

South Wales Trunk Road Agent

Managing and Improving
Motorways and Trunk Roads
through South Wales



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M4 23A-24 51 Bishton Llanmartin Overbridge CS 470 Management of Sub-standard Highway Structures

March 2026



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M4 23A-24 51
Bishton Llanmartin Overbridge

CS 470 Management of Sub-standard Highway Structures

March 2026

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SWTRA

M4 23A-24 51 Bishton Llanmartin Overbridge
CS 470 Management of Sub-standard Highway
Structures



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Introduction

WSP has been commissioned by the South Wales Trunk Road Agent (SWTRA) to prepare CS 470¹ Appendices' A4 and A6 proformas for Bishton Llanmartin Overbridge (structure reference number: M4 23A-24 51).

The structure carries Waltwood Road over the M4 between Junction 23A to the west and Junction 24 to the east (see Figure 1 below). The bridge is constructed from post-tensioned reinforced concrete 'I'-beams which are continuous over two piers to form three spans in total.

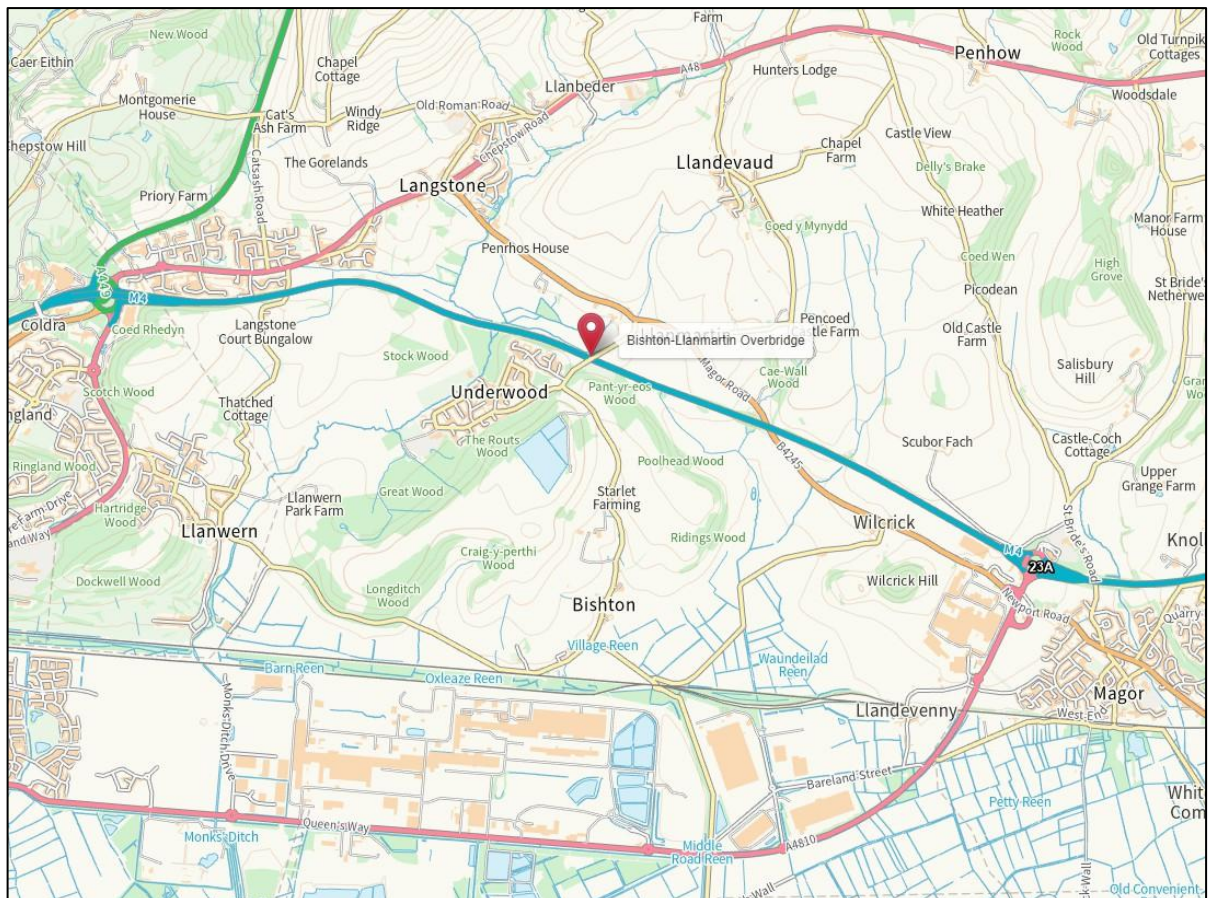


Figure 1: Location Plan

Records of the structure headroom varies:

- In 1974:
 - A letter from the Country Engineer and Surveyor dated 26th March 1974 (reference no. CS.530/2/2A/DFW/COR) states: "*The present clearance is 17'-13" (5.25 m) over the eastbound carriageway and more over the westbound carriageway.*"
 - The New Civil Engineer article title "*Flat jacks used to pre-stress beam flange of bridge over M4*" dated 16 May 1974 states that "*Although the*

¹ [CS 470 - Management of sub-standard highway structures](#)



*bridge was designed and built at a time when the recommended clearance above a motorway was 5 m, this overbridge has a minimum clearance which measures up to the latest recommendation of **5.1 m***”.

