

**The Thames Tideway Tunnel & London Borough of Tower Hamlets:
The KEMP Foreshore & Heckford Options**

EXECUTIVE SUMMARY



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This document is prepared for the Cabinet of the London Borough of Tower Hamlets. It summarises the work done by Nigel Legge Associates assessing the impact of the Thames Tideway Tunnel on the Borough, and evaluating various options for the interception of the North East Storm Relief sewer which enters the Thames below the King Edward Memorial Park.

THE PROJECT

Construction of the Thames Tideway Tunnel (TTT) project aims to deliver significant environmental benefits by reducing the 39 m tonnes of untreated sewage discharged annually into the River. The Thames Tunnel project involves constructing a deep tunnel from Acton in west London to Abbey Mills – the so-called Super Sewer - to intercept many of the existing combined sewer overflows (CSOs), so removing discharge into the River during storm events. Their flow will be intercepted and passed down shafts to the main tunnel, which runs at a depth of some 70 m below ground level, mostly beneath the Thames. The Thames Tunnel effectively operates as a very large collection or attenuation tank which is filled during storm events, and is then pumped out at Abbey Mills pumping station with the contents passed through the Lee tunnel to the Becton sewage treatment works.

The North East Storm Relief (NESR) sewer, which drains a large area of London to the west and north-west of Tower Hamlets, enters the Thames below the King Edward Memorial Park and discharges on average over 784,000 m³ of effluent a year, some 2% of the annual total discharged into the River. This sewer along with many others will be intercepted by the scheme and outflow diverted via a shaft into the main Tideway tunnel.

Objections & Alternatives

There have been a number of high-level objections to the TTT project on the grounds of its scale, effectiveness, impact and cost. In 2011 the independent Thames Tunnel Commission formed by Hammersmith and Fulham council and chaired by Lord Selbourne urged a review of alternatives including a shorter tunnel combined with green infrastructure solutions, such as sustainable drainage systems (SUDS). Thames Water claimed that the Selbourne Commission's proposals 'failed to provide viable, economic or timely alternatives'.

After a rise in the projected TTT costs to £4.1b, an influential independent consultant Chris Binnie claimed that the main tunnel could be shortened to include the Acton to Battersea section only. Thames Water responded that this would leave 17 CSOs unintercepted and not meet dissolved oxygen targets for the River, in breach of the EU Urban Wastewater Treatment Directive.

Both the Government and the Environment Agency indicated their support for the project following the Selbourne Commission report. A number of major cities in continental Europe, the USA, Japan and Thailand have implemented, or are in the process of implementing, similar tunnelled solutions to address CSO discharges. It is considered unlikely at this stage that fundamental changes will be made to the concept or scope of the TTT project.

NESR CSO INTERCEPTION OPTIONS

All parties including the London Borough of Tower Hamlets (LBTH) and local community groups accept the need to intercept the NESR CSO and prevent discharge of untreated sewage. Various sites for the interception of the NESR have been considered by Thames Water. These include the Shadwell and Limehouse basins, as well as several potential sites north of The Highway including the Heckford Street Business Centre, the Cemex site occupied by a concrete batching plant, Cable Street and the Studio site consisting of a Victorian brick warehouse subdivided into business units.

Thames Water have a standard site selection methodology in which sites are evaluated according to five principal criteria which have equal weighting: engineering; planning; environmental; community; property. In their Phase 1 public consultation a site on the KEMP foreshore was proposed as the Preferred Scheme. Due to the impact of this option on the park and following the involvement of local community groups other locations have subsequently been considered and various alternatives proposed, the principal one being the Heckford Street site (see Figure 1).

The Foreshore Option

The Foreshore Option involves both interception of the NESR and construction of the vertical drop shaft to the main tunnel in the KEMP foreshore. A minimum worksite area of 7,500 m² will be required for 3.5 – 4 years to achieve this.

Although the Foreshore Option has some engineering advantages due to combining the interception and shaft sites, as well as the option of using the River for transporting some materials to and from the site, it will have a significant impact on the park during the construction stage lasting for up to 4 years. After construction an additional 2,000 m² permanent legacy area will be left in the foreshore for ventilation and access structures, and various landscaping improvements to the park will be made.

The Heckford Option

The Heckford Option proposes two worksites: a smaller one of 1,750 m² located in KEMP for 1.5 – 2 years to intercept the NESR, connected by a 4.2m diameter transfer tunnel to the Heckford business site where the vertical shaft would be constructed in a site of 7,500 m² requiring 3.5 – 4 years.

