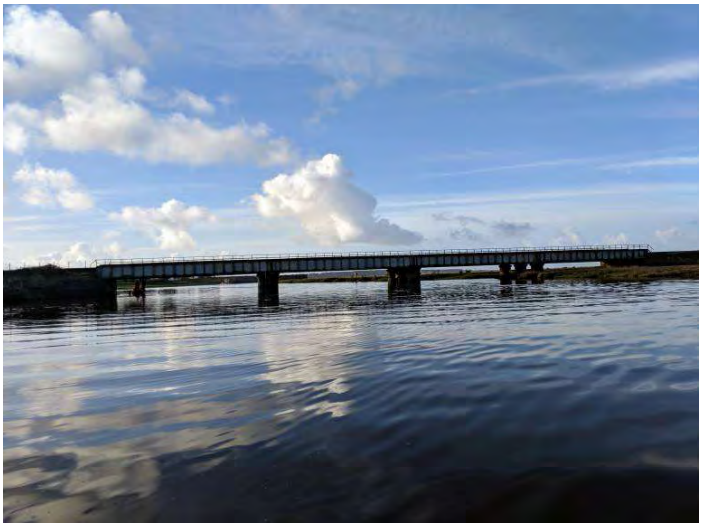
NETWORK RAIL INFRASTRUCTURE PROJECTS (WALES)

YEAR 5 DEVELEOPMENT PACKAGE

INSPECTION REPORT

Kidwelly Viaduct



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Report No:	152092-ARC-REP-ECV-000001
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INSPECTION REPORT

Kidwelly Viaduct

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1. SYNOPSIS

1.1 Inspection

Arcadis Consulting (UK) Ltd were instructed to undertake a Level 0 and targeted Level 1 assessment of Kidwelly Viaduct by Network Rail. The purpose of the assessment was to confirm the structural adequacy of the bridge in its current condition and provide information towards possible repairs.

An Inspection for Assessment was undertaken between 10th and 13th November 2018, with a trackside inspection undertaken within rules of route possession on 10th November and an underside inspection undertaken on 12th November 2018, utilising access to the underside of the structure via boat and foot where applicable. These were undertaken to establish the form and condition of the structure; trial pits were also undertaken to establish the condition of the existing waterproofing system.

The structure is generally in fair condition. Similar defects were found throughout all spans, however span 4 is considered to be in worse condition than Spans 1, 2 and 3. There appears to be minor surface corrosion and delamination throughout the structure. The corrosion is more significant to the interface between the cross girders and main girders and the strapping at Pier 2. There is delamination present which may also be hiding more serious defects or areas of significant section loss; therefore, re-assessment of these areas if grit blasting is undertaken is recommended.

Pitting to bottom flanges of main girders, cross girders and rail bearers is also present throughout, result in varying amounts of section loss. There are also several locations of welded repairs, to rail bearers and deck plates, subject to varying degrees of corrosion, some of which are no longer connected to the members they were originally welded to as a result. There are also minor signs of mechanical damage to rail side of MGE1 on DK1 and DK4 however these are not significant.

There were no observed defects considered as having immediate safety implications for the operation of the railway or the public at large.

During inspection on 13/11/18 the clearance between the bottom of the main girders and tide level was measured as 2.15m at 09:05. Which can used with tide records to calculate the likely clearance between the structure and tide levels at different times of the year.

1.2 Conclusions

The structure is generally in fair condition from Span 1-3, however Span 4 is in fair-poor condition due to increased degrees of corrosion found throughout. There is a general loss of paintwork throughout all spans which requires maintenance operations to be completed and has likely lead to the presence of the section loss noted within the inspection. There were also signs of mechanical damage to main girders within Spans 2 and 4, however these are deemed minor and are unlikely to have an effect on the structural capacity of the bridge as a whole. The defects noted within inspection considered to be most critical are the levels of corrosion to the bottom flange of the cross girders at the cross girder/main girder interfaces.

The observed defects are not considered as being of an immediate threat to operational safety of the railway, however certain defects noted will have an effect if left without maintenance and repair works being undertaken.

