

YUM RESTAURANTS INTERNATIONAL (KFC GB LIMITED)

PROPOSED KFCDT BEDHAMPTON, LARCHWOOD AVENUE, HAVANT, PO9 3QW

SITE INVESTIGATION REPORT

The Granary
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Long Itchington
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Report No. CCL02834.CA81

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1. INTRODUCTION

Yum Restaurants International (KFC GB Limited) proposes to redevelop a site off Larchwood Avenue, Bedhampton, Havant, for commercial purposes. Currently, the site is a former car park, which is occasionally used for motorcycle training. The proposed development comprises a single-storey fast food restaurant together with associated drive-through facilities, car parking and landscaped areas.

Crossfield Consulting Limited has been commissioned to undertake an investigation of the site to identify potential constraints to redevelopment relating to the ground conditions and including a risk-based environmental assessment and recommendations for remediation works, foundations, road pavement design and general construction advice in the context of the above development proposals.

This report presents the information obtained from a desk study and ground investigation. Sections 2 to 5 of the report, together with the associated Figures and Appendices, provides a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007.

A risk-based assessment of potential contamination is included in Section 7 of the report. This assessment makes reference to the desk study, ground investigation information and a Conceptual Site Model. It is considered that the report complies with National Planning Policy Framework and is in general accordance with guidance published by the Environment Agency and Havant Borough Council.

The report also includes information required to form a Geotechnical Design Report as defined in BS EN 1997-1:2004, and the salient information, assessments and recommendations are presented in Sections 9 to 14 of the report, together with the associated Figures and Appendices.

It is considered that the report is suitable for submission in support of a planning application and the report is appropriate to assist in an appraisal of development solutions and costs, together with the preparation of engineering designs for the development. The report also complies with the published guidance relating to the requirements of a Building Control authority.

2. THE SITE

2.1 Location

The site is located to the east of Larchwood Avenue, approximately 2 km to the northwest of Havant town centre, as shown on Figure 1. The National Grid Reference for the site is SU 6961 0758. The site boundaries are defined by a McDonalds Restaurant to the northeast and Larchwood Avenue to the northwest. The southern boundary is marked by an access road leading to an Asda supermarket car park.

2.2 Site Description

The following site description is based on the current Ordnance Survey plan, a topographical survey, and observations made during a ground investigation undertaken by staff from Crossfield Consulting Limited in March 2016.

The site comprises an approximately square-shaped plot of land covering 0.26 ha. The majority of the site comprises a tarmac-surfaced car park, as shown on Figure 2. It was noted that the tarmac surfacing is in a reasonable condition. The general area slopes markedly down to the northeast, with a fall of approximately 7 m from the southwestern to northeastern boundaries. The majority of the car parking area is relatively flat and the marked change in level is principally accommodated by the presence of slope features

within and adjacent to the site boundaries. In addition, a concrete retaining wall, about 3 m in height, is present along the southwestern and southeastern edge of the car park. A change in level, associated with a sloping, densely vegetated landscape strip, is also present within the car park. A tarmac-surfaced ramp provides vehicular access between the change in level within the car park.

Trees are present within the slopes bounding the site.

2.3 Site History

The site history has been researched with reference to old editions of the County Series and National Grid Ordnance Survey Plans obtained from Emapsite. Extracts from a selection of these plans are presented in Appendix I. The plans indicate the following development has taken place on and around the site.

The earliest County Series Plan, dated 1868, indicates that the site and immediate surrounding area consisted of unoccupied dense woodland, referred to as 'Littlepark Wood'. A small stream was present approximately 10 m to the north of the site. Several footpaths were present within the wooded area.

The site is shown to remain largely unchanged on the subsequent map edition of 1937 with only some additional woodland footpaths shown locally and the construction of a road approximately 190 m to the northeast.

The 1957 National Grid Plan indicates that developments had occurred on site and comprised a pair of semi-detached residential properties. Larchwood Avenue is shown adjacent to the western site boundary and an additional residential property had been constructed to the south of the site. Approximately 50 m to the north of the site, an industrial works was shown. An area of woodland is shown to the southeast at this time.

By 1965, another pair of semi-detached residential properties had been constructed adjacent to the northern site boundary.

A warehouse had been constructed approximately 50 m to the west of the site by 1975.

A large hypermarket had been constructed, by the early 1980s, approximately 90 m south of the site and the access road along the southern boundary of the site is also shown on the map edition of this date.

The residential properties had been cleared by 1993 and the site appears to be a car park, possibly associated with the works to the east of Larchwood Avenue.

The site is shown to remain unchanged on the subsequent map editions to the present day.

3. PUBLISHED GEOLOGY

Geological map data published by the British Geological Survey (BGS) online and in print, on 1:50,000 scale Sheet No. 316 (Fareham), indicates superficial Head Deposits (of clay, silt, sand and gravel) lie beneath the site.

The solid geology below the site is shown to comprise clay, silt and sand of the London Clay Formation.

4. DESK STUDY ENQUIRIES

Enquiries were made to the GroundSure Environmental Database regarding the site and surrounding area. Information obtained from these enquiries is presented in Appendix II and summarised below.

The GroundSure Database indicates that there is one record of Part B activities within 250 m of the site. This relates to the unloading of petrol into storage at a service station and is listed as being 113 m to the northeast of the site. There are no other recorded licensed or permitted processes, hazardous substance storage consents or pollution incidents listed within 250 m. Neither the site nor land in close proximity has been classified as contaminated under Part IIA of the Environmental Protection Act (1990).

There are no historical or active landfills recorded within 250 m of the site. There are no other waste handling facilities, such as scrapyards or waste transfer stations, recorded within a similar search radius.

Database records for current “industrial” premises note the presence of an electricity substation located approximately 13 m to the northwest of the site. An unspecified works is located approximately 45 m northwest of the site. Mitchell & James Caravans Ltd is present approximately 74 m north of the site. An Asda Petrol Filling Station is situated 121 m to the northeast of the site.

Hydrogeological information indicates that the superficial geology is shown to be a “Secondary Aquifer – Undifferentiated Layers”. The bedrock geology is shown to be “unproductive”. The proposed development property is within a “Zone 1c – Inner Catchment” Groundwater Source Protection Zone and this relates to a confined aquifer at depth beneath the site. There are no active groundwater abstraction licences, for potable or process water purposes, listed within 1 km of the site.

Hydrological information indicates that the site is not located within an area that is at risk of flooding, as defined by the Environment Agency.

The site lies within a Nitrate Vulnerable Zone, though this is a specialised designation usually relating to farming method restrictions. There are no other designated environmentally sensitive land classifications within the site or the immediate surrounding area.

The Building Research Establishment Document *BR211 (2015) Radon: Guidance on Protective Measures for New Buildings*, together with the information within the Groundsure Database, confirm the site is not located within an area where precautions against the ingress of radon are required in new buildings.

5. GROUND CONDITIONS AND GEOLOGICAL MODEL

5.1 Ground Investigation

Details of the rationale and scope of the ground investigation and laboratory testing, together with exploratory hole logs, monitoring, in situ and laboratory test results, are given in Appendix III. The investigation has identified the presence of the following, below the site.

5.2 Buried Foundations and Services

Buried foundations and services were not encountered during the investigation. However, it is considered that buried substructures associated with the former housing may still be present beneath the site.

5.3 Strata Encountered

Made Ground

Made Ground is recorded across the site. The materials generally comprise slightly clayey, sandy, gravel with brick fragments and are generally between 0.4 m and 0.8 m thick. However, at one location, at the base of the ramp (WS2), ash, wood, fabric, plastic and glass fragments were identified suggesting that the ramp may have been built up using waste materials.