- A report of a 1999 Principal Inspection (PI) by Gwent Consultancy records a minimum headroom as **5.013 m** at the eastbound and 5.100 m at the westbound.
- A report of the 2007 PI by Capita Symonds records a minimum headroom as **5.01 m** albeit it does not provide a date when it was measured².
- A 2009 Feasibility Report titled “M4 Bishton to Llanmartin Overbridge Options to Prevent Vehicular Impact” by Capita Symonds in the Section 4.2 Analysis of Existing Clearances provides a detailed table of existing clearances (see Figure 2 2 below) with the lowest value of the headroom quoted as **5.028 m**:

		Existing Clearance to Underside of Bridge Soffit (m):	
Lane**		Upstream*	Downstream*
Eastbound	H/1	5.229	5.028
	1/2	5.247	5.078
	2/3	5.217	5.093
	3/C	5.186	5.100
Westbound	H/1	5.529	5.476
	1/2	5.410	5.352
	2/3	5.289	5.222
	3/C	5.179	5.089

*Where Upstream is to the West of the bridge and Downstream is to the East.
**C = Central Reserve, H = Hard Shoulder

Figure 2 2: Headrooms reported in the 2009 Feasibility Report

- A 2019/2020 PI report record a minimum headroom as **5.03 m** at the eastbound and 5.13 m at the westbound³.
- A 2025/2026 PI reports record a minimum headroom as **5.01 m** at the eastbound.

The above records highlight some uncertainty surrounding the headroom geometry. However, it is clear that it is close to the minimum CD 127⁴ recommended maintained height of 5.03 m for existing structures. As part of the CS 470⁵ procedure WSP has reviewed 3D

² The 5.01 m headroom measurement in the 2007 PI report could potentially be a rounded up value of 5.013 m taken from the earlier 1999 PI report.

³ The 5.03 m could potentially be a rounded up value of 5.028 m taken from the 2009 Feasibility Report

⁴ [CD 127 - Cross-sections and headrooms](#)

⁵ [CS 470 - Management of sub-standard highway structures](#)



point cloud data obtained in May 2023⁶ and have estimated a minimum headroom clearance of 5.03 m located at the interface between the hard strip and Lane 1 on the eastbound carriageway at the eastern extent of the bridge, this is consistent with the values shown in Figure 2.

Regardless, the bridge has a history of vehicle impacts which have caused a series of defects including areas of completely spalled concrete with exposed reinforcement to the soffit of the bridge. The defects are particularly concentrated above Lane 1 and 2 of the eastbound M4 carriageway, likely due to the more frequent use of this lane by larger or heavier loaded vehicles. Due to the inclination of the bridge and the presence of defects in Lane 2 of the eastbound carriageway it is likely that the bridge is being struck by vehicles at a headroom greater than the CD 127 minimum.

Recent History

October 2010 – Structural Assessment

The most recent assessment of the structure was undertaken in October 2010 by Capita Symonds to BD 21/01⁷, the results of the assessment found the structure to have the following capacity:

- 40 tonne Assessment Live Loading,
- 30 units HB loading in conjunction with HA Assessment Live Loading,
- SV100 vehicle model in conjunction with HA Assessment Live Loading.

Author: Capita Symmonds,
Document Reference: CG/004282 BC 64

July 2025 – CS 462⁸ Desk Study

The CS 462 desk study reviewed the relevant historic data for the structure and concluded with the following recommended workflow:

- Review measures to address root cause (impact damage),
- Undertake the CS 451⁹ Structural Review,
- Undertake a Post Tensioned Special Inspection (PTSI),
- Undertake the CS 454¹⁰/ CS 455¹¹ Structural Assessment,
- Prepare Structures Management Option Report (SMOR),
- Undertake Concrete Testing,
- Design and undertake Concrete Repairs.

Author: WSP UK Ltd.
Document Reference: UK29359.5330-WSP-SBR-M4 23A-24 51-RP-C-1001

⁶ 3D Point Cloud Survey was carried out by Azimuth Land Surveys Ltd. as part of the services delivered under ORD-SW2200172 for the scheme 22/SW/CHR/004.

⁷ [BD 21/01 - The Assessment of Highway Bridges and Structures](#)

⁸ [CS 462 - Repair and management of deteriorated concrete highway structures](#)

⁹ [CS 451 - Structural review and assessment of highway structures](#)

¹⁰ [CS 454 - Assessment of highway bridges and structures](#)

¹¹ [CS 455 - The assessment of concrete highway bridges and structures](#)



August 2025 – CS 451 Structural Review

The CS 451 Structural Review was undertaken to establish the requirement for renewed assessment of the structure. An updated assessment (and PTSI) was recommended for the following reasons:

- Previous assessment was completed 15 years ago to previous suite of standards,
- Since the previous assessment further defects have been observed after a number of vehicle impacts between 2010-2025 (i.e., according to available data in August 2017, March 2018, May 2020, March 2022 and March 2023). It is possible that further unrecorded impacts have happened in this time period.

Author: WSP UK Ltd.

Document Reference: UK29359.0533-WSP-SBR-M4 23A-24 51-RP-C-0001

September 2025 – Technical Memorandum

This document outlines a step-by-step workflow based on the findings of the CS 462 Desk Study and the CS 451 Structural Review, refer to the Technical memorandum document for further details.

Author: WSP UK Ltd.

Document Reference: UK0029359.0533-WSP-SBR-M4 23A-24 51-RP-C-0002

December 2025 – Principal Inspection

The most recent 2025 PI found the structure to be in overall fair to poor condition, however Span 2 (the main span over the M4) was in poor condition. The PI recommended new assessment and PTSI works to be undertaken, as well as the investigation of interim measures. The defect plan is presented in Figure 3 Figure 33.

Author: Arcadis

Document Reference: 30286543-ARC-SBR-M4-TR-CB-00004

The aforementioned documents all point towards an updated assessment, which will inform the next step of repairs to the structure. However, whilst those works are being prepared this document will review what, if any, measures need to be implemented in the interim to ensure the safety of the structure and its users.

