14 April 2023

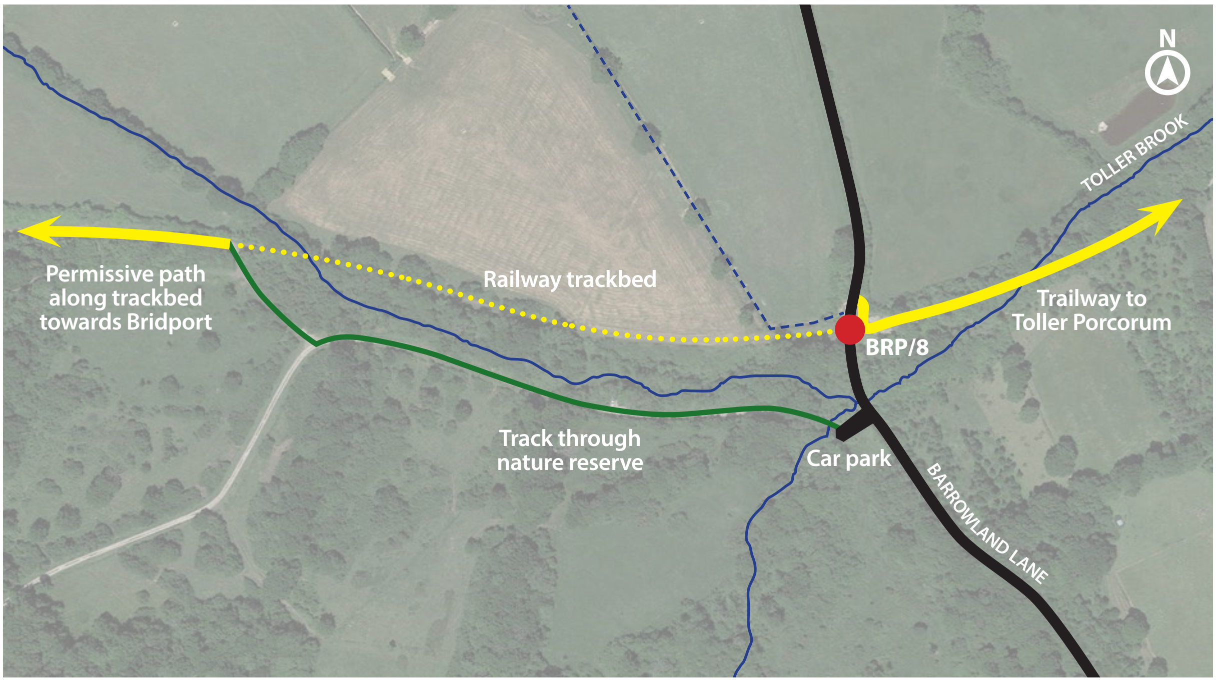
BRP/8 Barrowland Lane bridge, near Toller Porcorum, Dorset

We visited underbridge BRP/8 on the morning of Saturday 25 March 2023. Conditions were dry, bright and breezy, but underfoot conditions were wet following a period of heavy overnight rain.

Background context

East of the bridge, the trackbed of the former Bridport Railway is now used for a 'trailway' connecting the Kingcombe National Nature Reserve at Powerstock Common with Toller Porcorum, one mile to the east. The nature reserve is served by a small car park, the entrance to which is located 55 yards south of the bridge along Barrowland Lane.

Immediately west of the bridge, the trackbed is private property and the landowner is reportedly opposed to its repurposing either for active travel or a proposed light railway. After 400 yards, the trackbed is accessible again as part of a permissive path. A route between the two sections of path is available via Barrowland Lane, the car park and a rough, potholed track.



Aerial view indicating the location and connectivity value of the bridge, together with the local watercourses.

Bridport, six miles south-west of the bridge, is a lively and attractive town, holding a street market on Wednesdays and Saturdays. Tourism is a contributor to the local economy. The nearest railway station is at Maiden Newton, 3.6 miles east of the bridge. The dismantled railway links these two locations.

