NYMNPA
15/07/2022

North Yorkshire County Council

Beck Hole Bridge Maintenance 2022

Engineering Statement

Structure Reference Number: 392

Rev A

July 2022

Introduction

This report has been prepared by Ben Savage, Assistant Engineer North Yorkshire County Council in support of the application for Listed Building Consent to North Yorkshire County Council for the scheme to “Dismantle and rebuild south-east spandrel wall using existing stone”. This statement has been prepared in accordance with the current guidance regarding the conservation and enhancement of the historic environment. All drawings are to be read in conjunction with all relevant documents for the proposed works.

It is submitted as part of a package of information intended to outline and highlight the reasons why this bridge is in need of repair to protect and preserve the historical listed building. It will also show how the proposed repairs will not materialistically change any external appearance of the structure from its original intended appearance.

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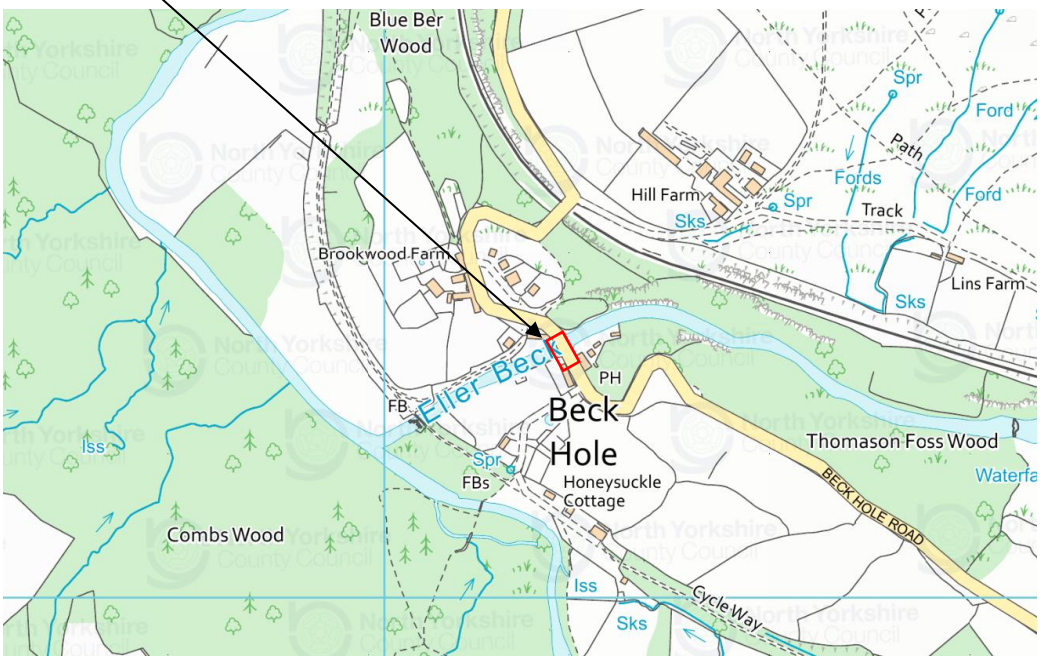
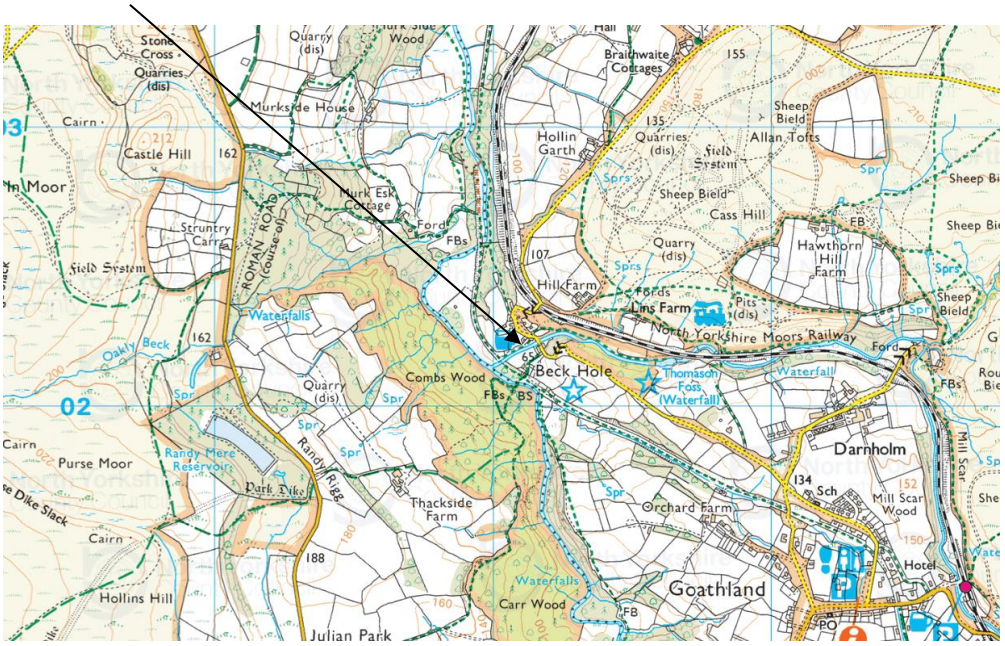
The Site

