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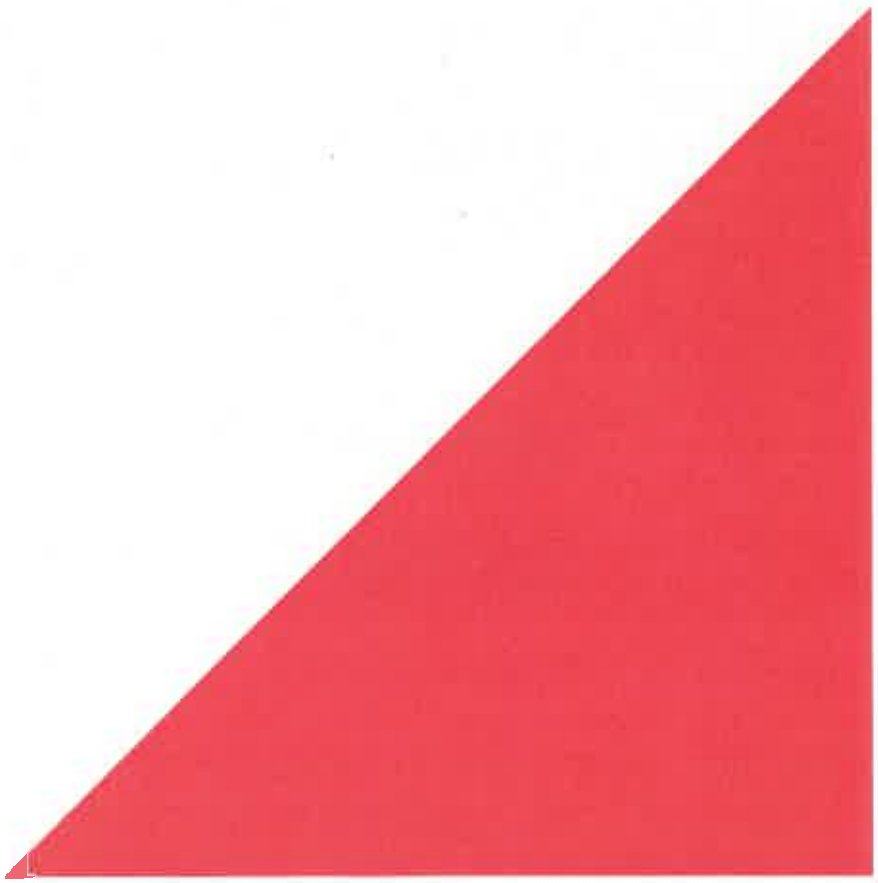
Botwell Lane, Hayes

Geo-Environmental Ground Investigation Report

for Lidl UK GmbH



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for Lidl UK GmbH

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Factual Information

1 Introduction

This report describes a geo-environmental ground investigation undertaken on behalf of Lidl UK GmbH on a site at Botwell Lane in Hayes.

It is understood that it is intended to redevelop the site with a Lidl supermarket and/or a residential development. A proposed site layout plan is included within the drawing section of this report, referenced 3176_01_B (Poole & Pattle Architects).

This report has been prepared by Opus International Consultants (UK) Ltd (Opus) with all reasonable skill, care and diligence within the terms of the Contract with The Client (Lidl UK GmbH) and taking account of the information made available by The Client, as well as the manpower and resources devoted to it by agreement with The Client. Opus disclaims any responsibility to The Client and others in respect of any matters outside the scope of the above Contract.

The objectives of the investigation were to carry out a phase I desk study report and a phase II geo-environmental survey of the site, comprising a ground investigation to obtain information relating to the ground conditions in order to obtain an initial assessment of potential contamination on the site, along with a preliminary appraisal of requirements for foundations and floor slabs associated with the proposed development.

This report has been produced on behalf of The Client, Lidl UK GmbH and no responsibility is accepted to any other Third Party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of Opus. If any unauthorised Third Party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

The findings and opinions conveyed via the desk study within this report are based on information obtained from a variety of sources, as detailed, which Opus believes are reliable. Nevertheless, Opus cannot and does not guarantee the authenticity or reliability of the information it has relied upon from these sources.

Whilst this report may express an opinion on the possible configuration of strata, contaminants or groundwater between or beyond exploratory hole positions or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only, and no liability can be accepted for its accuracy.

This report has been prepared on the understanding that the development is to comprise a Lidl supermarket in the south east half and new residential properties with associated gardens and parking in the north west half as shown on drawing referenced 3176_01_B Proposed Site Layout. Should the proposed site usage change significantly from the above, the contents of this report will require review and amendment as appropriate.

The comments on groundwater conditions are based on observations made at the time of the investigation. It should be noted, however, that groundwater levels may vary from those reported due to seasonal or other effects.

The site plans enclosed in this report should not be used for scaling purposes.

2 The Site

2.1 Location & Access

The grounds of the former swimming pool are approximately 1 hectare in area. The site is situated immediately north of the junction between Botwell Lane and Central Avenue. The site location, shown on the appended Drawing No. J-M0167.01_01_P1 is centred at approximate National Grid Reference 509730, 180080.

At the time of the investigation, vehicular access was gained off Central Avenue along the eastern site boundary.

2.2 Site Description

A brief walkover survey was undertaken on the 24th May 2013. Selected photographs are presented in Appendix 'A'. The aim of the survey was to identify the range of potentially contaminative activities carried out on the site and in the immediate vicinity and any obvious potential sources of ground contamination. The comments provided below give a general description of the site and any features of relevance in terms of assessing historical usage, potential for contamination etc.

At the time of the investigation, the site comprised a large grassed area with some semi mature and mature trees and an asphalt surfaced parking area to the north. Some fly tipping was present on the asphalt surfaced area and comprised mattresses, furniture, old paint and chemical cans which had been placed on polythene sheeting by others.

The majority of the site was surrounded by wooden hording, with the exception of a grassed area to the west next to Botwell Lane and a small grassed area to the north.

The site was generally flat and at an approximate level of 32mOD based on a benchmark offsite to the south.

3 Desk Study

3.1 Sources of Information

The following sources of information have been consulted as part of the desk study for the site;

(a) Environmental database report and historical mapping specific to the subject site.

(b) British Geological Survey 1:50,000 Sheet 269 'Windsor'.

(c) Environment Agency Groundwater Vulnerability mapping.

(d) BRE 211 (2007) – Radon, guidance on protective measures for new dwellings.

(e) Selected County Series and Ordnance Survey plans relevant to the site.

(f) APEC Environmental Survey of Asbestos Materials LDN/10/8/008/PC.

3.2 Site History

Historical mapping coverage of the site is included in Appendix 'B' and is briefly summarised as follows in Table 3.1.

Table 3.1: Review of Historical Map Extracts

Date	Comments
1875 - 1894 source map scale 1:2,500	The site appears to be Greenfield with mature trees located parallel to its northern and western site boundaries and within the centre of the site. Botwell Lane is constructed beyond. A pond is located approximately 30m east of the site. Botwell Lodge and Botwell House are located to the south east and south of the site. Orchards occupy the majority of land to the south and south west of the site, located beyond Botwell House.
1895 source map scale 1:2,500	The site appears to have remained undeveloped; however all of the trees previously shown on and bordering the site are no longer shown. Much of the orchard land previously shown to the south west of the site appears to have been cleared. The pond previously located 30m east of the site is no longer shown and may have been infilled. The grounds belonging to a property named Holmbury have been built

Date	Comments
	immediately north of the northern site boundary.
1914 scale 1:2,500	The site remains undeveloped. A printing office/works has been constructed 220m south west of the site. Allotment gardens are located approximately 170m and 210m south west and west of the site respectively.
1934 - 1935 source map scale 1:2,500	Two buildings have been constructed within the north west section of the site. The land located immediately north of the site and beyond has undergone extensive development for residential use. A recreation ground is located to the east of the site, located immediately beyond Central Avenue. Further residential and commercial developments are located south east of the site beyond Botwell Lane. A tank is shown located within the grounds of the printing works. A Wire Works is located approximately 180m west of the site.
1961 – 1965 source map scale 1:1,250	The site appears relatively similar to the previous edition; however the 'open space' occupying the majority of the site is identified as Botwell Green. Leisure facilities including a tennis courts, bowling green and playground are shown immediately east of Central Avenue. An engineering works is located approximately 100m west of the site. Further residential development, which includes a small allotment, has occurred to the north west of the site.
1961 - 1965 source map scale 1:1,250	The site and surrounding land appear relatively similar to the previous edition, although the footprints of the buildings on the site appear slightly different.

Date	Comments
1970 - 1975 source map scale 1:1,250	Only a partial view of the surrounding land is provided for this edition, however a telephone exchange now occupies the land located approximately 50m south east of the site, beyond Central Avenue.
1973 - 1975 source map scale 1:1,250	Hayes Swimming Baths have been constructed on site and primarily consists of one large building situated roughly towards the centre of the site. Both of the buildings previously located in the north west section of the site have been removed. The surrounding land appears relatively similar to the previous edition.
1991 - 1992 source map scale 1:1,250	The site appears relatively similar to the previous edition. Two electricity substations are located approximately 50m north and south of the site respectively. The land located beyond Botwell Lane to the south west is predominantly occupied by light industrial buildings.
1993 - 1997 source map scale 1:1,250	The site appears and surrounding land appear relatively similar to the previous edition.
1991 source map scale 1:1,250	The site and surrounding land appears relatively similar to the previous edition.
2006 - 2012source map scale 1:10,000	The site and surrounding land appear relatively similar to the previous edition.

In summary, historical mapping suggests that the site was Greenfield and partly bounded by mature trees in the late 19th Century.

All of the trees within and surrounding the site had been removed by the 1890's.

Two buildings are shown to occupy the north western area of the site by the 1930's.

Botwell Green was established on site by the early 1960's and remained until the construction of Hayes Swimming Baths, which took place in the early 1970's. The site appears to have remained unchanged up to the latest map edition dated 2012.

3.3 Geology

According to the inspected published geological information (BGS Sheet 269 'Windsor' 1:50000, 'Solid' and 'Drift' edition); the site is immediately underlain by superficial deposits in the form of Lynch Hill Gravel with the London Clay Formation located directly beneath.

The geological map indicates 'Worked Ground' or 'Infilled Ground' in the general surrounding area (but not encroaching onto the site).

The Lynch Hill Gravel comprises sand and gravel locally with lenses of silt, clay or peat.

The London Clay Formation comprises fine, sandy, silty clay and is glauconitic at its base.

Made Ground is not recorded on the geological plans as being present on site, however Made Ground may potentially have been brought on to site or generated on site during historic redevelopment works.