Head Deposits

Natural strata, considered to be Head Deposits, have been identified across the northern and eastern parts of the site to depths of about 2.0 m. The Head Deposits comprise firm consistency, brown and orange brown with grey mottling, silty, sandy clay with variable gravel content.

Measurements of undrained shear strength within the clays at shallow depth indicate values of approximately 50 kN/m² such that the material is indicated to be of medium strength.

London Clay Formation

Deposits, considered to be weathered London Clay strata, have been identified beneath the Head Deposits (or directly underlying Made Ground where the superficial deposits are absent) and typically comprise firm to stiff consistency, brown and orange brown, silty clay that become stiff consistency and less weathered with depth.

Undrained shear strength of between 50 kN/m² and 90 kN/m² have been measured at shallow depth within these deposits. These tests, together with observations from standard penetration tests (SPT), which recorded 'N' values of between 6 and 20, indicate that the London Clay is medium strength at subcrop and high strength below a depth of about 4 m

5.4 Groundwater

Groundwater has not been identified during the investigation, although perched water has been identified locally at the base of the Made Ground within the southwestern part of the site at approximately 0.5 m depth.

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

6. PROPOSED DEVELOPMENT

The proposed development is understood to include the following:

- o A single-storey restaurant building, of portal frame and cladding construction
- o Areas of hardstanding road pavements for vehicle access
- o Drive through facilities
- o Car parking
- o Landscaped areas will be included around the edges of the site

A plan showing the proposed development layout is presented as Figure 3.

7. ASSESSMENT OF POTENTIAL CONTAMINATION AND GROUND GASES

7.1 Assessment Criteria

Assessment of potential contamination and ground gases has been undertaken using a risk assessment based approach, as recommended within the Environmental Protection Act (1990), CLR11 (2004) CLEA Model (2004-2009), BS 10175:2011+A1:2013, CIRIA C552 (2001) and NHBC R&D Report 66 (2008). This approach considers the likely source of contamination, given the history and location of the site, and the possible migration pathways by which these potentially hazardous substances may reach likely receptors, such as end users of the site, controlled waters or the wider environment, in the context of the proposed development.

Part IIA of the Environmental Protection Act (1990) states that

“Contaminated Land is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused;”

All risk assessments carried out as part of this investigation have been carried out with respect to the definition of “contaminated land” within Part IIA of the Environmental Protection Act (1990) and have considered the site both before and on completion of the development. The basis of the risk assessment is the Conceptual Site Model, which is derived from the desk study and initial information and identifies potential pollutant linkages that could affect receptors relevant to the site and the wider environment. The Conceptual Site Model is presented in Table 1.

Based on the model, a ground investigation was designed to obtain relevant information to assess further the identified pollutant linkages. Where relevant this included the recovery of representative samples and subsequent analytical laboratory testing. The rationale for the sampling and testing is set out in Appendix III. It should be noted that the main rationale for the testing was to assess materials for waste disposal. However, the samples recovered are considered to be representative and certain testing that has been undertaken would also be relevant to providing an assessment of risks to environmental receptors. The results of the analytical testing are presented in Appendix III and summarised in Table 2. On the basis of the conceptual site model and the results of the analytical laboratory testing, an assessment of the identified pollutant linkages is presented in Table 3.

7.2 Potential Sources of Contamination

Based on the available information, the site has historically been associated with residential usage. Older housing may be associated with coal-fire heating that could give rise to very limited volumes of ashy wastes that may be deposited around garden areas. Potential contaminants associated with ashy Made Ground include toxic metals, phytotoxic metals and polyaromatic hydrocarbons (PAHs). In view of the age of the properties at the site, it is considered that only very limited volumes of ashy materials are likely.

Asbestos containing materials (ACMs) may have been used in the construction of the former structures on site and there is potential for ACMs to have become mixed with the shallow ground if uncontrolled demolition has occurred.

The site was recently used as a car park. There is potential that coarse-grained Made Ground materials were imported to site to form the car park and these materials could also be associated with the potential

contaminants identified above. There is limited potential for leaks of petroleum hydrocarbons, particularly oils, from poorly maintained vehicles. However, there was no evidence of surface staining, which would be expected as a result of such leakages.

With respect to potential sources of off-site contamination, the immediate surrounding commercial land use is considered not to be associated with any significant sources of potential contamination that could have potentially migrated on to the site.

Based on the above information, a ground investigation was designed to obtain data to assess the identified pollutant linkages. The results of the associated laboratory testing are summarised in Table 2 and have been compared to generic assessment criteria that are relevant to the proposed end use (commercial). As can be seen from Table 2, all priority contaminants are present at levels below the GAC and, therefore, represent a negligible risk to proposed site end users.

Asbestos screening tests have been undertaken on representative samples of near-surface soil samples and the results identify that very low concentrations of chrysotile and amosite asbestos, recorded as loose fibres and insulation board/tile, are present within the shallow Made Ground at the site. Risks to human health, including site end users, construction works and the general public, are assessed in Section 7.3.1.

Near-neutral soil pH and low sulphate ground conditions have been identified at the site. Potential contaminants have been recorded at very low to negligible concentrations with the Made Ground materials. The risk and implications to buried concrete and potable water supply pipe materials are discussed in Section 7.3.2.

Concentrations of phytotoxic metals are below guideline values given in BS 3882. Therefore, there is considered to be no potential source of contamination with respect to landscape plantings. Landscaping area requirements are discussed further in Section 7.3.3.

Certain metals, PAHs and long-chain petroleum hydrocarbons have been recorded at the site. The risks to controlled waters are considered to be low, as solubility and, hence, mobility of the potential contaminants is low at typical soil temperature and pH. Further assessment is presented in Section 7.3.4.

No significant putrescible material has been identified at the site and there are no recorded landfills within influencing distance. The site is not within an area where precautions against the ingress of radon gas are required in new dwellings. Therefore, it is considered that there are no sources of hazardous ground gases at the site and ground gas protection is not required for the proposed development.

7.3 Pollutant Linkages – Solids and Liquids

Based on the Conceptual Site Model, consideration is given below to identified pollutant linkages and a risk evaluation is undertaken of each possible source-pathway-receptor linkage that may occur at the site. The risk evaluation considers the potential consequences and probability of occurrence in accordance with CIRIA C552 (2001). Where risks are identified as “negligible”, then by implication such risks are within normally accepted levels for the proposed development, and the further reduction of such risks by remediation works is considered unnecessary. Where risks are identified that are “low” as defined in CIRIA C552 (2001), or worse, then consideration is given to the management of the identified risks, with appropriate recommended actions that may include engineering solutions / remediation works as described in the following sections.

7.3.1 Human Health

Recorded concentrations of contaminants relevant to the site history are all below the GAC for a commercial development. In addition, following completion of the proposed development, the majority of the site will be predominantly covered by hardstanding road pavements or the new building and these features would provide an effective barrier between end users of the development and the existing ground. However, there are minimal areas of soft landscaping that may represent possible dust exposure pathways to end users.

Loose fibres and insulation board/tile fragments of chrysotile and amosite have been identified within the shallow Made Ground. Due to the presence of these ACMs, there is a moderate to low risk of end user exposure to these ACM following completion of the development via dust migration pathways in soft landscaping areas. Therefore, it is recommended that a minimum of 500 mm of topsoil/subsoil be placed in landscaping areas to minimise the potential for root action or soil organism activity to return existing Made Ground to the surface. The recommended capping layer thickness is based on BRE document BR465 (2004). Following completion of the proposed remedial work, there should be no viable migration pathway from potential contaminants (ACMs) to affect site end users or the public.

Landscaping contractors involved in the maintenance of soft landscaping areas should not have to excavate through the topsoil growing layer in such areas and, therefore, should not be exposed to potential risks associated with the shallow soils. Therefore, it is considered that there should not be an unacceptable risk to this site user group following completion of the development.