Bridport street market, held on Wednesdays and Saturdays.

There can be reasonable confidence that a continuous, high-quality active travel route connecting Maiden Newton to Bridport/West Bay - passing over BRP/8 and through the Dorset Area of Outstanding Natural Beauty - would deliver an economic uplift, as well as bringing physical and mental health benefits whilst returning a heritage asset to use.

In this context, demolition would be short-sighted and negatively impact on the viability of completing an active travel route at some future time. The fact that the landowner objects to their section of trackbed being exploited for such a purpose does not justify loss of the bridge as the current circumstances may change (sale of the property, introduction of land management scheme incentivising public access etc). Ultimately there is also the option of seeking a creation order to establish a new right of way.

The Bridport Railway - including the bridge - is identified on the Dorset Historic Environment Record as asset number MWX70.

It can be inferred from Captain H W Tyler's Board of Trade inspection (6 October 1857) that, when opened, no bridges on the branch had metal spans. Testimony from a ganger and *The Bridport Railway* book (Jackson/Tattershall) indicates that all the timber spans were replaced between 1901 and 1934 following the line's takeover by the Great Western Railway.

As is clear from the 'ghost sign', the new girders were manufactured by the Patent Shaft & Axletree Co Ltd (1840-1980), operators of a major steelworks at Wednesbury in the West Midlands. The firm was responsible for an early steel bridge over the Ganges at Benares in 1885 and went on to become a prolific bridge builder in both the UK and abroad.

Access to/from the trailway

The existing 'temporary' ramp from Barrowland Lane onto the trailway is located on the north side of the eastern approach embankment and was used by one walker, one cyclist and two horseriders during our visit. Although it is steeper than the maximum 1:20 gradient recommended in LTN 1/20 (guidance for local authorities on designing high-quality, safe cycle infrastructure), the ramp only extends for approximately 40 feet. Simple and minor realignment works could be undertaken to further ease the gradient if such a need is identified.

The existing 'temporary' ramp onto the trailway that connects the nature reserve to Toller Porcorum.

One cyclist exited the trailway by riding down a narrow path on the south side of the eastern approach embankment. This follows Dorset Council's intended access ramp route prior to the emergence of National Highways' bridge demolition proposal. A longer ramp with a shallower gradient could still be constructed along this alignment.

National Highways asserts that demolition of the bridge would improve sightlines; however the practical benefits of this would be marginal. It should be noted that many access ramps to/from active travel routes are located alongside underbridges.

The view north (left) and south (right) from the bottom of the temporary ramp on the north side of the bridge. Beyond the abutment, the bend in the road is obscured by trees (see south-facing photo on next page).

Traffic approaching from the south - through trees and around a bend adjacent to the car park entrance - presents the greatest risk to walkers and cyclists. Demolition of the bridge would deliver little improvement in this regard; indeed, it would remove the opportunity to address the risk at some future time by routing the trailway over the structure.

From the bottom of the 'temporary' ramp, the bridge does not impede the visibility of traffic approaching from the south to any extent, but it does deter any cyclist heading down the ramp from riding straight out into the road without stopping.

If a replacement ramp was constructed on the south side of the embankment - closer to the bend - visibility of traffic approaching from the south would be unchanged. Looking north from the verge on the east side of the road, it is possible to see approaching traffic through the bridge without obstruction.

The view north (left) and south (right) from the bottom of the originally intended ramp on the south side of the bridge. The blind bend presents the greatest risk to trailway users.

We have spoken to locals who confirm that traffic levels on Barrowland Lane are very light. During our visit of just over 1½ hours, eight vehicles were recorded passing under the bridge - mostly 4x4s and pickups, plus one van. Several other vehicles approached from the south but turned into the car park. Speeds were slow, a function of the narrow lane and bends.

It is recognised that traffic levels/types will be different at other times; however, the risks presented by road traffic to individual trailway users would not be improved meaningfully by demolition of the bridge - the risk is mostly from the blind bend at the car park entrance.