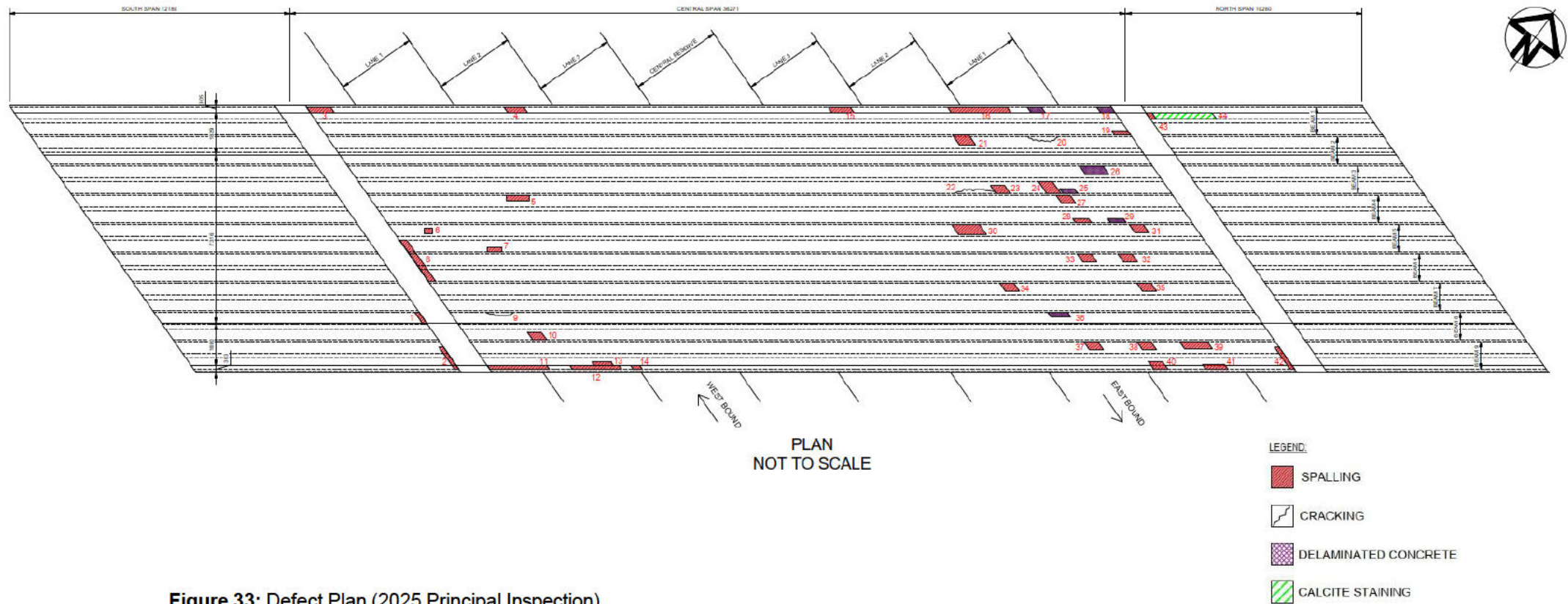


Figure 33: Defect Plan (2025 Principal Inspection)



This report follows the process outlined in DMRB CS 470 and the contents herein are as follows:

A1 General	Informative guidance only hence, not included
A2 Monitoring specification	Not Applicable
A3 Sub-standard structure summary	Not Applicable
A4 Interim measures feasibility assessment for bridges A4.1 General Details A4.2 Assessment Progress A4.3 Consideration of Risk Posed by Structure in Current State A4.4 Appropriateness of Monitoring A4.5 Options for Load Mitigation Interim Measures A4.6 Options for Monitoring Interim Measures A4.7 Recommended Options for Interim Measures	Included
A5 Interim measures feasibility assessment for retaining walls	Not Applicable
A6 Proposal for interim measures A6.1 General Details A6.2 Proposed Interim Measures A6.3 Acceptance of Interim Measures	Included
A7 Review of Interim Measures	Not Applicable
A8 Immediate risk structure: Emergency action record of agreement/incident log	Not Applicable
A9 Interim measures removal	Not Applicable
A10 Documentation of management processes	Informative guidance only



APPENDIX A4: INTERIM MEASURES FEASIBILITY ASSESSMENT FOR BRIDGES

A4.1 GENERAL DETAILS

A4.1.1. Structure name and assessment reference:

Structure ref. no. (WG no.): M4 23A-24 51 Bishton Llanmartin Overbridge

Refer also to Structure 277 Form in Annex A of this CS 470 report.

A4.1.2. Location, route and country/ area:

The structure is located to the east of Newport in South Wales, carrying Waltwood Road over the M4 between Junction 23A and 24 (O/S Grid reference no. E: 339122, N: 189223).

A4.1.3. Assessing Organisation:

- 1) Assessed by:** Capita Symonds
- 2) Checked by:** Capita Symonds
- 3) Assessment date:** October 2010

A4.1.4. Structure type, form, span, skew:

The structure consists of three spans: 10.26 m on the north side, a 36.27 m main span and 12.18 m on the south side, i.e. 58.7 m in total between abutments at a skew of 35 degrees. The deck features an in-situ reinforced concrete slab of varying depth (to achieve crown on carriageway), supported by nine longitudinal precast post-tensioned 'I'-beams, along with cast in-situ post-tensioned transverse diaphragms. There are two tendon layouts within the precast beams – the side span beams have 2 No. straight profile tendons, and the central span beams have 1 No. straight profile tendon and 2 No. parabolic profile tendons (sagging at mid-span and rising towards the anchorages). Each tendon is manufactured from 7 No. 0.7" (17.78 mm) diameter strands and was grouted after stressing.

The precast beams that form the deck are cast into the crossheads meaning the structure acts continuously over the two internal piers. Full fixity is provided at the north abutment, whilst movement is accommodated at the south abutment via pot bearings and a comb tooth expansion joint.

Precast concrete parapet fascia panels mask the beams at each elevation and steel pedestrian parapets are fixed to the 300 mm wide reinforced concrete parapet beams on each side.

A4.1.5. Obstacle crossed and facility carried:

The bridge carries Waltwood Road, a two-lane single carriageway with footways on both sides, over the M4, a six-lane dual carriageway.



A4.1.6. Estimated cost of permanent strengthening/ replacement works:

To be explored within an options report developed at a future stage.

A4.2 ASSESSMENT PROGRESS:

The previous assessment was undertaken in October 2010 to BD 21/01 which took into account the damaged condition of the structure up to April 2010.

