway network by eradicating the costs caused by the regular vehicular damage to the existing bridge and the time lost in traffic queues or on diversions. Removing the bottleneck at this point on the A65 has been an aspiration of the Highway Authority since the A65 was de-trunked and the council became responsible for the route.

Constructing a modern structure to carry two way traffic to the north of the original causeway is the preferred option due to site constraints.

9 Conclusions

The proposals for the widening of the causeway are quite different and radical in style and the length of time they take to complete.

The widening of the causeway requires a very long construction period of up to one year and during this period, the road would be closed for the construction of the widening. Extensive temporary works costing £1 million would be required to provide a temporary bridge if the only available diversion route is considered to be too great a distance.

Option 1 with a total estimated cost is £3.5m cannot be constructed while the A65 is open to traffic.

Option 5 includes the single or dual carriageway and costs from £5.4 to £9.5m

Option 6 traffic signal control with a total estimated cost is £0.75m can be constructed while the A65 is open to traffic.

The recommended option is Option 5, the construction of a new causeway with a 7.3m carriageway on the north side of the existing A65 at an approximate cost of £9.5 million.

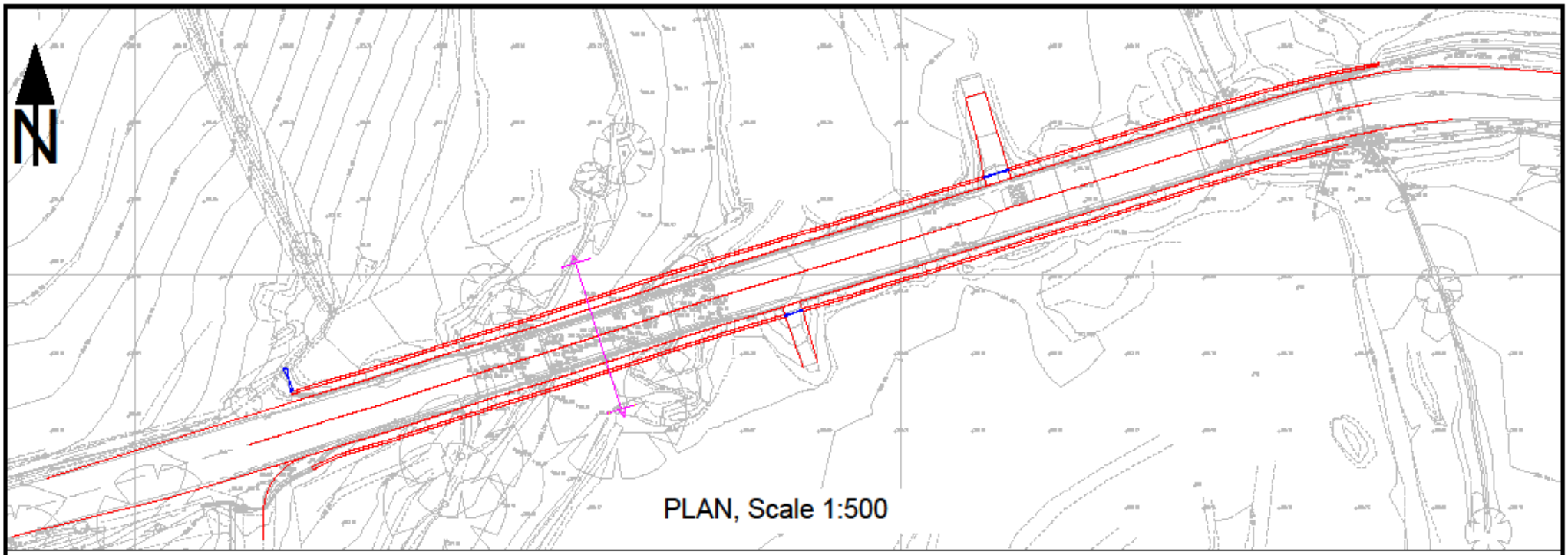
The recommendation is; that approval is given to Option 5 for the total cost of £9.5m for land and planning consent to build a new causeway with a 7.3m carriageway to the North of the A65 in the style of one of the attached drawings in Appendix A.

Appendix A FEASIBILITY DRAWINGS

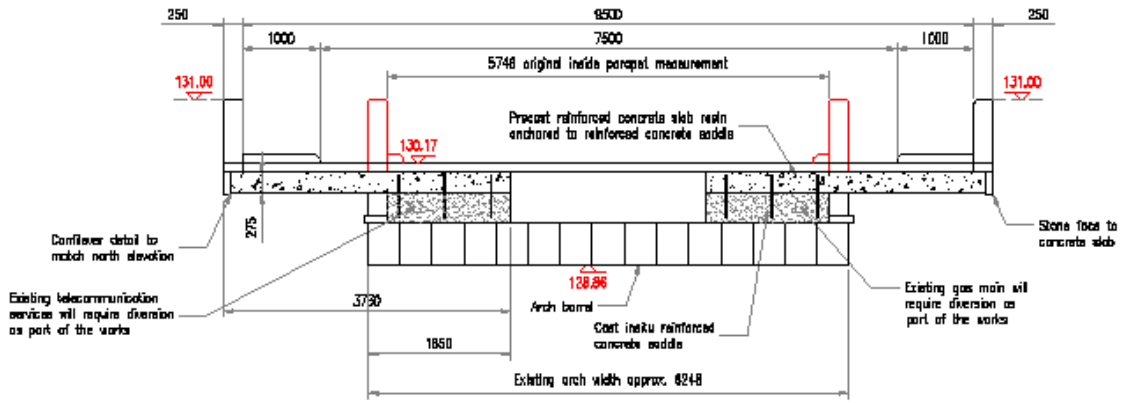
The following drawings are indicative to show the line of the new causeway and the types of structures that can be designed. These drawings are for information only and the final design will be determined when the decision on the route has been made.

Drawing List:

Option 2 - Two concrete cantilever slabs one each side of the causeway and the existing bridge



PLAN, Scale 1:500



CROSS SECTION A-A, Scale NTS

North Yorkshire County Council
Business & Environmental Services
Corporate Director: David Bowe

AMENDMENTS

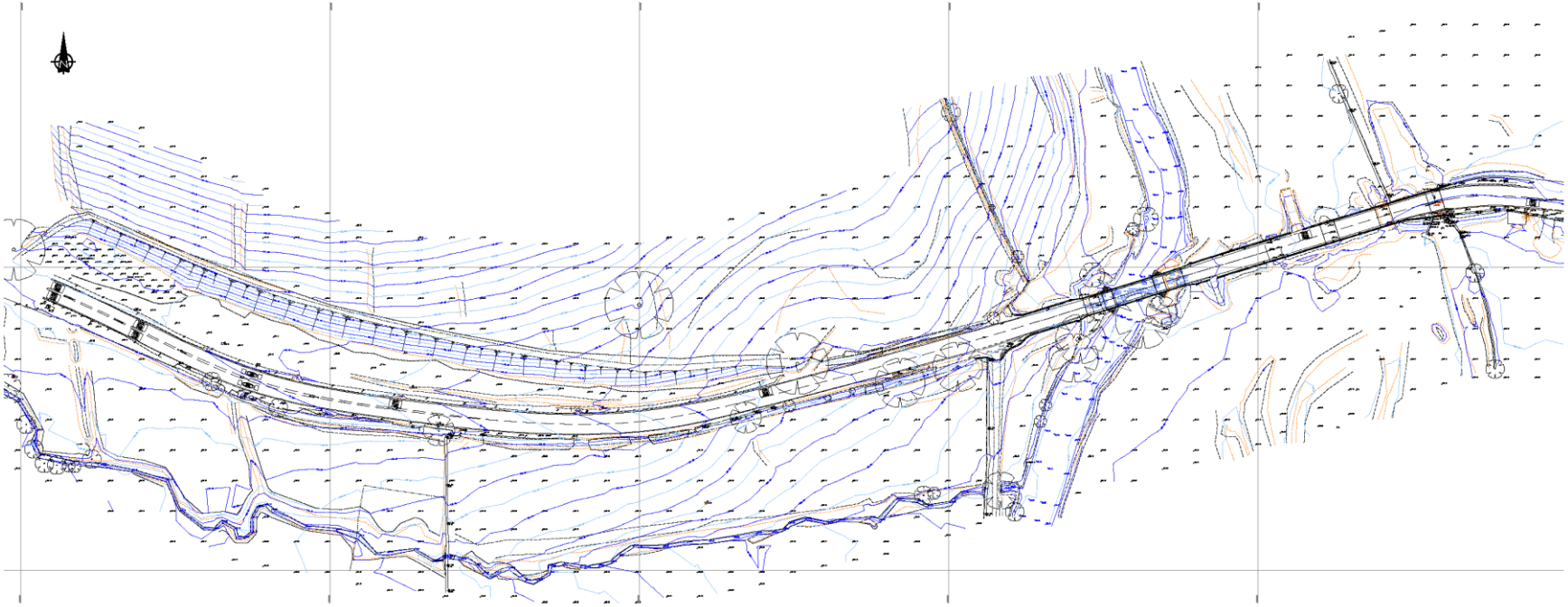
PROJECT:
CONISTON AIRE - FEASIBILITY 2017 - OPTION 2

DRAWN:- A BROS
CHECKED:- A BROS
DATE: 06/06/2017
SCALE: A3
DRAWING NO. BDS/No43222017/MISC-001

ORIGINAL DRAWING SIZE A3

GENERAL NOTES:

1. For information only.
2. Do not scale from this drawing.
3. All levels in metres ordnance datum.



TOPOGRAPHICAL SURVEY OF AREA SURROUNDING
CONISTON AIRE BRIDGE
(1:500)