3.4 Hydrogeology

The hydrogeology of the site is indicated to be characterised by the presence of a Non Aquifer associated with the London Clay Formation.

The environmental database report presented in Appendix 'B' indicates that there are no recorded licensed groundwater abstractions operating within a 1km radius of the site. There are two abstractions recorded within 2km of the site.

The site does not lie within a Source Protection Zone (SPZ) for the protection of groundwater quality as defined by the Environment Agency.

3.5 Hydrology

With reference to the environmental database report, the nearest recorded surface water feature is 300m south west of the site and is associated with the Grand Union Canal.

The indicative floodplain map for the area, published by the Environment Agency, indicates that the site does not lie within a floodplain and is not at risk from extreme flooding by rivers or the sea. However it should be noted that this report does not constitute a detailed flood risk assessment.

3.6 Mineral Extraction

The Envirocheck report does not indicate any cavities due to mining or man-made cavities.

3.7 Asbestos

An Asbestos Survey Report produced by APEC Environmental referenced LDN/10/9/008/PC dated September 2010 was provided to Opus by the client, the report details asbestos containing material within the former swimming pool prior to demolition. At the time of the walkover survey the former swimming pool had been demolished and the site levelled, it is assumed that the asbestos was dealt with appropriately and within current guidelines.

3.8 Environmental Considerations

Specific details relating to the environmental setting of the site are presented within the environmental database report included as Appendix 'B'. The salient issues which relate to the site are summarised as follows:

- There are no registered landfill sites within 2km of the site.
- There are three historic landfill sites within 1km of the site, the closest being 735m south east of the site last used in 1936 for commercial and household waste.
- There are two local authority pollution prevention and control authorised processes within 500m of the site, and a further eight within 1km of the site. The closest relates Direct Line Management Limited for respraying of road vehicles and is located 463m south west of the site.
- There are seventeen pollution incidents to controlled waters recorded within 500m of the site. The closest entry is 304m to the south, the pollutant type is not given and the incident was classed as Category 3 – a minor incident.
- There is one fuel station within 250m of the site and one within 500m of the site. The closest entry relates to M & W Motors located 228m west of the site and is no longer in use.
- There are forty-three contemporary trade directory entries within 250mm of the site, ninety-four within 500m of the site and two-hundred and thirty-one within 1km of the site. The closest entries to the site are detailed as follows;
  - Saints – breakdown and Recovery – Active (25m north west)
  - Reza Catering Equipment Ltd – Active (42m west)
  - Hamlyn Engineering Co Ltd –Precision Engineers – Active (77m west)
  - Jarzon Plastic Ltd – Injection Moulding – Inactive (77m west)
  - Hayes Town Bacon Co – Meat product manufacturers & wholesalers – Active (95m south)
  - Coolspan Ltd – Refrigeration Equipment – Inactive (99m south)
  - Airport Couriers – Road Haulage Services – Active (104m west)
  - Glebe Services Ltd – Photocopies – Inactive (115m south west)
- Reference to the Building Research Establishment (BRE) publication BR211 "Radon: guidance on protective measures for new dwellings" (2007 edition) indicates that the site is within an area where radon protective measures are **not** required in the construction of new dwellings.
- The site is not located within a Nitrate Vulnerable Zone.

- There are no sites of special scientific interest or national nature reserves within close proximity to the subject site.

4 Preliminary Conceptual Site Model

4.1 Introduction

A Conceptual Site Model (CSM) is a simplified written and/or visual or schematic description of the environmental conditions on the site and the surrounding area. It is developed from the individual components of the investigation at each stage to provide a depiction of likely contaminants, pathways and receptors, and highlights the key areas of uncertainty. Fundamental to the CSM is the principle of pollutant linkages.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

a) a source, i.e. a substance that is capable of causing pollution or harm;

b) a pathway, i.e. a route by which contaminants can reach the receptor.

c) a receptor, i.e. something which could be adversely affected by the contaminant;

If one of these elements is missing there can be no significant risk. If all three are present, then the magnitude of the risk is a function of the magnitude and mobility of the source, the nature of the potential migration pathway and the sensitivity of the receptor.

This form of risk assessment is referred to as a 'Source-Pathway-Receptor' risk assessment, and forms the basis for the production of a conceptual model of the site to assist the qualitative assessment of potential risks identified as part of this desk study, as detailed in the following section.

4.2 Potential Sources of Contamination

Based on the findings of the desk study and site walkover investigation detailed in the preceding sections, a preliminary conceptual model has been established for the site and is summarised below.

With reference to the findings detailed above, the following potential on site sources of ground contamination have been identified;

General Site Usage

- Potential for Made Ground associated with historic buildings on the site to have originated from an uncontrolled source with the potential for contamination by metals, metalloids, PAH's, asbestos etc.

- Potential for Made Ground used for backfilling the swimming pool which previously occupied the site to have originated from an uncontrolled source with the potential for contamination by metals, metalloids, PAH's, etc.

- Potential for asbestos within the Made Ground backfill of the former swimming pool. Asbestos was identified within the former swimming pool building prior to demolition as detailed in the Asbestos Survey Report refernced previously.

- Potential for TPH contamination within the soil underlying the site associated with the boiler room associated with the swimming pool.

4.3 Receptors of Contamination and Migration Pathways

Receptors are defined as human or non-human organisms that have the potential to experience adverse effects from direct or indirect exposure to contaminated material.

Migration pathways are defined as the courses chemicals take from a source to an exposed organism or receptor. The exposure pathway can be direct (i.e. stays within the same exposure media) or indirect transport from one medium to another can take place.

The following potential human health and environmental receptors have been identified (for the proposed commercial and residential properties):

- End users of the site who may come in contact with the soils (employees, customers and residents of the proposed development).

- Building structures and services placed in or on the ground (buried concrete and other construction materials within the ground including water supply pipes etc.).

- Site construction and maintenance workers during construction works.

Based on the proposed end use of the site and the ground conditions, the following potential contaminant pathways are potentially present, and considered within the CSM as follows:

Human Health

- **Inhalation**

  Breathing dust and vapours from contaminated soil in outdoor air. Vapours from volatile contaminants can also migrate into buildings resulting in inhalation by the residents.

- **Ingestion**

  Eating and swallowing of contaminated soil either by deliberate consumption, indirectly by eating or smoking with dirty hands or by ingestion of fugitive dust.

- **Dermal Contact**

  Direct contact with contaminated soil causing skin conditions such as dermatitis etc. Certain contaminants can be absorbed into the body through the skin or enter directly through open cuts or abrasions.

Groundwater

- **Leachate Generation**

  Mobile/leachable contaminants will generally migrate vertically down through any near surface permeable strata until meeting the water table, after which free / dissolved phases may potentially migrate beyond the site boundaries and impact off-site receptors.

- **Leachate Migration**

  Potential leachate could migrate to and impact on surface water quality in nearby watercourses.

Building Materials/Services

- **Aggressive Attack**

  Building materials can be damaged by direct contact with aggressive/contaminated ground, especially if mobile groundwater is present; for example sulphate attack on concrete.

4.4 Preliminary CSM Relationships

Based on the assumptions above, a preliminary CSM of pollutant linkages on the site has been developed and is summarised in Table 4.1 below bearing in mind the development proposals;

Table 4.1 Preliminary Conceptual Model

Source	Pathway	Receptor	Preliminary Assessment of Magnitude of Risks
Potentially Contaminated soil	Ingestion Dermal contact Inhalation (outdoor air)	Construction workers Future employees, customers and residents	Moderate
	Inhalation (indoor air)	Future employees, customers and residents s	Low
	Leaching	Groundwater	Low
	Aggressive attack	Building materials	Low
Potentially Contaminated groundwater	Ingestion Dermal contact Inhalation (outdoor air)	Construction workers	Negligible
	Inhalation (indoor air)	Future occupants	Negligible

	Lateral and vertical migration	Non Aquifer	Negligible
	Aggressive attack	Building materials	Negligible
Potential Ground Gases	Inhalation (indoor air)	Future employees, customers and residents	Low
	Inhalation (outdoor air)	Construction workers Future Residents	Low

To summarise, the preliminary conceptual model has identified some potential for ground contamination on the site, along with possible pathways for contamination to migrate and potentially impact sensitive receptors within the proposed development and the environment.

The findings of the conceptual model detailed above have been considered when implementing an intrusive investigation of the site.

5.0 Investigation Methodology

5.1 Objectives

Given the findings of the desk study searches and with reference to the preliminary conceptual model for the site as detailed in Section 4, the objectives of the intrusive investigation are as follows;

- To characterise the ground conditions across the proposed development area.
- To confirm potential pollutant linkages identified within the Preliminary Conceptual Site Model.
- To undertake a qualitative assessment of risks posed by any identified contaminants to the recognised receptors.
- To provide a preliminary geotechnical assessment of the proposed development area in the context of the proposed development.

The techniques adopted for the investigation have been chosen considering the anticipated ground conditions and development proposals on site, and bearing in mind the nature of the site, limitations to site access in some areas, services restricting areas of investigation and other logistical limitations.

The site work was carried out on the 23rd and 24th May 2013 and comprised window sampling and trial pitting under the supervision of Opus. The Exploratory Hole Locations are shown on the drawing MK J-M0167.00_01_R0 presented to the rear of this report.

Based on the desk study searches carried out for the site, the rationale for the positioning of the exploratory holes was to achieve good site coverage. In addition standard penetration tests (SPT's) were carried out within all the window sample holes to confirm the density of the underlying strata, near surface.

5.2 Clearance of Underground Services

Prior to commencing ground investigations, a walkover survey was carried out to identify the presence of underground services. Where underground services were suspected, exploratory

positions were relocated away from the suspected areas in the interests of health and safety. Statutory utilities plans were provided and exploratory holes were located away from any known services.

In addition to the above, the positions were scanned with a cable avoidance tool (CAT) as a further precautionary measure.

5.3 Site Works

All exploratory holes were logged by a qualified Opus Geo-Environmental Engineer generally in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'. Disturbed samples were taken at selected intervals from the strata encountered, placed in appropriate containers and submitted for geotechnical and chemical testing.

Exploratory hole records are presented as Appendix 'C'.

In situ standard penetration testing (SPT) was carried out in all of the exploratory boreholes to derive 'N' values, which can be used to assess the relative strength and density of encountered strata.

It should be noted that SPT 'N' values quoted within the borehole logs presented in Appendix " and referenced within this report, are presented as corrected values generally in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the 'N' values should therefore not be necessary. Raw field data is archived within the Opus project file and can be provided on request.

