

Transport and Environment Committee

10.00am, Thursday, 2 February 2023

Response to Motion by Councillor Booth - Rainbow Bridge / Lindsay Road Bridge - Infilling

Executive/routine Wards Council Commitments	Routine 13
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1. Recommendations

- 1.1 It is recommended that Transport and Environment Committee notes:
 - 1.1.1 The additional information gathered and analysis by officers in respect of infilling options and comparisons with similar projects progressed by other local authorities and in Edinburgh;
 - 1.1.2 The risks and on-going maintenance commitments which have been identified for implementation of an infilling solution, and therefore that officers recommend that an infilling solution is not progressed;
 - 1.1.3 The two alternative options presented which will reinstate the crossing and mitigate the risks identified. If Committee wish to proceed with one of these two options, additional funding of between £337,000 and £1.2m will be required. The allocation of additional funding would need to be referred to Council as part of the 2023/24 capital budget setting process. If additional funding is not identified in advance of winter 2023/24, the bridge deck will have to be removed to ensure public safety; and
 - 1.1.4 That regardless of the preferred solution, diversion of public utilities will now be undertaken.

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2. Executive Summary

- 2.1 This report provides an update on the request from Committee on [6 October 2022](#) for officers to liaise with organisations or individuals with relevant expertise, and to bring an updated report to committee outlining costed options for retention of all three spans of the existing Rainbow Bridge / Lindsay Road Bridge.

3. Background

- 3.1 Lindsay Road Bridge is located at the junction of North Fort Street and Lindsay Road in Newhaven, Edinburgh. The bridge was constructed in 1938 and is a three-span structure with span lengths of 10.3m, 9.8m and 11.25m. Spans are numbered 1-3 from north to south. The bridge is 85 years old and approaching the end of its functional life.
- 3.2 The bridge originally carried vehicular traffic over the North Leith branch of the Caledonian Railway but is now a footbridge over the Hawthornvale Path. The southern end of the bridge continues to be used as an outdoor seating area for a local pub.
- 3.3 Each span has a different form and of mixed steel and concrete construction. The bridge carries low and high voltage power and fibre optic cables.
- 3.4 With permission from the Council, a community-backed project painted the bridge in rainbow colours in August/September 2021, on the understanding that the bridge was due to be demolished. This led to the bridge being referred to locally as the 'Pride' or 'Rainbow' bridge.
- 3.5 Due to the immediate health and safety risk at the bridge, particularly with concerns around span 2, the following immediate actions were taken in December 2021:
- 3.5.1 The underside of span 2 was fenced-off immediately with heras panels;
 - 3.5.2 The topside of span 2 was fenced-off immediately with steel barriers; and
 - 3.5.3 Weekly monitoring of the structure has been undertaken, paying particular attention to span 2.

- 3.6 On [6 October 2022](#), a report was presented to Committee outlining ‘make-safe’ options. This report noted that removal of the Lindsay Road Bridge deck is the only technically and financially feasible solution and is required for the long-term safety of members of the public and presented possible future follow-up solutions.
- 3.7 Committee requested that officers liaise with organisations or individuals with relevant expertise, and bring an updated report to committee within three cycles outlining costed options for retention of all three spans of the existing bridge, using infill in spans 1 and 2, and infill with a metal culvert for span 3, and/or any other suitable solution which retains the structure, to allow committee to make a fully informed decision on the structure’s future (*Committee is asked to note that this numbering differs from that used in the report to Committee on 6 October 2022, and previous inspections, and that the numbering in the remainder of the report is consistent with the original report*). A cycle path/footway runs below span 1, and spans 2 and 3 are also publicly accessible.

4. Main report

- 4.1 Following on from Committee, officers have been exploring the options for retention of the three spans of the existing bridge.

Options to infill all spans (with culvert under span 1)

- 4.2 Following direct correspondence with ‘Asset International’ (culvert supplier), a costed option to infill spans 2 and 3, and infill with a metal culvert for span 1, was completed. This costing is included in Appendix 1 and illustrated below in Figure 1.

