



Whitby Wood Limited

**Plot B, Ferry Island,
Tottenham Vale
Masterplan
Redevelopment**

Remediation Strategy

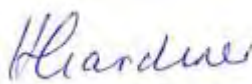
September, 2022



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FIGURES

Figure 1 Langan Exploratory Hole Location Plan

APPENDICES

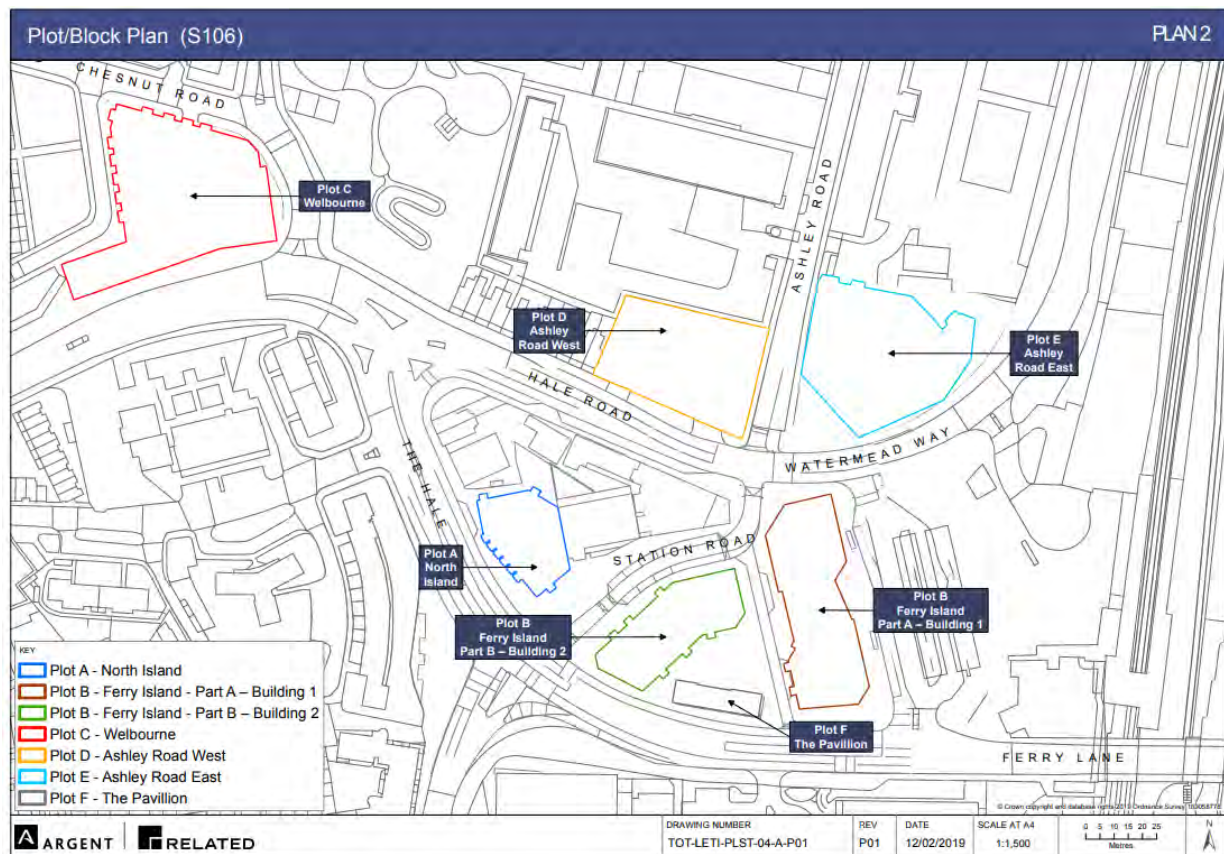
Appendix A	Tottenham Vale Masterplan Plot Boundaries
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1. INTRODUCTION

Card Geotechnics Limited (CGL) has been commissioned by Whitby Wood Limited to complete a Remediation Strategy for the site known as Plot B, Ferry Island (herein referred to as 'the site'). The site forms part of the wider Tottenham Hale Centre (THC) development in Haringey Council area. The THC development proposals originally extended across five plots of land (known as Welbourne; North Island, Ferry Island, Ashley Road East and Ashley Road West) in Tottenham Hale, totalling approximately 1.55 hectares ('ha').

A THC plot / block plan is presented as Plate 1 and the Tottenham Hale Masterplan boundaries are shown in Appendix A.

Plate 1: Tottenham Hale Masterplan boundaries



For the avoidance of doubt and to remove any ambiguity this report relates to Ferry Island (Plot B) only and not the Pavilion (Plot F). Plot F previously formed part of the Ferry Island Site (and was subject to ground investigation and assessment as part of the original Ferry Island Site boundary) but is now subject to separate planning conditions.

This report presents a summary of the findings of previous assessments of the site to present the scope for the remediation works necessary to mitigate, to acceptable levels, risks to human health,

vegetation, controlled waters and buildings/structures, in order to facilitate the proposed site development. The proposed development on the Ferry Island site comprises the demolition of the existing structures and the construction of two buildings between 7 storey and 38 storeys in height with a single storey basement connecting the two buildings and associated public realm space. Building 1 will include 376 build to rent apartments with ground floor shell and core retail units. Building 2 will include 108 private for sale apartments, also with shell and core retail units within the ground floor.

The following reports have previously been undertaken at the site and provided to CGL for review in the production of this report:

 BuroHappold Engineering Ltd, Tottenham Hale Masterplan, Phase I Geoenvironmental Desk Study, August 2016¹;

 Whitby Wood Limited, Geotechnical Interpretative Report, 2018²; This site assessment was based on a Factual report produced by Concept Consultants Ltd Site Investigation Report Tottenham Hale, Phase 1, reference 18/3092-FR 01 dated 7/06/2018.

This 2018 site assessment presented the results of the findings of the intrusive investigation undertaken on the Welbourne, North Island and Ferry Island plots including results and assessment of analyses undertaken on soil and groundwater samples collected during the investigation. Due to the Ferry Island Plot being in use by two food outlets and an electronics retailer the investigation was limited to a single borehole, FI-BH03, which is now in Plot F.

Elevated concentrations of chlorinated hydrocarbon volatile organic compounds (VOCs) (trichloroethene, cis-1,2-dichloroethene and vinyl chloride) and ammonia were identified within the single groundwater sample taken from FI-BH03. The concentrations of VOCs identified could present a risk to human health via the vapour inhalation pathway and to groundwater receptors. The source of the contamination was unknown. Additionally, a concentration of lead in Made Ground exceeded the generic assessment criteria (GAC) for public open space. The presence of existing infrastructure restricted the number of exploratory holes that could be drilled at this time so further investigation was required in order to understand the extent of the potential contaminant plume once the existing infrastructure had been cleared.

 Langan International Limited, Geo-Environmental Site Assessment Report, November 2021³.

¹ BuroHappold Engineering Ltd (2016). *Tottenham Hale Masterplan, Phase I Geoenvironmental Desk Study*. Reference 035543 Revision 00.

² Whitby Wood Ltd (2018). *Tottenham Hale Development. Geotechnical Interpretative Report*. Reference P450040-REP-004.

³ Langan International Ltd (2021). *Geo-Environmental Site Assessment Report for Ferry Island*, Tottenham Hale, London, United Kingdom. Reference 841011101.

This report presents the findings of the further investigations undertaken to assess the extent and significance of contamination within the near surface soils and groundwater noted in the 2018 report.

Please note that during these investigations two boreholes EBH105 and EBH105A (both in Plot F) were aborted at 1.10m and 0.45m depth respectively due to presence of concrete and steel tank obstruction. VolkerFitzpatrick, the demolition and enabling works contractor, noted that to the south of this location and partly beneath the pavement that abuts the site boundary (i.e not part of either Plot B or F) they had uncovered two number underground storage tanks, assumed to be associated with the former garage onsite. It is understood that they could not be removed due to their location and remain in-situ. The presence of these existing below ground structures and infrastructure may have implications for the development of Plot F and should be appropriately removed / verified at the time that plot is developed. This is not considered further in this report as it is beyond the boundary of Plot B.



Environment Agency Response Letter Ref NE/2022/134314/02 & NE/2022/134315/02 dated 22 August 2022⁴ to additional information submitted to discharge conditions B19 and B24 of HGY/2022/0779 and conditions F10 and F15 of HGY/2022/0780.

In their letter the Environment Agency noted some ambiguity over the locations of Ferry Island (Plot B) and Pavilion (Plot F).

Additionally, the Environment Agency requested further confirmation regarding the groundwater flow regime to understand if there is an on-site source of the dissolved phase chlorinated solvents detected during groundwater sampling.

Based on the comments provided they noted that the superficial deposits are to be excavated for a shared basement, with these works removing any unidentified contamination. As the works to date have not been sufficient to fully develop the CSM the Environment Agency would consider that the excavation works form part of a remediation strategy to deal with the identified contamination on site, in lieu of undertaking further works to better delineate contamination present and develop a more detailed CSM.

As such, while supportive of these works further information on how they will be managed and verified was requested.

⁴ Environment Agency (2022). Response Letter reference NE/2022/134314/02 & NE/2022/134315/02.

-  Midgard Construction Environmental Management Plan with Construction Logistics Plan
Included, 2022⁵

This CEMP is to be submitted to the London Borough of Haringey in order to discharge Conditions B29 and covers issues such as:

-  Control of surface water run-off, temporary drainage, spill kits etc to protect the water environment;
-  The waste management strategy;
-  Other environmental control measures such as dust, trafficking of mud, managing known contamination issues etc;
-  A discovery strategy for unexpected contamination including necessary contingency action arising from such a find;
-  Management of import of soils and aggregates; and,
-  Recognition of the requirements for a Thames Water Trade Effluent/Groundwater Discharge Licence.

The above reports have been used as supporting information in the preparation of this report. Reference should be made to the previous reports for full details of the investigations and assessments completed for the site. It is noted that the one borehole had previously been undertaken on the Ferry Island site as part of 2018 investigation². This borehole is not located in the current Plot B boundary (located in Plot F). The results of this investigation have not been included within.

This report should be submitted to the Local Planning Authority (London Borough of Haringey Council), pursuant to the following planning condition (HGY/2018/2223, Conditions B19 and B24), which refers to the requirement for a Monitoring and Maintenance Plan (Condition B19) and Contaminated Land – Part 1b (Condition 24). The wording of the condition is outlined below:

“Condition B19 Monitoring and Maintenance Plan – Contamination (Environment Agency)

The Plot B development hereby permitted may not commence other than for investigative works until a monitoring and maintenance plan in respect of contamination within Plot B, including a timetable of monitoring and submission of reports to the Local Planning Authority, has been submitted to, and

⁵ JRL Midgard (2022). Construction Environmental Management Plan with Construction Logistics Plan Included. Reference BO-JRLG-BM-XX-FM-Z-0006_A1_C01

approved in writing by, the Local Planning Authority. Reports as specified in the approved plan, including details of any necessary contingency action arising from the monitoring, shall be submitted to, and approved in writing by, the Local Planning Authority.

REASON: To ensure that the site does not pose any further risk to human health or the water environment by managing any ongoing contamination issues and completing all necessary long-term remediation measures. This is in line with paragraph 170 of the National Planning Policy Framework. To prevent deterioration of groundwater within the principal chalk aquifer.”

and,

“Condition B24 Contaminated Land – Part 1 (LBH Environmental Health)

Prior to the commencement of the development on Plot B (other than for investigative work):

- a) Using the information obtained from the previous assessments, an additional site investigation, sampling and analysis shall be undertaken at the Plot as appropriate. The investigation must be comprehensive enough to enable:-*
 - i) A risk assessment to be undertaken,*
 - ii) Refinement of the Conceptual Model, and*
 - iii) The development of a Method Statement detailing the remediation requirements.*

The risk assessment and refined Conceptual Model shall be submitted, along with the site investigation report, to the Local Planning Authority.

- b) If the risk assessment and refined Conceptual Model indicate any risk of harm, a Method Statement detailing the remediation requirements in respect of the Plot, using the information obtained from the site investigation, and also detailing any post remedial monitoring shall be submitted to, and approved in writing by, the Local Planning Authority prior to that remediation being carried out on the Plot.*

REASON: To ensure the development can be implemented and occupied with adequate regard for environmental and public safety.”

2. SITE CONTEXT

2.1 Site Location and Description

The Tottenham Hale Centre (THC) site is located to the northwest of Tottenham Hale Railway Station, London. The Ferry Island site within the wider masterplan development is located between Hale Road/Watermead Way to the north and The Hale/Ferry Lane to the south. An approximate National Grid Reference for the site is 534369E, 189535N. A site location plan is presented as Plate 2 and the THC boundaries are shown in Appendix A.

Plate 2. Site Location Plan



Scale: 1: 25,000

2.2 Proposed Development

The wider site is to be redeveloped for a mixed-use development. The Plot B of the Ferry Island portion of the development is to comprise the demolition of the existing structures (completed) and the construction of two buildings between 7 storey and 38 storeys in height with a single storey basement connecting the two buildings and associated public realm space. The basement finished floor level is 3.85mOD. It is assumed that the excavation will need to be in the order of 5-7m deep in order to account for the construction thickness of the basement floor as well as the basement height.

