Southern Testing
Environmental & Geotechnical

ST Consult
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Desk Study, Site Investigation & Risk Assessment Report

Project Name: 1 St James Road, Hampton

Location: Hampton, Richmond, TW12 1DH

Client: Hampton Hick Ltd

Project ID: J14219

Report Date: 6th May 2020

Report Issue: 2

SUMMARY

The site, which extends to 0.09 comprises a house and gardens. It is proposed to redevelop the site with a 3 storey residential building divided into flats.

Geological records indicate the site to be underlain by Taplow Gravel over London Clay.

A desk study was carried out and indicates that the site has a history of agricultural and residential use.

An Unexploded Ordnance (UXO) risk assessment was undertaken by a specialist subcontractor as part of these works.

A single phase of intrusive investigation was carried out. All areas surrounding the existing building were accessible during the fieldwork, however no investigation was undertaken within the footprint of the house.

The soils encountered comprised a covering of Topsoil over sandy Gravel over silty Clay.

Groundwater was encountered at 2.80m bgl

Conventional foundations are recommended for this site. An allowable bearing pressure of 150kpa is recommended for foundations placed at a minimum depth of 1.00m bgl. NHBC Volume Change Potential precautions will not apply for foundation placed at 1.00m bgl.

The sulphate content of the fill and natural soil was found to fall within Class DS-1The ACEC classification for the site is AC-1s.

No significant groundwater conditions requiring de-watering of excavations are anticipated

Suspended or ground bearing floor slabs are suitable.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

There is no evidence of significant soil contamination in the soils encountered during the ground investigation.

However no sampling was carried out under the footprint of the existing house on site. Further investigation below the footprint of the house is recommended post demolition.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

As with any site, areas of contamination not identified during investigation works may come to light during the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site. The presence of contamination may affect the classification of waste soils, or the potential for their re-use.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Hampton Hick Ltd and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

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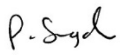
Check / Review	P J Sugden **MSc FGS**	

For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

Issue No.	Date	Purpose or Status	Author	Check / Review
1	24/04/2020	Desk Study, Site Investigation & Risk Assessment Report	JAC	PJS
2	06/05/2020	Updated MACC Report in Appendix G	JAC	PJS

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a Purchase Order signed by George Hickman of Hampton Hick Ltd and sent to Southern Testing Laboratories on the 18th March 2020.

2 Location

The site is located 2.7 km south west of Twickenham. The approximate National Grid Reference of the site is TQ 13829 71213. The site location is indicated on Figure 1 within Appendix A.

3 Proposed Construction

It is proposed to construct a three storey block of flats.

Ground loadings have not been given.

For the purposes of the contamination risk assessment, the proposed development land use is classified as Residential with consumption of Homegrown Produce CLEA Model Ref [1] / C4SL Report Ref [2].

The gas sensitivity of the proposed development is rated as High CIRIA C665 Ref [3].

4 Object

This is a Phase 1 Desk Study and Walkover and Phase II geotechnical and contamination (risk estimation and evaluation) investigation (Tier 1).

The object of the investigation was to assess foundation bearing conditions and other soil parameters relevant to the proposed development, and to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our desk study findings, exploratory hole logs and test results and our interpretation of these data.

A UXO risk assessment was included within our brief for the investigation.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The site investigation has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

Waste Classification of soils not been included within the brief for the investigation.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Hampton Hick Ltd and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study

A Desk Study has been carried out. Reference has been made to the following information sources.

- Online Geological Maps Ref [6] & Ref [7]
- Online Hydrogeological Maps Ref [8]
- Aerial Photographs
- Historical Ordnance Survey Maps
- Environmental Databases
- BGS Online Historical Borehole Records Ref [9]
- Search on Local Authority Planning Portal for planning history
- Environment Agency / Gov.UK Website Flood Risk Ref [10]
- UK Radon Ref [11] and BRE Radon Ref [12]
- Google Earth (for old aerial photographs)

The environmental databases search report compiled for this desk study contains site-specific environmental data drawn from data sets that comprise publicly available information together with data from third parties, some of which is under review. Accordingly, Southern Testing Laboratories Limited does not warrant its accuracy, reliability or completeness.

The full report is included in Appendix F and G, a summary of the salient features is included in the following sections of this report.

6.1 Geology

The British Geological Survey Map No 270 indicates that the site geology consists of Taplow Gravel over London Clay.

6.1.1 Taplow Gravels

The Taplow Gravel Member comprises deposits of sands and gravels with subordinate layers of finer grained clayey and silty sands. Lenses of silt, clay or peat may also be present. This is one of a sequence of River Terrace Deposits associated with the Thames. These gravels were laid down in a large braided river channel and can be quite variable in their composition.

River Terrace Deposits were commonly worked in the past, often on a piecemeal basis in ‘borrow pits’ as well as larger mineral workings. Old pits may have been infilled with poor quality or waste materials, and can contain contamination.

6.1.2 London Clay

The London Clay mainly comprises blue-grey or grey-brown fissured clay and silty clay, which weathers to brown near the surface. It commonly contains thin courses of carbonate concretions (‘cementstone nodules’), selenite crystals and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation.

Although slopes will stand in the clay at steep angles in the short term, the long-term stable slope angle is about 7o for grassed, or cleared slopes, and a few degrees more for wooded slopes.

This formation is known to contain pyrite.

6.2 Historical Borehole Records

A search of previous exploratory hole records both from the online British Geological Survey database [9] and Southern Testing in-house records, revealed three jobs within close proximity of this site, all from the STL source.

The most recent site investigation carried out is located approximately 560m to the south east of the site and comprised a series of trial pits, shallow boreholes and deeper (15m) boreholes. The general findings were up to 2.90m of Made Ground overlying 2.4-2.9m of dense sandy GRAVEL over firm to stiff brown silty CLAY becoming stiff fissured London Clay.

BH Reference	Final Depth (mbgl)	Distance from site (m) & Direction	Remarks
J12293 September 2015	Up to 15m	560m SE	Variable Made Ground overlying a 2.4-2.9m thick band of dense gravel over 0.5-0.7m of weathered London Clay over stiff London CLAY.
J9261 May 2007	5.00m	800m E	Typical soils encountered during this investigation were as follows the below is an extract from Hole No SH4. 0-0.25m Blacktop 0.25-0.80 Made Ground sandy gravelly CLAY 0.80-1.00m Orange brown sandy Clay 1.00-2.50m Dense clayey SAND with occasional flint gravel. 2.5-5.00m Dense SAND/GRAVEL
J10510 January 2011	4.50m	354m SE	Typical soils encountered during this investigation were as follows the below is an extract from Hole No 3A. 0.00-0.10m Concrete 0.10-0.60m Dark brown CLAY with flints 1.1-4.50m Dense pale orange brown fine to medium sandy fine to coarse flint GRAVEL with occasional thin clay beds.

6.3 Geological Hazards and Mining Activities

Data from various sources relating to potential geological hazards at the site are summarised below. The Hazard Potentials listed for the BGS data are as presented in the Envirocheck report, derived from various generic BGS sources, **which are not considered as site-specific**. It is important that this information is considered in context of the actual site topography, ground conditions encountered during future investigation, and development proposals.

Data Source	Hazard	Hazard Potential to Site	Remarks
BGS	Potential for Collapsible Ground Stability Hazard	Very Low	
	Potential for Compressible Ground Stability Hazard	Very Low	
	Potential for Ground Dissolution Stability Hazard	No Hazard	
	Potential for Landslide Ground Stability Hazard	Very Low	

Data Source	Hazard	Hazard Potential to Site	Remarks
	Potential for Running Sand Ground Stability Hazard	Very Low	
	Potential for Swelling or Shrinkage Clay Ground Stability Hazard	No Hazard	In our experience London Clay can be susceptible to swelling and shrinkage, depending on the depth of the superficial deposits and the proximity to vegetation.
	Shallow Mining Hazard	No Hazard	
	BGS recorded mineral site	No Hazard	
ARUP [Ref [13]]	Mining Instability	None Indicated	
CCS [Ref [14]] KURG [Ref [15]]	Underground Openings	None Indicated	

6.4 Radon Risk

With reference to the Envirocheck report, UK Radon Ref [11] and BRE Radon Ref [12] guidance: no radon protection is required on this site.

6.5 Hydrology and Hydrogeology

Data from the Environment Agency and other information relating to controlled waters is summarised below.

Data		Remarks	Possible Hazard to/from Site (Y/ N)
Aquifer Designation	Superficial Deposits	River Terrace Gravels are classified as a Principal Aquifer which can be defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.	Y
	Bedrock	London Clay is classified as Unproductive Strata defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.	N
Groundwater Vulnerability		Major Aquifer with High Vulnerability	Y
Abstractions	Surface Water	None recorded within 500m of the site boundary	N
	Groundwater	The nearest recorded groundwater abstraction point is located 431m west at “Well at Hampton” and is used for spray irrigation.	N
Source Protection Zones		The site is not located within a source protection zone	N
Groundwater Flood Risk		There is potential for Groundwater Flooding of Property Situated Below Ground Level, however this is considered unlikely.	N

Data	Remarks	Possible Hazard to/from Site (Y/ N)
Surface Water Flood Risk*	The site itself is shown to be at a low risk of surface water flooding along with the adjacent streets.	N
Marine / Fluvial Flood Risk*	The site is not shown within/adjacent to an area mapped as being at risk.	N
Reservoir Flood Risk*	The site is not shown within/adjacent to an area mapped as being at risk.	N
Discharge Consents	There are no recorded discharge consents within 1000m o the site boundary.	N

** These sections are provided for information only, this report does not constitute a formal flood risk assessment and specialist advice should be sought in relation to potential flooding issues.*

6.6 Historical Ordnance Survey Maps

Copy extracts of historical Ordnance Survey plans dating from 1866 to 2020 were obtained and are presented in Appendix F. A summary of the salient features is presented below.

The site is shown to be fields associated with nearby Vicarage Farm in the earliest available map (1866). By 1896 the site is shown to be within the garden of a large detached house. A large greenhouse is present on the edge of the site from 1915 to 1934. The site remains a garden until 1961/1962 where the present day building has been constructed. The site then remains unchanged until the present day.

The surrounding area is shown to be predominantly fields in the earliest available 1899 map. Thirty years on the 1896 shows the surrounding area has be greatly developed with predominantly detached houses and gardens. The 1898 map shows a gravel pit approximately 106m to the north west of the site and approximately 463m to the east. Both of these pits are shown to be backfilled by 1915. The local area shows a gradual expansion of residential housing through to the present day.

6.7 Environmental Databases

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Historical Industrial Land Use	106	NW	Quarrying of sand and clay, operation of sand and gravel pits.	N
	163	E	Rubber natural products manufacturer	N
Current Industrial Land Use	33	W	Computer manufactures (Inactive)	N
	105	S	Tyre Dealers (Active)	N
	137	N	Cleaning services - Domestic (Inactive)	N
Current and Historical Landfills	-	-	None recorded within 1000m of the site boundary. Unknown filled ground (pit, quarry etc.) has been recorded 108m NW	N
Fuel Sites	-	-	None recorded within 500m of the site boundary.	N
Pollution Incidents	347	NW	In 1998 a Category 3 – Minor Incident was recorded in the Hampton Hill area.	N
IPPC/LAPPC Authorisations	-	-	None recorded within 1000m of the site boundary.	N

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Hazardous Substances Consents	-	-	None recorded within 1000m of the site boundary.	N
Sensitive Land Uses	-	-	None recorded within 1000m of the site boundary.	N

There have been some light industrial uses in close proximity to the site such as computer manufactures, tyre dealers and cleaning services. Although the computer manufactures and cleaning services are shown to be inactive it is unclear how long these processes had been going on or the methods employed. As such given the close proximity and the potential age, there is a possibility that one or more of these uses may have had a contaminative effect on the groundwater beneath the site.

6.8 Planning Application History

A search of planning applications made to the London Borough of Richmond upon Thames on the 2nd April 2020 did not reveal any applications for the site or to the immediately surrounding properties.

6.9 Ground Gas Risk

The backfilled gravel pit located 106m to the north east is a potential source of land gas. The pit is shown to have been backfilled by 1915 indicating a period of 100 years from where any potential land gas would have been generated and or migrated. Considering the distance of the former pit to site and several roads and other buildings in between the pit and the site, the potential for any land gas associated with the pit to migrate onto site is considered low.

6.10 UXO Risk Management

The possibility of unexploded ordnance (UXO) being encountered on a site falls within the category of a potentially significant risk and should be addressed as a legal duty under the Construction (Design and Management) Regulations by the Client as early as possible in a project.

The CIRIA publication C681 Ref [16] has been developed to provide a consistent framework for the management of potential risks posed by UXO during site investigation and groundwork phases of construction. The process adopts a tiered approach, divided into four distinct stages; Preliminary risk assessment, Detailed risk assessment, Risk mitigation and Implementation.

A preliminary UXO risk assessment has been prepared by MACC International.

The findings of the preliminary UXO risk assessment found that there was “significant level of enemy bombing within the immediate surrounding area of the site footprint during WWII. Records are acknowledged to be incomplete and may include omissions and errors; the possibility that items of UXO may have found their way onto the site and remain there to the present day is considered credible”.

The Risk for Drilling or sampling was considered to be Medium which mitigated the requirement for a UXO Engineer to check for UXO using specialist magnetometers ahead of the drilling/sampling.

The full Preliminary UXO risk assessment is appended to this report.

7 Site Walkover Survey

7.1 General Site Description and Boundaries

The site was irregular in shape and covered an area of 0.09ha. The site comprised the house and gardens of 1 St James’ Road. The houses was two storeys with a garage attached to the north face. The garden was mostly overgrown, with scattered building materials and general rubbish/waste present throughout. Several cars were present on the lawn in the southernmost part of the site and these appeared to have been unused for some time. Some cement roof sheeting (possibly asbestos) was present near the driveway entrance.

The site was bounded by a fence on all sides with further residential properties to the north, St James' Road to the east, Windmill Road to the south and Uxbridge road to the west.

7.2 Topography and Drainage

The topography of the site and the surrounding area is generally level. Drainage is likely to be provided by piping water off site. Longford River runs to the south of the site and flows from west to east.

7.3 Vegetation

The garden areas of the site were heavily vegetated with a mixture of semi mature and mature deciduous trees and coniferous trees. Many of the trees had recently been cut back and the fallen branches and logs were present beneath the trees.

7.4 Buildings and Land Use on Site and Nearby

The building on site was showing signs of neglect however no evidence of settlement damage was noted.

7.5 Inaccessible Site Areas

The only areas that were inaccessible were the areas between the existing house and driveway.

7.6 Site Photographs

A series of photographs showing a general overview of the site is included in Appendix E.

C PRELIMINARY SITE MODELS

8 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following conceptual ground model has been formulated.

Data Source	Comments
Geology	The recorded soils beneath the site comprise London Clay with a superficial covering of Taplow Gravel. The gravel is anticipated to be in the region of 4-5m in thickness. If dense gravels are encountered and ground water is not present within the gravel at shallow depth then the site should be suitable for shallow foundations.
Former Site Use	The former site uses of agriculture and garden are unlikely to present any significant contamination issues. There may be Made Ground present from the construction of the present day house and former glazed roofed building.
Groundwater	Groundwater is likely to be present within the Taplow Gravel. Depending on the proposed depth of foundations and the time of year that construction takes place it is possible that groundwater could be encountered during excavation work, as a result de-watering of some kind may be required.
Surface Water	The site is not shown to be in an area at risk of surface water flooding.
Potential Geo-hazards	No significant potential geohazards are expected however differential settlement may present an issue of foundations cross different soil types

On the basis of the available information the geotechnical categorization for the proposed structure(s) is considered to fall within Geotechnical Category 2 – Conventional structure with no exceptional risk or difficult ground or loading conditions; Eurocode 7 Ref [17].

9 Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

9.1 Potential Sources of Contamination

The site has a history of agricultural and residential use and is located within a residential area.

A few potentially contaminative uses have been identified, both on site and in the locality.

Potential contaminants associated with these uses have been compiled from DoE industry profiles and our experience of such sites.