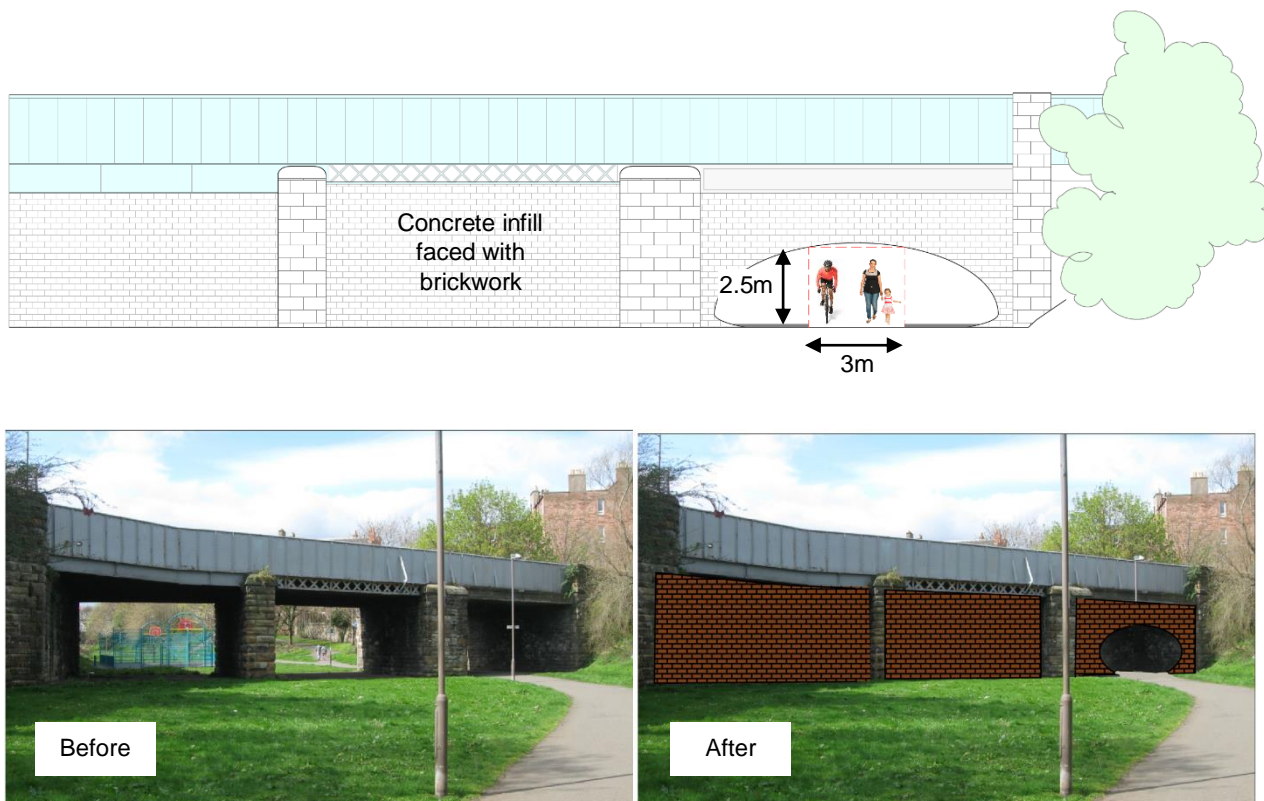


Figure 1 - Schematic of infilling solution

- 4.3 For independence, the costing of this option was undertaken by an external Chartered Engineer with experience of previous infilling projects.
- 4.4 The total cost of this solution has been assessed at £844,000. This is based on experience from infilling the Council's 'Pinkhill Bridge' in 2008, together with a recent costing of the metal culvert and recent experience of ancillary works (such as footpath refurbishment, 6N infill material, de-vegetation, masonry pointing, site investigation and site clearance).
- 4.5 In October 2022, Committee received information which provided a quotation of £28,920 for the supply of the arch for one span. This quotation excluded installation, concrete infill and all ancillary works, however this quotation has been incorporated within the cost estimate presented in Appendix 1.
- 4.6 This cost estimate was verified against other project case studies including Crosslee Station in Glasgow, HRE (Historical Railways Estate) Bridge CKP/94 in Cumbria and HRE Bridge CKP/87 also in Cumbria. Contact was made with Renfrewshire Council for additional information on the Crosslee example.
- 4.7 Following an enquiry to the SCOTS Bridges Group, a HRE Bridge in East Ayrshire was also considered, as was Pinkhill Bridge (infilled in 2008) in Edinburgh. An example provided from Camp Hill Bridge in Paisley was not considered as it was completed 23 years ago and so it is difficult to make any meaningful price comparison even with construction indices. This cost verification demonstrates that, while acknowledging many uncertainties with feasibility pricing exercises like this, the costs quoted are accurate for the purpose of exploring options.
- 4.8 These costs were also verified against the estimate provided in the 6 October 2022 report for infilling a single span ($3 - 4 \times £60,000 = £180,000 - £240,000$ per span = £480,000 - £720,000). This was for a make-safe solution and did not include a brick façade or refurbishing/painting the existing parapet edge beams. Again, this shows the cost estimates provided to date appear accurate.

Demolition and C4 Diversion

- 4.9 The estimated cost to demolish the existing bridge deck and leave the existing piers and abutments in place was presented in the report of 6 October 2022 at a total cost of £500,000. Since this report, Virgin Media have confirmed through the C4 process that, despite their initial indications that their apparatus crossed the bridge, this is not actually the case. C4 diversion quotes have also been received for the other utilities and a revised cost to divert utilities and remove the bridge deck is £459,000, as detailed in Appendix 2. This figure includes an estimate of one utility diversion for which a C4 price has not yet been received.

Risks and Maintenance

- 4.10 While infilling Lindsay Road Bridge would reinstate the crossing, officers have identified a number of risks and ongoing maintenance burdens which are summarised below:

