Appendix Aii – Original BCC Structural Recommendations

Asset ID	Location	Initial Asset Survey Repair cost estimate Upper £	Lower, £	Initial Harbour Asset Survey Recommendations	BCC Bridges and Highway Structures Department Recommendations Structural Repair or Replacement Costs
N06	**Hotwells Road**	2,683,556	2,422,023	• Install and monitor survey points • Dive inspection of affected arches	1. Undertake Diving inspection on arches. 2. Stabilise deformed arches and prop. 3. Reconstruct arches as required. 4. Undertake localised masonry repairs 5. Investigate scour and undermining of wall. 6. Install Scour protection measures. Original BCC Estimate = **£500,000.00**
NCN03a	**Cumberland Road**	548,750	495,270	• Cordon off bridge to prevent pedestrian access (actioned) • Investigation to determine the capacity of the girder and place load restrictions on the bridge. Action subsequent recommendations	1. Totally Replace Girder Beam with new bear 2. Undertake structural repairs to all elements 3. Undertake full masonry repairs throughout 4. Undertake Dive Inspection and Repairs. 5. Waterproof and Resurface PROW. 6. Install New Parapet Railing and transition. Original BCC Estimate = **£1,000,000.00**
NCN16	**Cumberland Road**	492,893	444,857	• Install and monitor survey points • Undertake repairs of the critical section	1. De vegetate fully extent of asset and determine overall structural condition. 2. Undertake full masonry repairs and all rebuilds of failed and collapsed areas. 3. Underpin foundations areas where required and anchor into rock 4. Replace full extent of copings along length. Original BCC Estimate = **£1,550,000.00**
NCS06	**Coronation Road**	151,458	136,697	• Conduct investigation to gauge whether the asset is providing direct support to the building at the western end and to confirm the depth of foundations of the building behind	1. De vegetate fully extent of asset and determine overall structural condition. 2. Undertake full masonry repairs and rebuild of failed areas. 3. Underpin foundations areas where required. 4. Replace full extent of copings along length. Original BCC Estimate = **£550,000.00**
NCS13	**Coronation Road**	590,312	532,781	• Install and monitor survey points • Repairs to eastern section of the asset where the embankment is directly supported by the wall	1. De vegetate fully extent of asset and determine overall structural condition. 2. Undertake full masonry repairs and all rebuilds of failed and collapsed areas. 3. Underpin foundations areas where required and anchor into rock 4. Replace full extent of copings along length. Original BCC Estimate = **£850,000.00**
NCS18	**Coronation Road**	4,916,611	4,437,449	• Install and monitor survey points • Repairs to the areas of deformation and collapsed sections where the wall directly supports the embankment	1. Devegetate but upper and lower level walls associated with old Slipway. 2. Undertake full masonry repairs and all rebuilds of failed and collapsed areas. 3. Underpin foundations areas where required and anchor into rock outcrop at lower level. 4. Replace full extent of copings along length.

					Original BCC Estimate = **£1,600,000.00**
NCS2 **NCS21 Continued**	Coronation Rd Coronation Road	459,887 459,887 Continued	415,068 415,068 Continued	• Protect rear of the footpath with barrier • Undertake vegetation removal at critical location and repairs to the area of deformation	1. Remove extended Blockwork wall, railings, and associated footway construction. 2. Construct structurally stable extended retaining wall and encompass river railing. parapets and connection to Bedminster 3. Bridge and transitions to railings. 4. Repoint adjacent masonry on lower section of masonry river wall. Original BCC Estimate = **£300,000.00**
NCS23	Coronation Rd	92,509	102,498	• Protect rear of the footpath with barrier • Vegetation removal at critical location • Repairs to the area of deformation	1. Investigate suitability of installing Masonry Rock Anchors into retaining wall to stabilise movement and repair masonry throughout. 2. Install anchor solution if suitable. Original BCC Estimate = **£400,000.00**
NCS28	York Rd	2,197,177	1,983,046	• Confirm the depth of foundations for Langton Street footbridge • Installation of survey points on the asset and bridge • Installation of survey pegs on the fill behind the asset	1. Remove vegetation throughout full length of wall and consider further options. 2. Undertake further structural assessment in relation to full scale removal of vegetation. 3. Underpin gravity retaining wall as is deemed necessary from Assessment. 4. Undertake localise rebuild to wall as deemed necessary from assessment. 5. Undertake full repointing of wall throughout 6. Investigate further cause of Wessex Water Outfall failure and take appropriate action. Original BCC Estimate = **£2,750,000.00**
NCS30	Bath bridge	149,805	135,206	• Install barrier to prevent pedestrian access • Installation of props or ties to restrain the bulging area and carry out repairs / reconstruction	1. De vegetate full wall to determine extent of movement and full arch deformation. 2. Undertake structural assessment of deformed arches and retaining wall. 3. Take down deformed arches and reconstruct in accordance with assessment. 4. Undertake required masonry repairs Original BCC Estimate = **£300,000.00**
S28b	Feeder Rd	480,862	433,998	• Install survey points to monitor the asset for movement	1. Underpin base of wall and stabilise capping Beam. 2. Undertake associated masonry repairs Original BCC Estimate = **£450,000.00**
TOTALS		£12.8M	£11.5M	Average Asset Survey total = **£12.15 million**	**Structures recommendation full Total = <u>£10.25 million</u> with no Contingency addition**