9.1.1 On-Site Sources

Potential Source	Potential Contaminants
Made Ground	Heavy metals, polyaromatic hydrocarbons, asbestos
Possible asbestos roofing	Asbestos
Fuel spills from parked cars	Heavy metals, hydrocarbons

9.1.2 Off-Site Sources

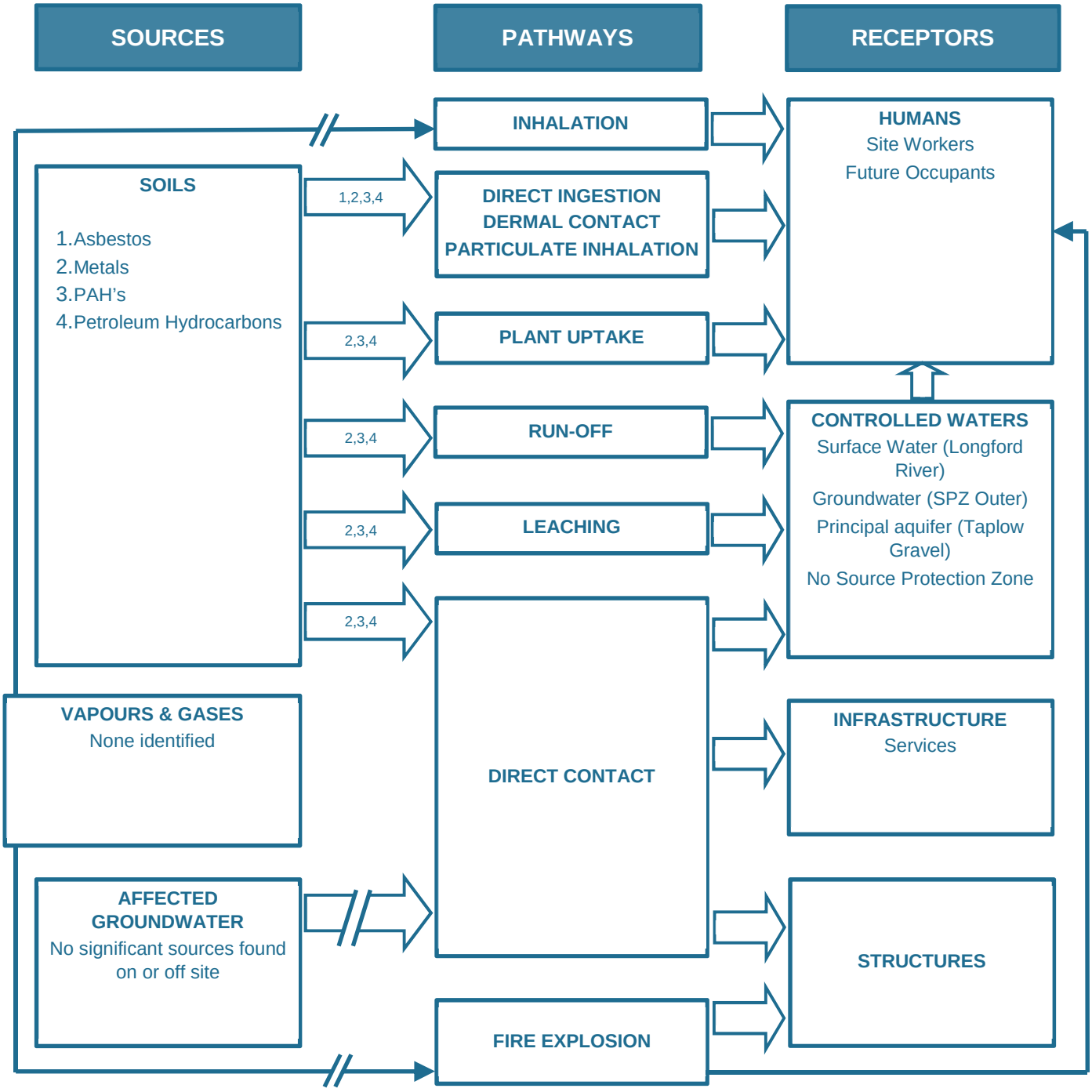
The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

Potential Source	Distance from Site Boundary	Direction	Potential Contaminants	Likely hazard to Site
Computer manufacturers	33	W	Metals, VOCs, SVOCs	Low
Backfilled gravel pit.	60	NW	Land Gas	Low

There is a potential to encounter shallow Made Ground on site and the materials found within this pose the greatest risk to the site. The parked cars identified on site during the walkover present a risk of localised fuel spills.

9.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:



// Denotes potential pollutant linkage not complete.

D GROUND INVESTIGATION

10 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / Method	Purpose	Max Depth Range (mbgl)	Installations / Notes
WLS1-4 Dynamic Windowless Sampling	Boreholes to investigate the shallow ground conditions within external areas. To allow SPT's and collection of samples for geotechnical and contamination testing. Installation of groundwater monitoring wells.	2.00-6.00m	50mm groundwater monitoring well installed within WLS2.
DCP CBR1-2	In-situ CBR / DCP CBR tests along proposed road lines.	1.00	

Exploratory hole locations are shown in Figure 2 in Appendix A.

In-situ test and sampling methods descriptions employed are given in Appendix B together with the test results.

SPT Energy Ratio certificates are provided within Appendix B.

The presence of the current building on site restricted the fieldwork. Additional investigation is recommended once access to the entire site is available (i.e. post demolition).

11 Weather Conditions

The fieldwork was carried out on the 30th March 2020, at which time the weather was generally dry and sunny.

12 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a covering of sandy Gravel over London Clay. A summary is given below.

Depth (m)	Thickness (m)	Soil Type	Description
0.00-0.30m	0.30m	TOPSOIL	Brown silty slightly gravelly SAND. Gravel is fine to coarse brick, flint and rootlets. (TOPSOIL)
0.30-0.60/0.70 (WLS1-3)	0.30-0.40m	TERRACE GRAVEL	Brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint.
0.60/0.70-4.80m	4.10-4.20m	TERRACE GRAVEL	Very dense orange brown very sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
4.80	Unproven	LONDON CLAY	Very stiff brownish grey silty CLAY.

The soils found are generally in accordance with those anticipated.

13 Groundwater Observations

Groundwater was observed in the exploratory holes as follows:

Hole ID	Water Strike Depth (m)	Stratum
WLS1	3.00	Taplow Gravel
WLS2	2.80	Taplow Gravel
WLS3	2.80	Taplow Gravel

E DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

14 Geotechnical Laboratory Tests

The following geotechnical laboratory testing was carried out on selected samples in order to aid material classification and characterise soil properties. The test method references and results are given in Appendix C.

Laboratory Test	Number of Samples Tested	Stratum
Moisture Content	1	Alluvium
Atterberg Limit	2	London Clay
Particle Size Distribution (Wet Sieve)	3	Taplow Gravel
Particle Size Distribution (Pipette)	4	Taplow Gravel
BRE SD1 Suite	5	London Clay
Single Stage Unconsolidated Undrained Triaxial Test (UUT)	6	London Clay

15 Soil Classification and Properties

15.1 Terrace Gravel Deposits (Taplow Gravel)

These deposits were seen to be predominantly dense to very dense sandy gravel. The distribution of individual soil types across the site is not predictable and rapid changes in soil type should be anticipated both vertically and laterally.

The sandy gravel materials were found to be very dense in nature with SPT N values in excess of 50. The sandy gravel materials had the following range of particle size distribution results.

Hole ID / Depth (m)	Clay & Silt (%)	Sand (%)	Gravel (%)	Cobbles (%)
WLS1 @ 1.50m	9	33	58	0
WLS2 @ 0.70m	6	36	57	0
WLS2 @ 2.00m	15	19	65	0
WLS4 @ 1.00m	17	30	54	0
WLS4 @ 2.00m	7	29	64	0

Three of the tested samples had very low fines content (under 10%) and have to potential to free-draining. However, permeability is often limited by vertical and lateral distribution of the grain which may be anticipated to be lenticular or ‘channelized’. Other more clayey materials will have substantially lower permeability’s.

The more cohesive soils within the terrace deposits are likely to have high to medium compressibility characteristics, the dense sandy gravels will have low compressibility.

15.2 London Clay Formation

The London Clay soils at this site were generally seen as firm becoming stiff and very stiff.

The London Clay was only encountered in the two deeper boreholes (WLS2 and WLS3) and a sample was selected from each hole for Atterberg limit testing.

The Atterberg limit results for this material indicates clays of high plasticity. Liquid Limit results were seen within the range 61 to 68%, Plastic Limit results between 23 to 26% and Plasticity Indices between 38 to 42%, indicating a Medium to High Volume Change Potential.

15.3 Summary of Geotechnical Parameters

Soil Type: Taplow Gravel

Parameters	Range	Suggested Design Value
SPT (N Value)	48-50	48
Effective Angle of Friction, ϕ' (degrees)	35-40	40

Soil Type: London Clay

Parameters	Range	Suggested Design Value
Plasticity Index (%)	38 - 42	40
Bulk Density (Mg/m^3)	1.84 – 2.05	2.0

16 Groundwater Levels

Groundwater levels vary considerably from season to season and year to year, often rising close to the ground surface in wet or winter weather, and falling in periods of drought. Long-term monitoring from boreholes or standpipes is required to assess the ground water regime and this was not possible during the course of this site investigation. A single groundwater monitoring visit was carried out on the 7th April 2020. Where the water level in WLS2 was recorded at 2.95mbgl

Based on the observations to date, we don't anticipate any significant seepages within the granular material above 2.50m. However this may depend on the time of year that construction takes place and water levels are likely to rise in the wetter winter months.

It is envisaged that seepages above the water table could be controlled within excavations by locally pumping from sumps.

17 Swelling and Shrinkage

Shrinkable soils are subject to changes in volume as their moisture content is altered. Soil moisture contents vary from season to season and can be influenced by a number of factors including the action of roots. The resulting shrinkage or swelling of the soil can cause subsidence or heave damage to foundations, the structures they support and services.

Considering the depth of the clay soils on site (4.80m) the proposed structure is unlikely to be affected by seasonal swelling and shrinkage.

However should deep foundations be considered or levels be significantly reduced allowance should be made for NHBC HIGH VCP.

Assessment of foundation depths should take into account trees, hedgerow and shrubs which are to be removed, remaining or are proposed which may be allowed to reach maturity.

Full details of protective measures are given in NHBC Standards Ref [18], Chapter 4.2 to which the reader is referred

NHBC Chapter 4.2 Foundation Depth Chart for HIGH Volume Change Potential Soils										
Water Demand	Tree Type (common examples)	Distance over Height Ratio (D/H)								
		0.0	0.1	0.2	0.3	0.4	0.5	0.6	1.0	1.25
		Foundation Depth (m)								
High	Broad Leaf (Elm, Eucalyptus, Hawthorn, Oak, Poplar, Willow or unknown species)	*	*	*	*	*	2.5	2.3	1.5	1.0
	Coniferous (Cypress)	*	*	*	2.2	1.85	1.4	1.0	1.0	1.0
Moderate	Broad Leaf (Ash, Beech, Fruit, Chestnut, Lime, Maple, Sycamore, Plane)	2.4	2.25	2.05	1.85	1.65	1.45	1.3	1.0	1.0
	Coniferous (Cedar, Pine, Spruce, Douglas Fir, Wellingtonia, & Yew)	2.4	2.0	1.6	1.2	1.0	1.0	1.0	1.0	1.0
Low	Broad Leaf (Birch, Hazel, Holly, Magnolia, Elder)	1.8	1.65	1.5	1.3	1.15	1.0	1.0	1.0	1.0

*Trench fill foundations deeper than 2.5m will only be acceptable if they are designed by an engineer (see NHBC Technical Requirement R5) taking into account all potential movement on the foundations and substrate (further details are given in NHBC Chapter 4.2, section D7).

Where trees have been or are to be removed from within 2m of the face of the proposed foundation and where the height on removal is less than 50% of the mature height given in NHBC Chapter 4.2 then distance (D) can be assumed to be 2m. This is to cater for the occurrence of 'saplings'.

Minimum foundation depths of 1.0m bgl apply outside the zone of influence of new planting. Where new planting is proposed foundation depths should be calculated in accordance with NHBC Chapter 4.2, section D6.

18 Soakaways

Soakage testing was carried out in one of the windowless sample boreholes (WLS1) The small scale falling head soakage test indicated little or no infiltration. The result of the test can be found in Appendix B.

On the basis of these test results and given the soil types present, the site is not considered suitable for shallow soakaway drainage. We would therefore recommend a positive drainage system be considered for all surface water disposal.

19 Sulphates and Acidity

Chemical analysis of the underlying soils has been undertaken to establish the aggressive chemical environment for concrete in accordance with the BRE Special Digest 1, Ref [19]. The site category determined is that of a brownfield location except those containing pyrites (or potential pyrites), as the underlying soils form part of the Taplow Gravel.

Given the sample numbers tested the characteristic value for sulphate concentration has been determined from the highest measured concentration.

The recorded pH values are in the range 5.80-8.00 which varies from slightly acidic to slightly alkali.

The Design Sulphate Class is DS-1. Groundwater should be assumed to be mobile. The ACEC site classification is AC-1s.

20 Foundation and Bearing Capacity

All loadings should be transferred beneath any fill or Made Ground, topsoil, soft or disturbed soils and be placed within the underlying natural dense to very dense sandy GRAVEL at a minimum depth of 1.00m. Based on the results of this investigation an allowable bearing pressure of 150kN/m^2 could be adopted for foundations set on these soils at a minimum depth of 1.2m below ground level.

Allowance should be made for nominal mesh reinforcement in all foundations to cater for differential movement where they span differing materials.

21 Floor Slabs

Suspended floor slabs or ground bearing slabs placed on the natural gravels would be suitable for this site.

22 Settlement

Based on the recommendations given above, settlement for the proposed structure should be within tolerable limits.

23 Excavations and Dewatering

Statutory support will be required in all excavations where personnel must work.

An allowance should be made for breaking out sub-surface obstructions associated with existing and past developments.

The sand and gravel materials will run and be highly unstable in excavations or boring operations below the water table.

Where excavation is proposed in close proximity to existing structures care will need to be taken to avoid undermining existing foundations.

Seepage of groundwater into excavations should be anticipated, especially from the superficial soils. However, these should be managed with simple pumping methods.

24 Road Construction

It is anticipated that proposed pavement areas will be formed very dense sandy GRAVEL. The results of in-situ DCP CBR testing generally indicated CBR values in the range of 6 to 22% from 0.5 to 1.0mbgl.

For preliminary design purposes of a CBR value of 5% can be assumed for pavement design. However, given that the soils are likely to be disturbed by construction plant during demolition and construction it may be prudent to reassess the CBR value as construction progresses.

The most important element of any road construction is drainage and attention must be given not only to the drainage of the subsoil but to the various layers of construction. To this end, the formation should be shaped to a camber or crossfall to allow water movement out of the sub-base. Silty soils soften extremely quickly if allowed to become wet or if they are excavated below the water table and this softening can give rise to a very substantial increase in costs.

Sub-base and coarse capping materials tend to segregate during placing operations, particularly when end tipped. On soft clay subgrades this can lead to punching and softening of the formation. The use of a layer of sand or geofabric will minimise the problem.

The formation should be proof rolled and any soft spots found should be excavated and replaced with compacted granular material. The surface of the formation should then be compacted, prior to laying the road sub base.

Construction traffic should be kept off formations and it is often advisable to leave a protective layer of soil above formation level until the last moment before placing the sub-base.

The formation should be considered potentially not frost-susceptible.

F DISCUSSION OF GEOENVIRONMENTAL TEST RESULTS AND RECOMMENDATIONS

25 Analytical Framework

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model Ref [1], provides a methodology for quantitative assessment of the long-term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4UL's Ref [20] and CL:AIRE Soil Generic Assessment Criteria Ref [21]. In addition, in 2014, DEFRA Ref [22] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act. Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

The results of any groundwater analyses are compared to relevant quality criteria, e.g. Environmental Quality Standards (EQS) or Drinking Water Standards (DWS).

Ground gases are assessed in accordance with the guidance given in CIRIA C665 Ref [3] and BS8485 Ref [23].

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

26 Site Investigation – Soils

26.1 Sampling Regime

The number of sample locations was limited to one day on site and was partly targeted at potential sources of contamination and also intended to provide general coverage.

Access was restricted by the presence of the two storey house on site and numerous parked cars in the front garden.

26.2 Testing

The potential for contamination by Made Ground, Asbestos and fuel spills from parked cars was identified in the preliminary conceptual model. Therefore, the following tests were selected.

Test Suite	Number of Samples	Soil Tested
STL Key Contamination Suite	4	Topsoil & Natural
Asbestos Screen	4	Topsoil & Natural
Speciated petroleum hydrocarbons with aliphatic and aromatic split, BTEX & MTBE	1	Topsoil

The test results are presented in full in Appendix D. A summary and discussion of the significance of the results and identified contamination sources is given below.

26.3 Test Results and Identified Contamination Sources

26.3.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. Due to the small sample size the samples have been grouped together into one population that comprises samples taken from the Topsoil and Natural soil. For each parameter the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required. Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix D. The screening values and source notes are presented in Table 1 “Tier 1 Screening Values” at the front of Appendix D.

Contaminants	Units	WLS2 @ 0.10m	WLS2@ 0.50m	WLS3@ 0.10m	WLS2@ 0.50m	Residential with Homegrown Produce Consumption Tier 1 Screening Values
Arsenic (As)	mg/kg	12	7.2	9.7	9.9	37
Cadmium (Cd)	mg/kg	<0.2	<0.2	<0.2	<0.2	11
Trivalent Chromium (CrIII)*	mg/kg	16	15	16	23	910
Hexavalent Chromium (CrVI)	mg/kg	<4.0	<4.0	<4.0	<4.0	6
Lead (Pb)	mg/kg	170	37	110	34	200
Mercury (Hg)	mg/kg	0.7	<0.3	0.5	<0.3	7.6-11
Selenium (Se)	mg/kg	<1.0	<1.0	<1.0	<1.0	250
Nickel (Ni)	mg/kg	12	9.0	11	16	130
Copper (Cu)	mg/kg	30	8.2	16	10	2,400
Zinc (Zn)	mg/kg	91	32	50	30	3,700
Phenol	mg/kg	<1.0	<1.0	<1.0	<1.0	120-380
Benzo(a)pyrene (BaP)	mg/kg	**1.80**	0.46	0.60	<0.05	1.7-2.4
Naphthalene	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	2.3-1.3
Total Cyanide (CN)	mg/kg	<1	<1	<1	<1	/
Acidity (pH values)	pH Units	6.2	5.8	7.5	6.2	/
Soil Organic Matter	%	6.1	3.3	4.5	1.8	/

* Assumed as Total Cr minus CrVI

With the exception of a slightly elevated level of Benzo(a)pyrene in the sample taken from WLS2 at a depth of 0.10m the soils can be considered uncontaminated in comparison to the screening values for Residential use with homegrown produce consumption.

Benzo(a)pyrene is used as a surrogate marker for all genotoxic PAH's, in line with HPA guidance Ref [24]. The test data has been compared with the concentration limits reported for the Culp study, as recommended by HPA. Other screening values may be used which take account of Soil Organic Matter. For this particular sample (WLS2 @ 0.1m) the Benzo(a)pyrene concentration would not be deemed significant.