- 4.10.1 Although the deck is no longer spanning between piers and abutments, it is still a structural element that is supporting the path above and is subject to further deterioration and maintenance. It is likely that 'hidden defects' will occur, however not be visible due to the infilling around the bridge deck. Asset owners seek to minimise structural forms with the potential for hidden defects, so introducing one on purpose is not favourable to the Council.
- 4.10.2 Infilling solutions are usually used for flat concrete decked bridges or masonry arches. Lindsay Road Bridge is of mixed construction including latticed steel girders which is not a construction form well suited to infilling.
- 4.10.3 Local residents have expressed concern over the safety of the Hawthornvale Path at night. Infilling the bridge will worsen the 'confined' feeling of the area in general and having large brick walls may encourage additional loitering and anti-social behaviour.
- 4.10.4 Local residents also expressed concern over the large block wall that was constructed as a temporary measure at the North end of the bridge when vandals continued to access the structure. A solid infill of two of the three spans would result in a large brick wall traversing the Hawthornvale path – this will be a target for graffiti and is not in keeping with the area.
- 4.10.5 Whilst the 'low profile' arch profile chosen by the supplier for the purpose of this costing is a cheap option, it also significantly reduces the cross-sectional area of the opening under the bridge. A more 'rectangular-like' option is available which would maximise the opening, but at additional cost – both for the arch and for the foundations necessary to support it.
- 4.11 Additionally, the extensive volume of concrete required would come at a significant carbon cost (this was detailed in the report of 6 October 2022) which is contrary to the Council's target to become a net zero city by 2030.
- 4.12 Infilling will require excavation or drilling through the existing bridge deck which contains critical statutory undertakers' apparatus (including fibre cables), therefore has a high risk of cost escalation on the contract due to the complexity of the works.
- 4.13 Sustrans were contacted to ascertain previous experience of infilling lattice girder bridges (or other forms of downstand beams). They indicated that they were not being aware of any lattice girder bridges that had been infilled but do have examples of bridges with metal beams which have been infilled. Sustrans advised that it may be possible to infill a bridge if the metalwork could be fully encapsulated but unfortunately this is not the case at Lindsay Road Bridge where there is a steel deck plate, service bay and parapet which cannot be fully contained in concrete. Sustrans also suggested that replacement with a lighter-weight alternative deck may be appropriate, which is explored below with Options 1 and 2.