Rev	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	MAY 17

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	DM	MAR 17	DM	MAR 17

Authorised for Issue | Purpose of Issue

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Topographical Survey of area surrounding Coniston Aire Bridge

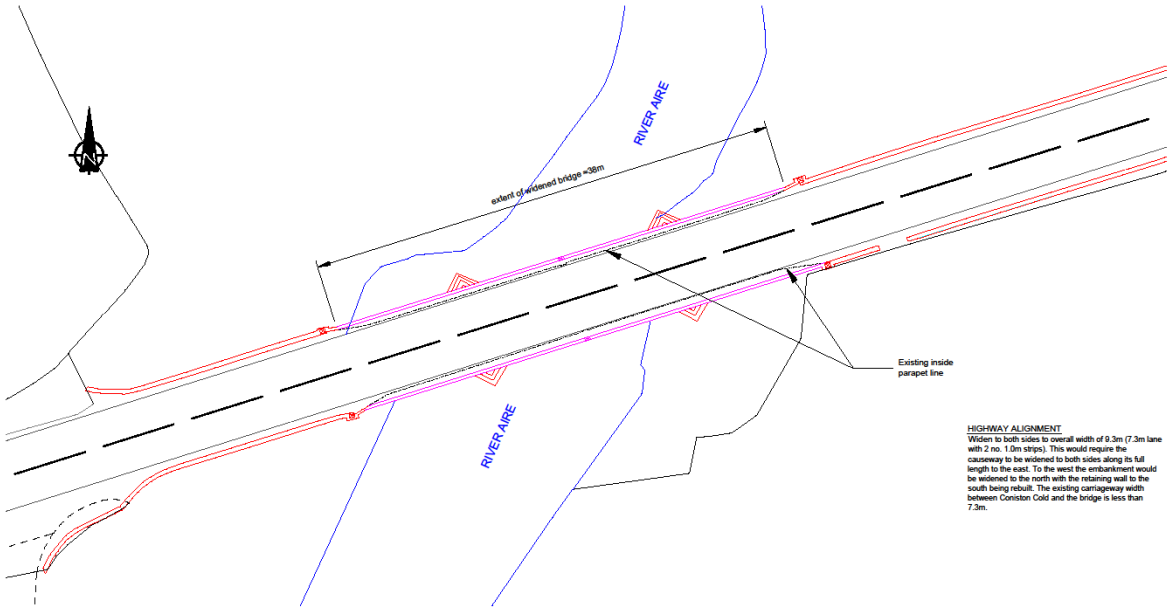
Job No.	Scales	Rev.
1073173	AS SHOWN	1

Mouchel Drawing No. 1077163-FEA-TBR-006

Original Size A0

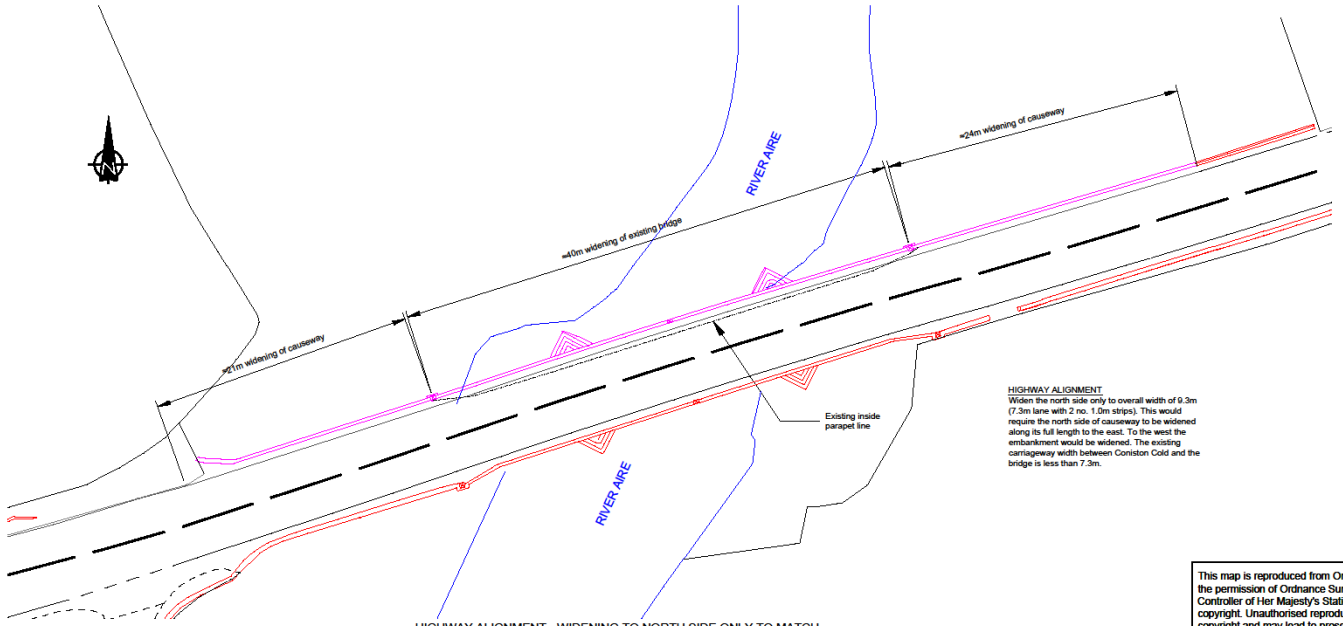
Prepared by Mouchel® Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

\\GBNAL190FL01\Data\Bridges\01 Projects\4322 Coniston Aire\03 Drawings\Bridges\Drawings\Coniston Aire - Checked\1077163-FEA-TBR-006 (Topo) REV1.dwg



HIGHWAY ALIGNMENT - WIDENING TO BOTH SIDES TO MATCH EXISTING CAUSEWAY WIDTH
(1:200)

HIGHWAY ALIGNMENT
Widen to both sides to overall width of 9.3m (7.3m lane with 2 no. 1.0m strips). This would require the causeway to be widened to both sides along its full length to the east. To the west the embankment would be widened to the north with the retaining wall to the south being rebuilt. The existing carriageway width between Coniston Cold and the bridge is less than 7.3m.



HIGHWAY ALIGNMENT - WIDENING TO NORTH SIDE ONLY TO MATCH EXISTING CAUSEWAY WIDTH
(1:200)

HIGHWAY ALIGNMENT
Widen the north side only to overall width of 9.3m (7.3m lane with 2 no. 1.0m strips). This would require the north side of causeway to be widened along its full length to the east. To the west the embankment would be widened. The existing carriageway width between Coniston Cold and the bridge is less than 7.3m.

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in millimetres unless stated otherwise.

Ver	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	MAR17

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	DM	MAR 17	DM	MAR 17

Authorised For Issue: | Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Highway Alignment Options 1 to 4

