Appendix 1 Bishopsford Road Bridge – Merton Cabinet – 24th February 2020

	Option 1 demolishing c50% of the bridge: the northern arch and half the central arch and rebuilding both	Option 2: demolishing c25% of the bridge: the northern arch only and rebuilding it, retaining and repairing the central arch
Scope of works	This option involves demolishing all of the broken northern arch and half of the damaged central arch (approximately 50% of the bridge). The other half of the central arch and the southern arch would then be held up by a restraint system (kenteledge) attached to the western bank. The northern arch and half of the central arch would be rebuilt in brick by hand to match in with the lines of the original bridge. During construction one arch – the southern arch – would be open to let the river flow through.	Option 2 is a variation on Option 1: this time leaving the central arch and pier in place and demolishing part of the northern arch only up to the crown (approximately 33% of the bridge). Again, it is proposed that the restraints would run from the western bank and hold most of the bridge in place while the work would be undertaken. It is proposed that the northern arch would be fully repaired in brick by hand, using lime mortar. The central arch would not be rebuilt in this option, it would be repaired including by inserting brick wedges into the arch.
Durability and servicability	In this option, half of the bridge would be +100 years old with the other half rebuilt in brick using traditional techniques. The proposal is for the new built elements to be bonded with lime mortar like the older parts of the structure. Scour survey and remediation will be carried out to the northern arch abutment and the first pier. If there are defects in the southern or central arch that are currently hidden but are exposed during repairs, this could result in the option being amended or not being able to be delivered	The central arch has visible cracks in it and is deformed. This option retains the deformed central arch and proposes a repair. In this option it is proposed that the central arch would remain deformed at the end, although this would not be easily visible. If there was any settling of the structure post construction (for example, if the repairs to the damaged central arch were to settle and deform further), the bridge would have to be closed again while further engineering work was investigated. If there are defects in the southern or central arch that are currently hidden but are exposed during repairs, this could

	The load capacity of the repaired structure in this option would not be the desired level for a modern transport system in an urban area. It is not currently known how the structure would react to the release of the restraint system. If there was any settling of the structure post construction (for example, if the repairs to the damaged central arch were to settle and deform further), the bridge would have to be closed again while further engineering work was investigated.	result in the option being amended or not being able to be delivered. The load capacity of the repaired structure in this option would not be the desired level for a modern transport system in an urban area. It is not currently known how the +100 year old structure would react to c75% of it being restrained from the western bank, particularly as the central arch is deformed.
Health and safety	Ongoing future maintenance liabilities will be greater with a partially repaired bridge. The bridge will require reconstruction in the medium term. It is not known how long the repaired bridge will last. The works proposed would allow only one of the three arches, the southern arch, to be open for the river Wandle to flow through, supplemented by pumps while the works were underway. However this approach is considered high risk. It isn't clear how the risks of excess rainfall (such as happened in June 2019) could be adequately mitigated to minimize the risk of upstream flooding. There are significant risks associated with installing, maintaining and removing the restraint system that is proposed to hold up the southern arch and half the central arch. There are also uncertainties as to how the southern and half the central arch would react structurally to being propped up, particularly if there are hidden defects. If either were to fail at any stage, the resulting collapse	Ongoing future maintenance liabilities will be greater with a partially repaired bridge. The bridge will require reconstruction in the short- medium term. It is not known how long the repaired bridge will last. The works proposed would allow only one of the three arches, the southern arch, to be open for the river Wandle to flow through, supplemented by pumps while the works were underway. However this approach is considered high risk. It isn't clear how the risks of excess rainfall (such as happened in June 2019) could be adequately mitigated to minimize the risk of upstream flooding. There are significant risks associated with installing, maintaining and removing the restraint system that is proposed to hold up the southern arch and half the central arch. There are also uncertainties as to how the southern and half the central arch would react structurally to being propped up, particularly if there are hidden defects. If either were to fail at any stage, the resulting collapse would result in significant flood risk upstream,