Fourteen machine excavated trial pits (TP1 to TP14) were carried out using a JCB 3CX type machine to depths of between 1.3m to 2.3m bgl.

Sixteen window sample holes (WS1 to WS16) were advanced using a tracked percussive Window Sampling rig to depths of between 1.90m to 5.45m below ground level (bgl) to provide good site coverage.

On completion the exploratory holes were backfilled with arisings.

Soil samples were placed in containers appropriate for the type of laboratory analysis to be undertaken. All samples were labelled following standard protocols to ensure the site location, borehole location, sample depth, sample type, date and job reference were all clearly identifiable.

Once soil samples were collected they were stored in cool boxes chilled with ice packs to preserve sample integrity as far as reasonably practicable. Subsequently the samples were transported to the laboratory under QA / QC controlled conditions employing a chain of custody system to ensure sample integrity prior to the laboratory testing.

5.4 Chemical Laboratory Testing – Soils

The programme of chemical tests was undertaken on samples obtained from the intrusive investigation to assess the levels of contamination within the strata encountered on the site with regard to identified receptors, as detailed within the Conceptual Site Model. This analysis was carried out at the MCERTS accredited laboratory of QTS Environmental Ltd, for suites of

determinands chosen bearing in mind the Conceptual Model for the site and the objectives of the investigation as detailed in Section 4.1.

In summary, the following analyses were carried out:

- General Screening suite (including metals, pH, Sulphate, Phenols, PAH's)
  (10 samples)
  Targeted at samples of near surface strata.

- Additional Metals Suites
  (10 samples)
  Targeted at samples of deeper soil including natural strata.

- Asbestos Screening
  (10 samples)
  Targeted at samples of Made Ground and fly tipped material.

- Total Petroleum Hydrocarbons (TPH) banded, including BTEX compounds
  (5 samples)
  Targeted at areas where fuel contamination is suspected or predicted.

- Total Organic Carbon
  (9 samples)
  Targeted at samples across the site to characterise mean organic content of the soils.

With regards to potential contamination, analysis was scheduled on separate soil types to allow a statistical analysis of results. The results of testing within Made Ground and natural soils were considered as two averaging areas for the purposes of statistical assessment in accordance with standard CLR11 methodologies.

Results of the chemical testing of soils are presented in Appendix 'D' along with a statistical assessment of the results in line with current guidelines.

5.5 Geotechnical Laboratory Testing

Representative samples were submitted to an approved and accredited laboratory and the following tests scheduled to determine soil properties as related to foundation design and construction.

- Aggressive ground suite – pH and water soluble sulphate.
  (18 samples)

- Plasticity Index Determinations and moisture content – Cohesive samples
  (5 samples)

Results of the geotechnical testing are presented within Appendix 'E'.

6.0 Results of the investigation

6.1 Strata Encountered

6.1.1 Topsoil

Topsoil was encountered at the surface in all the exploratory holes except for TP11, WS9, WS10, WS11 and WS14. The Topsoil was found to be up to 0.6m thick and generally comprised brown clayey sand.

No visual or olfactory evidence of contamination was observed within the Topsoil.

6.1.2 Made Ground

At the surface in the location of WS9, WS10 and WS14 asphalt hardstanding was encountered to a maximum depth of 0.20m bgl. There were no further layers of Made Ground underlying the asphalt surface in WS14. TP1, TP10, TP11 and TP14 were completed within the Made Ground strata at depths of between 2.50m and 3.30mbgl.

The encountered Made Ground underlying the initial layers of hard standing or Topsoil was variable in thickness and was of three distinct types.

The first Made Ground type was encountered within TP1, TP4, TP7 to TP11 inclusive, WS2, WS3, WS4, WS8, WS11, WS12, WS15 and WS16 and generally comprised brown sandy gravelly clay. Gravel is fine to coarse, angular concrete, brick, metal, plastic, tile, pipe and rare clinker,

The second type of Made Ground was encountered within TP1 to TP7 inclusive, TP10 to TP14 inclusive, WS1, WS7, WS8 to WS11 inclusive and WS13 and generally comprised light brown and grey sandy gravel. The gravel consisted of brick, concrete, metal, plastic, wood and tile. Frequent cobbles and boulders of concrete were present within the trial pits.

The third type of Made Ground type was encountered within WS5 and WS6 and consisted of soft to firm consistency orange brown slightly gravelly, sandy, silty clay. The gravel comprised fine to coarse, angular flint, brick and rare clinker.

SPT 'N' values obtained during the investigation within the second type of Made Ground revealed corrected 'N' values of 25 at 1m, 22 at 2m and 17 at 3m. A single SPT 'N' value of 22 was obtained from the first type of Made Ground. These values indicate a medium dense stratum in terms of density parameters.

No olfactory evidence of contamination was observed within the Made Ground. Clinker was observed within some layers of Made Ground as described above.

6.1.3 Lynch Hill Gravel

Strata interpreted as the Lynch Hill Gravel were encountered within all the exploratory holes except for TP1, Tp10, TP11 and TP14 which did not fully penetrate the Made Ground and were of either a cohesive or granular nature.

The granular Glacial Deposits were encountered within TP1 to TP9 inclusive, TP12, TP13, WS1 to WS11 inclusive and WS13 to WS16 inclusive at depths of between 0.10m to 3.8m bgl and proved to

a maximum depth of 4.4m bgl in WS8. The granular deposits encountered consisted of medium dense becoming very dense orange brown and black sandy gravel, or sand and gravel. The gravel comprised fine to coarse, angular to rounded flint.

The cohesive Glacial Deposits encountered in all the exploratory holes except for TP2, TP3, TP5 to TP9 inclusive, WS2 to WS6 inclusive and WS9 to WS16 inclusive at depths of between 0.40m and 2.80m bgl to a maximum depth of 4.44m in WS10. The stratum was generally described as firm consistency, high strength brown and grey gravelly sandy clay. The gravel, where present comprised fine to coarse, angular to rounded flint.

Within WS10 and WS11 black organic bands were noted between 1.1m to 2.5m bgl which are known to exist within the Lynch Hill Gravel strata.

SPT 'N' values obtained during the investigation within the cohesive Lynch Hill Gravels revealed corrected 'N' values in the range 5 to 46 indicating a soft to stiff consistency, very low to high strength clay strata.

SPT 'N' values obtained during the investigation within the granular Lynch Hill Gravels revealed corrected 'N' values in the range 13 to 68 indicating a medium dense to very dense granular strata.

All of the window sample holes, except for WS11 were completed at depths of between 1.9m to 4.44mbgl within the Lynch Hill Gravels at the refusal of the equipment with SPT's of a maximum of 50 blows (before any correction).

The seven hand shear vane results from within the cohesive Lynch Hill Gravel deposits within the trial pits gave results in the range of 65kPa to 89kPa indicating a firm to stiff consistency, medium to high strength strata. It is noted that the hand shear vane data is limited and therefore the SPT 'N' values should be used for design purposes as they give a more detailed general coverage of the site.

No visual / olfactory evidence of contamination was noted within the Lynch Hill Gravels.

6.1.4 London Clay Formation

Underlying the Lynch Hill Gravel in WS11 strata identified as the London Clay Formation was encountered at 2.90m and proved to the base of the hole at 5.45m bgl. The strata comprised an initially very soft consistency, becoming firm to stiff consistency brown, and yellow sandy clay to 3.95m bgl. From 3.95m bgl to 5.45m bgl the strata comprised firm to stiff consistency dark purple brown slightly sandy clay.

SPT 'N' values obtained during the investigation within the London Clay Formation revealed corrected 'N' values of 6 and 11 indicating a firm consistency, medium strength strata.

No visual / olfactory evidence of contamination was noted within the London Clay Formation.

6.2 Groundwater Observations

Groundwater was encountered within TP1, TP5 and TP10 at depths of between 2.50m and 3.00m bgl with both Made Ground and natural strata's.

6.3 Tree Roots

Roots were encountered within all of the exploratory holes except for WS9, WS10, WS11 and WS14 to a maximum depth of 0.6m (WS1).

6.4 Chemical Testing (Soils)

6.4.1 Introduction

This investigation has included testing for soil contaminants within shallow soil samples taken from across the site. The testing carried out can be summarised as follows;

- General Screening suite (including metals, pH, Sulphate, Phenols, PAH's) **(10 samples)**
- Additional Metals Suites **(10 samples)**
- Asbestos Screening **(10 samples)**
- Total Petroleum Hydrocarbons (TPH) banded, including BTEX compounds **(5 samples)**
- Total Organic Carbon **(9 samples)**

The results of the chemical testing on soil samples have been reviewed in accordance with the legislative framework and criteria set out in Appendix 'D'.

The Contaminated Land Exposure Assessment (CLEA) methodology has derived four 'generic' land use scenarios, for the assessment of potential contamination, namely residential (with home-grown produce), residential (without home grown produce), allotment and commercial.

The proposed end use of the site, which is a Lidl supermarket and residential properties (assumed to have private gardens), is considered to comply with a 'commercial' and a 'residential (with home grown produce)' end usages. At this stage to provide a preliminary assessment of any significant contamination, a 'residential with homegrown produce' end use (the more sensitive end use) has been adopted given the intended differing end uses of the site. Opus therefore refers initially to Soil Guideline Values (SGV's) or our In House Screening Values (IHSV's) relating to a residential (with home grown produce) end use.

Where SGV's or Opus IHSV's are not published for certain compounds, reference is initially made to any results exceeding the laboratory detection limit to flag up these results for subsequent discussion and assessment.

Should the nature of the proposed development change significantly it may be necessary to re-evaluate the contamination results and recommendations presented within this report.

Metals and PAH results have been split into separate data sets for statistical assessment purposes. Statistical results are therefore presented within Appendix 'D' as separate spread sheets for metals and PAH's.

Total Organic Carbon (TOC) values have been proved in the range 0.3 – 6.9% for the nine samples analysed. Consideration of the data set for TOC in the samples indicates that the mean TOC value is 2.1%. This is equivalent to a Soil Organic Matter (SOM) of 3.65% On this basis, for organic parameters, the 3.0% Soil Organic Matter scenario has been utilised for assessment purposes to be conservative in the first instance.

Based on the above methodology, chemical testing of the soil samples has recorded the presence of the following contaminants of concern.

6.4.2 Metals and Metalloids

A statistical analysis of results for metals and metalloids indicates that all parameters have calculated US95 values below the relevant SGV or IHSV's, indicating an absence of significant contamination by these compounds/elements in both Made Ground and natural strata.