Headroom 'issue'

On the basis of the traffic levels/types reported by locals and witnessed by us, there is little evidence to suggest that the bridge's limited headroom is problematic to any extent. No damage to the superstructure was observed during our visit, but we are unable to source any past inspection reports due to National Highways' effective ban on our Freedom of Information requests. We cannot therefore be certain that any previous damage has not been repaired.

Photos showing the width of Barrowland Lane at the entry/exit points of an alternative route via Toller Porcorum.

It is also noted that trees overhanging the road on both approaches to the bridge restrict vehicle height. Barrowland Lane is very narrow in places and not suitable for large vehicles. The road extends for approximately 1.2 miles between the entry/exit points of an alternative route of approximately 2.8 miles via Toller Porcorum.

Drainage/long-term flooding

As Barrowland Lane dips to pass under the bridge, a sump is created and flooding occurs occasionally, reaching a depth of up to approximately 3 feet. Two streams approach from the west, coming together immediately adjacent to a brick arch bridge carrying Barrowland Lane over what becomes Toller Brook, which passes beneath the former railway approximately 120 yards further east.

The confluence of two streams which pass under the road, forming Toller Brook.

The extent to which this watercourse contributes to the flooding is not clear. It was noted that channels appear to have formed through the otherwise raised verge on the west side of Barrowland Lane but, to overtop onto the road, the water level would have to be considerably higher than on the day of our visit, after heavy overnight rain.

A channel appears to have been excavated from farm buildings 600 yards north-west of the bridge, down the hill adjacent to a field boundary and then along the northern toe of the western approach embankment. During our visit, some of the water in this channel was flowing into a drain at the end of the collapsed north-west wingwall, whilst the remainder ran down the verge and pooled beneath the span before entering a drain at the base of the eastern abutment.

Locals also report water running down the road after downpours.

An overview of the bridge drainage system, with additional views into the south-west drain (right upper), south-east drain (right middle) and abutment drain (right lower).

Drains are located close to the lower end of all four wingwalls. Those on the south-side of the bridge appear to be linked, with the western drain observed to be full of water due to the eastern drain being blocked with mud/vegetation.

Pipes connect with the abutment drain from both the north and south. This drain contained water which was not escaping at any discernable rate. We were unable to locate any discharge point for this drainage system and have requested drawings from the highway authority.

National Highways asserts that demolition of BRP/8 would allow the road to be realigned above the typical floodwater level. In this event, it should be recognised that the resulting loss of grandfather rights would mean that any replacement bridge would have to be 7-8 feet higher than existing in order to achieve standard minimum highway clearances. In turn, considerable and expensive earthworks would be required on both approaches to achieve acceptable gradients, particularly in the case of any future rail use. This would negatively affect the viability of any proposal.

Demolition of the bridge would impose significant additional costs on any future active travel or rail scheme involving the former Bridport Railway.

We would instead wish to understand the extent to which modifications to the drainage system - or improvements in its maintenance - might help to alleviate the flooding problem.

Conclusion

On the basis of the above and the appended Engineering Appraisal, we do not believe that a reasonable case can be made for the demolition of BRP/8 Barrowland Lane bridge. When their practical impacts are considered, the arguments put forward by National Highways are weak, do not outweigh the harm caused or justify the cost.

The currently poor condition of parts of the substructure appears to result largely from the failure of successive asset managers to prevent trees establishing themselves in close proximity.

We believe the bridge should be proportionately and sympathetically repaired, recognising its role as a heritage asset and potential value as part of a future active travel route or railway.

The HRE Group

18 April 2023

BRP/8 Barrowland Lane bridge: Engineering Appraisal

By Alan Hayward FREng CEng FICE FIStructE

These comments reflect more than 50 years experience in the design, construction, inspection and assessment of bridges. Any opinions are made in good faith, but without professional responsibility, and would be subject to detailed investigation.