Building 1 will include 376 build to rent apartments with ground floor shell and core retail units.

Building 2 will include 108 private for sale apartments, also with shell and core retail units within the ground floor.

Proposed development plans are provided in Appendix B.

2.3 Site History

The BuroHappold¹ report indicates that historically Ferry Island was primarily residential, Tottenham Water Works and associated filter beds straddling the eastern boundary. By 1936, the residential properties were no longer present in the southwest and a single building was constructed (possibly a warehouse). By 1954 a garage (with associated pump island) was constructed in the south. The former pumping station in the east of the site had been developed into a Motor Vehicle Service and Repair Depot. During the 1970s/1980s, the garage and pump island as demolished and a new road junction appeared in the southeast corner of the site. By 2002, a single building was constructed in the centre of the site, which was occupied by three commercial outlets including an electronic seller and restaurants.

The wider area has been subject to historical potentially contaminated land uses including a woollen factory, braid and bootlace factory, pencil factory, dry battery factory, printing ink and varnish factory (including tanks) and a cabinet works, all located to the north. Further historical potentially contaminated land uses located to the south of the site include a nursery, boot and shoe factory, printing works, neo-cyclostyle works, bicycle factory, sewing and cotton factory and duplicating machine works. The Great Eastern railway and Tottenham Station is located to the east.

2.4 Geology

The ground conditions encountered during the Langan investigation³ comprised a variable thickness of Made Ground (between 0.80m and 3.7m in thickness), overlying the Enfield Silt Member and Kempton Park Gravel Formation. The superficial deposits are underlain by the London Clay Formation, Harwich Formation and Lambeth Group in succession. The bedrock deposits were not encountered during the Langan investigation.

The Langan report³ indicates the presence of two below ground tanks, which are assumed to be associated with the Ferry Island sites former use as a garage. The location of these tanks are located outside of the Plot B development boundary and are to be addressed appropriately during the development of Plot F.

2.5 Hydrology and Hydrogeology

With reference to the BuroHappold desk study¹, aquifer designations for the stratum expected to be encountered at the site are outlined in Table 1.

Table 1. Summary of Aquifer Designations

<i>Stratum</i>	<i>Environment Agency Classification</i>
Made Ground	Unproductive Stratum
Enfield Silt	Unproductive Stratum
Kempton Park Gravel Formation	Secondary (undifferentiated) Aquifer
London Clay Formation	Unproductive Stratum
Lambeth Group	Secondary (undifferentiated) Aquifer
Thanet Formation	Principal
White Chalk	Principal

The site is within Zone 2 - Outer Protection Zone of a groundwater Source Protection Zone (SPZ). The closest potable water abstraction is located 1km east of the site.

The closest surface water feature is Pymmes Brook located which is some 300m east, with the River Lea Navigation Channel and River Lea (also referred to as the River Lee and New River) and a series of reservoirs beyond. The anticipated groundwater flow direction of the region is towards the River Thames to the south/southeast.

Results of groundwater monitoring undertaken previously and reported by Langan investigation³ indicate that the main groundwater body is located within the Kempton Park Gravel, although where deeper deposits of Enfield Silt were encountered groundwater was also encountered within these deposits. Interpretation of the groundwater monitoring results by Langan did not indicate a clear groundwater flow direction. The results indicate that there is some flow towards the west / southwest across the wider Ferry Island site, with some mounding to the south and some flow to the north and west. Langan³ note that the River Moselle (one of London's 'lost rivers'), was historically located in the vicinity of the site and the presence of the London Underground tunnels that underlie the Ferry Island site to the west and south. Langan considers that these features appear to be locally influencing the groundwater flow direction³.

The basement excavation will encounter groundwater within the Made Ground, Enfield Silt and Kempton Park Gravels and will require dewatering as part of the construction process. As such it is noted that the basement construction will further influence local groundwater flow during and following construction.

3. CONTAMINATION ASSESSMENT AND QUALITATIVE RISK ASSESSMENT

3.1 Summary of Risks from Soil Contaminants

The findings of the previous investigation³ indicates there was no olfactory or visual evidence of contamination in the soil samples inspected.

Elevated concentrations of lead and PAH (benzo(b) fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene) exceeded the Generic Assessment Criteria (GAC) for a residential without consumption of homegrown produce end use. As these contaminants do not pose an inhalation risk they were also be compared to the public open space within a residential setting GAC. Two of the six lead exceedances and Dibenzo(a,h)anthracene exceeded the public open space GAC. The two lead exceedances are from Made Ground recovered from EBH105B at depths of 1.2m and 1.5m, which is outside of Plot B in Plot F so are not considered further.

The soil sample with the Dibenzo(a,h)anthracene public open space (residential) was from BHV102 at 0.3m bgl which is at a depth beyond which the direct contact pathway is assumed to be active, and in the area of the basement excavation. Additionally, the sample matrix included asphalt fragments and it is likely that these elevations are associated with these inclusions.

The Langan report considers that given that the site was to be being stripped by 0.5m depth and replaced with a 'clean' engineering fill to create a suitable construction platform (now completed), and will post-construction be covered by hard landscaping or soft landscaping with imported clean topsoil the risk to end users was considered to be low³.

PID readings from near surface soils were generally low (<1ppm).

Additionally, data from the Membrane Interface Probe (MIP) used to investigate the distribution of potential chlorinated hydrocarbons within the near-surface soils and groundwater noted limited detections as follows:

 MIP101 (Not in Plot B, in Plot F) – spike on the PID at 1.2m bgl to 1.5 $\mu\text{V}\times 10$ corresponding with readings on FID. Further spike to a maximum of c.2 $\mu\text{V}\times 10$ at 2.2m bgl falling to baseline at c3.8m bgl.

 MIP102 – falling from maximum at surface 1.2 $\mu\text{V}\times 10$ PID and 2.2 $\mu\text{V}\times 10$ FID to baseline at c1.2m bgl.

-  MIP103 – Initial spike on the PID at 1.2-1.5m bgl to 1.2/1.25 μVx10 corresponding with readings on FID. Reading continues to further maximum of c1.35 at 4.8m bgl falling to baseline at c6.7m bgl.
-  MIP104 –FID falling from maximum at surface 1.5 μVx10 to baseline at c6m bgl with a further spike to 1.2 μVx10 . Initial spike on the PID of c.3.75 μVx10 at 1.5m bgl reducing to 1 μVx10 and then returning to baseline at 5.3m bgl.
-  MIP105 – Steadily increasing PID reading from 0.9m bgl to maximum value of 4 μVx10 at c. 3m bgl where test was ended. It should be noted that the MIP Pressure/Flow is reported to have malfunctioned and hence these results have been discounted.
-  MIP106 - spike on the PID at 1.9m bgl to 2 μVx10 corresponding with readings on FID to 5.5 μVx10 .

The results were used to support soil sampling and position environmental boreholes to further investigate the distribution of any potential chlorinated hydrocarbons within the near-surface soils and groundwater.

Concentrations of BTEX, phenols were below the method detection limit in the samples analysed.

VOCs analysis was undertaken on twenty four soil samples and concentrations were found to be below the method detection limit. Concentrations SVOCs were below the method detection limit in the twelve of the thirteen samples analysed for each analysis suite. The exception was 2-Methylnaphthalene and Anthraquinone that were noted at the detection limit in EBH105B at 5.00-5.20. This sample was taken from the Kempton Park Gravels in Plot F and in the vicinity of the upgradient boundary.

The various PAHs (forming part of the SVOC suite) identified were in the range that would normally be anticipated for general Made Ground.

Concentrations of aromatic petroleum hydrocarbons (>EC21 - EC35) exceeded the GAC for residential without consumption of homegrown produce in two samples. The Langan report considers that these exceedances can be attributed to the presence of asphalt in the samples. One of the exceedances was from a near surface sample and would be removed as part of the sites reduced dig. It was considered by Langan that the other samples would be located beneath an area of soft landscaping, where clean imported soils/growth medium would be placed.

One round of vapour monitoring was undertaken on soil samples from three boreholes (EBH101, EBH102 and EBH104). A previous soil vapour sample had been recovered in 2018² with a number of the same determinands above the limit of detection. This sample was taken from BHFI-103 located in the Plot F area of the Ferry Island site. Langan have previously calculated soil vapour GACs for a limited number of more common determinands. Where GACs were available for the determinands detected, there were no exceedances of the selected GAC. Similarly, for the soil vapour results from 2018².

Trichloroethene (TCE) was detected in vapour samples taken from two boreholes EBH101 and EBH104 and from groundwater on a single occasion from two boreholes (EBH104 and EBH106). The concentrations detected in the vapour monitoring did not exceed the available GAC. Concentrations of those VOCs detected in the vapour samples and without GACs were not detected in the soil and groundwater samples at concentrations above the detection limit.

Asbestos was recorded in three of the 21 samples analysed. The samples contained amosite and chrysotile loose fibres and cement. Quantification analysis undertaken on the three samples revealed that concentrations were less than the method detection limit of <0.001%. Langan consider that the asbestos poses a low risk to future site users assuming that the impacted material is located beneath a cover layer (hardstanding, building footprint or topsoil).

3.2 Summary of Risk to Controlled Waters

3.2.1 Controlled Waters

Concentrations of volatile contaminants were compared with the GAC developed by SoBRA for the groundwater vapour inhalation pathway. There were no exceedances of the selected GAC.

Concentrations of petroleum hydrocarbons were detected in a single groundwater sample from EBH103. It is noted that all of the TPH in this groundwater sample were aliphatic compounds with aromatic compound concentrations less than the method detection limit. These compounds have a low vapour pressure (less tendency to escape to the vapour phase) hence the risk to end users of the site was considered to be low³.

Given that elevated concentrations of VOCs have not generally been identified within the soil, vapour or groundwater samples during the latest round of investigation, the risk via the vapour inhalation pathways to end users is considered by Langan to be low/medium³. Additionally, Langan consider that it is likely that the design of the basement waterproofing / ventilation etc will also offer some form of protection measures to mitigate against the vapour intrusion pathways.

Elevated concentrations of mercury and chloride were recorded above the Environmental Quality Standards (EQS) in one sample on one occasion. Ammoniacal nitrogen and ammonia were also recorded in three on-site boreholes (EBH101, EBH102 and EBH104). Due to the sporadic exceedances, Langan consider that these exceedances are more likely to be attributed to leaking sewage infrastructure in the vicinity of the site rather than a historical source³. Bioavailable concentrations of copper and manganese were recorded in samples from EBH103.

With the exception of Trichloroethene recorded on a single occasion, concentrations of VOCs were below their respective method detection limit. SVOCs 1,3-Dichlorobenzene, 1,2-Dichlorobenzene and 1,4-Dichlorobenzene were detected in single samples taken from the top and bottom of EBH104. There are no commonly available EQS values for these determinands. For synthetic substances with no EQS the EA's Remedial Targets Methodology indicates that the LoD should be used for comparison purposes, which is a conservative screen. All other SVOCs were below the method detection limit in the samples analysed.

Given that there is no clear groundwater flow direction, and due to the generally sporadic nature of the limited exceedances noted, Langan consider that it is possible that limited attenuation factors are occurring such that the groundwater quality whilst possibly locally affected it is not being generally impaired.

Additionally given the sites former uses and historical land uses within the wider area, and the lack of any source identified in the soils on site it is considered that TCE is likely to have originated from an off-site source such as the former dry battery factory or printing ink and varnish factory.

The basement excavation will encounter groundwater within the Made Ground, Enfield Silt and Kempton Park Gravels. To discharge the groundwater arising from dewatering the basement excavation will require either a permit from Environment Agency (EA) for disposal to surface water/groundwater or a permit from Thames Water to discharge to sewer. Analysis of the groundwater from beneath the site indicates that it is some limited impacted with a range of contaminants including mercury, chloride, copper, manganese, ammonia TPH, Trichloroethene, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene and 1,4-Dichlorobenzene. It is therefore likely that some form of treatment may be required prior to discharge to sewer.

Overall, the removal of the Made Ground during excavation of the basement, dewatering and treatment will likely aid the betterment of the groundwater situation at the site.

3.3 Summary of Ground Gas Risk

A total of three rounds of gas monitoring has been undertaken³. Langan consider that no ground gas or vapour source has been detected within the shallow groundwater aquifer. Methane concentrations were below the instrument detection limit in all seven monitoring wells and the maximum carbon dioxide concentration was 1.8% in EBH106. The gas flow rates was not recorded above the instrument's limit of detection. The groundwater level was also noted to be above the slotted section of the monitoring well in WBH103 during each visit and therefore CGL consider the monitoring results from this location to not be representative of the gassing regime of the site.

Based on the monitoring undertaken, the maximum hazardous gas flow rate is <0.0001l/hr for methane and 0.0021l/hr for carbon dioxide. The site is considered to be classified as Characteristic Situation 1 (CS1), where gas protection measures are not required.