6.4.3 PAH's and Phenols

The results for PAH's and Phenols can be summarised as follows;

The statistical mean and maximum value tests undertaken on the PAH results for all the samples tested, indicate that the statistical 95th Percentile values (US95) for the determinands tested are all below the relevant Opus IHSV's except for benzo(a)pyrene within the Made Ground in WS2 and WS3.

The 95th percentile for Benzo(a)pyrene within the Made Ground is 0.99mg/kg which marginally exceeds the Opus IHSV of 0.96mg/kg for a residential with home grown produce end use. It is noted that WS2 and WS3 are within the area of the proposed Lidl supermarket, therefore if the results are compared to the relevant Opus IHSV for a commercial end use which is 14mg/kg the results do not exceed the guideline value. If the proposed location of the Lidl supermarket remains the same no remediation is required, however if the layout changed and a residential end use is proposed for the area of WS2 and WS3 then some remediation may be required.

In addition to the above, all of the results for Phenols are below the laboratory detection limit, indicating an absence of significant contamination from these parameters.

6.4.4 Asbestos

Nine soil samples and one sample from some fly tipped insulation boarding were tested for asbestos presence/absence. All of these results were negative indicating an absence of asbestos within the Made Ground and the fly tipped material at the site.

6.4.5 TPH and BTEX Compounds

The results for speciated TPH and BTEX compounds in the vicinity of the former swimming pool boiler room and across the site are all below the laboratory detection limits.

6.4.6 Summary of Findings

In summary the investigation has proved an absence of significant soil contamination with the exception of marginally elevated benzo(a)pyrene contamination within WS2 and WS3 and in particular the areas close to the boiler room appear to be unaffected by TPH contamination.

Recommendations relating to the chemical results detailed above are provided within Section 8 of this report.

6.5 Geotechnical Testing

The results of geotechnical testing for pH and sulphate carried out during this investigation are included alongside the chemical testing data in Appendix 'D'. The plasticity indices and moisture content test results are included within Appendix 'E'.

The water soluble sulphate content and pH values determined for selected samples taken from across the site have proved values in the following ranges;

- Total Sulphate as SO4 <200 to 8345mg/kg
- Water Soluble Sulphate (SO4) 0.02 to 0.36g/l
- Total Sulphur <200 to 2317mg/kg
- pH 6.9 to 12.1 pH units

In addition to the above, the results of the Plasticity Index testing and moisture content determinations have been proved in the following ranges;

- Plasticity Index 32 – 45%
- Moisture Content 23 – 28%

Plasticity Index values have been proved in the range 32 to 45%. When modified to account for the percentage retained on a 425um sieve the Modified Plasticity Index (MPI) values lie in the range 19 to 33% which indicates soils of a 'medium volume change potential' in accordance with NHBC Chapter 4.2 requirements.

Geotechnical recommendations relating to the above results are included within Section 9 of this report.

Assessment & Recommendations

7 Introduction

This report has been prepared to provide preliminary information specific to the ground conditions at the site. It is understood that the proposed development comprises a Lidl supermarket and/or residential housing (assumed to have private garden areas).

Recommendations made within this report should be considered to be preliminary and subject to confirmation once development proposals and structural details are finalised. In particular the recommendations for foundation designs for the proposed development will be largely dependent on the nature and magnitude of imposed loads associated with the structures.

Given the nature of the proposed development, this investigation has been carried out on the assumption that the final development of the site will conform to the 'residential with homegrown produce' land use scenario in accordance with the Contaminated Land Exposure Assessment (CLEA) methodology.

Should the proposed site usage change significantly from the above, the contents of this report will require review and amendment as appropriate.

Unless otherwise stated, Opus International Consultants (UK) Ltd will not undertake any desk study searches or risk assessments for potential unexploded ordnance, and we therefore cannot be held liable for any delays or costs incurred either directly or indirectly as a result of the identification of unexploded ordnance risks on the site, or for losses incurred either directly or indirectly as a result of accidental detonations of ordnance on site during investigations and / or subsequent development works.

8 Environmental Assessment

8.1 Soil Contamination Summary

The findings of this investigation have been assessed in relation to a combination of specific site characteristics as identified in the Conceptual Model within Section 4 of this report and with reference to the proposed future site end-use.

The geology underlying the site has been classified as a non-aquifer however groundwater was encountered during the site works within the Made Ground and Lynch Hill Gravel at depths of between 2.5m and 3.0m bgl. It is likely that the groundwater is perched above the impermeable London Clay Formation.

Potential sources of contamination have been targeted by the intrusive ground investigation and chemical analysis of the retrieved soil samples has been specifically tailored to the identification of potential 'contaminants of concern', based on the desk study searches and the findings of a walkover survey of the site.

The desk study and walkover survey highlighted the location of the boiler room in the former swimming pool basement structure and this area was targeted with specific contamination testing. Other areas were subject to a general screening suite to include metals, PAH's, phenols and asbestos.

The results of the soil contamination testing indicate that all of the contaminants tested for were below the Opus IHSV's version 2009.2 with the exception of benzo(a)pyrene where the 95th percentile exceeded with guideline value for a 'residential with homegrown produce end use'.

The two samples which exceeded the Opus IHSV for a residential with 'homegrown produce end use' were taken from Ws2 and WS3 which are both currently location beneath the footprint of the proposed Lidl supermarket. When compared to the IHSV for a commercial end use the test results and the 95th percentile do not exceed the SGV therefore providing the location of the proposed Lidl supermarket does not change, and the residential development is kept to the rear and not in the area of WS2 and WS3 it is considered that there is no need for any remediation of the site.

If the site layout changes Opus should be consulted to reappraise the recommendations with regards to contaminated land.

Based on the above, providing the location of the Lidl supermarket does not change no contaminants of concern have been identified for the study site.

All samples tested for the presence of asbestos were negative including the sample taken from the fly tipped boarding.

Therefore in conclusion, based on the available data and findings to date, it is considered that remedial measures will not be necessary with regards to human health risks to ensure the safety of end users of the site.

In addition to the above, it is noted that no radon protection measures are required for the proposed development.

8.2 Recommended Remedial Strategy

Based on the findings of this investigation, the following measures are considered necessary to be protective of the identified receptors:-

8.2.1 Protection of Human Health & Controlled Waters

Should any unexpected significant contamination be encountered as development works progress, Opus should be consulted to undertake further site investigation deemed necessary and an appropriate remediation strategy should be formulated following inspection by a suitably qualified Geo-Environmental Engineer.

In addition to the above, site workers should adopt suitable health and safety measures to be protective of health for the duration of construction works, especially where operatives are likely to be coming into contact with soils.

An asbestos survey was carried out prior to demolition of the former swimming pool building. No evidence of asbestos within the Made Ground was found during the investigation therefore it is assumed that the asbestos present was dealt with appropriately and following current guidelines.

Once any below ground obstructions such as old drains etc. have been dealt with, it will be necessary to carry out a shallow reduced level dig to remove any topsoil from the development footprint. This topsoil should be carefully stockpiled on site and protected from contamination during construction work so that it can be re-used within gardens and landscaped areas within the completed development.

8.2.2 Summary

The identified receptors are not considered to be at significant risk from shallow soils within the study area, provided that the above recommendations are adhered to during the development of the site.

8.3 Re Use of Arisings

The reuse of clean natural materials (from say foundations etc.) on the site is generally acceptable provided that certain defined specific conditions are met. These conditions would include the material being "uncontaminated"; the material being suitable for use with no requirement for pre-treatment; there must be a certainty over the re-use and the quantities must be limited to those necessary for the specified works.

If re-use of arisings is envisaged, it will be essential to show that a material balance calculation has been carried out, to allow for the re-use of the arisings, rather than simply creating 'landscape mounds'.

Additionally, there will be a requirement to show that there will be no environmental impact; this may well require a quantitative risk assessment with regards to Controlled Waters and Human Health depending on the nature of the contamination. A Waste Management Exemption or Material Management Plan is normally required where re-use of arisings or significant earthworks operations are envisaged.

With regard to the movement of materials between sites, the current Environment Agency policy is that any soil taken off a site and moved to another development site would be regarded as a waste. As such the re-use of this material on sites other than that on which it had been generated, would require a waste management license or a registered exemption at the site where it was proposed for re-use.

8.4 Gas Risk Assessment

The desk study searches did not highlight a gas risk for the site therefore a gas risk assessment was beyond the scope of this report.

There are no requirements for radon protection for the proposed development.

8.5 Health & Safety

During the construction of the development, a high standard of health and safety awareness should be maintained in order to protect construction workers from exposure to potentially contaminated soil. It is therefore recommended that the appropriate precautions given in Health and Safety Executive Report HS(G)66 'Protection of workers and the general public during the redevelopment of contaminated land' are adopted.

It is our judgement that The Construction Design and Management (CDM) Regulations 2007 (regulation 3) will apply to this project. As a designer we have a responsibility to inform you of your duties to which you are subject by virtue of the Regulations as specified in regulation 11 (1).

We therefore draw your attention to the CDM Regulations 2007 and the Approved Codes of Practice contained therein.

8.6 Waste Disposal

If any excavated soils are to be removed from site, it may be necessary to undertake Waste Acceptance Criteria (WAC) testing to classify the waste for disposal purposes. WAC analysis and waste classification is beyond the scope of works for this project.

8.7 Service Pipes

Given the history of the site and the low contamination levels reported, the use of standard plastic supply pipes (such as HDPE) may be appropriate. However, if contamination is encountered during construction, protective measures will probably be required.

It is recommended that the water supply utility company is contacted for confirmation prior to any construction work commencing on the site.

8.8 Regulatory Liaison

It is recommended that the above recommendations are agreed with the Local Authority (Environmental Health and Planning) and the Environment Agency (where appropriate) prior to commencing work on site, especially where planning conditions relating to environmental assessment are outstanding for the proposed development.

9 Geotechnical Assessment

9.1 Introduction

Opus is not aware as to the precise details or form of construction that may be utilised for the proposed development and thus the precise loadings may need to be carried by the foundations. Subject to review, as and when these details become available, a range of foundation options may therefore be appropriate. The following discussion of foundation options should therefore be regarded as preliminary and subject to review as and when the detail of the intended development and the associated foundation loadings are known.

The proposed development of the site consists of a Lidl Supermarket to the south eastern area, and a residential development in the north western area.

The Topsoil and Made Ground proven during the investigation is considered to be unsuitable for the support of foundations. Made Ground was encountered to a maximum depth of 3.8m bgl in WS8 and the base was not proved within TP1, TP10, TP11 and TP14 which were located in the western area where the deeper end of the former swimming pool was located. The fill within the swimming pool area contained frequent cobbles and boulders of concrete which will need to be penetrated by any foundations.