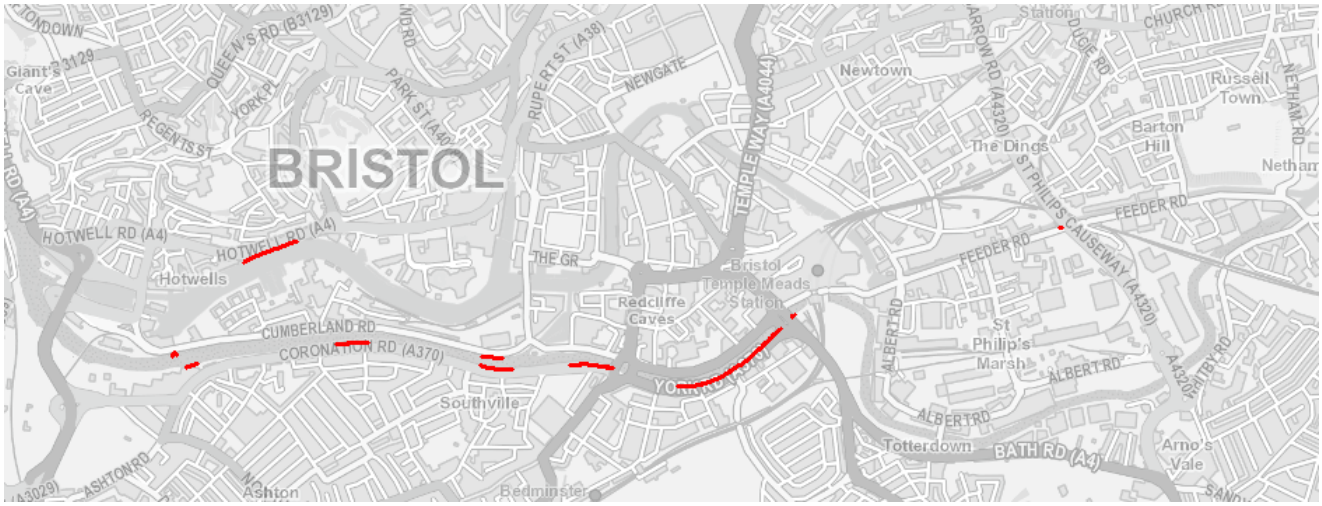


Figure 1. Location of all identified 11 highest priority assets (Refer to following Asset information)

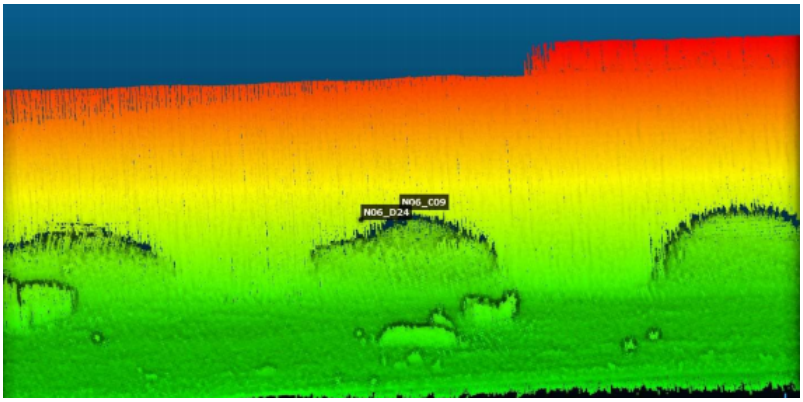
Asset No. 1 - N06 – Harbour Wall, Masonry Arches deformed below waterline

Location:

North side of the harbour, adjacent to Hotwells Rd, where the Grain Barge is moored

Defects

Deformation of underwater arches and areas of lost masonry, see image below showing deformation of arches.