3.4 Summary of Risks to Buried Water Supply Pipes

The assessment indicated that the soil samples analysed to date generally recorded concentrations below the relevant thresholds. However, concentrations of aliphatic and aromatic hydrocarbons within the EC16 to EC40 range were recorded that exceeded the limit of 500 mg/kg. Therefore, unless these materials are excavated, consideration will need to be given to the installation of barrier water pipes. Langan recommend that early discussions are held with Thames Water to confirm the water supply pipe specification.

3.5 Updated Qualitative Risk Assessment

A Generic Quantitative Risk Assessment has been produced by Langan (reproduced as *Table 2* below).

Where relevant, CGL has modified the GQRA to take into account the relevant contaminant linkages for Plot B only.

Table 2. Langan Summary of Remaining Contaminant Linkages for Ferry Island

Potential Source	Potential Pathway	Potential Receptor	Comments
Petrol Filling Station: Ferry Island (located off-site, within Plot F boundary) General industry Made Ground	Direct contact – human health	End users	The results of the assessment have indicated that concentration of lead and PAHs exceeded the GAC for residential without consumption of homegrown produce in the samples analysed. One sample of lead and PAH exceeded the public open space (residential) threshold. The exceedances for both contaminants are at a depth beyond which the direct contact pathway is assumed to be active/and or should be removed during construction process. Given that the site is being stripped to 0.5m depth and replaced with 'clean' engineering fill to create a suitable construction platform and will post construction be covered by hard landscaping or soft landscaping with imported clean topsoil. Concentrations of aromatic petroleum hydrocarbons (>EC21 - EC35) exceeded the GAC for residential without consumption of homegrown produce in two samples analysed but not the public open space (residential) threshold. Both of these were specific samples of asphalt. One was from the surface so is not considered further as it will be removed as part of the overall site enabling works. The other was from 0.7m bgl and was from within the Made Ground. Given that this result appeared to be isolated, at depth and as a suitably clean soils to provide a healthy growing medium will be imported in areas of soft landscaping it is considered unlikely that this result is indicative of a significant risk from a human health perspective.
Petrol Filling Station: Ferry Island (located off-site, within Plot F boundary) General industry Made Ground Natural geology	Direct contact – human health	Construction /maintenance workers	Direct contact pathways would be active throughout the construction phase of the project. However, typical mitigation measures such as use of personal protective equipment (PPE) should mitigate the risk presented by most contaminants. Contractor's risk assessments and method statements to take account of the presence Made Ground Consideration will also need to be given to protection of future maintenance workers.
	Vapour inhalation: human health Permanent gas migration	End Users Buildings	Ground gas monitoring results would place the plot into Characteristic Situation (CS1) which would not require gas protection measures to be installed. Concentrations of those VOCs detected in the vapour samples and without GACs were not detected in the soil and groundwater samples at concentrations above the detection limit. As elevated concentrations of VOCs have not generally been identified within the soil, vapour or groundwater sampled from the beneath the Ferry Island Plot during this latest round of investigation the risk via the vapour inhalation pathways to end users in this instance is considered low/medium. Additionally, it is likely that the

			design of the basement waterproofing / ventilation etc will also offer some form of protection measures to mitigate against the vapour intrusion pathways and it is suggested this is considered further as this design develops to ensure this is the case.
	Direct contact – construction materials	Construction materials	The Made Ground and natural geology at the plot contain concentrations of sulphate that can attack buried concrete. Therefore, concrete design will need to take into account the presence of this contaminant. In addition, TPH concentrations were above the limit for normal potable water supply pipes and as such consideration will need to be given to utilising contaminant resistant piping, unless the made ground source is removed as part of the redevelopment. Early consultation with the statutory undertaker is recommended.
	Groundwater migration	Controlled Waters: Secondary Aquifer Controlled Waters: Pymmes Brook and River Lea Controlled Waters: Principal Aquifer	EQS values for mercury, chloride, copper and manganese were exceeded. Concentrations of TPH were only detected in a single groundwater sample collected from EBH103 on one occasion. With the exception of Trichloroethene concentrations of VOCs were below their respective method detection. SVOCs were detected in single samples taken from the top and bottom of EBH104. There are no commonly available EQS values for these determinands. All other SVOCs were below the method detection limit in the samples analysed. The groundwater flow direction does not appear clear cut. Due to the limited impacts noted and the generally sporadic nature of the limited exceedances noted it is possible that limited attenuation factors are occurring such that the groundwater quality whilst possibly locally affected it is not being generally impaired. Given the results, the need to pile through the underlying London Clay and the planning conditions being applied to the site it is recommended early discussions are held with the EA to reduce the likelihood of delay to construction works.

4. REMEDIATION STRATEGY

4.1 Overview

Based on the identified relevant contaminant linkages and the findings of the previous assessment, the following mitigation measures to address the risks identified in the contamination assessment for the site. In summary, the recommended measures comprise the following:

-  Enabling works including site stripped by 0.5m depth and replaced with a 'clean' engineering fill to create a suitable construction platform. (Completed).
-  Basement excavation;
-  Provision of a capping layer and/or growth medium in areas of soft landscaping (inclusive of ground level and rooftop level areas of soft landscaping);
-  Selection of appropriate materials for buried water supply pipes;
-  Watching brief and implementation of a discovery strategy during enabling works and general earthworks in the event unexpected contamination is identified, and to facilitate appropriate waste characterisation of soils for disposal;
-  Materials management; and,
-  Implementation of appropriate protection of construction workers and mitigation of risks to off-site receptors from generation of dust and odours.

It is noted that the location of the exploratory holes was limited by a number of factors including existing infrastructure (including services and LUL infrastructure) and other site uses/operations on-going at the time of the investigation. This has placed restrictions on the location of the exploratory holes. However, potential for unencountered contamination in these areas of the site may be addressed with a contamination watching brief and discovery strategy during basement excavation and construction. There is also a requirement under Condition B20 – Contamination Not Previously Identified (Environment Agency) for any contamination not previously identified found to have a remediation strategy detailing how this contamination will be dealt with to be submitted to and approved in writing by the Local Planning Authority.

The below ground tanks that have been recorded in the south of the Ferry Island site are outside of the Plot B boundary and will be addressed during the Plot F redevelopment works.

Based on the above proposed remedial measures, CGL consider that a separate Maintenance and Monitoring Plan (Condition B19) is not required as the requirements that would be included in such a plan are covered by this Remediation Strategy and the Verification of the works outlined herein plus those required by the CEMP. In addition, a Piling Risk Assessment will be undertaken to satisfy Conditions B21, B22 and Condition B32 Source Protection Strategy (Ferry Island) – (Thames Water).

4.1 Basement Excavation

A single-story basement is proposed as part of the development plans, with the final finished floor level at 3.85mOD (approximately 4.65m bgl). The basement is to extend beneath Buildings 1 and 2 and covers c. 75-80% of the area of Plot B. Boreholes located in the vicinity of the proposed basement indicates that the strata at the assumed basement formation level is likely to comprise London Clay (the boundary with the overlying Kempton Park Gravels varying between 4.17mOD and 3.14mOD excluding FI-BH03 where due to poor recovery a level of 2.85mOD was assumed)³. The Made Ground (whilst not shown to be widely impacted by potential contamination) and superficial deposits will be removed during the basement excavation, although some Made Ground superficial deposits will remain across the wider Ferry Island site. The removal of the Made Ground and hence any associated source of potential contamination will provide general betterment to the surrounding groundwater quality.

The potential remains for limited leaching of contaminants from the Made Ground to have occurred / to occur, particularly now and during the construction process when there is likely to be an limited increased infiltration rate due to removal of surfacing materials. However this will be short term and overall infiltration at the site will be reduced due to the present of increase hardstanding and surface water drainage control. Other contaminant sources (e.g. historical PFS) also have the potential to impact natural soils and groundwater beneath the site. The underlying London Clay Formation (unproductive stratum) is likely to afford protection to the aquifers associated with the Lambeth Group, Thanet Sand Formation and White Chalk.

Furthermore, the proposed development plans include for hardstanding across the majority of the Ferry Island site which will reduce the potential for surface water infiltration and mobilisation of potential contaminants in the surrounding Made Ground on an ongoing basis.

It is understood that the basement will be piled, with the piles end bearing within the London Clay Formation/Thanet Sand Formation³. A Piling Works Risk Assessment will be completed to satisfy Conditions B21, B22 and B32 of the planning permission.

Given the depth of the basement, it is likely that dewatering of the basement excavation will be required from the Enfield Silt and Kempton Park Gravel. This will provide further betterment to the surrounding groundwater quality by removing any residual source in the groundwater. To discharge the groundwater arising from dewatering the basement excavation will require either a permit from the EA for disposal to surface water/groundwater or a permit from Thames Water to discharge to sewer. Analysis of the groundwater from beneath the site indicates that it is some limited impacted with a range of contaminants including mercury, chloride, copper, manganese, ammonia TPH, Trichloroethene, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene and 1,4-Dichlorobenzene. It is therefore likely that some form of treatment may be required prior to discharge to sewer³.

4.2 Capping Layers and/or Growth Medium

The majority of the site will either be covered in hardstanding/building footprint (reducing the potential for surface water infiltration of mobilisation of potential contaminants), however, where soft landscaping is to remain at ground level, a capping layer will be required. In addition, a growth medium will need to be placed in areas of soft landscaping over the basement or on roof top levels. To comply with Building Research Establishment (BRE) 465⁶, capping layers for proposed areas of soft landscaping will need to meet the following minimum criteria where above residual Made Ground soils:

 600mm of imported soil with a minimum of 150mm topsoil (including 50mm turf/sod); or

 450mm imported soil with a minimum of 150mm topsoil (including 50mm turf/sod) over a geotextile membrane.

It should be noted that the depth of the capping layer may need to be increased for trees/large shrubs and should be specified by the landscape architect.

The topsoil/subsoil placed to form the capping layer/growth medium will be clean imported soil from a known and reputable source. Imported soils will meet the chemical criteria presented in the import specification included as Appendix C and imported topsoil will also meet the requirements of BS 3882⁷ and subsoil the requirements for BS 8601⁸ plus any specific requirements noted by the Landscape Architects.

Where soft landscaping is proposed within planters/at podium levels i.e., has no contact with the underlying Made Ground, then a growth medium would be required where the thickness of the growth

⁶ Building Research Establishment (2004). *Cover systems for land regeneration - thickness design of cover systems for contaminated land*. BRE 465.

⁷ British Standards Institute (2015). *Specification for Topsoil and Requirements for Use*. BS3882:2015.

⁸ British Standards Institute (2013). *Specification for Subsoil and Requirements for Use*. BS8601:2013.

medium layer would not be required to meet the above thicknesses. However, the thickness of the growth medium would be subject to the requirements of a landscape architect.

Chemical certification of the source material test results and details of the sources should be provided by the Contractor to a qualified geoenvironmental engineer for approval prior to material being brought to site. The material should be free from propagules of aggressive weeds, free from obvious signs of contamination e.g., staining, free phase hydrocarbon, coal, non-odorous such that it could be considered a statutory nuisance and free from unsuitable material/foreign bodies e.g., brick, glass, pipework.

Once placed, the soils will be chemically tested by a suitably qualified geoenvironmental engineer to confirm they comply with the import criteria (Appendix C) at a frequency of one sample per 250m³ of each imported soil, with a minimum of three samples per source. Inspection pits will also be dug through the placed material to confirm the thickness meets the minimum requirements.

4.3 Buried Services

Due to elevated concentrations of hydrocarbons within the shallow soils, the use of barrier pipes for water supply will be required, or proprietary hydrocarbon resistant pipes such as Protectaline. The local water supply company should be contacted for the exact specification that is required.

4.4 Watching Brief and Discovery Strategy

A watching brief will be in place during the enabling works, earthworks and construction works by the Contractor. Should areas of unexpected contamination, including asbestos, be encountered or suspected, a qualified geoenvironmental engineer will be informed, and the risk associated with the contamination assessed.

Where necessary, and as required by Condition B20 an appropriate revised remediation strategy will be devised and implemented, and the regulators will be informed of additional areas of contamination so identified. The regulators will be provided with the risk assessment and proposed remediation methodology for agreement before undertaking such works. Appropriate verification works to be completed if remedial measures are required will also be identified and agreed.

The following nominal discovery strategy, in the event of unexpected contamination, is recommended:

1. Work to cease in that area.
2. Notify geoenvironmental engineer, to attend site and sample material. Notify Land Quality Officer at the Local Planning Authority, as appropriate.

3. Geoenvironmental engineer to supervise the excavation of contaminated material, which should be placed in a bunded area and covered to prevent rainwater infiltration.
4. Soil samples should be obtained by the geoenvironmental engineer from both the excavated material and the soils in the sides and base of the excavation to demonstrate that the full area of contamination has been excavated. If appropriate, in-situ testing should be undertaken on the sides and base of the excavation to assess the presence of residual contamination in the soils.
5. On receipt of chemical test results, the soils may be appropriately classified for treatment or disposal and dealt with accordingly.
6. Detailed records, including photographs and duty of care records, of the excavations, stockpile sizes, source and location should be kept and regularly updated to allow materials to be easily tracked from excavation until disposal off site.
7. Backfilling to be undertaken with material certificated as suitable for the proposed end land use.