It is known that the Lynch Hill gravel can contain organic layers, a thin layer was identified within the ground investigation and these should not be used to support foundations. If these layers are encountered within the excavations foundations should be deepened appropriately.

Former Swimming Pool and Basement Areas

The fill within the former swimming pool and basements appeared to be poorly sorted and not engineered. It was unstable and contained wood and metal indicating it hadn't been screened or crushed to a specific grade. It would be advisable to excavate the fill to a specified depth, crush and screen the material and replace to an engineered specification suitable for rafting foundations across. Alternatively the Made Ground could be excavated for off-site disposal and replaced with a compacted clay fill to allow foundations to be excavated through, however due to the depth of the Made Ground possibly being greater than 3.8m bgl in some areas this is not considered to be feasible. It is noted that the deepest Made Ground is encountered during the investigation located in the proposed residential area. The maximum depth of Made Ground in the south eastern area was 2.4m bgl, where the supermarket is proposed to be constructed.

The area where the deeper end of the former swimming pool is located and foundations are likely to require piling or the area to be engineered as discussed above.

Remainder of Site

Foundations for the rest of the site could be traditional strip, pads or raft foundations, however founding depths will vary depending on tree influence, Made Ground depth, and nature of the Lynch Hill Gravels.

The superficial deposits of Lynch Hill Gravels encountered underlying the site are variable and were either a cohesive or granular nature. In addition the depth to the London Clay Formation was only proved at one location and is likely to be at varying depths across the site; therefore to prevent

differential settlement where foundations span from cohesive to granular layers, foundations will require reinforcement.

The cohesive Lynch Hill Gravels underlying the site have been assessed to be of a medium volume change potential and a minimum foundation depth, outside the influence of any trees should be 0.75m bgl.

On the basis of the SPT 'N' values obtained, based on the above (assuming the Topsoil, Made Ground and any locally soft strata is fully penetrated by foundations), traditional strip foundations bearing onto the Lynch Hill Gravels, 0.60m wide, may be designed using an allowable net bearing pressure of 110kN/m² at 1.00m bgl, 130kN/m² at 2.0mbgl and 150kN/m² at 3.00m bgl, which would normally be adequate to accommodate loads from the proposed structures.

Where foundations are deepened, due to the depth of Made Ground or tree influence, foundations should be stepped accordingly. For the residential development foundations should be stepped in accordance with NHBC standards.

If, due to the depth of Made Ground or tree influence strip foundations are not cost effective or practical due to the required depth a piled foundation solution would be appropriate. If this is the case then piling contractors should be contacted to confirm the likely parameters for construction, with reference to the likely magnitude of imposed loads. Deep boreholes will be required to assist pile design.

Due to the large boulder size lumps of concrete within the Made Ground of the backfilled swimming pool it is advised that the piling contractor is contacted to ensure that they can penetrate the large potential obstructions.

The precise type and design of piled foundations for the development should be determined following consultations with an appropriately qualified and experienced piling contractor. Driven or pre-bored piles may be appropriate and the final design will be largely dictated by economic and site logistical factors.

Any foundation trenches should be inspected by a suitably qualified Geotechnical Engineer to confirm the suitability of the bearing strata due to the potential for organic layers and the variable nature of the underlying natural strata.

Final designs for the foundations should be carried out by a suitably qualified Engineer based on the findings of this investigation and with reference to the anticipated loadings and serviceability requirements for the structure.

9.2 Floor Slab Design

Due to the thickness of Made Ground and the influence of trees across the site along with the variable and sometimes cohesive nature of the Lynch Hill Gravels, suspended floor slabs will be required given the low geotechnical strength of near surface soils.

Final designs for the floor slabs should be carried out by a suitably qualified Engineer based on the findings of this investigation and with reference to the anticipated loadings and serviceability requirements for the structure.

9.3 Building Near Trees

The site is occupied by some semi-mature and trees, mainly close to the site boundaries, some of which will have an influence on foundation depths.

For the proposed development the design guidance provided within NHBC Chapter 4.2 should be adhered to for residential properties with regards to building near trees and the potential volume change potential of clayey strata.

Near surface soils are generally classified as a medium volume change potential with reference to NHBC Chapter 4.2.

9.4 Demolition and Construction

Where any significant obstructions (old foundations, drain runs, basement structures etc.) are encountered then these should be chased out and the position, extent and depth of any resultant voids should be recorded for future reference as this could influence foundation designs for the proposed development. Where deep voids are to be in-filled the advice of an Engineer should be sought to ensure that a suitable earthworks specification is achieved so as to minimise impacts of designs for foundations / floor slabs etc.

It is generally anticipated that excavations within the near surface strata should be readily achieved using conventional plant (JCB 3CX or similar). However, obstructions (old foundations, drain runs, basement structures etc.) may be encountered, associated with previous phases of development and may require a higher specification of plant and /or breaking out. It is anticipated that excavations will encounter collapsing ground, especially in the area of the backfilled former swimming pool where granular Made Ground was encountered.

Shallow groundwater is likely to be encountered within the Made Ground and the Lynch Hill gravels perched on top of clay layers and at varying depths. Sump and pump dewatering techniques should be adequate to deal with any localised groundwater entries in shallow excavations.

The results of the pH and sulphate analysis have been assessed for potential aggression to buried concrete in accordance with the Building Research Establishment: Special Digest 1: Concrete in Aggressive Ground. It is considered, with reference to the desk study review findings, that the site can be classified as a brownfield, pyritic site with regard to aggressive ground risks.

With reference to BRE Special Digest No 1 "Concrete in Aggressive Ground" and noting the above results, the site can be classified as Design Sulphate class DS-2 and ACES Class AC-2 assuming mobile groundwater conditions.

The specific concrete mixes for the Design Concrete Class (DCC) to be used on site will be determined by the site specific concrete requirements in terms of the required durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM), detailed in Part 2 with further guidance in Parts 3 and 4 of BRE Special Digest 1.

9.5 Pavement Design

At this stage, with reference to SPT 'N' values, shear vane data and Plasticity Index results, it is suggested that CBR values of around 4 to 6% should be assumed for the design of any access roads/pavements founded within the possible Made Ground or near surface natural strata. This assumes that any below ground obstructions will be grubbed up and any voids or soft spots will be backfilled and compacted with suitable crushed aggregate to achieve an appropriate standard of compaction.

Actual CBR values should be confirmed by appropriate testing in accordance with the Local Highways Authority requirements (where appropriate), or other relevant design requirements which might be specific to the proposed end use of the site.

9.6 Soakaways/Drainage

Due to the presence of the variable Lynch Hill Gravels soakaway are likely to be feasible in some areas where the gravels are close to the surface. However due to the variable nature of the underlying strata soakaways may not be feasible in all locations.

If it is desirable to adopt soakaways on this site then soakaway testing in accordance with BRE:365 would be required to provide design parameters. Targeted soakaway testing should be carried out in the proposed locations of any soakaways to confirm to confirm the infiltration rates. Soakaway testing should be carried out within gravel filled pits due to the unstable nature of the natural gravels underlying the site.

9.7 Design Recommendations

Any design recommendations made within this report are considered the most appropriate considering a number of factors including investigation findings, financial and safety implications. All design recommendations are considered to be achievable within a safe system of work. During construction due consideration should be taken in relation to the safety implications inherent in the chosen construction method.

Any design recommendations suggested within this report should be carried out in line with current best practice and regulatory requirements. It is considered that the contractor carrying out any recommendations contained within this report will be aware of the standard construction processes involved and have detailed knowledge of the relevant health and safety measures.

10 Further Recommendations

The following further works have been recommended prior to the development of the site:-

a. Finalisation of geotechnical designs for the proposed development with reference to a finalised planning layout, the magnitude of imposed structural loadings, and following consultation with a design engineer.

b. Inspection of any shallow foundation trenches by a suitably qualified Geotechnical Engineer.

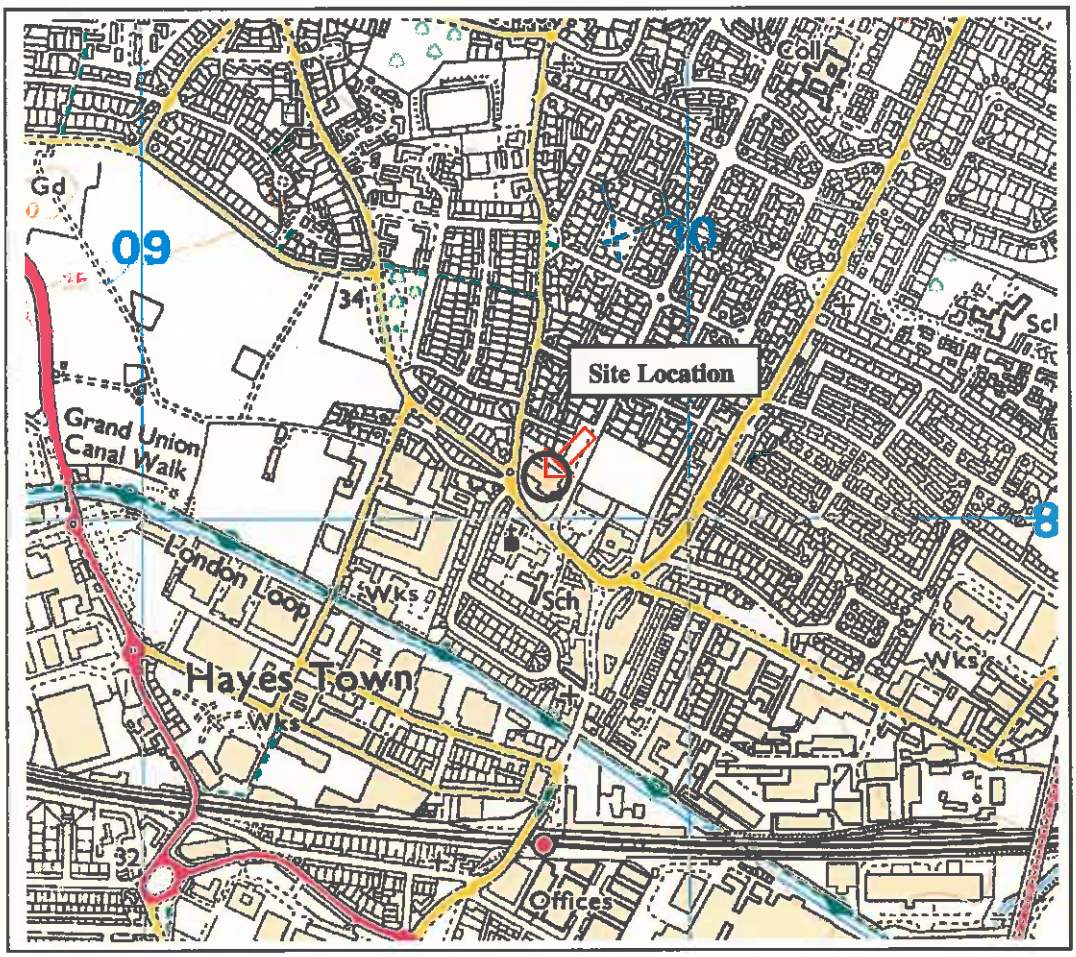
c. Target Soakaway testing in accordance with BRE:365 once the development layout and drainage scheme has been confirmed if soakaways are required.

d. If a piled foundation solution is adopted, deep boreholes will be required to confirm the soil parameters for pile design.

e. Confirmation of the water supply pipe specification with the appropriate authorities prior to construction.

