Site Investigation Strategy

Phoenix Place Site, Mount Pleasant, London

September 2016

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

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Comments

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1. Introduction

1.1 Objectives

The Livemore Partnership LLP, on behalf of Royal Mail Group (RMG), instructed Waterman Infrastructure & Environment Limited (Waterman) to prepare a strategy for a Site Investigation on the Phoenix Place site, Mount Pleasant, London, which is located in the London Borough of Camden. The location of the Phoenix Place site is shown on Figure A1 and Figure A2 of Appendix A.

The purpose of the Site Investigation on the Phoenix Place site is to:

- Assess ground conditions and the nature, extent and concentration of contaminants within the underlying soils;
- Assess the contamination status of the Secondary A Aquifer located within the Hackney Gravel Member;
- Assess the soil properties to inform design of foundations and paved areas;
- Undertake a Preliminary Waste Classification of the soils; and
- Assess the ground gas and vapour regime.

This Site Investigation Strategy sets out the framework and nature of the forthcoming Site Investigation at the Phoenix Place site. The Site Investigation shall cover the entirety of the Phoenix Place site, as defined by the planning application boundary shown in Appendix A.

A Site Investigation Specification for use by the Contractor for tendering and undertaking the Site Investigation has been produced separately in accordance with the Institute of Civil Engineers (ICE) UK Specification for Site Investigation (2012). A copy of this Site Investigation Strategy will also be passed on to the Contractor for further understanding of the Phoenix Place site and to communicate the objective of the Site Investigation.

This report is produced under the terms of, and in accordance with the Consultant's appointment with Royal Mail Group, and may be relied upon in accordance with the terms and conditions of the Appointment.

1.2 Previous Environmental Assessments

Three previous environmental assessments have been undertaken on the Phoenix Place site, as follows:

- A Site Investigation was undertaken by Geotechnics in 2005 and a factual report prepared ('Ground Investigation at Mount Pleasant Redevelopment' (report ref. PC051744, dated November 2005));
- A Preliminary Environmental Risk Assessment (PERA) prepared by Waterman in 2013 (report ref. EED13235-100.6.1.10_FA); and
- A PERA prepared by Waterman in 2016 (report ref. WIB13235-102-R-2-2-1-BGAH).

Copies of the 2005 Site Investigation factual report and the 2016 Phoenix Place site PERA will be forwarded onto the Contractor. Reliance on the 2005 Site Investigation factual report has not been provided and therefore the data will not be used within the subsequent interpretative reports.

This Site Investigation Strategy is based on the findings of the PERA updated in 2016 for the Phoenix Place site and resultant preliminary Conceptual Model included in the PERA. The Site Investigation will serve to quantify the potentially active pollutant linkages identified in the PERA and will be used to inform an updated Conceptual Model for the Phoenix Place site, which will be included in the Generic Quantitative Environmental Risk Assessment (GQRA).

1.3 Planning Context

Planning permission for the Phoenix Place Development was granted in March 2015 (ref. 2013/3807/P); a description of which is included in the PERA. Condition 6 of the Phoenix Place Development planning permission relates to contaminated land and seeks that prior to the commencement of work for each Section or stage in development that the following components are undertaken, submitted and approved by the London Borough of Camden:

- Condition 6(a): PERA;
- Condition 6(b): Site Investigation Strategy, accompanying Site Investigation and Geo-environmental interpretative report;
- Condition 6(c): Remediation strategy;
- Condition 6(d): Verification plan; and
- Condition 6(e): Unexploded Ordnance (UXO) and any further mitigation measures required.

The principal objective of this Site Investigation Strategy in a planning context is to support the discharge of Condition 6(b) of the planning permission. This Site Investigation Strategy has therefore been submitted to the London Borough of Camden for approval under Planning Condition 6(b).

1.4 Proposed Development

Planning permission for the Phoenix Place Development is for the following:

Comprehensive redevelopment, following the demolition of existing buildings, to construct four new buildings ranging from 5 to 15 storeys (above basement level) in height, to provide 38,724sqm. (GIA) of residential floorspace (345 dwellings) (Class C3), 823sqm (GIA) of flexible retail and community floorspace (Use Classes A1, A2, A3,D1, or D2) with associated energy centre, waste and storage areas, basement level residential car parking (54 spaces), the re-provision of Royal Mail staff car parking (approx. 196 spaces) cycle parking , residential cycle parking (431 residential spaces) hard and soft landscaping to provide public and private areas of open space, alterations to the public highway and all other necessary excavation and enabling works.

The description of the Phoenix Place Development is set out in the PERA for the Phoenix Place site that was updated by Waterman in 2016.

2. Environmental Site Summary

2.1 Site Description

The Phoenix Place site is located at National Grid Reference 530945, 182264 in the Clerkenwell area of London and within the administrative boundary of the London Borough of Camden. The location of the Phoenix Place site is shown on Figure A1 and Figure A2 of Appendix A and a selection of photographs in Appendix B.

With the exception of Phoenix Place (road), the remainder of the Phoenix Place site is in use as a Royal Mail staff car park. The surface of the car park comprises compacted fill material and concrete, although where present, the concrete surface is often in poor condition. No buildings are present on the Phoenix Place site, with Mail Rail House (Petrone House) demolished to ground level in 2014/2015.

The culverted Fleet River Sewer passes beneath Phoenix Place (road) and flows in a southerly direction, outfalling in the River Thames.

Anecdotal information from RMG management indicates a groundwater abstraction well is located towards the centre of Phoenix Place site, although this was not observed during the walkover. British Geological Survey (BGS) borehole records identify a series of boreholes founded within the London Clay Formation marked as wells on the plan; however, their use as groundwater abstraction wells cannot be confirmed.

2.2 Phoenix Place Site History and Known Ground Conditions

A detailed description of the historical development of the Phoenix Place site is provided in the PERA, together with potentially contaminative activities identified on and surrounding the Phoenix Place site.

The historical map extracts reviewed to inform the PERA date back to 1851, at which time the Phoenix Place site was relatively undeveloped with two buildings located on the north-eastern boundary adjacent to Phoenix Place (road). By 1874, the Phoenix Place site had been developed with a series of industries such as a foundry and cartridge manufacturer. The Phoenix Place site was subsequently redeveloped through the 20th century to include: garages (with sunken fuel tanks); food factory; printing works and foundries. Since the 1970's, the buildings on the Phoenix Place site have been demolished.

