Appendix A

Harbour & River Avon asset condition surveys – high priority conclusions & recommendations

Executive Summary

This report sets out the high priority conclusions of the harbour and new cut asset condition assessment work carried out in 2019-2020. Each assets location, defects, repair / replacement cost estimates, and recommendations for immediate action are provided.

There are 194 retaining wall assets in the harbour and new cut waterways. This report focuses on 11 highest priority retaining wall assets of 68 assets that were found to be in a critical or serious condition. Serious or critical condition means that the asset has either already failed (in full or part) or there is a possibility of failure within the next 5 years. The 11 assets were prioritised based on identifying both a high likelihood and high consequence of failure of each asset. Details of all 68 serious & critical assets and the prioritisation process can be found in the BCC Harbour Condition Surveys Serious & Critical Asset Prioritisation report. This, as well as details on the condition of all assets within the scope of the harbour and new cut condition assessments project, including other asset types can be found at https://bristolcouncil.sharepoint.com/sites/Harbourassetconditionassess

Table 1 provides a summary of the recommendations and repair costs, and figure 1 shows the geographical extents of the assets within the scope of this report.

Table 1. Summary of 11 high priority assets

Asset ID	Location	Repair cost estimate Upper Lower, £		Recommendations	Recommendations cost estimate, £
N06	Hotwells Rd	2,683,556	2,422,023	• Install and monitor survey points • Dive inspection of affected arches	
NCN03a	Cumberland Rd, western edn	548,750	495,270	• Cordon off bridge to prevent pedestrian access (actioned) • Replace girder	
NCN16	Cumberland Rd, eastern end	492,893	444,857	• Install and monitor survey points • Undertake repairs of the critical section	
NCS06	Coronation Rd	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	
NCS13	Coronation			• Install and monitor	

	Rd	590,312	532,781	survey points • Repairs to eastern section of the asset where the embankment is directly supported by the wall	
NCS18	Coronation Rd	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	
NCS21	Coronation Rd	459,887	415,068	• Protect rear of the footpath with barrier • Undertake vegetation removal at critical location and repairs to the area of deformation	
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	
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	
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	
S28b	Feeder Rd	480,862	433,998	• Install survey points to monitor the asset for movement	
TOTALS		**£12.8M**	**£11.5M**		

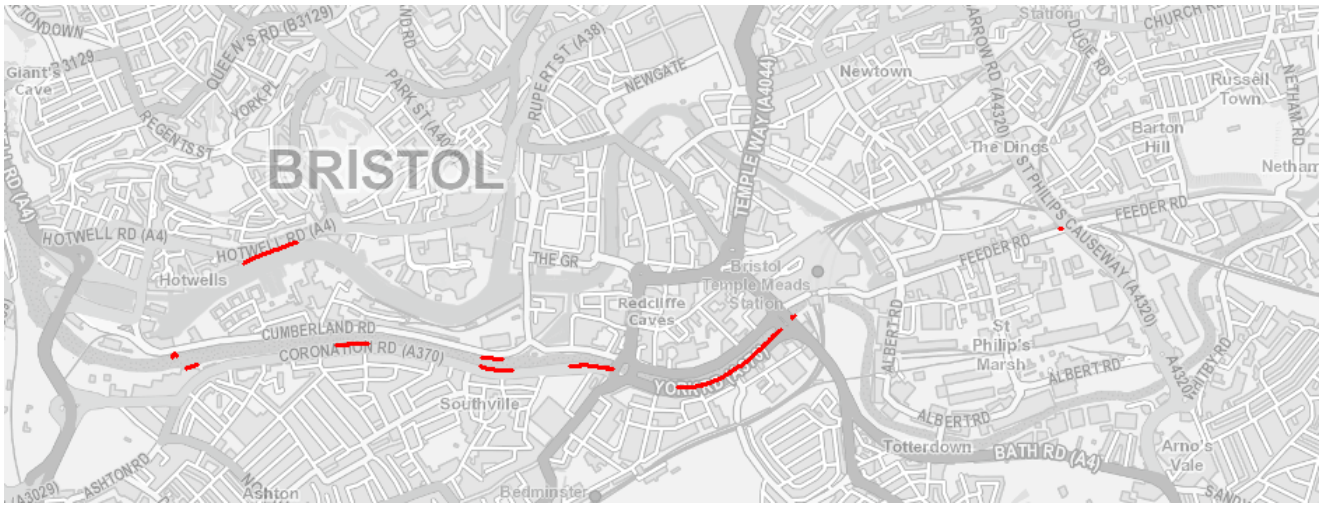


Figure 1. Location of highest priority assets

Introduction

The failure of the section of River Avon New Cut retaining wall supporting Cumberland Road has been disruptive and high profile. The scope of the harbour and new cut condition assessments work was extended to further understand the potential likelihood and consequences of a sudden failure of those assets identified to be in a serious or critical condition as part of the project. Serious or critical condition means that the asset has either already failed (in full or part) or there is a possibility of failure within the next 5 years.