	would result in significant flood risk upstream, increase the costs, time and programme associated with the project. The programme and costs do not adequately take account of the risks associated with this complex project	increase the costs, time and programme associated with the project.
Impact on statutory undertakers plant	Minor lifting and temporary support of existing utilities crossing the bridge deck will be required. The saddle in footway areas will require advanced demolition to ensure that services can be accessed and supported prior to demolition of the main saddle areas. Services supported in existing locations include; BT Openreach and UKPN Thames Water services will however require both temporary and permanent diversion. Temporary diversion will be via the east (upstream) service bridge, with permanent diversion through the saddle in the previously proposed positions. This will be at a cost of over £300k, which is not currently incorporated into the programme	Services (SGN, UKPN, Thames Water and BT) supported by the original structure will need temporary support or diversion during construction · Services (BT and Thames Water) supported by the eastern footway deck and piers can remain in place · Services reinstated into new arch structure will be (as currently) encased in concrete saddle · The existing eastern footway can be used to supported diverted services
Programme (inc road closures)	The programme provided with this option proposes a start on site on 13th May 2020 with a proposed completion by 17th September 2020. The proposed programme omits considerations including the following: drying time for the area under the central and northern arch, drying time for lime mortar, adequate time for carrying out and acting on environmental surveys etc.	The programme provided with this option proposes a start on site on 13th May 2020 with a proposed completion by 27th August 2020. The proposed programme omits considerations including the following: drying time for the area under the central and northern arch, drying time for lime mortar, adequate time for carrying out and acting on environmental surveys etc.

	This proposal is presented with an estimated cost of £708,000. This estimated cost does not incorporate design costs, carriageway resurfacing, contractors fee allowance. The estimated costs does not incorporate adequate costs for diverting utilities infrastructure. Current estimated costs from the utilities companies are in excess of £400,000 for this work 5% risk is allowed for additional costs against risk, which is considered low for such a complex project with many unknowns.	This proposal is presented with an estimated cost of £452,000, This estimated cost does not incorporate design costs, carriageway resurfacing, contractors fee allowance. It also does not include the total costs for the restraints or kenteledge. 5% has been allowed for additional costs against risk which is considered low for such a complex project with many unknowns. If there was any settling of the structure post construction (for example, if the repairs to the damaged central arch were to settle and deform further), the bridge would have to be closed again while further engineering work was investigated.
Buildability	Challenging access to the northern pier for underpinning work. The works proposed would allow only one of the three arches, the southern arch, to be open for the river Wandle to flow through, supplemented by pumps while the works were underway. There are significant risks associated with installing, maintaining and removing the restraint system that is proposed to hold up the southern arch and half the central arch. There are also uncertainties as to how the +100 year old southern and half the central arch would react structurally to being propped up, particularly if there are hidden defects. If either were to fail at any stage, the resulting collapse would result in significant flood risk upstream, increase the costs, time and programme	This option does not restore the structure to the way it would have been prior to the incident in June 2019. The central arch would remain deformed and while this may not be easily visible, it would leave many unknowns about the structural integrity and the load-bearing ability of the bridge and its ongoing lifespan. This is considered too high a level of risk to bear. There are significant risks associated with installing, maintaining and removing the restraint system that is proposed to hold up more than 66% the structure, particularly when structural damage has been identified in the central arch and the pier between the central and northern arch. It is not currently evidenced how this would react structurally to being propped up, particularly how the deformations and cracks would respond. If either were to fail at any stage, the resulting collapse would result in significant flood risk upstream, increase the

	associated with the project. It is unlikely that this risk could be sufficiently mitigated. The programme and costs do not adequately take account of the risks associated with this complex project.	costs, time and programme associated with the project. It is unlikely that this risk could be sufficiently mitigated.
Aesthetics	Asethetics maintained as existing.	Asethetics largely maintained as existing – the central arch would remain deformed but this would not be easily visible from public areas.
Environmental and sustainability	Bricks used, so maintains the current aesthetic Although this option utilises the current structure as much as possible, it would need replacement in future leading to less efficient use of materials. Lots of work within the watercourse over a longer period, so high on disturbance to riverbed	Bricks used, so maintains the current aesthetic If option needs later further replacement, then a less efficient use of materials. Lots of work within the watercourse over a longer period, so high on disturbance to riverbed
Capacity	This option would not provide the capacity suitable for a modern transport system.	This option would not provide the capacity suitable for a modern transport system.
Estimated costs	£708,000 not including utilities diversions + VAT	£452,000 not including utilities diversion + VAT
Recommendation	Not recommended	Not recommended