2.2.1 Geology and Hydrogeology

The geology and hydrogeology of the Phoenix Place site has been established from BGS boreholes, historical boreholes as part of the 2005 Site Investigation, geological maps and data from the Environment Agency website. A summary of the geology and hydrogeology is provided in Error! Reference source not ound. with further details provided in the PERA.

Table 1: Geology and Hydrogeology of the Underlying Strata

Stratum	Area Covered	Estimated Thickness	Typical Description	Hydrogeology
Made Ground	Entire Phoenix Place site	1.5m to 5.2m	Clayey sandy Gravel with fragments of brick, concrete, oyster shells, ceramic, ash,	Unproductive Strata
Hackney Gravel Member	Majority of the Phoenix Place site	0.9m to 1.2m	Sandy Gravels with rare clay.	Secondary A Aquifer
London Clay Formation	Entire Phoenix Place site	5.4m to 9.4m	Silty Clay	Unproductive Strata
Lambeth Group	Entire Phoenix Place site	15.5m to 15.8m	Mottled sandy Clay containing shell fragments.	Secondary A Aquifer
Thanet Sand Formation	Entire Phoenix Place site	7.0m	Fine grained Sand with rare clay	Secondary A Aquifer
Upper Chalk Formation	Entire Phoenix Place site	>13.0m (not proven)	White Chalk with flints	Principal Aquifer

The former Fleet River (now known as the Fleet River Sewer) and associated flood plains were historically on the Phoenix Place site and therefore alluvial deposits are therefore likely to be encountered. Currently, the Fleet River Sewer is culverted beneath Phoenix Place (road), outfalling to the River Thames approximately 1.6km to the south.

Within the Phoenix Place site, the Hackney Gravel Member has been replaced by Made Ground in some locations, resulting in the Secondary A Aquifer sitting within the Made Ground rather than the Hackney Gravel Member.

The site is not located within a groundwater Source Protection Zone.

Groundwater within the River Terrace Deposits is predicted to flow south-east towards the culverted Fleet River Sewer.

One groundwater abstraction borehole located within the Upper Chalk Formation is recorded within 1km of the Phoenix Place site. The groundwater abstraction point, which is located 517m north-east, is operated by Thames Water as a potable water supply and is considered likely to influence groundwater flow within the Upper Chalk Formation.

2.3 Preliminary Conceptual Model

The preliminary Conceptual Model is included within the PERA. Potentially active pollutant linkages identified within the preliminary Conceptual Model include:

- Construction workers may come into direct contact with potentially contaminated soils and material, being exposed to ground gases and vapours in confined spaces;
- Off-site users/residents may inhale potentially contaminated soils and dust during construction works; and
- Buried foundations, structures or services may come into direct contact with contaminated soils and groundwater.

3. Proposed Scope of Works for the Site Investigation

The Site Investigation shall include the following items:

- Clearing all Site Investigation locations for buried services;
- 1.2m hand dug pits at all locations to confirm service clearance;
- UXO clearance during the Site Investigation;
- 2No. Boreholes to maximum depths of 50mbgl (BH11, and BH13);
- 8No. Boreholes to maximum depths of 40mbgl (BH12, BH14, BH15, BH19, BH20, BH21, BH22, and BH23);
- 6No Window sample boreholes to maximum depths of 5mbgl (WS13 – WS18);
- 10No. Trial pits to maximum depths of 3.5mbgl (TP1 – TP10);
- In-situ geotechnical testing as per the requirements of the AKT II Geotechnical Design Brief to this Site Investigation Strategy (Appendix C);
- Ground gas and groundwater monitoring installations within boreholes. The strata encountered and the target features will inform the installation design;
- Collection of soil samples, to be used for geo-environmental and geotechnical testing;
- In-situ headspace analysis using a Photo-Ionisation Detector (PID);
- Backfilling of all exploratory hole locations with arisings and finish to existing conditions where not installed with groundwater or ground gas monitoring wells, as per Section 4.6; and
- Surveying of all exploratory hole locations to National Grid and m Above Ordnance Datum (AOD).

The Site Investigation shall be carried out in accordance with BS 10175:2011 'Investigation of Potentially Contaminated Sites – Code of Practice' and BS 5930:2015 'Code of Practice for Site Investigations'.

The Site Investigation shall be undertaken across the Phoenix Place site. The Exploratory Hole Location Plan in Appendix A shows the proposed borehole, window sampling and trial pit locations.

3.1 Site Investigation Rationale

Given the current and historical contamination sources identified in the PERA, a number of potentially active pollutant linkages were identified, as reported in the PERA. The Site Investigation will serve to quantify the validity of the identified potentially active pollutant linkages, through recovery and assessment of soil and groundwater samples and the completion of ground gas and vapour monitoring. The results of the Site Investigation shall be reported within a GQRA, which shall include an updated Conceptual Model.

Boreholes installed as part of the 2005 Site Investigation shall be monitored and sampled for groundwater and gas where accessible and considered suitably installed. Data from these boreholes will be used within the GQRA.

The exploratory holes shown on the Exploratory Hole Location Plan (Appendix A) have been positioned as far as possible to target the identified contaminant sources and assess the contamination status of the Secondary A Aquifer located within the Hackney Gravel Member.

The PERA describes the possible presence of a series of sunken (underground) petrol tanks historically present on the Phoenix Place site, although details are unknown. As part of the Site Investigation, exploratory holes shall be located so as to identify whether underground fuel tanks still exist, and where possible, the condition of the tanks. Excavation with caution will ensure that any tanks, if present, are not ruptured.

3.1.1 Controlled Waters

Shallow Aquifer and Surface Waters

As part of the Site Investigation, groundwater samples shall be recovered from the Secondary A Aquifer within the Hackney Gravel Member / Made Ground. Given the presence of potential contaminant sources on and off the Phoenix Place site, elevated contaminant levels are considered likely to be present. The recovery of groundwater samples from the Secondary A Aquifer will therefore determine the aquifer's contamination status and consequently allow a qualitative assessment of the risk to the River Thames (via the Fleet River Sewer pathway).

