4036 – Whites Footbridge

DATE:	01 September 2023	**CONFIDENTIALITY:**	Internal
SUBJECT:	West Sussex County Council – 4036 Whites Footbridge – Special Inspection & Condition Review		
PROJECT:	70109888-CE1	**AUTHOR:**	[redacted]
CHECKED:	[redacted]	**APPROVED:**	[redacted]

SITE INSPECTION DETAILS

General

Date / Time: Wednesday 23rd August 2023 / 11:00-14:30

Inspectors: [redacted]

Weather: Hot, dry & sunny – circa 24 degrees Celsius

Location Plan:

https://goo.gl/maps/LNRqYo4vJNra7qXk6
Grid Reference: TQ 18994 11278
Easting/ Northing: 518994 , 111278

Methodology

A special inspection to determine the existing condition of the half-through truss steelwork and timber decking on the WSCC Ref. 4036 - Whites Footbridge. The inspection has been provided by WSP and commissioned to provide the West Sussex County Council Bridge Team with recommendations for maintenance/repair interventions.

The inspection was undertaken on foot without any specialist access equipment. The topside, abutments and underside/soffit (*by embankments*) were all observed within touching distance. The central span over the watercourse was visible, but without specialist access equipment, could not be reached within touching distance.

Appendix A provides a defect sketch plan and numbered defect log of the worst affected defects observed on site. The defect log provides an indication of their location on the truss. Photographic evidence of the defects was taken throughout the site visit and a monopod was utilised to gain photographs of harder to reach areas. Appendix B provides a summarised photograph log, which can be viewed in conjunction with the defect sketch plan. Chalk was used to independent labelling of defects, and this can be seen in the photographs. Additional photographs from the site visit can be found on the West Sussex County Council WDM bridge folders.

INSPECTION FINDINGS

Structure Detail

The footbridge crosses the River Adur with an east to west orientation, see Figure 1 & Figure 2. The structure is believed to have been installed in 1903 and the timber deck was refurbished in 2013-14. The footbridge comprises a 21m long, single span, arched profile half-through truss with a timber deck. Construction form comprises 12-14mm thick plated steel with riveted connections/fixings and hardwood timber decking. The refurbishment works included retrofitting of hardwood timber deck boards. The deck boards are seated on 2 galvanised plates, bolted to the interior flange of the bottom chord.

Top & Bottom Chord

The top and bottom chords comprise of 2no. 132x132 mm steel angle sections, placed back-to-back with a gap of 12mm in between the angles. The chords are joined longitudinally with approx. 1m long riveted splice plates.

The steel angles exhibit severe laminated corrosion over the entire lengths of the top and bottom chords to the steel trusses. Laminated corrosion to the web plates of the steel angles is evident with the gap between the steel angles being completely sealed with expanded metal corrosion, in some areas this has led to deformation of the steel sections.

Localised areas of the chords also display loss of section of up 30mm to the depth of the section, originally 130mm deep.

The top chord to the southern truss exhibited localised section loss varying from 20mm – 90mm in width at many isolated locations, in addition, consistent moderate to severe corrosion to the underside of the chord was observed, see Figure 3 & Figure 4. The corrosion appears to consistent between both the top chord and connections with the diagonal bracing components due to water collecting in these locations.

The bottom chord of the southern truss exhibits moderate-major laminated corrosion with significant loss of section to both exterior and interior steel angle flanges, see Figure 7. This is typical across the structure and has resulted in localised holes to the web flanges.

The top chord on the northern truss also exhibits steelwork section losses ranging from 20mm – 50mm in width, see Figure 8 & Figure 9.

The bottom chord to the northern truss was also affected by severe pitting throughout its length. It was observed that the base chord throughout was extremely friable. Minor pressure was applied by the inspectors and large sections of laminated corrosion up to 200mm in length were observed falling off the interior/exterior flanges. Holes were also found in the lower flanges at various location, ranging from 60-40mm in diameter, see Figure 11 & Figure 12.

Diagonal Bracing

19 of the 24 steel plate diagonal bracing members on the Southern truss were found to have partial section loss (40-80%) or full section loss, see Figure 3-6. There were also large number of areas where plate thicknesses were found to be less than half of the original thickness, thus reducing the structural integrity of the individual components.