The Heckford Option will therefore require two worksites, but the area taken in the park during construction will only be approximately 20% of the area of the Foreshore Option and be required for up to 2 years less time. The main shaft site at the Heckford business park will be required for the full 3.5 – 4 years during construction. After this time the area has the potential to be redeveloped for mixed commercial and residential use, although a 2,000 m² legacy area is required. Thames Water have confirmed that this option is technically feasible.

Other Options Considered

A further option, proposed by the SaveKEMP group, involved intercepting the NESR outflows in LBTH, then transferring effluent via a 1640m long connection tunnel across the Thames to an existing vertical drop shaft at King's Stairs Gardens or Chambers Wharf in Southwark (Figure 4). Thames Water carried out various studies and concluded this option was not feasible because of the unstable hydraulic and pneumatic conditions it would introduce into the system. The hydraulic engineering aspects of this option were assessed for LeggeAssociates on behalf of LBTH by Professor Maksimovic of Imperial College, London, who was of the opinion that various unfavourable hydraulic conditions were associated with this solution. Due to existing tunnels under the Thames this option would

also require a deeper, larger shaft in KEMP compared with the Heckford option and, more significantly, result in an overall prolongation of the entire TTT project by 1 year with substantial cost implications.

Other sites to the north of The Highway were rejected on the basis they were not large enough and that combining them, e.g. the Cemex and Studio site was not feasible. The Shadwell and Limehouse basins are surrounded by residential properties, and would also have access problems for site construction traffic; they were also not considered suitable shaft locations.

A further technically possible option would be to identify another foreshore site located away from KEMP. There are access issues for site construction traffic with alternative foreshore sites in LBTH, and it is understood there may be resistance from both the Port of London Authority and the Environment Agency.

Considering the various constraints within LBTH it is concluded that the only viable alternative shaft site to the KEMP foreshore is the Heckford Street site.

COMPARISON OF THE KEMP FORESHORE & HECKFORD OPTIONS

Thames Water's Phase 2 public consultation process has, as for Phase 1, proposed the KEMP Foreshore Site as their Preferred Scheme. As part of our evaluation of the impact of the TTT project on LBTH, an independent assessment has been made of both options and this is summarised below.

Construction Logistics

The **Foreshore Option** has the advantage of combining interception of the NESR with the vertical drop shaft to the TTT, requiring a single work site rather than two. Locating the combined worksite on the foreshore minimises impact on the urban environment. In addition, the foreshore location enables spoil from the shaft construction and tunnelling work to be transported away on the river by barge, therefore minimising construction vehicle movements. Thames Water has confirmed that use of the river for transport will be a contractual requirement for constructors.

The principal issue with the Foreshore Option is its impact on KEMP. The entire 7,500 m² work site would be located in KEMP including a large area of the foreshore, an access road and associated facilities including workshops, stores, offices, canteens and welfare facilities located in the western area of the park. It is not currently known how large the actual shaft site on the foreshore would be, this will be decided by the contractor when appointed. The total required area including access and associated facilities in the park may therefore exceed 7,500 m². Thames Water has indicated that the size of the site would vary during the construction process.

The **Heckford Option** involves two sites: a 7,500 m² worksite for the vertical shaft located away from KEMP in what is currently a business park, and a smaller 1,750 m² site to intercept the NESR in KEMP. A 4.2m diameter tunnel would connect the two sites. The Heckford Option site area within KEMP is only 23% the size of the Foreshore Option.

The CSO interception worksite KEMP is currently located centrally within the park. It has been shown that other locations within the park, e.g. to the south east towards the River and the Free Trade Wharf flats, are not feasible due to the alignment of the Rotherhithe road tunnel which would interfere with the required connection tunnel.

Access for both options is off Glamis road. The Foreshore Option requires a longer access road through KEMP along the south side of the open sports area and river path; the

Heckford Option access road would occupy the location of the path from the main park entrance toward the King Edward memorial.

Construction Programme

Both options will involve construction activity within the Borough for 3.5 – 4 years duration. The principal difference is that for the Foreshore Option all work activity will be focused in KEMP, whereas for the Heckford Option construction in the park will only last 1.5 – 2 years - work on the vertical drop shaft at the Heckford business park site would last for the full 3.5 – 4 years duration however.

Construction Costs

A cost comparison by Thames Water of the two options has shown that they are comparable.