The focus of the project extension was to better understand what the function of the structure is, to understand the potential consequences of a failure and to refine the likelihood of the structure failing. Recommendations and time frames for actions were also identified along with associated high-level costs estimates for any repair / replacement work recommended. The assets under consideration were then prioritised, firstly based on the consequences of asset failure and then prioritised based on the likelihood of asset failure.

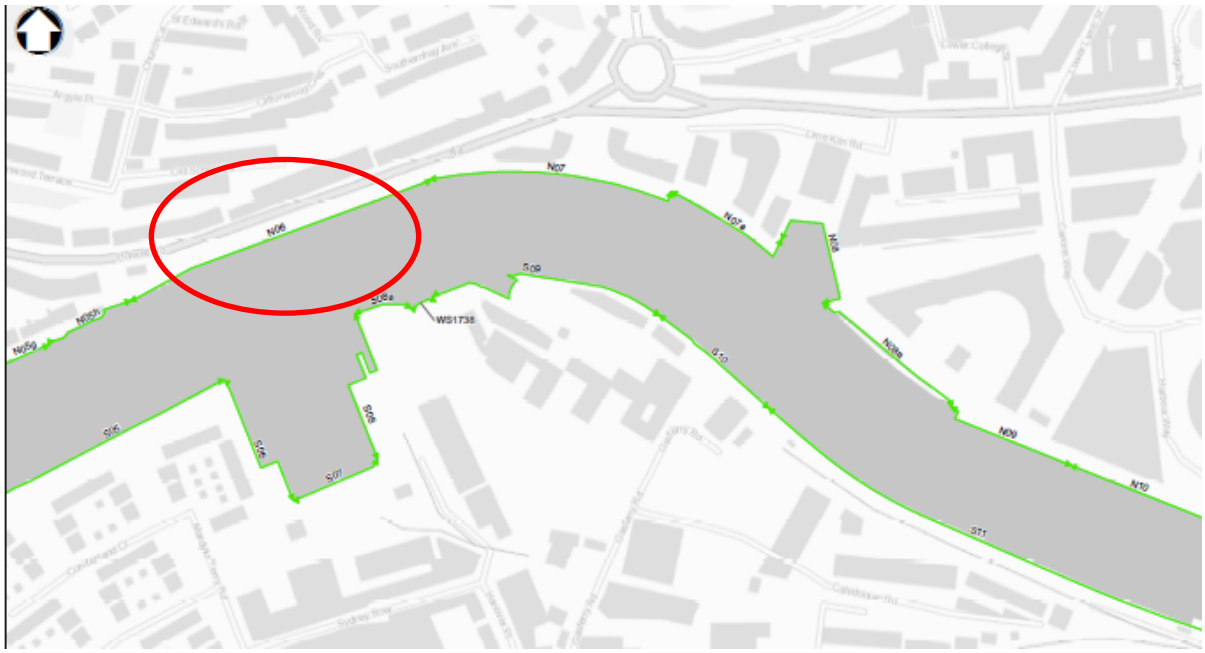
Asset details

The following sections provide more detail on each asset within the scope of this report.

N06

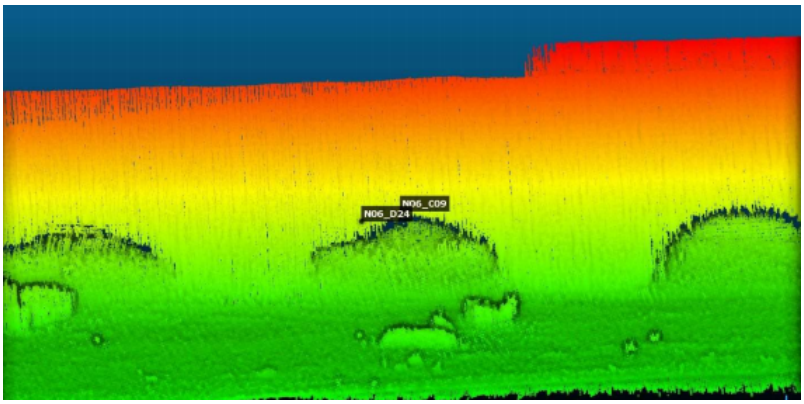
Location

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.