11 of the 24 steel plate diagonal bracing members on the Northern truss were found to have partial section loss (40-80%), see figure 25 & Figure 26.

On the southern truss there were seven identified instances of pitting and/or perforations, and holes in the steel plates, see Figure 5 & Figure 6.

Significant historic corrosion was observed, as evidenced from surface treatment and painting to , see Figure 10. Sectional losses range up to 80mm in width, which is effectively 75% section loss of structural elements.

Foundations

Potential foundation faults have been considered, as a transverse 20mm crack was observed on the south abutment, see Figure 18. It is likely that historic settlement of the embankment has resulted in localised subsidence of the concrete bank seat. Figure 23 indicates that the timber river training works on the east bank are due for renewal, with an increased potential for scour. The vegetation obscures the east bank, however there is potentially a shear crack on the bank as a result of scour.

Painted Finishes

Protective paints to both superstructure and parapet elements have failed. See Figure 19, Figure 20 & Figure 21.

Service Pipes

The outrigger components on the exterior face of the truss support a 300mm mains water on the north side, and a 300mm gas main on the south side. Fixings and support members were observed to have major surface and pitting corrosion, including disintegration of steelwork, similar to the chords and diagonal bracing members of structure, see Figure 15 and Figure 24. Seven out of the eight outrigger sections were identified with severe sectional loss. The most eastern outrigger was identified as the worst affected corrosion. The corrosion has resulted in a 600x100mm and 500x100mm full loss of section to the steel plate on the underside of the beam, including minor deflection and loss of structural integrity to an isolated

instance of the plate, see Figure 16 & Figure 17. It would appear that the service pipe is self-supporting at this location.

Other Elements

The timber deck boards were found to be in a good condition since their replacement in 2013, similarly, the surface texture was found to be in good condition, see Figure 13, Figure 14 and Figure 22.

Summary & Recommendations

A total of 44 individual instances of severe corrosion were identified during the site visit, including significant pitted corrosion and disintegration of the primary load bearing elements, such as the top and bottom chords, diagonal bracing and service pipe outriggers.

Significant structural defects have been observed widespread across the primary load bearing elements of the footbridge. These defects have been located at critical nodes of the truss, whereby the structural integrity of the truss has now been compromised.

It is recommended to prohibit pedestrian movements over this structure for the foreseeable future, until a suitable replacement structure can be installed. Intervention by way of localised repairs would be futile due to the significance of the defects.

The application of a structural assessment at this point in the life span of the structure would not provide justification of loading capacity. It is highly likely that the presence of severe defects would result in a failed assessment.

Appendix A
Defect Log – *Please note, this is not an exhaustive list. This list compiles the worst affected areas.*