4.5 Health and Safety

Precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances during earthworks. The risks to contractors can be controlled through the implementation of site safety procedures and the use of suitable personal protective equipment (PPE). Attention should also be paid to restricting possible off-site nuisance such as dust and odour emissions.

All site works should be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (HSE, 1991)⁹ and CIRIA Reports 132¹⁰ and C650¹¹ and all work should also be carried out in accordance with the Contractor's Construction Health and Safety Plan.

Health and safety precautions that should be taken to limit the exposure of construction workers and potential off-site in contact with the works should include, but not be limited to:

-  Personal hygiene, washing and changing procedures, noise and dust;
-  Adequate PPE including disposable overalls, gloves and particulate filter masks/vapour respirators, where required;

⁹ Health and Safety Executive (1991). *Protection of Workers and the General Public during the development of contaminated land*. Guidance Note HS(G)66, Health and Safety Executive, HMSO, 1991.

¹⁰ CIRIA (1996). *A guide for safe working on contaminated sites*. Steeds JE, Shepherd E & Barry DL. CIRIA Report 132.

¹¹ CIRIA (2005) *Environmental good practice – Site guide*. 2nd Edition. CIRIA Report C650.

-  Dust and vapour suppression methods, including dampening down, minimising the working face exposed and covering stockpiles, where required;
-  Regular cleaning of all site access routes and public area outside;
-  Safe storage of fuel and other potentially polluting liquids and the provision of spill control and clean up facilities; and
-  Positive collection and disposal of on-site run-off.

Excavations should be planned and inspected regularly by a competent person. No operatives should be permitted to enter unshored or otherwise protected excavations identified as unstable by a competent person, however shallow they may be. The stockpiled material and excavations should be dampened during all earthworks excavation and earth moving activities and vehicles should be washed before leaving site, with washings contained on site and suitably disposed.

4.5.1 Asbestos Control

Asbestos has been detected during the current site investigation and therefore there is the potential for undiscovered asbestos fibres and / or asbestos containing materials (ACMs) during future excavations. Where necessary, asbestos containing material should be handled / removed in accordance with current regulations and guidance^{12,13,14,15}. ACMs, if encountered, should be segregated by hand picking by a trained person utilising the appropriate PPE and implementing necessary precautionary measures to minimise exposure to construction workers and general public during earthworks. The contractor will be responsible for determining whether the works are notifiable or licensable, and for implementing the appropriate procedures.

Site staff undertaking groundworks should be advised of the potential for asbestos fragments and fibres being present and be trained in basic visual recognition of asbestos. Soils being handled should be dampened, taking care that damping is carried out at the appropriate time and with appropriate amounts of water to suppress dust but not saturate the soils. Soils movement should be minimised, and double handling avoided.

A watching brief should be maintained by the Main Contractor with support from a suitably qualified geoenvironmental engineer. Should areas of unexpected contamination, including asbestos,

¹² HSG247 (2006) *Asbestos: The licensed contractors' guide*

¹³ Health and Safety Executive (2006). *Work with materials containing asbestos. Control of Asbestos Regulations 2006. Approved Code of practice. and guidance*, HSE 2006.

¹⁴ Health and Safety Executive (2012). *The Control of Asbestos Regulations*.

¹⁵ Health and Safety Executive (2010). *Asbestos: The Survey Guide*. HSG 264. January 2010.

hydrocarbons and free produce, be encountered or suspected, a qualified geo-environmental engineer should be informed, and the risk associated with the contamination assessed.

4.6 Materials Management

As indicated in The Waste (England and Wales) Regulations (2011), the “waste hierarchy” should be used to rank waste management options according to what is best for the environment. Top priority should be given to preventing waste in the first place, for example during the pre-construction and planning stages of a new development. However, if waste is created, priority should be given to preparing it for re-use, then recycling, then recovery, and last of all disposal.

Soil arisings should be handled appropriately given the potential contamination, including asbestos. It is noted that visual segregation will be difficult. Therefore, frequent testing will be required by the contractor to accurately classify soil arisings for disposal purposes. Where possible, consideration should be given to sending the soil arisings to an appropriate soil treatment facility rather than landfill.

It should be noted that in May/June 2012 HMR&C issued Briefs 15/12 and 18/12 clarifying how construction spoil and excess soils will be assessed for landfill tax purposes. Detailed accurate descriptions of waste are required for all wastes to support the landfill tax assessment.

Uncontaminated naturally occurring soils will remain inert by default and eligible for the lower rate of landfill tax. Similarly, ‘reworked soils’ and demolition ‘stone’ comprising ONLY materials listed in the Schedule of the Landfill Tax (Qualifying Material) Order 2011 (SI 2011/1017) will also be eligible for the lower rate of landfill tax.

However, Made Ground containing soil and foreign objects such as timber, plastic, rubber, metal, paper, plasterboard, asbestos etc., regardless of the results of chemical analysis for waste classification purposes, will be eligible for the standard (higher) rate of landfill tax. Therefore, to maximise eligibility for the lower rate landfill tax on construction spoil/reworked ground, careful waste segregation and controls are necessary.

4.6.1 Waste Handling

A preliminary waste assessment has been undertaken by Langan. The assessment is summarised below.

Table 3. Preliminary Waste Assessment Summary

Population	Name	Waste Classification and List of Waste Code	Comments
A	Asphalt	UNKNOWN – Potentially Non Hazardous 17 05 04: soils and stones other than those mentioned in 17 05 03.	The majority of the general Made Ground should be regarded as non-hazardous waste and assigned the LoW code 17 05 04: soils and stones other than those mentioned in 17 05 03. However, some of the Made Ground will be classified as hazardous waste on the basis of TPH and therefore should be assigned the LoW code 17 05 03: soils and stones containing hazardous substances. Further sampling and analysis will be required to fully classify which material should be placed in which category.
B	General Made Ground	Hazardous 17 05 03: soils and stones containing hazardous substances and Non Hazardous 17 05 04: soils and stones other than those mentioned in 17 05 03	The majority of the general Made Ground should be regarded as non-hazardous waste and assigned the LoW code 17 05 04: soils and stones other than those mentioned in 17 05 03. However, some of the Made Ground will be classified as hazardous waste on the basis of TPH and therefore should be assigned the LoW code 17 05 03: soils and stones containing hazardous substances. Further sampling and analysis will be required to fully classify which material should be placed in which category.
C	Enfield Silt	Non Hazardous 17 05 04: soils and stones other than those mentioned in 17 05 03 and Inert 17 05 04: soils and stones other than those mentioned in 17 05 03	One samples (MIP104 at 1.2m, exceeded the WAC threshold for disposal to hazardous waste landfill with respect to antimony. This samples would classify as non hazardous waste for which WAC testing is not required. Given that the Enfield Silt is a natural material and to date no evidence of contamination has been identified it is considered that in general terms the Enfield Silt could potentially be classified as inert waste and assigned the LoW Code 17 05 04: soils and stones other than those mentioned in 17 05 03.
D	Kempton Park Gravel	Inert 17 05 04: soils and stones other than those mentioned in 17 05 03	
E	London Clay	Inert 17 05 04: soils and stones other than those mentioned in 17 05 03	

All material intended for off-site disposal should be transported and disposed in accordance with the Environmental Protection (Duty of Care) Regulations, 1991 and the Landfill (England and Wales) Regulations, 2002 (as amended). Waste legislation stipulates that *hazardous* and *non-hazardous* waste should be pre-treated prior to disposal. Pre-treatment can be undertaken either at the site of origin or may be carried out at a licensed off-site facility and can include selective segregation of soils conducted

on site.

4.6.2 Asbestos

Asbestos has been identified across the site, and there is the potential that further asbestos material may be present in the existing Made Ground soils.

As noted above, where asbestos material is present within the soil matrix, this material would not be acceptable for disposal to an inert landfill and asbestos quantification would be required to determine whether the material would be acceptable to a licensed non-hazardous landfill or hazardous landfill that accepts asbestos material.

If asbestos containing materials (ACMs) rather than fibres are encountered, there is the presumption that asbestos is present at greater than 0.1% in elements of the soil and therefore the soil mix is classified as “*hazardous*” with respect to waste disposal unless appropriate remedial measures are undertaken to segregate the ACMs i.e., hand picking by a suitable qualified person.

Asbestos has been detected in three of the twenty one samples selected for an asbestos screen. Chrysotile and Amosite fibres were identified. Quantification analysis undertaken on the three samples revealed that concentrations were less than the method detection limit of <0.001% (i.e. trace levels). The contractor will need to follow the guidance set out in the Joint Industry Working Group (JIWG) CAR-SOILTM Control of Asbestos Regulations 2012 Interpretation of Managing and Working with Asbestos in Soil and Demolition Materials, Industry Guidance, guidance to assess the risks posed by the asbestos in the made ground and, where necessary, undertake the work in accordance with the requirements of CAR 2012.

Vigilance should be maintained for asbestos in the made ground. As a precautionary measure made ground should be kept damp and the works should avoid the spread of made ground. All personnel on-site should, as a minimum, have asbestos awareness training including soils and those liable to disturb asbestos containing soils should have additional training including:

 Regulation 10 Non Licensed training; and

 RPE Training.

4.6.3 UXO risk

As this area of London was subject to extensive bombing during WW2, UXO risk mitigation measures may be necessary for some activities.

5. VERIFICATION

5.1 General

Site inspections and compliance testing should be carried out during the works by a suitably qualified geoenvironmental engineer for the elements of the remediation works summarised below:

-  Site inspection records, photographs and testing should unexpected contamination be encountered;
-  Inspect the topsoil/subsoil capping layer construction and verify placement and thickness of the capping layer including obtaining photographic evidence of the topsoil/subsoil capping layer construction; and
-  Sample and test imported capping layer soils (and site won natural soils if appropriate) to confirm compliance with the specification (Appendix C), including review of source data prior to import of material to site.

Documentation required to be provided by the contractor will include, but not be limited to:

-  As built drawings;
-  Duty of care records for the disposal of soils / asbestos containing materials;
-  Source data and pre-import laboratory data of imported topsoil/subsoil;
-  Specification of water supply pipes used (including confirmation from the water supply company of their acceptance of the material used);
-  Material management procedures (i.e. permits, exemption etc.) as appropriate; and,
-  Discovery records or statement confirming no significant observations of contamination.

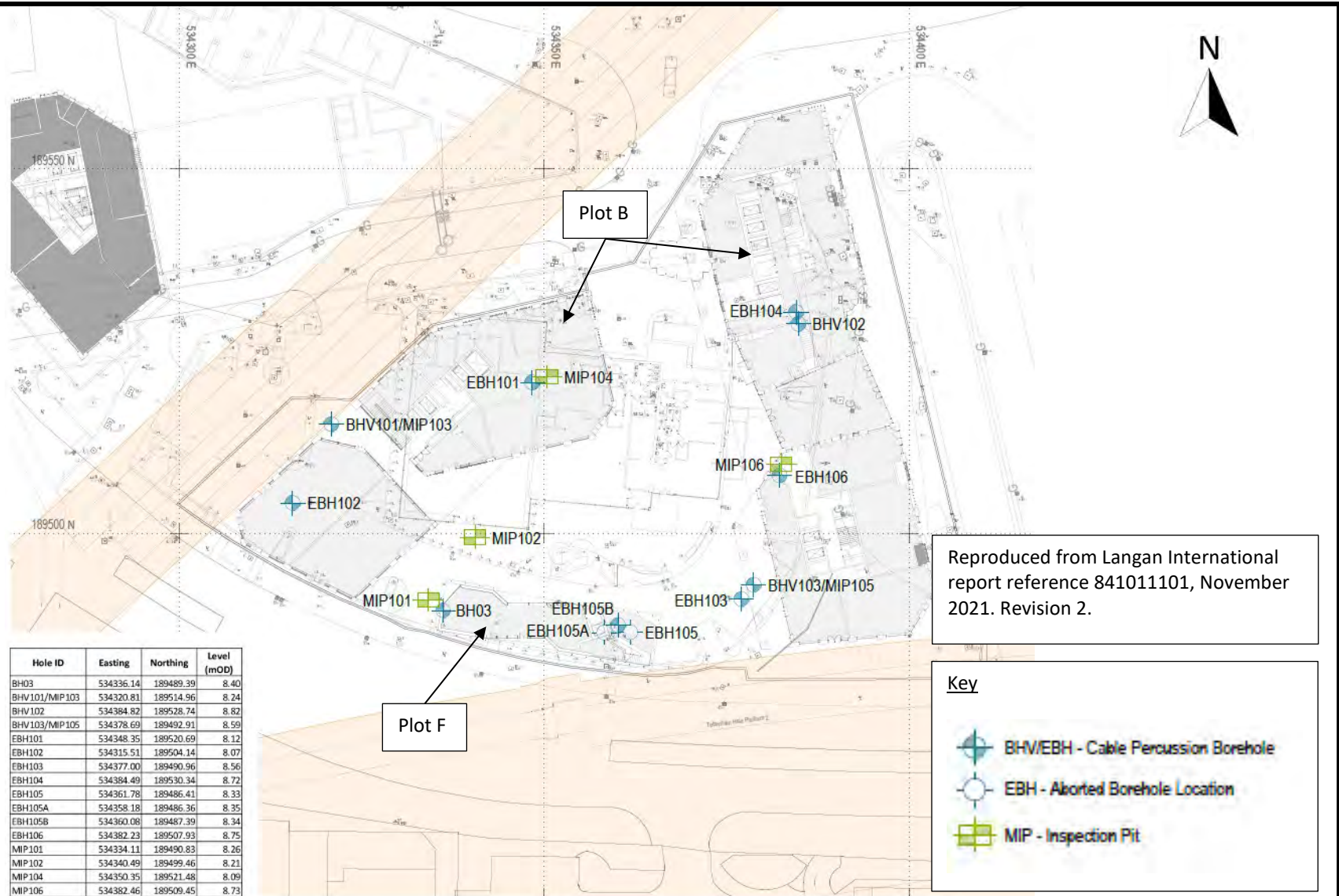
A Verification Plan which details the activities and information required to confirm the remediation of the site is carried out in compliance with this Remediation Strategy is presented in Appendix D.