2. STRUCTURE DESCRIPTION

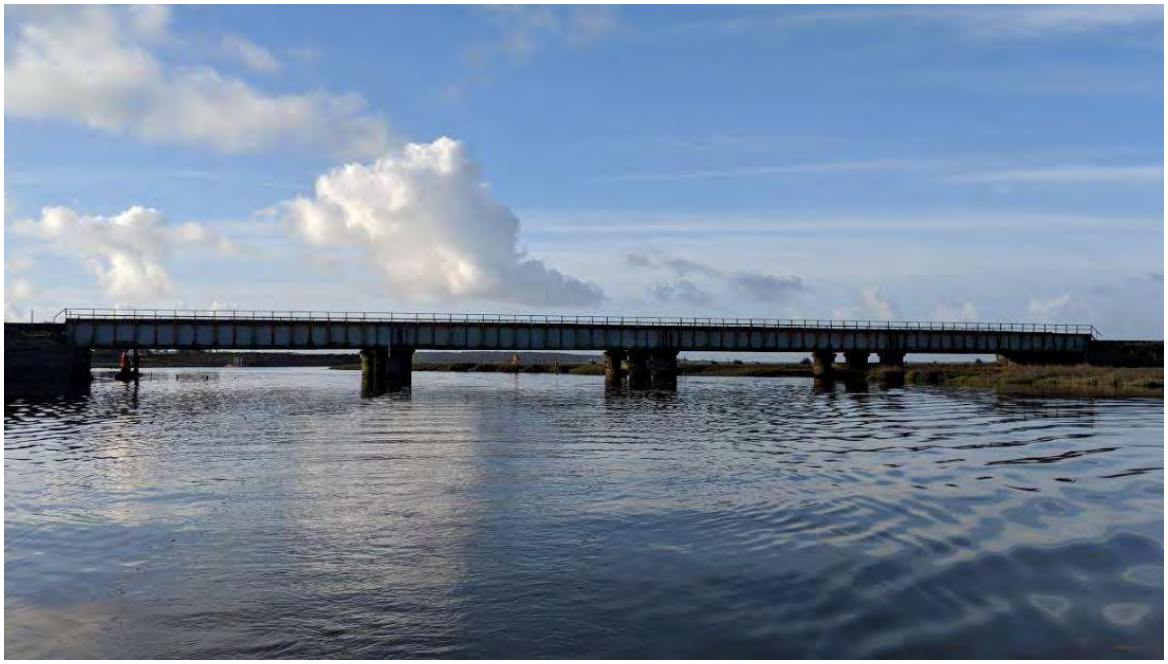
The structure is a four-span bridge of half through construction carrying the two non-electrified lines of the South Wales Mainline (SWM2) from Kidwelly station towards Milford over the Gwendraeth Fach river in Kidwelly. The structure comprises 4 No. spans, each span is simply supported and comprises steel main longitudinal girders and staggered cross girders with rail bearers and steel deck plates. There are also rail bearers that are strengthened by the presence of an extra plate on the bottom flange and cranked cross girders present above the intermediate supports. The deck is supported on stone abutments at its ends and intermediate supports of concrete and brick filled wrought iron caissons of 1.83m diameter capped with stone. The caissons are transversely braced with wrought iron girders either fixed with strapping or riveted directly into the caissons.

The structure was formerly of timber construction but was replaced circa 1894 with wrought iron construction and further replaced circa 1939 with the steel construction seen today.

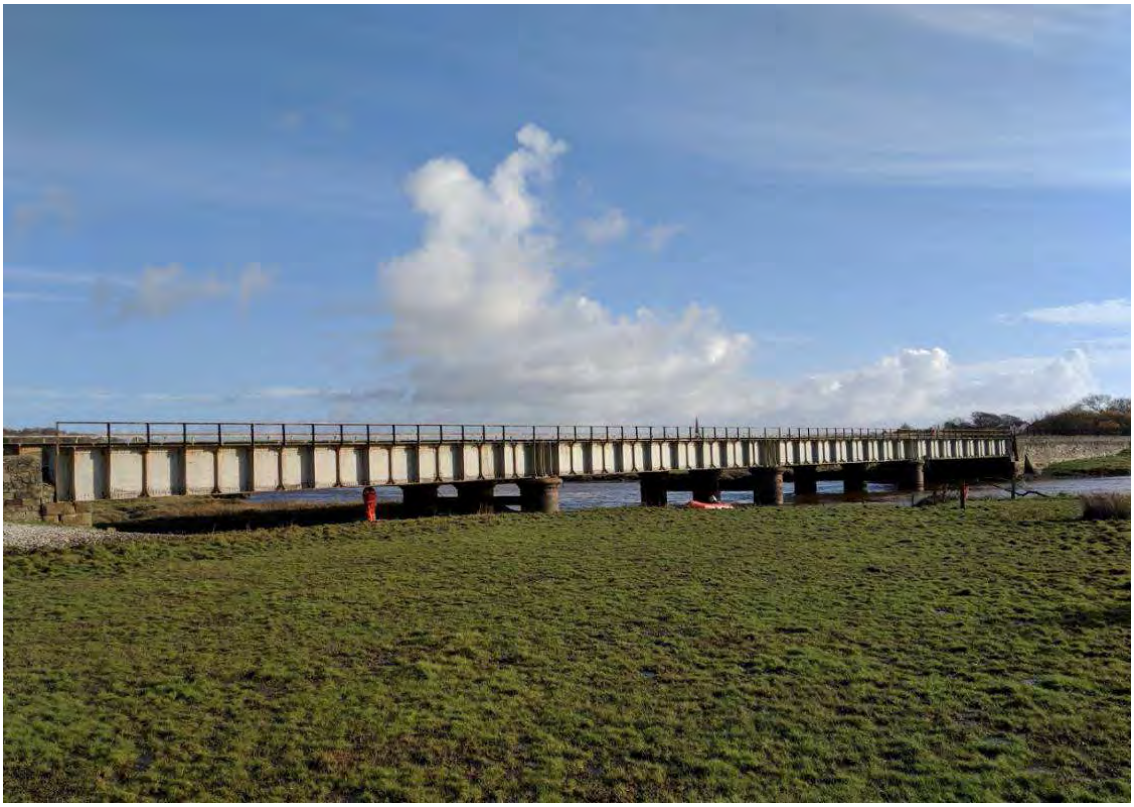
Each deck has a span of 20.72m, with the total span of the bridge being 82.9m. With record drawings indicating the bridge has a radius of 2414.016m (7920 feet). During inspection multiple trains passed and no visable deflection was noted.