	Defect Ref	Defect Description	**Key:** SL = Section Loss Ch = Chainages – logged east to west orientation
SOUTHERN TRUSS	1	Ch 0.6m – 80mm SL	
	2	Ch 2.2m – 80mm SL	
	3	Ch 2.7m – Full section loss – Exterior diagonal bracing	
	4	Ch 2.8m – Diagonal bracing - Plate thickness reduction and localised major corrosion	
	5	Ch 3.8m – 20mm SL	
	6	Ch 3.9m – 50mm SL	
	7	Ch 4.7m – Internal diagonal bracing – Perforations to the steel plate – 50 x 30mm SL	
	8	Ch 5.6m – Top chord and diagonal bracing interface – Major corrosion and plate thickness 50%	
	9	Ch 5.8m – Diagonal bracing – 80mm SL	
	10	Ch 6.4m – Exterior diagonal bracing – 90 x 20mm SL	
	11	Ch 7.3m – Diagonal bracing – 40mm SL (very thin plate)	
	12	Ch 8.2m – Internal Diagonal bracing – 120 x 36mm SL	
	13	Ch 8.2m – Service Pipe Outrigger – East side full SL / West side 50mm SL	
	14	Ch 9.0m – Diagonal bracing – 80mm SL	
	15	Ch 11.5m – Internal diagonal bracing – 120 x 35mm SL	
	16	Ch 12.4m – Diagonal bracing – 80mm SL	
	17	Ch 13.3m – Service Pipe Outrigger – East side 50mm SL	
	18	Ch 14.1m – Diagonal bracing – Full SL	
	19	Ch 15.0m – Internal diagonal bracing – 30 x 40mm hole	
	20	Ch 15.8m – Diagonal bracing – 80mm SL	
	21	Ch 15.9m – Internal diagonal bracing – 170 x 40mm SL	
	22	Ch 17.4m – Diagonal bracing – very thin plated steel, pitted corrosion	
	23	Ch 18.4m – Service pipe outrigger – Full section loss	
	24	Ch 19.1m – Diagonal bracing – 90mm SL (75%)	
	25	Ch 19.3m – Internal diagonal bracing – 50 x 70mm hole	
	26	Ch 20.7m – Diagonal bracing - 50mm SL	
NORTHERN TRUSS	27	Ch 2.8m – Service pipe outrigger – East side – 50 x 40mm hole	
	28	Ch 3.8m – Diagonal bracing – 20mm SL	
	29	Ch 4.6m – Top chord exterior face – 50mm SL	
	30	Ch 5.6m – Diagonal bracing – moderate surface corrosion.	
	31	Ch 7.2m – Diagonal bracing – moderate surface corrosion.	
	32	Ch 8.0m – Service pipe outrigger – 300mm SL	
	33	Ch 9.6m – Internal diagonal bracing – 80 x 30mm hole	
	34	Ch 12.3m – Diagonal bracing – moderate surface corrosion.	
	35	Ch 13.2m – Service pipe outrigger – 200 x 80mm hole (80% SL)	
	36	Ch 14.2m – External diagonal bracing – historic 40 x 40mm hole	
	37	Ch 15.5m – Diagonal bracing – Moderate corrosion	
	38	Ch 17.4m – Diagonal bracing – 75% SL	
	39	Ch 18.3m - Service pipe outrigger – large holes throughout	
	40	Ch 19.0m – Diagonal bracing – very thin steel plate (pitted corrosion) – <50% thickness	
	41	Ch 20.7m – Diagonal bracing – very thin steel plate (major pitted corrosion) - <50% thickness	
	42	Ch 18.5m – External diagonal bracing – very thin steel plate (pitted corrosion) – <40% thickness	
	43	Service Pipe Outrigger – 600mm SL	
	44	Service Pipe Outrigger (Beam) – 500 x 60mm SL	

Appendix B: Photographs

To be read in conjunction with Appendix A. Chalk markings refer to defect on the Defect Location Plans.

Figure 1: North Elevation

Figure 2: South Elevation

Figure 3: South Truss - View of disintegration corrosion to top chord and diagonal bracing (Defect 6)

Figure 4: South Truss - View of consistent corrosion to top chord and diagonal bracing (Defect 9)

Figure 5: Disintegration of diagonal bracing (external plate, south)

Figure 6: Disintegration (historic) of diagonal bracing (internal plate, south)

Figure 7: Severe pitting corrosion to bottom chord (south)

Figure 8: View of typical moder-major corrosion to underside of northern top chord

Figure 9: Major section loss to exterior member of top chord (north)

Figure 10: Historic perforations within diagonal bracing (north)

Figure 11: Disintegration to underside edges of bottom chord (north).

Figure 12: Disintegration to exterior plate of bottom chord (north).

Figure 13: Timber deck elements, following 2013 refurbishment.

Figure 14: View of timber deck configuration with bottom chord.

Figure 15: Loss of thickness and perforation to outrigger (south).

Figure 16: Sectional loss to underside of outrigger (photographed southeast).

Figure 17: Sectional loss to underside of outrigger (eastern end).

Figure 18: Transverse crack to concrete (east).

Figure 19: Significant paint loss allowing for corrosion to develop.

Figure 20: Slight paint losses to parapet railing.

Figure 21: Minor surface corrosion to parapet railing.

Figure 22: View looking east shows footway surfacing.

Figure 23: Deteriorated timber wall to east embankment.

Figure 24: Disintegration of service pipe supports, pictured to south side.

Figure 25: Typical example of corrosion found on the Northern truss. Diagonal bracing member (Defect 41)

Figure 26: Significant pitted corrosion of diagonal bracing member – Northern truss (Defect 30)