During construction, it is recommended that a watching brief be maintained by construction personnel. Any visible fragments of ACMs that are identified should be hand-picked and bagged before being placed in a lidded skip or bin that should only be used for asbestos materials. Such materials should be disposed of in accordance with the guidance given in Section 14.

Appropriate personal protective equipment (PPE) should be worn by all personnel during groundworks. Soils should be kept damp during groundworks to minimise the potential for airborne dust, both with respect to construction workers and to prevent dust migrating off-site and affecting the general public.

7.3.2 Durability of Buried Structures and Services

In view of the low soluble sulphate content and near-neutral soil conditions, there are no special precautions required for the protection of good quality buried foundation concrete. Based on guidance within *BRE Special Digest 1* (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

The site has not been associated with past fuel and/or chemical storage and there are no such storage facilities in close proximity. Therefore, the site would not be considered to be 'brownfield' under the definition provided by UKWIR (2010) with respect to the assessment of ground for water supply pipes. Based on the guidance provided by UKWIR, conventional plastic materials can be used for potable water supply pipes without any requirements for specific testing.

It should be noted that individual water companies may have in-house requirements for the assessment of ground conditions for potable water supply pipes and these requirements may be in addition to, or may contradict, the guidance provided by UKWIR. Therefore, it is recommended that the relevant water supply company be consulted prior to finalising the potable water supply design.

7.3.3 Landscape Areas

There is no evidence of phytotoxic metals within investigated areas of the site at concentrations in excess of values published in BS 3882. Therefore, it is considered that there are no unacceptable risks to landscape planting associated with the existing ground. However, there is currently no suitable topsoil present at the site such that there will be a requirement to import and place a suitable thickness of topsoil within proposed landscaping areas as a growing medium to support health plant growth.

It is anticipated that the topsoil/subsoil capping layer outlined in Section 7.3.1 should be appropriate as a growing medium.

7.3.4 Controlled Waters

Metal compounds, traces of PAHs and long-chain petroleum hydrocarbons have been recorded within the Made Ground at the site in localised areas. Such potential contaminants, at typical soil temperatures, are generally of low solubility and, hence, are relatively immobile and incapable of migration through the unsaturated zone. Therefore, it is considered unlikely that potential contaminants would be mobilised from the shallow soils. It is also noted that the site is underlain by low permeability Head Deposits and effectively impermeable London Clay strata (classified as non-aquifer) such that there is no valid potential migration pathway to controlled waters.

On the basis of the above, it is considered that there are no unacceptable risks to controlled waters associated with the ground conditions at the site.

7.4 Recommended Remedial Works

It is recommended that a topsoil/subsoil capping layer be used in the limited proposed landscaping areas. The capping layer within this area should have a minimum thickness layer of 500 mm, which is compatible with BRE BR465 (2004) and assumes that there will be no mixing of the placed materials and the existing ground. Any imported soils should be verified with documentation/laboratory test reports as suitable for use within a commercial development. The placement of the capping layer should be undertaken in accordance with a Remediation Implementation Plan, which should detail the work to be carried out and how it will be verified such that a Remediation Verification Report can be prepared on completion.

7.5 Potential Liabilities

Providing the work outlined in Section 7.4 is undertaken, it is considered that there should be no environmental liabilities associated with site ownership following completion of the proposed development.

8. ASSESSMENT OF MINING, QUARRYING AND OVERALL GROUND STABILITY

The site is not within an area of recorded underground mining or other such mineral extraction. There are no quarrying activities recorded at the site or in close proximity. Therefore, it is considered that the proposed development should not be constrained by ground stability issues.

With reference to published information provided by the British Geological Survey, and in the context of the low sensitivity of the proposed structure to very minor background seismic events recorded in the UK, it is considered that the foundation solution should not be constrained by potential ground vibrations from natural sources and that more detailed assessment is not necessary.

9. RETAINING STRUCTURES

It is understood that the existing concrete retaining walls, of approximately 3 m height, in close proximity to the southern boundary of the site will be incorporated into the proposed development and that a new retaining wall, of approximately 1 m height, will be constructed in close proximity to the base of the existing wall, as shown on Figure 3.

The construction of the new wall will require to be undertaken using methods that will ensure the stability of the existing structure. It is understood that trial excavations have been undertaken to determine the foundations to the existing wall and, based on the findings of the excavations, it is understood that it is possible to design temporary works to enable the construction of a conventional gravity wall, such as a cast in situ, or pre-cast, concrete structure in front of the existing wall.

Retaining walls, generally of less than 2 m height, are also proposed remote from the site boundaries, as shown on Figure 2. It is considered that temporary cut slopes are appropriate for construction of these walls. It is considered that a temporary cut slope with an angle of up to 30° should be appropriate to enable either reinforced concrete or reinforced masonry walls to be constructed.

All retaining structures should include adequate drainage measures to ensure that there is no build-up of water pressure behind the wall. The design parameters for the retained materials will be dependent on the backfill conditions, which will be dependent on the temporary works employed during the construction of the retaining walls.

Characteristic values relating to the geotechnical properties of the strata within influencing distance of the proposed retaining structures are presented in Appendix IV. For materials that may influence the design, coefficients of earth pressure can be obtained from Tables in Annex C, BS EN 1997-1:2004 Part 1. It should be noted that the actual coefficients of earth pressure for the design of retaining walls should also reflect the form of construction employed and the temporary works required.

The foundations for these walls may be assessed in accordance with the recommendations given in Section 10.5 and Appendix IV of this report.

Based on guidance published within BRE Special Digest 1 (2005), the specified DC Class of concrete for buried structures and foundations, placed within the Head Deposits at the site, should be suitable for an ACEC site classification of AC-1.

10. FOUNDATION RECOMMENDATIONS

10.1 Design Approach

In compliance with the requirements of the National Annex of BS EN 1997-1:2004 the geotechnical design assessment is based on Design Approach 1 (as defined in BS EN 1997-1:2004). As the structural loads for the proposed building are well defined, uncertainty and risks of potential unfavourable conditions (or deviations from characteristic values) are primarily associated with the ground conditions.

Consideration is given to the assessment of ultimate limit state (ULS) conditions, where full collapse or failure conditions are considered, and relevant design information is presented in Appendix IV in this regard. In addition, the assessment considers serviceability limit states (SLS), to ensure that the recommended design parameters are compatible with an acceptably low risk of serviceability criteria being exceeded during the

standard design life of the structure. It is noted that the SLS has a greater influence on the design parameters in comparison to ULS conditions and this is considered in the following assessment.

10.2 Proposed Structural Loadings and Serviceability Criteria

Details of imposed foundation loads (i.e. actions imposed by the building structure) and serviceability limit values are not currently available for the proposed structures. The geotechnical assessment presented in the report has considered generic values for the proposed development type, which is considered appropriate for the appraisal of engineering solutions and preliminary design, and these are listed below:

Preliminary Values, for appraisal purposes:

Maximum Imposed Load on Foundations: 50 kN (column load for a single-storey building)

Serviceability Limit Values (associated with above action)

Maximum Total Settlement: 25 mm

Maximum Differential Settlement: 15 mm (individual pad footings)

Maximum Deflection: 1/1000 (strip or trench fill footings)

10.3 Geotechnical Category of Proposed Structures

In view of the nature of the proposed structures, comprising a two-storey commercial unit, and with reference to the indicated ground conditions, as outlined in Section 5, it is considered that the development is compatible with Geotechnical Category 2, as defined in BS EN 1997-1:2004, and the necessary information relating to the Ground Investigation and Geotechnical Design Reports has been obtained and assessed on this basis.

10.4 Assessment of Foundation Solutions

With reference to the recorded ground conditions and corresponding Geological Model presented in Section 5, characteristic values relating to the geotechnical properties of the strata within influencing distance of the proposed structures presented in Appendix IV (Category 2). Salient elements of the geotechnical model are outlined below.

