Moray Council

Bridges Workbank Prioritisation

Prioritisation Procedure Report

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Contents

Table of Tables

1.0 Background, Scope, and Approach

1.1 A prioritisation scheme is required to help formalise the current system that is in place regarding the prioritisation of capital funded maintenance, repair, strengthening and renewal ("works") for the public road bridges that are under Moray Council ownership. This system will ensure that the available capital funding is used in the most effective manner in relation to the road network.

1.2 The prioritisation procedure will be applied to all **bridges** on the public road network. This includes all structures with spans that are 1.5m and over, and is inclusive of culverts. Bridges (or culverts) with spans under 1.5m are deemed to be drainage structures and are not covered by this procedure (being the responsibility of Roads Maintenance).

1.3 The prioritisation of bridges for works will be based on a range of factors, grouped as follows: (1) an indicator of the importance of the structure as a component of the Moray Council road network, termed "**Network Criticality**" and in broad terms classifying the scale of the consequences of any failure or loss of functionality of the bridge, and (2) an indicator of the probability of failure of the structure, termed "**Bridge Alert Status**" and in broad terms classifying the scale of the threats to the functionality of the bridge.

1.4 These factors will be combined according to an algorithm to give a **Priority Score** for each individual bridge.

1.5 This prioritisation will be maintained periodically and can be expected to change over time as the above factors change. It is suggested that the prioritisation should be revised on an annual basis taking account of the latest available information. For example, Bridge Alert Status will change with time as bridge condition deteriorates with asset age (typically as detected and updated by the routine, cyclical inspection programme), or as bridge works are implemented (maintenance, repair, strengthening, and/or renewal). Network Criticality will change as the social and economic geography of Moray develops (for example, construction of new roads and new residential developments and businesses, commissioning or decommissioning of strategic infrastructure and sites of civic amenity such as water treatment works, secondary schools and hospitals, demographic change, and changes to the spatial distribution of population and economic activity).

1.6 The determination of Network Criticality and Bridge Alert Status are defined in the following sections of this report. The algorithm for combination of these factors to determine the Priority Score is then defined, and a worked example is presented.

2.0 Network Criticality – Categorisation Process 1

2.1 For bridge prioritisation, a "Network Criticality" will be defined for each bridge. Initially the structures will be sorted into three Network Criticality categories: **Vital**, **Important** and **Standard**. A large number of structures are expected to be categorised as Standard, so a further sorting will be carried out to categorise these structures as Standard-High, Standard-Medium or Standard-Low.

2.2 For Moray, this cannot simply be done using the existing national road classification system (i.e. A, B, C and U class roads) as this approach, devised by central government in the 1920s, does not realistically consider the present-day use of the roads at a local level. Also, with 376 public road bridges maintained by Moray Council, the national road classification does not provide sufficient granularity for effective prioritisation of the bridges work bank. Several Moray-specific factors will be used to determine which Network Criticality category each bridge goes into.

2.3 Network Criticality will consider whether a bridge is on a heavily used route or an important access to dwellings, businesses, or crucial infrastructure in Moray. Properties that provide sole vehicular access to residential or business addresses will be deemed more critical than those for which there is an alternative route.

2.4 Bridges that carry heavy traffic will be classified as Vital. Heavy traffic is defined as Average Annual Daily Traffic (AADT) of 7000 vehicles. This data is generally only available for major roads. However, where this information can be found it will be utilised.

2.5 Secondly, a check will be carried out on the number of individual properties (residential or business) for which the bridge provides a sole vehicular access. Bridges that are the sole access for twenty or more properties will be classified as vital, since these properties would lose all vehicular access should the bridge become unserviceable. This will be based on counting permanent residences and rateable businesses (this definition will apply wherever the term "properties" is used below).

2.6 Thirdly, a check will be carried out on whether the bridge provides sole access to **Critical Sites** or **Critical Infrastructure**. These sites/infrastructures will include: main hospitals (those with an accident and emergency department); main fire stations (those with full-time crews); water supply treatment and storage, including reservoirs; power generation and major substations; and major armed forces sites. A list of these sites in Moray will be compiled, and any bridges that provide sole access will be classified as Vital.