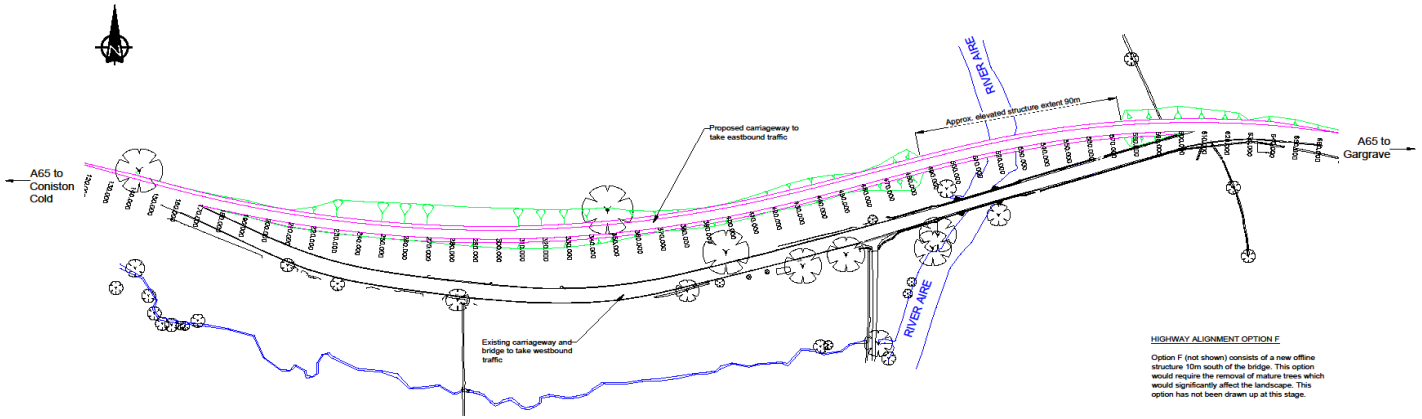
Job No.	Scales	Ver.
1077163	AS SHOWN	1

Mouchel Drawing No. 1077163-FEA-TBR-001

Prepared by Mouchel © Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

Original Size A1

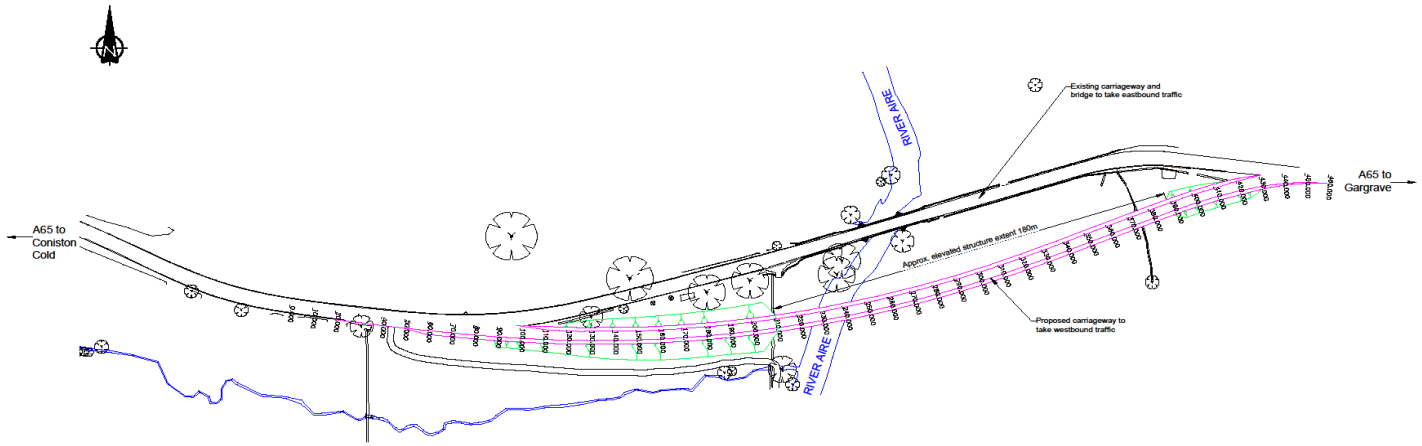
N:\BES-DATA\Bridges\Bridge Stock NYCC - Folder Structure\No.4322 Coniston Aire\Schemes\feasibility 2017\Drawings With References\1077163-FEA-TBR-001 (Alignments A And C) REV1 - Standard\1077163-FEA-TBR-001 (Alignments A And C) REV1.dwg



HIGHWAY ALIGNMENT OPTION F

Option F (not shown) consists of a new offline structure 10m south of the bridge. This option would require the removal of mature trees which would significantly affect the landscape. This option has not been drawn up at this stage.

HIGHWAY ALIGNMENT OPTION E - NEW OFFLINE STRUCTURE TO THE NORTH OF EXISTING BRIDGE
(1:1000)



HIGHWAY ALIGNMENT OPTION G - NEW OFFLINE STRUCTURE TO SOUTH OF EXISTING BRIDGE AVOIDING MATURE TREES
(1:1000)

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in meters unless stated otherwise.

HIGHWAY DESIGN STANDARDS

Highway cross section is based on NYCC requirement with a 4m carriageway and two 1.8m wide footways. Footways are separated from the carriageway with 75mm high 45° splayed kerbs.

Option E (Northern)

Horizontal Alignment

Designed to DMRB TD9/93 85kph standard with minimum radius of 400m (1 step below desirable minimum). This is permissible as it is mid-link.

Vertical Alignment

Designed to DMRB TD9/93 85kph standard with crest radius of K=30 (1 step below desirable minimum, this is permissible as it is mid-link), a down gradient of 2.6% and a sag radius of K=20 (absolute minimum).

Option G (Southern)

Horizontal Alignment

The minimum radius is 97m. This equates to 2 steps below desirable minimum for a design speed of 50kph (1 step below desirable minimum). Whilst not desirable, this is a continuation of the existing horizontal curvature and at the start of the realignment.

Vertical Alignment

Designed to DMRB TD9/93 85kph standard with a sag radius of K=15 (1 step below absolute minimum, this is a permissible relaxation), an up gradient of 1.7%.

Carriageway super-elevations are provided as per TD93/93. Footways are provided with a 2.5% fall towards the carriageway.

Highway Drainage

Positive drainage will be required as the carriageway is kerbed. It is not anticipated that the vertical alignment will provide any issues with providing positive drainage, however it may be a requirement by the Environment Agency that attenuation of the surface water run-off will be required. This may have to be provided by using over-sized pipes within the structures, or provided off-highway at the eastern end of the scheme.

Ver	Amendment	By	Checked	Approved	Date
	First Issue				

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	DM	MAR 17	DM	MAR 17

Authorised For Issue:

Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Highway Alignment Options E to G

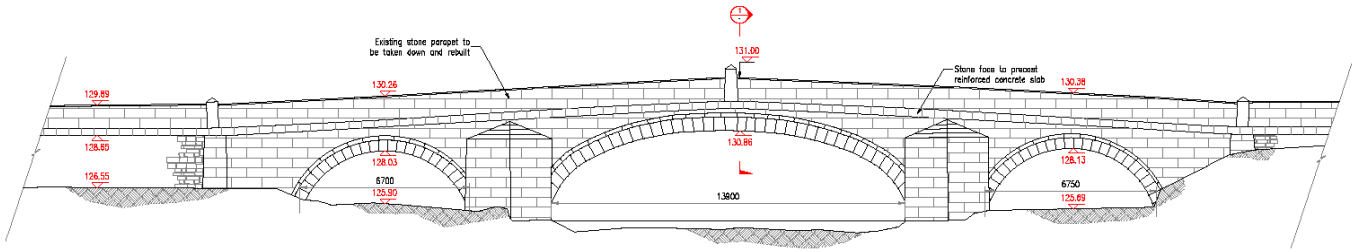
Job No.	Scales	Ver.
1077163	AS SHOWN	0

Mouchel Drawing No. 1077163-FEA-TBR-002

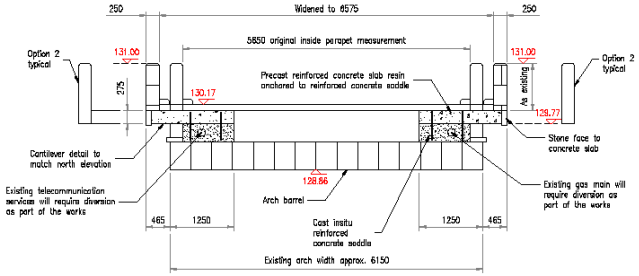
Original Size A1

Prepared by Mouchel © Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

S:\Highways\Bridges\01 Projects\4322 Coniston Aire\03 Drawings\Bridges\Drawings\Working March\1077163-FEA-TBR-002 (Alignments E And G).dwg



OPTION 1: PRECAST CONCRETE CANTILEVER (SYMMETRICAL WIDENING) – TO MATCH EXISTING CAUSEWAY WIDTH
NORTH ELEVATION
1:100



SECTION 1–1: PRECAST CONCRETE CANTILEVER– OPTION 2
1:50

OPTION 1: ESTIMATED COST £1,200,000 (excluding road closure and diversion costs – 28 Weeks)

An extension to the existing structure shall comprise precast reinforced concrete cantilever slabs to the north and south elevations of the structure. For Option 1 the width between parapets shall match the existing causeway width. The existing parapet shall be taken down and rebuilt along the edge of the proposed cantilever. Intrusive investigations and structural assessment will be required to ensure the existing arch and substructure can withstand the additional loading.

Advantages:

- This option minimises the impact on the existing structure by maintaining the elevation of existing arch.
- There will be no construction within the river, maintaining the existing flow capacity.
- The Grade II listed causeway will not be affected.

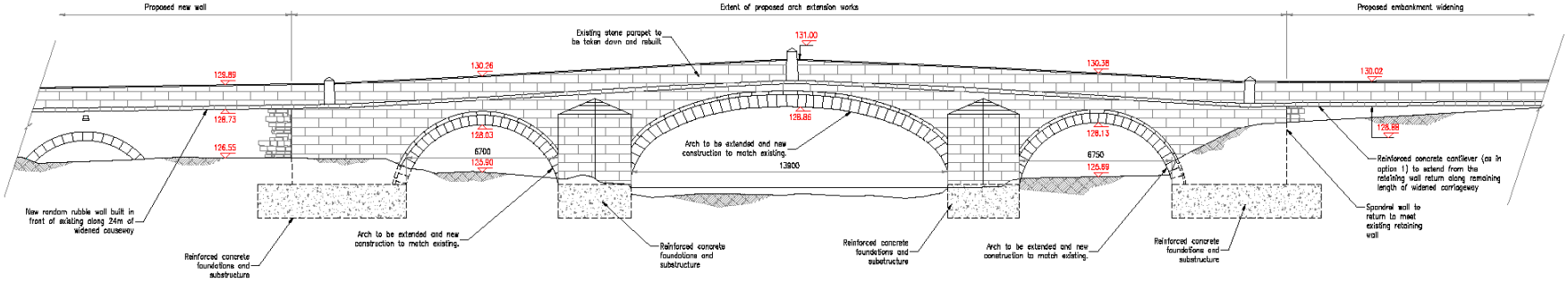
Disadvantages:

- Construction will require full road closure and diversion for approx 8 weeks.
- Temporary works may be required within the river to provide access to reconstruct the proposed parapet.
- Reinstated masonry parapet is considered to be substandard.

OPTION 2: ESTIMATED COST £850,000 (excluding road closure and diversion costs – 20 Weeks – Stats to move)

Option 2 not shown but elevation similar to Option 1. Section similar to Option 1 and indicative parapet positions shown on Section 1–1.

Option 2 shall be as for option 1 but for option 2 the width between parapets shall be equal to 9.3m and shall be provided by precast reinforced concrete cantilever slab units, transversely spanning the full width of the carriageway. The causeway will need to be widened for the full length with a cantilever of 1.5m each side.



OPTION 4: STONE ARCH EXTENSION TO NORTH ELEVATION – TO MATCH EXISTING CAUSEWAY WIDTH
1:100

OPTION 4: ESTIMATED COST £3,300,000

The structure shall be as for Option 3 but will provide a width of 9.3m between parapets. The arch extension will be 3.65m wide and the causeway with the 5no. flood arches widened by 3.0m using a stone faced retaining wall, either comprising a reinforced concrete cantilever or mass concrete.

Advantages:

- The use of masonry is in-keeping with existing structure
- Stone arches will match profile of existing structure.
- No road closure required to construct arch extension.
- Minimal disruption to the fabric of the existing historic Grade II listed structure.