Ground conditions at the site (within the area of the proposed new building) comprise Made Ground, typically to depths of 0.8 m, overlying medium strength sandy clay of Head Deposits. Medium to high (becoming high) strength London Clay Formation strata are present beneath the superficial deposits (or, locally, directly below the Made Ground where the superficial deposits are absent). Shallow groundwater has not been identified.

Whilst Made Ground is considered to be not suitable as founding strata for supporting the new structure on conventional foundations, it should be feasible to excavate through the Made Ground so that pad foundations or strip/trench-fill footings can be placed in competent Head Deposits or London Clay Formation strata. Alternatively, given the small size and loadings of the proposed new building, a shallow, flat-slab raft could provide a suitable solution.

10.5 Recommended Foundation Design Parameters

10.5.1 Conventional Spread Foundations

On the basis of the foregoing assessment and the details presented in Appendix IV, it is considered that conventional pad or strip/trench-fill footings provides an appropriate foundation solution for the proposed structure. The recommended parameters for the foundation design are as follows:

<i>Foundation Strata :</i>	Medium strength, firm consistency, clay (Head Deposits/London Clay Formation)
<i>Foundation Depth :</i>	Minimum 1.0 m, deepened through Made Ground and within influence of trees.
<i>Foundation Width/Size:</i>	Up to 3 m max
<i>Nett Allowable Bearing Pressure:</i>	100 kN/m ²

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm) as outlined in the assessment presented in Appendix IV.

Laboratory testing results indicate the clayey horizons at the site comprise “high volume change” potential soils, as defined in NHBC Standards (2016). Within the influence zones of existing or proposed trees, suitable foundation precautions should be adopted, as outlined in NHBC Standards (2016) and reference by The Building Regulations Approved Document C (2004).

10.5.2 Raft Foundations

On the basis of the foregoing assessment and the details presented in Appendix IV, it is considered that a flat-slab raft foundation will provide an alternative foundation solution for the proposed structure. The advantage of this solution relate to a potential reduction in waste soil arisings and concrete volumes. The recommended parameters for the foundation design are as follows:

<i>Foundation Strata :</i>	Clayey sandy gravel (Made Ground) or Medium strength clay (Head Deposits/London Clay Formation)
<i>Treatment of Foundation Strata :</i>	Formation strata are to be proof-rolled with a heavy vibratory roller prior to placement of a compacted granular sub-base and construction of the raft foundation
<i>Foundation Depth or depth of perimeter thickenings:</i>	Minimum 0.6 m below final ground level
<i>Foundation Stiffness:</i>	The raft foundation may be designed on the basis of a modulus of subgrade reaction of 30 MN/m ³
<i>Nett Allowable Bearing Pressure:</i>	50 kN/m ² (below entire raft footprint)

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm) as outlined in the assessment presented in Appendix IV.

10.5.3 Buried Concrete

Based on guidance published within BRE Special Digest 1 (2005) and as outlined in Section 7.3.2, the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

10.6 Floor Slab Recommendations

For a spread foundation solution, it is considered that provided the existing coarse-grained Made Ground remains in situ, a ground bearing floor slab will be suitable.

If using a raft foundation, the ground floor slab will be an integral part of the raft design.

10.7 General Construction Advice

All formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Care should be taken to ensure that any field drains encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

11. TEMPORARY WORKS

Conventional plant is considered appropriate for excavation works at this site.

Shallow excavations may remain stable in the short term. However, instability should be anticipated in excavations left open for extended periods of time. Support should be provided, or the sides battered back, in any excavations requiring man entry in compliance with the relevant risk assessment.

Shallow groundwater should not be encountered in excavations. In the event that perched water seepages are encountered, the resultant water should be adequately controlled by pumping from screened sumps.

12. ASSESSMENT OF SOAKAWAY DRAINAGE

Soakaway drainage is effectively precluded by the low permeability clay strata, which extends to depths in excess of 5 m beneath the site. Therefore, it is recommended that an alternative surface water drainage solution be identified for the site.

13. ROAD PAVEMENTS

Based on an examination of the soils present at the site, and the guidance of IAN73/06 and TRRL Report LR1132, it is considered that an equilibrium design CBR value of 3% may be used for pavement design in the car park and access road areas. The strata at formation depth are likely to be frost-susceptible.

14. ASSESSMENT OF MATERIALS FOR WASTE DISPOSAL

There should be no environmental requirement to remove materials from site to permit development. Therefore, excavated materials should be retained and reused on site where possible.

On the basis of the material description and the results of the analytical laboratory testing, it is considered that the majority of the Made Ground at the site would be classified as “non-hazardous” waste if taken off site to landfill. Allowance should also be made for the disposal of some Made Ground materials as “hazardous” waste, due to localised elevated petroleum hydrocarbon concentrations. It appears that the materials that could be classified as “hazardous” waste are associated with the deeper Made Ground placed to construct the car park ramp and a wider variety of man-made inclusions, such as plastics and glass, were noted in these materials. It may be prudent to undertake some additional sampling and testing to better delineate the extent of the identified “hazardous” waste materials. As outlined in Section 7.3.1, any visible fragments of asbestos containing materials should be hand-picked, bagged and placed in a lidded skip or bin that is only for the disposal of asbestos. These materials should then be removed from site as “hazardous” waste.

Tarmac surfacing materials, if removed from site, should be taken to a suitable recycling facility.

The natural strata beneath the site should be classified as “inert” waste for landfill disposal. Providing such materials are not impacted by potential contaminants, no laboratory testing would be required on these materials.

Landfill tax would be payable on any materials removed from site and taken to landfill. However, “inert” and “non-hazardous” waste may also be taken to a facility that is exempt under the Environmental Permitting regulations, subject to specific exemption requirements.

15. RECOMMENDED SUPERVISION AND MONITORING

In compliance with the requirements in BS EN 1997-1:2004 and BE EN 1997-2:2007, construction and workmanship of the engineering solutions recommended in this report shall be supervised. In particular, issues listed in Section 10.7 General Construction Advice shall be considered in the implementation of the works and design of any necessary temporary works set out in Section 11.

In relation to the foundation solution and ground floor slab recommendations in Section 10, the following supervision and monitoring is recommended.

- Inspections of formation strata in excavations for foundations (pad foundations, strip/trench fill footings or raft foundations)

16. SUMMARY

Yum Restaurants International (KFC GB Limited) proposes to redevelop a site off Larchwood Avenue, Bedhampton. Currently, the site is occupied by a former car park. The proposed development comprises a single-storey fast food restaurant together with associated drive-through facilities, car parking and landscaped areas.

The indicated ground conditions at the site comprise a thickness of Made Ground, beneath which, in the northern and eastern parts of the site, are firm consistency, greyish brown, silty, sandy, gravelly clay Head Deposits. London Clay Formation strata underlie the Head Deposits (or the Made Ground where the superfcials are absent). Groundwater has not been encountered during the ground investigation.

Potential contaminants at the site are present in concentrations below GAC values and, therefore, do not represent an unacceptable risk to human health. However, low concentrations of asbestos containing materials have been encountered and precautions to mitigate potential risks to human health will be required. It is recommended that a 500 mm thick topsoil/subsoil capping layer be provided in any proposed soft landscaping areas. Soils should also be kept damp during groundworks to mitigate potential dust exposure to construction works and airborne migration to neighbouring properties. A watching brief should be maintained during construction works and any visible fragments of asbestos containing materials identified should be hand-picked, bagged and placed in a lidded bin or skip for disposal as “hazardous” waste.

The materials present on site should not represent an unacceptable level of risk to controlled waters.

Neither the desk study nor the ground investigation has identified a potential source of hazardous ground gases that may affect the proposed development.