5.2 Verification Report

On completion of the remediation works, a Verification Report will be prepared. This report should detail the works undertaken and should include copies of relevant information listed above including waste transfer records, test results, inspection records and source certificates for imported materials (if required).

The verification report will be submitted to the Local Authority on completion, pursuant to Condition B25 – Contaminated Land – Part 2 .

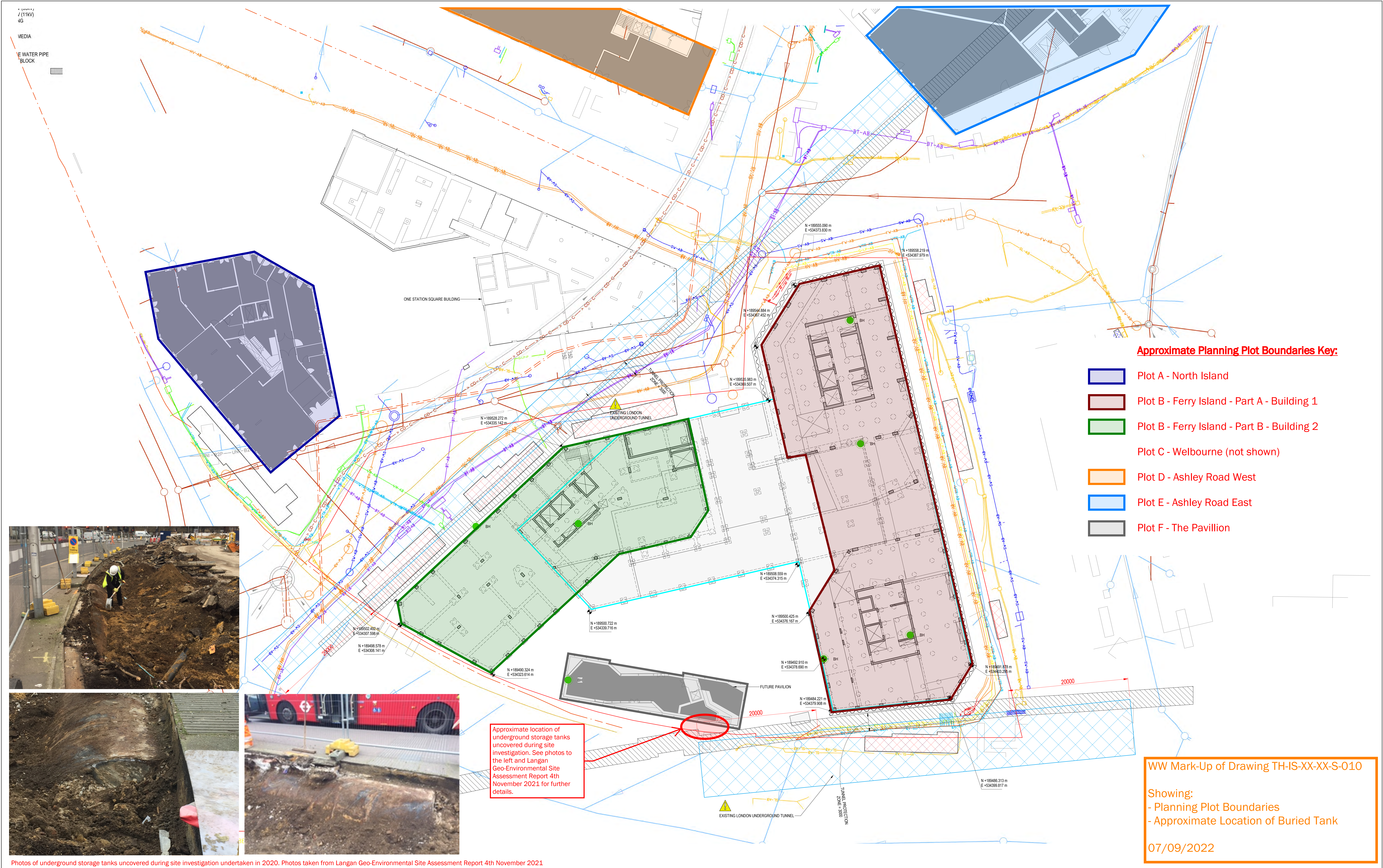
FIGURES



Client	Project	Job No
Whitby Wood Limited	Plot B, Ferry Island, Tottenham Hale Masterplan Redevelopment	CG/39277A
	Title	Figure 1
	Exploratory Hole Location Plan	

APPENDIX A

Tottenham Vale Masterplan Plot Boundaries



Approximate Planning Plot Boundaries Key:

- Plot A - North Island
- Plot B - Ferry Island - Part A - Building 1
- Plot B - Ferry Island - Part B - Building 2
- Plot C - Welbourne (not shown)
- Plot D - Ashley Road West
- Plot E - Ashley Road East
- Plot F - The Pavillion

WW Mark-Up of Drawing TH-IS-XX-XX-S-010

- Showing:
- Planning Plot Boundaries
 - Approximate Location of Buried Tank

07/09/2022



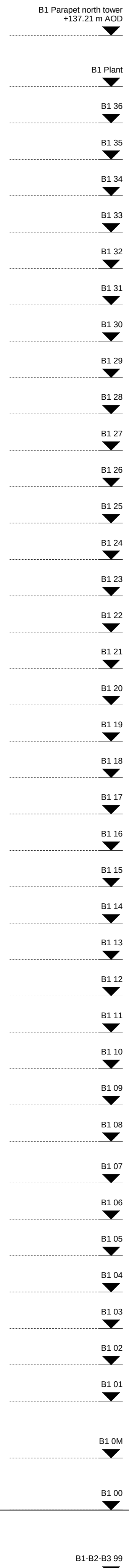
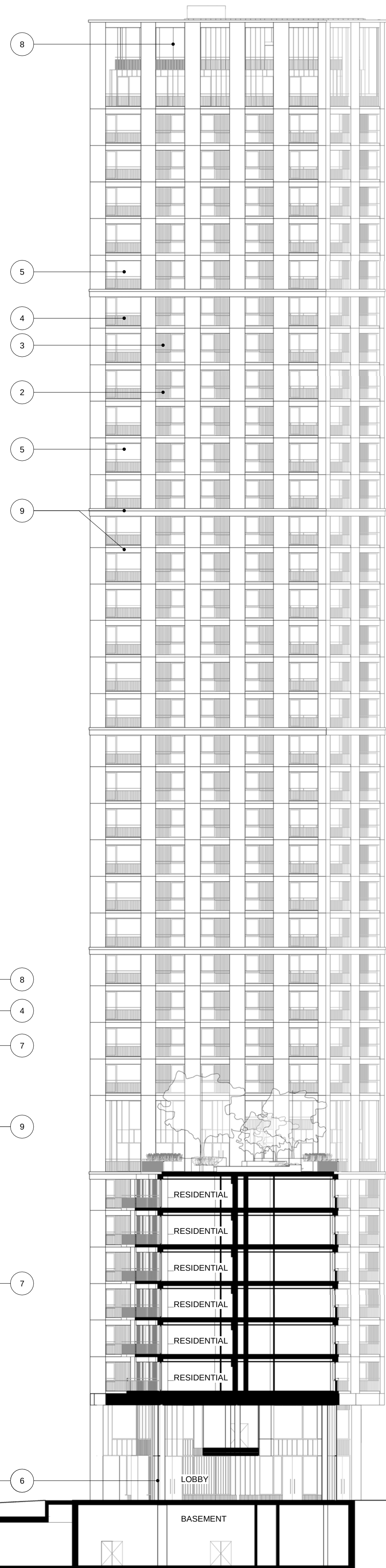
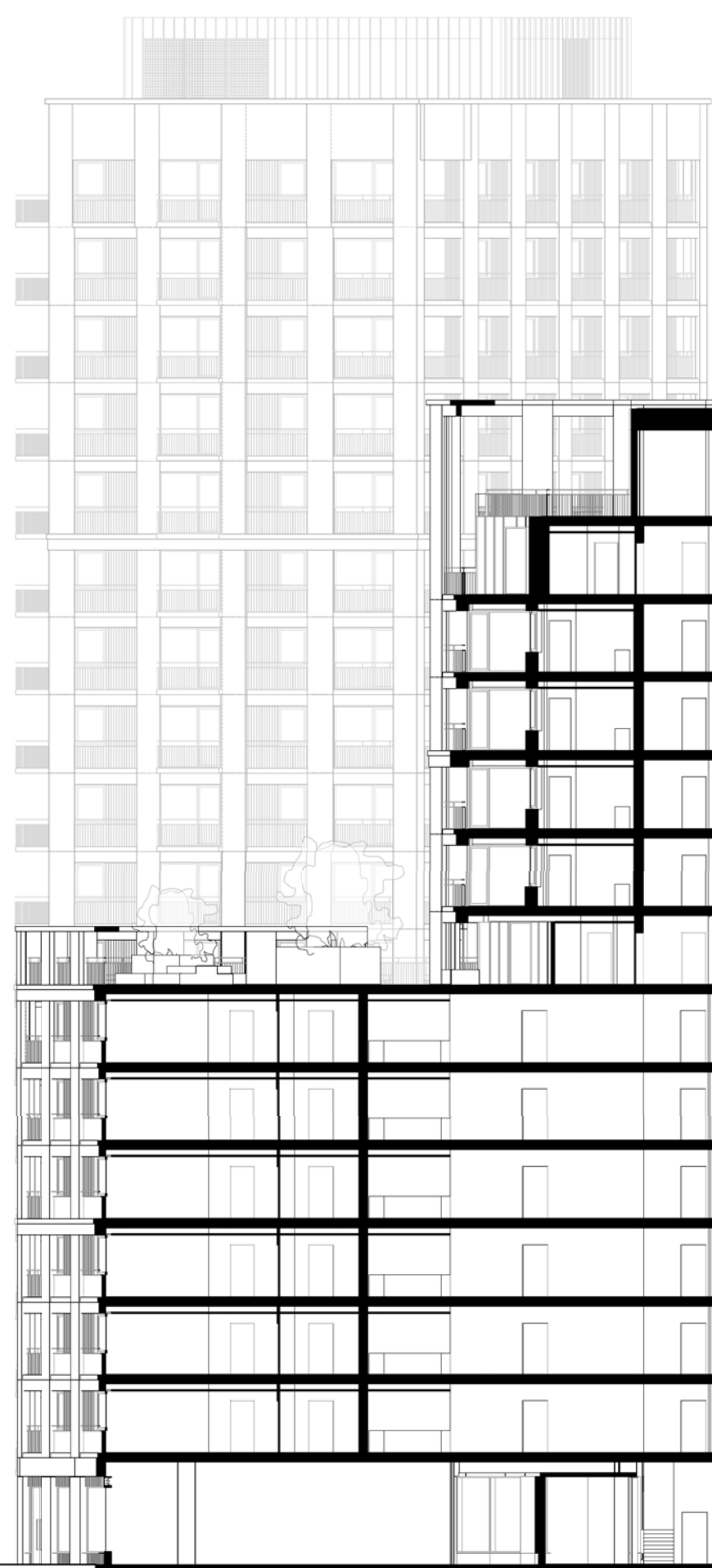
Approximate location of underground storage tanks uncovered during site investigation. See photos to the left and Langan Geo-Environmental Site Assessment Report 4th November 2021 for further details.