Structure Information	
Location of Structure	Kidwelly, Carmarthenshire
Structure Name	Kidwelly Viaduct, No. 234 40.25
Grid Reference	SN 398 066
Type of Structure	Half-through Metallic Underbridge
Obstacle Crossed	Gwendraeth Fach river / tidal estuary
Carrying	South wales main line, twin directional non-electrified line.
Evidence of Services Carried	5 No. services carried in concrete trough in cess of downside of structure
Date of Construction / Modification	Archive information indicates the bridge was originally of timber construction and was built circa 1852, however was replaced circa 1894 with a wrought iron structure. The superstructure was then replaced with a steel bridge circa 1939.
Principal Dimensions:	
Span Length	4 No. spans of 20.72m, Total 82.9m
Width	Varies up to 9.5m
Skew	Square (0^o)
Radius	2414.016m (7920 feet)
Surfacing Material	Concrete infill above deck plates with ballast and concrete sleepers above

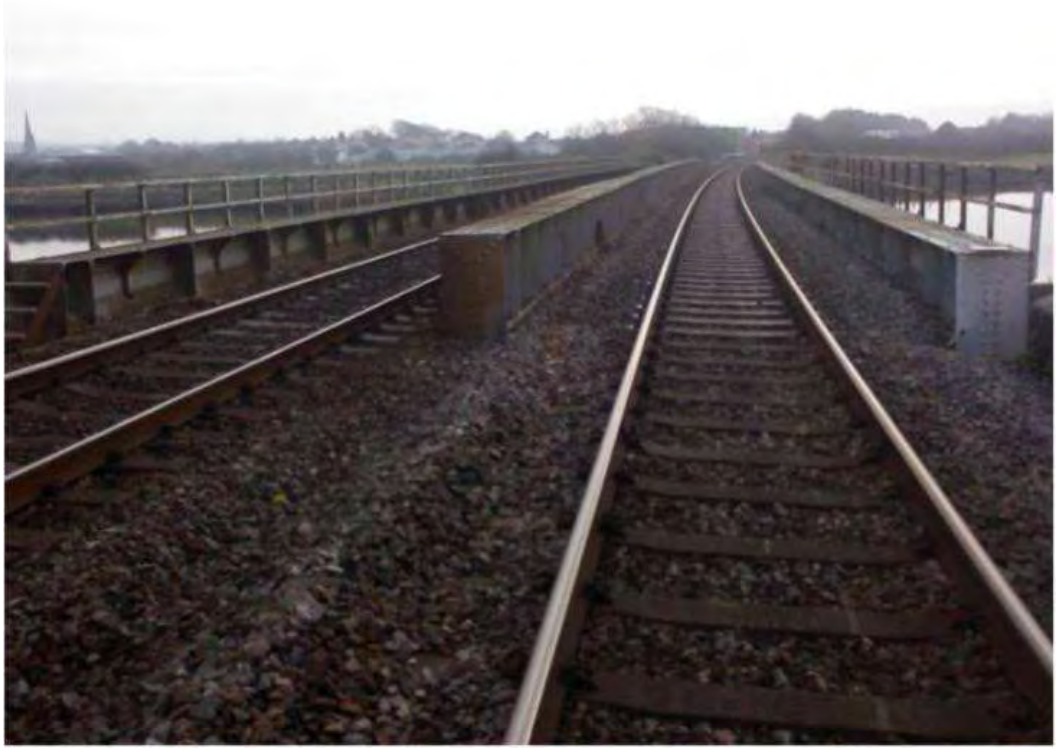
Form of Construction:	The bridge is a four-span half through steel underbridge, supported on stonework abutments and wrought iron caissons. The bridge spans the Gwendraeth Fach river and carries the South Wales main line from Kidwelly station towards Milford.
Number of Spans	4
Superstructure	The superstruture consists of 4 simply supported spans of steel riveted plate girder through construction. Longitudinal plate girders support rolled steel cross girders which are staggered between the two UL and DL decks and support the deck plating above which ballast and concrete sleepers are laid. The rail bearers span longitudinally between cross girders.
Bearings	The superstructure is supported on steel bearing plates.
Substructure	The superstructure is supported on stonework abutments and wing walls at either end with concrete and brickwork filled wrought iron casons as intermediate supports between spans.
Parapet Type	Masonry on approach ands and steel handrails over the four spans.
Drainage	Drainage is provided by concrete benching laid at fall over the steel deck plates leading to drainage pipes located at 4 cross girder intervals.
Waterproofing	Waterproofing is present in the form of a 3/4" layer of asphalt over the deck plates, trial pits were undertaken within inspection works confirming its presence however there are signs of possible failure throughout the structure