Groundwater monitoring wells shall be installed within five boreholes progressed into the Hackney Gravel Member. As far as practically possible, and based on the predicted south-east groundwater flow, wells installed within the Hackney Gravel Member shall be located both up-hydraulic gradient and down-hydraulic gradient of the Phoenix Place site; thus allowing the background groundwater quality and the Phoenix Place site's impact on the underlying groundwater quality to be sufficiently assessed.

Deep Aquifers

As identified within the PERA, the London Clay Formation, which is between 5.4m and 9.4m in thickness, is considered to be acting as a sufficient aquiclude to prevent the vertical migration of contaminants within the Made Ground from reaching the underlying Secondary A Aquifer and Principal Aquifer. Groundwater samples recovered from the deeper aquifers during the 2005 Site Investigation did not record contaminants in excess of the Drinking Water Standards (DWS).

The potential for an existing groundwater abstraction well(s) and proposed pile foundations of the Phoenix Place Development penetrating the London Clay Formation could act as preferential pathways for contaminants to reach the aquifers beneath the London Clay Formation. The historical groundwater abstraction well, if present, should be decommissioned in accordance with Environment Agency guidance[1] and piles penetrating the London Clay Formation shall require a Foundations Works Risk Assessment (FWRA). These will serve to prevent a preferential pathway being created to the deep aquifers and the vertical migration of contaminants from the overlying deposits.

As part of the Site Investigation, groundwater samples shall not be recovered and tested from wells installed within the Lambeth Group (Secondary A Aquifer), Thanet Sand Formation (Secondary A Aquifer) or Upper Chalk Formation (Principal Aquifer).

[1] Environment Agency (2012) "Good practice for decommissioning redundant boreholes"

Protection of the Aquifers during the Site Investigation

Throughout the Site Investigation, measures shall be taken to ensure as far as is practically possible that the aquifers are protected from further contaminants entering the aquifers as a result of the works undertaken.

Where the ground is identified as highly contaminated, clean drilling techniques shall be considered if relevant. The method shall be confirmed with the Waterman representative prior to commencement.

The Contractor shall take all necessary precautions to prevent the pollution and / or discoloration of the ground resulting from the Site Investigation.

No discharge to controlled waters, sewers or drains shall be permitted.

Post Investigation Groundwater Monitoring

Following the Site Investigation, groundwater monitoring and sampling shall be undertaken by a Waterman engineer, in accordance with the following procedures.

The standing level of the groundwater in the monitoring wells shall be monitored using a dip meter prior to any groundwater development or purging and sampling.

The Waterman engineer shall check for the presence of floating product using a bailer. If a free product layer is present, its thickness shall be measured with an interface meter prior to obtaining the water sample. The Waterman engineer shall record the time and date of the monitoring event, in addition to the colour, turbidity, odour, sheen and free-product thickness (if present) on a fieldwork record sheet.

2no rounds of groundwater sampling from relevant boreholes installed within the Hackney Gravel Member shall be carried out. The groundwater samples shall be stored in appropriate sample containers and kept in cool boxes before transit to the laboratory.

Prior to the first round of groundwater sampling, 3no. well volumes shall be purged prior to sampling using low flow techniques. During low flow sampling the parameters listed in Table 2 shall be monitored until they have reached a steady state, after which the relevant samples shall be recovered. The second round of groundwater sampling shall also be undertaken using low flow sampling techniques. On both sampling rounds, the stabilisation parameters shall be recorded at regular intervals until stabilisation within the defined degrees has been reached. Dedicated equipment shall be used for each borehole.

Table 2: Stabilisation Parameters to be Monitored during Low Flow Groundwater Sampling

Parameter	Stabilisation levels
Dissolved Oxygen	±10% of reading or ±0.2mg/l, whichever is greater
Temperature	±0.2^{o}C
pH	±0.2pH units
Eh or ORP	±20mV
Conductivity	±3% of reading

Where insufficient water is present within installed boreholes or groundwater conditions prevent sampling through low flow techniques, a disposable bailer shall be used to ensure a groundwater sample is recovered. The GQRA shall identify where this occurs and the inherent limitations in the data recovered using this technique. Dedicated bailers for each monitoring well shall be used where required.

All groundwater sampled shall be transferred immediately into the correct containers as provided by the laboratory.

The Waterman engineer shall carry out four subsequent groundwater level monitoring visits to coincide with ground gas and vapour monitoring visits.

3.1.2 Human Health

The results of the 2005 Site Investigation identified elevated levels of lead and mercury across the Phoenix Place site, in addition to a limited number of PAH exceedances. Given the age of the laboratory testing and Site Investigation, together with recent improvements in laboratory and investigatory techniques, it is considered possible that further contaminants, in particular asbestos, is present. The Site Investigation shall therefore recover soil samples from the geological strata encountered and test them for a wide range of determinands, including those detailed within the PERA for the Phoenix Place site. This will determine the contamination status of the soils and assess the risk to human health receptors (construction workers, off-site receptors and future Phoenix Place site users).

The Phoenix Place Development will be underlain by basements or hardstanding and thus the active pollutant linkage to future human health receptors will be broken following completion of the Phoenix Place Development. The recovery of soils samples and assessment against human health Generic Assessment Criteria will therefore be conservative and indicative of contamination hotspots only.

3.1.3 Ground Gas and Vapours

Potential ground gas and vapour sources identified in the PERA include:

- Thick deposits of Made Ground;
- Possible Alluvial deposits towards the north-eastern boundary (ground gas only);
- Sunken petrol tanks; and
- Various sources beyond Phoenix Place site including Made Ground, alluvial deposits, industrial and commercial activities.

To assess the risk from ground gas and vapour to future users / occupiers of the Phoenix Place Development and structures, ground gas monitoring wells shall be installed within six shallow boreholes. The wells shall be installed, where possible, so that the screened section is located within the Made Ground, Alluvial Deposits or within other identified ground gas / vapour source.

Given the ground gas potential of sources known or potentially considered present, and the predominately commercial and residential use within basements, guidance in CIRIA C665 indicates six ground gas monitoring rounds over a three month period are required. Where possible, two of these ground gas monitoring rounds shall be taken during periods of low and falling pressure.

As part of the Site Investigation, six monitoring rounds within suitably installed boreholes shall be completed over a three month period. Where possible, two monitoring rounds shall be undertaken during periods of low or falling pressure.