DRAWINGS

Site Location Plan



	BY	CHECKED	DATE
DESIGN	ES	NM	Jun13
DRAWN	ES	NM	Jun13
APPROVED:			

OPUS
Milton Keynes Office
Letchworth House
2 Chesney Wold
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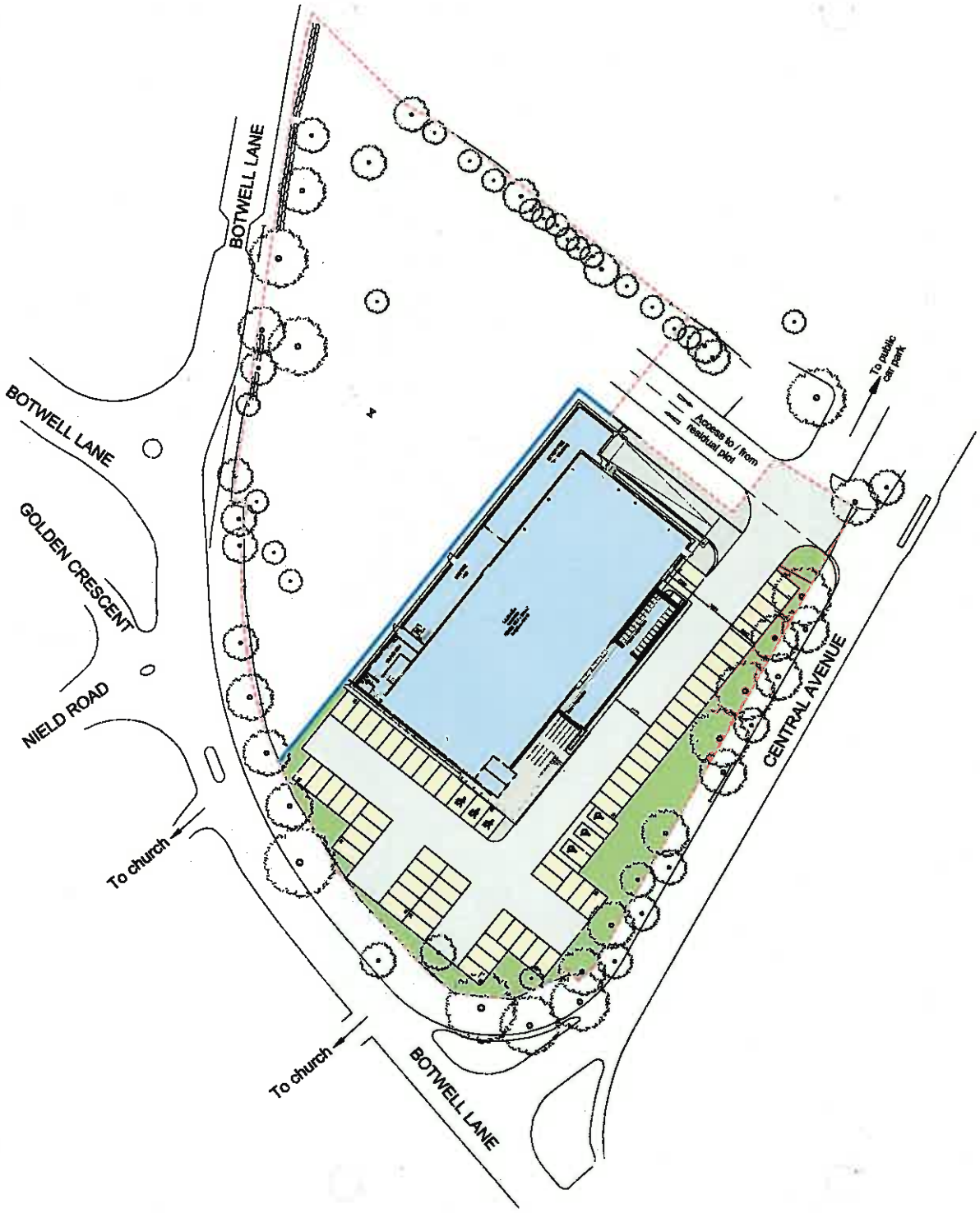
MK6 1NE
Tel: 01908 693021
Fax: 01908 201587

Site:	Botwell Lane, Hayes		
Client:	Lidl UK GmbH		
Status:	For Information	**File:**	J-M0167.00
Scale:	Not to scale	**Date:**	June 2013
Drawing Number:	MK J-M0167_100_P1		



SITE AREA 0.53 ha (1.31 acres)

70 PARKING SPACES

POOLE & PATTLE chartered architects

PROPOSED LIDL, CENTRAL AVENUE, HAYES	MARCH	1:500 @ A2
PROPOSED SITE LAYOUT	3176	01 B

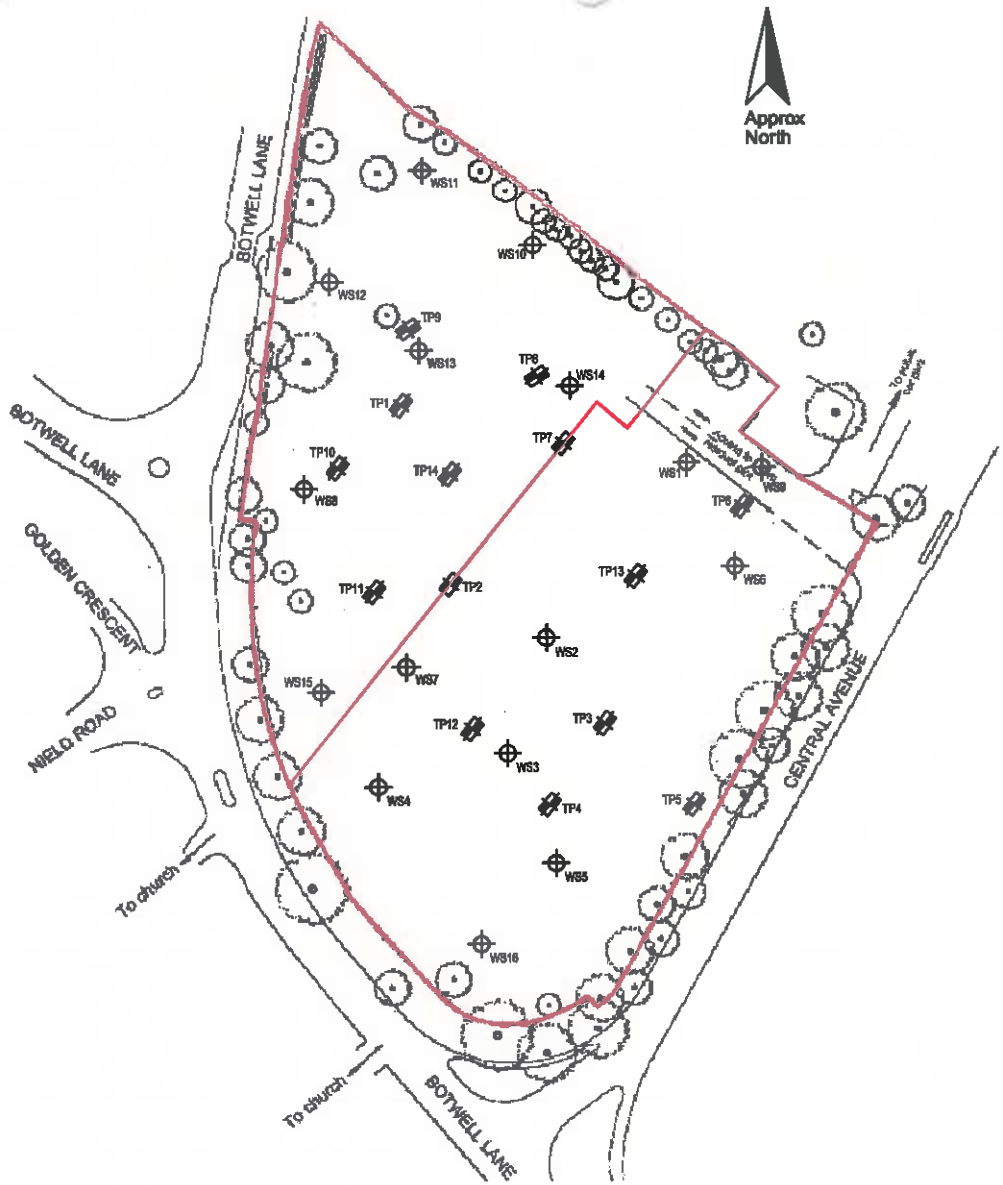
NOTES

1. DO NOT SCALE.
2. This drawing is to be read in conjunction with all other relevant drawings.
3. All boundaries are approximate.

KEY

WS1 — Approximate Location of Window Sample Boreholes (Opus May 2013)

TP1 — Approximate Location of Trial Pits (Opus May 2013)



FOR INFORMATION

Lidl UK GmbH	OPUS Milton Keynes Office	Project: Botwell Lane, Hayes	
	Drawn: MF; Designed: BB; Approved: ; Rev/Last Chk'd:	Title: Exploratory Hole Location Plan	
	Project No.: J-M0167	Scale: Not To Scale	Drawing No.: MK J-M0167.00 — Sheet No.: 01 — Revision: R0

1:1 @ A3 — 0 10 20 30 40 mm

APPENDIX A

Photographic Plates

Plate 1: View north showing eastern site boundary and fly tipping on site.

Plate 2: View west showing area of former swimming pool.

Plate 3: View north showing area of former swimming pool.