Since the previous assessment was undertaken there has been a significant change to the assessment standards. The structure has also suffered a series of subsequent vehicle impact strikes, as follows (according to available data):

- August 2017,
- March 2018,
- May 2020,
- March 2022, and
- March 2023.

Further unrecorded impacts may have also taken place.

An updated assessment is proposed to account for both the assessment standards and the unaccounted defects. However, this appendix is written to advise on interim measures to be implemented prior to the publication of the proposed assessment to manage the short-term safety of the structure and its users following receipt of the 2025 PI report.

A4.2.1. Level of assessment reached:

Full Category 2 assessment of deck, pier crossheads and intermediate piers undertaken in October 2010 in accordance with BD 21/01.

A4.2.2. Assessed Capacity:

With its damaged deck condition **as of April 2010**:

- 40 tonne HA Assessment Live Loading,
- 30 units HB loading in conjunction with HA Assessment Live Loading, and
- SV100 vehicle in conjunction with HA Assessment Live Loading.

A4.2.3. Date of assessment:

October 2010

A4.2.4. Assessment Report reference:

TEDDMS file ref.: 2010 M4 23A-24 51 Bishton Llanmartin - Assessment Report

T-WHIS Number: 10143048

Document Reference: BC64



A4.2.5. Provisionally Sub-standard or Sub-standard?

Provisionally sub-standard

A4.2.6. Description of anticipated mode of failure, including its progression from local overstress to global collapse mechanism:

The mode of failure of the bridge is likely to be progressive, however, without further assessment it is difficult to state.

Following review of available records of correspondence, the 2025 CS 462 Desk Study noted that there had been a debate surrounding the structural significance of the bottom flanges of the beams, the two schools of thought are as follows:

- The beams are essentially T-beams with the bottom flange being for stability during construction and to provide a uniform soffit. With the majority of damage being at the point of contraflexure, it is likely that the redistribution of stress was not significant.
- The bottom flanges are subject to appreciable prestress and now (following impact damages) have a considerable eccentric loading giving an undesirably high prestress.

The 2010 assessment removed the flange on one side of the web for the 1/6th of the span for each beam in the calculation models and found the bridge to still have capacity for 40t ALL with 30 units HB/ SV100.

However, what this does not consider is that areas of damaged concrete on the bottom flange of the beams may allow subsequent impacts to damage the web of the beams, where the post-tensioning tendons are located. If the concrete around these tendons or the tendons themselves are damaged, this could lead to significant redistribution of the prestress to other areas of the structure. This could have one of the following two consequences:

- If the redistribution of the prestress to the new locations is sustained, then no further degradation would occur.
- If the redistribution of the prestress is not sustained, that member would also fail and progressive redistribution of even greater stresses would occur. If this process continues unarrested, it could lead to a catastrophic brittle failure of the structure.

Hence, it is important to further investigate the structural behaviour through updated assessments and PTSI. Furthermore, before this can be done, and given the structure current condition as reported in the 2025/26 PI, it would be prudent to impose interim measures on the structure to limit the applied loading.

A4.2.7. Description of distress (if present):

The 2010 assessment certified the structure to full capacity in its damaged state at that time. Subsequently, there have been further impacts to the bridge causing further defects. No further assessment has yet been undertaken to appraise the structural implications of these impacts and the associated defects that have arisen. The latest 2025/26 PI report did not record any signs of structural distress (e.g.,



flexural or shear cracking) albeit records significant deterioration/ further defects since the previous 2019/20 PI. The 2025/26 PI report recorded the overall condition of the bottom flange of the precast beams in Span 2 as poor, particularly above Lane 1 and 2 of the eastbound M4 carriageway. As discussed in the previous section, further impact strikes could lead to distress and failure.

A4.3 CONSIDERATION OF RISK POSED BY STRUCTURE IN CURRENT STATE

A4.3.1 Discussion

In the structure's current state it is considered that there is minimal risk of the structure collapsing as the latest 2025/26 PI has not recorded any signs of structural distress. However, given the frequency of vehicular impacts in the past and likelihood of future vehicular impacts, combined with the uncertainty surrounding the redistribution of the prestress, the structure should be considered to be at risk.

A secondary risk posed by this structure is to users of the M4 from falling debris following any future impacts. The likelihood of this is reasonably low as loosened debris from previous impacts have been removed, however, a risk is still present from debris loosened by any future impacts, especially unreported impact events. Therefore, it is prudent to mitigate the potential structural inadequacies and the risk of spalling concrete over the highly tracked M4 carriageway below, in particular Lane 1 of the eastbound carriageway.

A4.3.2 Is the Structure an Immediate Risk Structure?

No - CS470 Clause 3.2.1 outlines scenarios where an immediate risk structure should be considered. For Bishton Llanmartin Overbridge, it is not considered that any of the thresholds have been met within this clause viz:

- 1) According to the 2010 Assessment, the structure is able to withstand full HA, 30 units HB and SV100 loading, albeit based on the condition at that time. Furthermore, this assessment also considered the removal of one half of the flange for 1/6th of the span in this analysis.
- 2) The 2025/26 PI has not recorded any signs of structural distress (i.e., the formation of any flexural or shear cracking).
- 3) The structure is not considered to be at risk of a brittle failure mode based on the information known at this stage but this will be kept under continual review as the assessment progresses.

Whilst we consider the structure has not met the threshold of an Immediate Risk Structure, based on this qualitative appraisal of the 2025/26 PI alongside the 2010 assessment, the structure's condition and high likelihood of further bridge strikes could lead to a collapse scenario if the structure is not remediated in the short-term.

A4.3.3 Is the Structure a Low Risk Provisionally Sub-standard Structure?

No - CS470 Clause 4.4.1 outlines the scenarios indicative of a low risk structure. This asset is not considered low risk for the following reasons:



- 1) The primary load carrying elements are the ones exposed to increased structural risk with each bridge impact following the 2010 assessment, which only considered the condition of the structure at that time.
- 2) The consequences of failure are high, given the structure spans the six-lane dual M4 carriageway below.