The risk to receptors from vapours shall be assessed on a semi-quantitative basis, through headspace analysis of soils, VOC and SVOC testing of soil and groundwater samples. Vapour monitoring shall be undertaken on four occasions. Where levels of vapour are considered high, consideration shall be given to the collection of vapour samples from installed boreholes.

Post Investigation and Ground Gas and Vapour Monitoring

Waterman shall undertake six rounds of ground gas and vapour monitoring over a three month duration to coincide with ground water sampling and level monitoring visits. Concentrations of oxygen (%), carbon dioxide (%), methane (%), lower explosive limit (%), carbon monoxide (ppm) and hydrogen sulphide (ppm) shall be recorded. Air flow (l/hr) and differential pressure (Pa) on opening the gas tap shall also be recorded. Concentrations of hydrocarbon vapours (ppm) using a PID shall also be recorded. Readings shall be recorded at regular intervals until a steady concentration for the above mentioned gases has been reached.

The ambient atmospheric pressure shall be recorded at the beginning and end of the monitoring visit. Details of the weather and the condition during the visit shall also be recorded.

Calibration certificates shall be provided for all equipment used during ground gas and vapour monitoring.

4. Contractor Tender Specification

Should the Contractor employ sub-contractors to undertake any aspects of the Site Investigation, the Contractor shall ensure the sub-contractors receive and work to this Site Investigation Strategy.

As part of the tender process and in advance of the Site Investigation, the Contractor shall visit the Phoenix Place site to ensure they are comfortable with the access to exploratory hole locations and the specific constraints present on the Phoenix Place site. Waterman shall act to organise Phoenix Place site visits for Contractors.

4.1 Site Access and Constraints

The Phoenix Place site is currently in use as a car park by RMG staff, and shall be in constant use throughout the Site Investigation. The car park is understood to be operational during normal working hours. Security is located on the egress point on Phoenix Place (road).

Washroom facilities shall be made available to the Contractor for the duration of the Site Investigation. A hydrant point shall also be made available for use by the Contractor.

Vehicles shall be located close to the exploratory hole locations. Where required the Contractor shall ensure appropriate protective measures are undertaken to avoid damaging vehicles on-Phoenix Place site.

To minimise disruption during the works exploratory holes have been located away from ramps. Where possible, the Contractor shall avoid blocking the access ramps to each level on the Phoenix Place site.

Prior to commencement of the Site Investigation an agreed location for the storage of required materials, including skip, well installation material and Contractor vehicles shall be agreed with the Waterman representative.

Unexploded Ordnance

A desk-based UXO report was completed by Bactec in 2012 (Appendix D). The Contractor shall implement in full any procedures and / or methodologies as recommended in the Bactec 2012 UXO report.

The Contractor shall accept the instruction of a UXO Contractor (if required) to halt works if deemed necessary. Any standing time in this respect shall be included in the re-measurement of the contract, unless the cessation of works is necessitated due to the Contractor's failure to implement any recommendations in the above mentioned report. No claim shall be entertained as a result of standing time incurred in such circumstances. Where the Contractor has been instructed to or has been required to stop work at a location owing to instruction from the UXO Contractor or on discovering a suspicious device, the Contractor shall consult the Waterman representative immediately to make arrangements to begin work at an alternative exploratory hole location if deemed productive to do so.

Archaeology

It shall be the Contractor's responsibility to ensure the recommendations detailed within the archaeological Written Scheme of Investigation (WSI) are followed. Waterman will be responsible for the procurement and appointment of a competent fieldwork contractor to undertake appropriate archaeological mitigation such as watching brief, where required, as stipulated by planning condition.

4.2 Site Security

At the end of each working day, the Phoenix Place site shall be left in a safe and secure condition by the Contractor.

The Contractor is responsible for the security of all plant and equipment for the duration of the Site Investigation. The Client shall not accept liability for security of plant and equipment during the Site Investigation and the Contractor is responsible for providing security for their plant equipment and other material required to carry out the works.

4.3 Emergency Arrangements

The Contractor shall provide first-aid cover and equipment for their employees. Designated first aiders shall be provided by the Contractor and at least one such first aider shall be present on-site at all times during the Site Investigation. The Contractor's employees who provide the necessary first-aid expertise shall hold a current first-aid certificate issued by the St John Ambulance Brigade / Red Cross or other approved association. The Contractor shall not be allowed to start work on the Phoenix Place site until this capability has been demonstrated.

No works shall proceed at any time without first-aid cover being available.

4.4 Professional Attendance

The Contractor shall provide professional attendance to technically supervise activities on the Phoenix Place site, liaison, logistics, logging, in-situ testing and sampling, photography and the preparation of daily records and preliminary logs.

All members of staff, including sub-contractors, shall be registered under the Construction Skills Certification Scheme (CSCS) or equivalent. CSCS cards (or equivalent) shall be made available at the outset of the Site Investigation.

4.5 Method of Drilling / Excavation

The most appropriate method of drilling / excavation is to be determined by the Contractor.

The method of drilling for exploratory holes shall be appropriate to facilitate the following, in addition to the geotechnical requirements detailed within Appendix C.

- The collection of discrete environmental samples;
- The accurate logging to Eurocode 07 of all strata encountered during the drilling works;
- The installation of monitoring wells in selected boreholes, as specified by the Waterman representative;
- To prevent the vertical migration of contamination into the groundwater; and
- To ensure that no drilling flush or other fluids enter the drainage network.

The casing utilised shall be specified by the Contractor in full consideration of the likely ground / groundwater conditions, UXO requirements, and potential for contamination. The number of strings of casing utilised shall ensure optimal drilling progress.

A 1.2m deep inspection pit shall be excavated at all exploratory holes prior to the undertaking of the drilling works. Photographs shall be taken of all inspection pits with a clear label used at all locations.

Lubricant use shall be minimised and only used on temporary casing or drilling equipment and not on well screen or permanent casing. Lubricants shall be restricted to degradable or inert lubricants, such as vegetable oil or PTFE (Teflon) based. Metallic greases such as those containing copper or lead and hydrocarbon based lubricants shall not be used.

If lubricants of any description are used, this shall be noted in the drilling records.

After 1hr boring, pitting through hard material or obstructions, the Waterman representative shall be contacted to agree a course of action.