2.7 Bridges that do not satisfy one of the above checks will be considered Important or Standard.

2.8 Fourthly, a check will be carried out to determine if the bridge is on a **Priority 1 (P1) Gritting Route**, as defined in the council's Winter Service Operational Plan. It is assumed that a range of factors, highly relevant to the specific social and economic geography of the Moray Council area, have already been accounted for in the prioritisation of routes for gritting, and that this work does not need to be duplicated. It is assumed that this will cover important infrastructure such as: local hospitals (those without A&E); secondary fire stations (those with retained/part-time/volunteer crews); sewage treatment sites (not including private systems); and primary schools (it is assumed that this captures all the sites deemed "Essential Infrastructure" as defined in National Planning Framework 4 (NPF4) which are not already covered by the Critical Infrastructure definition above). Bridges on such routes will be classified as Important.

2.9 It is considered that if a site or infrastructure has not been judged to be sufficiently important to be on a P1 gritting route, then it is not important site for the purposes of bridges prioritisation.

2.10 Fifthly, a check will be carried out to determine if the bridge provides sole vehicular access to eight or more properties. Bridges meeting this threshold will be classified as Important.

2.11 Remaining bridges will be classified as Standard.

2.12 The process described above is summarised in a flowchart in **Appendix A**.

3.0 Network Criticality – Categorisation Process 2

3.1 Based on a trial application of the above process, it is expected that it will result in a large number of structures of Standard Criticality. To provide greater granularity for prioritisation of works, a further process will be followed to subdivide the Standard Criticality bridges.

3.2 The remaining bridges will be those that do not provide access to critical or important infrastructure, and do not provide sole vehicular access to eight or more properties (i.e. they exist upon a network or, minimally, a loop of road such that there is at least one route that bypasses the bridge).

3.3 Firstly, a check will be carried out to determine whether the route carried by the bridge is a **Critical Route**. This is defined here as a credible direct link connecting **Settlements** or **Localities** together. Settlements and Localities are statistical entities defined by National Records of Scotland (NRS) as groups of densely populated postcodes that add up to 500 or more people,

and represent urban or built-up areas of Scotland. The purpose of this check is to identify a functional minimum road network connecting not only the larger settlements in Moray but also modest concentrations of population such as small towns and villages. These routes are likely to be important for social and economic reasons, being key routes from homes to workplaces and civic amenities for large numbers of people. When carrying out this check, links to the closest Settlements and Localities outside Moray will be considered as well as intra-Moray links. A popular route-finding tool such as Google Maps will be used to derive realistic Critical Routes between all the Settlements and Localities recorded by NRS. In practice, for many settlements this will involve finding a credible route to a key cross-Moray artery such as the A96 trunk road.

3.4 If a structure is found to be on a Critical Route, it will be classified as Standard-High in terms of Route Criticality. Furthermore, if a bridge is on a route that provides sole access to eight or fewer properties, then it will also be classified as Standard-High. All other structures will be subject to additional tests to determine if they are Standard-Medium or Standard-Low.

3.5 A check will be carried out to identify the shortest diversion routes if the structure is ever closed or restricted, if the diversion route is over 7.5 miles, the structure will be classified as Standard-Medium. Additionally, any remaining structures on a school bus route will also be classified as Standard-Medium.

3.6 All remaining structures will be defined as Standard-Low.

3.7 The process described above is summarised in a flowchart in **Appendix B**.

4.0 Bridge Alert Status

4.1 A “Bridge Alert Status” will be defined for each bridge to categorise the structures according to an appraisal of the likelihood that the bridge will fail prematurely. Failure is defined as the point where a bridge becomes unserviceable (resulting in a need for weight restriction, closure, or other load mitigation measures) and/or collapse. The Bridge Alert Status for each structure considers the following factors:

- **Load carrying capacity –** Based on original design loading criteria where known, or structural assessment results where these are available and supersede the design criteria. The structure will be considered higher risk if it does not pass assessment at the required category of load carrying capacity (the required loading will be 40/44 tonnes in most, if not all, cases). Engineering judgement may be used to tentatively classify the structure in the event that a design/assessed load carrying capacity is not documented, but in most cases such structures will be deemed higher risk.