The measured concentrations of PAH's exceed the UKWIR threshold(s) for the use of plastic water supply pipes / British Plastics Federation Pipes Group thresholds for drainage and sewage pipes.

26.3.2 Asbestos Containing Materials

No asbestos containing materials were detected in the samples analysed and none were observed in the exploratory holes. However, it should be noted that the exploratory holes are of small size relative to the area investigated and the investigation was constrained by the presence of the existing building. Therefore, the samples obtained may not reflect the full composition of the soils on the site, and there is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling.

It is also our experience that asbestos containing materials are quite often encountered in buried pockets and beneath slabs (sometimes adhering to the concrete) on older sites. It is, therefore, advised that further examination is carried out in trial pits, when suitable access is available.

No assessment of the existing buildings has been made.

26.3.3 Organic Contaminants

The following table summarises the results of the analysis for TPH and BTEX.

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)
	WLS2 @ 0.10m
BTEX	<1.0
Benzene	<1.0
Toluene	<1.0
Ethylbenzene	<1.0
Xylenes	<1.0
MTBE	<1.0
Aliphatics	
EC5-EC6	`< 0.001
>EC6-EC8	< 0.001
>EC8-EC10	< 0.001
>EC10-EC12	< 1.0
>EC12-EC16	< 2.0
>EC16-EC21	< 8.0
>EC21-EC35	< 8.0
Aromatics	
EC5-EC7 (Benzene)	< 0.001
>EC7-EC8 (Toluene)	< 0.001
>EC8-EC10	< 0.001

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)
	WLS2 @ 0.10m
>EC10-EC12	< 1.0
>EC12-EC16	3.4
>EC16-EC21	10
>EC21-EC35	30
Hazard Index	0.038

Petroleum hydrocarbon mixtures are assessed using the Hazard Index approach. The calculated Hazard Index value for the sample above (WLS2 @ 0.10m) is less than 1, indicating that the recorded concentrations are within tolerable limits for long term exposure with regards to human health. Therefore, in regards to TPH the above levels of contamination do not pose a significant risk to human health.

27 Risk Evaluation

The object of the risk evaluation is to assess the pollution linkages for specific contaminant groups considered in the conceptual model, identify any unacceptable risks and, therefore establish whether there is a need for further investigation and/or remedial action.

The risks are considered in the context of the specific development proposals for the site and, therefore, the conclusions may not be appropriate for alternative schemes.

27.1 Benzo (a) Pyrene

A slightly elevated concentration of Benzo(a)pyrene exceeding the screening value for residential with home grown produce consumption land use was recorded in one of the four soil samples analysed (WLS2 @ 0.10m). Using other screening values which take account of Soil Organic Matter, the result is not considered significant.

This sample of topsoil from WLS2 was very shallow at a depth of 0.10m. The concentrations of Benzo(a)pyrene were not shown to be elevated in a sample taken from the same borehole but at a depth of 0.50m therefore indicating that Benzo(a)pyrene contamination has not migrated downwards.

In addition a very slightly elevated Dibenz(a,h)anthracene concentration was recorded in this sample.

Given the marginal exceedance, and that no obvious contamination was noted in the topsoil, no further action with respect to Benzo(a)pyrene in the topsoil is considered necessary.

The chemical test results may have implications for disposal of materials off site.

27.2 Asbestos

No asbestos containing materials (ACMs) were encountered during our intrusive works and loose asbestos fibres were not detected in any of the four samples analysed. However, given the site's history we would recommend that during the groundworks phase a careful watch be kept for the presence of any ACMs.

27.3 Revised Conceptual Model

The preliminary site model has been refined in light of the findings of this investigation and is summarised below.

Metals	Petroleum Hydrocarbons	PAH	Asbestos	Pathways	Receptors
N	Y	N	N	Ingestion and inhalation of contaminated soil and dust	Human Health
N	Y	N	n/a	Dermal contact with contaminated soil and dust	
N	N	N	n/a	Inhalation of vapours or gases	
N	Y	N	n/a	Uptake into edible fruit and vegetables	
N	Y	N	n/a	Surface water run-off into surface water features	Water Environment
N	Y	N	n/a	Migration through ground into surface water or groundwater	
N	P	N	n/a	Off-site migration of contaminated groundwater	
N	P	N	n/a	Vegetation on site growing in contaminated soil	Flora and Fauna
N	N	N	n/a	Aquatic life in affected waters	
N	Y	N	n/a	Contact with contaminated soils	Building materials / buried services
N	N	N	n/a	Fire or explosion	

Key:

Y Pollutant linkage likely

N Pollutant linkage not likely

P Pollutant linkage possible

n/a Pathway not applicable to contaminant

27.4 Relevant Pollutant Linkages

No Relevant Pollutant Linkages for which remedial action will be required have been identified.

28 Soil Waste Management

28.1 Re-use of Soils

It is anticipated that the arisings from groundworks on this site will comprise sandy gravel.

Clean natural arisings from groundworks may be re-used on site without further testing, where there is a definite use for such materials, e.g. raising levels or construction of landscaping layers or bunds as set out in the approved plans for the development.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

If contaminated soils are encountered, treated contaminated soils may be reused on site under an appropriate Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice, Ref [25].

28.2 Disposal of Soils

It is likely that some soils may require removal from site and disposal to suitably licensed landfills. Different guidelines and charges will apply to different waste classifications. As waste producers, the Developer holds responsibilities under the various governing regulations, particularly the Waste Duty of Care Code of Practice under the Environmental Protection Act 1990, Ref [26].

The chemical analyses appended to this report can be used to inform the initial classification of the soils as either Hazardous or Non-Hazardous, and derive the appropriate EWC code, for offsite disposal or transfer. Waste Acceptance Criteria (WAC) testing may be needed for confirmation of the material's classification, and will be required to demonstrate an inert classification.

There are strict requirements in place for the accurate description of wastes using EWC codes and, therefore, it is essential that materials that would be given different descriptions (e.g. blacktop, made ground and natural soils), as well as those with different classifications, are carefully segregated during excavation and storage on site. This will also ensure the most cost effective disposal. Mixing these materials can give rise to significant difficulties in disposal and also substantially increase costs.

Soil arisings may be transferred to other development sites under a Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice Ref [25].

All soils leaving site will need to be pre-treated. Waste minimisation by selective excavation is a recognised form of pre-treatment.

29 Discussion and Conclusions

No visual or olfactory contamination was noted with soils during the ground investigation.

Based on the contamination test results to date, no significant contamination has been identified.

Marginally elevated levels of Benzo(a)pyrene and Dibenz(a,h)anthracene have been recorded however these are not considered significant and should not require remediation.

It should be noted that no soils within the footprint of the existing house have been inspected or testing. Further investigation is recommended once demolition has taken place.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

Should contaminated soils be discovered during development, a formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

30 General Guidance

Allowance should be made for experienced verification of any remedial works.

It may be that specific local requirements apply to this site, of which we are not aware at this time.

In general terms, the workforce and general public should be protected from contact with contaminated material. There is a range of relevant documents published by the Health and Safety Executive, and organisations such as CIRIA, and the BRE.

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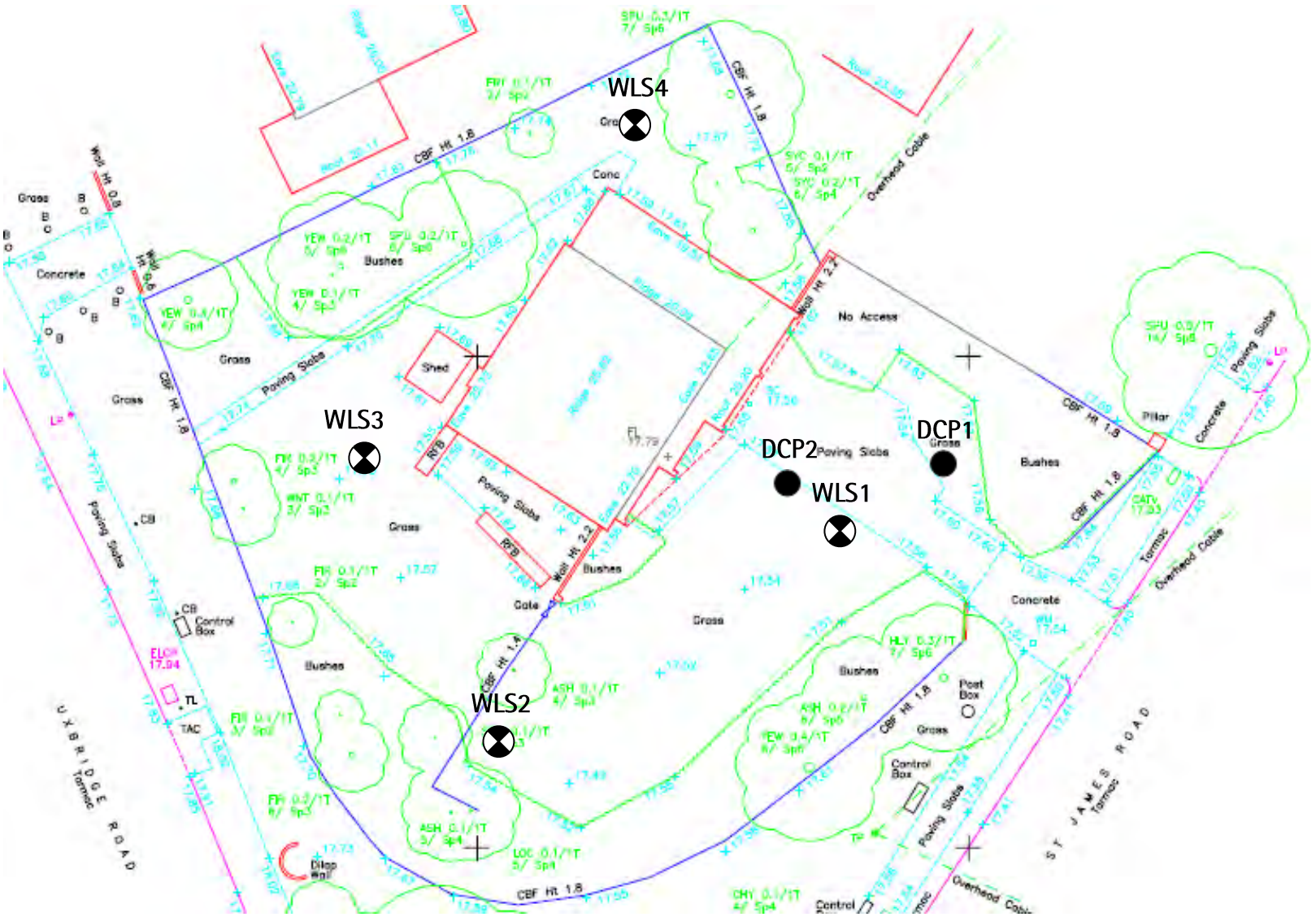
APPENDIX A

Site Plans and Exploratory Hole Logs

A

Site:	1 St James' Road, Hampton	Project ID	J14219
Figure 1	Site Location Plan	Date:	01/04/2020



NB: Positions of Boreholes are only indicative unless dimensioned

Site: 1 St James' Road, Hampton	STL: J14219	Fig No: 2
Date: 02 April 2020	Exploratory Hole Location Plan	

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult

Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers	
BH	Borehole (undefined)
CP	Cable Percussive
RC	Rotary Core
RO	Rotary Open Hole
ODC	Rotary Odex/Symmetrix drilling cased
CP+RC	Cable Percussive to Rotary Core
SNC	Sonic
CFA	Continuous Flight Auger
FA	Flight Auger
VC	Vibro Core
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core
WLS	Windowless Sampler
WS	Window Sampler
HA	Hand Auger
C	Road / Pavement Core
IP	Inspection Pit (Hand Excavation)
TP	Trial Pit (Machine Excavated)
OP	Observation Pit (Supported Excavation Hand or Machine)

In-situ Test Location / Method	
DP	Dynamic Probe
CPT	Cone Penetration Test
CBR	In-situ CBR Test
DCP	CBR using Dynamic Cone Penetrometer
CBRT	CBR using TRL Probe
PB	Plate Bearing Test
SPT (S)	Standard Penetration Test (Split Barrel Sampler)
SPT (C)	Standard Penetration Test (Solid Cone)
N	SPT Result
-/-	Blows/Penetration (mm) after seating drive
-*/-	Total Blows / Penetration (mm)
( )	Extrapolated Value
PPT	Perth Penetration (In-House Method - Equivalent N Value)
HP / UCS	Strength from Hand Penetrometer (kN/m^2)
IVN	Strength from Hand Vane ((kN/m^2) P = peak, R = residual
PID	Photo Ionisation Detector (ppm)
MEXE	Mexi-Cone CBR (%)

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

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Start - End Date	Project ID:	Hole Type:	WLS1
30/03/2020	j14219	WLS	Sheet 1 of 1

Project Name:	1 St James Road	Remarks:	Co-ordinates:	Level:	Logger:
					JAC
Location:	Hampton Hill, London	Dry. Falling head soakage test carried out.			
Client:	Hampton Hick Ltd				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.15	ES			(0.30)		0.30	Brown silty slightly gravelly SAND. Gravel is fine to coarse brick, flint and rootlets. (TOPSOIL)
		0.40	ES			(0.40)		0.70	Orange brown silty gravelly SAND. GRavel is fine to coarse subangular to subrounded flint.
		0.80	D						Very dense brown silty sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		1.00	SPT(S)	N=48 (4,7/10,13,11,14)					
		1.50	B			(2.30)			
		2.00	SPT(S)	N=61 (12,12/13,13,15,20)					
		3.00	SPT(S)	N=50 (12,11/50 for 275mm)				3.00	End of Borehole at 3.00m

1 2 3 4 5

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks

Southern Testing ST Consult

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Start - End Date	Project ID:	Hole Type:	WLS2
30/03/2020	j14219	WLS	Sheet 1 of 2

Project Name:	1 St James Road	Remarks:	Co-ordinates:	Level:	Logger:
Location:	Hampton Hill, London	Water seepage at 2.80m			
Client:	Hampton Hick Ltd				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.10	ES			(0.30)			Brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint with rootlets. (TOPSOIL)
								0.30	
		0.50	ES			(0.30)			Orange brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint.
		0.70	B					0.60	
						(0.30)			Very dense brown and grey sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		1.00	SPT(S)	N=62 (7,11/12,14,18,18)				0.90	Very dense orange brown very sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		1.50	ES						
		2.00 - 2.50	B			(2.10)			
		2.00	SPT(S)	N=60 (10,12/14,14,16,16)					
		3.00	SPT(S)	N=64 (11,11/14,14,18,18)				3.00	Very dense range brown gravelly SAND. Gravel is fine to coarse sub angular to subrounded flint. *2.90-3.00m colour is dark brown/black.*
						(0.30)		3.30	
									Very dense orange brown very sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		4.00	SPT(S)	N=66 (12,15/16,16,16,18)		(1.50)			
		4.50	ES						
		4.80	HP	UCS(kPa)=300				4.80	Very stiff brownish grey silty CLAY.
		5.00	D						

1 2 3 4 5

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
					2.80				0				

Southern Testing ST Consult	Start - End Date	Project ID:	Hole Type:	WLS2
www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020	30/03/2020	j14219	WLS	Sheet 2 of 2

Project Name:	1 St James Road	**Remarks:**	**Co-ordinates:**	**Level:** / **Logger:**
Location:	Hampton Hill, London	Water seepage at 2.80m		
Client:	Hampton Hick Ltd			

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
			HP SPT(S)	UCS(kPa)=300 14 (2,3/3,,5,6)		(0.65)		5.45	Very stiff brownish grey silty CLAY. End of Borehole at 5.45m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
					2.80				0				

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Start - End Date	Project ID:	Hole Type:	WLS3
30/03/2020	j14219	WLS	Sheet 1 of 2

Project Name:	1 St James Road	Remarks:	Co-ordinates:	Level:	Logger:
					JAC
Location:	Hampton Hill, London	Water seepage at 2.80m			
Client:	Hampton Hick Ltd				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.10	ES			(0.30)		0.30	Brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)
		0.50	ES			(0.30)		0.60	Brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint.
		1.00	ES SPT(S)	N=56 (7,12/14,14,15,13)					Very dense orange brown and grey very sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		2.00	D SPT(S)	54 (13,18/54 for 225mm)					
	▼					(4.20)			
		3.00	SPT(S)	50 (12,12/50 for 220mm)					
		4.00	ES SPT(S)	50 (10,14/50 for 220mm)					
		4.80	HP	UCS(kPa)=300				4.80	Very stiff brown mottled grey silty slightly sandy CLAY.
		5.00	HP	UCS(kPa)=300					

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
					2.80				0				

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Start - End Date	Project ID:	Hole Type:	WLS3
30/03/2020	j14219	WLS	Sheet 2 of 2

Project Name:	1 St James Road	Remarks:	Co-ordinates:	Level:	Logger:
					JAC
Location:	Hampton Hill, London	Water seepage at 2.80m			
Client:	Hampton Hick Ltd				

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		Depth (m bgl)	Type	Results					
			SPT(S)	N=26 (4,4/8,6,6,6)					Very stiff brown mottled grey silty slightly sandy CLAY.
		5.20	D						
		5.50	HP	UCS(kPa)=400		(1.20)			
								6.00	End of Borehole at 6.00m

Hole Details		Casing Details		Waterstrike (m bgl)					Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
					2.80				0				

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Start - End Date	Project ID:	Hole Type:	WLS4
30/03/2020	j14219	WLS	Sheet 1 of 1

Project Name:	1 St James Road	Remarks:	Co-ordinates:	Level:	Logger:
					JAC
Location:	Hampton Hill, London	Dry			
Client:	Hampton Hick Ltd				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.10	ES			(0.30)			Brown silty gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)
								0.30	
		0.50	ES						Very dense orange brown and grey very sandy GRAVEL. Gravel is fine to coarse subangular to subrounded flint.
		1.00	B						
			SPT(S)	N=49 (4,8/10,11,14,14)		(1.70)			
		2.00	B					2.00	End of Borehole at 2.00m
			SPT(S)	N=58 (10,12/14,14,14,16)					

1 2 3 4 5

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks

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APPENDIX B

Field Sampling and In-Situ Test Methods and Results

B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [4].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [27].