The Contractor shall include for breaking out or coring all exploratory hole locations as required.

4.6 Monitoring Well Installation

Prior to the installation of monitoring wells, the Contractor shall contact the Waterman representative, who will advise on the specific installation details relevant to the exploratory hole. The well installation shall be dependent on the ground conditions encountered, and the objectives of the exploratory hole.

Groundwater monitoring wells shall be installed within the five boreholes and ground gas monitoring wells shall be installed within six window sample holes. As detailed above the Secondary A Aquifer within the Hackney Gravel Formation is the only underlying aquifer considered at risk from contaminants originating from the Phoenix Place site. Groundwater monitoring wells shall therefore be installed within the Hackney Gravel Formation, for the purposes of sampling and monitoring groundwater level. Ground gas monitoring wells shall be installed where possible within the Made Ground / alluvial deposits if present.

50mm UVPC pipe shall be used in all groundwater and ground gas monitoring wells installed. The Contractor shall ensure sufficient 50mm UVPC pipework is available on-site throughout the Site Investigation. Bentonite shall surround plain pipe sections and 10mm pea gravel shall surround slotted pipe sections. A 300mm sand bridge shall be installed between the bentonite and the pea gravel. Metal covers sufficiently durable enough for a car to drive over shall be installed at all well locations. If the Contractor requires deeper installations for geotechnical purposes, these shall be designed and specified by the Contractor.

4.7 Reinstatement of the Site

Exploratory hole locations not installed with groundwater or ground gas monitoring installations, shall be backfilled with arising, compacted where required, and capped with concrete. The reinstatement shall be sufficient to prevent differential settlement post-completion of the Site Investigation.

Should spoil remain after the exploratory holes have been suitably backfilled the spoil shall be removed from the Phoenix Place site and disposed of in-line with all relevant legislation.

As far, as is practically possible the Phoenix Place site shall be returned to its original state.

4.8 Prevention of Pollution of Controlled Waters

Whilst the presence of extensive contamination is not anticipated given the results of the 2005 Site Investigation, the construction of exploratory holes shall be such that any contamination that may be encountered in the Made Ground shall be prevented from migrating vertically into the natural ground. The general procedures described below shall be followed and the Contractor shall allow for carrying out the Site Investigation as described. No standing time or other additional costs shall be permitted for the collection of additional casing, etc.

Where the ground is identified as highly contaminated, clean drilling techniques shall be considered, if relevant. The method shall be confirmed with the Waterman representative prior to commencement.

The Contractor shall take all necessary precautions to prevent the pollution and / or discoloration of the ground on and off-site resulting from his operations on the Phoenix Place site.

No discharge to controlled waters, sewers or drains shall be permitted.

4.9 Soil and Bituminous Surface Sampling

In Made Ground, soil samples shall be collected at a depth of 0.50mbgl and at subsequent 0.5m intervals. In the event of a strata change, or evidence of visual or olfactory contamination, further samples shall be recovered. A sample shall also be recovered from the material directly underlying the topsoil / hardstanding.

In natural material samples shall be collected at 1.0m intervals up to 10.0mbgl, after which samples shall be collected at 3.0m intervals to a depth of 20mbgl. Beyond 20mbgl, a sample every 5m is sufficient. .

At the interface between each natural stratum encountered, a sample shall be taken from the base of the terminating stratum and beginning of the new stratum.

The laboratory testing required shall include metals, Poly-cyclic Aromatic Hydrocarbons (PAH), asbestos (screen and quantification), cyanide, Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG), Volatile Organic Compounds (VOC), Semi-Volatile Organic Compounds (SVOC), phenols, and BTEX. It shall be the Contractor's responsibility to liaise with the MCERTS accredited laboratory as to the exact number and type of sampling containers required to undertake the above testing. The laboratory Waterman would prefer the Contractor to use is Jones Environmental Laboratory Ltd (Jones).

Waterman shall undertake all scheduling of laboratory testing and shall liaise directly with Jones during scheduling.

The Contractor shall be responsible for the provision of all sample containers (tubs, jars and phials) and associated equipment (e.g. Chain of Custody sheets, address labels and cool boxes).

The samples obtained shall be despatched at regular intervals during the Site Investigation, under a chain of custody procedure, for subsequent chemical analysis. Prior to collection, samples shall be appropriately stored within cool boxes containing ice packs.

Disposable gloves shall be worn by the sample collector and shall be disposed of following the collection of each sample. Each sample container shall be accurately labelled.

If bituminous surfacing is encountered within the exploratory holes, a sample shall be recovered. Prior to sample collection the receiving laboratory shall be contacted to ensure that the appropriate bituminous surfacing samples are recovered to enable the laboratory to assess the concentration of coal tar.

The Contractor shall ensure the following works are undertaken:

1) 1.All samples are clearly labelled as follows:
    - Client: Waterman
    - Site: WIE13235 – Phoenix Place
    - SI location number: BH**/WS**
    - Depth: **m
    - Date: **/**/16

(** to be inserted as appropriate)

2) All samples which have been obtained during the Site Investigation shall be listed on a Chain of Custody sheet;

3) A PID shall be used to monitor head space concentrations of the soils. The methodology of the headspace testing shall be approved by Waterman and is to be carried out in a consistent manner throughout the contract;

4) All samples shall be logged in general accordance with BS 5930 / Eurocode 07, with care taken to ensure any visual or olfactory evidence of contamination is noted;

5) All glass and / or fragile samples shall be secured in bubble wrap and carefully packed into the provided cool boxes;

6) All cool boxes shall be labelled with the address details of the receiving laboratory;

7) Any bulk or tub samples shall be placed in a clearly defined area for collection;

8) Wherever possible courier collections shall be via refrigerated vehicles. However, where this is not possible the Contactor shall be responsible for ensuring that ice packs are placed within the cool boxes. Please note that as part of the MCERTS accreditation, many laboratories are now required to measure the temperature of the cool box upon receipt at the test facility.

9) The Chain of Custody sheets shall be distributed as follows:
   - White: Receiving Laboratory (in cool box);
   - Yellow: Contractor (either faxed, e-mailed or photocopied and forwarded by 1st class post); and
   - Pink: To be kept on-site by Contractor.