Recommendations

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

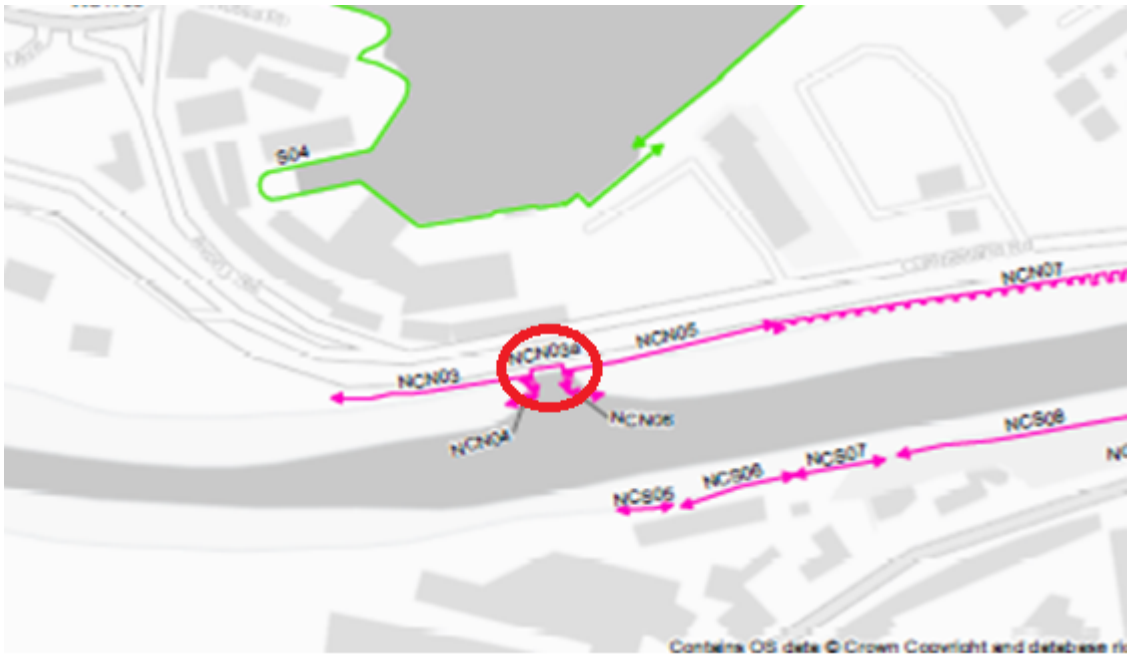
Consequence of failure

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

NCN03a

Location

Steel beam supporting chocolate path where it bridges the Underfall sluices



Defects

Severe corrosion of steel beam as shown in image below

Consequence of failure

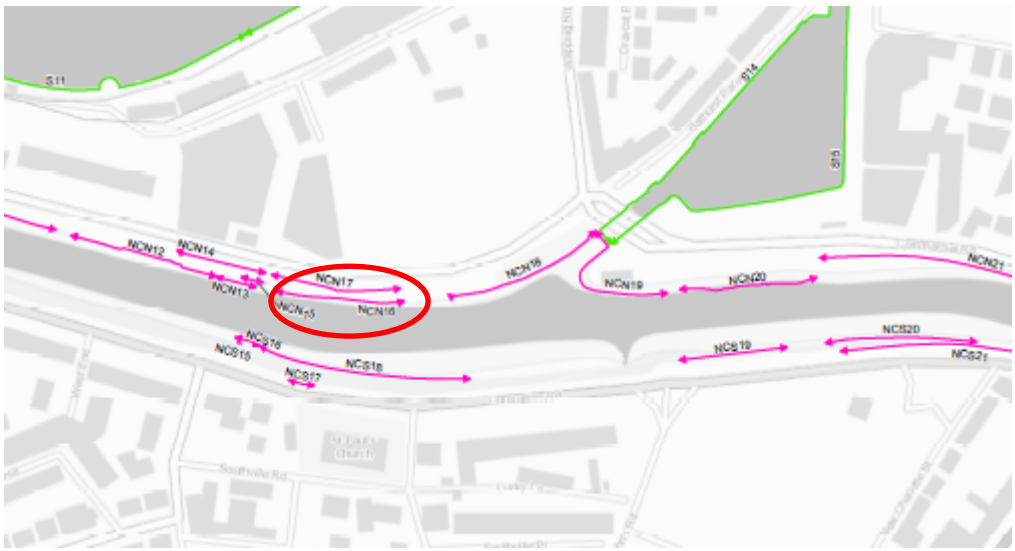
Collapse of the structure poses risk to life, reputational risk, financial risk and loss of function of Underfall sluice gates. Loss of the sluice gates would result in a loss of the ability to control the water level in the harbour with far reaching consequences.