Disadvantages:

- Extension will hide the existing historic elevation.
- Construction may require temporary diversion of the main river channel to allow for construction of centring.
- Reinstated masonry parapet is considered to be substandard.

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in millimetres unless stated otherwise.
3. All levels in metres unless stated otherwise.
4. Foundations shown are indicative and shall be confirmed at detailed design stage.
5. Hydraulic modelling will be required to ensure suitability of proposed options.
6. All proposals are subject to planning permission and approval from the Environment Agency.
7. The bridge and causeway are Grade II listed structures.

Ver	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	[illegible]

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	AR	MAR 17	DM	MAR 17

Authorised For Issue:
Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Bridge Widening Option 4

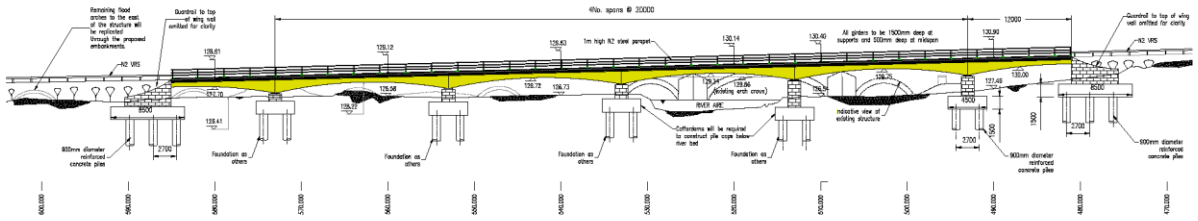
Job No.	Scales	Ver.
1077163	AS SHOWN	1

Mouchel Drawing No. 1077163-FEA-TBR-003

Prepared by Mouchel© Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

Original Size A1

N:\BES-DATA\Bridges\Bridge Stock NYCC - Folder Structure\No.4322 Coniston Aire\Schemes\feasibility 2017\Drawings With References\1077163-FEA-TBR-003 (Option 1 To 4 Widening) REV1 - Standard\1077163-FEA-TBR-003 (Option 1 To 4 Widening) REV1.dwg



STEEL CONCRETE COMPOSITE STRUCTURE – 1.5m HIGH GIRDERS
NORTH ELEVATION
1:250

ESTIMATED COST £5.5M

The 8no. span structure will comprise variable depth steel girders with a composite reinforced concrete deck. The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge.

2no. additional culverts shall be provided through the embankment to the east of the structure to replicate the existing flood arches.

Option 6 has shallower girders over the supports to reduce the arch profile.

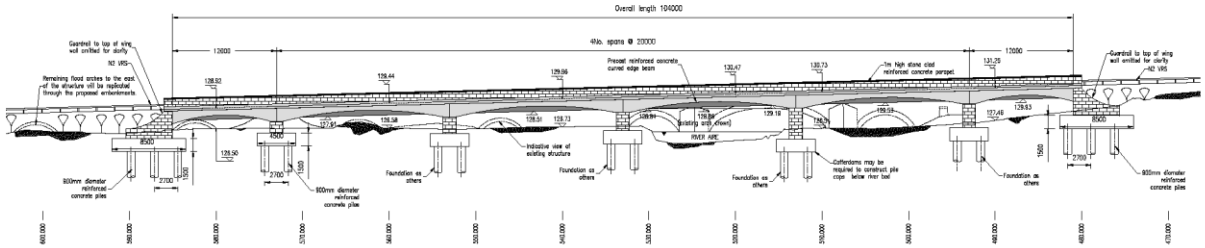
The stone clad parapet as shown in Option 7 below could be applied to this option.

Advantages:

- Slender deck reduces impact of the structure on the landscape.
- Variable depth girders will complement the existing arch profile.
- Sandstone cladding to piers and abutments is in-keeping with materials of existing bridge.

Disadvantages:

- Modern structure conflicts with the existing arch.
- Maintenance painting will be required unless weathered steel is used.



W7 PRESTRESSED BEAM COMPOSITE CONCRETE STRUCTURE WITH CURVED EDGE PANEL
NORTH ELEVATION
1:300

ESTIMATED COST £4.5M

The 8no. span structure will comprise W7 prestressed beams with a reinforced concrete deck and curved edge panels. The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge.

ESTIMATED COST £4.5M
(not shown but similar to 7E without curved edge panels)

The 8no. span structure will comprise W5 prestressed beams with a reinforced concrete deck.

The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge.

2no. additional culverts shall be provided through the embankment to the east of the structure to replicate the existing flood arches.

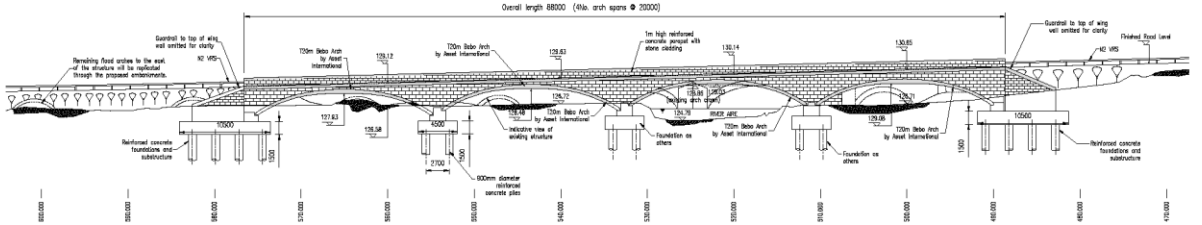
The steel parapet as shown in Option 6 above could be applied to this option.

Advantages:

- Curved edge panels of Option 7 will complement the existing arch structure.
- Sandstone cladding to piers and abutments is in-keeping with materials of existing bridge.
- Use of precast concrete will reduce construction time.

Disadvantages:

- Modern structure conflicts with the existing arch.
- The concrete options are less slender than the steel composite options.



MULTI-SPAN BEBO ARCH STRUCTURE
NORTH ELEVATION
1:200

ESTIMATED COST £3.5M

The 4no. span structure will comprise 20m span twin leaf, proprietary precast concrete Bebo arches. Precast concrete spandrel walls and wing walls will be clad in stone to match the existing structure.

3no. additional culverts shall be provided through the embankment to the east of the structure to replicate the existing flood arches.

Arrangement of arches to be confirmed with manufacturer.

Advantages:

- Stone clad, arch structure compliments existing bridge.
- Precast arch units will increase speed of construction.
- Low maintenance liability.

Disadvantages:

- May require substantial and complex foundations to accommodate horizontal forces through arch.
- Stepped foundations required to accommodate vertical highway alignment.

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in millimetres unless stated otherwise.
3. All levels in metres unless stated otherwise.
4. Pile type and arrangement to be confirmed at detailed design stage.
5. Hydraulic modelling will be required to ensure suitability of proposed options.
6. All options are based on the proposed southern highway alignment option E.
7. The following variation to all the options shown on this drawing can be achieved: structures comprising 3no. spans with central span over the river and approach embankments and culverts across the flood plain to the east. Cost estimates for these variations are given in the Feasibility Report. (Ref:1077163-FEA-TBR-REP1).
8. All proposals are subject to planning permission and approval from the Environment Agency.

Rev	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	AR	MAR 17	DM	MAR 17

Authorised for issue | Purpose of issue

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Proposed Structure Options 5

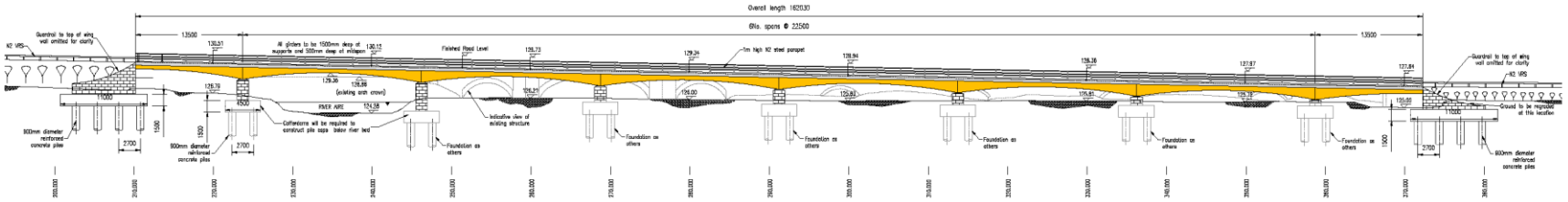
Job No.	Scales	Rev.
1077163	AS SHOWN	1

Mouchel Drawing No: 1077163-FEA-TBR-004

Prepared by Mouchel© Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

Original Size A0

N:\BES-DATA\Bridges\Bridge Stock NYCC - Folder Structure\No.4322 Coniston Aire\Schemes\Feasibility 2017\Drawings With References\1077163-FEA-TBR-004 (North Alignment) REV1 - Standard\1077163-FEA-TBR-004 (North Alignment) REV1.dwg



STEEL CONCRETE COMPOSITE STRUCTURE – 1.5m HIGH GIRDERS
SOUTH ELEVATION
1:200

ESTIMATED COST £8M

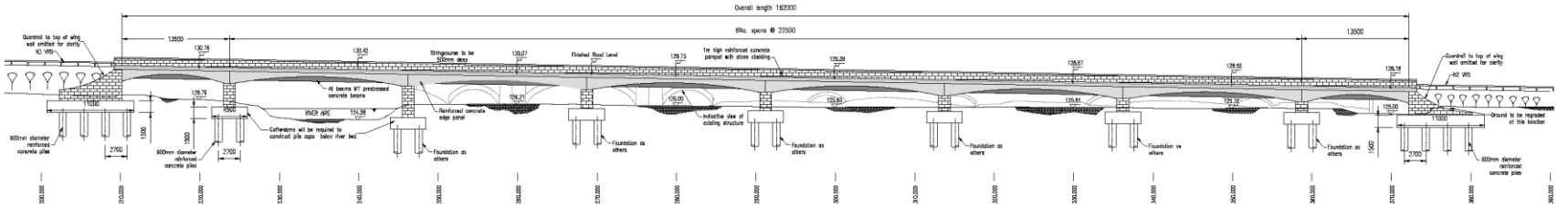
The 6No. span structure will comprise variable depth steel girders with a composite reinforced concrete deck. The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge. Option 5 has shallower girders over the supports to reduce the arch profile.
The stone clad parapet as shown in Option 7G below could be applied to this option.