On the basis of the size and loadings of the proposed new building, in conjunction with the recorded ground conditions, it is recommended that allowance be made for the restaurant to be supported on either spread foundations, taken into the Head Deposits/London Clay Formation, or a flat-slab raft foundation.

Soakaway drainage will not be feasible for the proposed development and it is recommended that an alternative method of surface water drainage be identified.

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GENERAL NOTES

1. This report is provided in the context of the stated development proposals and should not be used in a different context.
2. The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
3. Any borehole data from the British Geological Survey sources are included on the following basis: "The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation.
4. Where any data supplied by the Client or by other external sources, including previous site investigation data, have been used it has been assumed that the information is correct unless otherwise stated. No responsibility can be accepted by Crossfield Consulting Limited for inaccuracies within the data supplied by others.
5. Exploratory hole locations provided in the report are generally established by tape measurement from existing features or boundaries. Hole locations are not accurately surveyed and ground levels at these locations are not obtained unless specifically requested.
6. Any assessments made in this report are based on the ground conditions indicated by the trial pits and/or boreholes, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant site data which may have been obtained for the site. Variations in ground conditions may occur between exploratory hole locations and there may be special conditions appertaining to the site which have not been revealed by the investigation and which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
7. The report is provided for the sole use by the Client or its assignees and is confidential to the Client's professional advisers. No responsibility whatsoever for the contents of this report will be accepted to any person other than the Client or its assignees.
8. New information, improved practices and legislation may necessitate an alteration to the report in whole, or in part, after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Crossfield Consulting Limited for re-assessment and, if necessary, re-appraisal.

TABLES

TABLE 1

CONCEPTUAL SITE MODEL

Potential Contaminant Source	Potential Pathway	Receptors and Assessed Pollutant Linkage
Solids <i>Toxic heavy metals:</i> Possible minor source associated with Made Ground <i>Phytotoxic metals:</i> Possible minor source associated with Made Ground <i>Petroleum residues:</i> Possible minor sources associated with spillages/leakages from use as a car park <i>PAHs:</i> Possible minor source associated with Made Ground <i>Asbestos:</i> Potential source if uncontrolled demolition of former structures took place or potentially associated with Made Ground, depending on material source	Movement of Solids Direct dermal contact, ingestion of soil and inhalation of dust are all viable pathways during construction. New building and hardstanding will provide effective barrier to negate dermal, ingestion and inhalation pathways following development. Dust exposure pathways may be present after development if landscaping areas are proposed. Release into Liquid Phase Metal solubility generally low at typical soil temperature and pH. Low possibility of metal uptake by plants. Polyaromatic hydrocarbons are typically of low solubility. Petroleum residues likely to be degraded and of limited solubility. Release into Vapour Phase Not applicable (no source)	Human Health <i>Construction workers:</i> Pollutant Linkage Possible <i>End users:</i> Pollutant Linkage Possible <i>Adjacent properties:</i> Pollutant Linkage Possible Buried Structures & Services <i>Plastic pipes for potable water:</i> No Pollutant Linkage <i>Buried concrete:</i> No Pollutant Linkage <i>Other structures and services:</i> No Pollutant Linkage Landscape Areas Pollutant Linkage Possible
Liquids No source identified	Movement of Liquids Not applicable (No source)	Controlled Waters <i>Groundwater:</i> Secondary aquifer – No Pollutant Linkage <i>Surface Water:</i> (secondary river approximately 343 m to the south of the site) No Pollutant Linkage
Ground Gases <i>Landfill gases:</i> No source identified <i>Radon:</i> No source identified	Movement of Gases Not applicable (no source)	Human Health (Ground Gases) No Pollutant Linkage

NOTES

1. The above conceptual model is based on CIRIA C552 (2001) and BS 10175:2011+A1:2013.
2. The Conceptual Site Model is prepared from available desk study information. Where a site walkover or ground investigation identifies information that was not known at the desk study stage, such information is used to modify the Model.
3. Where a pollutant linkage is identified, any subsequent ground investigation is designed to obtain relevant information to assess the pollutant linkage. See Table 3 for a summary of pollutant linkage assessments.

TABLE 2

SUMMARY OF ANALYTICAL TEST DATA: SOILS
POTENTIAL RISKS TO HUMAN HEALTH

Determinand	Units	No of Tests	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Commercial		Category 4 Screening Level (mg/kg) Commercial	
			Min	Max	Value	No>GAC	Value	No>C4SL
Arsenic	mg/kg	3	8.5	15	640 ¹	0	640 ⁴	0
Cadmium	mg/kg	3	0.2	2.5	190 ¹	0	410 ⁴	0
Chromium (Total) ⁵	mg/kg	3	9.8	20	8600 ¹	0	-	-
Lead	mg/kg	3	77	150	1200 ²	0	2330 ⁴	0
Inorganic Mercury	mg/kg	3	<0.3	<0.3	1100 ¹	0	-	-
Nickel	mg/kg	3	9.4	18	980 ¹	0	-	-
Selenium	mg/kg	3	<1.0	<1.0	12,000 ¹	0	-	-
Copper	mg/kg	3	15	42	68,000 ¹	0	-	-
Zinc	mg/kg	3	130	210	730,000 ¹	0	-	-
Petroleum Hydrocarbons								
PRO C ₆ – C ₁₀	mg/kg	3	<0.1	<0.1	2000 ⁶	0	-	-
DRO C ₁₀ – C ₂₅	mg/kg	3	<10	660	9700 ⁶	0	-	-
MRO C ₂₅ – C ₄₀	mg/kg	3	18	690	28,000 ⁶	0	-	-
PAHs								
Naphthalene	mg/kg	3	<0.05	<0.05	190 ¹	0	-	-
Acenaphthylene	mg/kg	3	<0.10	0.69	83,000 ¹	0	-	-
Acenaphthene	mg/kg	3	<0.10	1.2	84,000 ¹	0	-	-
Fluorene	mg/kg	3	<0.10	1.5	63,000 ¹	0	-	-
Phenanthrene	mg/kg	3	0.21	18	22,000 ¹	0	-	-
Anthracene	mg/kg	3	0.10	6.9	520,000 ¹	0	-	-
Fluoranthene	mg/kg	3	0.43	48	23,000 ¹	0	-	-
Pyrene	mg/kg	3	0.40	39	54,000 ¹	0	-	-
Benz(a)anthracene	mg/kg	3	0.22	21	170 ¹	0	-	-
Chrysene	mg/kg	3	0.20	19	350 ¹	0	-	-
Benzo(b)fluoranthene	mg/kg	3	<0.10	25	44 ¹	0	-	-
Benzo(k)fluoranthene	mg/kg	3	<0.10	8.2	1200 ¹	0	-	-
Benzo(a)pyrene	mg/kg	3	0.25	18	35 ¹	0	76 ⁴	0
Indeno(123cd)pyrene	mg/kg	3	0.20	13	500 ¹	0	-	-
Dibenzo(ah)anthracene	mg/kg	3	<0.10	2.9	3.5 ¹	0	-	-
Benzo(ghi)perylene	mg/kg	3	0.29	15	3900 ¹	0	-	-

NOTES

- Suitable for Use Level (S4UL) published by LQM/CIEH, 2015 – Commercial landuse. S4UL assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type. Where S4UL presented by LQM is greater than 100%, the S4UL for this assessment has been capped at 1,000,000 mg/kg. S4ULs are copyright © Land Quality Management Limited reproduced with permission; Publication Number S4UL3133.
- Generic assessment criteria (GAC) for lead calculated using CLEA Software version 1.06 (Environment Agency, 2009) with a lead intake based on a target blood level of 3.5 µg/dL. Other model assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type.
- Soil GAC for Human Health Risk Assessment produced by CL:AIRE (2010) – Commercial. Assumption of 1% soil organic matter.
- Category 4 Screening Level (C4SL), Department for Environment Food and Rural Affairs (March 2014)
- In the absence of desk study or historical map evidence indicating a potential source of chromium (VI) usage at or in the near vicinity of the site, total chromium concentrations have been compared to the GAC for chromium (III).
- PRO: petrol range organics. DRO: diesel range organics. MRO: mineral oil range organics. GAC presented against these organic ranges is the lowest of the aromatic or aliphatic GAC relevant to that organic range, based on S4UL.