Notwithstanding the above, there is also additional secondary risks from the bridge impacts whereby falling debris poses significant safety risks to users of the M4 who are travelling at high speed.

A4.4 APPROPRIATENESS OF MONITORING

A4.4.1. Discussion

As noted in Section A4.2.6, the failure of the structure could be progressive or sudden depending on the redistribution of prestress after vehicle impact damage. Regardless, it would be prudent to undertake regular visual inspections of the bridge soffit as a precautionary measure to detect any new signs of distress.

Due to the significance future vehicle strikes may have; it is imperative that the WG/ SWTRA are aware of any unreported strikes. Further to this, future strikes may loosen concrete and subsequently fall onto the underlying carriageway resulting in significant disruption and risk to public safety. Regular monitoring activity would help to detect this and allow the WG/ SWTRA to act swiftly should they need to.

A4.4.2. Is the structure monitoring-appropriate?

No - given the uncertainty in failure mode of the structure, at this stage, and the potential for hidden signs of distress within the structure (tendons), the structure does not fully satisfy the criteria outlined in Clause 6.9 of CS 470. However, there are elements that can be monitored that would provide forewarning to WG/ SWTRA in the interim before the assessment and post-tensioning special inspection are completed.

The following should be monitored at regular intervals:

- Signs of distress (checking for development of flexural and/or shear cracking),
- Signs of unreported vehicle impact (new defects, paint exchange, scrapes etc.),
- Signs of loosened concrete/ debris that could fall onto carriageway (removal activity should be prepared for prior to inspection to take advantage of traffic management should any loose debris be found).



A4.5 OPTIONS FOR LOAD MITIGATION INTERIM MEASURES

A4.5.1 Option L1: Lane Closure on Waltwood Road

To reduce applied loading on the bridge, the north-eastbound lane of Waltwood Road would be closed, employing a contraflow system on the opposing lane. This lane has been chosen as it sits above the highest quantity of existing defects.

This would mean that should a vehicle strike the bridge in future and cause damage, the loading applied to the bridge would be reduced, meaning the likelihood of overloading would also be reduced.

These measures should remain in place until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

This would require long-term traffic management and reduction of network capacity for Waltwood Road and the surrounding areas.

The following anticipated cost factors should be considered:

- Traffic management design,
- Traffic management installation, operation and removal.

A4.5.2 Option L2: Lane Closure on M4 Eastbound Lane 1

To mitigate further vehicle impacts Lane 1 of the M4 eastbound carriageway could be closed. It is above this lane where the highest quantity of defects is found and where the lowest headroom (marginally) is found. Closing this lane would move the traffic away from this area, lowering the risk of existing defects worsening.

These measures should remain in place until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

This would require long-term traffic management and reduction of network capacity for the M4 eastbound carriageway and the surrounding areas.

The following anticipated cost factors should be considered:

- Traffic management design,
- Traffic management installation, operation and removal.

A4.5.3 Option L3: Impose a Weight Restriction on the Bridge

An alternative option to reduce the applied live loading from Waltwood Road is to apply a 7.5 t weight restriction (pending agreement with WG/ SWTRA). This would allow both lanes to remain open reducing disruption to most users but would exclude any heavier vehicles.

The weight restriction would reduce the risk of overloading should the structure be affected by a future vehicle impact.

Traffic management would not be required as drivers could be informed of the weight restriction through pre-engagement and signage on approach routes to the structure. However, without additional enforcement, there is a risk that this exclusion could be



ignored by some drivers. Vehicles above 7.5 t would require a diversion route to reach the other side of the bridge.

These measures should remain in place until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

This option would not need traffic management, however, pre-engagement with road users and temporary signage would need to be installed. A diversion route would also be required for vehicles greater than 7.5 t tonnes.

The following anticipated cost factors should be considered:

- Community engagement,
- Installation, operation and removal of temporary signage for weight restriction and diversion route.

A4.5.4 Option L4: Close the Bridge

The final option to reduce the applied live loading from Waltwood Road would be to close the bridge to traffic in both directions. This would remove all live loading and reduce the risk of overloading if the structure was damaged by a future vehicle impact. In comparison to Option L1 and L3, this option provides the greatest reduction in live loading and therefore risk of overloading. However, it also has the most severe impact on the network and would require a diversion route for all traffic.

These measures should remain in place until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

No through traffic would be allowed on Waltwood Road meaning a diversion route for all traffic would need to be in place. Vehicles would need to be physically excluded through traffic management apparatus and signage.

The following anticipated cost factors should be considered:

- Traffic management design,
- Traffic management installation, operation and removal.

A4.6 OPTIONS FOR MONITORING INTERIM MEASURES

Whilst not strictly monitoring-appropriate to manage the structural risk, for the reasons as outlined in Section A4.4.2. Monitoring of the structure to manage the risk of unreported bridge strikes and the risk posed to the public from falling debris is considered proportionate given the regularity of the impacts and potential for degradation of loose and delaminated concrete.

A4.6.1 Option M1: Reactive Monitoring

Regular visual monitoring of the soffit of the bridge could identify any new key defects, review whether there have been unreported vehicle strikes and check whether there is loose debris that needs to be removed. The inspections can be



undertaken in combination with a 3D point cloud system that would scan the bridge from a vehicle driving underneath it. This would allow a comparative analysis of the data to a baseline set undertaken in May 2023, showing any changes in geometry and allowing measurements to be extracted.

It is recommended that these visits are undertaken every three months and after each reported new incident until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

Each inspection visit would require full or sequential lane closure of the M4 carriageways to allow the inspection to take place, which could cause some disruption to the network. The 3D point cloud would not require traffic management as the scan is undertaken from a vehicle driven on the carriageway in normal traffic conditions – multiple passes may be required to achieve accurate datasets.

The following anticipated cost factors should be considered:

- Traffic management design,
- Traffic management installation, operation and removal,
- Visual check/ inspection operational costs.
- Specialist contractor for collection and processing of 3D data,
- Comparative analysis of the data to a baseline set.