The application site is across Eller Beck, as shown on the location plans below.



Beck Hole Bridge



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North Yorkshire County Council 100017946

Photographs

Downstream Elevation (SW Spandrel) – 1997

Downstream Elevation (SW Spandrel) - 2011

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Downstream Elevation (SW Spandrel) - 2015

Downstream Elevation (SW Spandrel) – 2021

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Engineers Report

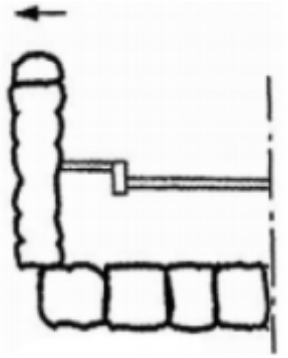
Beck Hole Bridge is a two span masonry arch structure which carries 'Beck Hole Road' over Eller Beck through the village of Beck Hole, North Yorkshire. Each arch spans approximately 6.3m with a rise of 3.5m.

The bridge is a Grade II listed structure. It has a unique listing entry (No. 1174143), which details the following:

'GOATHLAND BECK HOLE NZ8202-8302 19/86 Bridge over the Eller Beck GV II Bridge. C19. Rusticated sandstone. Two semi-circular arches of voussoirs with cutwaters on both sides of centre pier. Pilaster piers at each end rising through plain parapet over moulded band. Parapet slightly raked with cambered coping. Flat caps to piers. Included for group value.'

The National Planning Portal Framework (NPPF) states that "Any harm to, or loss of, the significance of a designated heritage asset (from its alteration or destruction, or from development within its setting), should require clear and convincing justification. Substantial harm to or loss of: grade II listed buildings, or grade II registered parks or gardens, should be exceptional."

Beck Hole Bridge has undergone routine inspections since 1997 with all identifying movement in the south west spandrel wall for the southern span of the structure. The movement is clearly not typical of the original build and is classed as a defect. The movement has been monitored and has since continued to move and now requires remedial work to prevent further structural instability.



From a Principal Inspection and assessment report (1997)

"Beck Hole Bridge is in good condition. No defects were found that would seriously affect the capacity of the bridge. The South West wing wall and spandrel wall should be monitored at regular intervals to assess if any further movement is taking place.

Movement has taken place on the South West side of the structure which is affecting the spandrel wall, wing wall and parapet. The spandrel wall and wing wall are bulging outward. This has caused the spandrel to separate from the edge voussoirs of the South arch by up to 25mm. No cracking or other defects have taken place."

The structure has received routine inspections with BCI scoring from 2005. In 2017 further movement was identified with the crack appearing to increase from 30mm to 50mm.

From an BCI inspection report (2017)

"The SW spandrel to the south-arch appears to have displaced outwards further since the last inspection. This should be pointed to enable any future movement to be detected more easily. Bulge appears to be increasing SW (30mm to 50mm)."

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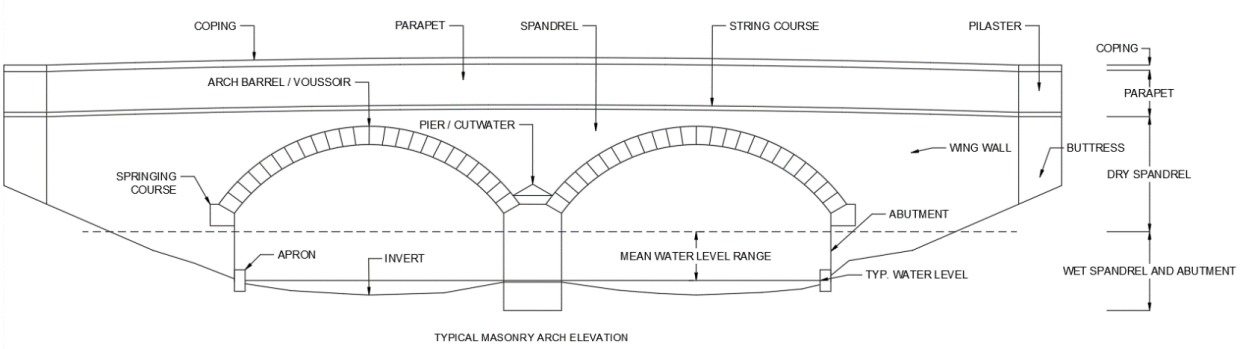
To discover the route of the spandrel wall movement, the structure has undergone random inspections, on days of wet and dry weather. On days after heavy rain it can be seen that water is pooling on the bridge approach/grass verge.