Chalk descriptions are based on CIRIA C574 Ref [28] and Mortimore Ref [29].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Inspection Pit

Inspection pits are hand excavated from the surface (maximum depth 1.2 – 1.5m) using appropriate tools to locate and avoid existing buried services at exploratory hole positions. They are also regularly used as part of investigations on existing structures to expose and determine foundation detail.

Dynamic Sampling - Window or Windowless

Window sampling is carried out by driving hollow steel tubes incorporating a longitudinal access slot (window) and a cutting shoe into the ground using a percussive 'breaker'. This enables recovery of a continuous soil sample for examination and sub-sampling.

Windowless samplers are designed for taking disturbed, continuous soil samples to depths up to 10 metres (depending on ground conditions). The samplers comprise steel tubes of about 50-100mm diameter with a rigid plastic liner (no window) and are driven into the ground with a sliding hammer mounted on a tracked purpose-designed soil sampling rig. After driving and extracting the sampler from the ground, the plastic liner is extracted together with the enclosed soil sample. The sample can then either be extracted, split and sub-sampled or plastic end caps may be fitted, the tube labelled and transported for future examination and sub-sampling.

Soil samples are disturbed by the driving process with both techniques and can be regarded as being between Class 5 up to Class 3 samples at best (in favourable ground).

The major advantage of using windowless samplers is that the plastic liner greatly reduces the possibility of cross-contamination between successive samples.

An equivalent in-situ test to the Standard Penetration Test can be carried out with the windowless sampler rig.

Standard Penetration Test (SPT)

The Standard Penetration Test (SPT) is specified in BS EN ISO 22476-3 Ref [30]. In this test, an open-ended tube is driven into the ground by blows from a free-falling hammer (with specified sizes, weights and distances).

The tube is seated by driving to a penetration of 150mm, or by 25 blows, whichever occurs first. It is then driven for a maximum of a further 300mm and the number of blows is termed the penetration resistance (N). If 300mm penetration cannot be achieved in 50 blows, the test drive is terminated and penetration depth is recorded.

When testing in gravels, a conical end piece is attached to the tube. The test is then called an SPT(C).

A classification of relative density descriptions as used on borehole logs, based upon uncorrected SPT N values, is given within BS5930 Ref [4] and set out as follows:

Classification based on uncorrected SPT N Value	Term
0 - 4	Very Loose
4 - 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Over 50	Very Dense

Hand Penetrometer Test

The handheld soil penetrometer consists of a spring loaded and calibrated plunger which is forced into cohesive soil. A reading of unconfined compression strength (equal to twice cohesion) is given on a calibrated scale. The average of a set of three readings shall be recorded.

In common with other hand methods of strength assessment it does not give an accurate indication of bearing capacity in stiff or fissured soils, because of the small test area.

Dynamic Cone Penetrometer (DCP) CBR Test (Modified)

The dynamic cone CBR test uses light portable equipment and is used to provide a continuous record of the penetration resistance of each layer in the ground for a depth of a metre from the surface. The penetration resistance provides a measure from which CBR values may be calculated.

In the test a 22 mm diameter 60º cone is driven into the ground to a depth of up to one metre by a 9.09 kg weight, freely falling over 600 mm. The number of blows is recorded for each successive 50mm penetration increment.

A plot of the cumulative number of blows versus depth penetrated is drawn. This plot usually takes the form of a series of straight lines, the slopes of which are measured and expressed as penetration in mm per blow. It is the practice of this laboratory to adopt the lower of two values derived from formulae established by Kleyn & Van Heerden Ref [31]

$$CBR = 10^{(2.632-1.28Log_{10}(mm\ /\ blow))}$$

& TRL Ref [32]

$$CBR = 10^{(2.48-1.057Log_{10}(mm\ /\ blow))}$$

The test is an adaptation of the Perth Penetrometer Test developed for the granular soils in Perth West Australia in the 1960's, and in the UK by this laboratory since 1973. It is similar to the TRL dynamic cone penetrometer. Local experience by this laboratory has shown in UK conditions it has been found to give consistent results for granular soils.

Disturbed Samples

Disturbed samples were taken from exploratory holes in general accordance with BS 5930 [4] and BS EN ISO 22475-1 Ref [33] as required and stored in appropriately labelled containers. Details of the type, size and depth of sample will be recorded within the exploratory hole record. Such samples can be regarded as being between Class 5 up to Class 3 quality depending upon their method of sampling.

Environmental Samples

Environmental samples were taken from the boreholes at regular intervals in the made ground and natural soils as indicated on the exploratory hole logs. The sampling strategy was in general accordance with BS10175 Ref [5] and BS ISO 18400 Refs [34], [35], [36], [37] & [38].

These samples were collected and stored in glass jars or plastic pots and transferred to the laboratory in cool boxes as appropriate to the proposed laboratory testing.

Monitoring Well

A groundwater and/or ground gas monitoring well consists of a perforated pipe, which is installed in the ground. The standpipe is typically 50mm nominal in diameter and is installed in a lined borehole. It is perforated from the base with a sand/gravel surround through the soil horizon of interest to an appropriate depth below ground level. Above this there is a bentonite seal with solid pipework and is provided with an end cap or a gas valve at the top as appropriate.

Gas monitoring is carried out via the gas tap. Water sampling/purging can be undertaken by removing the gas tap and bung.

The well is usually completed at the surface with a flush cast iron cover or raised lockable cover.

Groundwater Monitoring – Dip Meter

The dip meter is used to measure standing water levels within boreholes. The probe is lowered into the borehole until the meter detects the groundwater with an audible 'beep'. The level is then read from the tape.

In-situ Permeability Tests (after BS EN ISO 22282)

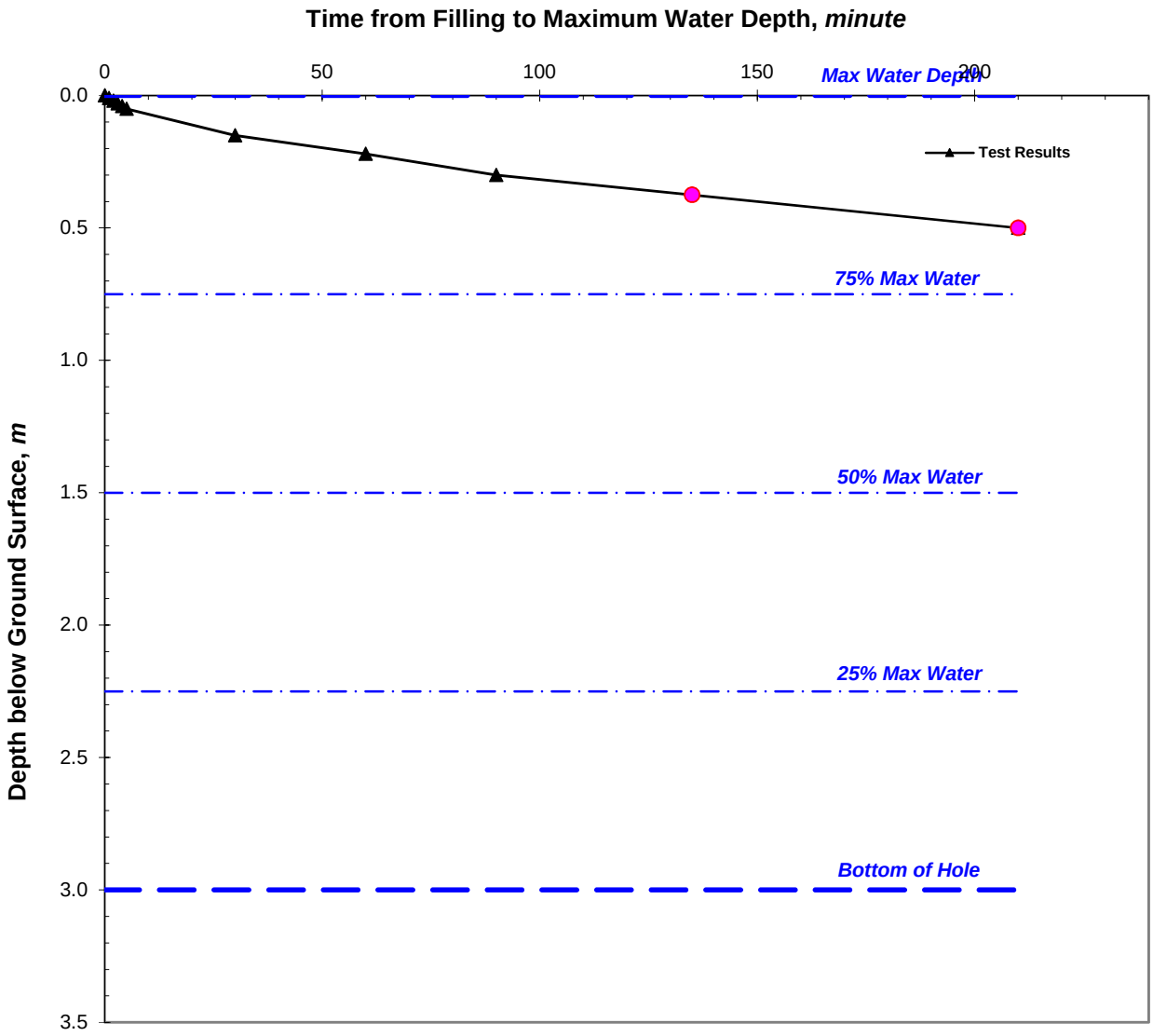
Testing within boreholes can either be a variable head test (falling or rising head) where the hydraulic pressure within the borehole during the test is either increased or lowered or a constant head where the hydraulic pressure is held constant. During boring when the required depth for testing has been reached, the borehole casing is withdrawn by one metre and the borehole cleaned out if necessary. Testing can alternatively be undertaken within a piezometer sealed into the strata of interest.

Detailed guidance for such tests are given within BS EN ISO 22282 Ref [39], and are summarised below.

- **Falling Head Test** - the borehole is filled with water and the head loss is then recorded either until the level falls to the standing water level (or until dry), or a maximum two-hour period.

Preliminary Falling-Head Soakage Test

Test Hole No: WLS1
Test No: Test No 1 (Initial)



Diameter of Borehole, m	0.100	Depth to Water at Start of Test, *m*	0.000
Depth to End of Borehole Casing, m		Max Water Dropdown during Test, *m*	0.500
Depth to Borehole Base, m	3.000	Total Soakage Test Time, *min*	210.0
Depth to Top of Permeable Soils, *m*		Mean Internal Discharge Area, m^2	0.813
Depth to Groundwater Surface, *m*		Discharge Rate, *litre/min*	0.013
Depth to Top of Granular Fill, *m*		Soakage Rate, *litre/m^2/min*	**0.016**
Voids Assumed within Borehole, %	100%	BRE Soil Infiltration Rate, *m/sec*	**2.68E-07**

Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client:	Hampton Hick Ltd	**Job No:**	J14219	**Test Date:**	30/Jan/2019		
Site:	1 St James' Road, Hampton	**Tested By:**	JAC	**Engineer:**	JAC	**Fig.**	**S1**

Summary Sheet

Results of Preliminary Falling-Head Soakage Tests

Site :	1 St James' Road, Hampton				**Job No :**	J14219	
Client :	Hampton Hick Ltd				**O S Reference :**		
Tested By :	JAC		**Engineer:**	JAC	**Test Date :**	30.03.20	
Hole No	**Test No**	**Hole Depth** *m*	**Soakage Rate for Each Test** *litre/m² /min*	**Soakage Rate for Each Hole** *litre/m² /min*	*m/sec*	**Water Level at Finish of Test**	**Remarks**
WLS1	No 1	3.00	0.016	0.016	2.68E-7	Pit was not emptied; Non compliant value was calculated.	
Mean Value of All Calculated Soakage Rates :				**0.016** *litre/m² /min*	**2.68E-7** *m/sec*		

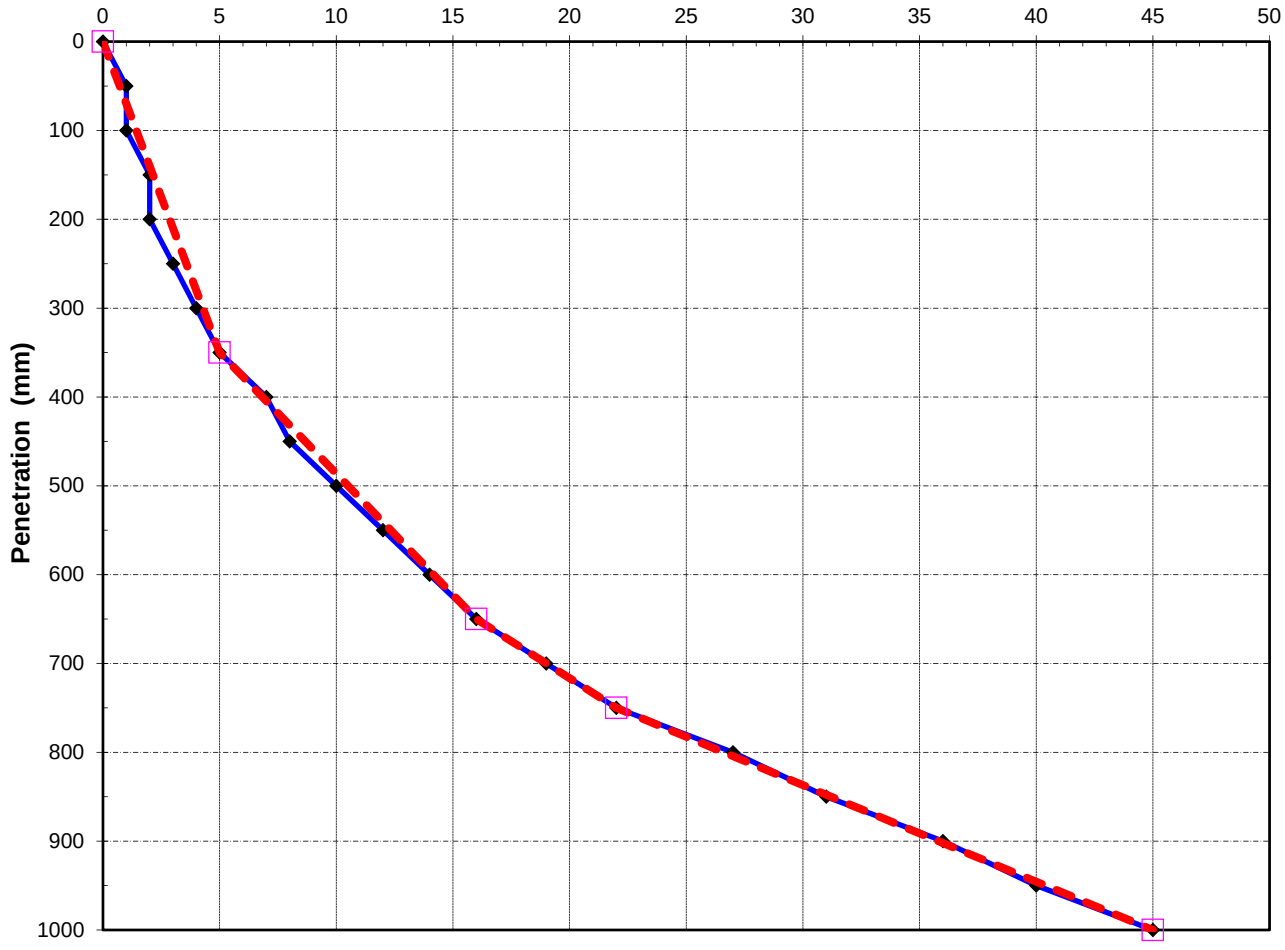
Dynamic Cone Penetrometer (DCP) Test Results

Test No: DCP1

Chainage:
Start Layer:
Soil Condition:
Notes:

Tested By: JAC
Checked By: JAC
Test Date: 30-Mar-20

Perth Cone CBR Penetration *vs* Cumulative Blow Count



Evaluated CBR Values from DCP Test Results

Layer No	From *(mm)*	To *(mm)*	Depth *(mm)*	Blow Count	No. of Blows	DCP *mm/blow*	CBR *%*	Soil Type	Remarks
1	0	350	350	5	5	70.0	1.9		
2	350	650	300	16	11	27.3	6.2		
3	650	750	100	22	6	16.7	12		
4	750	1000	250	45	23	10.9	20		