Photograph 1: Downside Elevation

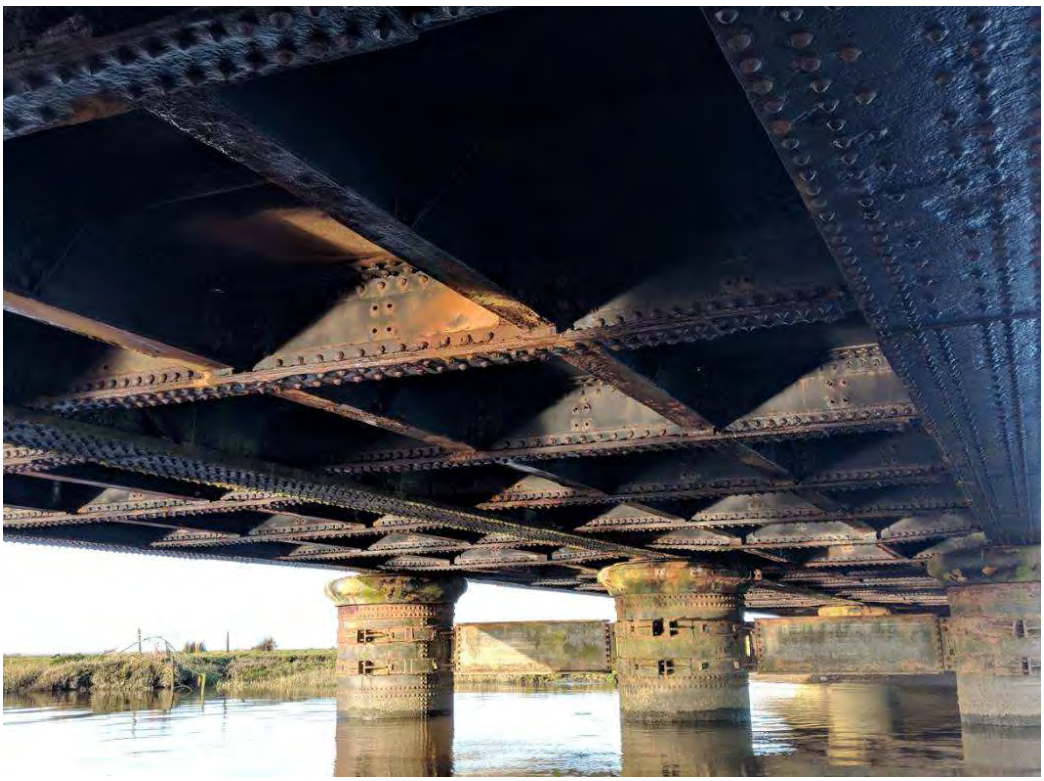


Photograph 2: Upside Elevation

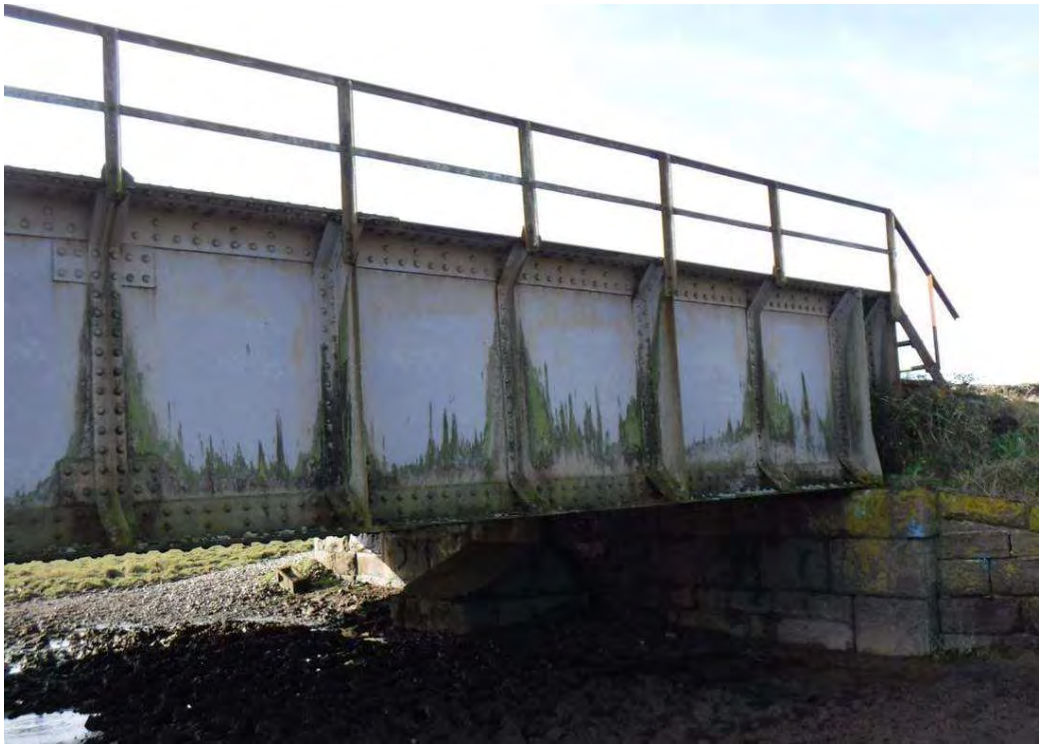