Initial Harbour Asset Survey Recommendations

- Install and monitor survey points
- Dive inspection of affected arches

Structural Recommendation

- Undertake full diving inspection and stabilise Arch and install scour protection measures
- Estimated Cost = **£500,000.00**

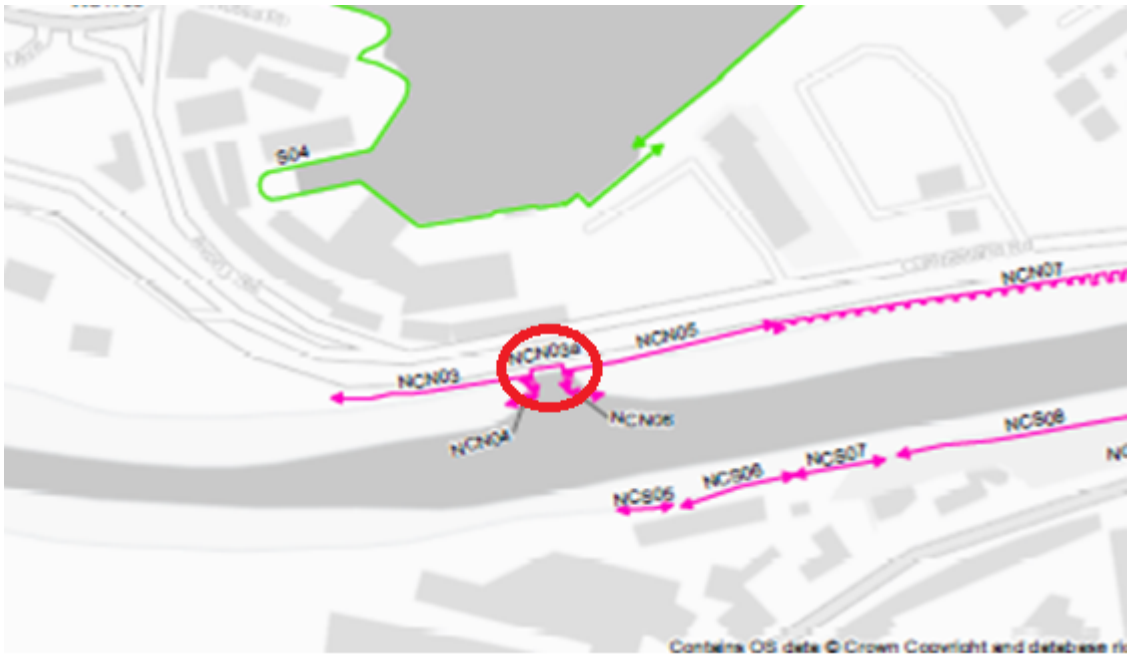
Consequence of failure

If the wall were to collapse, there is a risk that Hotwell Road will also be affected by a loss of support and lane closures would be necessary. There are boats moored along the asset in the vicinity of the critical defects and there is the potential for them to be damaged by falling masonry

Asset No. 2 - NCN03a Girder Bridge spanning over Outfall on Chocolate Path

Location:

Steel beam supporting chocolate path footbridge where it bridges the Underfall sluices



Defects

Severe corrosion of steel beam footbridge as shown in image below

Initial Harbour Asset Survey Recommendations

- Cordon off bridge to prevent pedestrian access (actioned)
- Investigation to determine the capacity of the girder and place load restrictions on the bridge. Action subsequent recommendations accordingly