A4.6.2 Option M2: Live Monitoring

Alternatively, a live monitoring approach could be investigated and if found suitable used, for example, by deploying accelerometers on the bridge in combination with CCTV cameras¹² or similar. When the bridge is struck by a vehicle a real-time alert would be sent to the bridge manager, with video and images from the CCTV cameras as well as data from the accelerometer. This would allow the bridge manager to view any visible damage, quantify the magnitude of the impact and record the details of the offending vehicle. Following an impact the reactive monitoring mentioned in Option M1 would be activated triggering inspection and 3D point cloud surveys. This data can be used to inform any reactive closures and repair/maintenance of the structure as well as provide WG/ SWTRA with evidence for insurance or legal claims. It is recommended that regular (trimonthly) inspection visits and point cloud surveys are still undertaken to monitor for newly developed signs of distress.

This system would need to be in place until a repair/ remediation strategy can be implemented, it could also be retained for future use after repair.

Operational and Cost Implications

Each inspection visit would require full or sequential lane closure of the M4 carriageways to allow the inspection to take place, which could cause some disruption to the network. The operational and cost implications associated with Option M1 also need to be figured into this option.

¹² [BridgeStrike System TfL Case Study](#)



The following anticipated cost factors should be considered:

- Specialist contractor for planning, installation, operation and maintenance of monitoring system and CCTV,
- Traffic management design,
- Traffic management installation, operation and removal,
- Visual check/ inspection operational costs.
- Specialist contractor for collection and processing of 3D data,
- Comparative analysis of the data to a baseline set.

A4.6.3 Option M3: Preventative Live Monitoring

The final monitoring approach to be considered is a preventative measure that aims to forewarn over height vehicles in advance of the structure so they can join an unrestricted route (possibly via the A4810). This would involve the use of a camera system that can measure the height of vehicles and display a warning to the driver.

These measures should remain in place until further assessment of the bridge deck has been undertaken and a repair/ remediation strategy can be implemented.

Operational and Cost Implications

Operationally this would be quite difficult to achieve given the position of the bridge. Either side of the bridge are major motorway junctions (M4 23a and 24) which have accesses from multiple different routes. All of these routes would require the detection system far enough in advance for the offending vehicles to be able to change route before they enter the M4 – as once they enter they would have no way to stop or turn back. The facility to accurately measure vehicles may require a speed restriction and traffic management.

The following anticipated cost factors should be considered:

- Traffic management design,
- Traffic management installation, operation and removal,
- Specialist contractor for planning, installation, operation and maintenance of monitoring system.

This option deemed to be impractical due to the position of the bridge and the adjacent junctions' geometries.



A4.7 RECOMMENDED OPTIONS FOR INTERIM MEASURES

A4.7.1 Recommended Load Mitigation Interim Measures:

It is recommended that **Option L1: Lane Closure on Waltwood Road** is implemented. It is recommended that the northbound lane of Waltwood Road is closed given that is where the majority of the defects have been reported within the 2025/26 PI report.

A4.7.2 Recommended Monitoring Interim Measures:

It is recommended that **Option M2: Live Monitoring** is implemented as this will provide real time information on the quantity and magnitude of vehicle strikes as well as full visual inspection and 3D point cloud data to ascertain the condition of the bridge at regular intervals. It is recommended that the options are investigated further (including cost analysis) in an options study.



APPENDIX A6: PROPOSAL FOR INTERIM MEASURES

A6.1 GENERAL DETAILS

Refer to Section A4.1 in this document.

A6.2 PROPOSED INTERIM MEASURES

A6.2.1 Summary of assessment progress

As discussed in the introduction, the bridge is frequently struck by vehicles. This has resulted in the soffit of the bridge being in poor condition with numerous areas of completely spalled concrete with exposed reinforcement on the bottom flange of the precast beams. Due to the impact history of the structure, future vehicle impacts are highly probable until a permanent measure is implemented to address the root cause of the issue.

The previous assessment undertaken in 2010, found the bridge to have a capacity of 40t Assessment Live Loading in combination with 30 units HB loading or an SV100 load model. This assessment was undertaken to the previous suite of DMRB standards and took into consideration the condition of the structure at that time. Since then, there have been numerous subsequent impacts and the assessment standards have been updated. Accordingly, an updated assessment has been instructed. However, before the assessment is undertaken, temporary interim measures have been explored in Appendix A4 of this report to minimise the risk to the structure and the networks users until a more comprehensive understanding of the structural risks is determined. Following the completion of the assessment this document should be reviewed based on the assessment outcomes to mitigate any change in the level of structural risk and the immediacy of the risk.

A6.2.2 Summary of feasibility of options for Interim Measures

Four options for load mitigation interim measures have been proposed:

- Option L1: Lane Closure on Waltwood Road,
- Option L2: Lane Closure on M4 eastbound Lane 1,
- Option L3: Weight Restriction on the bridge,
- Option L4: Closure of the bridge.

Option L2 provides mitigation from future vehicle impacts in one of the most severe location, whilst Options L1, L3 and L4 reduce the applied live loading such that if a future vehicle impact occurs the risk of overloading is reduced. In terms of disruption to the network, Options L2 and L4 are likely to be the most onerous; Option L2 will be reducing the capacity of a major trunk road whilst Option L4 will require a diversion route for all traffic. Option L3 also requires a diversion route for vehicles that are over the imposed weight limit (7.5 t is suggested).



It is recommended that **Option L1 – Lane Closure on Waltwood Road**, is adopted to reduce the magnitude of the live load applied to the deck and also push traffic to the side of the bridge where there are fewer defects. It is proposed that the northbound lane of Waltwood Road would be closed. This will require long-term traffic management and consequently there will be some disruption to the local network. Therefore liaison with Newport City Council (NCC) is recommended at an early stage.

Additionally, three options for interim monitoring measures have been proposed:

- Option M1 – Reactive Monitoring,
- Option M2 – Live Monitoring,
- Option M3 – Preventative Live Monitoring.