My comments are based on:

- *HRE major work review template: proforma for SAF consideration (published on National Highways' website)*
- *Report on site visit on 25 March 2023 by The HRE Group*
- *A series of 34 photograph images of the bridge provided by The HRE Group*

[No inspection reports were provided due to National Highways' Freedom of Information ban]

1 Introduction

1.1. The bridge carried the former Maiden Newton to Bridport single track branch railway over Barrowland Lane near Toller Porcorum. The line was opened in 1857 to the 7ft broad gauge [2140 mm] by the Bridport Railway Company and operated by the Great Western Railway. Conversion to standard gauge [1435mm] was in 1874 and the GWR took ownership in 1901. The line was closed in 1975. To the east of the bridge the trackbed is now used as a 'trailway' to Toller Porcorum. West of the bridge for a length of 400 yards the landowner is reportedly opposed to reopening the trackbed for active travel or any future railway.

1.2. With a single clear span estimated at 6.2m, the bridge has brick abutments and wingwalls. Originally the deck was almost certainly of timber construction, supported onto the string course [brick-on-edge plus 2 courses depth] located around 700mm below the present bridge soffit. Reconstruction with longitudinal metal troughs and solid parapets took place after the GWR took over and replaced the line's timber bridges. The troughs are supported on less substantial brick walls above the string course. Pilasters were probably added at this time. Reconstruction would have increased the headroom to the current 3.5m limit. (See Figure 1)

Figure 1: The bridge's north elevation with sign indicating the height restriction.

1.3. In cross section there are 5 troughs, approximately 305mm [12 in] depth and 817 [32 in] wide, likely to be of at least 12.7mm [0.5 in] thickness, butt jointed with riveted cover plates. There are additional lower flange plates over centre part of the span. Material is almost certainly steel [wrought iron was little used in bridges after 1890]. Pressed steel troughing 203mm [8 in] deep was being used by the GWR and other lines in the 1890s for spans up to 4m. However troughing of corresponding sizes to this bridge was only published by Joseph Westwood & Co in 1912 and by Dorman Long from the 1920s. If the deck was replaced after 1912, or as late as the 1930s, it would help to explain the apparent good condition. From markings on the parapets Patent Shaft & Axletree Co Ltd of Wednesbury fabricated the deck, and who manufactured many bridges from 1866.

2 National Highways' intention

2.1 For several years National Highways has intended to demolish the bridge and this remains one of the options presented to the Stakeholder Advisory Forum, citing: "Identified issues with structure" as below:

2.1.1 "The fundamental issue is the substructure, it contains numerous fractures...the abutments [in particular the L/E abutment] appear to be rotating..."

However I would have expected National Highways to have carried out an engineering assessment of the bridge to standards such as CS 454[1] and/or NR/GN/CIV/025[2] in order to justify their intentions. I am not aware of any such assessment. The proforma does not actually refer to the form of construction, or even the span of the bridge.

2.1.2 “The works would be combined with a reprofiling of the carriageway...in order to remove future flooding at the location...”

However The HRE Group has noted a “...wish to understand the extent to which modifications to the drainage system - or improvements in its maintenance - might help to alleviate the flooding problem.”

2.1.3 “...headroom limited to 3.5m [as compared to the required minimum maintained headroom of 5.03m for all existing bridges].”

Many existing bridges, especially on minor roads, have headroom significantly below 5.03m, yet remain in everyday use with height restriction posted. The HRE Group has noted “...there is little evidence to suggest that the bridge’s limited headroom is problematic to any extent.”

3 Present condition of the bridge

3.1 I noted the presence of mature tree stumps around the bridge, especially at the east abutment, where trees have apparently been recently felled. (See Figure 2)

Figure 2: Plan view of felled trees at east abutment and south-east wingwall.