- 4.14 This enquiry to Sustrans also asked if they had any experience of infilling with borrowed (recycled) material, or a mixture of this and concrete. They advised of two examples that they own where have been infilled with poor quality granular material which settled, leaving a void and ineffective infilling. At Lindsay Road Bridge, infill with a granular material would require construction of retaining walls each side of the bridge as the fill is not self-supporting. An example provided by Sustrans where this was done was at Great Musgrave bridge (documented in the 6 October 2022 report) where vertical walls were not formed around the infilling, and grout was pumped into the top of the infill to address the issue of settlement.

Reinstatement of Crossing

- 4.15 To mitigate the risks identified above, two additional options to reinstate the crossing have been analysed. Both options would improve pedestrian links to the new Newhaven tramstop (which is currently under construction). Both options would utilise the existing piers and abutments.

Option 1

- 4.16 The first option is a modular steel footbridge across all three spans. 'Mabey'; a supplier of steel modular bridges was approached for a feasibility estimate for the supply of a 3.15m wide pedestrian footbridge similar to the example in Figure 2. With ancillary costs and service diversions included, the cost of this option is £837,000.
- 4.17 This is less than the £1.2m estimate presented in the report of 6 October 2022 for a new bespoke custom-designed concrete bridge deck (3.5m wide). The modular solution is advertised as permanent, and having a 'long life', but it would require regular maintenance. However, it fulfils the role of reinstating the 3-span crossing between the existing abutments.



Figure 2 - Mabey Compact 200 steel modular bridge (Option 1)

- 4.18 The costs of a fibre reinforced plastic (FRP) bridge were also explored and were found to be on par with the modular steel solution. If Option 1 is progressed, further work would be done to determine the most suitable material for the replacement deck.

Option 2

- 4.19 A second option was explored following a meeting arranged with Ward Councillors on 10 January 2023 where there were concerns that the modular steel solution would not retain the public realm space enjoyed by the local community prior to the bridge closure.
- 4.20 This second option would involve a wider bridge deck over the southern span 3, reducing to a narrower 3.5m clear width over spans 2 and 1. The wider span could be utilised as a public seating or community space whilst facilitating a pedestrian travel link over the Hawthornvale path. With ancillary costs and service diversions included, the approximate cost of this option is £1.7m. This figure includes a high level of optimism bias and would be refined during the options development stage, however, can be used at this stage in considering the options.



Figure 3 - Splayed bridge (Option 2)

- 4.21 Figure 3 indicates one possible layout but additional deck configurations would be explored during design. The construction of an extended abutment/embankment (following removal of the existing deck) under span 3 would also be explored to reduce costs.

Other Considerations and Projects

- 4.22 It has been confirmed that a replacement deck would fall under 'Permitted Development' planning rights.
- 4.23 It is important to note that infilling bridges can be appropriate in the right scenarios. Traquair Park East Bridge – Pinkhill, and Gilmerton Dykes Street Bridge are two examples in Edinburgh where infilling has been done successfully.



Figure 4 - Traquair Park East Bridge – Pinkhill



Figure 5 - Gilmerton Dykes Street (Hyvots Bank) Bridge

Recommendation

- 4.24 Based on the cost analysis and disadvantages of the infilling solution presented above, officers have concluded that Lindsay Road Bridge is not an appropriate application of this solution.
- 4.25 An allocation of £500,000 of capital budget has been made for Lindsay Road Bridge, for a long-term 'make-safe' solution of removing the deck. Should Committee decide to retain the existing crossing, additional funding will be required.
- 4.26 To fund the option of a steel modular bridge (Option 1), an additional £337,000 of capital funding will be required to maintain a pedestrian and cycle link. However, in order to minimise conflict between dwellers and cyclists, it is important to note that it will not be possible to retain the area previously used as a seating area to the south of the bridge, as required by current design guidance.