Photograph 3: Trackside, photo looking towards low mileage

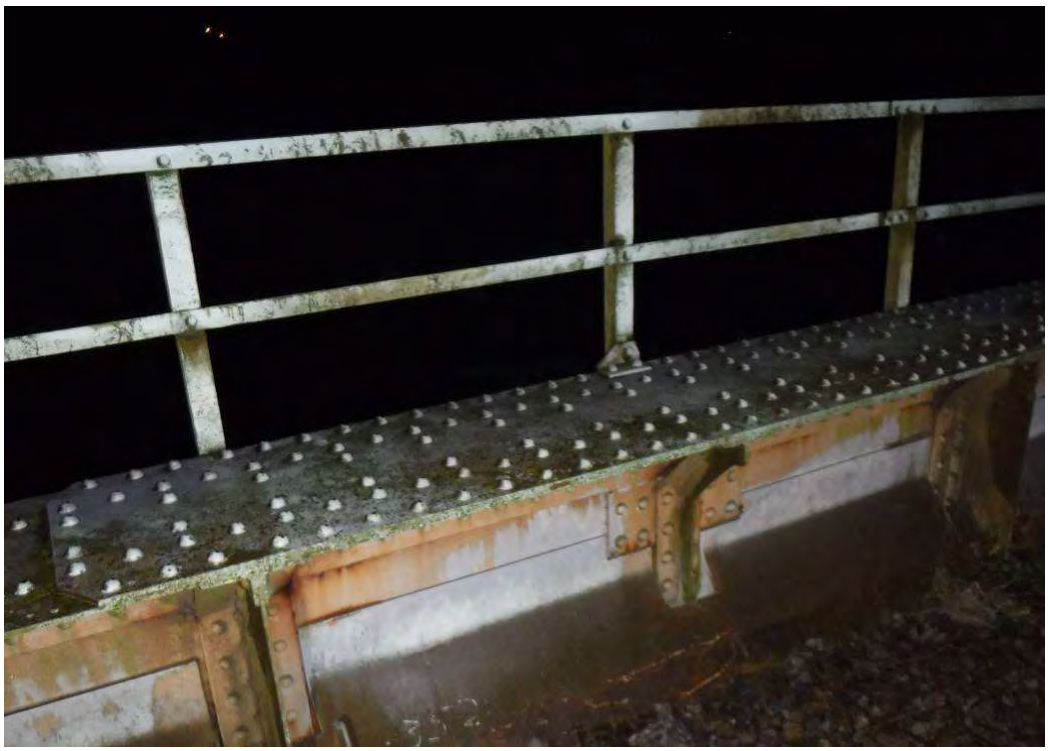
Photograph 4: Trackside, photo looking towards high mileage