Photos of underground storage tanks uncovered during site investigation undertaken in 2020. Photos taken from Langan Geo-Environmental Site Assessment Report 4th November 2021

HEALTH AND SAFETY INFORMATION		NOTES		AS-BUILT LEGEND		SITE CONSTRAINTS SHEET 1 OF 2, REFER ALSO TO B1-B2-S-011		NEW PLAN		whitby wood		PRELIMINARY	
IN ADDITION TO THE HAZARDS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILLED ON THIS DRAWING, NOTE THE FOLLOWING AND REFER TO WHB-AS-ASSESSMENT CONSTRUCTION.		DO NOT SCALE FROM THIS DRAWING. ONLY FIGURED DIMENSIONS ARE TO BE USED. ALL DIMENSIONS ARE IN MILLIMETRES U.N.O. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.		FOUL WATER SURFACE WATER INSTALLED GULLEY STREET LIGHTING TRAFFIC SIGNAL LAMP L.V. LAMP H.V. (11kV) EARTHING CCTV VIRGIN MEDIA BT POTABLE WATER PIPE THRUST BLOCK GAS LP GAS MP		BH DENOTES LOCATIONS OF BOREHOLES		ISLAND SITES, TOTTENHAM HALE - FERRY ISLAND		91-94 LOWER MARSH LONDON SE1 7AB, UNITED KINGDOM +44 (0)20 7442 2216 www.whitbywood.com		BUILDING 1 & 2 EXISTING SITE CONSTRAINTS INFORMATION SHEET 1 OF 2	
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.		LUL TUNNEL POSITION BASED ON LUL CORRELATION SURVEY DATED 27/04/18. FOR EXISTING, TERMINATING AND NEW UTILITY CONNECTIONS REFER TO BURD HAPPOLD DRAWING NUMBER TH-SW-XX-001-C-C12721-90-103		DENOTES BUILDING 1 & 2 FERRY ISLAND LAND OWNERSHIP BOUNDARY FERRY ISLAND LUL TUNNEL MONITORING & CONDITION SURVEY EXTENT DENOTES BOUNDARY OF BASEMENT BELOW GROUND FLOOR LAYOUT. DENOTES TREE PITS		DATE: 27/08/21 SCALE: 1:50 DRAWN BY: LS CHECKED: JB APPROVED: SL		CLINT MIDGARD LTD		REVISION		TH-IS-XX-XX-S-010	
DECOMMISSIONING/DEMOLITION													

APPENDIX B

Proposed Development Plans



AOD: Above Ordnance Datum

REV	DATE	DESCRIPTION
P00	July '18	ISSUED FOR PLANNING
P01	Oct. '18	PLANNING ADDENDUM

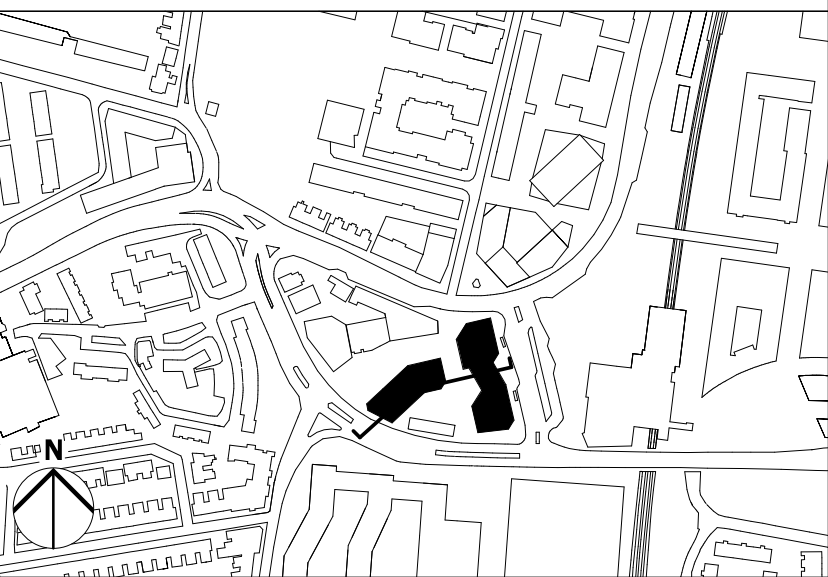
ARCHITECTS Ashley Road East ALISON BROOKS ARCHITECTS	Alison Brooks Architects Unit 610, Highgate Studios 53-79 Highgate Road London NW5 1TL www.alisonbrooksarchitects.com info@alisonbrooksarchitects.com +44 (0)20 7627 9777
Ferry Island North Island ALLFORD HALL MONAGHAN MORRIS	AHMM ARCHITECTS Ltd Moredlands 5-23 Old Street London EC1V 9HL www.ahmm.co.uk info@ahmm.co.uk +44 (0)20 7251 5261
Ashley Road West Welbourne Pollard Thomas Edwards	Pollard Thomas Edwards Diespeker Wharf 302 Graham Street London N1 8JX www.pollardthomasedwards.co.uk mail@ptea.co.uk +44 (0)20 7336 7777
Ferry Square Pavilion RUFFARCHITECTS	RUFFARCHITECTS 205 Wardour Street, London W1F 8EJ www.ruffarchitects.co.uk info@ruffarchitects.co.uk +44 (0)20 3814 8992

NOTE
Residential layouts, terrace layouts, planting and materials are shown for illustrative purposes only.

When this drawing is issued in uncontrolled CAD format it will be accompanied by a PDF version and is issued to enable the recipient to prepare their own documents / models / drawings for which they are solely responsible. The recipient should report all drawing errors, omissions and discrepancies to the architect. All dimensions should be checked on site by the contractor and such dimensions shall be the contractor's responsibility.

- The 'Architects', as listed, accepts no responsibility or liability for:
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 - any alterations or additions to or discrepancies arising out of changes to the information on which the drawing was based that was current at the time of issue, and which occur to information after it has been issued by the 'Architects'
 - any loss or degradation of the information held in this drawing resulting from the use of the drawing from the original form to any other format or from the recipient's reading of it in any other programme or any version of the programme other than that which was used to prepare it
 - the accuracy of survey information provided by others or for any costs, claims, proceedings and expenses arising out of reliance on such information
- The use of this drawing is limited to that authorised by the local planning authority solely for the purposes of the planning application to which it relates

LOCATION



job title
TOTTENHAM HALE CENTRE
drawing title / location
ISLAND SITES
PROPOSED SECTION AA

drawn by	checked	scale	status
MG	AM	1 : 250@A1, 1 : 500@A3	INFORMATION

drawing number	revision
TH-IS ZZ 001 A 16092 (P00) P300	P 01

B1 Parapet north tower
+137.21 m AOD

B1 Plant

B1 36

B1 35

B1 34

B1 33

B1 32

B1 31

B1 30

B1 29

B1 28

B1 27

B1 26

B1 25

B1 24

B1 23

B1 22

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B1 Parapet south tower
+79.23 m AOD

8

4

1

3

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2

6

TH-IS_ZZ_001_A_16092_(P00)_P253

1

P302-Section CC - 1 : 250

0 1 5 10 metres

KEY

- Smooth concrete pier
- Profiled concrete infill panel
- Profiled metal cladding
- Metal balustrades to match cladding
- Window system to match cladding colour
- Curtain walling to shopfronts and entrances
- Brickwork panels
- Metal plant screens
- Textured concrete lintel

AOD: Above Ordnance Datum

REV DATE DESCRIPTION

P00 July '18 ISSUED FOR PLANNING
P01 Oct. '18 PLANNING ADDENDUM

ARCHITECTS

Ashley Road East

**ALISON BROOKS
ARCHITECTS**

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Ferry Island
North Island

**ALLFORD
HALL
MONAGHAN
MORRIS**

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Ashley Road West
Welbourne

**Pollard
Thomas
Edwards**

Pollard Thomas Edwards

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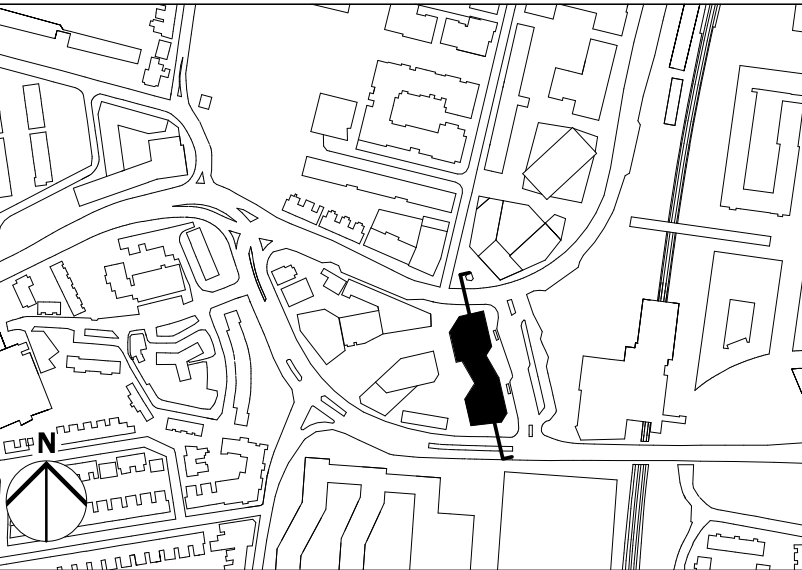
NOTE

Residential layouts, terrace layouts, planting and materials are shown for illustrative purposes only.