It is assumed that the pooling water is penetrating through the grass verge into the bridge fill, causing the existing fill to be saturated. As the bridge is now subject to modern day to day use of public and agricultural vehicles, which can weigh up to 44t without any restriction. The increased usage and saturated fill can cause the spandrel to push outwards. It is commonly found defect on masonry arch bridges particularly with a reduced road width and no verge protection. A typical repair is to take down the defected stonework to sound material and rebuild back up using the existing stone and introducing a structural backfill with the addition of drainage gully's to prevent any pooling from occurring. Back of wall drainage and weep holes will be added to elevate any pressure from within the structure.

Due to the structures listed status, there is a requirement to rebuild the structure using a more traditional mortar mix. There will be three different mixes used on the rebuild.



TYPICAL MASONRY ARCH ELEVATION

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1. Copings (Water-Shredding) mix:

    - **1 Part - Prompt natural cement -** In accordance to NFP 15-314:1993**;**
    - **2 Parts – Sharp sand** (Suitably graded);
    - Slate Gallets as required to minimise joint thickness.

2. Parapets & Dry spandrel wall mix:

    - **1 Part – CL90-Q Quicklime (Powdered)** – In accordance to BSEN 459-1:2010 and is CE marked;
        i. **20% - Trass** as a proportion of the quicklime. **Trass** in accordance with DIN 51043;
    - **1 Part – Coarse sharp sand**;
    - **2 Parts** – **Fine sharp sand** (Locally sourced, such as cooks or similar approved or plastering sand).

3. Wet Spandrels & Abutments mix:

    - **1 Part** – **CL90-Q Quicklime** (Powdered) – In accordance to BSEN 459-1:2010 and is CE marked;
    - **1 Part** – **Trass -** in accordance with DIN 51043;
    - **1 Part** – **Fine sharp sand**;
    - **1 Part** – **Coarse sharp sand**.

Ecology report

A bat and ecology survey was carried out in June/July 2021 on the structure. The survey found that although bats were recorded in the area, none were found to be seen emerging from any part of the structure. It was recommended that works should proceed with care and must stop if bats are encountered.

A check of a stretch of the Eller Beck was carried out to search for evidence of Otters and Water Voles. Although there is some potential for both of these species in the vicinity (especially Otters) no evidence of their presence was found. This stretch of watercourse is generally quite disturbed due to its location in the village, proximity to the pub and ready accessibility to the public.

A check was also made for evidence of invasive non-native plant species. There have been past records of Japanese Knotweed and Rhododendron within 2km of the bridge, but these records do not relate to the 1km square in which the bridge is located. No evidence of either of these species was found during the field survey, but there was a small amount of Buddleia upstream of the pub and cultivated Rose species in a garden on the north bank close to the bridge. Neither of these locations will be disturbed as a result of the proposed works which are very localised in extent.

It is concluded that the proposed works are unlikely to adversely impact on protected species or result in the spread of invasive non-native species. The works are restricted to the south-west corner of the bridge and to parts of the structure on land. There is some potential for the crevice that is to be repaired to support roosting bats on a casual basis, so care must be taken during works and must stop if bats are encountered.

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As there is no bat roosts in the structure there is no legal requirement to install bat boxes or other similar roosting opportunities. The works are defined as maintenance works, and not a development, to a highways structure maintainable at the public expense. The works are carried out under the Highways Act 1980. It is not common practice at NYCC to install bat boxes or similar on bridges where there are currently no bats present, as this impacts future maintenance of the structures and carry's a higher cost to the public to do so.

Any correspondence should be given in writing to:-

Mr Ben Savage,

Bridges and Design Services,

Assistant Engineer,

North Yorkshire County Council,

County Hall,

Northallerton,

DL7 8AH.