	Option 3 Do minimum – retain and refurbish the existing superstructure	Option 4 Partial reconstruction – reconstruct north and central spans, retain south span
Scope of works	Minimal demolition and brickwork repair to the bridge, enabling pedestrians, cyclists and cars to cross the river but not heavier vehicles such as busses or lorries.	Demolishing 66% of the bridge: the northern arch and the central arch, holding up the southern arch. Repairing the northern and central arch in brickwork with concrete foundations.
Durability and servicability	This option does not restore the structure to the way it would have been prior to the incident in June 2019 This option will increase the serviceable life by only 10 years, after which reconstruction would be required. Extensive re-pointing throughout the bridge will be required where not previously addressed through the preceding strengthening works. The load capacity of the repaired structure in this option would not be the desired level for a modern transport system in an urban area. This option would result in a bridge that would not be able to support busses and other heavier vehicles. If there are defects in the southern or central arch that are currently hidden but are exposed during repairs, this could result in the option being amended or not being able to be delivered.	In this option a third of the bridge (the southern arch) will be +100 years old as it will be retained and two thirds of the bridge (the central and southern arch) rebuilt in brick. The anticipated service life of the entire structure will be limited by the service life of the retained southern span, which would be less than a full reconstruction. The load capacity of the repaired structure in this option would not be the desired level for a modern transport system in an urban area. If there are defects in the southern arch that are currently hidden but are exposed during repairs, this could result in the option being amended or not being able to be delivered.
Health and safety	Multiple phases of work within watercourse to install and remove dams and pipes.	Multiple phases of work within watercourse to install and remove dams and pipes.

	Work around/ protection of statutory undertaker's plant required. Work within water required to underpin foundations, installation of Armco pipe. Ongoing future maintenance liabilities	Work around/ protection of statutory undertaker's plant required. Work within water required to underpin foundations, installation of Armco pipe. Ongoing future maintenance liabilities
Impact on statutory undertakers plant	Minor lifting and temporary support of existing utilities crossing the bridge deck will be required to provide access to demolish the failed saddle. The saddle in footway areas will require advanced demolition to ensure that services can be accessed and supported prior to demolition of the main saddle areas. Services supported in existing locations include; BT Openreach and UKPN (HV and LV services). Thames Water services will require both temporary and permanent diversion. Temporary diversion will be via the east (upstream) service bridge, with permanent diversion through the saddle in the previously proposed positions.	Services (SGN, UKPN, Thames Water and BT) supported by the original structure will need temporary support or diversion during construction. Services (BT and Thames Water) supported by the eastern footway deck and piers can remain in place. Services reinstated into new arch structure will be (as currently) encased in concrete saddle. The existing eastern footway can be used to supported diverted services
Programme (inc road closures)	Overall works duration low (c3 months)	Overall works duration: medium (6 to 8 months)
Buildability	Limited clearances within arch will lead to congestion when the geometry of the Armco liner and shoring is considered. Challenging access to the northern pier for underpinning work. Diversion route as existing	Works significantly affected by waterflows; many activities required while 'in- river'' – higher risk of being flooded out & work being stopped. Standard construction materials, readily available, no significant lead-ins. Small to moderate sized plant required due to smaller units (bricks) used.

		Construction of brick arches requires skilled labour. Diversion route as existing
Aesthetics	Aesthetics worse than existing due to additionally cluttered appearance of northern span	Aesthetics maintained as existing
Environmental and sustainability	Although this option utilises the current structure as much as possible, it would need replacement in future leading to less efficient use of materials. Lots of work within the watercourse over a longer period, so high on disturbance to riverbed	Vernacular materials used, so maintains the current aesthetic If option needs later further replacement, then a less efficient use of materials. Lots of work within the watercourse over a longer period, so high on disturbance to riverbed
Capacity	The load capacity of the repaired structure in this option would not be the desired level for a modern transport system in an urban area.	Desired 40Tonne capacity is achievable
Estimated costs	£880,000 exc VAT	£1,860,000 exc VAT
Recommendation	Not recommended	Not recommended