Structural Recommendations

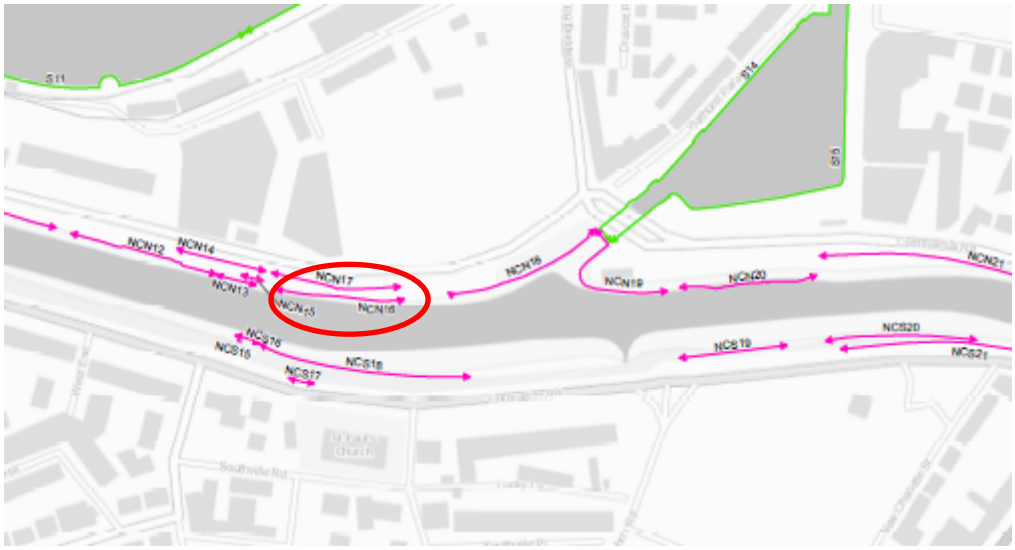
- Replace whole Structure. Estimated Cost = **£1,000,000.00**

Consequence of failure

Collapse of the structure poses serious risk to life, reputational risk, financial risk and loss of function of Underfall sluice gates. Loss of the sluice gates would result in a loss of the ability to control the water level in the harbour with far reaching consequences. Flooding and damage to property.

Asset No. 3 - **NCN16 –** Lower Level Masonry Retaining Wall on Cumberland Road

Location: Cumberland Road Adjacent to Bathurst Lock (now filled in)



Defects

The critical section of the asset is an area of lost masonry measuring 6m x 4.5m

Initial Harbour Asset Survey Recommendations

- Install and monitor survey points
- Undertake repairs of the critical section

Structural Recommendations

- Undertake full masonry reconstruction/masonry Repairs and underpinning at base
  Estimate = **£1.550,000.00**

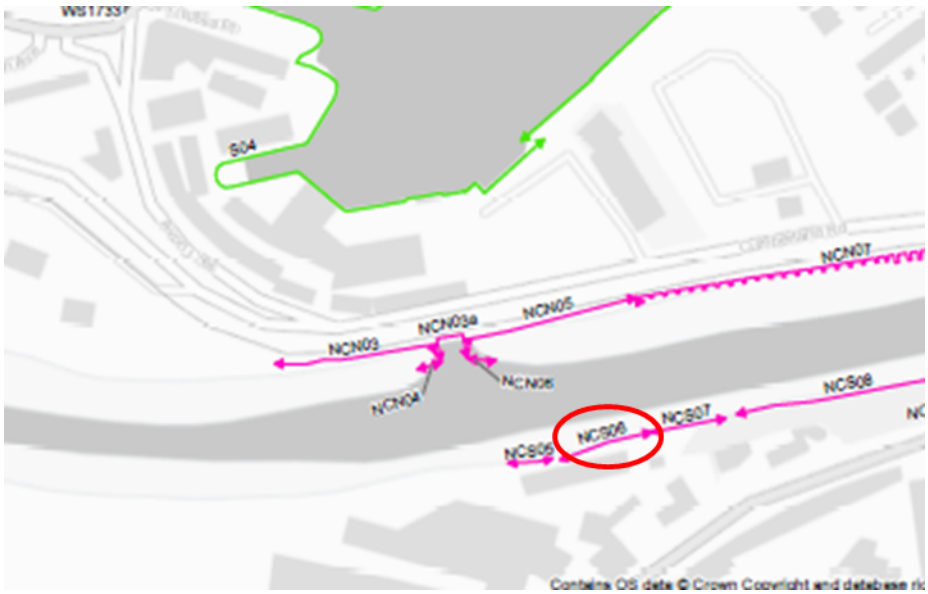
Consequence of failure

The failure of NCN16 could cause a failure in NCN17 resulting in a collapse of the footpath and partial collapse of Cumberland Road. There is a risk of major travel disruption.

Asset No. 4 - **NCS06 –** Lower level Stone Masonry Retaining Wall

Location

Riverside wall set back from Coronation road, adjacent to industrial / warehouse building



Defects

Several areas of collapsed wall along the length of the asset and the remaining masonry is generally in a poor condition as shown the image below.