- **Condition –** based on the Bridge Condition Indicator (BCI) score calculated from the results of the most recent cyclical inspection. The BCI Critical score will be used as this indicator focuses on the elements most critical to the ongoing safety and serviceability of the structure to carry vehicular traffic.
- **Environmental Risk –** based on exposure to conditions that are considered likely to promote accelerated degradation, with high risk defined as the existence of any one of: (1) exposure to chlorides from de-icing agent (if the bridge is on a P1 or P2 gritting route then the risk is deemed to be high); (2) exposure to chlorides from seawater or airborne salt (i.e. if the bridge would have an exposure class of XS1, XS2, or XS3 according to BS 8500; for exposure to airborne salt from seawater this will be taken to be any structure within 200m of the Normal Tidal Limit or High Water Mark as shown on an Ordnance Survey 1:50,000 scale map); (3) any degree of scour damage or vulnerability reported in the most recent Principal Inspection, General Inspection, or Special Inspection (e.g. following a significant flood/spate event). Vulnerability will be indicated by the bridge inspector recommending a specific scour inspection in the relevant inspection report.
- **Recent movement/deterioration** – based on whether the bridge is subject to a monitoring regime or has been subject to monitoring in the past six years (or since the most recent Principal Inspection, whichever interval is shorter).

4.2 A flowchart will be used to determine the Bridge Alert Status, which can be seen in **Appendix C.** The output from the flowchart (Appendix C) gives each bridge a Bridge Alert Status in the form of a coloured tiered system. This ranges from Green, Yellow, Amber, Red and Black, increasing in severity.

5.0 Prioritisation Algorithm

5.1 By combining the outputs from both the Network Criticality and Bridge Alert Status, an 'Initial Priority Score' can be given to each of the structures. Each output will have an associated rating with it, which are given in Tables one and two below.

Table 1: Network Criticality Ratings

Network Criticality (NC)	NC Rating
Vital	7
Important	5
Standard-High	3
Standard-Medium	2

