Increasing Longevity: King's Scholars' Pond Sewer Repair Trial

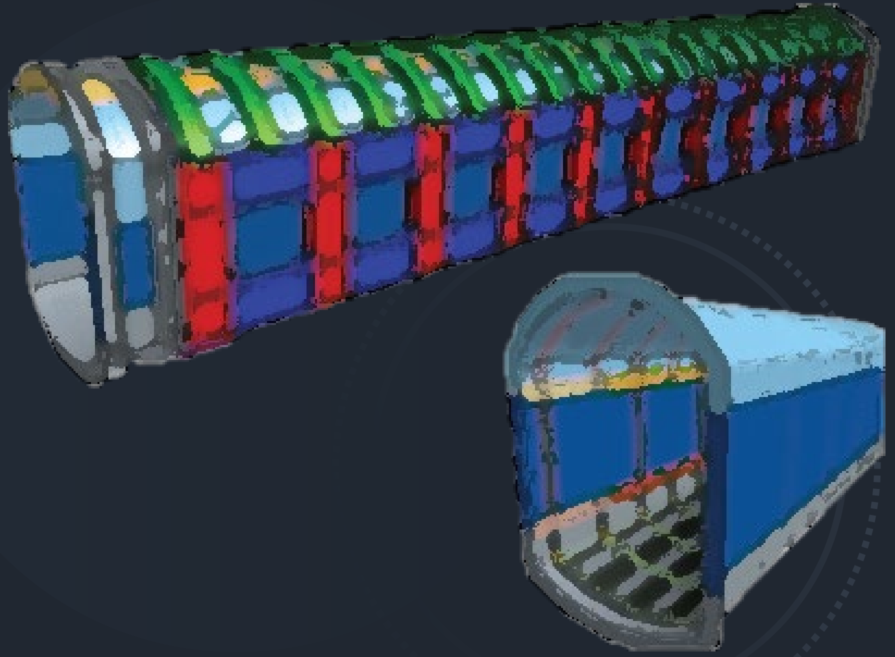
TfL Lane Rental Industry Publication

TRANSPORT FOR LONDON

Introduction

King's Scholars' Pond Sewer is located in the vicinity of the London's Baker Street tube station; situated beneath a key arterial road and above the underground line, any repairs are particularly difficult and extremely costly.

While undertaking a routine inspection, there was evidence of significant internal degradation and deterioration, with cracks visible within the brickwork. Given the location of the sewer, the preferred option was for remediation to be carried out from within the sewer and possible solutions were investigated.



The Project

Initial solutions involved the development of a carbon fibre modular liner which would transfer load from the brick crown, through the invert plate of the sewer and onto support beams spanning between the cast iron beams.

Another possible solution was to replace the existing cast iron beams and strengthening the London Underground walls. It was calculated three months' worth of train possessions would be required to facilitate the work, with an approximate cost of £30m. A further £7m would be required to complete the civils works.

Other considerations included the use of vertical anchors to make use of the concrete and reinforced concrete slabs installed in the sub-surface above the sewer, believed to have been placed during World War 2. The solution was to 'hang' a lining solution from the roof, thereby negating the need to carry out any additional support work from within London Underground. Unfortunately, ground investigation work carried out yielded unsatisfactory results as to the structural integrity of the concrete/reinforced concrete slabs.

After thorough investigation, the chosen method was to construct a modular duplex steel Vierendeel truss with an associated glass fibre reinforced plastic (GFRP) liner, designed to be carried through the existing manhole, and once in situ, bolted together to form a permanent bridge

Outcomes

Undertaking the project in this way has avoided disruption both on the road and underground networks. There is the additional benefit that the expected life span of the steel is 120 years without any major maintenance or replacement and the liner having a 50 year life span.

There are several locations where Thames Water has similar situations of sewers crossing railways and this is now an option that can be considered in designing a solution and could also be used by other parties with similar network constraints.

Lessons Learnt

When undertaking large scale projects of this nature, it is important to investigate all possible solutions to ensure that the most optimum is used. Early communication to understand requirements and constraints enables a collaborative approach to avoid delay.

Finally, carrying components the size and weight of the truss down a manhole was a completely new challenge and therefore lessons on safe systems of work, methodologies and equipment have recorded which will help improve future programmes.

Conclusion/ Recommendations

Overall the scheme managed to mitigate the risk of sewer collapse, while keeping all transport modes in operation. This was also done without having to isolate a major trunk sewer or diverting power cables in the process. A world class bridge has been constructed with global tolerances of +/- Imm in an extremely challenging environment.

TfL Lane Rental Scheme

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