Option M1 would require sequential lane closures on the M4 carriageway to facilitate tactile inspections. Option M2 implements a live system in combination with tactile inspections and 3D point cloud surveys requiring the same traffic management (for the inspections) but with the benefit of additional data collection. **Option M2: Live Monitoring** provides the best of both options and is the option recommended. Option M3 – Preventative Live Monitoring is ruled out due to the practicalities of setting up check-points on all of the access routes to M4 Junction 23a and 24 enough in advance for rejected vehicles to be able to take alternative routes or leave the M4.

For further details, refer to Appendix A4 Interim Measures Feasibility Assessment for bridges document as part of this CS 470 proforma (see Section A4.6 above).

A6.2.3 Summary of Recommended Load Mitigation Interim Measures (details attached as an appendix, if appropriate) including maximum duration and date for formal review

Option L1 - Lane Closure on Waltwood Road

Closure to be on northbound lane on Waltwood Road as this is directly above the highest quantity of defects on the soffit below. Traffic management to be employed through contraflow or similar system designed by a competent contractor.

The maximum duration of the load mitigation interim measures is subject to agreement with WG TAA, as the interim measures should be kept in place until a permanent solution is implemented or pending review after the updated assessment has been completed.



A6.2.4 Summary of Recommended Monitoring Interim Measures, if appropriate (refer to Monitoring Specification, attached as an appendix) including maximum duration and date for formal review.

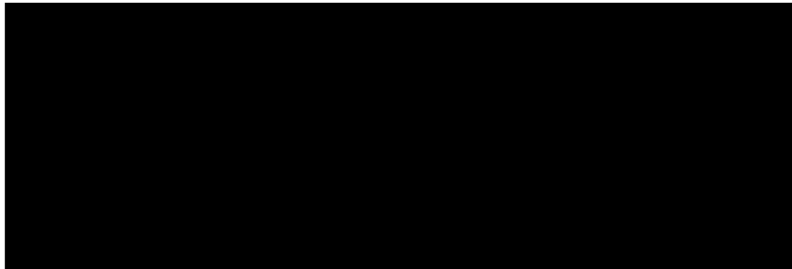
Option M2: Live Monitoring

Combination of tactile visual inspection, live monitoring and 3D point cloud surveys allow the benefit of up-close inspection and surveying (picking up on small defects like development of cracks etc.), with the real time feedback provided by the live monitoring system. It is advised that the inspections are still undertaken on a 3-monthly basis and after each vehicle strike.

The maximum duration of the monitoring interim measures is subject to agreement with WG TAA, as the interim measures should be kept in place until a permanent solution is implemented or pending review after the updated assessment has been completed.



A6.2.5 Proposal made by:

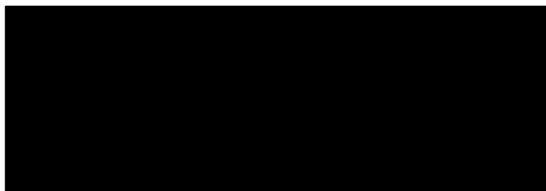


Date: *Refer to digital
signature*

[Redacted Name]

Assessment Team Leader

[Redacted Title]



Date: *Refer to digital
signature*

[Redacted Name]

Principal

[Redacted Title]



A6.3 ACCEPTANCE OF INTERIM MEASURES

A6.3.1 Appraisal of recommended Load Mitigation Interim Measures and Monitoring Interim Measures (if appropriate)

Comments (Structures Engineer)

Date: *Refer to digital signature*

TAA - Structures Engineer

Comments (Head of Structures)

Date: *Refer to digital signature*

Head of Structures, Welsh Government,
Transport



A6.3.2 Acceptance of Load Mitigation Interim Measures (if required)

..... Date:

..... Newport City Council

A6.3.3 Instruction to Implement Interim Measures

Interim Measures to be implemented:

..... Date:

..... Overseeing Organisation and/ or
Structures Owner



Annex A: Roads 277 Form

(an extract from 2025/26 PI)

STRUCTURE NAME

BISHTON-LLANMARTIN OVERBRIDGE

ROADS 277(REV 4/24) WALES



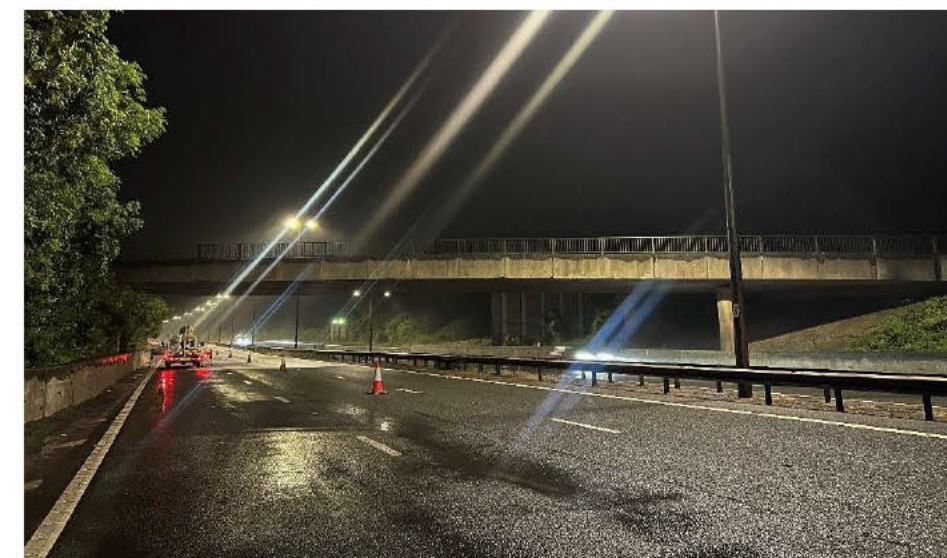
W.G.	M4 23A-24 51	National Grid Ref.	339121	189225
Structure No.				
W.G. File Ref		Date of issue of form	NOVEMBER 2025	
Current LA	MONMOUTHSHIRE COUNTY COUNCIL	Date of Last Principal Inspection	JULY 2025	
Previous LA	GWENT COUNTY COUNCIL			
Maintaining Agent For Structure	SOUTH WALES TRUNK ROAD AGENT	Structure Owner		
For Road Surface	SOUTH WALES TRUNK ROAD AGENT	If not W.G.		
		Maintaining Agent		
		Structure Ref.		