Standard-Low	1

Table 2: Bridge Alert Status Ratings

Bridge Alert Status (BAS)	BAS Rating
Black	7
Red	5
Amber	4
Yellow	2
Green	0

5.2 Using the associated ratings, the Initial Priority Score of any bridge is calculated as follows:

Initial Priority Score = 10 x BAS x NC

5.3 For a full worked example please refer to **Appendix D.**

6.0 Future Considerations

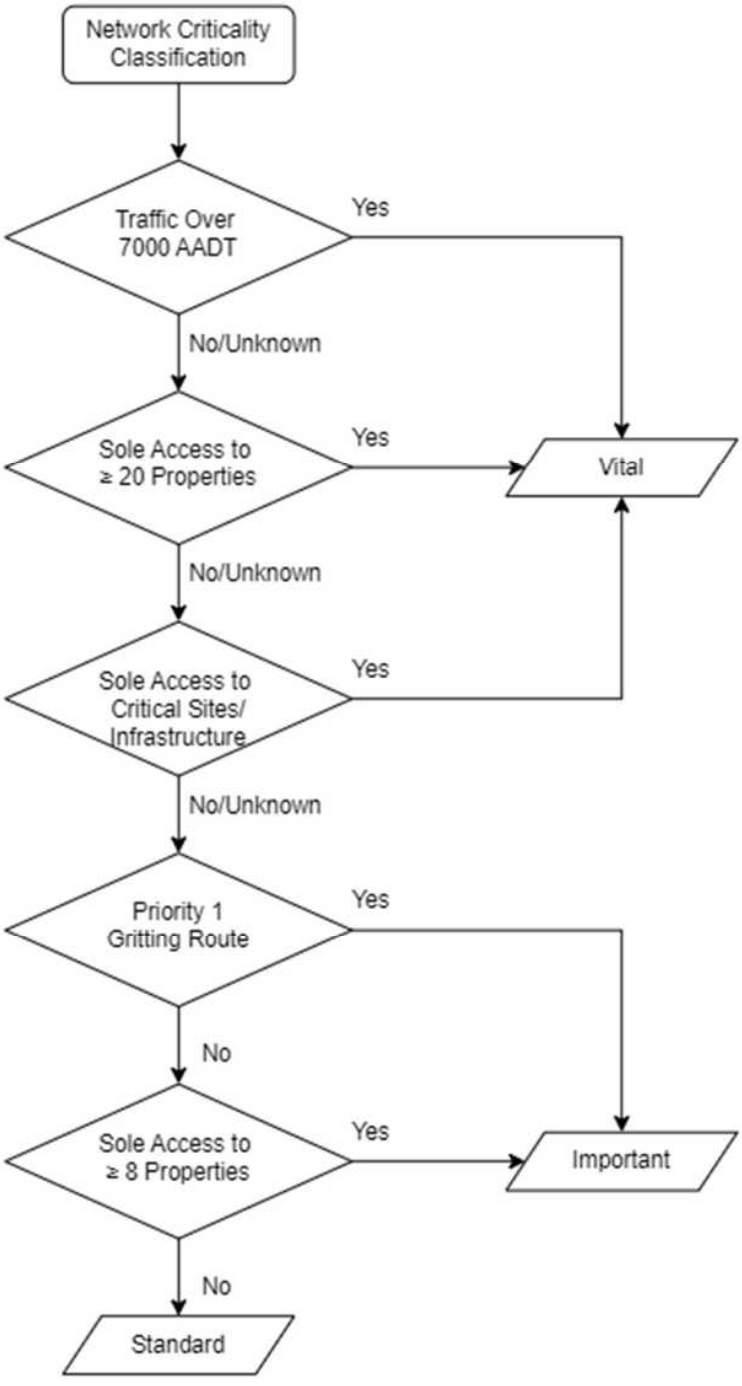
6.1 To ensure the prioritisation remains relevant, the input data needs to be updated when changes occur. An annual review is suggested. Further one-off reviews should be considered when significant events occur, such as major storms, floods, or spates with potential to damage road infrastructure in a local area.

6.2 Through regular inspections the condition of the bridge stock is monitored. In the event that any significant changes are documented, a review of the Bridge Alert Status and prioritisation is recommended as this may elevate the priority of the bridge for works above other planned schemes.