Tunnel Alignment & Settlement

With the Foreshore Option the main tunnel is located under the Thames and then below the Limehouse Cut as it runs north-east towards Abbey Mills pumping station. This will minimise the settlement impact of tunnelling on the Borough. The Heckford Option requires the alignment of the main Tideway tunnel, which is located some 70m underground, to be altered so that it intercepts the shaft below the Heckford business park. In addition, a shallower smaller diameter tunnel will connect the CSO interception in KEMP with the main shaft at the Heckford site. The Heckford option therefore has increased potential for settlement to impact buildings in the Borough, particularly where the connection tunnel to KEMP is located above or near the main tunnel. This option will involve more input from Thames Water during the planning and implementation phases concerning issues associated with easements, consents, condition surveys etc.

There have been a number of major tunnelling projects beneath East London in the last 20 years including the Jubilee Line Extension and Channel Tunnel Rail Link. Following these and other projects, the amount of settlement and its impact on surface buildings is now better understood and accurate predictions can be made. Based on initial calculations made by Thames Water it is assessed that the impact of the connection tunnel between KEMP and Heckford should not be significant, and that the impact of the deeper main Tideway Tunnel on buildings within the Borough is likely to be minor.

Air Management & Quality Control

Managing the quality of the air coming out of the Tideway Tunnel project involves adequate ventilation and filtration to avoid nuisance odour releases and adverse effects on occupational and public health.

Both options will require permanent ventilation structures in the form of columns from 0.3m - 1.6 m in diameter and between 4m - 6m high during operation of the system. The size of these structures has been considerably reduced since the Phase 1 consultation. It is currently proposed that the Foreshore Option has 4 ventilation columns, and the Heckford Option has 2 in the business park site and 3 in KEMP. Air will only be exhausted from the tunnel system during major storm events and the predicted air quality impact for both options is minor.

Environmental & Socio-Economic Impacts

The location of the Heckford option will lead to air quality and noise / vibration impacts on a larger overall number of residential dwellings. These impacts will however be ameliorated and minimised during construction.

The Heckford Option will have significantly reduced impact on biodiversity than the Foreshore Option, and less impact upon townscape and local views. The impact of the Foreshore Option on the King Edward Memorial Park as a valuable amenity resource will be greater, and for approximately double the duration through the construction, compared with the Heckford Option.

The Heckford Option may lead to a temporary loss of local employment at the business park during the construction phase, and this will need to be addressed. Following completion of the project there may be potential for enhancement of the employment offered in the area depending on redevelopment options.

Both options have a number of beneficial and adverse aspects in terms of environmental and socio-economic impact. It is considered, however, that many of the adverse environmental and socio-economic impacts identified could be minimised to an acceptable level through appropriate mitigation.

Legacy Issues

Following construction of the Foreshore Option, Thames Water are proposing to retain a 2000 m² area in the foreshore for ventilation, access and maintenance purposes, and to carry out a landscaping scheme in KEMP to incorporate the various legacy structures into the park landscape.

For the Heckford Option the legacy impact in KEMP would be limited to ventilation structures, an electrical kiosk and an increased area of hardstanding to access the underground structures. After construction there is a possibility that the Heckford business site will be redeveloped to include mixed commercial and residential use. A permanent area of 1,500 m² – 2,000 m² will be required here by Thames Water for access, maintenance and ventilation purposes.

PHASE 2 CONSULTATION DOCUMENTS

Thames Water's Phase 2 public consultation documents have been reviewed to assess whether the technical content is consistent with information received directly by LeggeAssociates and LBTH during various meetings and discussions concerning the TTT project and its impact on the Borough. It is concluded that the Phase 2 documents are consistent, and also that the level of technical information received directly from Thames Water is more quantitative and detailed than that in the consultation documents.

The Heckford Option is not addressed in any significant detail in the Phase 2 documents.

CONCLUSIONS

From an engineering perspective it is concluded that both the Foreshore and Heckford options are technically feasible and, according to Thames Water, the cost estimates for both are similar. During construction the Heckford Option will result in significantly less overall impact on the park compared with the Foreshore Option due to the reduced area requirements and shorter programme, and the fact the main worksite for the vertical shaft is located north of The Highway. The Foreshore Option will have relatively less impact on the urban environment due to its location, as well as reduced vehicle movements due to material transport by river. Both options have similar legacy requirements for access, ventilation and maintenance of permanent underground structures. Air quality issues are predicted to be minor for both options, although due to its location the Heckford Option has the potential for greater urban impact.

Thames Water has made clear its preference for The Foreshore Option, but have said they will consider the Heckford Option if community support is clearly in favour of this.

Figure 1 Locations of the Foreshore & Heckford Options & Other Proposed Sites in LBTH