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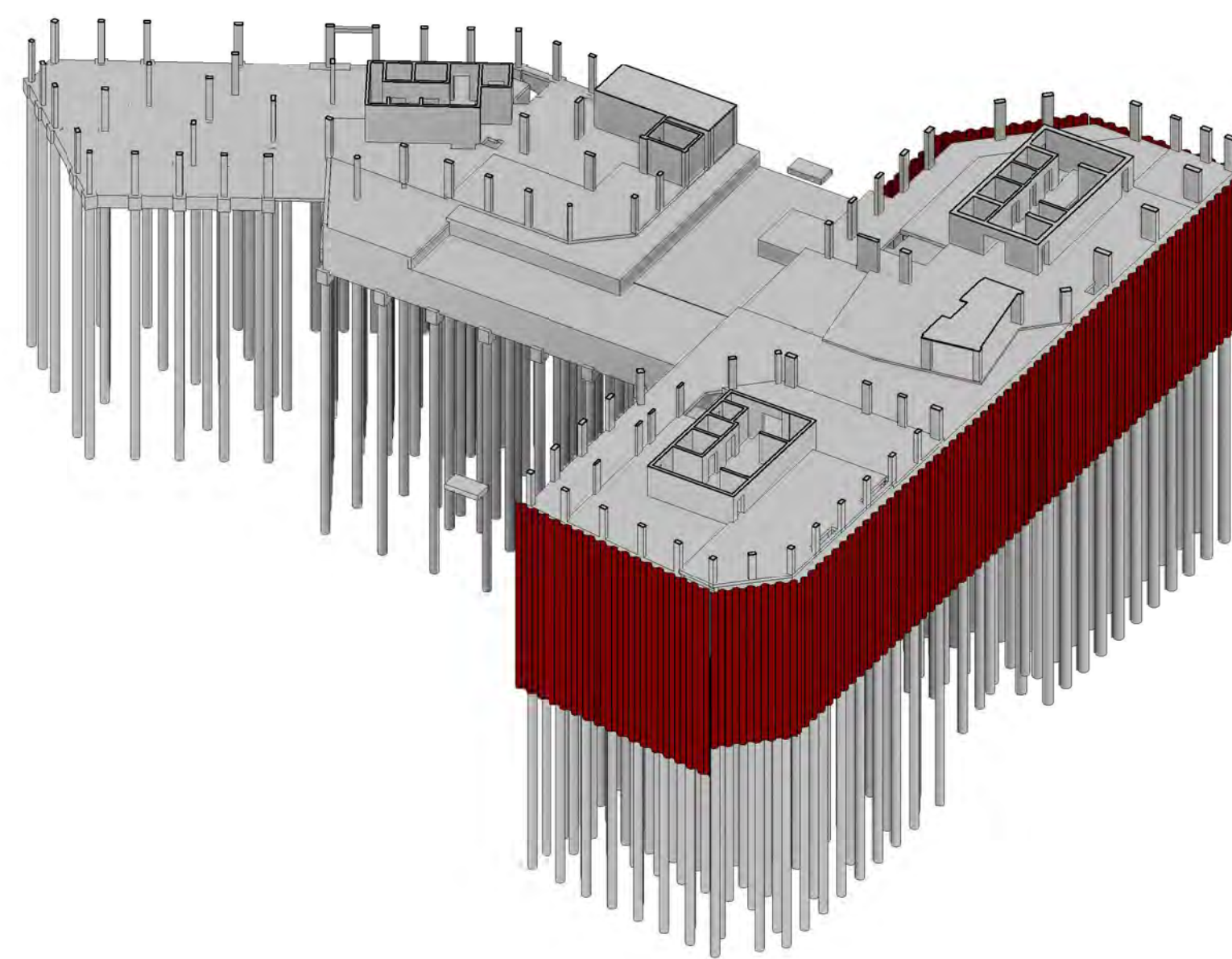
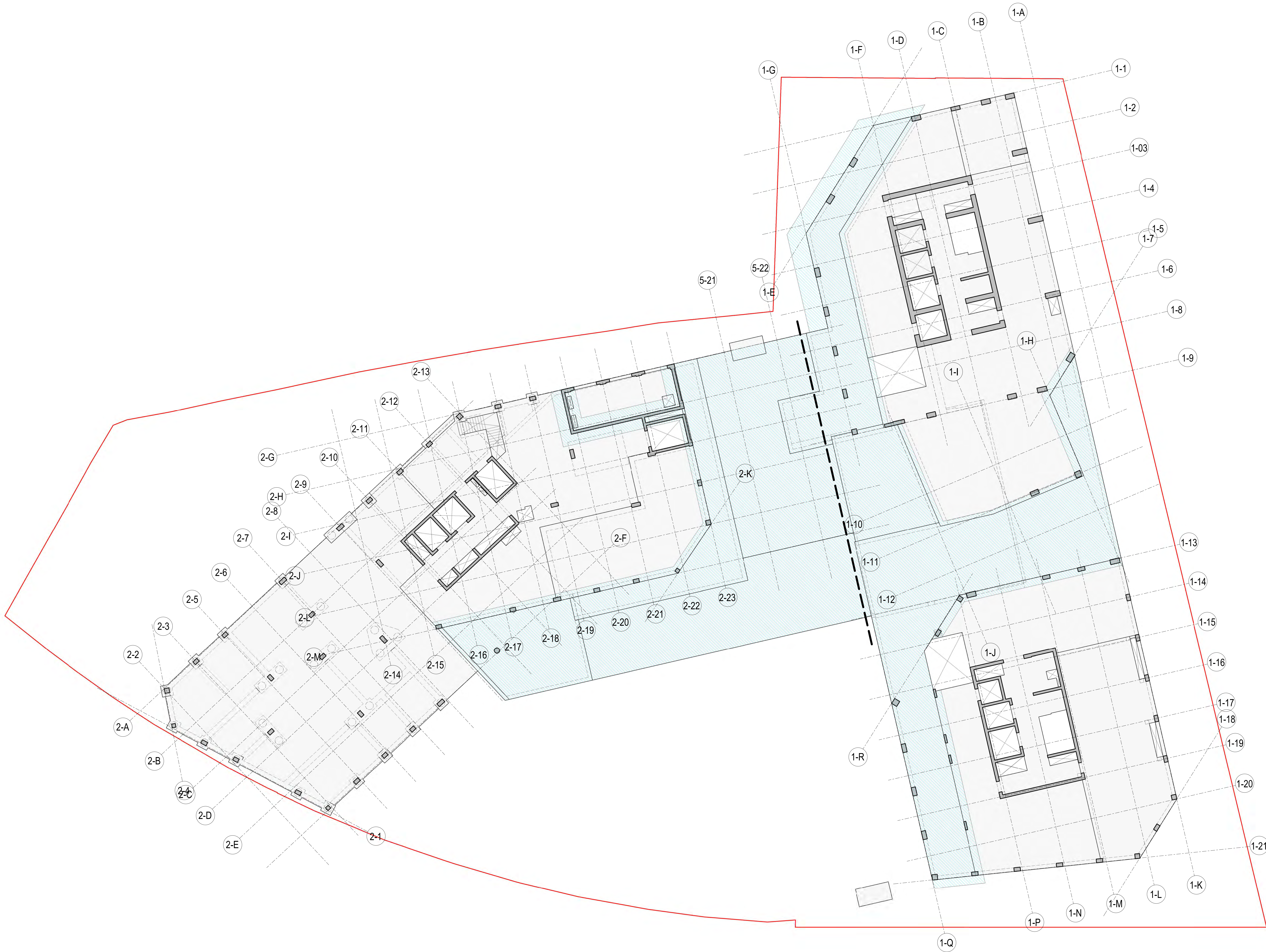
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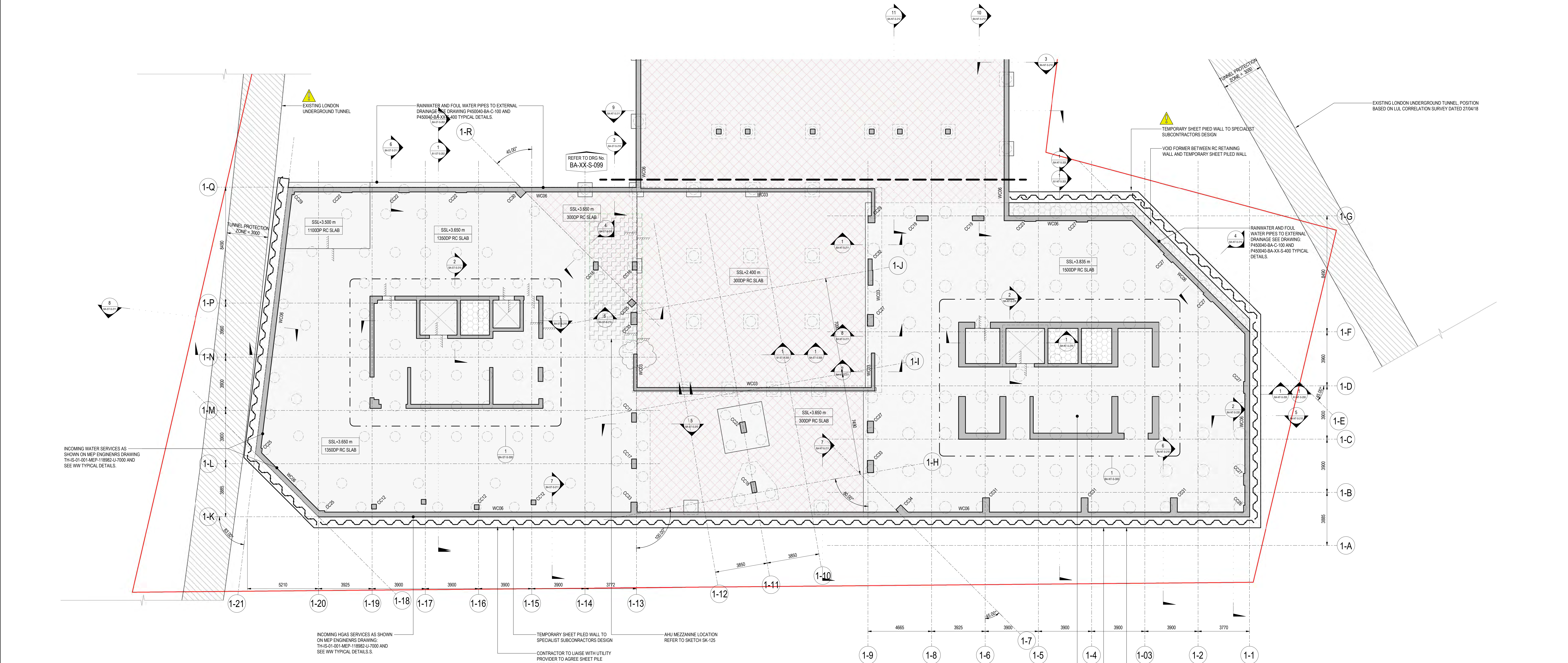
job title
**TOTTENHAM HALE CENTRE
ISLAND SITES**
drawing title / location
PROPOSED SECTION CC

drawn by checked scale status
MG AM 1 : 250@A1 1 : 500@A3 INFORMATION

drawing number revision
TH-IS_ZZ_001_A_16092_(P00)_P302 P 01



HEALTH AND SAFETY INFORMATION				NOTES												FOR TENDER			
IN ADDITION TO THE HAZARDOUSNESS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING AND REFER TO THE RISK ASSESSMENT CONSTRUCTION.				DO NOT SCALE FROM THIS DRAWING. ONLY FIGURED DIMENSIONS ARE TO BE USED. ALL DIMENSIONS ARE IN MILLIMETRES U.N.O. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.				WATERPROOF CONCRETE (MIN. 250 THICK)				WATERPROOF CONCRETE & MEMBRANE TO ACHIEVE GRADE 3 ENVIRONMENT. REFER TO TYPICAL DETAILS				91-94 LOWER MARSH LONDON SE1 7AB, UNITED KINGDOM +44 (0)20 7442 2216 www.whitbywood.com			
MAINTENANCE/CLEANING/OPERATION.																ISLAND SITES, TOTTENHAM HALE			
DECOMMISSIONING/DEMOLITION.																WATERPROOF CONCRETE EXTENTS BUILDING 1 & 2 GROUND FLOOR PLAN			
																DATE 27/08/21			
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																DRAWING NO. P450040-BA-XX-S-002			
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HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARD RISKING NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING AND REFER TO RISK ASSESSMENT CONSTRUCTION:
1. PILES TO BE CONSTRUCTED CLOSE TO SHEET PILE CONTRACTOR TO ALLOW FOR IN METHOD WORK.
2. PILES TO BE CONSTRUCTED CLOSE TO EXISTING SERVICES. CONTRACTOR TO ALLOW FOR IN METHOD WORK.
3. PILES TO BE CONSTRUCTED WITHIN (HAP) TUNNELS REQUIRE VIBRATIONLESS PILING MAT. CONTRACTOR TO ALLOW FOR IN METHOD WORK.
4. TEMPORARY WORKS REQUIRED FOR THE EXCAVATION SHOULD BE DESIGNED BY SPECIALIST TEMPORARY WORKS ENGINEER.
5. TEMPORARY WATER TANKS CONTRACTOR TO IMPLEMENT SUITABLE DE-WATERING STRATEGY.
6. MAINTENANCE CLEANING OPERATION.

DECOMMISSIONING/DEMOLITION

NOTES

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ALL DIMENSIONS ARE IN MILLIMETRES U.N.O.
ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
REFER TO DRAWING BA-XX-S-402 FOR THE BASEMENT WATERPROOFING STRATEGY.

HEAVE PROTECTION CELLORE HXS 225 1824 BY CORDEX OR SIMILAR AGREED ALTERNATIVE BELOW SLAB

VIBRATIONLESS PILING METHOD REQUIRED <15mm FROM LUL TUNNELS.

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DRN CHK APD

P 3	19/11/21	FOR TENDER
P 2	03/08/21	TENDER
P 1	27/08/21	TENDER

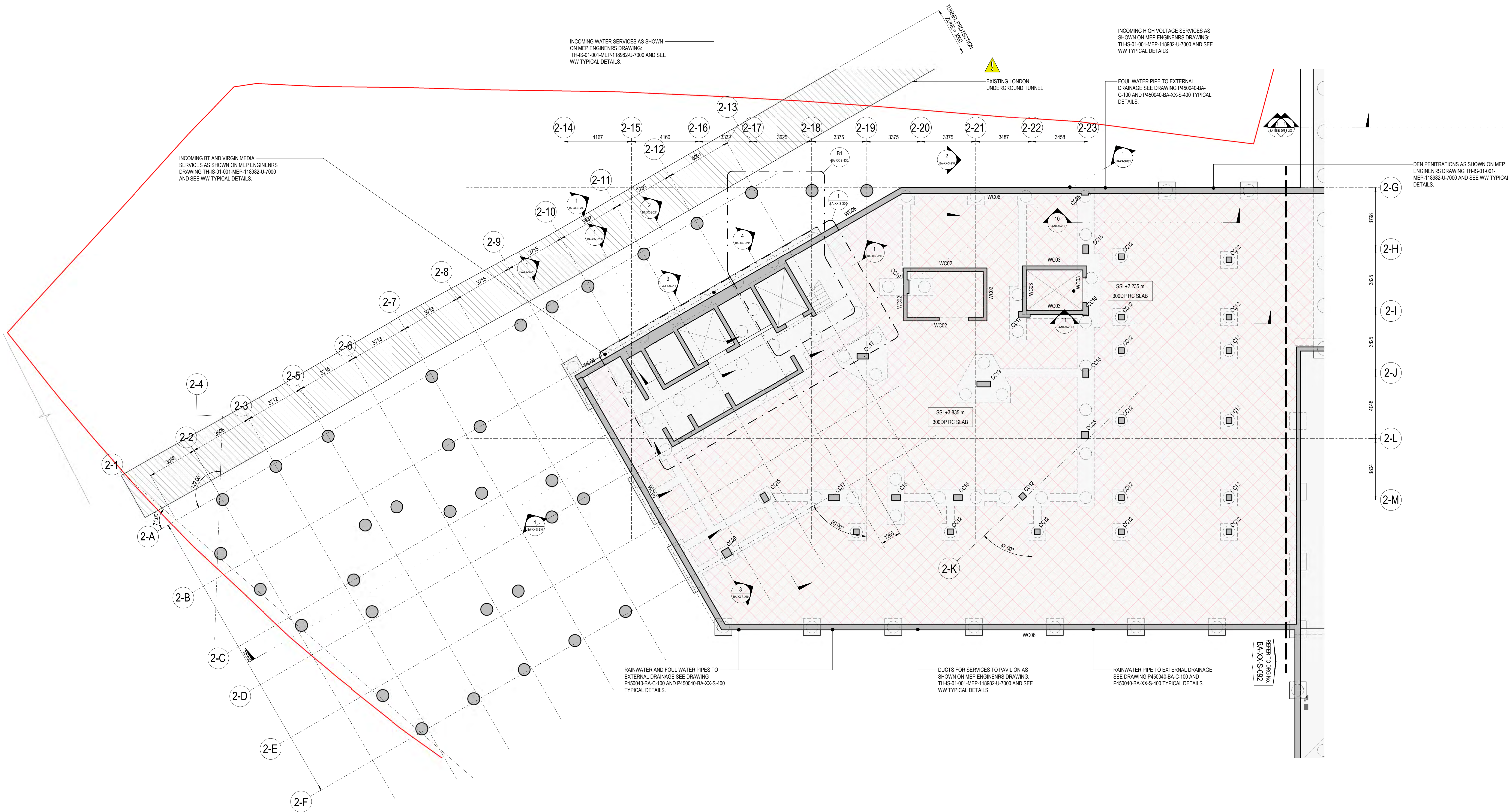
REV DATE DESCRIPTION

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CLIENT
ARGENT RELATED

FOR TENDER			
PROJECT ISLAND SITES, TOTTENHAM HALE			
DRAWING TITLE GENERAL ARRANGEMENT BASEMENT BUILDING 1			
DATE 27/08/21	SCALE As indicated	DRAWN BY LS	CHECKED AB
DRAWING NO. P450040-BA-XX-S-092			APPROVED SL
			REVISION P 3