Year Structure Commissioned	1966	WGAMP Asbestos Status	Amber <i>Asbestos Presumed</i>	
Design Office	UNKNOWN			
Does the road go *over/under	UNDER			
*Railway, Canal, River, Road?	ROAD	Is the Structure susceptible to scour?	YES ☐	NO ☒
Railway Bridge Number	N/A	BD 97 Scour Risk Rating	N/A	
		Road/Rail Incursion Score	N/A	
Is the River/Canal Tidal?	YES ☐ NO ☐	Is the Structure on the High Load Route?	YES ☐	NO ☒
Is the River/Canal navigable?	YES ☐ NO ☐	Is the Structure on the Heavy Load Route?	YES ☐	NO ☒
Name of Navigation/Drainage Authority	NATURAL RESOURCES WALES	Name of Statutory Undertakers having services on bridge		
Is the Structure scheduled as an Ancient Monument?	YES ☐ NO ☒			

*Please delete as necessary

Min Headroom Clearance *under/over	*Motorway/Trunk Road carriageways		
N. Bound / W. Bound	5130	Design Load	UNKNOWN
S. Bound / E. Bound	5030	Design standard version	-
* Please delete as necessary		Special loading/restriction	-
Assessed Capacity HA/HB	HA & 30 UNITS HB	CS 470 Monitoring	YES ☒ NO ☐
Date of Assessment	2010		
CS 461 Parapet Risk Rating	VERY LOW	CS 453 At Risk Support Cat.	-

Materials:	Construction Details
Deck/Wall/Mast (e.g. in situ PSC)	PRECAST POST-TENSIONED I-BEAMS WITH IN-SITU
	REINFORCED CONCRETE DECK SLAB
Type of Construction (e.g. Solid Slab)	BEAMS AND SLAB
Form of Deck (e.g. Propped Cantilever)	3 SPAN CONTINUOUS
End Supports (e.g. Skeleton Abutment)	SKELETON ABUTMENTS
Intermediate Supports (e.g. Slab Wall)	COLUMNS WITH CROSSHEAD INTEGRAL WITH DECK
Nature of Foundations (e.g. Caissons)	CONCRETE PAD FOUNDATIONS
Half joint / Hinge Joint / Post tensioned?	POST-TENSIONED CONCRETE I-BEAMS





Annex B: Risk Management Matrix



1) RISK MANAGEMENT MATRIX

The following Risk Management Matrix has been extracted from *Risk Essentials – A Risk Management Framework* prepared by Welsh Assembly Government. All identified risks are mapped onto the risk management matrix which feeds into the Risk Register provided in the **2) Risk Management Register**.

Likelihood \ Impact	Low (1)	Low/Medium (2)	Medium (3)	Medium/High (4)	High (5)
High (5)	5	10	15	20	25
Medium/High (4)	4	8	12	16	20
Medium (3)	3	6	9	12	15
Low/Medium (2)	2	4	6	8	10
Low (1)	1	2	3	4	5

1-3	Overall rating is 3 or less. Manageable Risks: The Assembly Government is content to carry these risks. No need to consider the risk appetite nor to proceed any further with the assessment but merely record that the risk has been identified and that due to its low likelihood or impact not further action will be required.
4-14	Overall rating is 4 - 14. Material Risks: The Assembly Government is concerned about these risks. The risks need to be managed by the department/division in which they have been identified.
15-25	Overall rating is 15 or above. Significant Risks: The Assembly Government is most concerned about these risks. These risks will be considered as significant and should be notified to the Head of Department who will decide whether they need to feature in the Management Board's risk register.



2) RISK MANAGEMENT REGISTER

The risk register below is based upon *Risk Essentials – A Risk Management Framework, Annex A5 Departmental risk register* and modified to reflect the relevance of each section at the current stage of writing this proforma.

It shall be noted that the risks and the associated overall rating are considered appropriate for a period of **12 months**.

It is recommended that these risks are dynamically reappraised.

I = Impact (impact if the risk materialises, scored 1-5)

L = Likelihood (likelihood of the risk materialising, scored 1-5)

O = Overall rating (impact x likelihood, scored 1-25)



Ref. no.	Risk Description (including cause and consequence in the format "If...then...")	I	L	O	Proposed Risk Mitigation Measures	I	L	O	Date of last review
001	Risk of structure collapse or local failure due to future vehicle impact on bridge causing damage to post-tensioned beams leading to overload of structure Future vehicle impacts could cause reduction in capacity and redistribution of prestress in the post tensioned beams. This combined with live loading from the bridge deck could cause overloading of the structure leading to brittle failure if redistribution is not sustained. Likelihood of this happening is low, even though frequency of vehicle strikes is high. Waltwood road is a small residential road, unlikely to be loaded to level of full live load model. Previous assessment certified the structure for full Assessment live loading in damaged state (at time of writing in 2010).	5	2	10	Load Mitigation Measure: Lane Closure on Waltwood Road: Closure of northbound lane on Waltwood Road, reduces applied loading on top of bridge so that risk of overloading is reduced should a future vehicle impact take place. Monitoring Mitigation: Live monitoring with regular (3 monthly) visual inspections and point cloud survey: Live monitoring will allow the bridge manager to view any visible damage, quantify the magnitude of the impact and record the details of the offending vehicle. This data will be used to inform any reactive closures and maintenance of the structure as well as provide WG/ SWTRA with evidence for insurance or legal claims. Regular visual inspections and 3D point cloud surveys will allow SWTRA/ WG to monitor for: • Unreported bridge strikes, • New signs of distress (flexural and/or shear cracking), and • Loosened concrete in soffit.	5	1	5	December 2025 – Principal Inspection