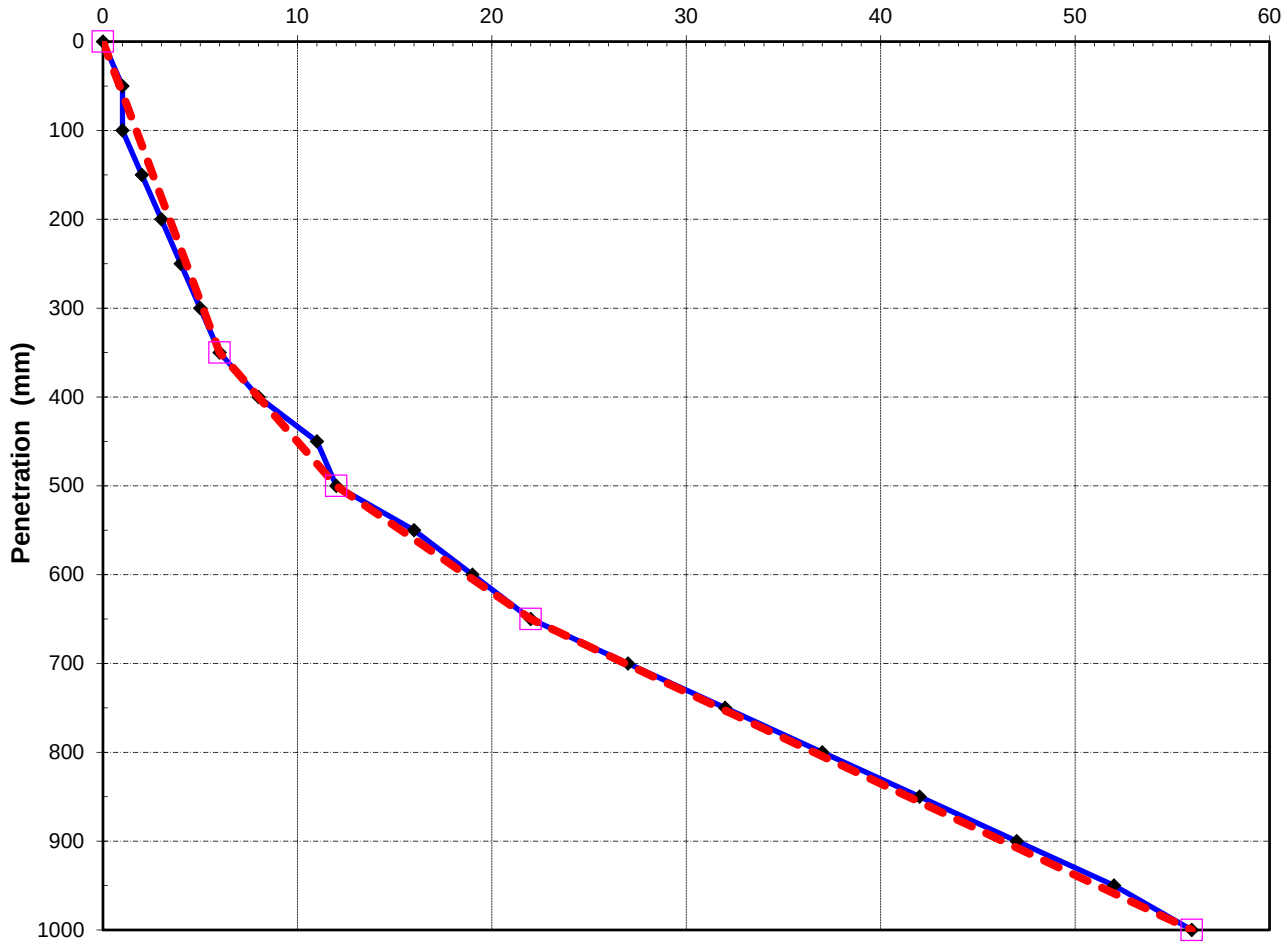
Client:	**Hampton Hick Ltd**	**Job No:** J14219	
Site:	**1 St James' Road**	**Date:**	**Fig.**

Dynamic Cone Penetrometer (DCP) Test Results

Test No: DCP2

Chainage:		Tested By:	JAC
Start Layer:		Checked By:	JAC
Soil Condition:		Test Date:	30-Mar-20
Notes:			

Perth Cone CBR Penetration *vs* Cumulative Blow Count



Evaluated CBR Values from DCP Test Results

Layer No	From *(mm)*	To *(mm)*	Depth *(mm)*	Blow Count	No. of Blows	DCP *mm/blow*	CBR *%*	Soil Type	Remarks
1	0	350	350	6	6	58.3	2.4		
2	350	500	150	12	6	25.0	7.0		
3	500	650	150	22	10	15.0	13		
4	650	1000	350	56	34	10.3	22		

Client:	**Hampton Hick Ltd**	**Job No:**	J14219
Site:	**1 St James' Road**	**Date:**	**Fig.**

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

SPT Hammer Ref:	110RP75
Test Date:	10/06/2019
Report Date:	10/06/2019
File Name:	110RP75.spt
Test Operator:	NPB

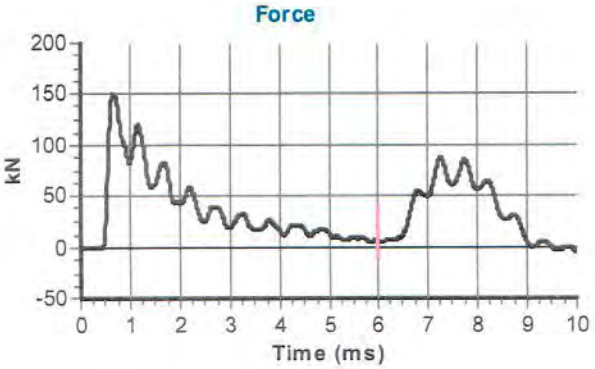
Instrumented Rod Data

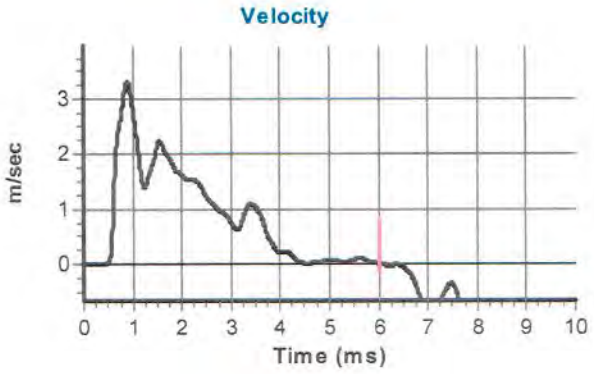
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	6458
Accelerometer No.2:	9607

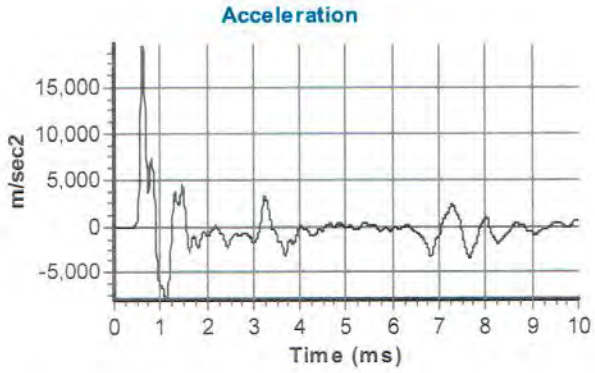
SPT Hammer Information

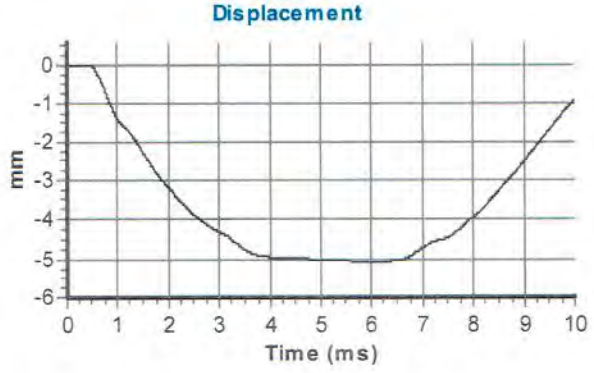
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

Comments / Location
CHARLWOODS









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	363

Energy Ratio E_r (%): **77**

Signed: Stuart Simmonds
Title: Field Operations Technician

The recommended calibration interval is 12 months

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APPENDIX C

Geotechnical Laboratory Test Methods and Results

C

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Atterberg and Moisture Content Summary

BS1377-2 cl.3.2, 3.3, 4.2, 4.3 & BS EN ISO 17892-1

AGS

Project Name	1 St James' Road, Hampton						Project Number		J14219	
Client	Hampton Hick Ltd				PE	JAC	Date Issued		08-Apr-20	
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
WLS1	0.80	D			9					
WLS2	5.00	D	Stiff brown CLAY.		32	68	26	42	CH	100
WLS3	2.00	D			6					
WLS3	5.20	D	Stiff brown and grey brown slightly sandy slightly gravelly CLAY. Gravel consists of fine and medium subangular flint.		28	61	23	38	CH	96

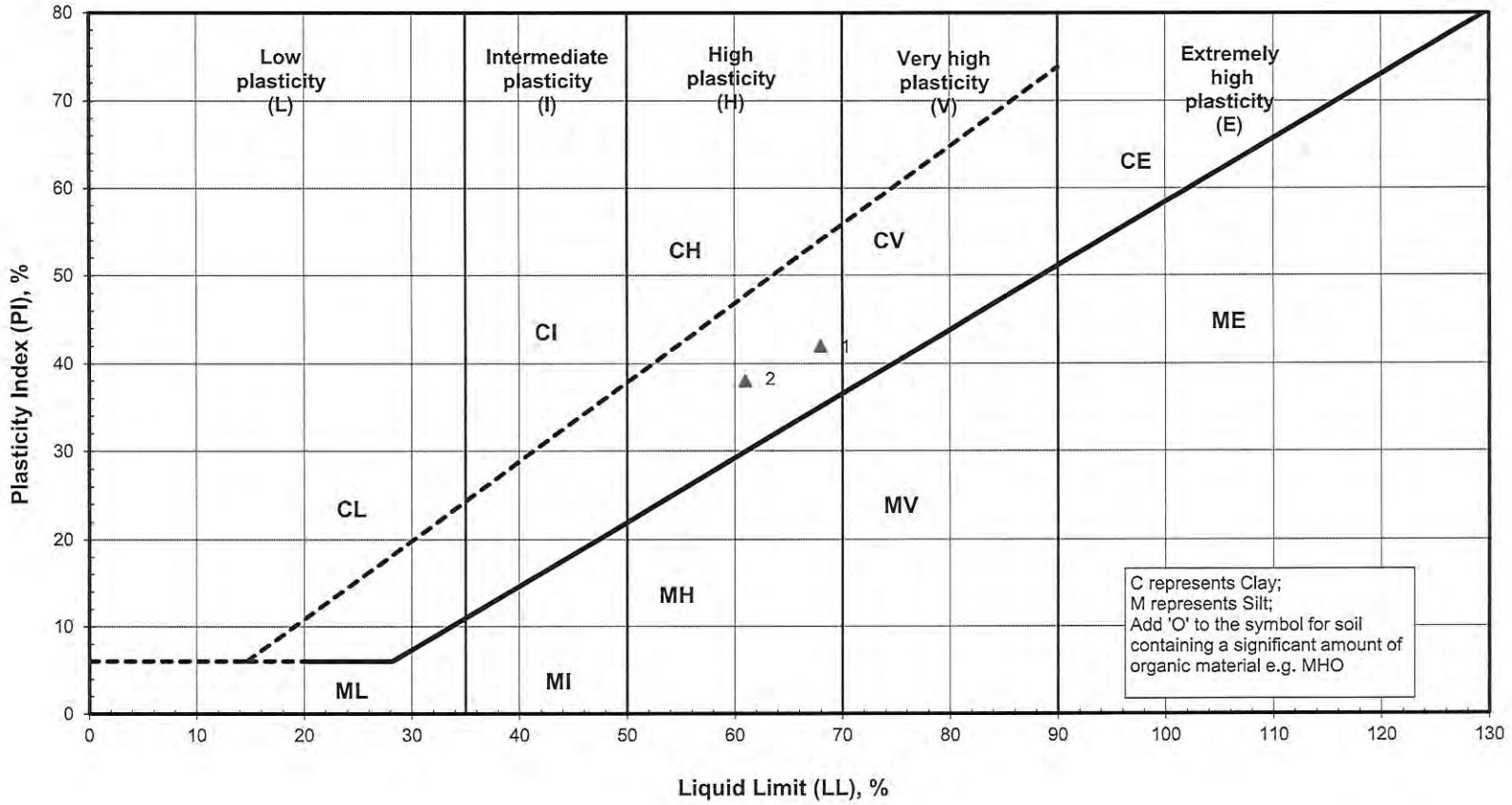
Jun 13

Plasticity Chart for Atterberg Limit Tests

Project Name	*1 St James' Road, Hampton*			**Project Number**	*J14219*
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Key

No.	TH No.	Depth
1	WLS2	5.00
2	WLS3	5.20



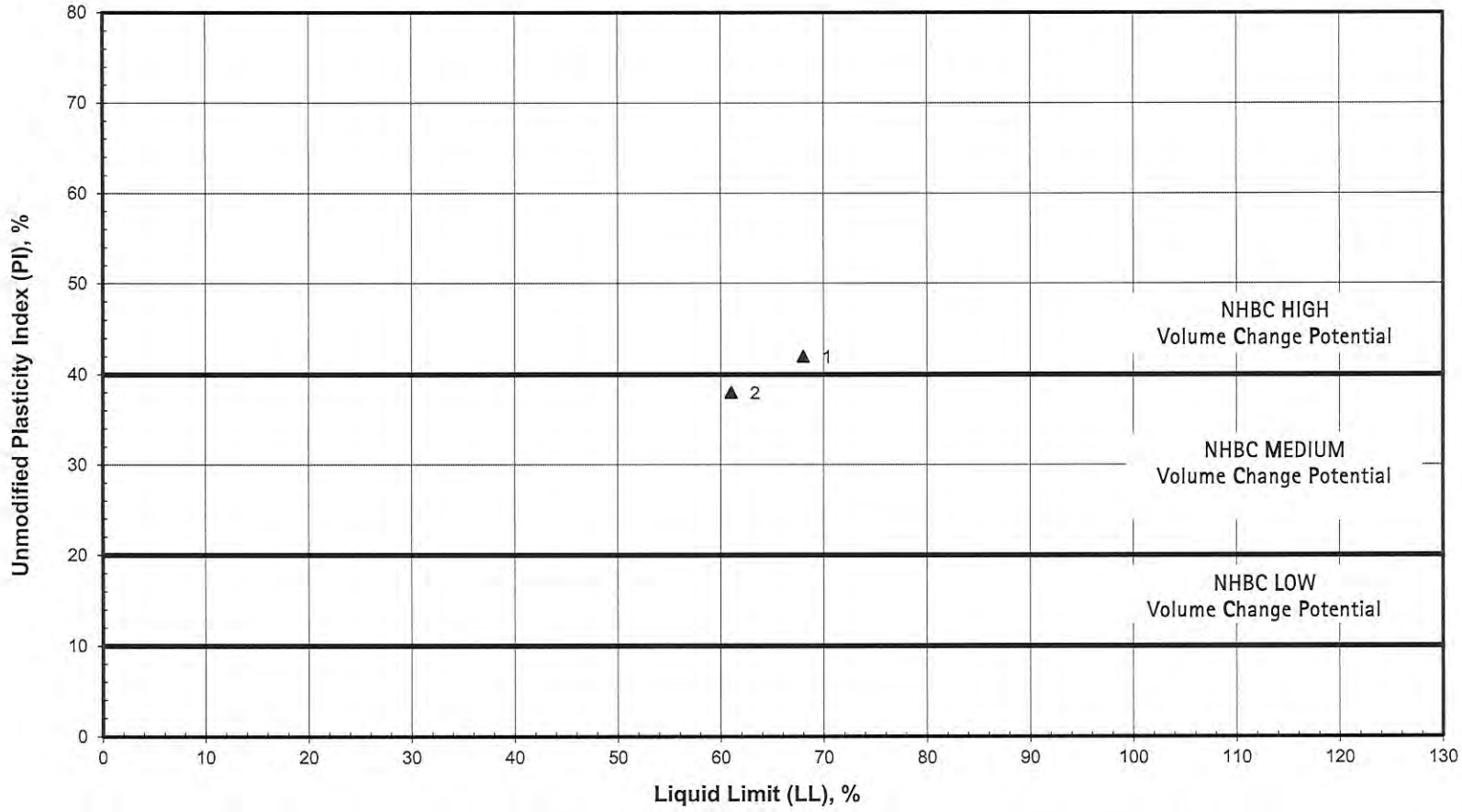
Liquid Limit		**Plastic Limit**		**Plasticity Index**	
Maximum Value	68	Maximum Value	26	Maximum Value	42
Minimum Value	61	Minimum Value	23	Minimum Value	38
Average Value	65	Average Value	25	Average Value	40

NHBC Classification for Volume Change Potential

Project Name	*1 St James' Road, Hampton*			**Project Number**	*J14219*
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Key

No.	TH No.	Depth
1	WLS2	5.00
2	WLS3	5.20



Liquid Limit		**Plastic Limit**		**Unmodified Plasticity Index**	
Maximum Value	68	Maximum Value	26	Maximum Value	42
Minimum Value	61	Minimum Value	23	Minimum Value	38
Average Value	65	Average Value	25	Average Value	40

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PARTICLE SIZE DISTRIBUTION REPORT

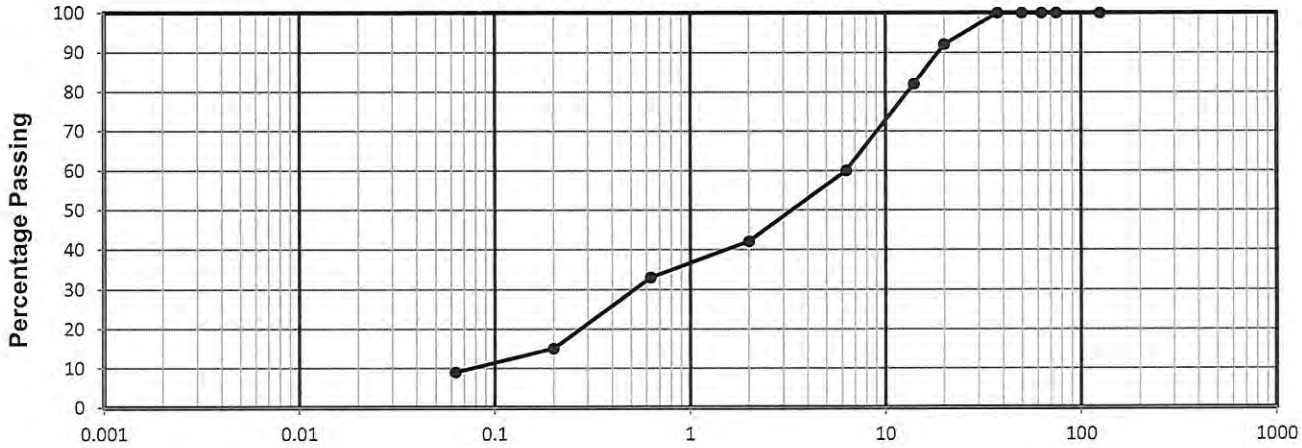
To BS1377-2 cl. 9.2-9.5

AGS

Project Name	*1 St James' Road, Hampton*			**Project Number**	*J14219*
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	100
20mm	92
14mm	82
6.3mm	60
2mm	42
630µm	33
200µm	15
63µm	9

Particle Size Distribution Chart



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
	9			33			58			0

Visual Description of Sample:

Dark orange brown clayey/silty very sandy fine to coarse subangular and subrounded flint GRAVEL.

