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| **From:** | Mike Whiting, Cabinet Member for Planning, Highways, Transport and Waste<br><br>Simon Jones, Director of Highways Transportation & Waste |
| **To:** | Environment & Transport Cabinet Committee - 20 September 2018 |
| **Subject:** | Approach to Managing Highway Structures |
| **Classification:** | Unrestricted |
| **Past Pathway:** | NA |
| **Future Pathway:** | NA |
| **Electoral Division:** | Countywide |

**Summary:** This paper outlines the approach taken to managing highway structures in Kent with specific reference to sub-standard highway structures

**Recommendation:** The Cabinet Committee is asked to note the report and comment on the contents.

## 1. Introduction

1.1 The County Council maintains 2,800 highway structures including bridges, tunnels, culverts, retaining walls and a number of heritage and listed assets . with no structural failures resulting in injury to persons reported in at least the past 30 years, which is as long as our records go back.

1.2 Management of adopted highway structures, valued at an estimated £1.3bn, is undertaken by the Structures Team within Highways Asset Management. The team comprises three engineers and three specialist inspectors with considerable support from professional service providers. Although a relatively low-profile service from a customer service perspective, structures management is one of the most technically complex services provided by Highways Transportation & Waste (HTW).

1.3 Management of highway structures is underpinned by detailed design standards and quality control processes and is supported by a regime of regular inspections. As a minimum, all highway bridges are subject to a two-yearly general inspection, during which an assessment is made of the physical condition of all visible elements of the highway structure. A more comprehensive principal inspection is carried out every six to twelve years depending on the risk associated with the location, usage and condition of the bridge. Additional monitoring, testing and assessments is carried out over and above this where it is deemed to be necessary due to the condition or complexity of a specific structure.

1.4 In March 2017, the RAC Foundation carried out a survey of local highway authorities with the support of the National Bridges Group of ADEPT (the Association of Directors of Environment, Economics, Planning and Transportation). It reported that 4.4% (3,203) of British local road network bridges over 1.5m in span are not fit to carry the heaviest vehicles now seen on our roads, including lorries of up to 44 tonnes. At the time of the report, 29 bridges over 1.5m span owned and maintained by KCC were identified as being included in this number.

1.5 In light of the RAC Foundation report and in readiness for the routine 2019 review of structures, further analysis was carried out encompassing all highway structures. A total of 70 structures were identified of which 39 are highway structures owned and maintained by KCC. These structures comprise of the following:

- 1 pedestrian subway
- 25 bridges with a span greater than 3.0m
- 11 bridges with a span greater than 1.5m but less than 3.0m
- 2 bridges with a span greater than 0.9m but less than 1.5m

1.6 The 31 other structures are owned, maintained and managed by third parties including Network Rail, Highways England and the Environment Agency, all of whom are considered to be competent bridge management authorities.

1.7 The 39 highway structures owned and maintained by KCC are listed at Appendix A.

1.8 KCC owns and maintains structures in other service areas, e.g. PROW and Education, which are not contained within the scope of this report.

## 2 Discussion

2.1 The first government loading standards for highway bridges were introduced in 1922. The term “sub-standard” structure refers to any structure that does not fully meet with current design standards for loading. The current standards, detailed in *BD 21: The Assessment of Highway Bridges and Structures,* were published in 2001.

Management of Sub-Standard Structures

2.2 As noted in *Well-managed Highway Infrastructure*, the new code of practice for highway maintenance, "monitoring interim measures can avoid the disruptive effect of applying load mitigation interim measures". Advice on the monitoring of structures that fail a strength assessment is given in the industry standard *BD 79: Management of sub-standard structures*. This sets out the procedures for managing structures that have been found to be sub-standard.

2.3 A monitoring interim measure is periodic or continuous observation and recording of information. The purpose of monitoring is to determine the extent, severity and rate of deterioration and to determine whether a critical state or other criteria is at risk of being reached.