Advantages:

- Slender deck reduces impact of the structure on the landscape.
- Variable depth girders will complement the existing arch profile.
- Sandstone cladding to piers and abutments is in-keeping with materials of existing bridge.

Disadvantages:

- Modern structure conflicts with the existing arch.
- Maintenance painting will be required unless weathered steel is used.



W7 PRESTRESSED BEAM COMPOSITE CONCRETE STRUCTURE WITH CURVED EDGE PANEL
SOUTH ELEVATION
1:200

ESTIMATED COST £7M

The 6No. span structure will comprise W7 prestressed beams with a reinforced concrete deck and curved edge panels. The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge.

ESTIMATED COST £7M

(not shown but similar to 7G without curved edge panels)

The 6No. span structure will comprise M5 prestressed beams with a reinforced concrete deck. The deck will span between reinforced concrete abutments and piers clad in stone to match the existing arch bridge.

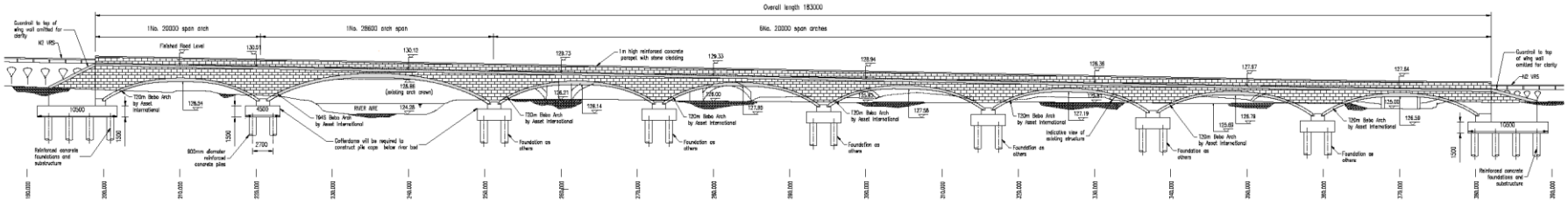
The steel parapet as shown in Option 6 above could be applied to this option.

Advantages:

- Curved edge panels of Option 7 will complement the existing arch structure.
- Sandstone cladding to piers and abutments is in-keeping with materials of existing bridge.
- Use of precast concrete will reduce construction time.

Disadvantages:

- Modern structure conflicts with the existing arch.
- The concrete options are less slender than the steel composite options.



MULTI-SPAN BEBO ARCH STRUCTURE
SOUTH ELEVATION
1:200

ESTIMATED COST £6.5M

The 8No. span structure will comprise twin leaf, proprietary precast concrete Bebo arches. The structure will have a span of 30m over the river and side spans of 20m. Precast concrete spandrel walls and wing walls will be clad in stone to match the existing structure.

Advantages:

- Stone clad, arch structure compliments existing bridge.
- Precast arch units will increase speed of construction.
- Low maintenance liability.

Disadvantages:

- May require substantial and complex foundations to accommodate horizontal forces from the arch.

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in millimetres unless stated otherwise.
3. All levels in metres unless stated otherwise.
4. Pile type and arrangement to be confirmed at detailed design stage.
5. Hydraulic modelling will be required to ensure suitability of proposed options.
6. All options are based on the proposed south highway alignment option G.
7. The following variation to all the options shown on this drawings can be achieved: structures comprising 3no. spans with central span over the river and approach embankments and culverts across the flood plain to the east. Cost estimates for these variations are given in the Feasibility Report (Ref:1077163-FEA-TBR-REP1).
8. All proposals are subject to planning permission and approval from the Environment Agency.

Rev	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	MAR 17

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	AR	MAR 17	DM	MAR 17

Authorised for issue:
Purpose of issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Proposed Structure Options 5

Job No.	Scales	Rev.
1077163	AS SHOWN	1

Mouchel Drawing No. 1077163-FEA-TBR-005

Original Size A0

Prepared by Mouchel © Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

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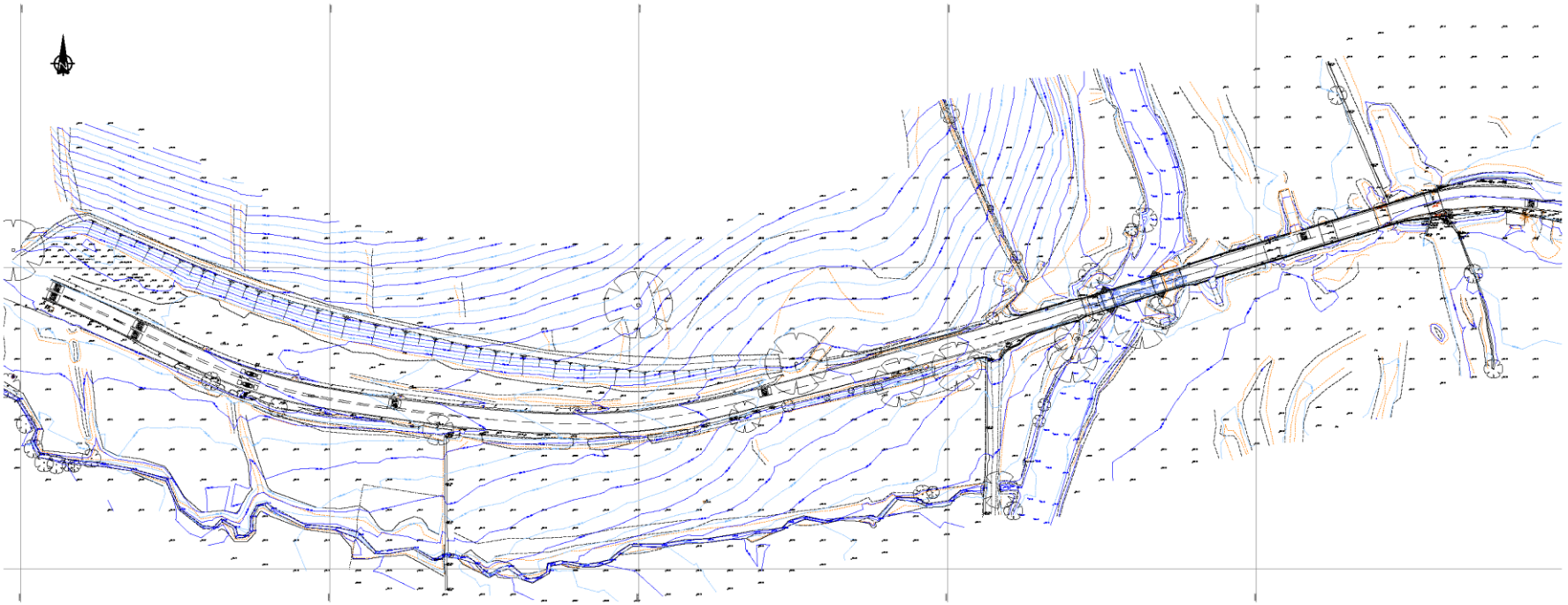
GENERAL NOTES:

1. For information only.
2. Do not scale from this drawing.
3. All levels in meters ordnance datum.



TOPOGRAPHICAL SURVEY OF AREA SURROUNDING
CONISTON AIRE BRIDGE
(1:500)

Rev	Amendment	By	Checked	Approved	Date
	First Issue				

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	DM	MAR 17	DM	MAR 17

Authorised For Issue:

Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Topographical Survey of area surrounding Coniston Aire Bridge