RC COLUMN SCHEDULE		
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CC03	225 x 900mm	
CC04	225 x 1200mm	
CC07	250 x 1200mm	
CC08	250 x 2200mm	
CC09	250 x 2400mm	
CC12	350 x 350mm	
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CC14	350 x 500mm	
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CC26	450 x 800mm	
CC27	450 x 850mm	
CC29	500 x 500mm	
CC30	550 x 550mm	

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CC31	500 x 1400mm	
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CC34	500 x 850mm	
CC35	250 x 250mm	
CC36	250 x 1300mm	
CC37	200 x 400mm	
CC38	500mm	
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CC44	350 x 650mm	
CC45	650 x 650mm	
CC47	250 x 1500mm	
CC48	300 x 1200mm	

HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDOUSNESS NORMALLY ASSOCIATED WITH THE TYPES OF WORK, DETAIL 2 ON THIS DRAWING NOTE THE FOLLOWING AND REFER TO THE RISK ASSESSMENT CONSTRUCTION.

1. PILES TO BE CONSTRUCTED CLOSE TO EXISTING SERVICES. CONTRACTOR TO ALLOW FOR IN METHODOLOGY.

2. PILES TO BE CONSTRUCTED WITHIN 15M OF TUNNELS REQUIRE VIBRATIONLESS PILING MAT. CONTRACTOR TO ALLOW FOR IN METHODOLOGY.

3. TEMPORARY WORKING REQUIRED FOR THE EXCAVATION SHOULD BE DESIGNED BY SPECIALIST.

4. HIGH WATER TABLE. CONTRACTOR TO IMPLEMENT SUITABLE DE WATERING STRATEGY.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

NOTES

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REFER TO DRAWING BA-XX-S-402 FOR THE BASEMENT WATERPROOFING STRATEGY.

SITE BOUNDARY

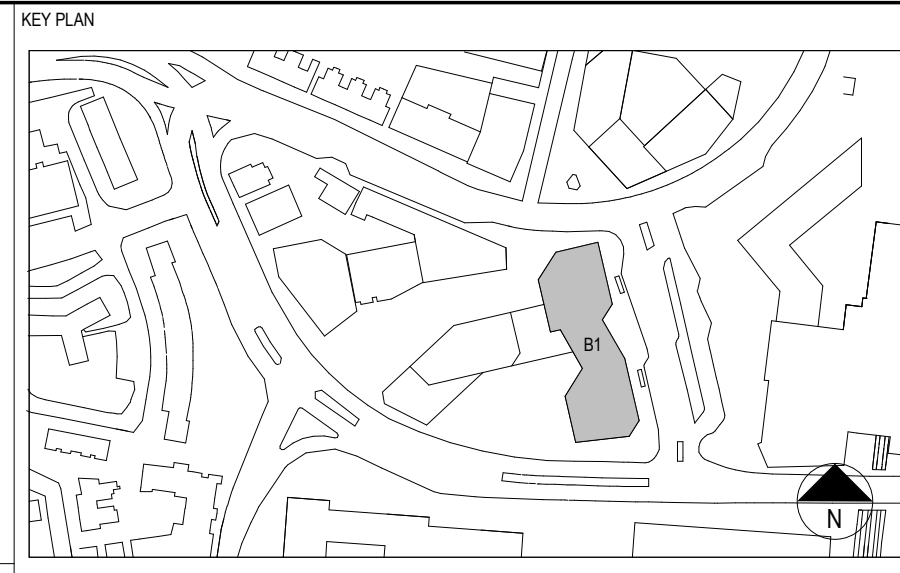
HEAVY PROTECTION CELLULOSE HWS 225 18224 BY CORDEX OR SIMILAR AGREED ALTERNATIVE BELOW SLAB

VIBRATIONLESS PILING METHOD REQUIRED <15m FROM LUL TUNNELS.

P 3 25/11/21 FOR TENDER
P 2 19/11/21 FOR TENDER
P 1 27/08/21 TENDER

HG AB SL
LS AB SL
RD AB SL

DRY CHK AND



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CLIENT
ARGENT RELATED

FOR TENDER

PROJECT
ISLAND SITES,
TOTTENHAM HALE

DRAWING TITLE
GENERAL ARRANGEMENT
BASEMENT
BUILDING 2

DATE 27/08/21 SCALE 1:50 DRAWN BY LS CHECKED AB APPROVED SL
DRAWING NO. P450040-BA-XX-S-099 REVISION P 3

APPENDIX C

Capping Import Specification

Appendix C. Maximum Permissible Concentrations for Imported Capping Layer Soils

Determinant		Maximum permissible concentration ¹ (mg/kg) ²	Rationale
		6% SOM	
Arsenic		30	GAC ⁴
Beryllium		1.7	GAC ⁴
Boron (water soluble)		5	Lower limit for potential phytotoxic effect ⁵
Cadmium		85.3	GAC ⁴
Chromium (III)		887	GAC ⁴
Chromium (VI)		5.75	GAC ⁴
Lead		310	C4SL ¹⁰
Mercury		75.3	GAC ⁴
Selenium		596	GAC ⁴
Copper		135 ³	BS 3882:2015 Specification for Topsoil ³
Nickel		75 ³	BS 3882:2015 Specification for Topsoil ³
Zinc		200 ³	BS 3882:2015 Specification for Topsoil ³
Vanadium		651	GAC ⁴
Benzo(a)pyrene		3.2	GAC ⁴
Benzo(a)anthracene		15	GAC ⁴
Benzo(b)fluoranthene		4.06	GAC ⁴
Benzo(k)fluoranthene		107	GAC ⁴
Chrysene		31.9	GAC ⁴
Dibenzo(a,h)anthracene		0.34	GAC ⁴
Indeno(1,2,3-cd)pyrene		46.2	GAC ⁴
Naphthalene		12.4	GAC ⁴
TPH aliphatic ⁶	EC5-6	107	GAC ⁴
	EC>6-8	328	GAC ⁴
	EC>8-10	87.7	GAC ⁴
	EC>10-12	453	GAC ⁴
	EC>12-16	1,000 ⁷	Hazardous waste threshold ⁷
	EC>16-35	1,000 ⁷	Hazardous waste threshold ⁷
TPH aromatic ⁶	EC5-7	1.42	GAC ⁴
	EC>7-8	1,000 ⁷	GAC ⁴ / Hazardous waste threshold ⁷
	EC>8-10	144	GAC ⁴
	EC>10-12	720	GAC ⁴
	EC>12-16	1,000 ⁷	GAC ⁴ / Hazardous waste threshold ⁷
	EC>16-21	1,000 ⁷	GAC ⁴ / Hazardous waste threshold ⁷
	EC>21-35	1,000 ⁷	Hazardous waste threshold ⁷
Sum of TPH aliphatic & aromatic C5-C10		< 1,000	Hazardous waste thresholds ⁸ (C10+ MPC based on threshold for C25+)
Sum of TPH aliphatic & aromatic C10+		< 1,000	
pH		5-10	
Monohydric Phenols		2,310	GAC ⁴
Free Cyanide		34	GAC ¹¹
Asbestos		No detectable fibres ⁹	

Notes:

- These maximum permissible concentrations (MPCs) are import criteria only and are not necessarily appropriate for human health risk assessment.
- In mg/kg dry soil except pH and asbestos.
- British Standard BS3882:2015 Specification for Topsoil and requirements for use. Table 1. Values taken for pH 6-7.
- Generic Assessment Criteria generated 'in-house' based on CLEA model Version 1.071.
- Nable, Banuelos and Paul. (1997). *Boron Toxicity*. Plant and Soil, **Vol. 193**, pp1 81-198.
- Speciated TPH values must not exceed individual GAC. Assessment of sum of TPH must also be made against hazardous waste threshold to confirm imported soils do not classify as hazardous material.
- GAC derived MPC for TPH fraction limited to 1,000mg/kg based on 'waste thresholds'.
- Environment Agency. (2007). *A Guide to Hazardous Waste Regulations: How to find out if waste oil and waste that contain oil are hazardous*. HWR08.
- Laboratory screen by microscopy may be required subject to source of material.
- Published C4SL for lead (DEFRA, 2014)
- GAC for free cyanide derived by Atkins based on acute exposure for a 0-6 year old child

APPENDIX D

Verification Plan

Reference	Principal requirements	Design or construction related	Site visit required by qualified geoenvironmental engineer	Supporting documentation to be provided by Client / Contractor
1.0 General principles	The site remediation requirements are as follows: - Provision of capping layers and/or growth medium in areas of soft landscaping. - Use of appropriate materials for buried services. - Watching brief and discovery strategy. - Implementation of environmental controls and health and safety procedures to protect construction workers and adjacent site users from potential risks associated with dust, vapours and nuisance odours. - Appropriate materials management. Amendments will be made to accord with differing conditions encountered during the progress of the works.	Design & construction	YES As detailed below	Details of construction programme to be provided by client/contractor.
2.0 Compliance with legislation	The construction and remediation activities on the site should be undertaken in accordance with all current health and safety and environmental legislation.	Construction	-	-
3.0 Capping Layer and/or Growth Medium	Where soft landscaping areas will remain at ground level (with Made Ground at formation level), clean capping layers will be required to mitigate the potential risks to future site users from the asbestos within the Made Ground. A growth medium is required in areas of soft landscaping at podium/roof top level. In areas of soft landscaping the capping layer will consist of a minimum of 450mm of clean soil over a geotextile separator or a minimum of 600mm of clean soil. The thickness of the growth medium is to be confirmed by the landscape architect. Soils will be tested by a suitably qualified geoenvironmental engineer at a frequency of one sample per 250m³, with a minimum of three samples per source.	Construction	YES, if required - Site visit records & photographs of capping layer. - Depth check records - Chemical test results of imported material taken by CGL.	- Source certificates and pre-delivery test data to be provided by the Contractor. - Layout drawings showing location of areas of soft landscaping and private gardens.

Reference	Principal requirements	Design or construction related	Site visit required by qualified geoenvironmental engineer	Supporting documentation to be provided by Client / Contractor
4.0 Buried services	Due to elevated concentrations of hydrocarbons within the shallow soils, the use of barrier pipes or metal pipes for water supply will be required, or proprietary hydrocarbon resistant pipes such as Protectaline. This needs to be confirmed with the water supply company prior to commencement of development.	Design & Construction	NO	Confirmation of pipework material and acceptance of material choice by water supply company.
5.0 Watching brief and discovery strategy	A watching brief and discovery strategy is to be put into place whereby should unexpected conditions be encountered during construction works a qualified geoenvironmental engineer is to be informed to conduct a site visit, take additional samples and assess the risk, as required. The regulators should also be notified. Where there is no evidence of unexpected conditions observed, signed statements from the on-site manager and any other key contractors involved in the groundworks process should be provided and will be included in the validation report.	Construction	YES, if required - Occasional visits during site clearance and construction works to inspect the soils - Inspect areas - To take samples for chemical analysis	- Site visit reports including photographs - Chemical test results - Test certificates - Revised risk assessment and subsequent mitigation actions - If no suspect conditions are recorded, a statement will be required from the contractor to that effect and to confirm the watching brief was carried out
6.0 Health and Safety requirements	This verification plan does not specifically cover health and safety requirements. This should be addressed in the Contractor's Health and Safety Plan.	Design & Construction	-	-

Reference	Principal requirements	Design or construction related	Site visit required by qualified geoenvironmental engineer	Supporting documentation to be provided by Client / Contractor
7.0 Waste disposal and materials management	All material bound for off-site disposal (either to a soil treatment facility or to landfill) will require characterisation in accordance with the Hazardous Waste Regulations 2005 and disposal in accordance with the requirements of the Landfill Regulations (2002, as amended) and the Environmental Protection (Duty of Care) Regulations, 1991. The reuse of materials on site could be accomplished through waste exemptions, environmental permits or through the Development Industry Code of Practice, depending on the material in question.	Construction	YES Should additional classification of arisings be required prior to disposal/reuse	- Duty of care records for disposal of waste (including discharge consent if pumped groundwater discharged to sewer) - Laboratory test results - Material management protocols, as required (i.e. exemptions, permits etc.)