TABLE 3

ASSESSMENT OF POLLUTANT LINKAGES

NOTES:

- 1. Pollutant linkage validity assessed following qualitative or semi-quantitative risk assessment.
- 2. Pollutant linkage assessed following detailed quantitative risk assessment or assuming the recommended remediation or mitigation measures are in place

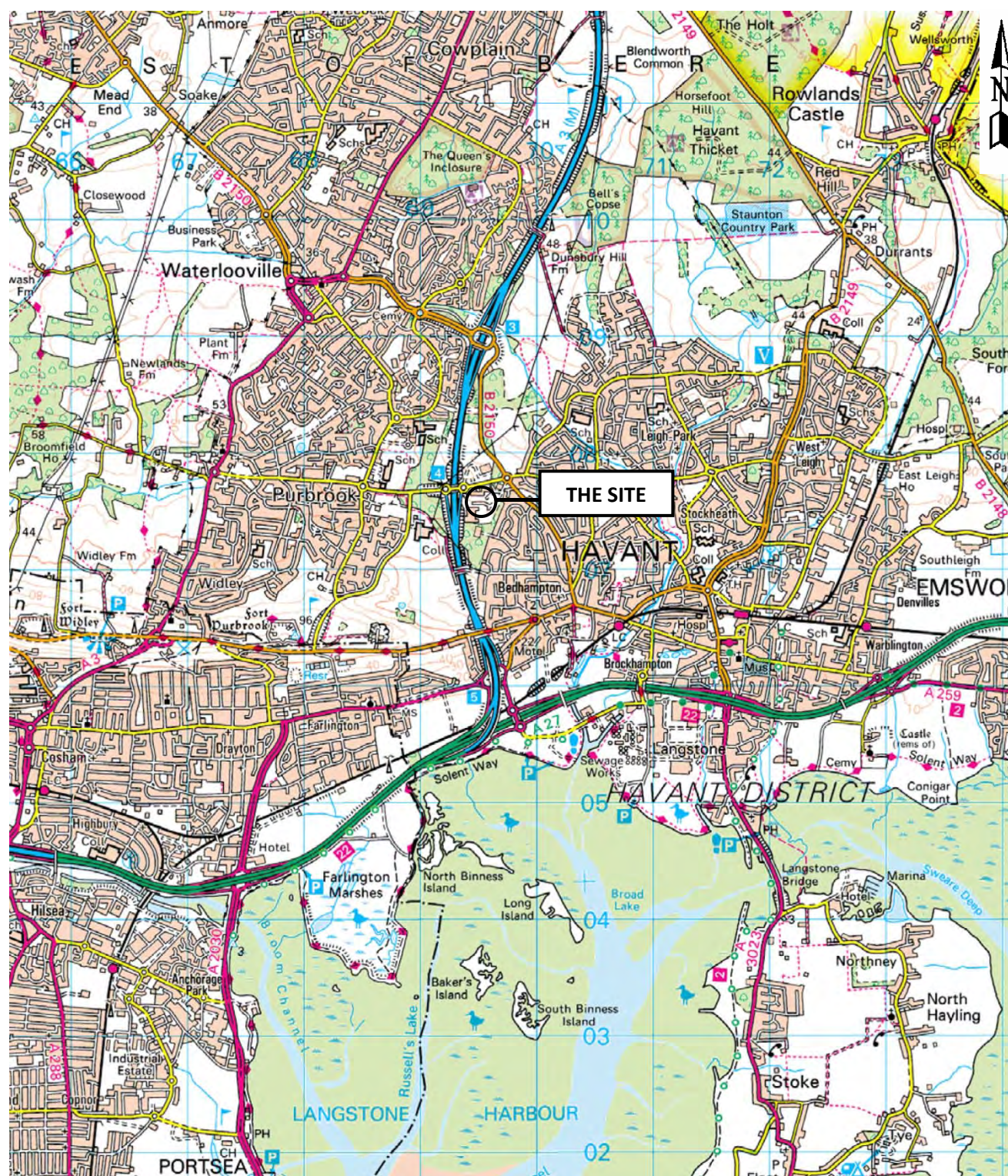
		Consequence (C)			
		Severe	Medium	Mild	Minor
Probability (P)	High likelihood (HL)	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely (L)	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low likelihood (LL)	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely (UL)	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

All terminology in accordance with the definitions provided in CIRIA C552 (2001)

Pollutant Linkage			Assessment of Pollutant Linkage following Ground Investigation	Pollutant Linkage Valid? ¹	Risk Rating			Quantitative Risk Assessment	Recommended Remediation/Mitigation (See Section 7 for further details)	Recommended Work Verified?	Pollutant Linkage Valid? ²
Source	Pathway	Receptor			C	P	Risk				
Toxic Metals Petroleum Hydrocarbons PAHs	Ingestion of dust, inhalation of dust, dermal contact with dust	Site End Users	All toxic metals present below GAC values All TPH present below GAC values All PAHs present below GAC values	No No No	n/a n/a n/a	n/a n/a n/a	n/a n/a n/a	Not applicable	Recommended topsoil capping layer in the landscaping areas, to act as barrier between potential contaminant and site end users.	To be confirmed during construction phase	No
Asbestos	Inhalation of fibres		Traces of asbestos containing materials and loose fibres identified	Yes	Sev	UL	Mod/Low				
Toxic Metals Petroleum Hydrocarbons PAHs	Ingestion, inhalation, dermal contact	Construction Workers	All potential contaminants identified in concentrations below short-term (acute) exposure limits	No No	n/a n/a	n/a n/a	n/a n/a	Not applicable	Appropriate personal protective equipment is recommended and conventional dust control methods are to be used during construction.	To be confirmed during construction phase	No
Asbestos	Inhalation of fibres		Traces of asbestos containing materials and loose fibres identified	Yes	Sev	LL	Mod				
Toxic Metals Petroleum Hydrocarbons PAHs	Ingestion of dust, inhalation of dust, dermal contact with dust	Public	All toxic metals present below GAC values All TPH present below GAC values All PAHs present below GAC values	No No No	n/a n/a n/a	n/a n/a n/a	n/a n/a n/a	Not applicable	Conventional dust control methods are to be used during construction phase to mitigate migration pathway of dust to the public	To be confirmed during construction phase	No
Asbestos	Inhalation of fibres		Traces of asbestos containing materials and loose fibres identified	Yes	Sev	UL	Mod/Low				
Phytotoxic metals	Plant uptake	Landscape plantings	Concentrations of phytotoxic metals identified at concentrations considered acceptable to healthy plant growth based on BS 3882:2007	No	n/a	n/a	n/a	Not applicable	Not applicable	Not applicable	No