Job No.	Scales	Rev
1073173	AS SHOWN	0

Mouchel Drawing No: 1077163-FEA-TBR-006

Original Size A0

Prepared by Mouchel © Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

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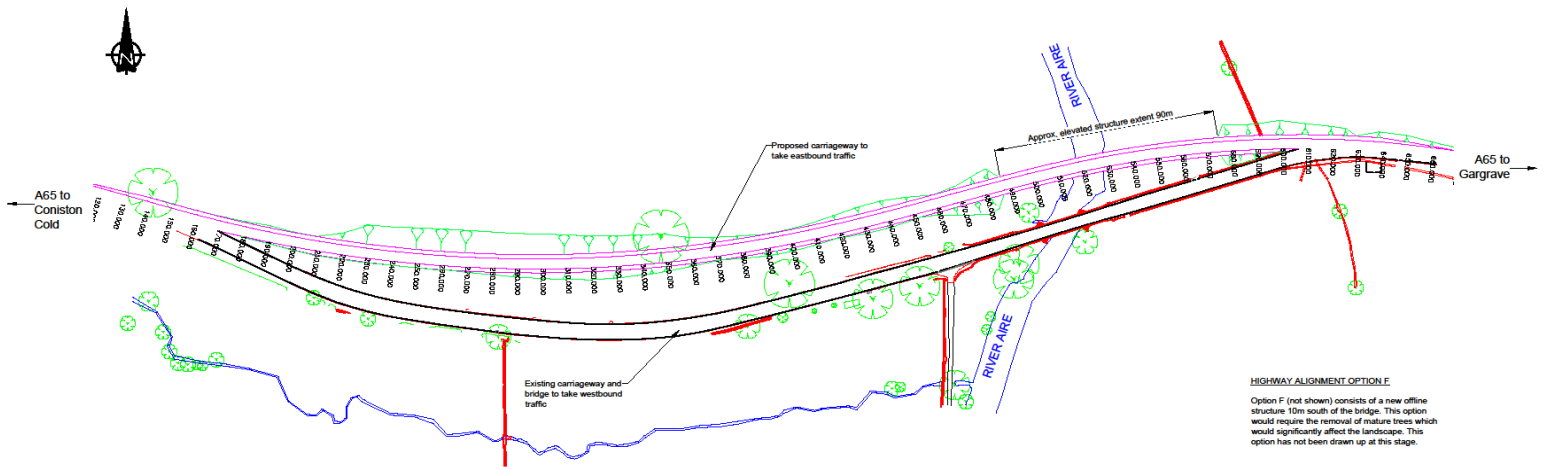
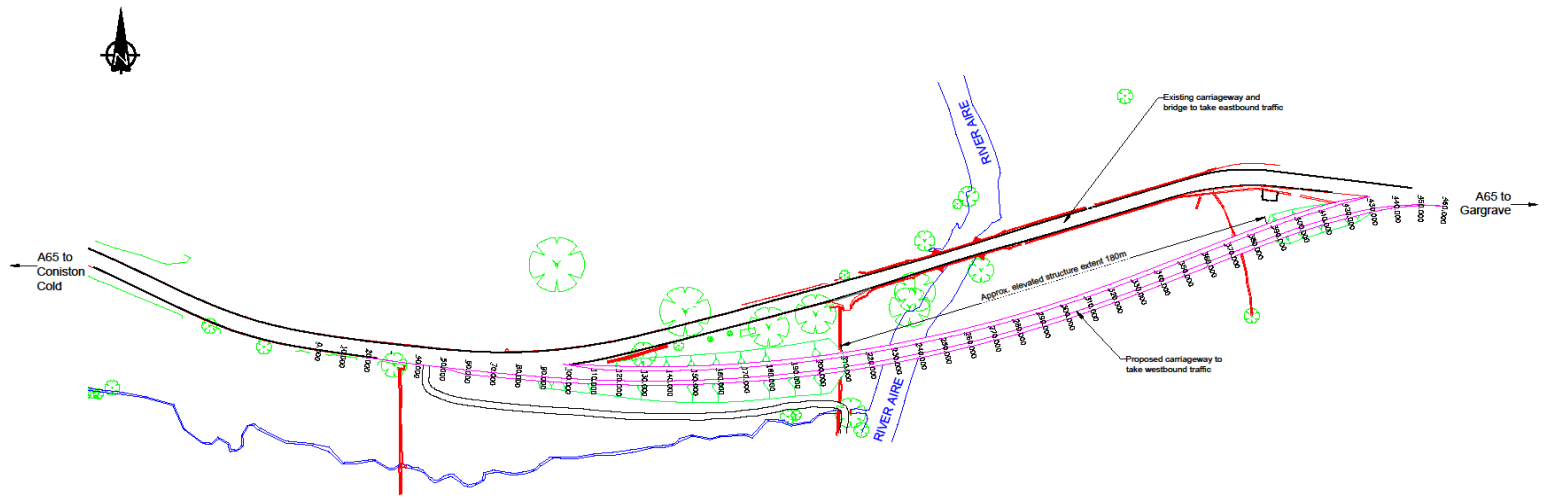


HIGHWAY ALIGNMENT- NEW OFFLINE STRUCTURE TO THE NORTH OF EXISTING BRIDGE
(1:1000)

HIGHWAY ALIGNMENT OPTION F

Option F (not shown) consists of a new offline structure 10m south of the bridge. This option would require the removal of mature trees which would significantly affect the landscape. This option has not been drawn up at this stage.



HIGHWAY ALIGNMENT - NEW OFFLINE STRUCTURE TO SOUTH OF EXISTING BRIDGE AVOIDING MATURE TREES
(1:1000)

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in meters unless stated otherwise.

HIGHWAY DESIGN STANDARDS

Highway cross section is based on NYCC requirement with a 4m carriageway and two 1.8m wide footways. Footways are separated from the carriageway with 75mm high 45° splayed kerbs.

(Northern)

Horizontal Alignment

Designed to DMRB TD9/93 85kph standard with minimum radius of 400m (1 step below desirable minimum). This is permissible as it is mid-link.

Vertical Alignment

Designed to DMRB TD9/93 85kph standard with crest radius of K=30 (1 step below desirable minimum, this is permissible as it is mid-link), a down gradient of 2.6% and a sag radius of K=20 (absolute minimum).

(Southern)

Horizontal Alignment

The minimum radius is 97m. This equates to 2 steps below desirable minimum for a design speed of 50kph (1 step below desirable minimum). Whilst not desirable, this is a continuation of the existing horizontal curvature and at the start of the realignment.

Vertical Alignment

Designed to DMRB TD9/93 85kph standard with a sag radius of K=15 (1 step below absolute minimum, this is a permissible relaxation), an up gradient of 1.7%.

Carriageway super-elevations are provided as per TD93/93. Footways are provided with a 2.5% fall towards the carriageway.

Highway Drainage

Positive drainage will be required as the carriageway is kerbed. It is not anticipated that the vertical alignment will provide any issues with providing positive drainage, however it may be a requirement by the Environment Agency that attenuation of the surface water run-off will be required. This may have to be provided by using over-sized pipes within the structures, or provided off-highway at the eastern end of the scheme.

Ver	Amendment	By	Checked	Approved	Date
1	Spelling changes	MJL	DM	DM	MAR 17

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	DM	MAR 17	DM	MAR 17

Authorised For Issue:

Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Highway Alignment

Job No.	Scales	Ver.
1077163	AS SHOWN	1

Mouchel Drawing No. 1077163-FEA-TBR-002

Original Size A1

Prepared by Mouchel © Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

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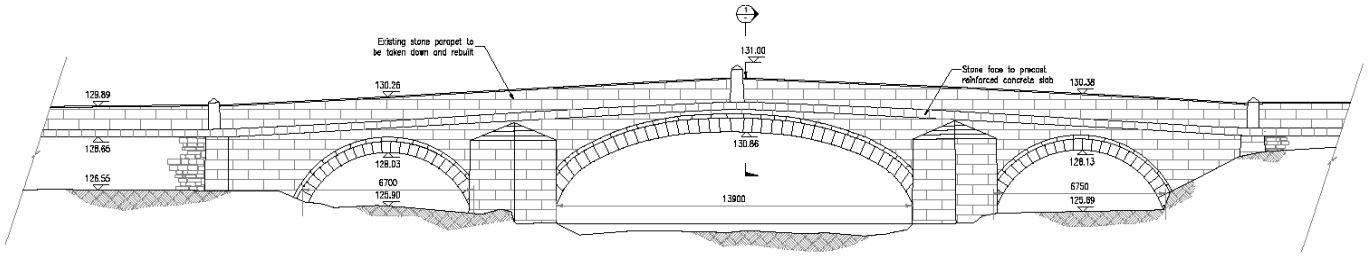
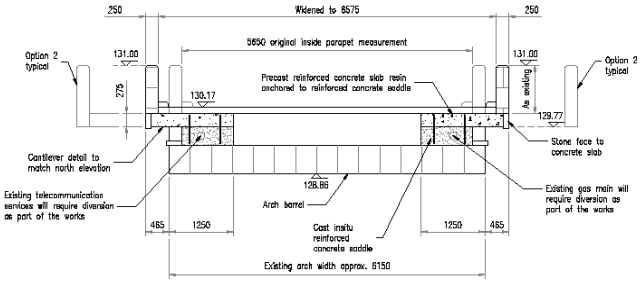


OPTION 1: PRECAST CONCRETE CANTILEVER (SYMMETRICAL WIDENING) – TO MATCH EXISTING CAUSEWAY WIDTH
NORTH ELEVATION
1:100



SECTION 1–1: PRECAST CONCRETE CANTILEVER
1:50

OPTION 1: ESTIMATED COST £250,000 (excluding road closure and diversion costs)

An extension to the existing structure shall comprise precast reinforced concrete cantilever slabs to the north and south elevations of the structure. For Option 1 the width between parapets shall match the existing causeway width. The existing parapet shall be taken down and rebuilt along the edge of the proposed cantilever. Intrusive investigations and structural assessment will be required to ensure the existing arch and substructure can withstand the additional loading.

Advantages:

- This option minimises the impact on the existing structure by maintaining the elevation of existing arch.
- There will be no construction within the river, maintaining the existing flow capacity.
- The Grade II listed causeway will not be affected.

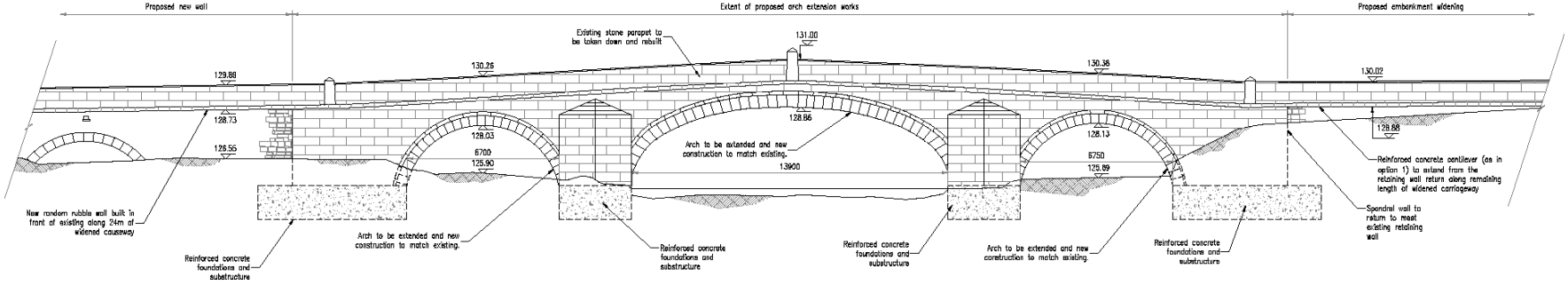
Disadvantages:

- Construction will require full road closure and diversion for approx 8 weeks.
- Temporary works may be required within the river to provide access to reconstruct the proposed parapet.
- Reinstated masonry parapet is considered to be substandard.

