Elysian Residences

KEW RIVERSIDE

Piling adjacent to Thames Water Transfer Tunnel

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PUBLIC

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EXECUTIVE SUMMARY

This report provides a technical response to Planning Condition ref U0079761 in relation to piling adjacent to the Thames Water Transfer Tunnel.

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1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report explains the surveys and investigations undertaken and the engineering design and assessments carried out to demonstrate the proposed development will not adversely impact the Thames Water transfer tunnel passing beneath the site.

In particular, the report is prepared to respond to Planning Condition no. U007961, which states:

'No piling shall take place until a piling method statement (detailing the depth and type of piling to be undertaken and the methodology by which such piling will be carried out, including measures to prevent and minimise the potential for damage to subsurface sewerage infrastructure, and the programme for the works) has been submitted to and approved in writing by the local planning authority in consultation with Thames Water. Any piling must be undertaken in accordance with the terms of the approved piling method statement'

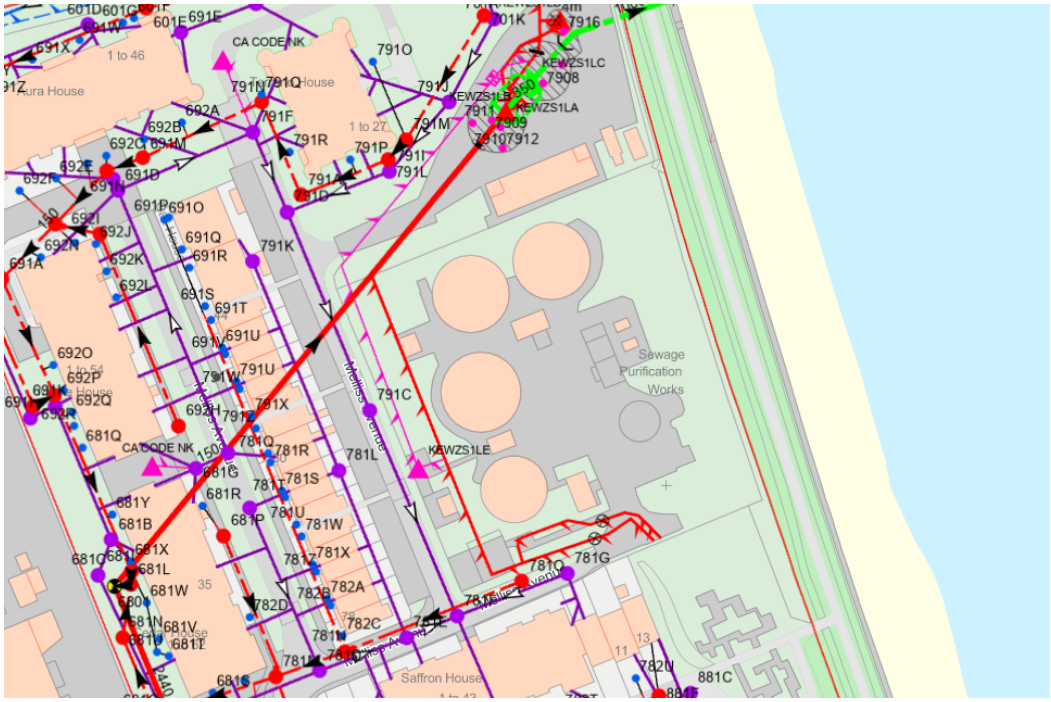
1.2 THE SITE

The site is located on the site of a former Biothane plant located off Mellis Avenue, Richmond, London. The site is located at grid reference 519780, 176920. The site is at approximately 7000sqm and the +3.8 - +4.5m AOD.

Immediately to the north of the site is Thames Water pumping station – which is a media control centre, inlet tank and storm tank for the Thames Water sewer.

A 2.44m diameter Thames Water transfer tunnel ('the tunnel') passes beneath the north-west corner of the site heading in an northeast direction to the pumping station.