4.10 Geotechnical Testing

Geotechnical testing undertaken during and post-site investigation completion shall be sufficient to meet the requirements of the AKT II Geotechnical Design Brief (Appendix C).

4.11 Post Investigation Groundwater Monitoring

Post-investigation groundwater monitoring shall be undertaken by Waterman.

4.12 Post Investigation Ground Gas and Vapour Monitoring

Post-investigation ground gas and vapour monitoring shall be undertaken by Waterman.

4.13 Daily Records

At the end of each working day the Contractor shall forward all exploratory hole logs (day sheets) and sample depths taken to the Waterman representative, to allow contamination scheduling to be undertaken.

In the event that a Waterman representative is not on-site, the Contractor shall contact the Waterman representative at the beginning and end of each working day.

4.14 Geo-environmental Laboratory Testing

The geoenvironmental testing laboratory shall be Jones Environmental Laboratory Ltd (Jones). Waterman's contacts at Jones Environmental Laboratory are Ed Moore or Dale Ankers.

The contamination scheduling shall be undertaken by Waterman, not by the Contractor.

4.15 Contractor Reporting Requirements

The Contractor shall allow for the submitting of one Interpretative Geotechnical Site Investigation Report in electronic format and the incorporation of any comments by the Waterman, RMG and AKT representative. The Interpretative Geotechnical Report shall meet the requirements of the AKT Geotechnical Design Brief.

The Interpretative Geotechnical Site Investigation Report shall be submitted within two weeks of completion of geotechnical laboratory testing.

A draft version of the exploratory hole logs shall be submitted to Waterman on the day the individual exploratory hole is completed. A final version of the exploratory hole logs shall be submitted to Waterman three days following completion of the Site Investigation. The exploratory hole shall be reported separate from the Interpretative Geotechnical Site Investigation Report.

Exploratory hole logs shall include:

- A diagram indicating the nature, extent, depth and levels of strata encountered;
- Level or levels at which water was met and level of standing water in the complete exploratory hole;
- PID reading from the headspace analysis;
- Coordinates to (national grid) of the exploratory holes / boreholes.
- The levels at the top of the exploratory holes; and
- Installation details.

All levels shall refer to Ordnance Datum (mAOD).

All descriptions and classifications of soils shall be in accordance with BS 5930 / Eurocode 07. Exploratory hole logs shall include fully detailed descriptions of the materials encountered and not generic descriptions like 'spoil'. The exploratory hole logs shall contain details of sampling, including the type and depth of soil samples collected.

All exploratory holes shall be logged by the driller's and the Contractor's engineer.

The Contractor shall provide all Site Investigation data in AGS format in a single file. A complete set of digital data shall be supplied with draft and approved final copies of the report.

AGS data shall be provided in 4.0.

4.16 Health and Safety Measures

The Contractor shall operate within the requirements of the Principal Designer and comply to the Health & Safety at Work Act 1974, and the other relevant publications such as those prepared by the ICE, BSI and BDA.

The Contractor shall provide sufficient risk assessments and method statements to undertake the Site Investigation. All equipment required within the risk assessments and method statements shall be available at all times in good working order and in sufficient quantity throughout the period of the Site Investigation.

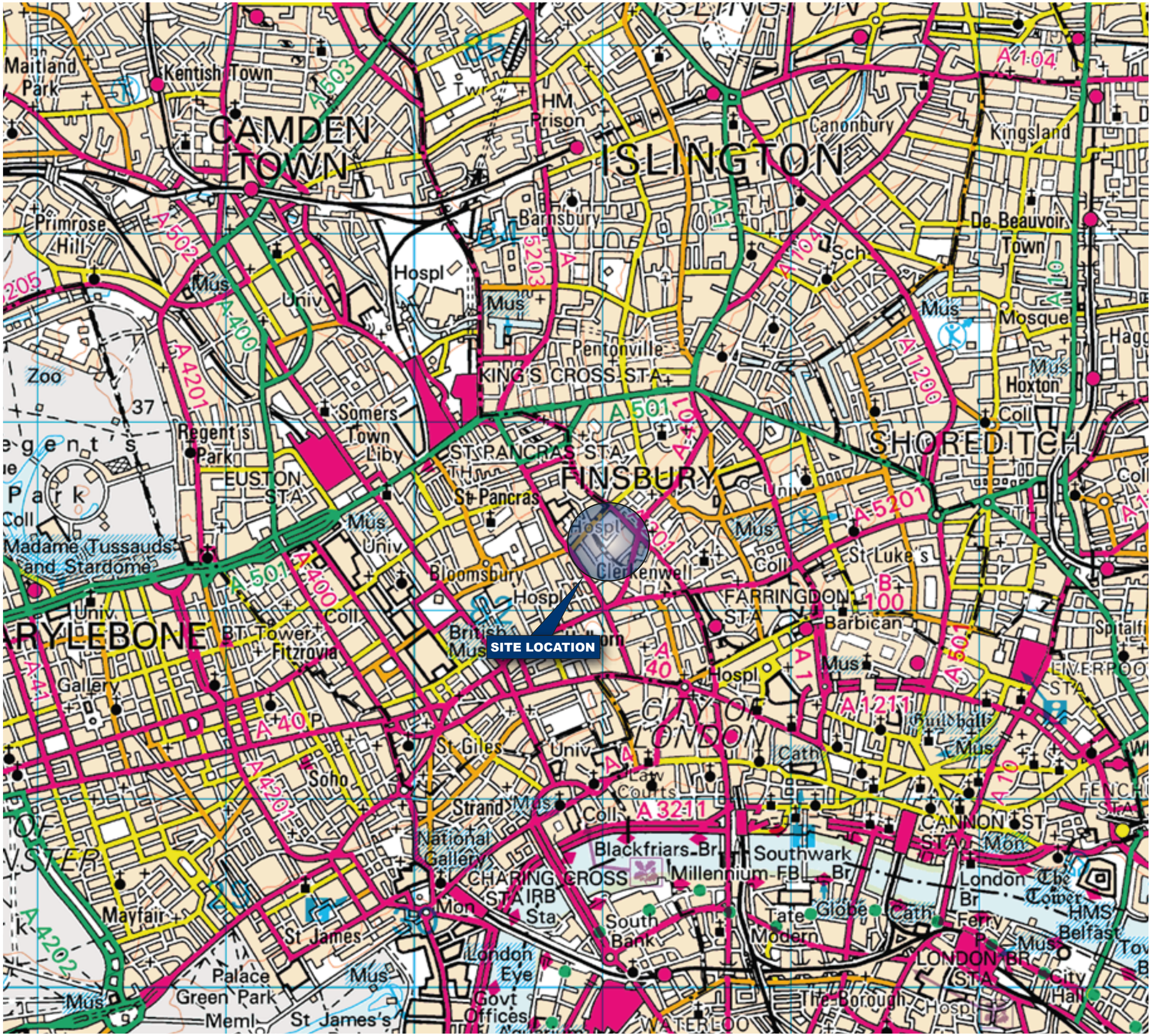
The Contactor shall classify the Phoenix Place site under the BDA classification and the Contractor shall ensure that appropriate PPE is worn at all times by all of their employees on-site.