- 4.27 Should Committee prefer to retain the outdoor community space (Option 2), an additional £1.2m will be required. Careful design would be required to ensure this option did not introduce conflict between cyclists and people using the outdoor community space, and so there would be additional public realm considerations at the southern end of the bridge, at additional cost.
- 4.28 Should Committee wish to retain the crossing with the use of either Option 1 or Option 2, the additional funding would have to be identified within the Council's 2023/24 capital budget setting process, as there is no surplus funding within the existing Roads and Infrastructure capital budget.
- 4.29 In line with the Roads Investment briefing note circulated to Members in December 2022, there is a shortfall of £8.0m in road and footway investment to maintain the steady state condition. There is also already a shortfall of £2.2m per annum within the 2022-2032 Sustainable Capital Budget Strategy (presented to Finance and Resources Committee on [3 February 2022](#)) for structures.

5. Next Steps

- 5.1 Regardless of the chosen solution, it is now necessary to progress the diversion of services crossing the structure. This task will now be progressed with the relevant public utility statutory undertakers through the C4 process. The bridge deck will be left in place whilst funding options are explored over the next six - nine months, but in the interests of public safety due to the risk of falling spalled concrete over the walkway, the bridge deck will have to be removed in advance of winter 2023/24. The existing piers and abutments will be retained to facilitate the installation of a new deck in future.
- 5.2 If Committee agree that the crossing should be maintained and Option 1 or 2 progressed, the decision on how this should be funded should be referred to the Council to consider as part of the capital budget setting process for 2023/24. As noted below, the additional funding required is anticipated to be in the region of between £337,000 for Option 1, and £1.2m for Option 2, and staff resource will then have to be identified.

Sustrans funding application

- 5.3 If Committee agree that the crossing should be maintained, in parallel with the budget setting process for 2023/24, an application will be made for match funding from Sustrans to cover the additional funding requirement. It should be noted however, that the Active Travel Investment Programme (ATInP) approved by Committee on [14 October 2021](#) did not identify this as a priority project, nor does the Draft Active Travel Action Plan (ATAP) (which is presented to this Committee meeting for approval to progress consultation). Officers from the Active Travel team were consulted and also do not see this as a priority project for facilitating active travel in the area. There is a possibility that if funding was granted for this project, that it would be to the detriment of other projects within the ATInP and ATAP. There is also a possibility that the bridge would not be well suited to cycling due to the interface with the community space and the lack of connectivity either side – this is not a priority route for cycling.
- 5.4 The funding application for Option 2 would be made in two stages. Firstly, an application would be made for developing a feasibility design; considering various structural forms which may be suitable following removal of the existing deck - for example if span 3 would be more suited to an earthworks solution rather than a spanning deck, and if a modular steel bridge could be used over span 1 to reduce costs. The developed design would be costed and used to inform a Sustrans application for the construction phase. Under current Sustrans funding arrangements, a 30% matched contribution from the Council would be required.

6. Financial impact

- 6.1 Due to other bridge works priorities in the city and a current £2.2m shortfall in capital funding for maintaining and developing structures, it is recommended that works at Lindsay Road Bridge be limited to the minimum necessary to ensure the long-term safety of the public, i.e. removal of the bridge deck and make-safe of the resulting open ends.
- 6.2 The estimated cost of utility diversions, removal of the bridge deck, and making safe the open ends of the bridge is estimated at £459,000, and this can be contained within the existing capital funding allocation for structures. Should an enhanced solution be preferred by Committee, additional funding in the region of between £337,000 (for Option 1) and £1.2m (for Option 2) will need to be identified.
- 6.3 As noted above, the allocation of any additional funding would need to be referred to Council to consider as part of the capital budget setting process for 2023/24. There is currently no provision made in the capital programme for the additional funding required (in the region of between £337,000 for Option 1, and £1.2m for Option 2) therefore any additional funding would need to be reallocated from other areas of the Capital Programme.