Figure 1-1 – Site Plan showing line of TW Transfer Tunnel



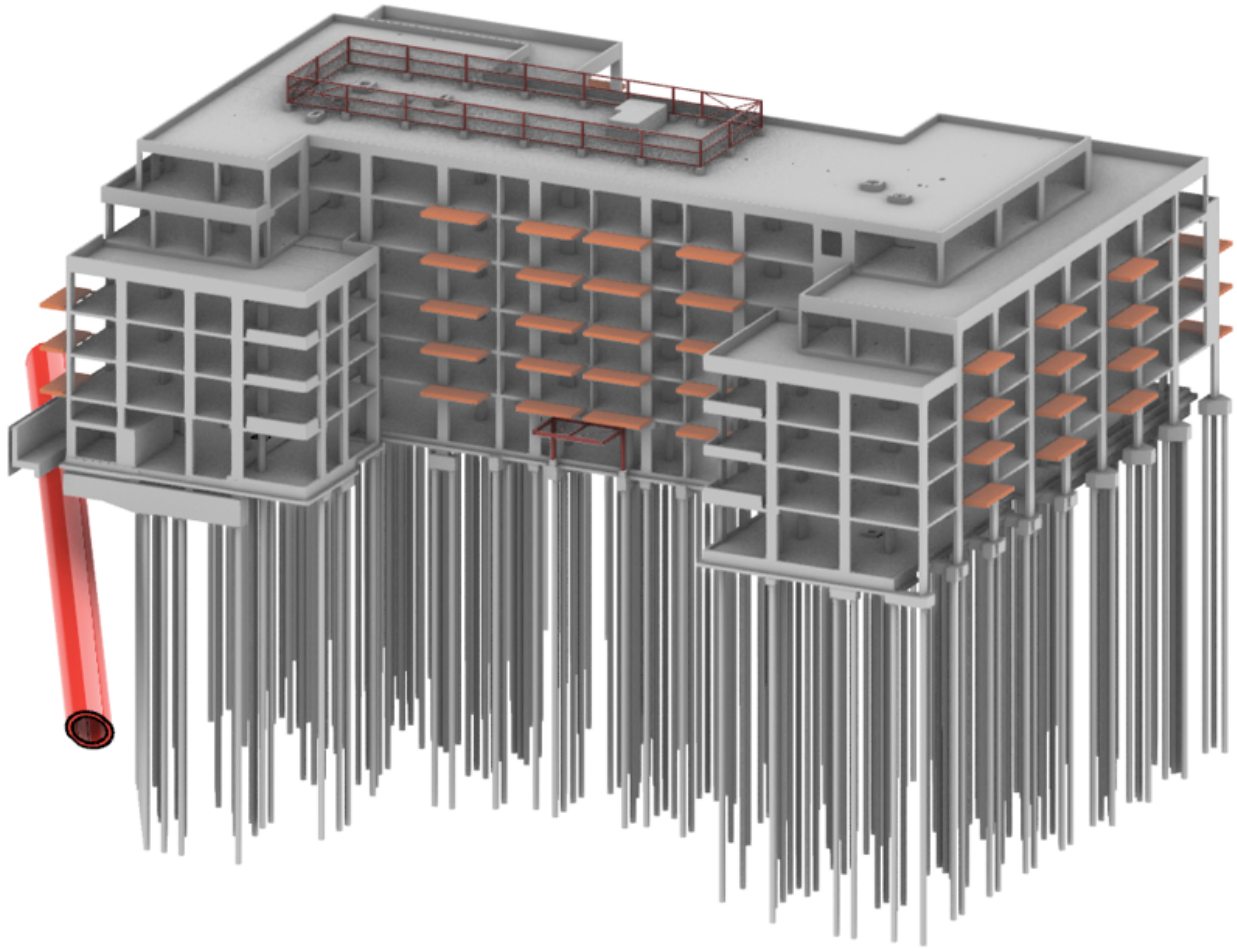
The transfer tunnel runs in a straight line between a manhole next to Cedar House ref TQ19766801 to the Thames Water pumping station. The tunnel has an invert level of -6.5m AOD (c10.5m bgl) where it passes beneath the site, hence the crown of the tunnel is approximately 7.5m below ground.

1.3 PROPOSED DEVELOPMENT

The proposed development comprises a new six storey reinforced concrete residential building. Given the ground conditions, piled foundations are required to support the proposed building.

Thames Water require a 3.0m piling exclusion zone each side of their asset. Piles must be kept outside of this.