4.17 Particular Inspection Pit Requirements

Photographs shall be taken of all exploratory holes undertaken. A clear label and scale shall be used.

APPENDICES

Appendix A Site Plans



waterman

N

Project Details	WIB13235-102: Royal Mail Mount Pleasant Sorting Office
Figure Title	Figure A1: Site Location
Figure Ref	WIB13235-102_GR_PERA2_A1A
Date	June 2016
File Location	\\nt-lncs\weedl\projects\eed13235\102\graphics\pera2\issued figures

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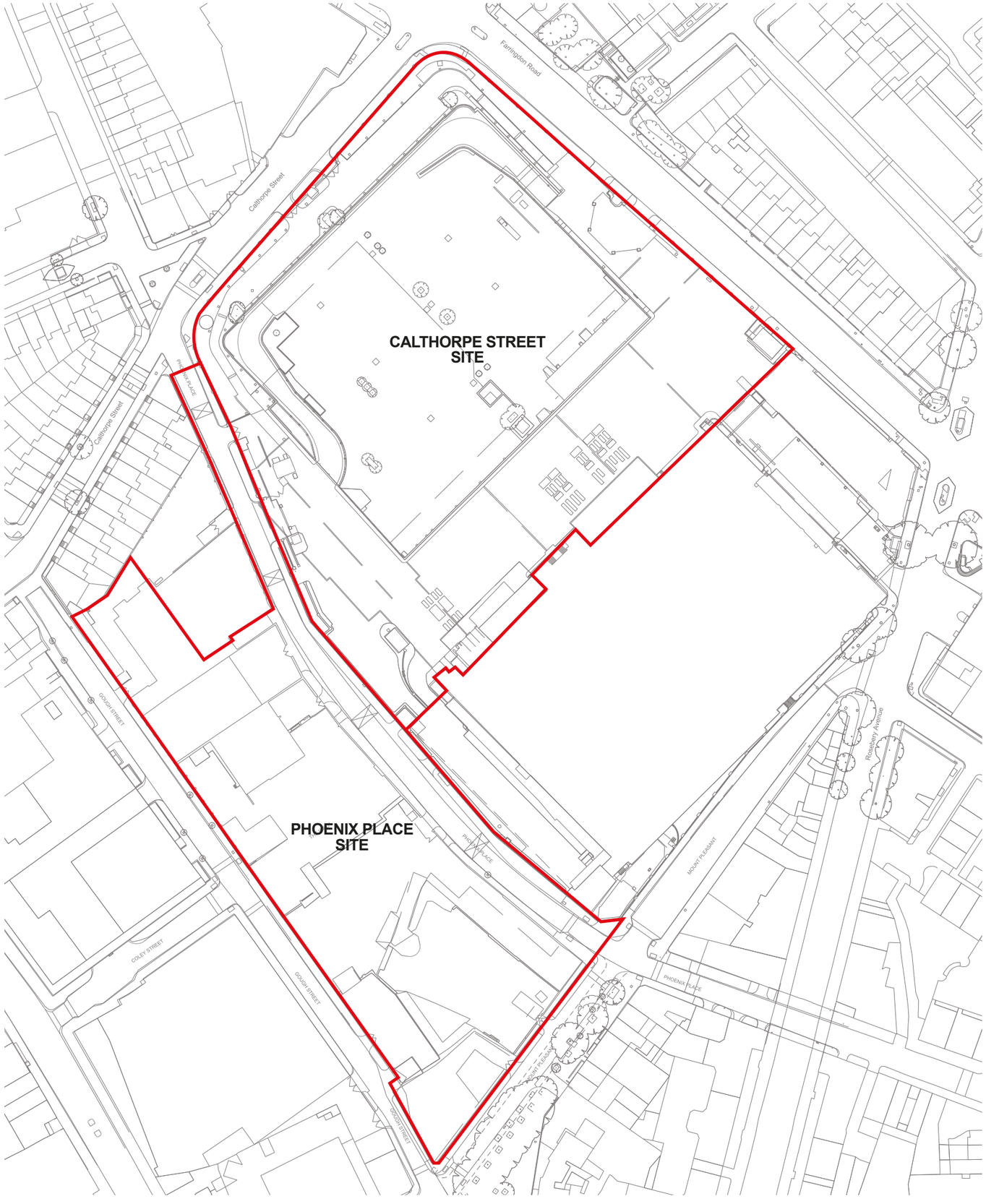

Planning Application Boundaries

Project Details	WIB13235-102: Royal Mail Mount Pleasant Sorting Office
Figure Title	Figure A2: Planning Application Boundaries
Figure Ref	WIB13235-102_GR_PERA2_A2A
Date	June 2016
File Location	\\s-lncs\wiel\projects\eed13235\102\graphics\pera2\issued figures

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Planning Application Boundary

D

C

PLOT P2

B

A7

A6

A1

PLOT P1

A5

A2

A4

A3

N

Project Details	WIB13235-102: Royal Mail Mount Pleasant Sorting Office
Figure Title	Figure A3: Pheonix Place Plots
Figure Ref	WIB13235-102_GR_PERA2_A3A
Date	June 2016
File Location	\\s-lncs\wiel\projects\eed13235\102\graphics\pera2\issued figures