	Option 5: demolition of the existing bridge and reconstruction with a two-span bridge	Option 6: demolition of the existing bridge and reconstruction with a single span bridge
Scope of works	This option would involve the demolition of the existing bridge and its reconstruction to a two span structure (i.e. with a pier in the middle) Construction would be carried out in modern materials to hold the weight and volume of traffic and accommodate river flow, including increasing resilience for climate change (e.g. accommodating heavy rainfall scenarios). Some elements of the bridge would be constructed off site and assembled on site, minimizing the disturbance associated with construction for local residents and businesses. While the underlying structure of the bridge would be made with modern materials, the look of the bridge could be determined to reflect and compliment the local area Developing the foundations and the central pier in the river will require more working in the river than with a single span bridge, and is likely to require more maintenance over the lifetime of the structure and scour protection.	This option would involve the demolition of the existing bridge and its reconstruction to a single span structure. This option would involve more highways work either side of the bridge to support a bridge that spanned the whole river Construction would be carried out in modern materials to hold the weight and volume of traffic and accommodate river flow, including increasing resilience for climate change (e.g. accommodating heavy rainfall scenarios). Some elements of the bridge would be constructed off site and assembled on site, minimizing the disturbance associated with construction for local residents and businesses. While the underlying structure of the bridge would be made with modern materials, the look of the bridge could be determined to reflect and compliment the local area The look of the bridge could be determined to reflect and compliment the local area. A single span bridge may require a different highways alignment than a bridge with a pier in the middle.
Durability and servicability	A piled structure will be less sensitive to scour, removing restrictions in the watercourse will allow the river flow to slow down and reduce scour; formation level for substructures will be designed to allow for scour, or measures incorporated during foundation construction.	

	Target design life of 120 years, life to major maintenance is circa 20 years (metallic parapet elements)	
Health and safety	Installation of temporary restraints to south pier. Multiple phases of working within watercourse to install, reconfigure (twice) and remove the dams and pipes. Work around / protection of statutory undertaker's plant required. Work within watercourse required for pier construction (risk of flooding to be mitigated) Lifting of pre-cast elements	Installation of temporary restraints to south pier Two phases of working within watercourse to install, and remove the dams and pipes. This option requires the least amount of working in the river. Work around / protection of statutory undertakers plant required Lifting of pre-cast elements
Impact on statutory undertakers plant	Services (SGN, UKPN, Thames Water and BT) supported by the original structure will need temporary support or diversion during construction. Services (BT and Thames Water) supported by the eastern footway deck and piers will need temporary support or diversion during construction. Any services temporarily supported in place will hamper construction, particularly piling and placement of beams. SGN services will be reinstated on the new structure after construction. UKPN services should be diverted via the downstream footbridge. The Thames Water service that passes through the saddle will need disconnection and reinstatement over the new deck, at which point the rider main can be decommissioned. BT services within the downstream verge will need careful extraction and supporting from a temporary structure or diversion to the ducts below the downstream footbridge. BT services supported by the eastern footway deck /piers and the Thames Water rider main should be supported from a temporary structure until it can be decommissioned.	

Programme (inc road closures)	Long: approximately one year start to finish	Long: approximately one year start to finish
Buildability	Challenging access to the central pier foundation. Small precast elements that can be lifted by modest sized plant. Any services temporarily supported in place will hamper construction, particularly piling and placement of beams. Some beams will need sliding sideways after initial landing to move them under the temporary service bridges. Diversion route as existing	Foundations can be constructed from the river bank – least amount of working the river Larger pre-cast elements than other options, requiring larger cranes than other options Some beams will need sliding sideways after initial landing to move them under the temporary service bridges Diversion route as existing
Aesthetics	Aesthetics will be different from existing. Materials will be salvaged from the existing structure and can be incorporated into the new structure. Consultation pre-application for planning proposes will inform the look and feel of the new bridge.	Aesthetics will be different from existing. Materials will be salvaged from the existing structure and can be incorporated into the new structure. Consultation pre-application for planning proposes will inform the look and feel of the new bridge.
Environmental and sustainability	New structures, so no need for further works in short to medium term No use of materials for shorter term solutions	
Capacity	Will be able to accommodate traffic loads and volumes of a modern urban transport system, including HGVs and abnormal loads.	
Costs	£2,690,000 exc VAT	£2,690,000 exc VAT
Recommendation	Both are recommended options	

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