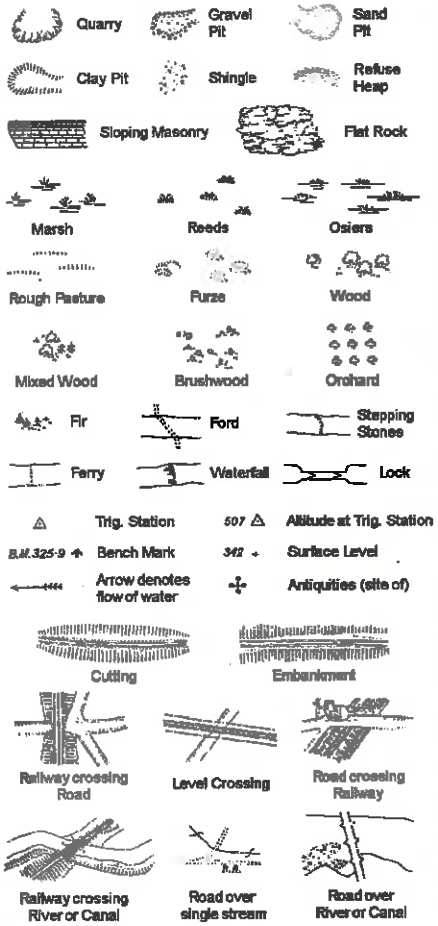
Plate 4: View north showing former car park.

APPENDIX B

Environmental Database Report

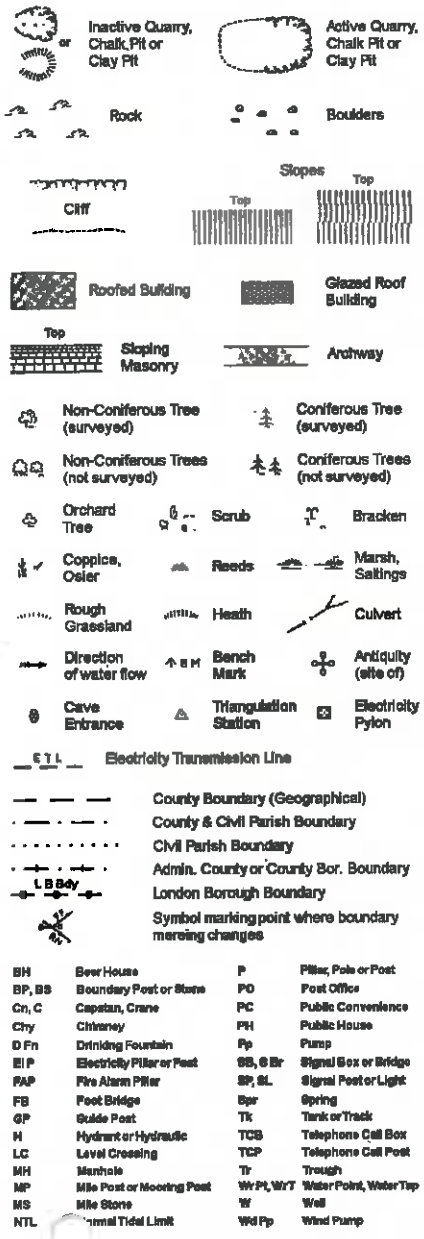
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



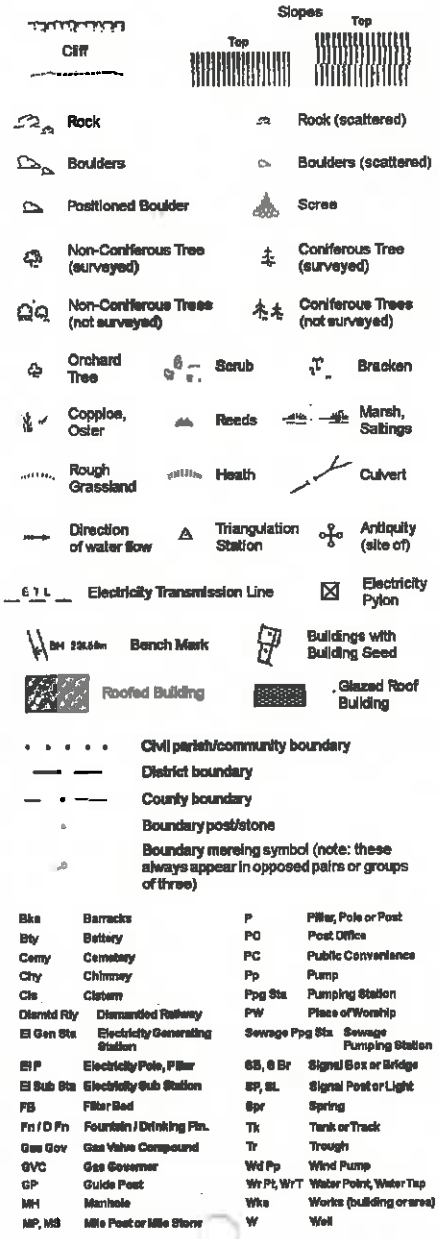
B P B S	Boundary Post or Stone	*P.C.B*	Police Call Box
B.R.	Bridle Road	*P*	Pump
E.P	Electricity Pylon	*S.P*	Signal Post
F.B.	Foot Bridge	*St.*	Stable
F.P.	Foot Path	*Sp.*	Spring
G.P	Guide Post or Board	*T.C.B*	Telephone Call Box
M.S	Mile Stone	*Tr.*	Trough
M.P M.R	Mooring Post or Ring	*W*	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



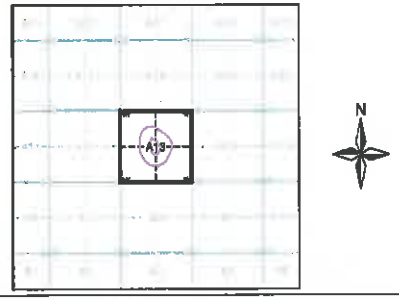
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governor	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

OPUS

Historical Mapping & Photography Included:

Mapping Type	Scale	Date	Pg
Middlesex	1:2,500	1866	2
Middlesex	1:2,500	1866	3
Middlesex	1:2,500	1875 - 1894	4
Middlesex	1:2,500	1895	5
Middlesex	1:2,500	1914	6
Middlesex	1:2,500	1934 - 1935	7
Historical Aerial Photography	1:1,250	1947	8
Ordnance Survey Plan	1:1,250	1961 - 1965	9
Ordnance Survey Plan	1:2,500	1962 - 1967	10
Additional SIMs	1:2,500	1964	11
Additional SIMs	1:1,250	1965 - 1982	12
Ordnance Survey Plan	1:1,250	1970 - 1975	13
Supply of Unpublished Survey Information	1:1,250	1973 - 1976	14
Additional SIMs	1:1,250	1984 - 1986	15
Ordnance Survey Plan	1:1,250	1985	16
Large-Scale National Grid Data	1:1,250	1991 - 1992	17
Large-Scale National Grid Data	1:1,250	1993 - 1997	18
Large-Scale National Grid Data	1:1,250	1994	19

Historical Map - Segment A13



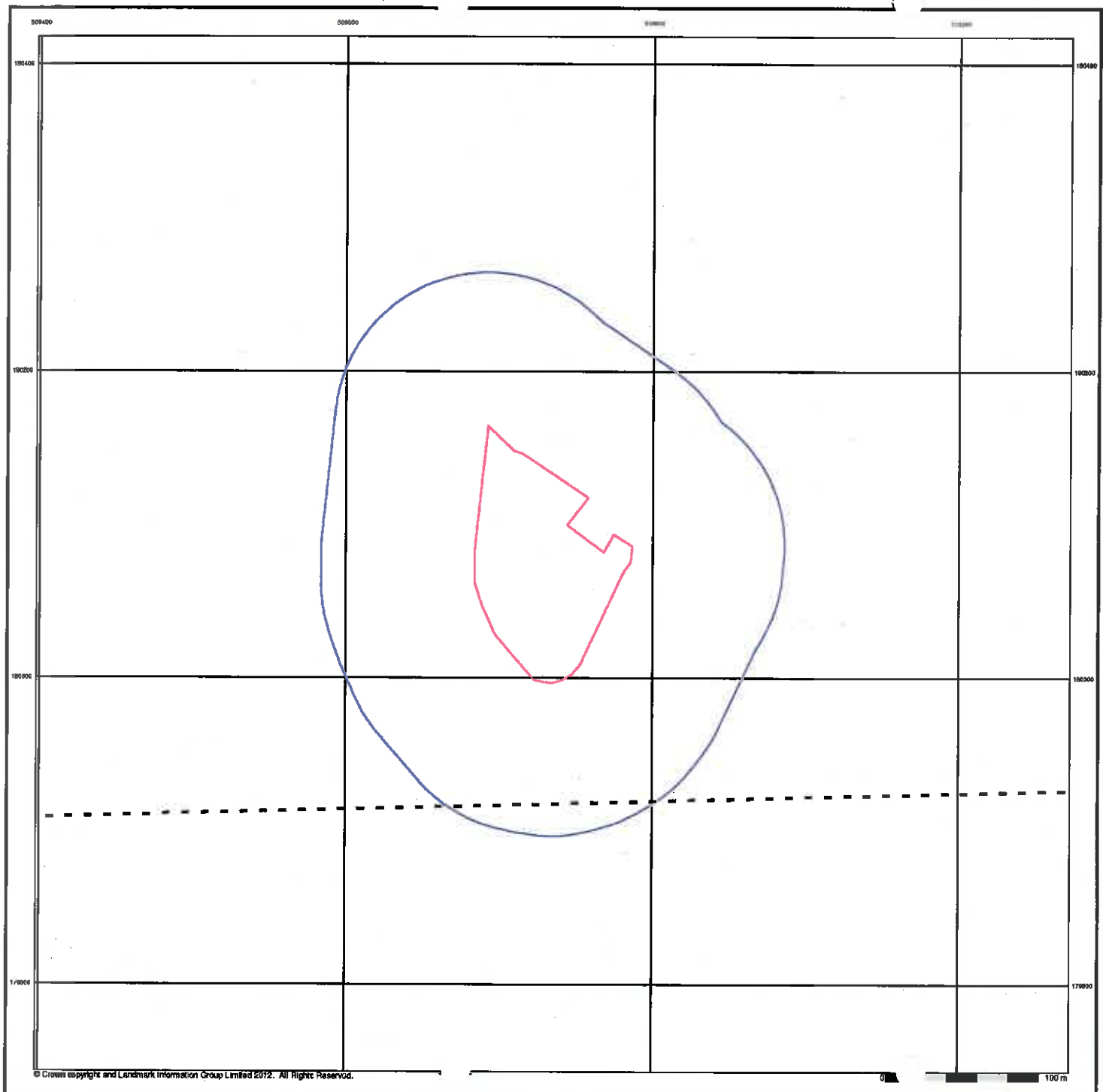
Order Details

Order Number: 46303056_1_1
Customer Ref: J-M0167.00/MK001
National Grid Reference: 509730, 180080
Slice: A
Site Area (Ha): 1.01
Search Buffer (m): 100

Site Details

Hayes Swimming Pool, Botwell Lane, HAYES, Middlesex, UB3 2BG

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



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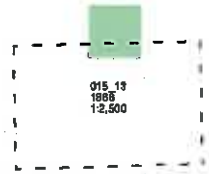
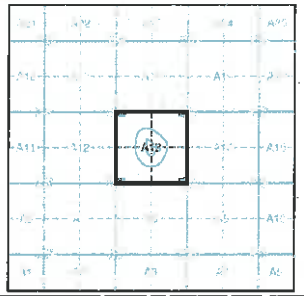
Middlesex
Published 1866
Source map scale - 1:2,500

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 and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1936, 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.