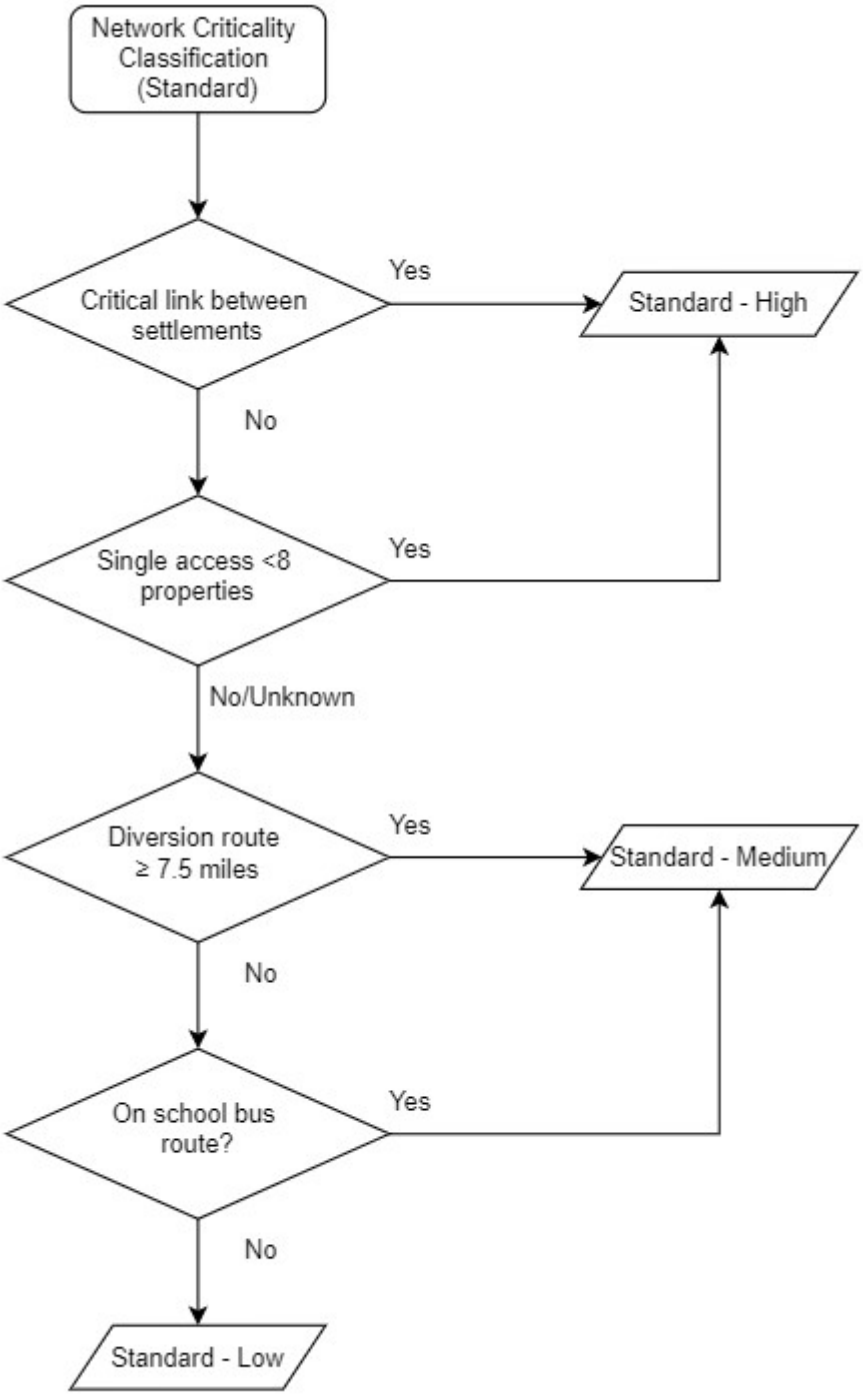
6.3 The prioritisation will not provide a definitive answer on the prioritisation of bridges. It should be considered as guidance to inform the process of planning the bridges work bank. In particular, the process described above does not take into account potentially important interactions between sets of two or more bridges. For example, two bridges on a loop of road could be ranked as "Standard-Low" and deprioritised for works, when in reality both bridges are the only alternative vehicular route in case the other is closed or load-restricted. Exhaustively identifying such cases is significantly more complex and time-consuming and has therefore been left to be determined when work

on these structures is being considered. This task would involve consultation with internal stakeholders (school transport, waste collection, and roads maintenance), to identify any significant financial implications for the council regarding bridge closure or load restriction to determine a way forward on a case-by-case basis.