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15/07/2022

North Yorkshire County Council

Beck Hole Bridge Maintenance

Heritage Statement

Rev A

April 2022

1 Introduction

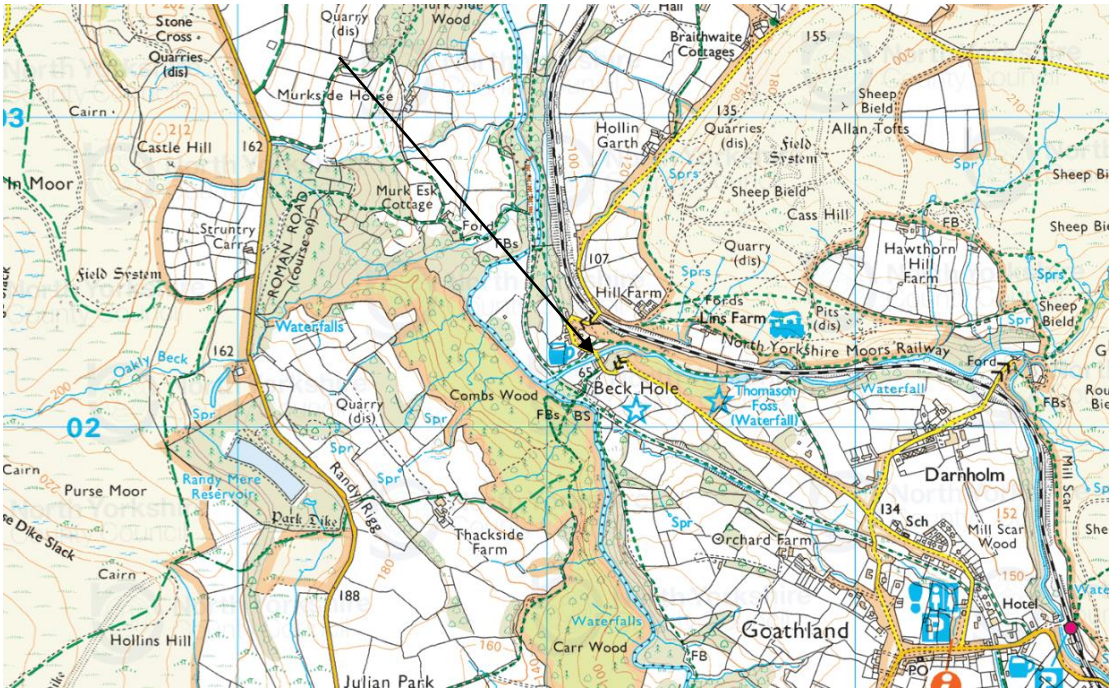
This design and access statement has been prepared to accompany the detailed planning application for the masonry repairs of Beck Hole Bridge, Beck Hole, North Yorkshire.

This statement has been prepared in accordance with the current guidance as part of North Yorkshire County Council's detailed application for the masonry repairs to Beck Hole Bridge. It is submitted as part of a package of information intended to show how repairs will not affect the Listed Status of the bridge.

2 The Site

The application site is in the centre of Beck Hole, as shown on the location plans below.

Beck Hole Bridge



OS GRID REF 482165, 502231

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North Yorkshire County Council 100017946

Beck Hole Bridge is a two span Grade II listed Masonry arch structure carrying the Beck Hole loop Road to Goathland over Eller Beck in the centre of Beck Hole. The original construction date is believed to be the 19th century. The two arches have a spans of 6.3m each with a maximum rise of 3.5m and the arch barrels are 425mm thick at the crown.

The South of the bridge the approach is by a very steep hill which leads to a gentle humped profile over the bridge. The approach from the North is flat but curved. This results in traffic speeds over the bridge being quite low but the likelihood of conflict on the bridge is high. The bridge is only wide enough for single way traffic at 3.8m

The stone is Rusticated sandstone. The structure has two semi-circular arches of voussoirs with cutwaters on both sides of the centre pier. Pilaster piers at each end rising through plain parapet over moulded band. The parapet has slightly raked with cambered coping with flat caps to piers.

3 Consultation

The sections of parapet, spandrel and wing walls for dismantle and rebuild (see attached drawings) will be carefully taken down and cleaned of all mortar before being used for the reconstruction, it is not thought any new stone will be needed however any stone badly damaged or weathered will be replaced with new, expected to be less than 5% of the total amount of stone taken down. Where possible existing masonry shall be reused in the repairs, existing masonry that is to be reused shall not be redressed before use and shall be incorporated back in their original positions. The rebuilding is on a like for like basis ensuring that only minimal changes in the appearance of the bridge are noticed.

Any stone work incorporated into the works shall match the colour, texture, surface finish, character, kind and size of existing stonework as closely as possible. Stone shall be good, hard, durable quality, uniform in texture and free from iron bands, spots, sand holes, flaws, shakes and other imperfections. Imported stone used as part of a structure with existing stone adjacent to it shall be of a similar compressive strength to that existing stone. The sizes of the stones shall be selected to blend into the structure with no discernible difference between the original, undamaged, structure and the new. It is requested that the Contractor provides samples of the selected replacement stone before an order is placed.