- 6.4 Due to the current volatile situation within the construction industry, providing accurate cost estimates out with a tender process is difficult. The figures presented in this report contain 'best-guess' estimates for the purpose of option appraisal but have been prepared by Chartered Engineers with relevant experience. There is a risk that the additional funding required will be greater than the estimated values stipulated in this report.

7. Stakeholder/Community Impact

- 7.1 Under licence from the Council, the bridge is used as an outdoor seating area for a nearby pub, and the bridge provides a link between Nichollfield/North Fort Street, and the northern part of Lindsay Road. When the deck is removed, it will not be possible to retain the seating area over the southern span of the bridge deck, however it may be possible to retain a small amount of this area which is situated over the existing south abutment.
- 7.2 Removal of the bridge deck will remove the availability of the crossing and increase the length of some journeys in this area by less than 200m.
- 7.3 It will ensure the safety of the public walking and cycling along the Hawthornvale Path under the structure, and curtail further costs associated with inspection and maintenance works.
- 7.4 Should an enhanced solution be preferred, and funding allocated, the crossing will be restored and depending on the preferred option, the community space may be reinstated.

8. Background reading/external references

- 8.1 None.

9. Appendices

- 9.1 Appendix 1 Infill pricing breakdown and cost verification
- 9.2 Appendix 2 Utility diversion and deck removal cost breakdown
Modular bridge cost breakdown

Appendix 1

Infill Price Breakdown

Specification Series	Description	Cost
200	Site Clearance	£ 5,000
600	Earthworks	£ 6,526
700	Pavements	£ 4,304
1100	Kerbs and Footpaths	£ 1,664
1300	Street Lighting	£ 2,209
1400	Electrical Works	£ 675
1700	Insitu Concrete	£ 243,173
1800	Steel Arch	£ 52,000
2300	Sealing of Gaps	£ 1,000
2400	Brickwork	£ 55,724
5000	Maintenance Painting	£ 25,056
	Miscellaneous	£ 49,000
	Preliminaries	£ 133,899
	Design / PM @ 15%	£ 68,750
	Optimism Bias as per Green Book @ 30%	£ 194,694
	TOTAL	£ 843,674

Cost Verification

Bridge	Form	Indexed Cost* /m ³
Lindsay Road Bridge (Baseline)	Downstand steel beams	£ 414
Crosslee Station Disused Rail Bridge	Concrete flat deck	£ 381
HRE Bridge CKP/94 in Cumbria	Concrete flat deck	£ 374
HRE Bridge CKP/87 in Cumbria	Concrete flat deck	£ 466
HRE Bridge in East Ayrshire #	2-span masonry arch	£ 965
Traquair Park East Bridge - Pinkhill, Edinburgh	Concrete flat deck	£ 529

* This cost has been calculated by the total project cost, divided by the volume of infilling, then adjusted using construction cost indexing to the equivalent cost in January 2023. It is used as verification only.

Included extensive parapet rebuild

Appendix 2

Deck Removal Price Breakdown

Specification Series	Item	Cost
200	Utility Diversions	£ 197,517
200	Deck Removal	£ 70,000
Various	Ancillary works	£ 100,000
	Design / PM @ 5%	£ 14,876
	OB @ 20%	£ 76,479
	TOTAL	£ 458,871

Modular Bridge Price Breakdown

Specification Series	Item	Cost
200	Demolition and diversion costs	£ 342,517
1800	Fabrication and delivery	£ 179,100
1800	Installation	£ 60,000
Various	Allowance for on/off ramps over abutments	£ 25,000
	Design / PM @ 15%	£ 90,993
	OB @ 20%	£ 139,522
	TOTAL	£ 837,131