Recommendations

- Cordon off bridge to prevent pedestrian access (actioned)
- *Motts recommendation*: Investigation to determine the capacity of the girder and place load restrictions on the bridge. Action subsequent recommendations accordingly
- BCC structures recommendation: no further investigation required. Replace girder

NCN16

Location



Defects

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

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.

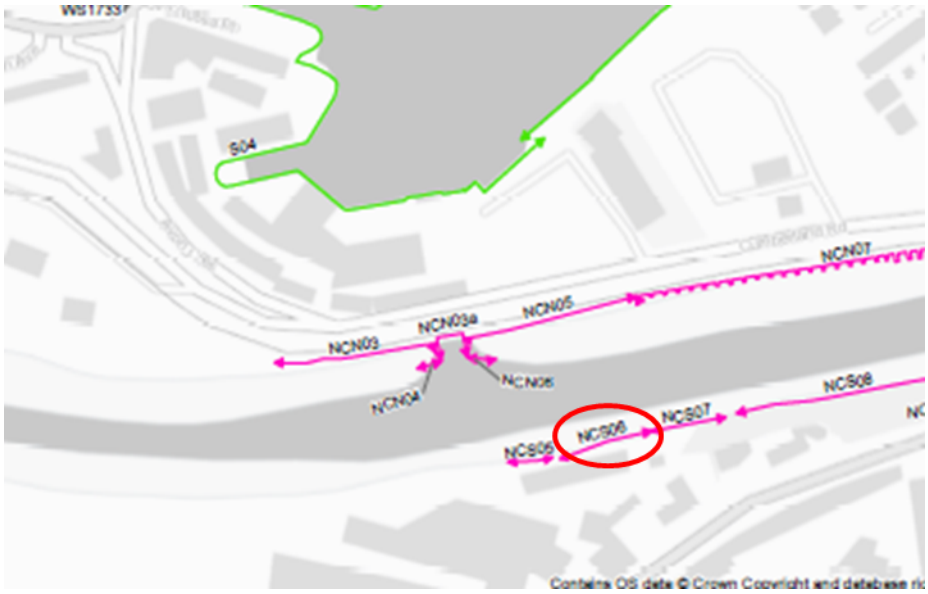
Recommendations

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

NCS06

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.

Consequence of failure

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

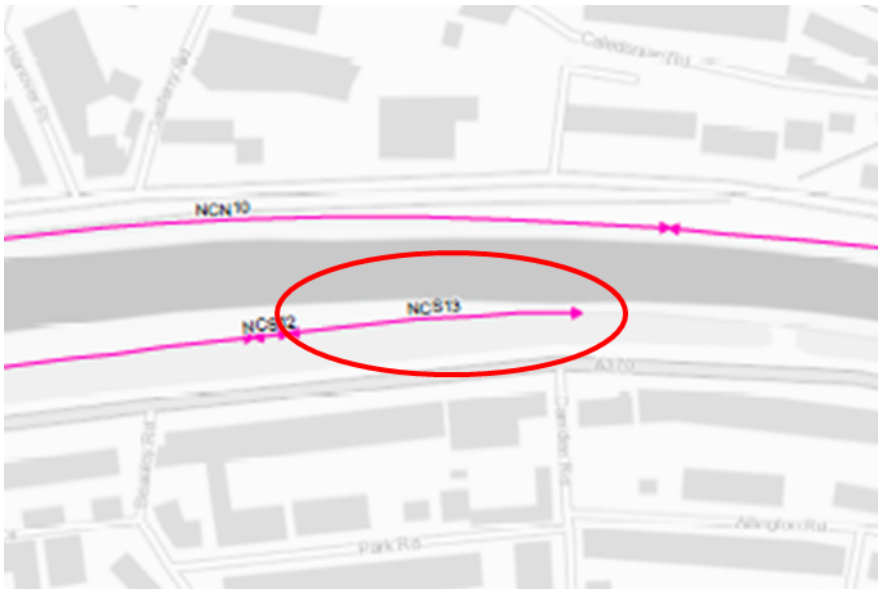
Recommendations

- 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

NCS13

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.