The nature of the works is due to the deterioration and movement of the South-West spandrel wall and South-East wing wall. The works are to ensure the structure is suitably safe for public use and that no loss of character is endured if the stonework falls down.

Physical Context

Beck Hole Bridge is Grade II Listed.

The maintenance works required have been chosen to best remidy the defect in the structure to improve the lifespan of the structure. The proposal is to reuse the existing stonework, where possible. A quicklime mortar mix is to be introduced to help eleviate the saturation in the structure. The repairs shall have minimum impact on the appearance of the bridge.

Social Context

The bridge carries Beck Hole Road over Eller Beck. It is not such a vital link as the road loops round but carries ensures the village of Beck Hole is connected at both sides. It provides a picturesque location for tourism during the summer.

Amount

The amount of masonry which is to be repaired has been limited to the South-West spandrel wall and South-East wing wall where bulging and movement has occurred. The remaining stonework is to be left, as it is in a good condition. The areas, which include stonework in the spandrel, parapet and wing wall are illustrated in the drawings. All stone removed shall be placed back in original locations as best as possible.

Layout

The layout of the structure will not change as part of the development and therefore this will not affect the local surroundings. The masonry repairs shall replicate the existing as far as possible within the specific guidelines required for a listed building application.

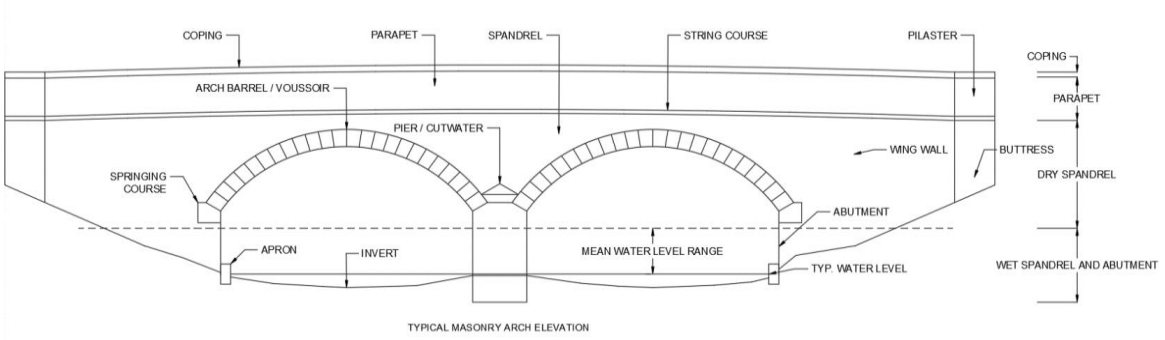
Landscaping

There has been some vegetation growth around the rebuild section and will be removed during works. Ivy has started to grow within the stonework and is causing structural damage to the structure.

Appearance

The change in appearance of the bridge due to these works is minimal, existing stone is to be reused, where possible. If any new stonework is incorporated into the works, it shall match the colour, texture, surface finish, character, kind and size of existing stonework as closely as possible. Stone shall be good, hard, durable quality, uniform in texture and free from iron bands, spots, sand holes, flaws, shakes and other imperfections. Imported stone used as part of a structure with existing stone adjacent to it shall be of a similar compressive strength to that existing stone. The sizes of the stones shall be selected to blend into the structure with no discernible difference between the original, undamaged, structure and the new. Where possible existing masonry shall be reused in the repairs, existing masonry that is to be reused shall not be redressed before use.

Due to the structures listed status, there is a requirement to rebuild the structure using a more traditional mortar mix. There will be three different mixes used on the rebuild.



TYPICAL MASONRY ARCH ELEVATION

1. Copings (Water-Shredding) mix:

    - **1 Part - Prompt natural cement -** In accordance to NFP 15-314:1993**;**
    - **2 Parts – Sharp sand** (Suitably graded);
    - Slate Gallets as required to minimise joint thickness.

2. Parapets & Dry spandrel wall mix:

    - **1 Part – CL90-Q Quicklime (Powdered)** – In accordance to BSEN 459-1:2010 and is CE marked;

i. **20% - Trass** as a proportion of the quicklime. **Trass** in accordance with DIN 51043;

- **1 Part – Coarse sharp sand**;
- **2 Parts** – **Fine sharp sand** (Locally sourced, such as cooks or similar approved or plastering sand).