Figure 1-2 – Proposed Building (looking from south west)

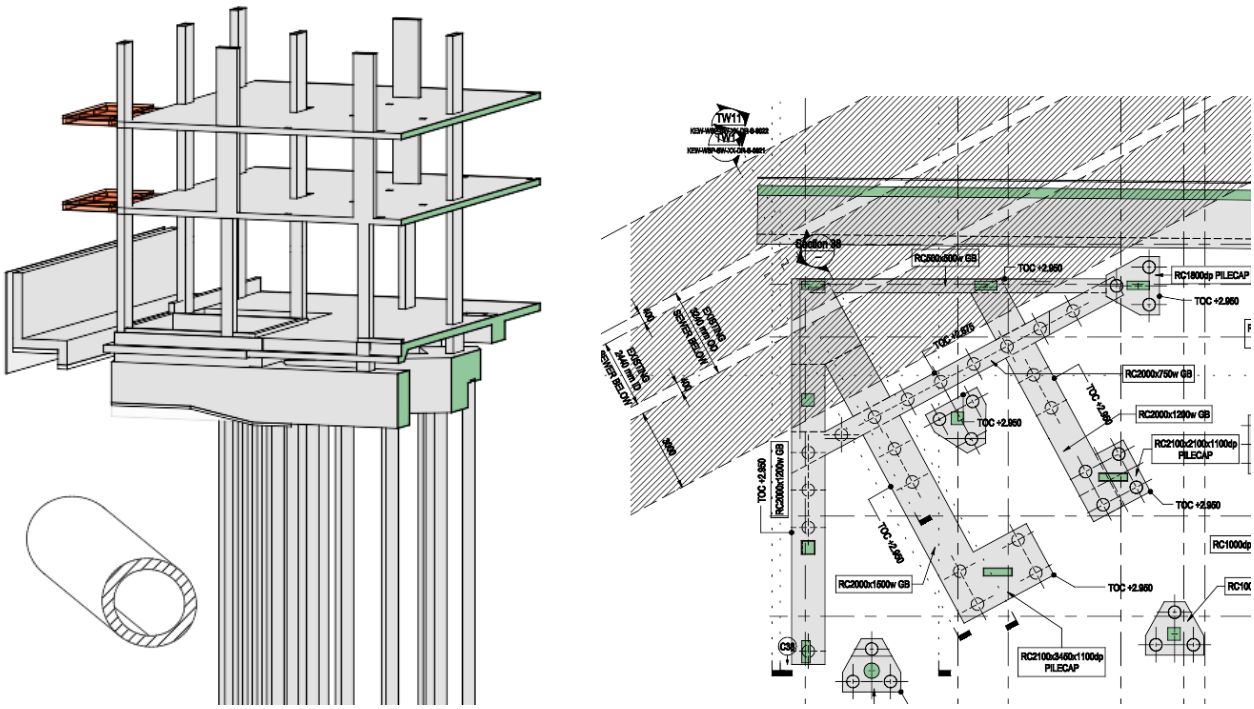


The north-west corner of the building is four storeys high and is positioned over the tunnel. Three superstructure columns required to support the building land in this zone to support the building. Piled foundations cannot be placed beneath the columns.

1.3.1 FOUNDATION PROPOSAL

A row of piles are lined parallel to the tunnel and three ground beams cantilever out to support the building columns. A 100mm layer of compressible material will be provided beneath the beams to allow beam settlement without loading the ground beneath the beams.

Figure 3 - Transfer structure over transfer tunnel



All piles are located outside of the exclusion zone. The proposed piles have been positioned outside of the exclusion zone of the tunnel allowing for the following:

- Tunnel position as per the line and level survey – refer to Section 2
- 400mm tunnel wall thickness
- 3m easement zone
- 200mm pile tolerance (position and verticality) – refer to Section 1.4

For the magnitude of the design loads, 450mm diameter piles are proposed. To generate the required load capacity, piles will be typically 25m long, terminating in the London Clay. All piles will pass through made ground, Alluvium and the Kempton Park Gravels, to the London Clay to obtain shaft adhesion and end bearing in the London Clay formation.

Structural drawings for the transfer structure are contained in Appendix D

1.4 PROPOSED PILING TYPE

Continuous flight auger (CFA) piles are suited to the ground conditions at the site. CFA piles are cast in-situ a non-displacement system; hence the soil from the shaft is brought to the surface without the need for support fluid or casings to support an open bore technique.

CFA piling is regarded as the least intrusive method in terms of ground movements and will fall below Thames Water's maximum peak particle velocity limit of 10mm/s (normal CFA activities produce less than 5mm/s.

Therefore, CFA piling has been adopted.

Tolerances

Piling shall be installed to industry standard construction tolerances of 75mm plan position and 1:75 verticality. This piling tolerance has been allowed for when setting out of the nearest piles from the transfer tunnel to ensure that the 3m exclusion zone is always maintained and will not be encroached.

Further details on the piling method statement is shown in Section 3.