3.2 An inward lean of around 150mm is apparent to the east abutment. Numerous existing 19th Century bridges have leaned abutments, generally due to long term consolidation of ground beneath the foundation toe, but which is rarely critical to overall stability. Usually two abutments supporting a bridge lean by similar degrees. In this case it is strongly suggestive that the east abutment lean has been caused by growth of tree roots expanding against the ground and behind the abutment. (See Figure 3)

Figure 3: Recently felled trees behind the east abutment. (Trevor Streeter)

3.3 The wall above the string course supporting the deck to the east abutment is cracked with fractures and is not leaning in sympathy with the abutment. This suggests propping restraint by the deck, but that the wall has been insufficiently rigid to arrest lean of the abutment. (See Figure 4)

Figure 4: Rotation of the east abutment.

Figure 5: Degradation of the east abutment.

3.4 The east abutment and wingwalls show significant spalling, local cracking, loss of bricks and degradation of brickwork. (See Figure 5) However I see little sign of differential settlement or separation between abutments and wingwalls, indicating that overall integrity of the substructures is intact. Upper parts of the north-west wingwall have collapsed together with loss of front brick face down to road level, apparently due to extensive tree root damage. A photograph from 2011 shows extensive tree growth here. (See Figure 6)

Figure 6: 2011 photograph showing extensive tree growth around the north-west wingwall. (Google Streetview)

3.5 The deck troughs and solid parapets appear to be in good condition, but it would be important to check for corrosion of concealed parts including bearing areas and surfaces covered by fill.

4 Remedial works

4.1 Remedial works should be considered in conjunction with surveys and any available information such as drawings. Brickwork to the abutments and wingwalls should I consider be repaired by brick replacements and repointing as is necessary to maintain integrity, acceptable appearance and public confidence.

4.2 In particular fractured areas should be repaired locally, especially the walls supporting the deck on the east abutment. The north-west wingwall should be rebuilt onto sound existing footings.

4.3 Tree stumps around the abutment/wingwall areas should be removed with treatment of exposed roots to prevent future growth.