Particle Density (Assumed) Mg/m³	**N/A**
Coefficient of Uniformity	**82.5**

Location	WLS1
Depth (m)	1.50
Sample Type	B

Comments:

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Tested By	STL Lab
Checked By	AnnaS

Southern Testing | ST Consult

PARTICLE SIZE DISTRIBUTION REPORT

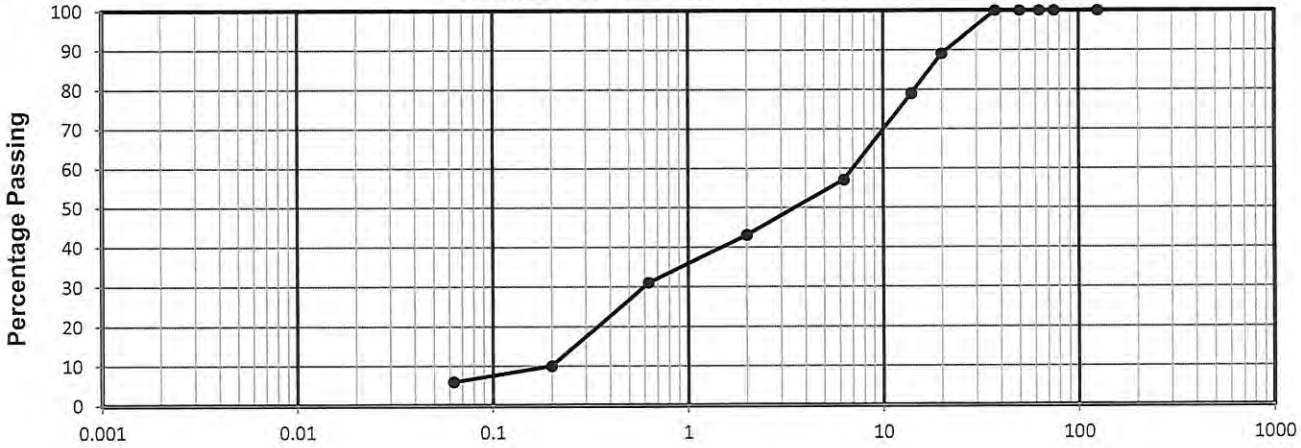
To BS1377-2 cl. 9.2-9.5

AGS

Project Name	*1 St James' Road, Hampton*			**Project Number**	*J14219*
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	100
20mm	89
14mm	79
6.3mm	57
2mm	43
630µm	31
200µm	10
63µm	6

Particle Size Distribution Chart



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
	6			36			57			0

Visual Description of Sample:

Dark orange brown clayey/silty very sandy fine to coarse subrounded to subangular flint GRAVEL.

Particle Density (Assumed) Mg/m³	**N/A**
Coefficient of Uniformity	**35.1**

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location	WLS2
Depth (m)	0.70
Sample Type	B

Comments:

Tested By	STL Lab
Checked By	AnnaS

Southern Testing | ST Consult

PARTICLE SIZE DISTRIBUTION REPORT

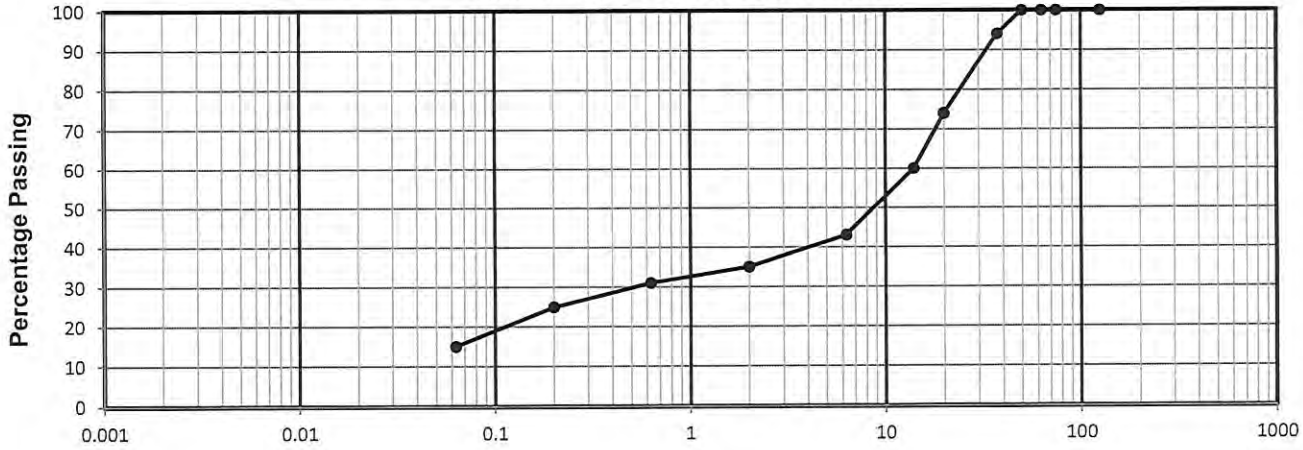
To BS1377-2 cl. 9.2-9.5

AGS

Project Name	*1 St James' Road, Hampton*			**Project Number**	***J14219***
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	94
20mm	74
14mm	60
6.3mm	43
2mm	35
630µm	31
200µm	25
63µm	15

Particle Size Distribution Chart



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
	15			19			65			0

Visual Description of Sample:

Brown slightly sandy gravelly CLAY. Gravel consists of fine to coarse subangular and subrounded flint.

Comments:

Particle Density (Assumed) Mg/m³	**N/A**
Coefficient of Uniformity	

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location	WLS2
Depth (m)	2.00
Sample Type	B

Tested By	STL Lab
Checked By	AnnaS

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PARTICLE SIZE DISTRIBUTION REPORT

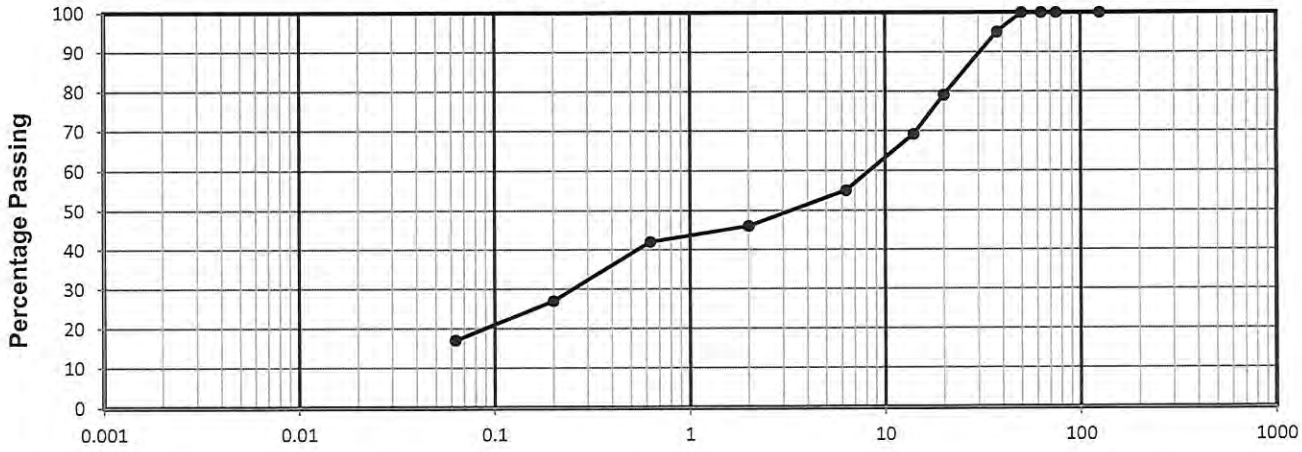
To BS1377-2 cl. 9.2-9.5

AGS

Project Name	*1 St James' Road, Hampton*			**Project Number**	*J14219*
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	95
20mm	79
14mm	69
6.3mm	55
2mm	46
630µm	42
200µm	27
63µm	17

Particle Size Distribution Chart



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
	17			30			54			0

Visual Description of Sample:

Dark brown slightly sandy gravelly CLAY. Gravel consists of fine to coarse subangular and subrounded flint.

Particle Density (Assumed) Mg/m³	**N/A**
Coefficient of Uniformity	

Location	WLS4
Depth (m)	1.00
Sample Type	B

Comments:

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Tested By	STL Lab
Checked By	AnnaS

Southern Testing | ST Consult

PARTICLE SIZE DISTRIBUTION REPORT

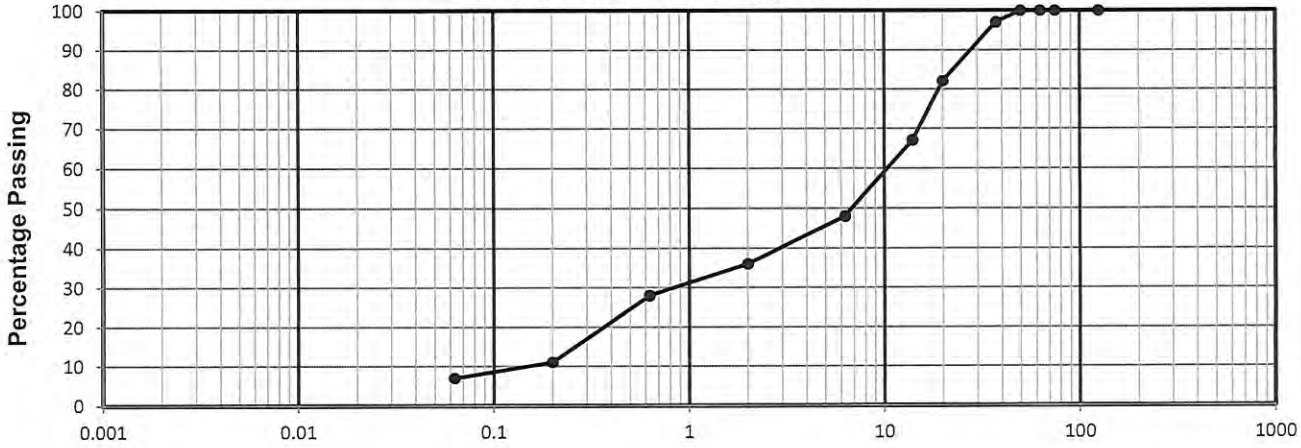
To BS1377-2 cl. 9.2-9.5

AGS

Project Name	*1 St James' Road, Hampton*			**Project Number**	***J14219***
Client Name	*Hampton Hick Ltd*	**PE**	*JAC*	**Date Issued**	*08-Apr-20*

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	97
20mm	82
14mm	67
6.3mm	48
2mm	36
630µm	28
200µm	11
63µm	7

Particle Size Distribution Chart



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
	7			29			64			0

Visual Description of Sample:

Orange brown clayey/silty very sandy fine to coarse subangular and subrounded flint GRAVEL.

Particle Density (Assumed) Mg/m³	**N/A**
Coefficient of Uniformity	**69.6**

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location	WLS4
Depth (m)	2.00
Sample Type	B

Comments:

Tested By	STL Lab
Checked By	AnnaS

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Environmental & Geotechnical

APPENDIX D

Contamination Laboratory Test Methods and Results

D

These screening values are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

Table 1 – Tier 1 Screening Values							
Contaminant	Units	Proposed Land Use					
		Residential with home grown produce consumption	Residential without home grown produce consumption	Open Space * (Residential)	Open Space * (Park)	Allotments	Commercial / Industrial
Arsenic (As) [2]	mg/kg	37	40	79	170	43	640
Cadmium (Cd) [2]	mg/kg	11	85	120	555	1.9	190
Trivalent Chromium (CrIII) [2]	mg/kg	910	910	1,500	33,000	18,000	8600
Hexavalent Chromium (CrVI) [2]	mg/kg	6	6	7.7	220	1.8	33
Lead (Pb) [3]	mg/kg	200	310	630	1300	80	2330
Mercury (Hg) [1,2,7]	mg/kg	7.6-11	9.2-15	40	68-71	6.0	29-320
Selenium (Se) [2]	mg/kg	250	430	1,100	1,800	88	12,000
Nickel (Ni) [2,4]	mg/kg	130	180	230	800	53	980
Copper (Cu) [2,4]	mg/kg	2,400	7,100	12,000	44,000	520	68,000
Zinc (Zn) [2,4]	mg/kg	3,700	40,000	81,000	170,000	620	730,000
Phenol [1,2]	mg/kg	120-380	440-1200	440-1300	440-1300	23-83	440-1300
Benzo[a]pyrene [1,5]	mg/kg	1.7-2.4	2.6	4.9	10	0.67-2.7	36
Naphthalene [1,2]	mg/kg	2.3-1.3	2.3-13	77-430^{+}	77-430^{+}	4.1-24	77-430^{+}
Total Cyanide (CN) [6]	mg/kg	/	/	/	/	/	/
Free Cyanide [6]	mg/kg	/	/	/	/	/	/
Complex Cyanides [6]	mg/kg	/	/	/	/	/	/
Thiocyanate [6]	mg/kg	/	/	/	/	/	/

Notes:

* Open Space levels calculated on the basis of the exposure modelling developed in the C4SL research.

+ Screening values constrained to saturation limit. Higher values may be acceptable on a site specific basis.

[1] Where ranges of values are given for organic contaminants the screening value is dependent on the Soil +Organic Matter.

[2] LQM/CIEH S4UL (2014). Copyright Land Quality Management Ltd. reproduced with permission; Publication Number S4UL 3116. All rights reserved.

[3] C4SL (DEFRA 2014).

[4] Copper, Zinc and Nickel may have phototoxic effects at the given concentrations. Alternative criteria should be adopted for importation of Topsoil or other soils for cultivation. BS3882:2015 and BS8601:2013 suggest values of 200 to 300mg/kg for Zn, 100 to 200mg/kg for Cu, and 60 to 110mg/kg for Ni, for topsoil and subsoil, depending on pH.

[5] Based on the Surrogate Marker approach and modelled using the modified exposure parameters of C4SL but retaining 'minimal risk' HCV.

[6] Screening criteria derived on a site specific basis if test results indicate.

[7] S4UL for Methyl Mercury, higher concentrations may be tolerable if inorganic mercury is the only species present. Lower concentrations apply for elemental Mercury.