Initial Harbour Asset Survey Recommendations

- Conduct investigation to gauge whether the asset is providing direct support to the building at the western end and to confirm the depth of foundations of the building behind.

Structural Recommendations

- Masonry Repair and rebuild along with some foundation underpinning
  Estimated Cost = **£550,000.00**

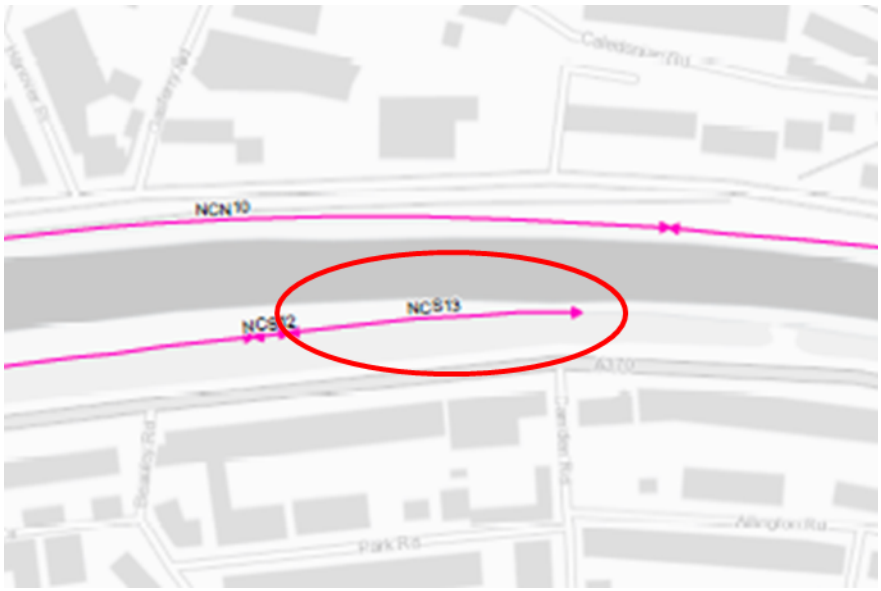
Consequence of failure

Potential for a loss of support to building foundations and the building could collapse, presenting risk to life.

Asset No. 5 - **NCS13 –** Lower Masonry Retaining Wall supporting Embankment

Location

Riverside wall adjacent to Coronation Road in vicinity of Camden Road



Defects

Numerous collapsed sections along the full length of the asset and the masonry is in a poor condition with deformations noted. Scour is affecting the rock outcrops which the asset is constructed on.

Initial Harbour Asset Survey Recommendations

- Install and monitor survey points
- Repairs to eastern section of the asset where the embankment is directly supported by the wall.

Structural Recommendations

- Masonry Rebuilds and repair along with some underpinning and rock anchoring at base. Structural Estimate = **£850,000.00**