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.

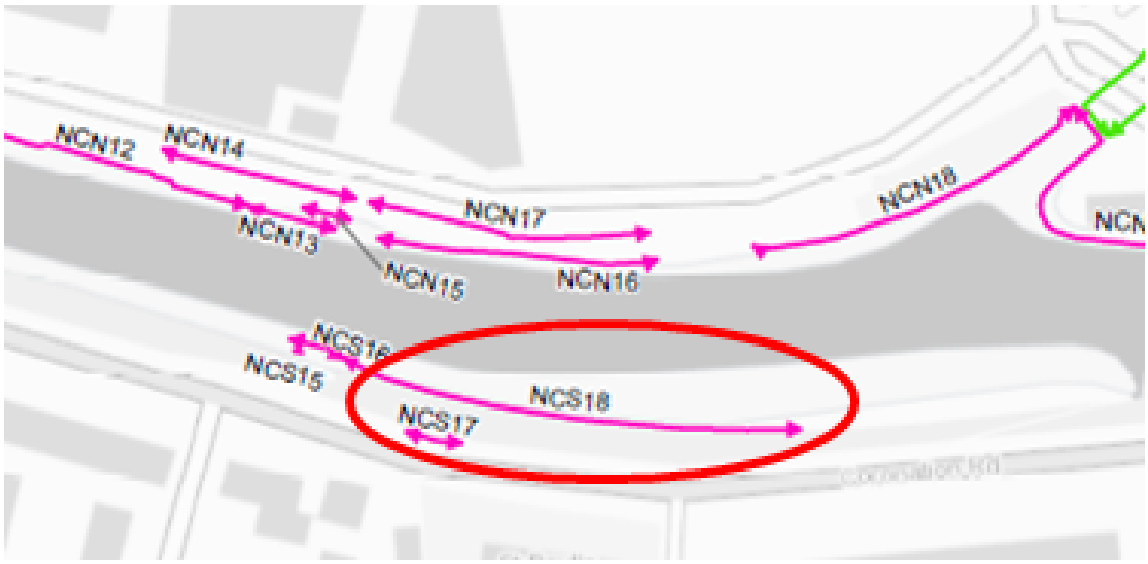
Recommendations

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

NCS18

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

Consequence of failure

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

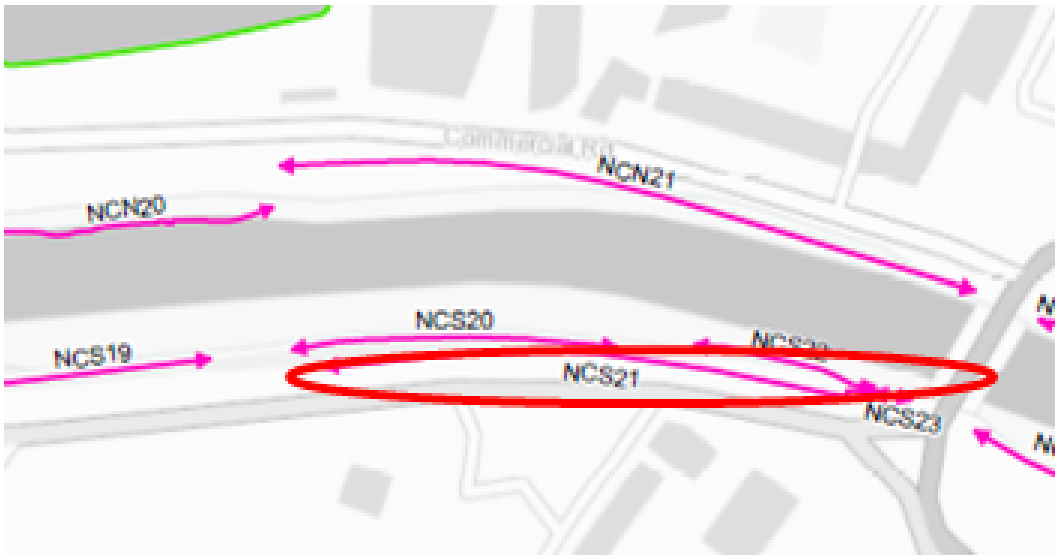
Recommendations

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

NCS21

Location

Adjacent to Coronation Road east of Gaol Ferry Bridge



Defects

Significant deformed area situated at the eastern end of the asset

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.