3. Wet Spandrels & Abutments mix:

- **1 Part** – **CL90-Q Quicklime** (Powdered) – In accordance to BSEN 459-1:2010 and is CE marked;
- **1 Part** – **Trass -** in accordance with DIN 51043;
- **1 Part** – **Fine sharp sand**;
- **1 Part** – **Coarse sharp sand**.

Access

Access to and from the bridge is gained from the road. Access to the upstream and downstream elevations is gained via land adjacent to the bridge. It is not proposed to change any access routes to and from the bridge.

A temporary scaffold will be erected on the elevations of the bridge to allow the works to be carried out, this shall be in no way attached to Beck Hole Bridge.

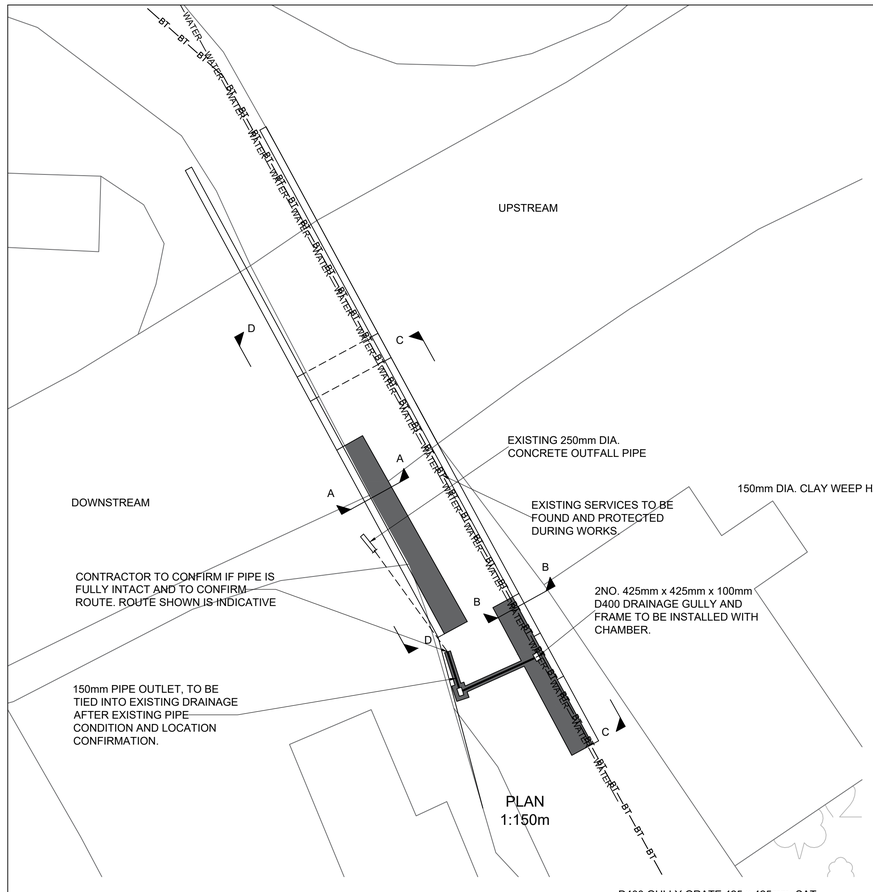
Heritage statement

The reconstruction of the stonework on the Grade II listed bridge is now at essential stage. The reconstruction is needed for the safety of the travelling public due to the deteriorating strength of the parapets and spandrel walls and also the visual appearance of the listed structure.