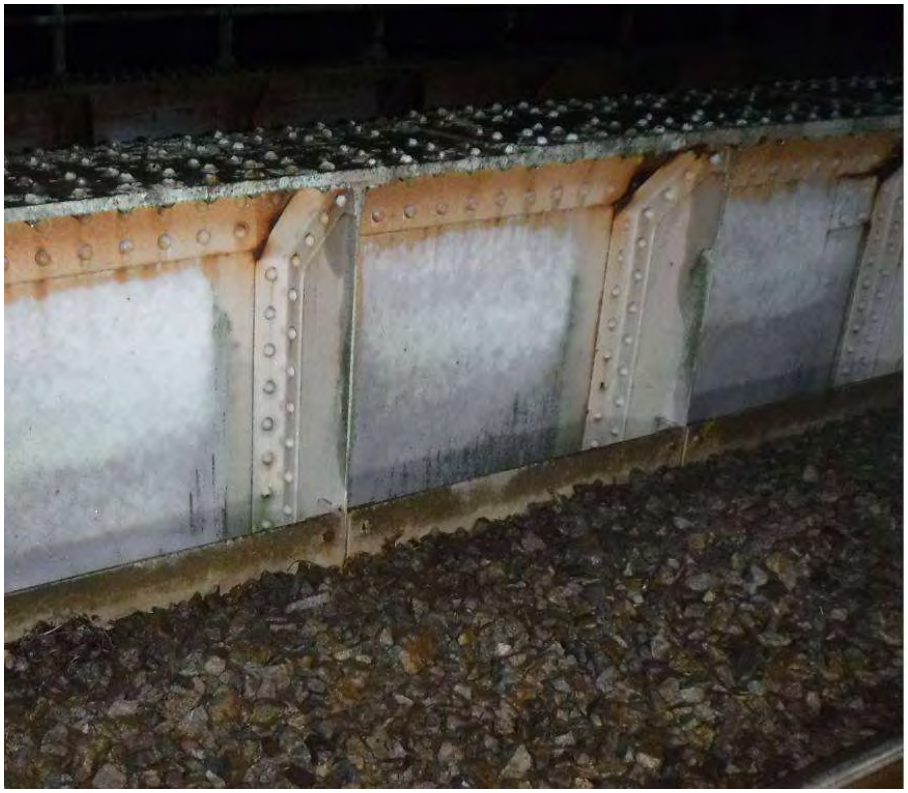
Photograph 5: General soffit view



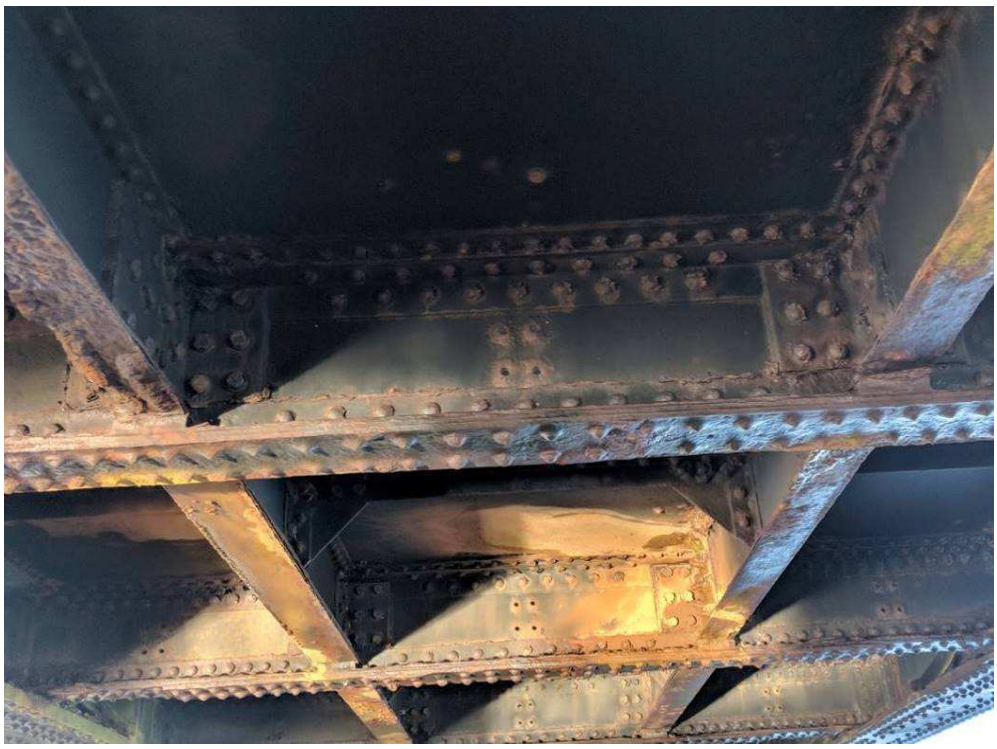
Photograph 6: General view of external main girder (MGE) bankside