2.4 The industry standard states that if a structure is found to be "sub-standard", interim measures must be used pending strengthening or replacement of the structure. Load Mitigation Interim Measures i.e. a weight restriction, propping or closure to traffic must be imposed unless all the following criteria are met:

- No sign of significant distress is observed, and hidden distress, deterioration or weakness is unlikely to be present
- Distress is observed but does not appear to be recent or significant and detrimental to the safety of the structure.
- Failure is likely to be gradual over time and it is it must be possible to predict deterioration rates with reasonable certainty.
- Monitoring will be meaningful and effective

Sub-standard Structures owned and maintained by KCC HTW

2.5 The 39 sub-standard highway structures have been identified as such for one, or a combination of, the following reasons:

- Increased design and loading requirements since construction of the structure
- Deterioration
- The structure was inherited from a third party in poor condition
- A historic designation which has not been reviewed since the completion of strengthening

The design life for modern highway structures is 120 years. Over this period of time it is inevitable that road usage and vehicle specifications will evolve with a knock-on effect on design and loading requirements. It is therefore unsurprising that the biggest influence, affecting 32 of the 39 structures listed, is changes in the design and loading requirements since construction.

2.6 All 39 structures are subject to six-monthly monitoring. Weight restrictions have been imposed at six locations and asset protection such as trief kerbing to prevent vehicles leaving the carriageway and discourage pedestrians from crossing the highway due to the height of the kerb, has been implemented at a further five locations. Details of the interim measures that have been imposed at each structure are provided at Appendix A.

2.7 During 2019, the management of all 39 structures considered sub-standard will be subject to a routine review. The primary outputs of this review will be:

- a revised list of monitoring and interim asset protection measures
- a prioritised list of strengthening, refurbishment and renewal works

2.8 Strengthening or replacement of the County's sub-standard structures is likely to take a number of years. The necessary work will need to be prioritised, whilst ensuring the safety of the structures by maintaining appropriate interim measures.

2.9 Prioritisation of strengthening and replacement work will take account of the following:

- Highway safety
- Network disruption not only in the immediate vicinity but on alternative routes
- The impact on local businesses, communities and the surrounding environment
- The maximum intended duration for Monitoring Interim Measures

## 3 Financial Implications

3.1 In Kent, the estimated backlog of work on all highway structures is estimated at £22m and includes a broad range of activities ranging from the repair of minor defects, large scale refurbishments and maintenance tasks such as painting which is designed to preserve and protect the asset. In 2018/19 capital investment in highway structures is expected to be £2.24m. This, and any further capital funding which becomes available, will be prioritised based on safety, usage and the removal of restrictions on the highway network in line with KCC's approved asset management approach.

## 4 Conclusion

4.1 The County Council maintains 2,800 highway structures including 945 bridges exceeding 1.5m in span. 39 highway structures i.e. 1.3% have been identified as sub-standard in accordance with national technical guidance and of these, 36 are bridges exceeding 1.5m in span.

4.2 The implementation of an improved asset management-based approach to highway maintenance has highlighted the need to strengthen some structures due to changes in design and loading requirements since construction. There will be a growing need for increased investment in years to come.

4.3 In 2019 all sub-standard highway structures managed by HTW will be subject to a routine review. The need for strengthening, replacement or enhanced monitoring will be determined on a site by site basis and a risk-based approach will be used to prioritise delivery.

## 5 Recommendation

5.1 The Cabinet Committee is asked to note the report and comment on the contents.

## 6 Background Documents

- RAC Foundation report regarding sub-standard structures (2017): https://www.racfoundation.org/research/economy/substandard-road-bridges-foi-2017
- Well-managed Highway Infrastructure: http://www.ukroadsliaisongroup.org/en/codes/
- BD 21: The Assessment of Highway Bridges and Structures http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol3/section4/bd2101.pdf
- BD 79: Management of sub-standard structures: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol3/section4/bd7906.pdf
- BD101: The Structural Review and Assessment Process http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol3/section4/bd10111.pdf