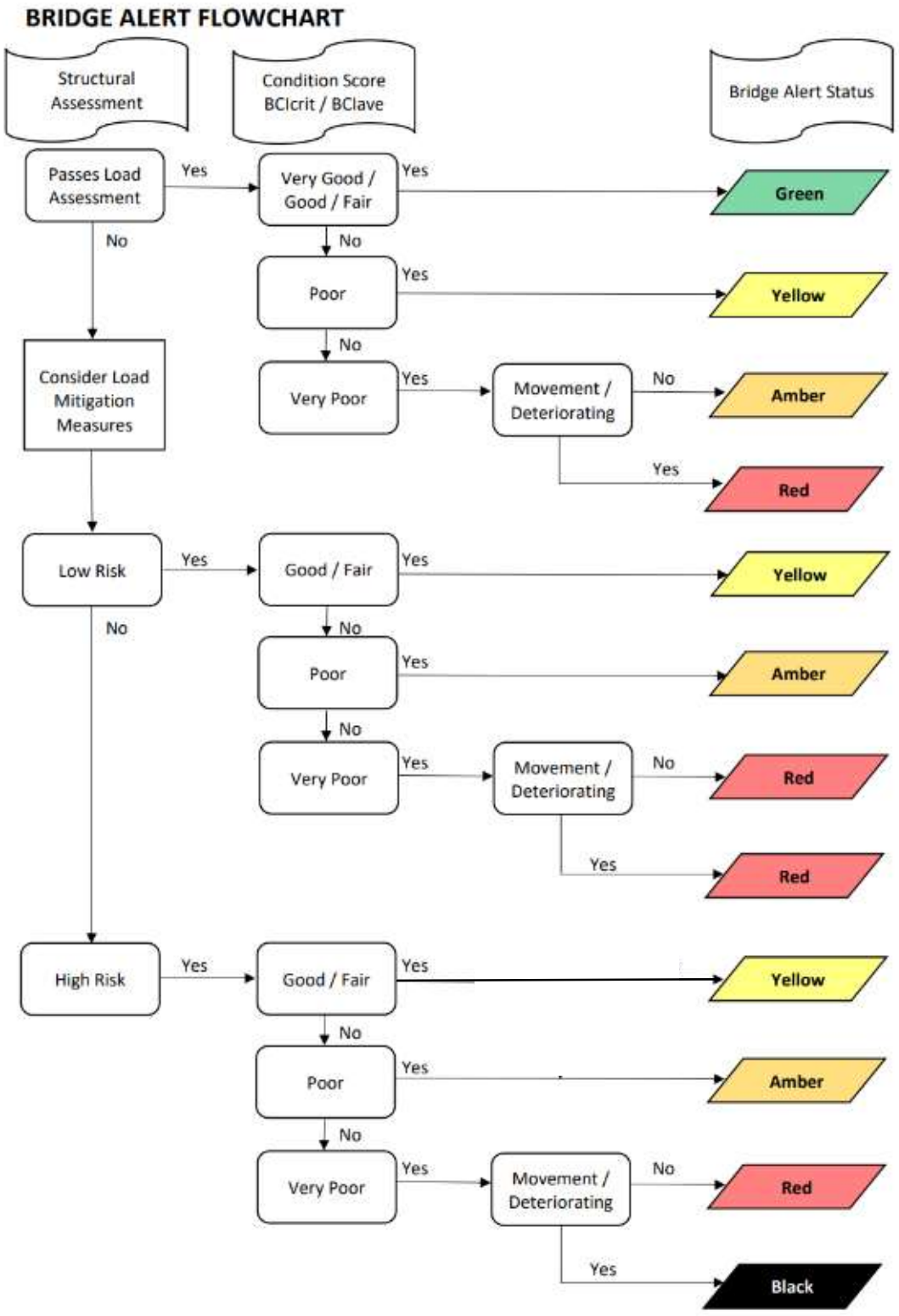
Appendix A – Network Criticality Procedure 1