1.5 GROUND MOVEMENT ANALYSIS (GMA)

A detailed ground movement analysis (GMA) has been carried out by WSP to assess the likely ground movements and imposed strains on the tunnel wall as a result of the proposed construction works (piling and superstructure) and from the building when in operation. The applied movements and strains are checked against the Thames Water acceptance criteria.

Full details of the GMA are contained in WSP report ref KEW-WSP-SW-XX-RP-GE-003. This report has been submitted to Thames Water as part of the Build Over Technical submission.

The GMA confirms that the movements and strains are within the TW acceptance criteria.

2 SURVEYS & INVESTIGATIONS

2.1 INTRODUCTION

This section summarises the surveys and investigations carried out to inform the structural design and the assessment of the impact on the tunnel.

2.2 GROUND CONDITIONS

Site specific SI was undertaken in March 2024 to identify the ground conditions at the site to inform the structural foundation design. The SI was specified by WSP and carried out by specialist SI contractor Lucion Ground Engineering.

The ground conditions are summarised in Table 1 below.

Table 1 – Existing Ground Conditions

Stratum	Elevation of Upper Surface (m bgl)	Elevation of Upper Surface (m bgl)	Typical thickness
Surfacing	NA	3.80 to 6.14*	0.10 to 0.50
Made Ground	0.00 to 0.80	3.14 to 5.98*	0.20 to 5.10
Alluvium	1.40 to 5.20	0.88 to 2.91*	0.30 to 1.90
River Terrace Deposits (Kempton Park Gravel Member)	2.40 to 6.30	-0.16 to 2.01*	0.20 to 3.60
London Clay Formation	3.60 to 8.70	-1.64 to -0.22*	0.15 to 25.75 (base not proven)

2.2.1 GROUND PENETRATING RADAR (GPR) SURVEY

A GPR of the site has been carried out in August 2024 to confirm locations and types of existing below ground utilities within the site and with beneath Mellis Avenue. With the exception of the TW tunnel, all existing subterranean drainage within the site has been decommissioned, grubbed up and capped at the site boundary as part of the demolition works. All applications to close the existing drainage have been submitted to the relevant authority.

The GPR survey can be found in Appendix A.

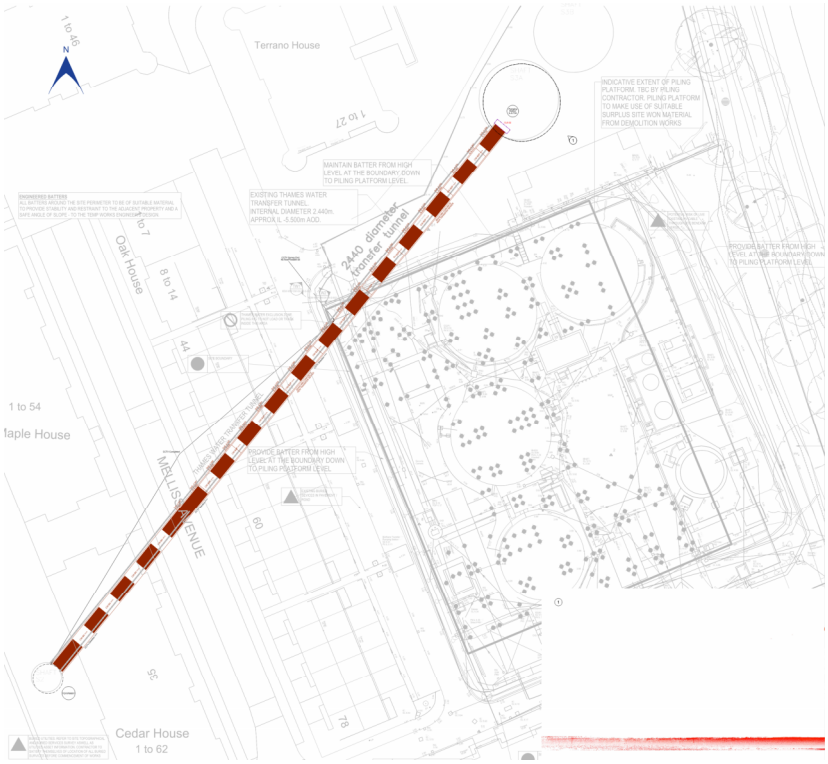
2.2.2 THAMES WATER TRANSFER TUNNEL LINE AND LEVEL SURVEY

A line and level survey of the transfer tunnel was carried out 28 October 2024 by specialist surveying contractor Ploughman Craven. The survey involved a CCTV GPS device passed within the tunnel on a floating pontoon.