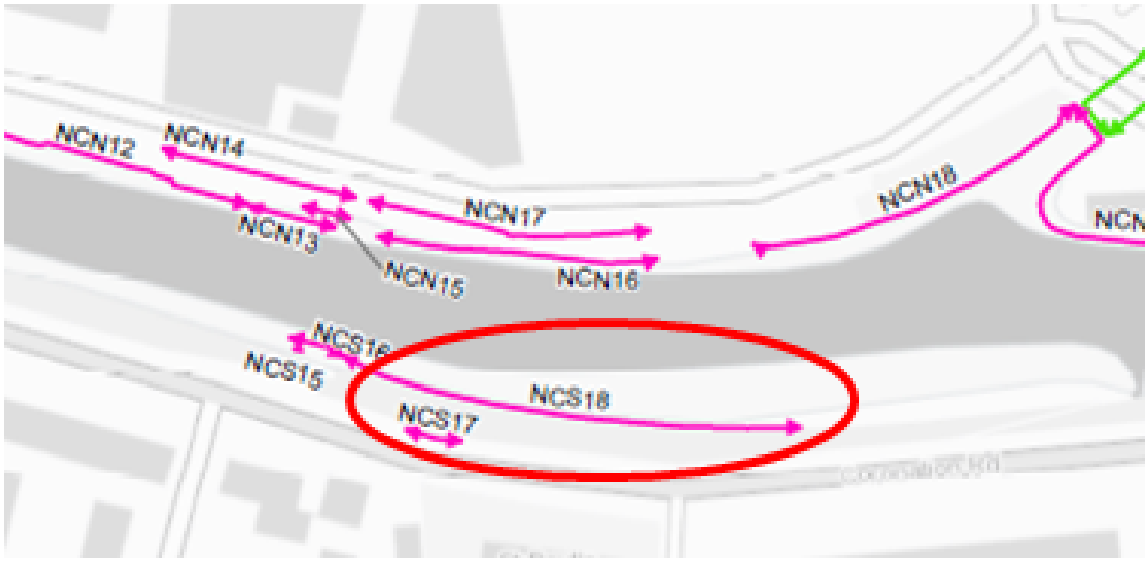
Consequence of failure

If there was a loss of support to the embankment, Coronation Road may be affected. There is a risk of major disruption to travel.

Asset No. 6 **- NCS18** – Lower Level Masonry Retaining Wall supporting slipway

Location

Adjacent to Coronation Road near Gaol Ferry Bridge



Defects

Several collapsed sections and areas of deformation along the length of the asset including slipway

Initial Harbour Asset Survey Recommendations

- Install and monitor survey points
- Repairs to the areas of deformation and collapsed sections where the wall directly supports the embankment.

Structural Recommendations

- Masonry Rebuilds and repair along with some underpinning and rock anchoring at base. Structural Estimate = **£1,600,000.00**

Consequence of failure

Coronation Road may be affected by a loss of support and failure. There is a risk of major travel disruption.

Asset No. 7 - **NCS21** - Upper Blockwork extended Back of Footway River Wall

Location

Adjacent to Coronation Road east of Gaol Ferry Bridge

Defects

Significant deformed area situated at the eastern end of the asset

Initial Harbour Asset Survey Recommendations

- Protect rear of the footpath with barrier
- Undertake vegetation removal at critical location and repairs to the area of deformation.

Structural Recommendations

- Remove upper Blockwork Wall and Railings and stabilise and then reconstruct.
  Structural Estimate = **£300,000.00**

Consequence of failure

Loss of support/collapse of the footpath is likely in the event of a failure. Load restrictions and a partial closure would be necessary. There is a risk of major travel disruption.

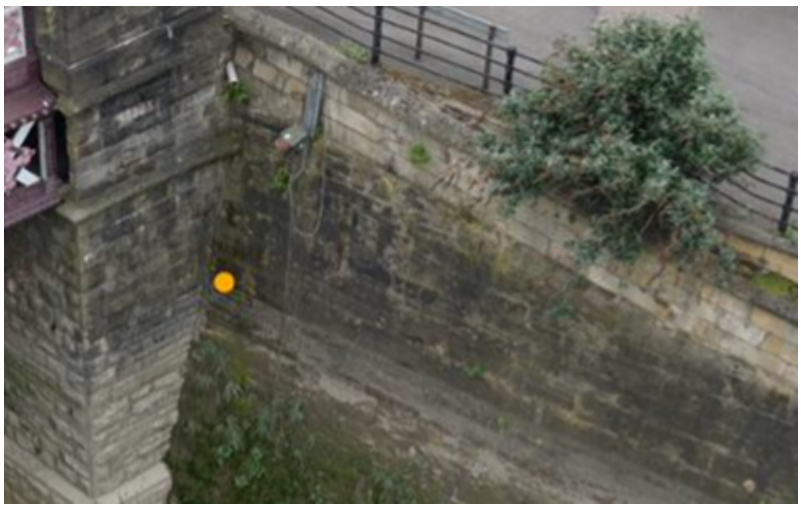
Asset No. 8 - **NCS23 –** Lower section of masonry wall supporting Asset : NCS21

Location

Coronation Road adjacent to Bedminster Bridge Roundabout

Defects

Area of deformation at the crest of the wall adjacent to Bedminster Bridge roundabout



Initial Harbour Asset Survey Recommendations

- Protect rear of the footpath with barrier
- Vegetation removal at critical location
- Repairs to the area of deformation

Structural Recommendations

Stabilise lower level wall with rock anchors and repair masonry facing. Structural Estimate = **£400,000.00**

Consequence of failure

Loss of support/collapse of the footpath is likely in the event of a failure. Load restrictions and a partial closure would be necessary. There is a risk of major travel disruption.