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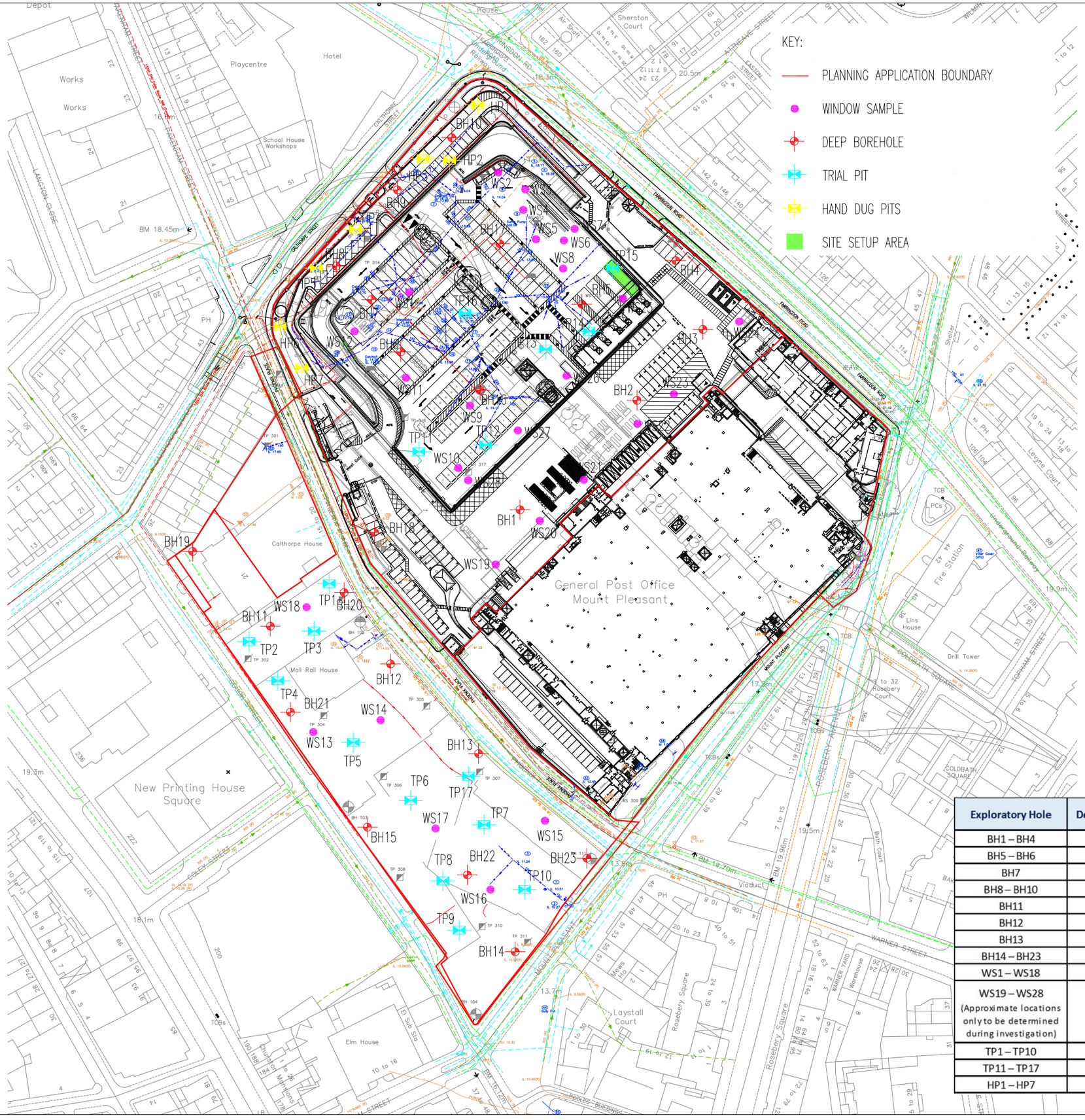

Exploratory Hole	Depth (mbgl)
BH1 – BH4	40
BH5 – BH6	50
BH7	10
BH8 – BH10	40
BH11	50
BH12	40
BH13	50
BH14 – BH23	40
WS1 – WS18	5
WS19 – WS28 (Approximate locations only to be determined during investigation)	5
TP1 – TP10	3.5
TP11 – TP17	2.5
HP1 – HP7	1.2

- Power cable
- Storm water drain showing flow direction
- Telecommunications cable
- Water pipe
- Unidentified apparatus
- EDF power cable
- Telecommunications cable (various suppliers)
- Colt telecommunications cable
- Thames water pipe
- Thames water sewer
- Fleet River Sewer
- Fleet River Sewer Branch

Rev	Date	Description	By
A04	26.08.16	ADDITIONAL WINDOW SAMPLES	DC
A03	22.07.16	SITE SETUP AREA & ADDITIONAL SI LOCATIONS ADDED	MC
A02	23.06.16	UNDERGROUND SERVICES ADDED	MC
A01	08.06.16	PRELIMINARY ISSUE	DC

Amendments

Project
MOUNT PLEASANT SORTING OFFICE

Title
EXPLORATORY HOLE LOCATION PLAN

Client
ROYAL MAIL

Waterman
Pickfords Wharf Clink Street London SE1 9DG
t 020 7928 7888
mail@watermangroup.com www.watermangroup.com

Drawing Status
PRELIMINARY

Designed by	BG	Checked by	BG
Drawn by	DC	Date	JUNE 2016
Scales @ A3 work to figured dimensions only	1:1500		

Project No: WIB13235-102
Computer File No: WIB13235-102-SA-80-0001_A04.dwg

Publisher	Zone	Category	Number	Revision
WIE	SA	80	0001	A04

A3-Wat-S, MP_Current parking plan_160609_v1.01, OS BASE

Appendix B Site Photographs

Example of hardstanding on Phoenix Place

Phoenix Place looking north east

Phoenix Place looking south

Phoenix Place looking southwards

Vaults underlying Phoenix Place in the southern site corner

Vaults underlying southern corner of Phoenix Place

Project Details	WIB13235-102: Royal Mail Mount Pleasant Sorting Office
Figure Title	Figure B1: Pheonix Place Site Photographs
Figure Ref	WIB13235-102_GR_PERA2_B1A
Date	June 2016
File Location	\\s-lncs\wiel\projects\eed13235\102\graphics\pera2\issued figures

Appendix C Geotechnical Requirements