The extent of the survey was from the rear of Cedars House approximately 80m south-west of the site, (ref Shaft S2 @ TQ19766801) up to the pumping station wet well (ref Shaft S3A). The depth of the tunnel is 10.0 - 10.70m deep to the invert passing beneath the site at IL -6.57m AOD.

The line of the sewer was found to be c700mm further south (into the site) than shown on asset record drawings.

Figure 2-1 – Surveyed position of the tunnel



The thickness of the tunnel was not possible to be surveyed and so has been conservatively assumed for the purpose of design as 400mm thick. This assumption has been agreed by Thames Water – refer to email in Appendix F.

The position of the tunnel based on the line and level survey is shown in Appendix B.

2.2.3 THAMES WATER TRANSFER TUNNEL CONDITION SURVEY

A CCTV condition survey was carried out 28 October 2024 by specialist surveying contractor Ploughman Craven using a float survey. The survey was commenced from Shaft S2 at the rear of Cedars House and extended 87m downstream towards the pumping station reaching the corner of the site.

The water level when surveyed was at approx. 50% depth with a gentle flow towards the pumping station. The survey was stopped at 87m due to insufficient flow.

The CCTV survey shows that the transfer tunnel is of concrete construction without an internal lining. WSP has reviewed the survey information and is satisfied that the sewer is in good condition with no observed concerns. Refer to Appendix C for Thames Water's confirmation of no further comment.

A similar survey will be undertaken post-completion of the construction.

The CCTV survey can be found in Appendix C.

2.2.4 PILE PROBING

Pile probing shall be carried out prior to piling works to confirm that they are clear of below ground obstructions. A magnetometer survey will also be carried out to clear the risk of UXOs.

Every pile position will be probed.

3 PILING METHOD STATEMENT

3.1 INTRODUCTION

This section describes the process of installing CFA piles in the vicinity of the tunnel.

A piling method statement has been prepared by piling contractor Franki Piling Ltd. Full details can be found in appendix E.

3.1.1 SITE PREPARATION AND MOBILISATION

A working platform shall be laid to support the loads imposed by the CFA piling rig. The working platform shall be made up on a minimum 500mm thick, well-graded, well compacted material at +4.100m AOD. The pile mat will be designed, tested and maintained in accordance with good practice guidance.

The tunnel exclusion zone (3m easement) will be clearly marked out on site and fenced off to prevent accidental access by the piling rig.

Piles will be set out as per the position given in WSP pile schedule and marked with a peg in the pile centre position. Setting out will be carried out by an experienced site surveyor / site engineer using site control points.

The setting out will be checked again by the site surveyor/engineer immediately before piling commences and will be a check criteria on the permit to pile.

3.1.2 PILING WORKS

The CFA rig shall be placed in position, with assistance from a banksman, so that the tip of the auger is exactly on the pile centre. The rig will be orientated perpendicular to the tunnel from the south of the line of piles such that the rig does not encroach into the exclusion zone.

Once the rig has been set up over the pile position, the CFA shall bore to the required depth required by the design. The pile toe depth is monitored by the rig operator.

Once the toe level is reached, concrete is pumped into the shaft as the auge is retracted. Concrete will stop on completion of the withdrawal of the auger, such that the shaft is not open/empty at any stage.

3.1.3 REINFORCING

The prefabricated reinforcing cage is installed as soon as the auger is removed. The length of the reinforcement cage within the pile is dependent on the pile design loads and is plunged into the pile under its own weight. The cage will be rigid enough to ensure it does not bend or buckle during installation.

4 CONCLUSION

A condition survey has been undertaken by specialist surveyor Ploughman Craven. The survey shows the tunnel to be in good condition with no observed signs of concern. Thames Water has confirmed a statement of no further comment.

The position of the tunnel has been verified by a GPS line and level survey undertaken by specialist surveyor Ploughman Craven.

A foundation solution has been developed that positions all piles outside of the exclusion zone of the tunnel, allowing for the following:

- Tunnel position as per the line and level survey
- 400mm tunnel wall thickness
- 3m easement zone
- 200mm pile tolerance (position and verticality

CFA piling has been proposed as it is recognised as the method of piling with the least vibration and ground movement.

A detailed Ground Movement Assessment (GMA) has been undertaken to assess the likely movement and tunnel wall stresses. The GMA shows that the movements and stress are within acceptable limits set by TW.

A piling method statement has been prepared by Franki Piling Ltd for the piling works.