## 7. Contact Details

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**Appendix A**

A summary of substandard structures managed by Kent County Council [Highways Transportation & Waste]

| Structure No. | Structure Name | Category | Primary reason for sub-standard designation | Interim Measures |
|---|---|---|---|---|
| 1 | Ashford Town(W) N.Deck | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Asset protection in place + 6 monthly monitoring |
| 13 | Bucksford | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |
| 123 | Worten Mill | Main Bridge > 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 157 | Hampton | Main Bridge > 3.0 m | Deterioration | 6 monthly monitoring |
| 167 | Old Blackmill Bridge | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Closed to through traffic + 6 monthly monitoring |
| 196 | Stone Bridge | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 212 | Stair | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 216 | Bow Bridge | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | Structural weight limit imposed + 6 monthly monitoring in place |
| 225 | Jefferstone Lane | Main Bridge > 3.0 m | Inherited structure in poor condition | 6 monthly monitoring |

| Structure No. | Structure Name | Category | Primary reason for sub-standard designation | Interim Measures |
|---|---|---|---|---|
| 226 | Tonbridge Little | Main Bridge > 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 250 | Chartham North | Main Bridge > 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 262 | Mayton Road | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 320 | Shalmsford Farm | Main Bridge > 3.0 m | Deterioration | 6 monthly monitoring |
| 324 | Bolingbroke | Main Bridge > 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 352 | Ruckinge Canal | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Structural weight limit imposed + 6 monthly monitoring in place |
| 379 | Kenardington No 1 | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Structural weight limit imposed + 6 monthly monitoring in place |
| 387 | Bonnington No. One | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Structural weight limit imposed + 6 monthly monitoring in place |
| 439 | Grove Ferry | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | Structural weight limit imposed + 6 monthly monitoring in place |
| 448 | Arnolds Lodge | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |

| Structure No. | Structure Name | Category | Primary reason for sub-standard designation | Interim Measures |
|---|---|---|---|---|
| 660 | Sconce | Main Bridge > 3.0 m | Increased design and loading requirements since construction + Inherited structure in poor condition | 6 monthly monitoring |
| 705 | Hope Lane | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction + Inherited structure in poor condition | 6 monthly monitoring |
| 709 | Yoakes | Main Bridge > 3.0 m | Increased design and loading requirements since construction + Inherited structure in poor condition | 6 monthly monitoring |
| 723 | Arrowhead | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | Temporary overbridge installed + 6 monthly monitoring |
| 734 | Grave Yard Bridge | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction + Inherited structure in poor condition | 6 monthly monitoring |
| 994 | Stanford End | Minor Bridge 1.5 - 3.0 m | Deterioration | |
| 1020 | Ashford Town(E) N.Deck | Main Bridge > 3.0 m | Increased design and loading requirements since construction | Asset protection in place + 6 monthly monitoring |
| 1058 | Cattle Market Culvert | Minor Bridge 0.9 - 1.5 m | Historic designation - Strengthening works now completed - substandard designation is likely to be removed following review | |
| 1116 | Bridge Farm North | Main Bridge > 3.0 m | Increased design and loading requirements since construction + Inherited structure in poor condition | 6 monthly monitoring |
| 1445 | Betenson Avenue | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |

| Structure No. | Structure Name | Category | Primary reason for sub-standard designation | Interim Measures |
|---|---|---|---|---|
| 1944 | Austins Lane Culvert | Minor Bridge 0.9 - 1.5 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |
| 1945 | Market Street Culvert | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |
| 1946 | Harnet Street Culvert | Minor Bridge 1.5 - 3.0 m | Historic designation - Strengthening works now completed - substandard designation is likely to be removed following review | |
| 2373 | Star Inn | Main Bridge > 3.0 m | Historic designation - Strengthening works now completed - substandard designation is likely to be removed following review | 6 monthly monitoring |
| 2393 | Turnpike Close | Minor Bridge 1.5 - 3.0 m | Increased design and loading requirements since construction | 6 monthly monitoring |
| 3029 | Cheriton Gardens Subway | Pedestrian Subway | Increased design and loading requirements since construction | 6 monthly monitoring |
| 3120 | Torrington Road | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | Asset protection in place + 6 monthly monitoring |
| 3125 | Mill Cottage | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |
| 3168 | The Causeway | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | Structural weight limit imposed + 6 monthly monitoring in place |

| Structure No. | Structure Name | Category | Primary reason for sub-standard designation | Interim Measures |
|---|---|---|---|---|
| 3649 | Mill Street | Main Bridge > 3.0 m | Increased design and loading requirements since construction + deterioration | 6 monthly monitoring |