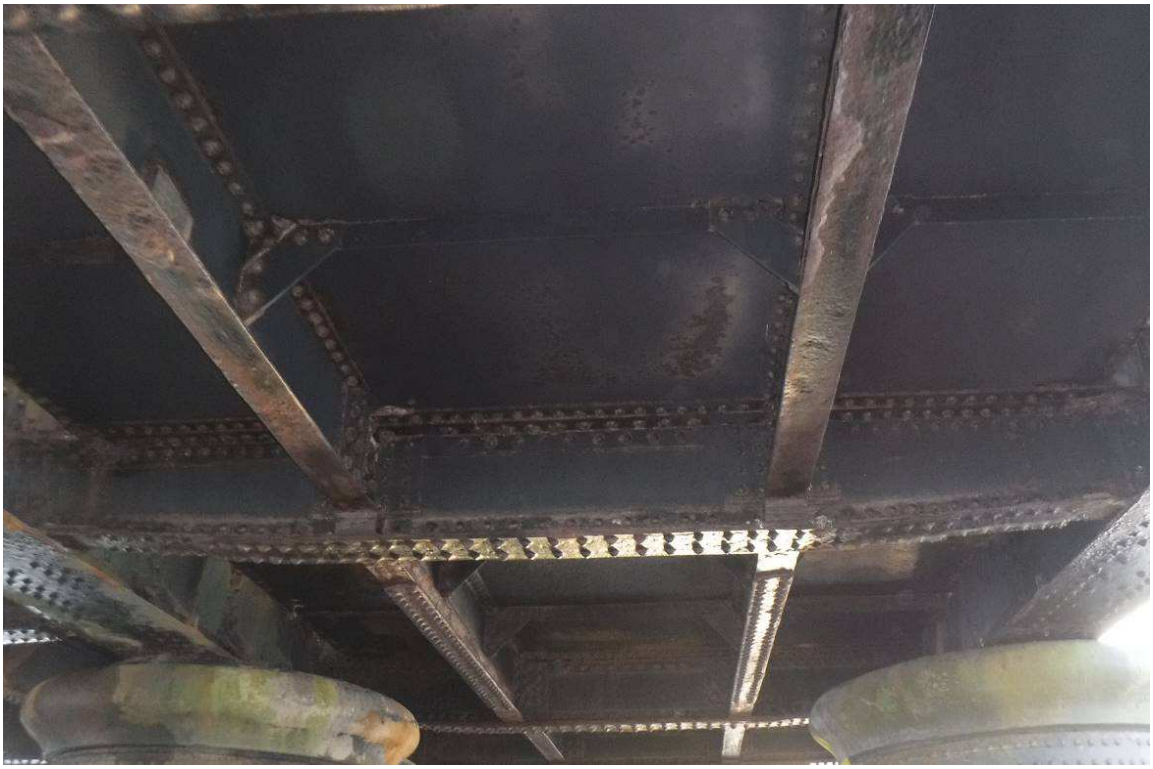
Photograph 7: General view of external main girder (MGE) trackside



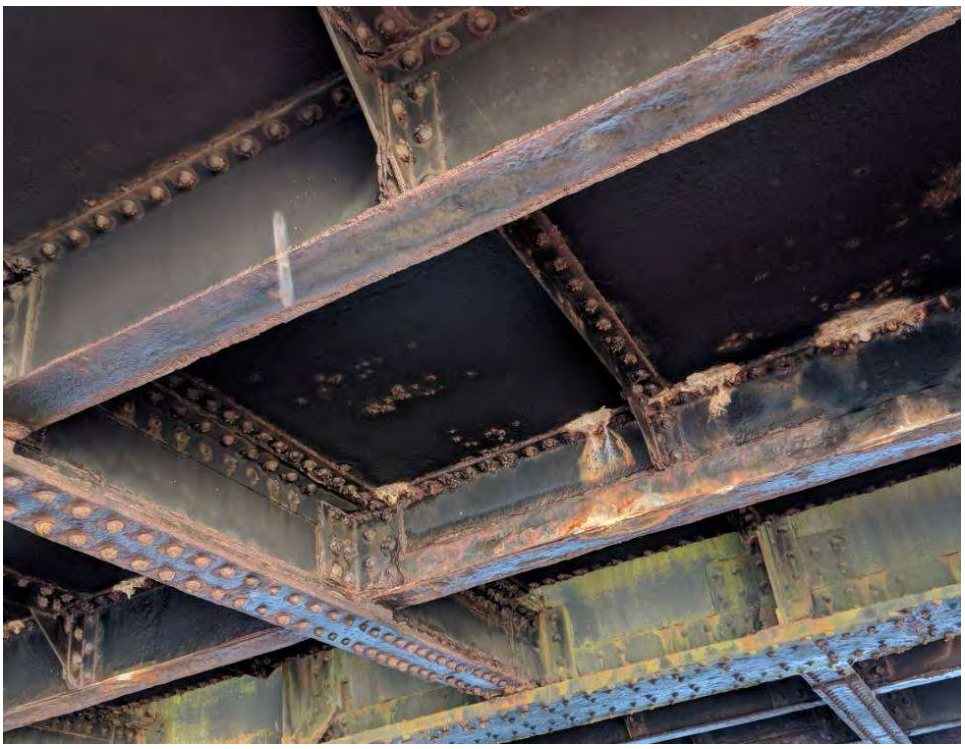
Photograph 8: General view of internal main girder (MGI) trackside