Recommendations

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

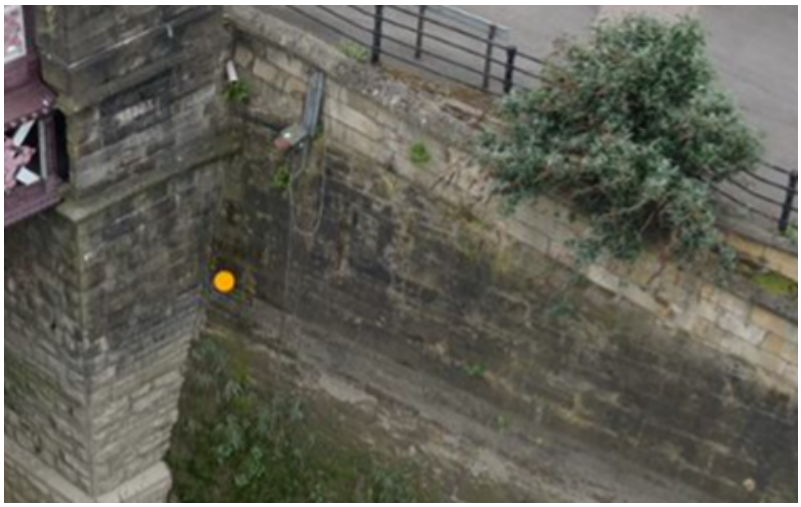
NCS23

Location

Coronation Road adjacent to Bedminster Bridge Roundabout

Defects

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



Consequence of failure

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

Recommendations

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

NCS28

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

Consequence of failure

If there were a failure in the region of the Langton Street footbridge, there would be a loss of support to the abutment and potential destabilisation / collapse of the footbridge. Risk to life if the bridge were to collapse

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

NCS30

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

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. It would also expose the edge of the bridge abutment and is likely to affect the stability of the road approaching the bridge. Bath Bridge Roundabout is not expected to be damaged as a result of a failure, there is potential for the road approaching the bridge to require a partial closure. The NR access road is likely to be affected, risk to life if people are on the land close to the river used for car parking.

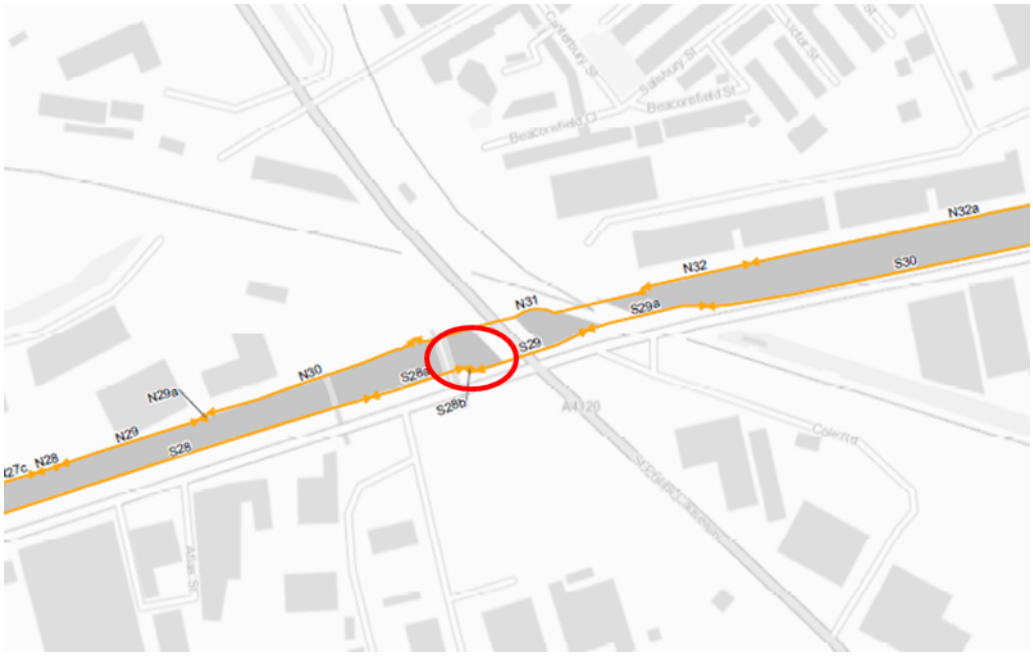
Recommendations

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

S28b

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

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

Recommendations

- Install survey points to monitor the asset for movement