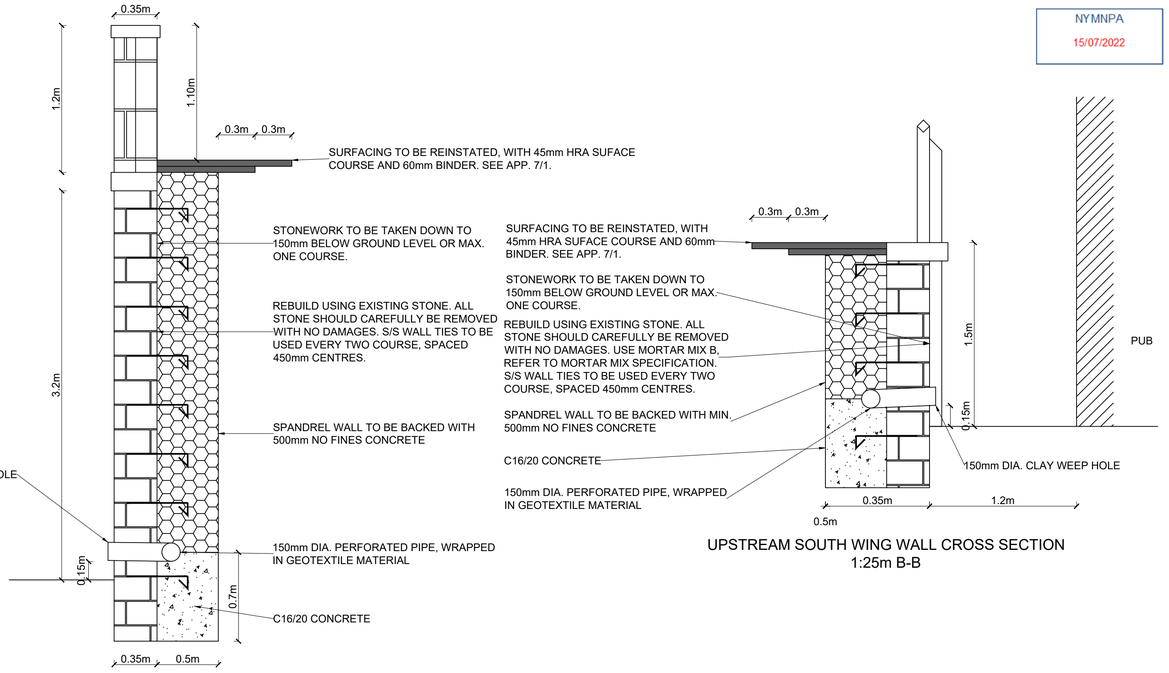
The change in appearance of the bridge due to these works is minimal. All stonework taken down will be reused and incorporated back into the structure. It is not expected new stone will be needed. The existing structure uses a cement type mortar, which will be replaced with a more traditional hot mixed quicklime mortar and a natural cement, refer to drawings for extent and location.

Any correspondence should be given in writing to:-

Mr Ben Savage
Bridges and Design Services,
North Yorkshire County Council
County Hall
Northallerton
DL7 8AH
Ben.savage@northyorks.gov.uk