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Analytical Report Number : 20-95427

Project / Site name:	1 St James' Road, Hampton	**Samples received on:**	01/04/2020
Your job number:	J14219	**Samples instructed on:**	01/04/2020
Your order number:	J14219-1	**Analysis completed by:**	14/04/2020
Report Issue Number:	1	**Report issued on:**	14/04/2020
Samples Analysed:	8 soil samples		

Signed: Karolina Marek

Karolina Marek
Head of Reporting Section

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-95427

Project / Site name: 1 St James' Road, Hampton
Your Order No: J14219-1

Lab Sample Number				1487924	1487925	1487926	1487927	1487928
Sample Reference				WLS2	WLS2	WLS2	WLS2	WLS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.50	1.50	4.50	0.10
Date Sampled				30/03/2020	30/03/2020	30/03/2020	30/03/2020	30/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	14	15	3.4	5.7	11
Total mass of sample received	kg	0.001	NONE	0.84	1.1	0.81	0.68	1.1
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	-	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	6.2	5.8	8.0	7.7	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	-	< 1
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.014	0.0083	0.0093	0.0097
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	8.3	9.3	-
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
Organic Matter	%	0.1	MCERTS	6.1	3.3	-	-	4.5
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.2	0.53	-	-	0.52
Anthracene	mg/kg	0.05	MCERTS	0.19	< 0.05	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	3.3	1.0	-	-	1.0
Pyrene	mg/kg	0.05	MCERTS	2.8	0.87	-	-	0.88
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.7	0.54	-	-	0.57
Chrysene	mg/kg	0.05	MCERTS	1.7	0.50	-	-	0.53
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.2	0.63	-	-	0.71
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.0	0.20	-	-	0.28
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	0.46	-	-	0.60
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	0.27	-	-	0.37
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.31	< 0.05	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	0.29	-	-	0.44
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	18.6	5.29	-	-	5.90
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	7.2	-	-	9.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	-	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	15	-	-	16
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	8.2	-	-	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	170	37	-	-	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	< 0.3	-	-	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	12	9.0	-	-	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	91	32	-	-	50

Analytical Report Number: 20-95427

Project / Site name: 1 St James' Road, Hampton
Your Order No: J14219-1

Lab Sample Number				1487924	1487925	1487926	1487927	1487928
Sample Reference				WLS2	WLS2	WLS2	WLS2	WLS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.50	1.50	4.50	0.10
Date Sampled				30/03/2020	30/03/2020	30/03/2020	30/03/2020	30/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	3.4	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	10	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	30	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	43	-	-	-	-

Analytical Report Number: 20-95427

Project / Site name: 1 St James' Road, Hampton
Your Order No: J14219-1

Lab Sample Number				1487929	1487930	1487931		
Sample Reference				WLS3	WLS3	WLS3		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	1.00	4.00		
Date Sampled				30/03/2020	30/03/2020	30/03/2020		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	11	1.9	5.9		
Total mass of sample received	kg	0.001	NONE	0.47	0.68	0.76		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	6.2	6.1	6.3		
Total Cyanide	mg/kg	1	MCERTS	< 1	-	-		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0088	0.013	0.0094		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	13.4	9.4		
Sulphide	mg/kg	1	MCERTS	1.1	-	-		
Organic Matter	%	0.1	MCERTS	1.8	-	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	-		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.9	-	-		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	-		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	-		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	-	-		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	10	-	-		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	34	-	-		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	-		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	-	-		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	30	-	-		

Analytical Report Number: 20-95427

Project / Site name: 1 St James' Road, Hampton
Your Order No: J14219-1

Lab Sample Number				1487929	1487930	1487931		
Sample Reference				WLS3	WLS3	WLS3		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	1.00	4.00		
Date Sampled				30/03/2020	30/03/2020	30/03/2020		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-		
Toluene	µg/kg	1	MCERTS	-	-	-		
Ethylbenzene	µg/kg	1	MCERTS	-	-	-		
p & m-xylene	µg/kg	1	MCERTS	-	-	-		
o-xylene	µg/kg	1	MCERTS	-	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

Analytical Report Number : 20-95427

Project / Site name: 1 St James' Road, Hampton

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1487924	WLS2	None Supplied	0.10	Brown loam and sand with vegetation.
1487925	WLS2	None Supplied	0.50	Light brown loam and sand with vegetation.
1487926	WLS2	None Supplied	1.50	Light brown sand with gravel.
1487927	WLS2	None Supplied	4.50	Light brown sand with gravel.
1487928	WLS3	None Supplied	0.10	Brown loam and sand with gravel and vegetation.
1487929	WLS3	None Supplied	0.50	Light brown loam and sand with gravel and vegetation.
1487930	WLS3	None Supplied	1.00	Light brown sand with gravel.
1487931	WLS3	None Supplied	4.00	Light brown sand with gravel.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 20-95427

Project / Site name: 1 St James' Road, Hampton

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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APPENDIX E

Photographs

E

Drilling WLS1 looking east.

Parked cars in the front garden looking south east.

Rubbish including cardboards wood and possibly asbestos cement sheet roofing near entrance to site.

Front lawn looking north towards the front door of the property.

Drilling WLS3 looking east.

Looking north east viewed from WLS3.

The western corner of the site looking west.

Looking south east viewed from WLS3.

The far north of the site looking east.

WLS4 north north east.

Looking north east from WLS4.

Looking west from WLS4.

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APPENDIX F

Historical Mapping

F

Historical Ordnance Survey Map Interpretation				
Date	Scale	Features On Site	Features Off Site	Significant Potential Contamination Sources
1869	1:10,560	The site is shown to be an open field forming part of Vicarage farm	St James Church is approximately 100m to the north east. Vicarage Farm house/buildings is approximately 75m to the north west.	
1896	1:10,560	The site is shown to form part of a garden for a detached house on St James Road	Extensive development has taken place since the previous map with many residential properties built surrounding the site. A gravel pit is also shown to the north west of the site (approx. 60m) and another gravel pit 200m to the north east. A railway line is also present to the east	
1915	1:2,500	A glazed roofed building (greenhouse) is shown to be encroaching onto the site	No significant Changes	
1934	1:2,500	The glazed roofed building (greenhouse) no longer shown.	No significant Changes	Made Ground
1961	1:2,500	The site is now show to be developed with a detached house with the description “Boundaries”	The area immediately north west of the site is now shown to be developed with terrace housing.	Made Ground
1969	1:2,500	As previous	The site to the south east has been cleared of the detached house and “Willowbrook” flats have been constructed in its place.	
2020		The site remains unchanged since 1961	No significant Changes	

NOTE: Additional maps at 1:10,560 and 1:10000 scale of similar age have been obtained. These maps are appended but do not provide much additional information.

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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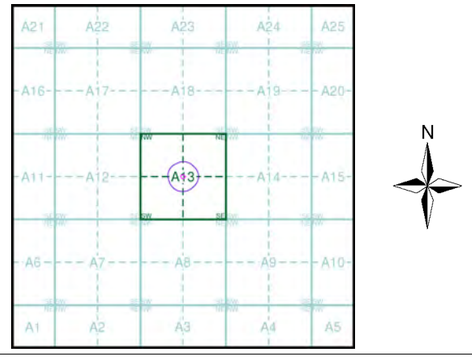
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Middlesex	1:10,560	1869	3
Surrey	1:10,560	1871	4
London	1:10,560	1896	5
Middlesex	1:10,560	1897	6
Surrey	1:10,560	1898 - 1899	7
Middlesex	1:10,560	1920	8
Middlesex	1:10,560	1920	9
Surrey	1:10,560	1920	10
Surrey	1:10,560	1920	11
Middlesex	1:10,560	1932 - 1935	12
Surrey	1:10,560	1933	13
Middlesex	1:10,560	1934	14
Middlesex	1:10,560	1938	15
Surrey	1:10,560	1938	16
Middlesex	1:10,560	1938	17
Surrey	1:10,560	1938	18
Ordnance Survey Plan	1:10,000	1940	19
Historical Aerial Photography	1:10,560	1948	20
Ordnance Survey Plan	1:10,000	1960 - 1966	21
Ordnance Survey Plan	1:10,000	1965 - 1968	22
Ordnance Survey Plan	1:10,000	1975 - 1976	23
Ordnance Survey Plan	1:10,000	1985 - 1987	24
London	1:25,000	1985	25
Ordnance Survey Plan	1:10,000	1991 - 1992	26
10K Raster Mapping	1:10,000	1999	27
10K Raster Mapping	1:10,000	2006	28
VectorMap Local	1:10,000	2020	29

Historical Map - Slice A



Order Details

Order Number: 239269821_1_1
Customer Ref: J14219/JAC/AM
National Grid Reference: 513830, 171220
Slice: A
Site Area (Ha): 0.09
Search Buffer (m): 1000

Site Details

1 St James' Road, Hampton, Richmond, TW12 1QS

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Fireproof Building
- Prominent Fireproof Building
- Non-fireproof Building
- Non-fireproof Building (non-dwelling)
- Factory, mill, and flour mill, with chimneys
- Factory, mill, and flour mill, without chimneys
- Power Station, drawn to scale
- Hydroelectric Power Station
- Radio Station, drawn to scale
- Telephone Station, drawn to scale
- Abandoned Open-pit Mine or Quarry
- Open-pit Salt Mine
- Pit
- Oil Deposit or Well
- Oil Seepage
- Tailings Pile
- Fuel Storage Tanks
- Natural Gas Tank
- Bench Mark
- Drill Hole
- Burial Mound
- Triangulation Point on Burial Mound
- Single-track Railroad
- Double-track Railroad and Station Building
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Lawns
- Citrus Orchard
- Wet Ground
- Scattered Vegetation

243,8 — Values for prominent elevations

186.0 — Numbers for spot elevations, depth soundings, contour lines, etc.

0,2 — Velocity of the current, width of river bed, depth of river

Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	ъ (–)
Д д (D)	Л л (L)	У у (U)	ы (Y)
Е е (E)	М м (M)	Ф ф (F)	ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Partly Demolished Buildings
- Demolished Buildings
- Built-Up Area with Fireproof Buildings Predominant
- Built-Up Area with Non-Fireproof Buildings Predominant
- Individual Fireproof Building
- Prominent Industrial Building
- Individual Dwelling, Fireproof
- Ruins of an Individual Dwelling
- Factory or Mill Chimney
- Factory or Mill with Chimney
- Factory or Mill without Chimney
- Mine or Open Pit Mine
- Operating Shaft or Mine
- Non-Operating Shaft or Mine
- Salt Mine
- Tailings Pile
- Pit
- Stone Quarry
- Gas Pump or Service Station
- Fuel Storage or Natural Gas Tank
- Oil or Natural Gas Derrick
- Small Hydroelectric Power Station
- Power Station
- Transformer Station
- Cemetery
- Burial Mound (height in metres)
- Triangulation Point on Burial Mound
- Triangulation Point
- Bench Mark
- Bench Mark (monumented)
- Telegraph Office
- Telephone Station
- Radio Station
- Radio Tower
- Airfield or Seaplane Base
- Landing Strip
- Main Highway
- Highway under Construction
- Improved Dirt Road (former truck road)
- Double-track Railroad with First Class Station
- Dismantled Railroad
- Railroad Under Construction
- Shore Embankment
- River or Ditch with Embankment
- Direction and velocity of current
- Well
- Water Reservoir or Rain Water Pit
- Spring
- Isobath with value
- Heavy (Index) Contour Line
- Contour Line and Value
- Half Contour Line
- Spot Elevation Value
- Coniferous
- Deciduous
- Mixed
- Scrub

Key to Numbers on Mapping

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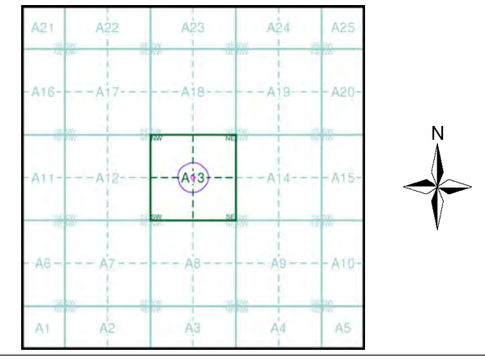
Historical Mapping & Photography included:

Russian Map - Slice A



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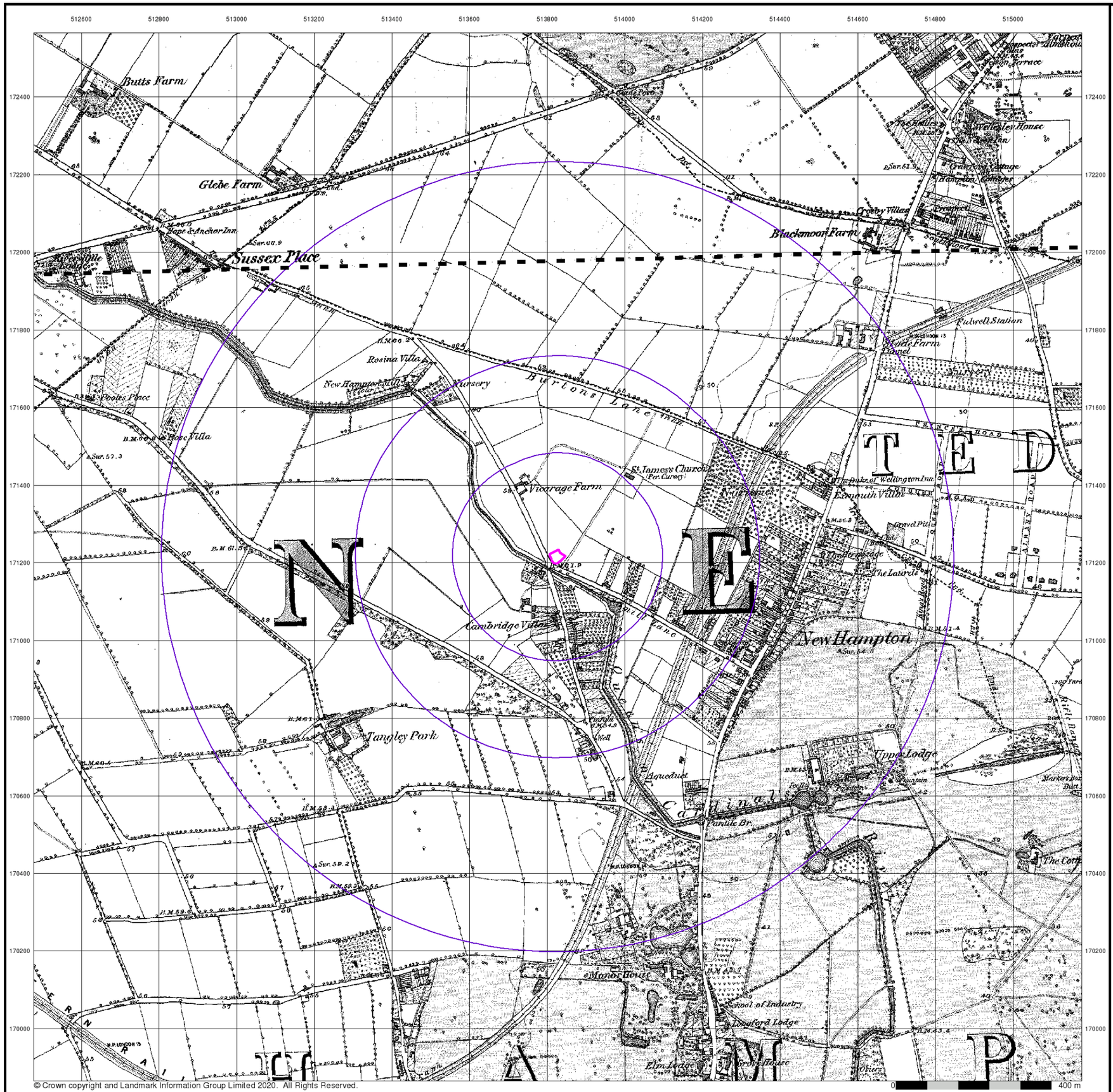

0 400 m

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Middlesex

Published 1869

Source map scale - 1:10,560

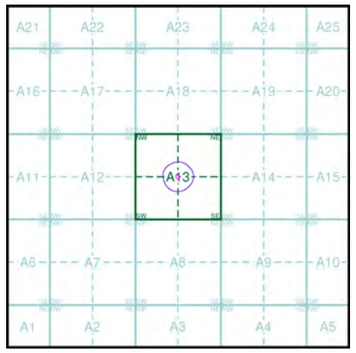
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

02000
1869
1:10,560

02500
1869
1:10,560

Historical Map - Slice A



Order Details

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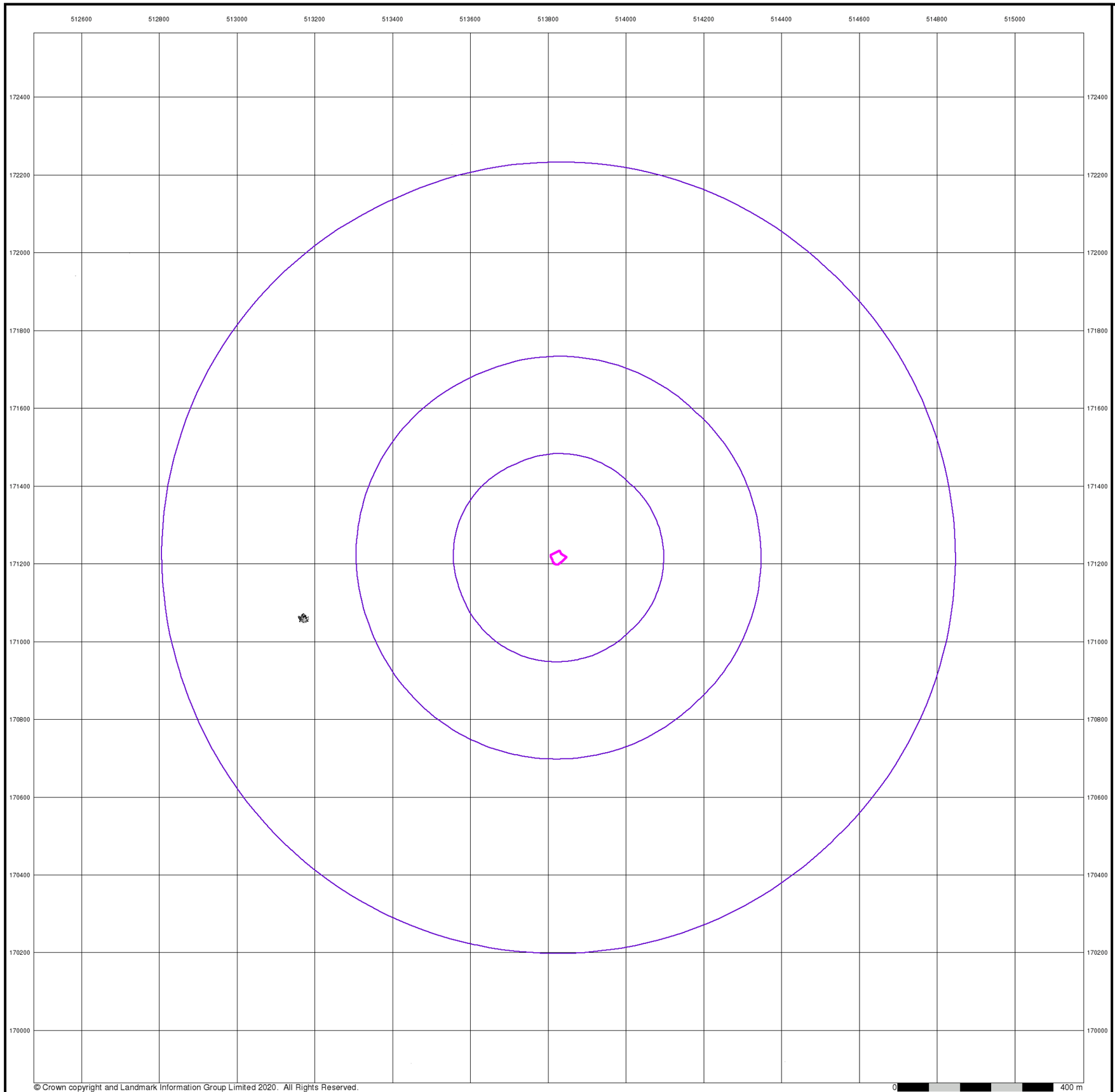