OPTION 2: ESTIMATED COST £850,000 (excluding road closure and diversion costs)

Option 2 not shown but elevation similar to Option 1. Section similar to Option 1 and indicative parapet positions shown on Section 1–1.

Option 2 shall be as for option 1 but for option 2 the width between parapets shall be equal to 9.3m and shall be provided by precast reinforced concrete cantilever slab units, transversely spanning the full width of the carriageway. The causeway will need to be widened for the full length with a cantilever of 1.5m each side.



OPTION 3: STONE ARCH EXTENSION TO NORTH ELEVATION – TO MATCH EXISTING CAUSEWAY WIDTH
1:100

OPTION 3: ESTIMATED COST £400,000

The structure shall be extended by constructing a 1.0m wide arch in traditional stonework contiguous with the existing arch. Stone faced mass concrete retaining walls 24m long shall be used to return the proposed structure to the existing carriageway alignment. The first flood arch will also need to be widened by 0.3m.

Advantages:

- The use of masonry is in-keeping with existing structure
- Stone arches will match profile of existing structure.
- No road closure required to construct arch extension.
- Minimal disruption to the fabric of the existing historic Grade II listed structure.

Disadvantages:

- Extension will hide the existing historic elevation.
- Construction may require temporary diversion of the main river channel to allow for construction of centering.
- Reinstated masonry parapet is considered to be substandard.

OPTION 4: ESTIMATED COST £1M

The structure shall be as for Option 3 but will provide a width of 9.3m between parapets. The arch extension will be 3.85m wide and the causeway with the 5no. flood arches widened by 3.0m using a stone faced retaining wall, either comprising a reinforced concrete cantilever or mass concrete.

GENERAL NOTES:

1. Do not scale from this drawing.
2. All dimensions in millimeters unless stated otherwise.
3. All levels in metres unless stated otherwise.
4. Foundations shown are indicative and shall be confirmed at detailed design stage.
5. Hydraulic modelling will be required to ensure suitability of proposed options.
6. All proposals are subject to planning permission and approval from the Environment Agency.
7. The bridge and causeway are Grade II listed structures.

Ver	Amendment	By	Checked	Approved	Date
	First Issue				

Drawn	Date	Checked	Date	Approved	Date
SH	MAR 17	AR	MAR 17	DM	MAR 17

Authorised For Issue:
Purpose of Issue:

North Yorkshire County Council

Client: North Yorkshire County Council

Project: Coniston Aire Bridge Feasibility Study

Title: Bridge Widening Options 1- 4

Job No.	Scales	Ver.
1077163	AS SHOWN	0

Mouchel Drawing No. 1077163-FEA-TBR-003

Prepared by Mouchel© Dale House, Mount View, Standard Way Business Park, Northallerton, DL6 2YD

Original Size A1

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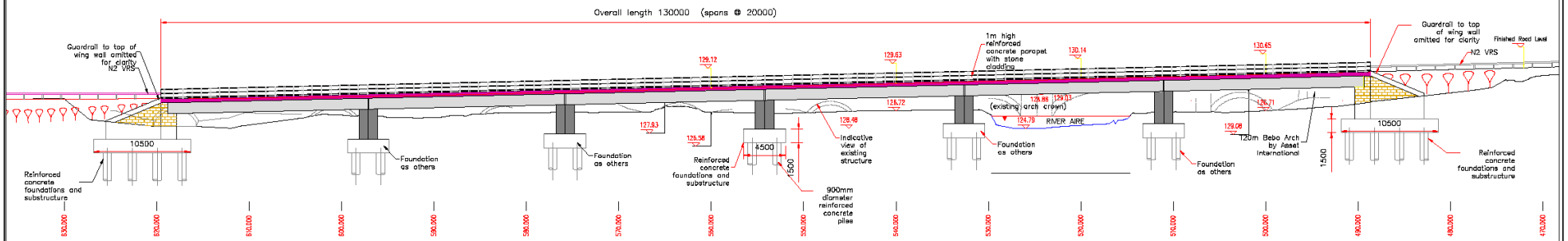

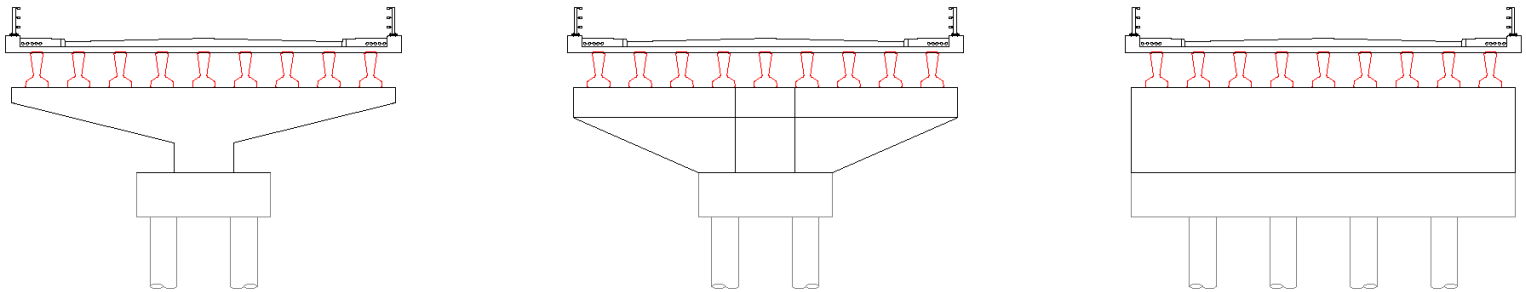

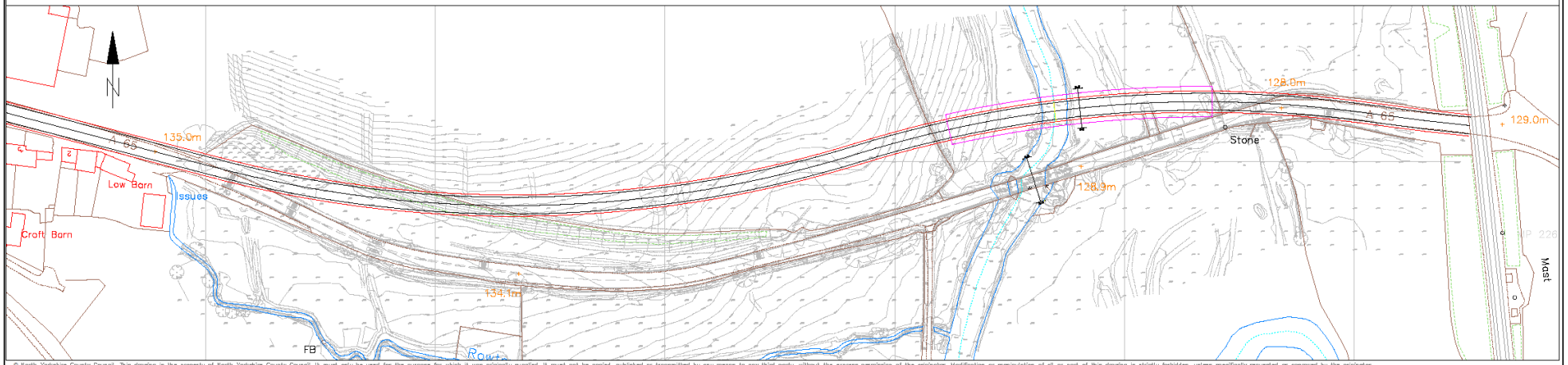

North Yorkshire County Council
Business & Environmental Services
Corporate Director: David Bowe