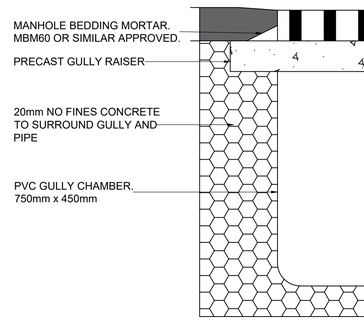


PLAN
1:150m

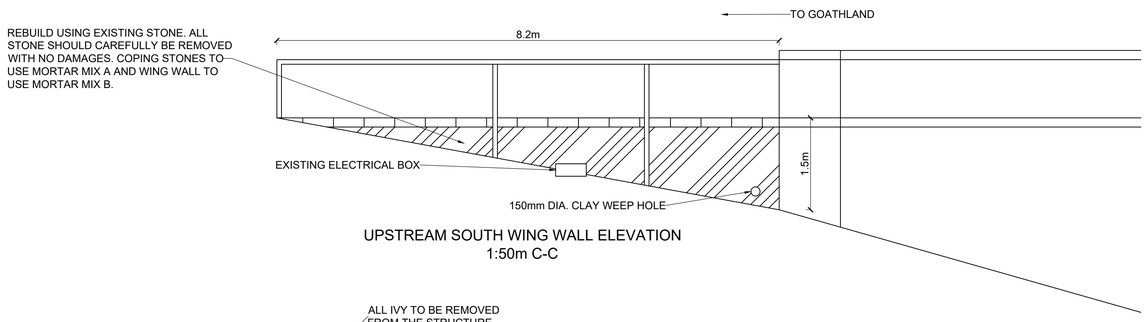


DOWNSTREAM SOUTH SPANDREL CROSS SECTION
1:25m A-A

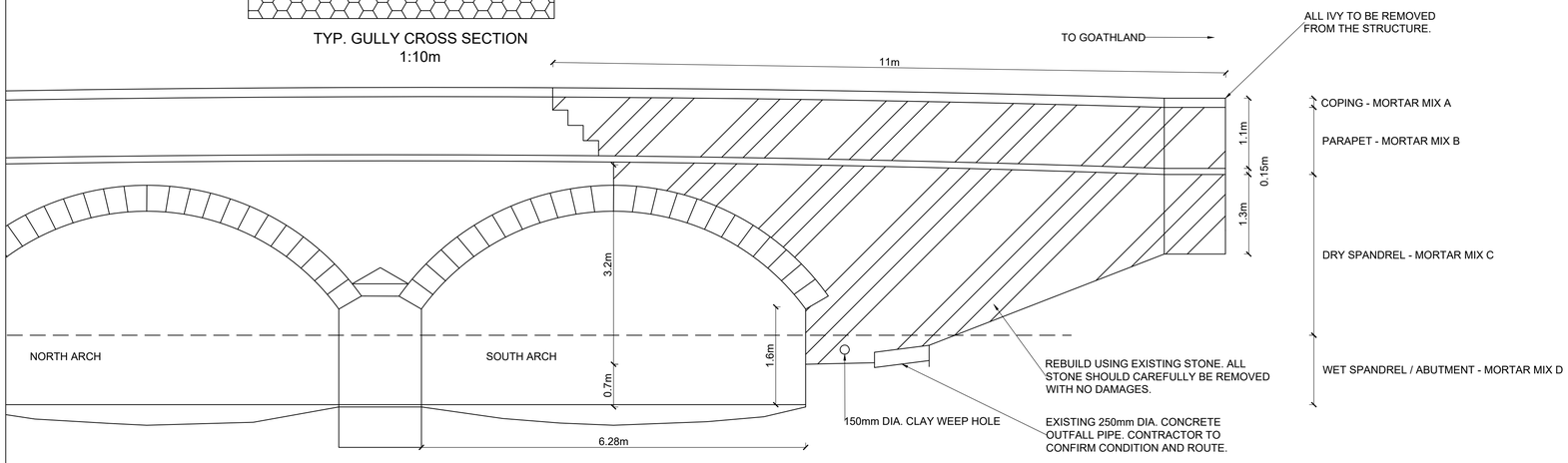
UPSTREAM SOUTH WING WALL CROSS SECTION
1:25m B-B



TYP. GULLY CROSS SECTION
1:10m



UPSTREAM SOUTH WING WALL ELEVATION
1:50m C-C



DOWNSTREAM SOUTH SPANDREL WALL ELEVEATION
1:50m D-D

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15/07/2022

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NOTES

1. All dimensions in metres unless stated otherwise.
2. All drawings are to be read in conjunction with specification and all other contract documents
3. Location of Bridge - Beck Hole
4. OS Grid reference - 502230, 482163
5. Watercourse - Eller Beck
6. Road - Beck Hole Road

LEGEND / KEY	
	TAKE DOWN AND REBUILD AREA
	ROAD EXCAVATION AND REINSTATEMENT
	NO FINES CONCRETE
	STONEWORK / BLOCKWORK
	CONCRETE
	S/S WALL TIES

MORTAR SPECIFICATION

1. Copings (Water-Shredding) mix A:
   - **1 Part - Prompt natural cement -** In accordance to NFP 15-314:1993**;**
   - **2 Parts - Sharp sand** (Suitably graded);
   - Slate Gallets as required to minimise joint thickness.
2. Parapets & Dry spandrel wall mix B:
   - **1 Part - CL90-Q Quicklime (Powdered) -** In accordance to BSEN 459-1:2010 and is CE marked; **i.20% - Trass** as a proportion of the quicklime. **Trass** in accordance with DIN 51043;
   - **1 Part - Coarse sharp sand**;
   - **2 Parts - Fine sharp sand** (Locally sourced, such as cooks or similar approved or plastering sand).
3. Wet Spandrels & Abutments mix C:
   - **1 Part - CL90-Q Quicklime** (Powdered) - In accordance to BSEN 459-1:2010 and is CE marked;
   - **1 Part - Trass -** in accordance with DIN 51043;
   - **1 Part - Fine sharp sand**;
   - **1 Part - Coarse sharp sand**.
4. Underwater mix D:
   - **1 Part - Prompt natural cement -** In accordance to NFP 15-314:1993;
   - **2 Parts - Sharp sand** (Suitably graded);
   - Slate gallets as required to minimise joint thickness.

ISSUE / REVISION

REVISION	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY	DATE
A	LBC	BS	PR	PR	11/07/2022

PROJECT

BECK HOLE BRIDGE GENERAL MAINTENANCE

SHEET TITLE

GENERAL ARRANGEMENT
SCALE: VARIES

SHEET NUMBER

NYCC BADS 2022 392 - 001 GENERAL ARRANGEMENT

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NOTES

1. Beck Hole Bridge - OS Map Coordinates: 482165, 502231
2. Watercourse: Eller Beck
3. Road: Beck Hole Road

NYMNPA
15/07/2022

ISSUE / REVISION

REVISION	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY	DATE
A	AIP	BS	PR	PR	07/04/2021

PROJECT

Beck Hole Bridge Maintenance

SHEET TITLE

LOCATION PLAN
SCALE: 1:1250

SHEET NUMBER

NYCC BADS 2021 392 002 - LOCATION PLAN

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