Map Name(s) and Date(s)



Historical Map - Segment A13



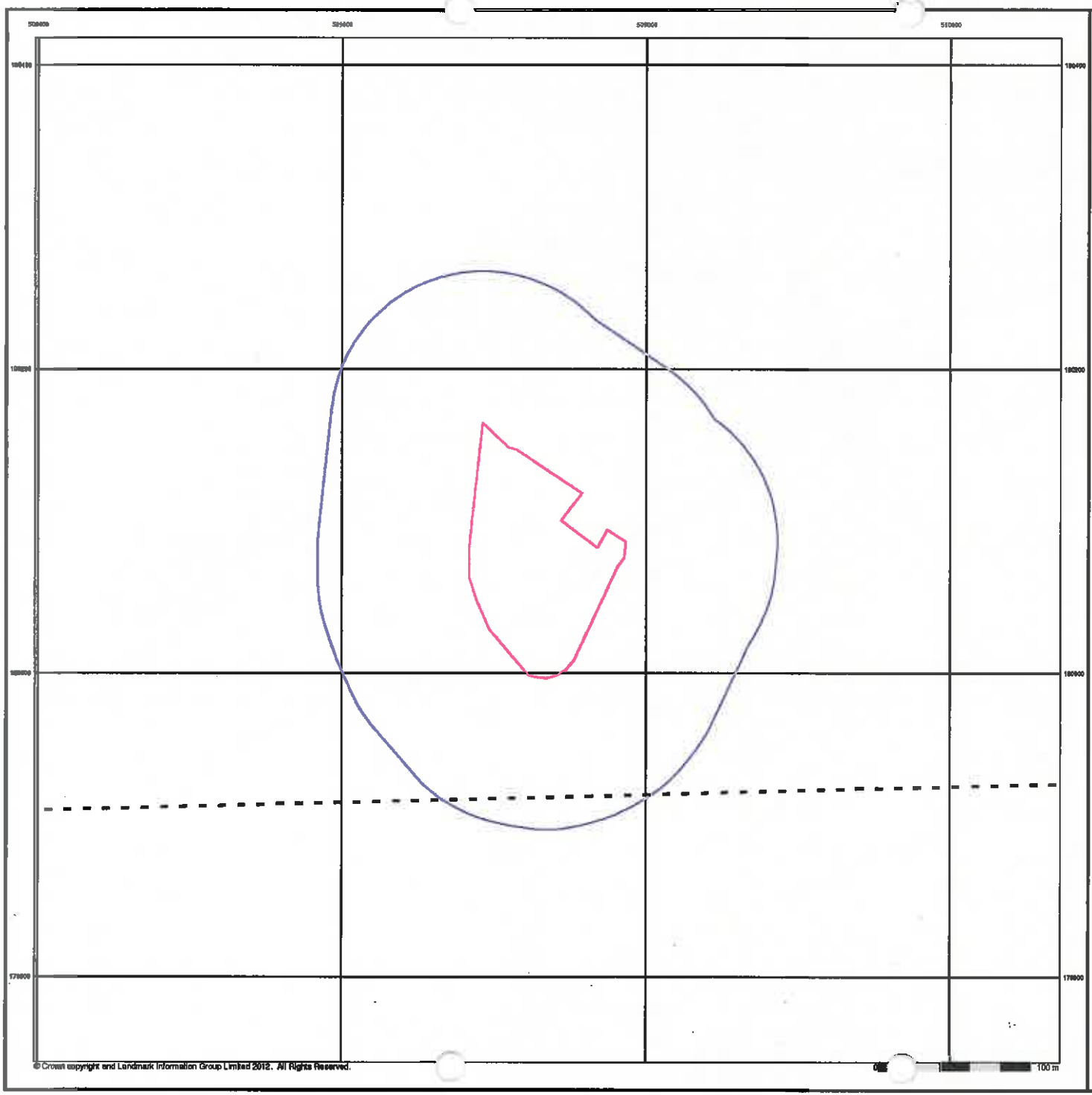
Order Details

Order Number:	46303056_1_1
Customer Ref:	J-M0167.00/MK001
National Grid Reference:	509730, 180080
Slice:	A
Site Area (Ha):	1.01
Search Buffer (m):	100

Site Details

Hayes Swimming Pool, Botwell Lane, HAYES, Middlesex, UB3 2BG

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



OPUS

Middlesex
Published 1866
Source map scale - 1:2,500

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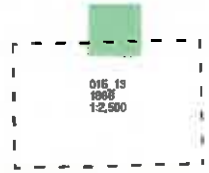
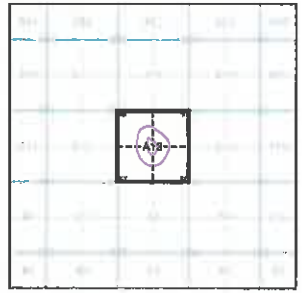
Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	46303056_1_1
Customer Ref:	J-M0167.00/MK001
National Grid Reference:	509730, 180080
Slice:	A
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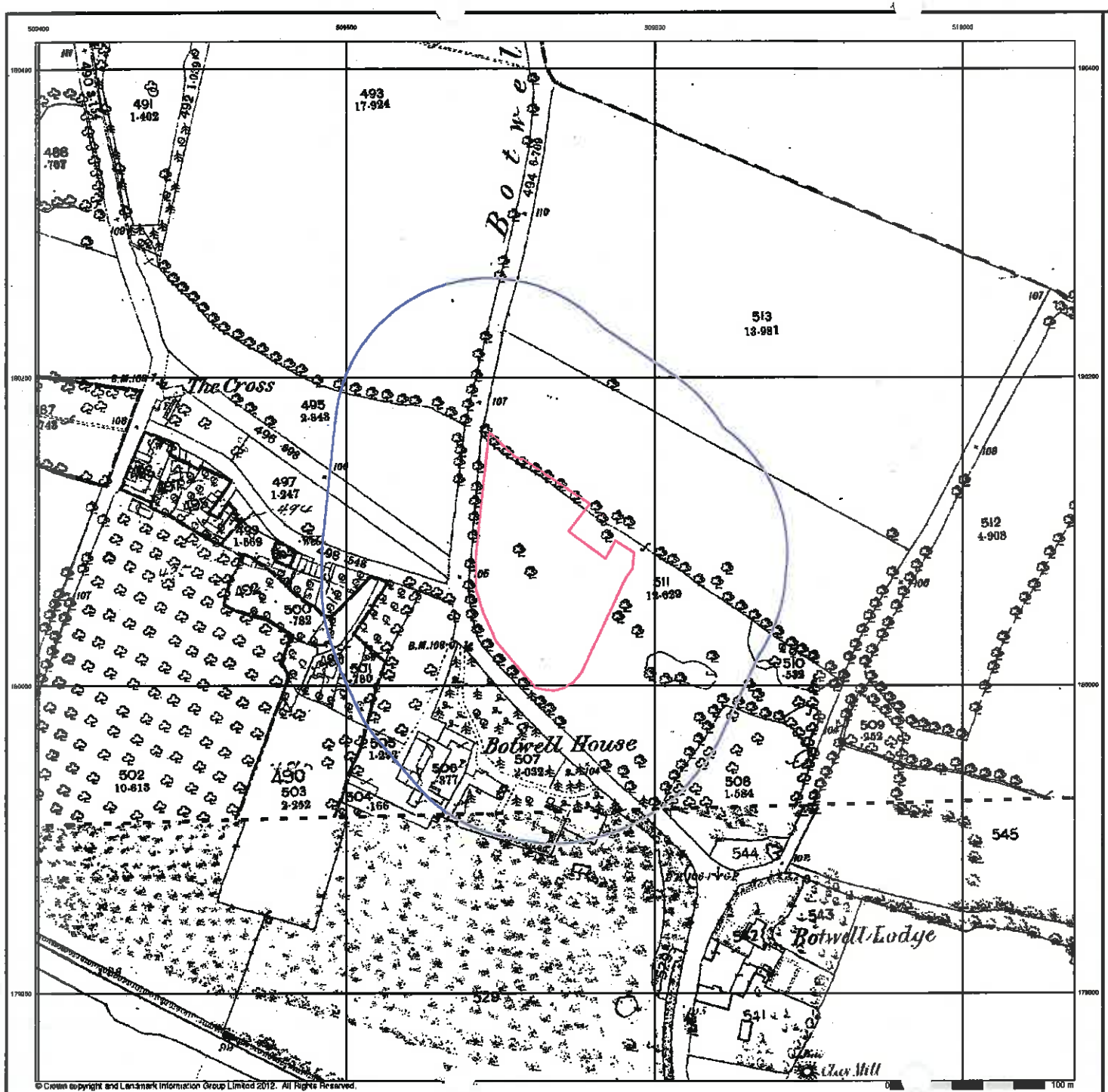


OPUS

Middlesex

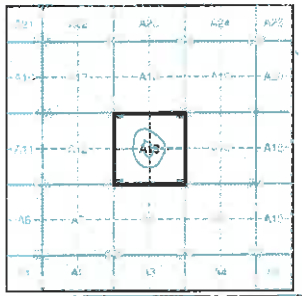
Published 1875 - 1894

Source map scale - 1:2,500

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 and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below 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.

Map Name(s) and Date(s)

Historical Map - Segment A13



Order Details

Order Number:	46303056_1_1
Customer Ref:	J-M0167.00/MK001
National Grid Reference:	509730, 180080
Slice:	A
Site Area (Ha):	1.01
Search Buffer (m):	100

Site Details

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