CONISTON AIR – FEASIBILITY 2017 – OPTION 5
TY PRECAST CONCRETE BEAMS

AMENDMENTS	DRAWN	CHECK	DATE
FIRST APPROVED	AB	JDS	06/17

DRAWN BY	
INITIALS	DATE
AB	08/17
AutoCAD BY	
INITIALS	DATE
AB	08/17
CHECKED BY	
INITIALS	DATE
JDS	08/17

SCALE: NTS

DRAWING NUMBER: BDS/No4322/17/MISC-01

ORIGINAL SHEET SIZE: A1

DATE: JUNE 2017

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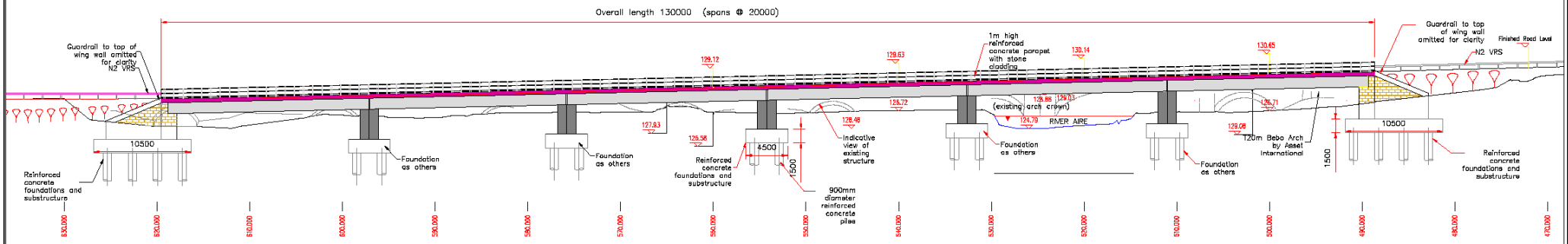
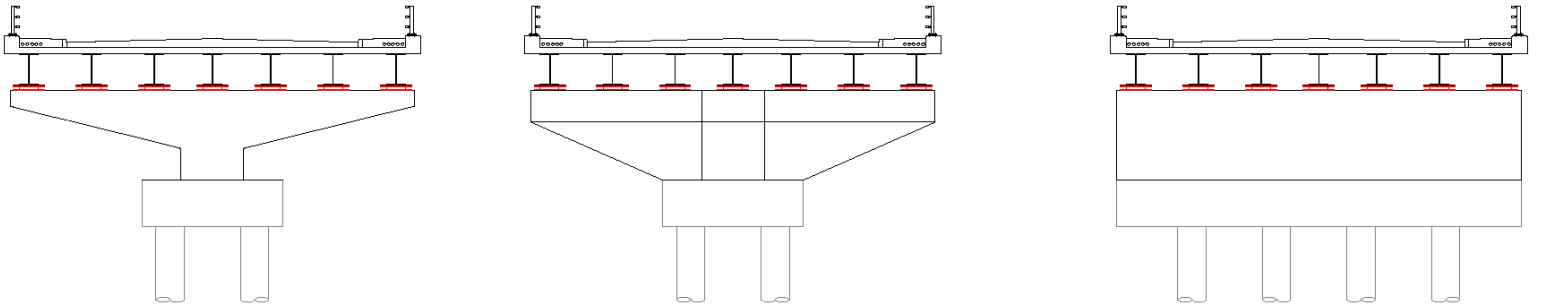
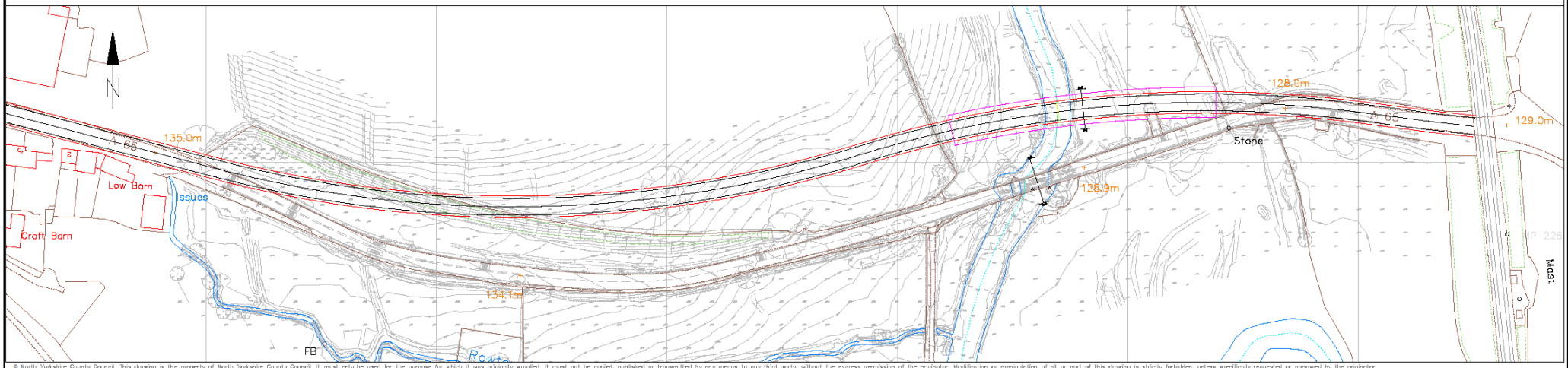
PLOTTED BY: BEN SAVAGE 09/2018







North Yorkshire County Council
Business & Environmental Services
Corporate Director: David Bowe

CONISTON AIR – FEASIBILITY 2017 – OPTION 5
I STEEL BEAMS

AMENDMENTS	DRAWN	CHECK	DATE
FIRST APPROVED	AB	JDS	06/17

DRAWN BY	
INITIALS	DATE
AB	08/17
AutoCAD BY	
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INITIALS	DATE
JDS	08/17

SCALE: NTS

DRAWING NUMBER: BDS/No4322/17/MISC-02

ORIGINAL SHEET SIZE: A1

DATE: JUNE 2017

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PLOTTED BY: BEN SAVAGE 08/2019

Appendix B - Traffic Signals Report

A65 Aire Bridge Shuttle Signals
Summary of Work and Reasoning
Flows

For the flows, the data provided by Mouchel was used.

Examination of the data indicated that there were peaks in the traffic volumes associated with busy traditional holiday periods (high seasonal variation). Two sets of flows have been modelled the first average daily peak traffic AM and PM, the second is the busiest two AM and PM peaks in the year occurring in August.
The peak hours are traditionally between 11:00 and 12:00 for the AM peak and between 15:00 and 16:00 for the PM peak. This location does not have traditional peak periods as it is not on a commuter type route.

The difference between an average day and the peak day recorded is an increase of 73%.

Modelling

Two models have been created one with 170m between stop lines that was considered due to the location that equipment could be sited and where large (HCV) vehicles stopped to give way to each other. The second model would require widening off the structure to allow for a nearside and offside signal pole to be sited and reflects the length of the Grade II structure and would allow the stop line to be 80m apart. The carriageway is still narrow at this location so detailed modelling and track assessment of HCV movements would need undertaking, **Figure 1** and **2** below show the approximate location of the stop lines for the two modelled scenarios.

Figure 1: 170m between Stop Lines Scenario 1

Figure 1: 80m between Stop Lines Scenario 2

The difference between the two models is simply the amount of lost time created by vehicles clearing the area between the stop lines. The overall operation is simple, two stages required in a simple shuttle configuration. The use of "All Red" detection would help to reduce intergreen times but for very slow vehicles would increase intergreens (farm vehicles/cyclists). The required intergreen times are 25 seconds per stage (170m) equating to lost time of 50 seconds per cycle with a cycle of 120 seconds. The shorter distance option (80m between stop lines) would require 16 seconds between stages utilising a 120 second similar cycle.
It can be seen that the benefits associated with shorter distances is significant and would generate additional green time per cycle of 18 seconds which can be simply translated into 9 vehicles per cycle equivalent to roughly 270 vehicles per hour.

Results

The results are presented below in **Tables 1** (Queues and Degree of Saturation) and **Table 2** (Delays), for each stop line scenario two sets of flows have been modelled. Average AM and PM peaks flows and peak AM and PM holiday traffic which occurs generally at the weekends between July and August (Average weekday traffic also increases during this period to approximately 950 vehicles in the peak hour). Degree of Saturation is a measure of capacity and anything over 90% indicates that an approach is reaching its operational capacity.

Models	Direction	AM Average Queues and DoS	PM Average Queues and DoS	AM Peak Queues and DoS	PM Peak Queues and DoS
170m Stop Line	**Westbound**	13 (73%)	13 (75%)	75 (116%)	97 (128%)
	Eastbound	13 (75%)	14 (74%)	65 (115%)	121 (129%)
80m Stop Line	**Westbound**	12 (59%)	11 (60%)	26 (92%)	40 (103%)
	Eastbound	11 (59%)	12 (59%)	24 (93%)	44 (102%)

Table 1: Queue and Degree of Saturation Results Both Scenarios

The results in **Table 1** indicate that under normal operating conditions with stop lines 170m apart there is plenty of spare capacity and queues can be managed. Peak Holiday flows cause a significant issue with the signals operating well over capacity. Inevitably moving the stop line locations closer has a significant impact on the results however during those very busy periods the signals would still operate over capacity.

A simple sensitivity test was undertaken but the results have not been summarised and with the stop lines 170m apart the theoretical maximum capacity of the signals is approximately 1000 vehicles an hour. For stop lines at 80m apart the theoretical capacity is closer to 1200 vehicles per hour.

Models	Direction	AM Average Sec Delay	PM Average Sec Delay	AM Peak Sec Delay	PM Peak Sec Delay
170m Stop Line	Westbound	49	52	330	492
	Eastbound	52	49	339	508
80m Stop Line	Westbound	36	38	60	147
	Eastbound	38	36	71	131

Table 2: Delays in Scenario 1 and 2

The results of the total vehicle delay in **Table 2** indicate that there are significant delay benefits in moving the stop lines closer together. For a typical AM and PM peak the delays are within acceptable limits for both scenarios. There is however a significant difference in delay between the scenarios for the peak annual flows.

Costs

Consideration of costs has been undertaken these are difficult to determine in any detail as there are so many unknowns which include electricity and communications supplies which are the biggest cost risk. If mobile connectivity is available then costs could be reduced.

For the purpose of the works an estimate of around £150,000 would be sensible. Extensive ducting of the approaches is required to implement advanced detection of the approaches that may need to up to 80-100m in advance of the stop lines. Detection in the form of "All Red" loops are required between the stop lines for safety.

The cost does not include a permanent power supply and Variable Message Sign "Queue" related on the Gargrave side of the bridge warning of queues. This in itself could be an expensive undertaking as wind/solar may not be sufficient to power the sign, a permanent supply would mitigate against the sign running out of power.

Also site visibility clearance works would need undertaking based on 85%ile speeds. Presently there is extensive vegetation and trees on the eastbound approach that would need clearing the costs for this work, has not been included in the estimate.

A high PSV value carriageway surfacing may be required which would also need including in the estimated cost.

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