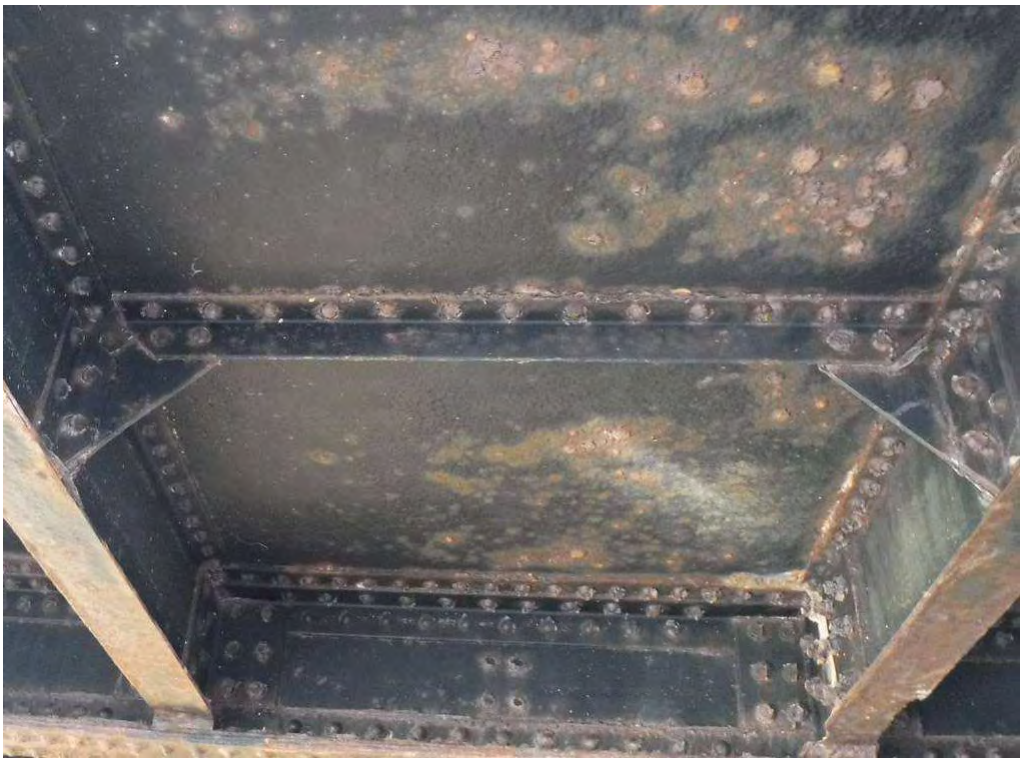
Photograph 9: General view of internal cross girders (XGI)



Photograph 10: General view of fish bellied external cross girders (XGE) and strengthened rail bearers above caissons



Photograph 11: General view of rail bearers (LSI)



Photograph 12: General view of deck plates and stiffeners (DCK)

APPENDIX A – ASSOCIATED DOCUMENTS

DOCUMENTS		
152092-ARC-ASS-ECV-000001	A02	Level 0 assessment (Form AA and BA included in tool)

DRAWINGS		
152092-ARC-DRG-ECV-000001	A02	Kidwelly viaduct topographical survey
152092-ARC-DRG-ECV-000002	A02	Kidwelly viaduct existing general arrangement
152092-ARC-DRG-ECV-000003	A02	Kidwelly viaduct as built cross sections
152092-ARC-DRG-ECV-000004	A02	Kidwelly viaduct existing defects abutment, wingwall and retaining wall elevations – Sheet 1 of 2
152092-ARC-DRG-ECV-000005	A02	Kidwelly viaduct existing defects abutment, wingwall and retaining wall elevations – Sheet 2 of 2
152092-ARC-DRG-ECV-000006	A02	Kidwelly viaduct existing defects caisson elevations
152092-ARC-DRG-ECV-000007	A02	Kidwelly viaduct existing defects – Span 1 (Sheet 1 of 2)
152092-ARC-DRG-ECV-000008	A02	Kidwelly viaduct existing defects – Span 1 (Sheet 2 of 2)
152092-ARC-DRG-ECV-000009	A02	Kidwelly viaduct existing defects – Span 2 (Sheet 1 of 2)
152092-ARC-DRG-ECV-000010	A02	Kidwelly viaduct existing defects – Span 2 (Sheet 2 of 2)
152092-ARC-DRG-ECV-000011	A02	Kidwelly viaduct existing defects – Span 3 (Sheet 1 of 2)
152092-ARC-DRG-ECV-000012	A02	Kidwelly viaduct existing defects – Span 3 (Sheet 2 of 2)
152092-ARC-DRG-ECV-000013	A02	Kidwelly viaduct existing defects – Span 4 (Sheet 1 of 2)
152092-ARC-DRG-ECV-000014	A02	Kidwelly viaduct existing defects – Span 4 (Sheet 2 of 2)

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