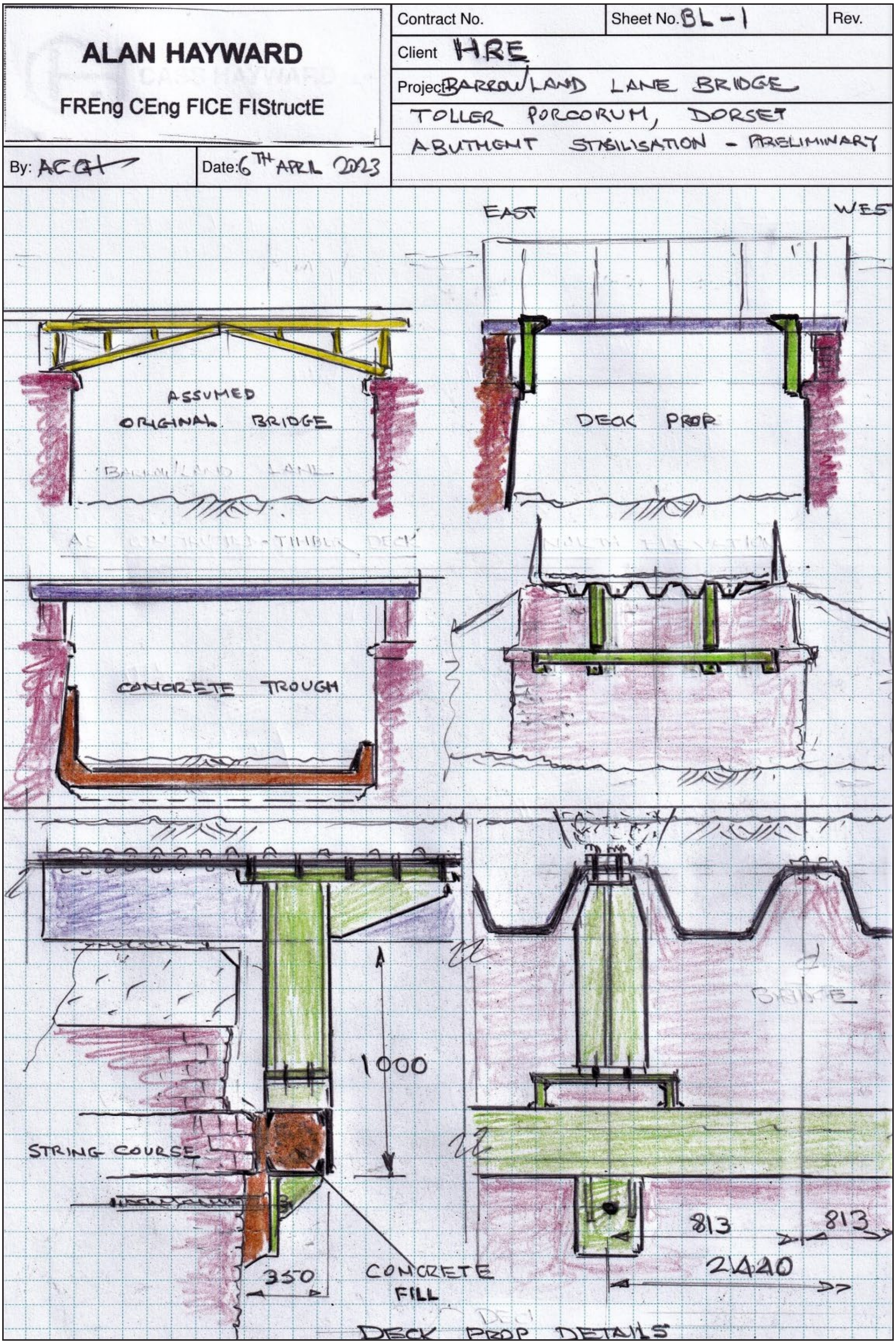


Figure 7: Sketch BL-1 showing two alternatives for stabilisation of the east abutment.

5 Stabilisation of the east abutment

5.1 In order to preserve stability of the east abutment stabilisation options should be considered. Sketch BL-1 (See Figure 7) shows two alternatives as in 5.2 and 5.3.

Options are limited by the reported refusal of the landowner on the west side of the bridge to allow any construction work on their property.

5.2 Concrete trough

A reinforced concrete trough would be constructed within the roadway, taken up to suitable height to restrain the east abutment. At the west abutment the trough could form a kerb so minimising roadway restriction, or be taken up to height as for the east side. The slab beneath the roadway could incorporate a downstand at each end to prevent floodwater ingress.

5.3 Deck prop

Restraint would be achieved by propping at the string course level with steel spreader beams, connected by two brackets at each abutment to the trough deck above. The spreader beams would be secured to the abutment walls and with infill concrete cast against the string course. The brackets would be connected to the trough top flanges with bolting access from above. An indicative calculation shows that troughs with a 12.7mm [0.5 in] thickness would have more than sufficient capacity to resist the forces from "at rest" earth pressures including surcharge. Connection between spreader beam and bracket would incorporate vertical flexibility to allow for deflection of the deck under live loading. This option would minimise restriction to roadway clearance.

6 Conclusion

Based on the information referred to, my conclusion is that the bridge should not be demolished, but should be retained. The bridge can be made suitable for future use for a trafficked throughway above by appropriate remedial works.

References

1 "Assessment of Highway Bridges and Structures", CS 454, National Highways

2 "The Assessment of Underbridges", NR/GN/CIV/025, Network Rail, 2006

20 April 2023

BRP/8 Barrowland Lane bridge: Post-publication note

From Dorset Council

We don't currently possess any drawings/documents showing/describing the drainage system arrangements at BRP/8 Barrowland Lane bridge (formerly carrying the Bridport Railway) near Powerstock Common (SY5470097448), as-built drawings or detailed plans.

Our investigations so far have identified that the gullies under the bridge discharge into a manhole which then discharges water into a ditch system, to the north-east of the bridge that runs parallel to the track, before linking to the river. There is a land drain that discharges into our highway gully to the north-west of the bridge. This is a surface/ground water system that is piped through the embankment which openly discharges into a highway gully.

We are in the process of reviewing the drainage at this location and have instructed a drainage survey from specialist contractors.