Asset No. 9 - **NCS28 –** Lower retaining wall supporting York Road and Bridge

Location

York Road, critical location in vicinity of Langton Street footbridge

Defects

There are several areas of significant masonry loss and extensive deformed sections, particularly in the vicinity of Langton Street footbridge. The asset is generally in a poor condition along the entire length

Initial Harbour Asset Survey Recommendations

- Confirm the depth of foundations for Langton Street footbridge
- Installation of survey points on the asset and bridge

- Installation of survey pegs on the fill behind the asset

Structural Recommendations

Undertake full structural assessment and based on findings. Stabilise full extent of retaining wall
Structural estimate = **£2,750,000.00.**

Consequence of Failure

Immediate loss of support to York Road and to Abutments of Langton Court Road footbridge

Asset No. 10 **- NCS30 –**Upper level Masonry Retaining Wall & associated arches

Location

Immediately to the east of Bath Bridge Roundabout on south side of river

Defects

The arch adjacent to Bath Bridge Roundabout has failed from its springing point and the masonry is bulging significantly. There are also areas of collapsed masonry above this arch

Initial Harbour Asset Survey Recommendations

- Install barrier to prevent pedestrian access
- Installation of props or ties to restrain the bulging area and carry out repairs / reconstruction

Structural Recommendations

Undertake full assessment of deformed arches and take appropriate stabilisation measures and stabilise full masonry wall. Structural Estimate = **£300,000.00**

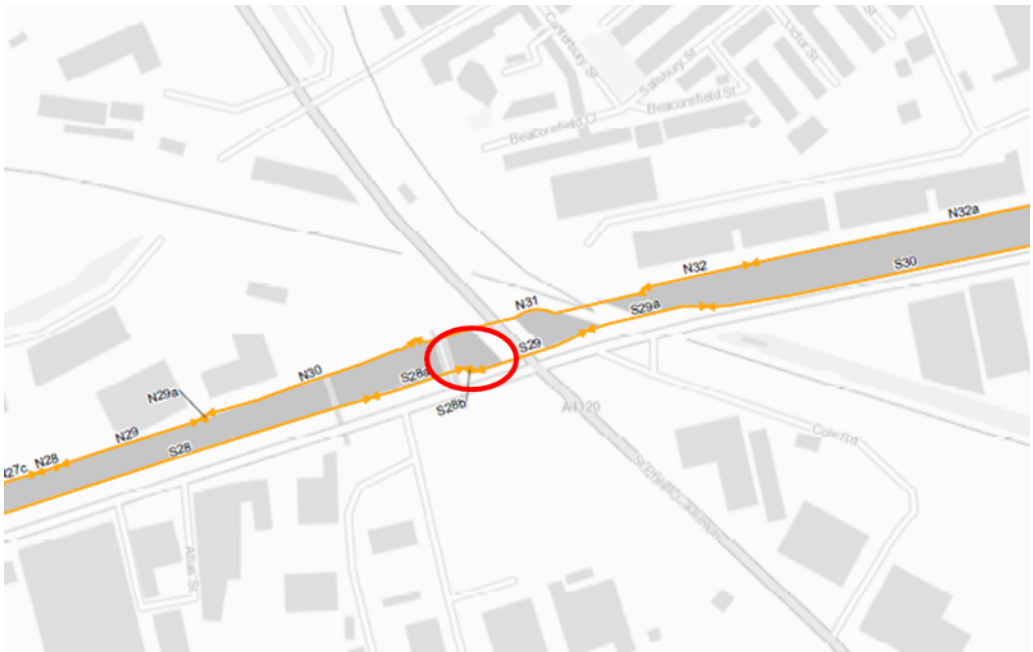
Consequence of failure

Collapse of the arch will cause a loss of support to the retained material leading to a collapse of Network Rail land, exposing the edge of the bridge abutment and is likely to affect the stability of Bath Road

Asset 11 - **S28b –** Feeder Road Canal Retaining Wall supporting Feeder Road

Location

North side of Feeder road (canal south bank), in vicinity of St Phillips Causeway flyover



Defects

There are large areas of lost masonry underwater at the western end and numerous capping beam failures along the length. There is an extensive amount of vegetation growth from gaps between the concrete planks. There are several large areas of deformation visible on the capping beam

Initial Harbour Asset Management Survey Recommendations

- Install survey points to monitor the asset for movement

Structural Recommendations

Underpin base of wall and stabilise retaining wall/ capping beam. Structural estimate = **£450,00.00**

Consequence of failure

Loss of support to the retained material would result in a collapse of the footpath and potentially a partial collapse of Feeder Road. Risk of minor travel disruption