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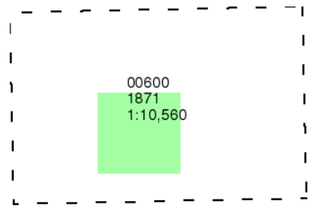
Surrey

Published 1871

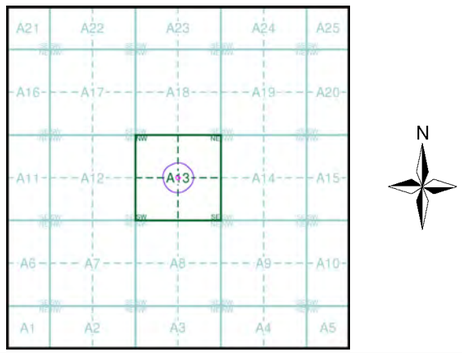
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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National Grid Reference:	513830, 171220
Slice:	A
Site Area (Ha):	0.09
Search Buffer (m):	1000

Site Details

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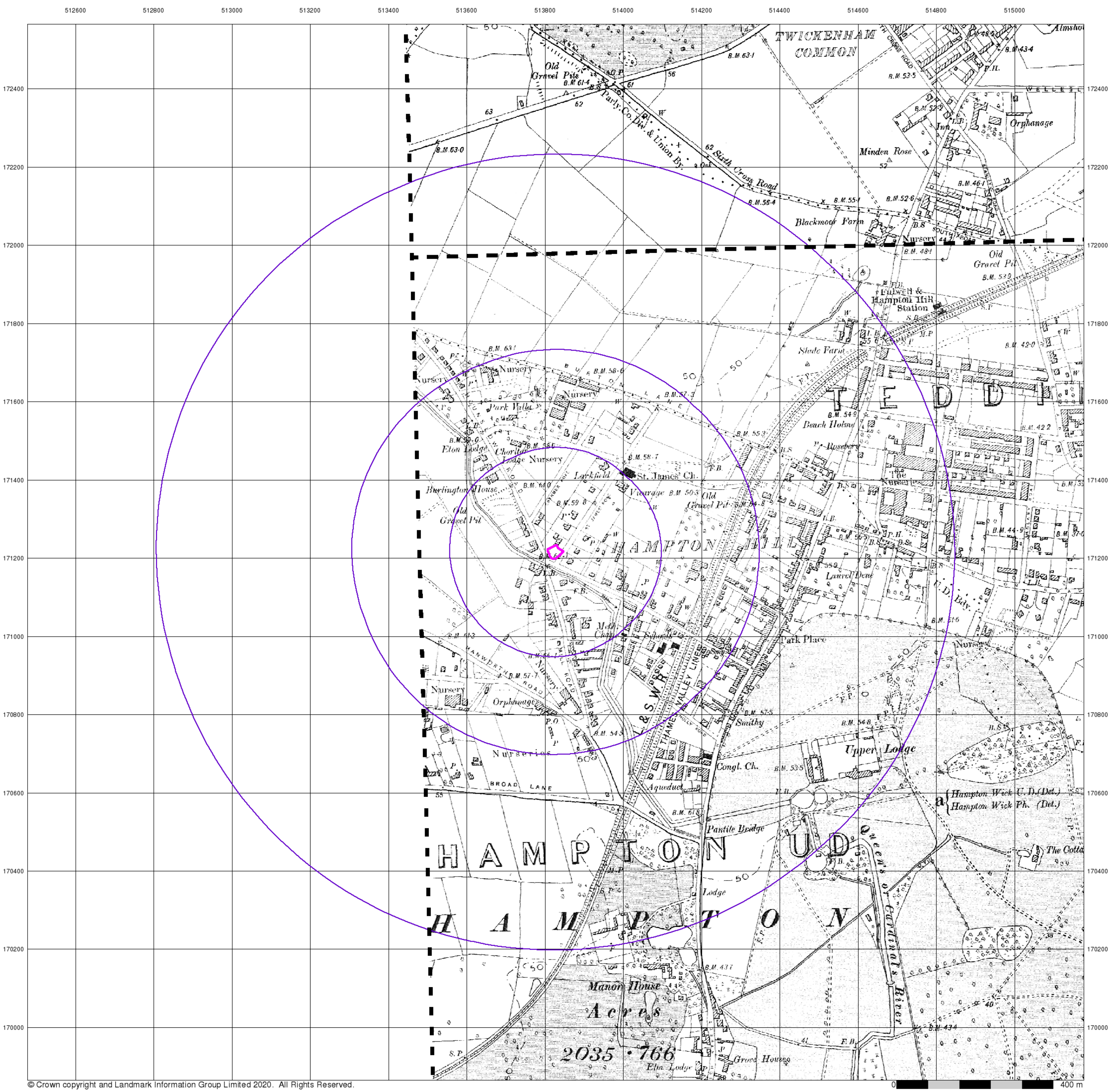

0 400 m

Southern Testing
Environmental & Geotechnical

London
Published 1896
Source map scale - 1:10,560

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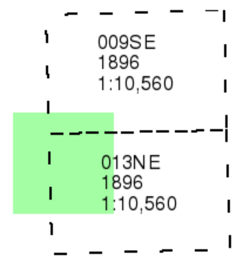
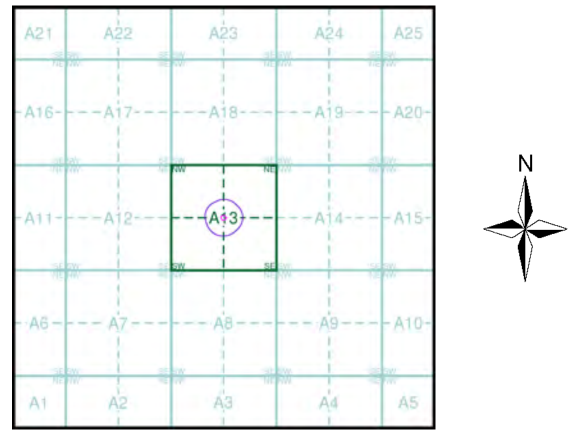
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

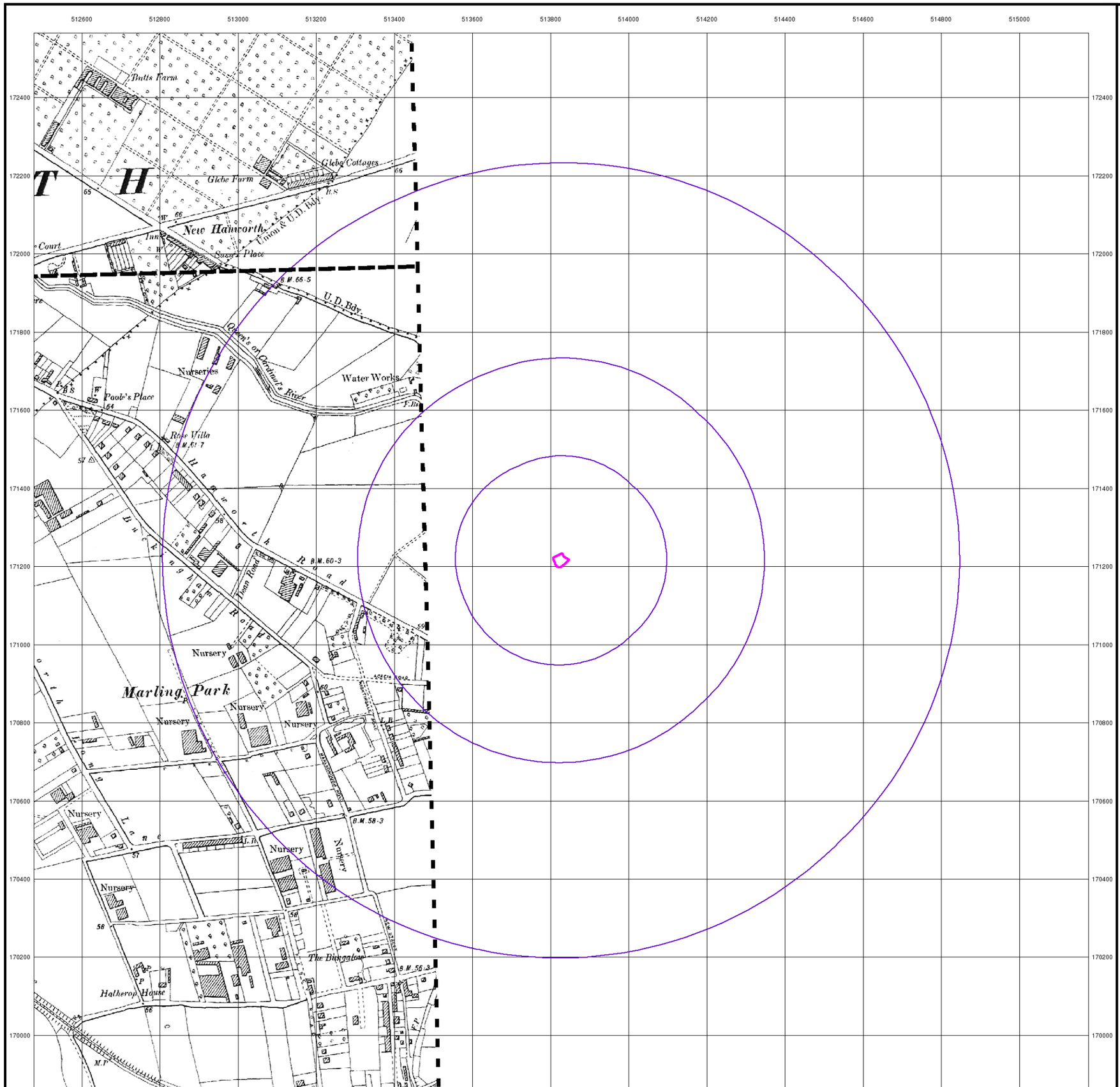
Order Number: 239269821_1_1
Customer Ref: J14219/JAC/AM
National Grid Reference: 513830, 171220
Slice: A
Site Area (Ha): 0.09
Search Buffer (m): 1000

Site Details

1 St James' Road, Hampton, Richmond, TW12 1QS

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Southern Testing
Environmental & Geotechnical

Middlesex

Published 1897

Source map scale - 1:10,560

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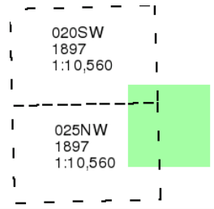

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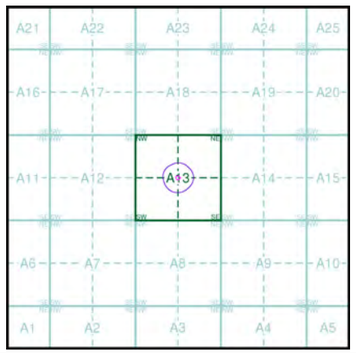

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Southern Testing
Environmental & Geotechnical

Surrey

Published 1898 - 1899

Source map scale - 1:10,560

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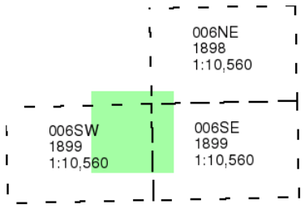

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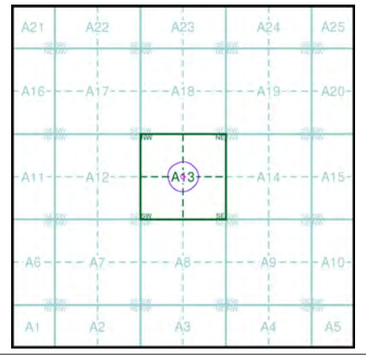

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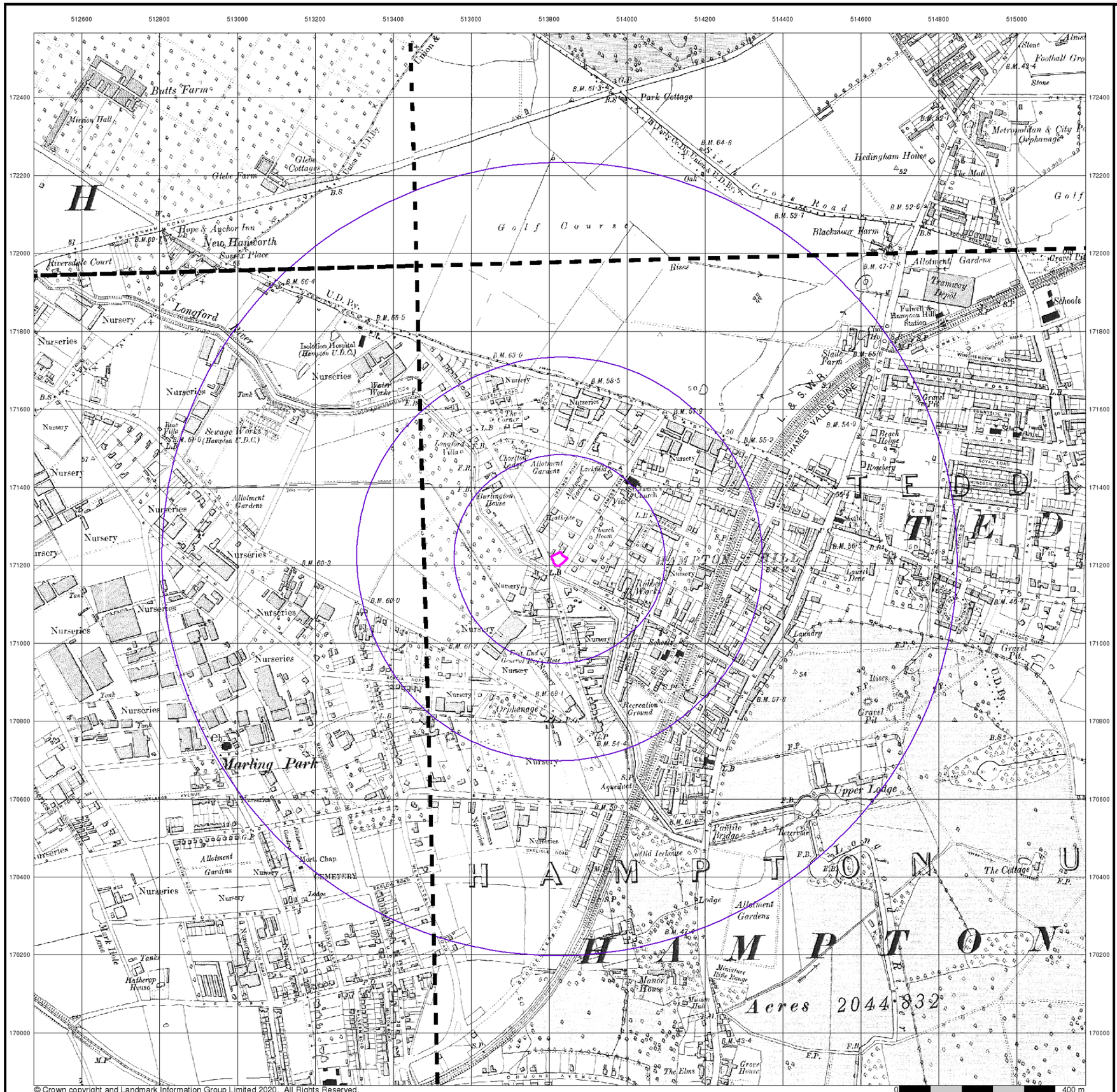

Southern Testing
Environmental & Geotechnical

Middlesex

Published 1920

Source map scale - 1:10,560

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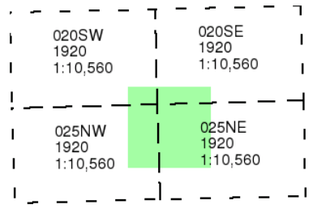

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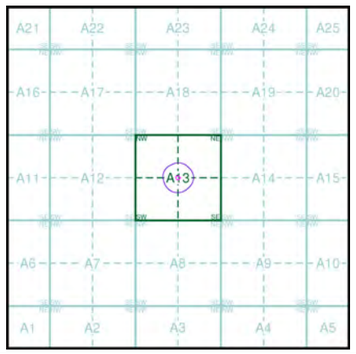

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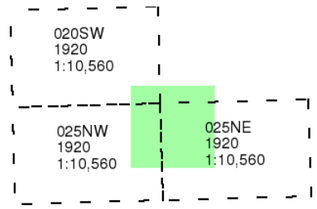

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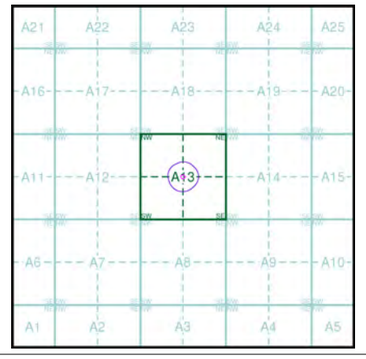

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Surrey

Published 1920

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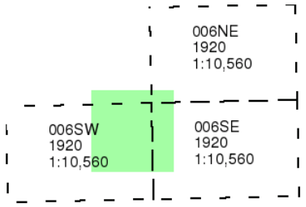

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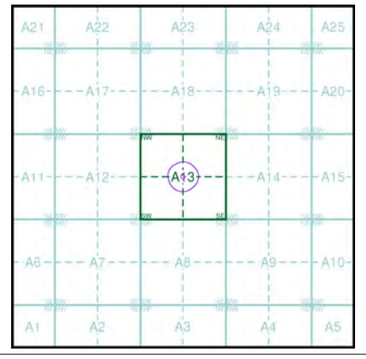

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