Appendix B – Network Criticality Procedure 2

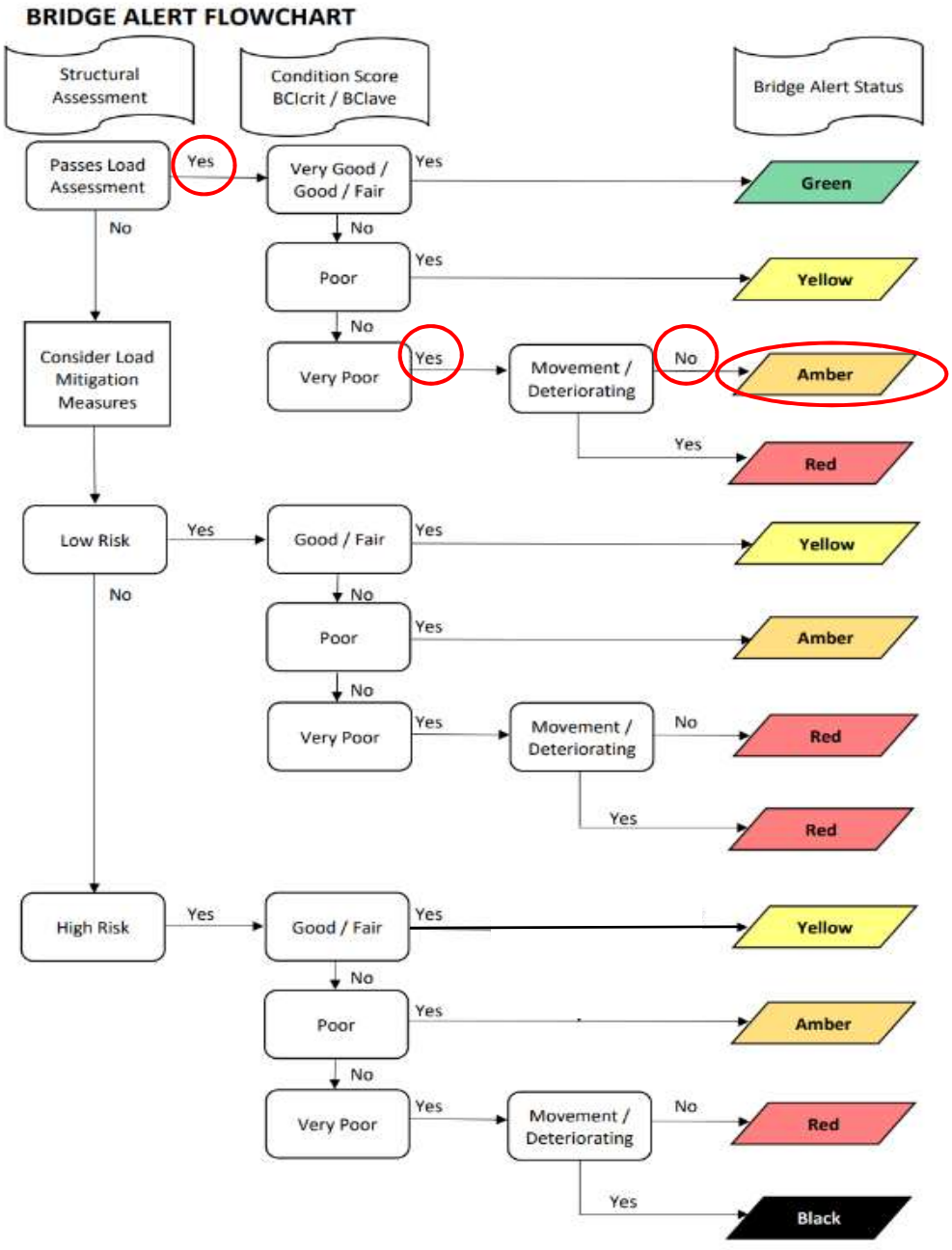


Appendix C - Bridge Alert Status Procedure



Appendix D – Worked Example

Keithmore bridge (A920/190) has been selected to show how the Bridge Prioritisation procedure works.



Assessed for 40T GVW (passes load assessment)

As the structure has passed its assessment, the risk does not have to be considered however, as Keithmore bridge is on a P1 gritting route, it would be considered high risk

BCI score of 31 (very poor if BCI_{CRIT} < 39).

Not monitored at present (no evidence of movement/not deteriorating rapidly)

The Network Criticality of this structure has been assessed to be Vital.

Initial Priority Score = *10 x 4(BAS) x 7(NC) = 280*