FIGURES

FIGURE 1

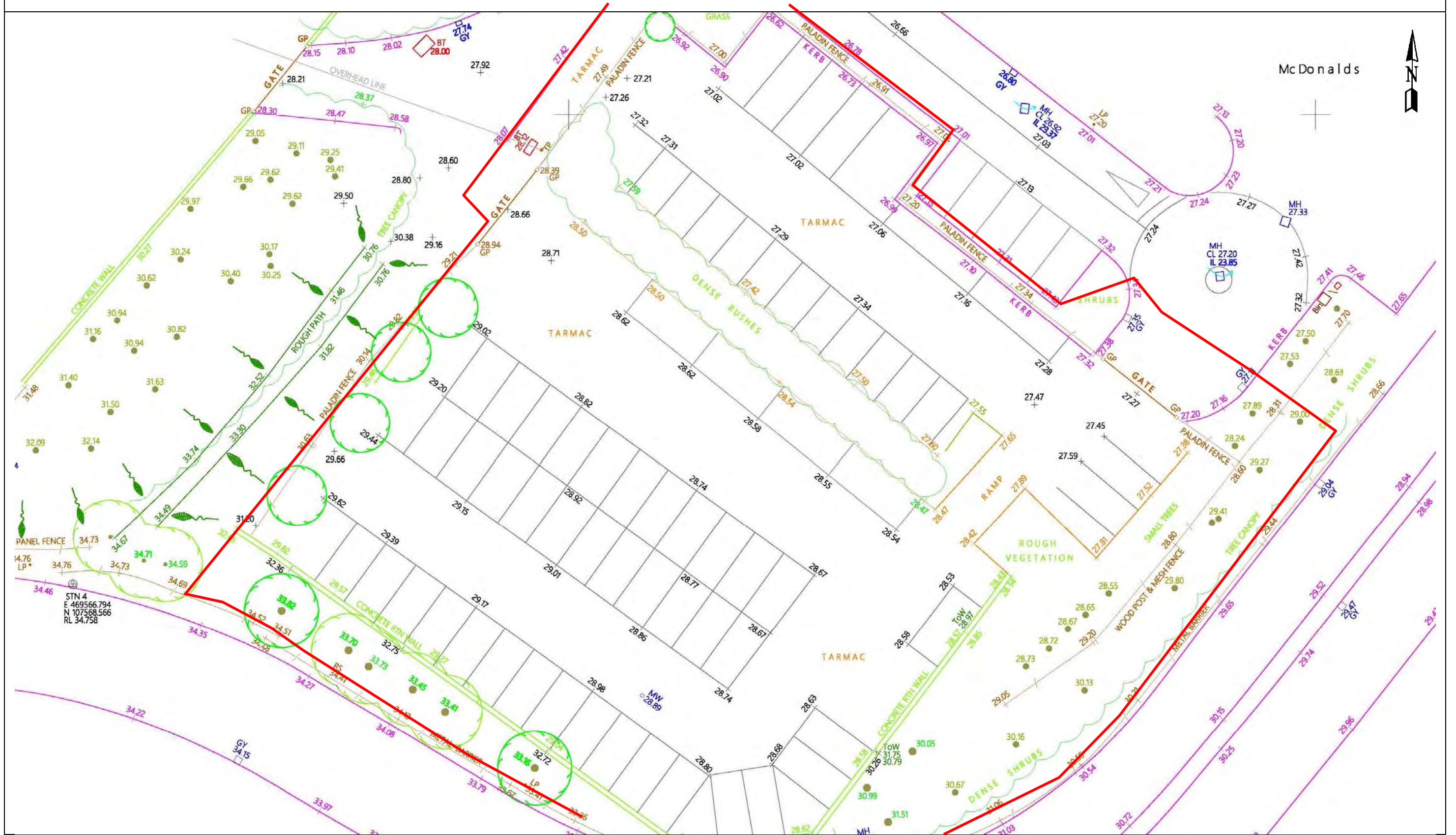


SITE LOCATION PLAN

Scale 1: 50,000

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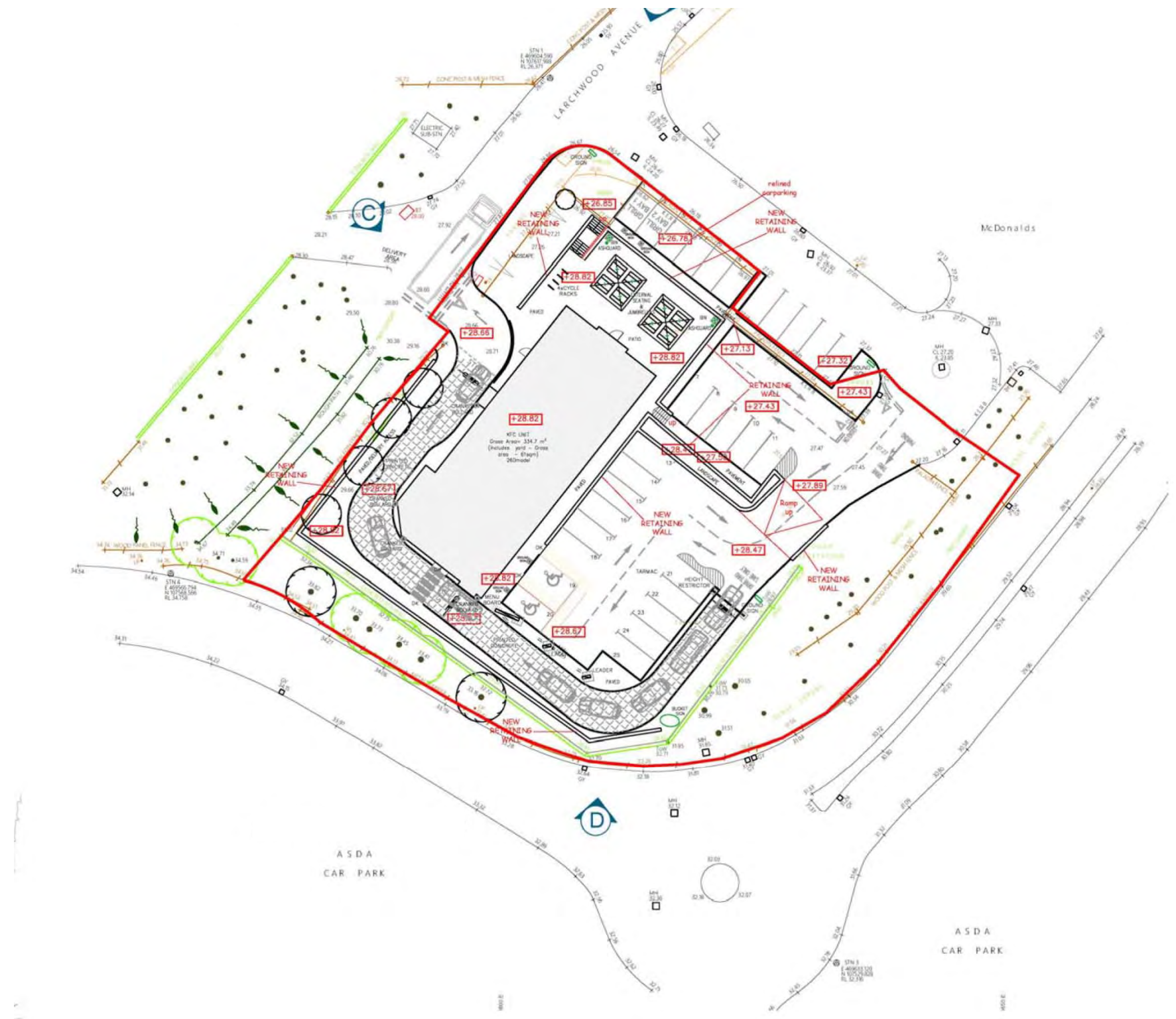
FIGURE 2



SITE PLAN
Scale 1: 250

Based on the Topographical Survey by CTES Surveys, dated January 2016

FIGURE 3



PROPOSED DEVELOPMENT PLAN
Scale 1:500

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APPENDIX I

Site Details:

CCL02834-Bedhampton,KFC
Larchwood
Avenue,Bedhampton,PO9 3QW

Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: County Series

Map date: 1868

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1868
Revised 1868
Edition N/A
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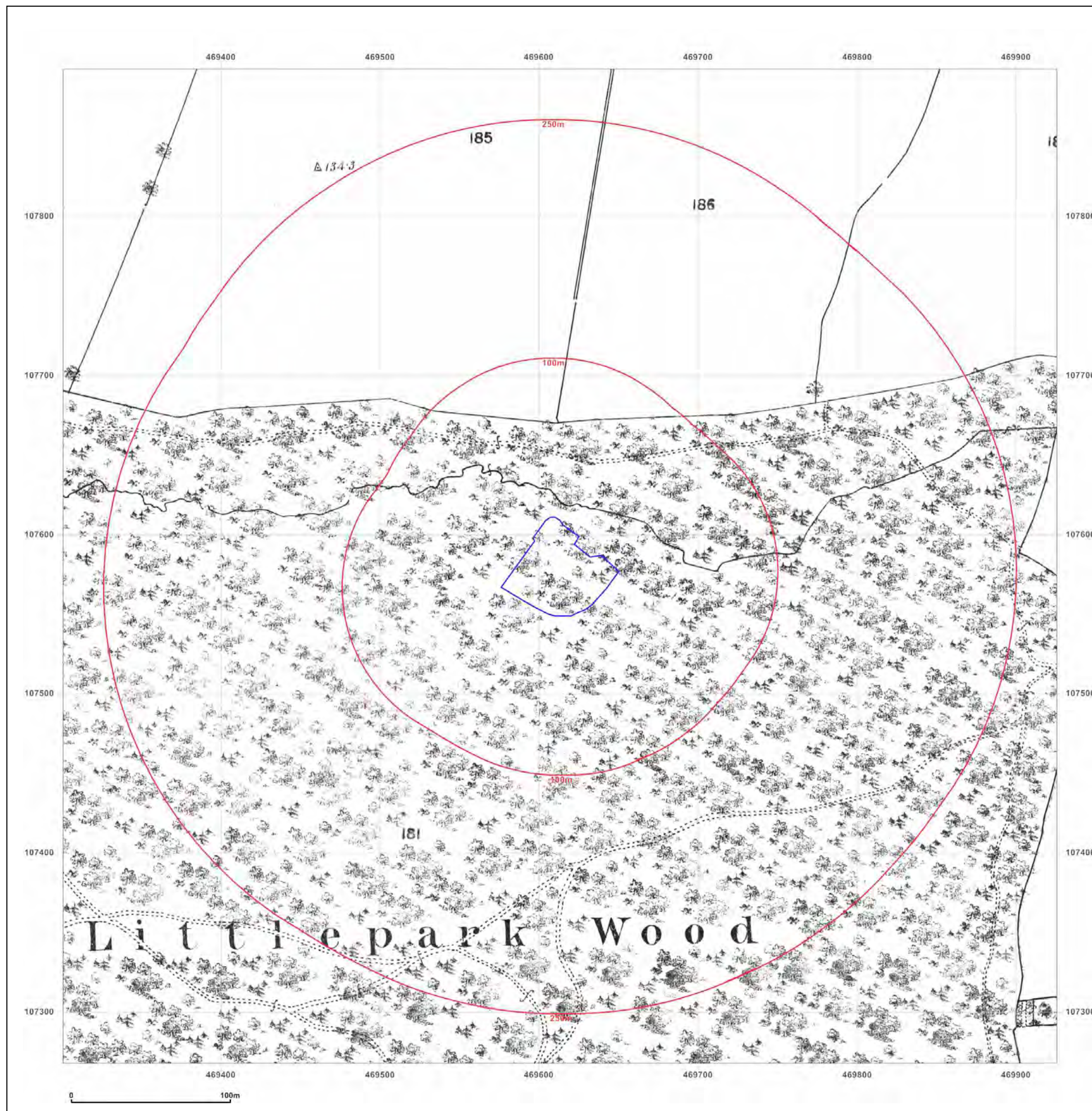


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Site Details:

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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: County Series

Map date: 1937

Scale: 1:2,500

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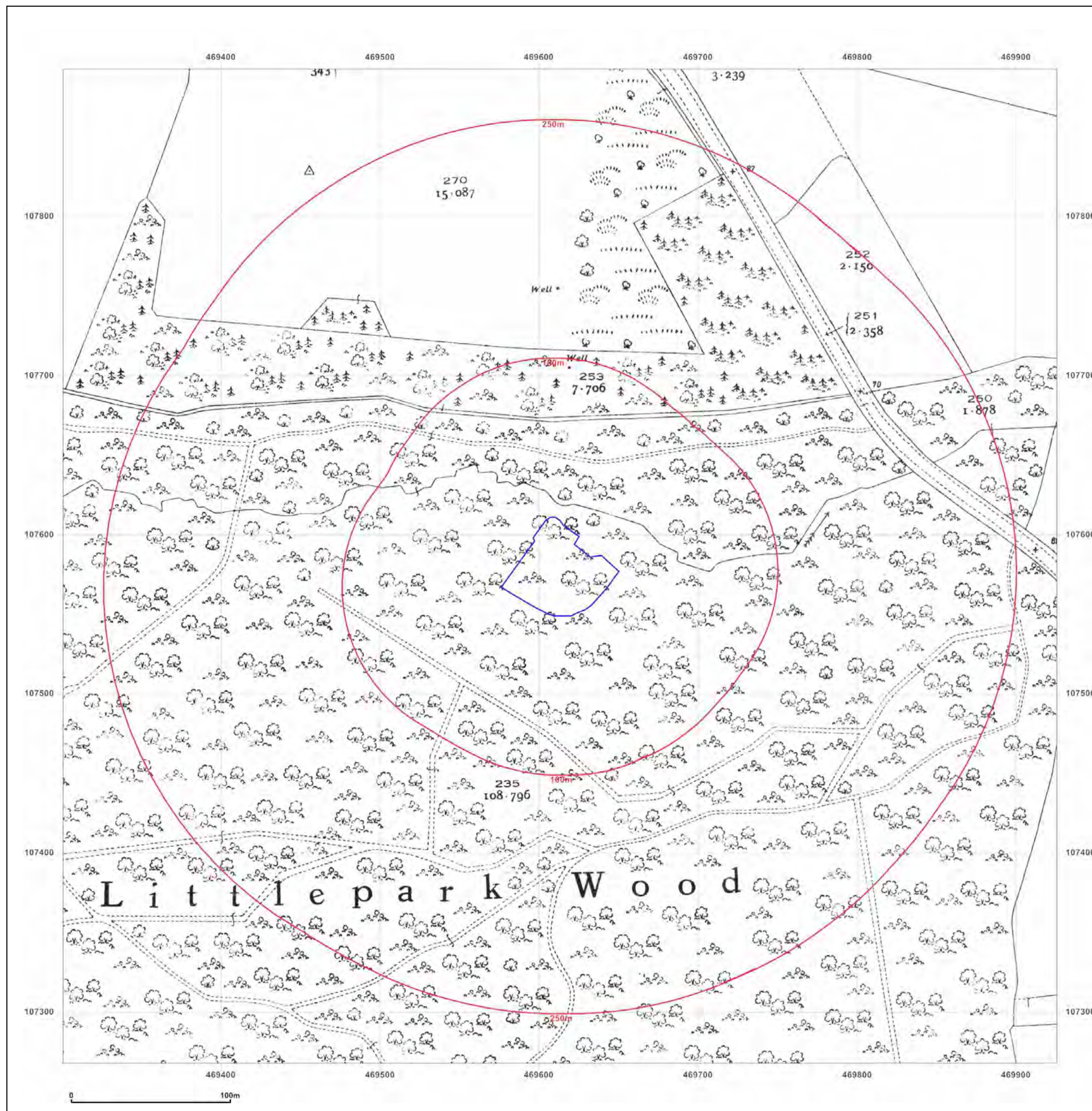


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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1957

Scale: 1:1,250

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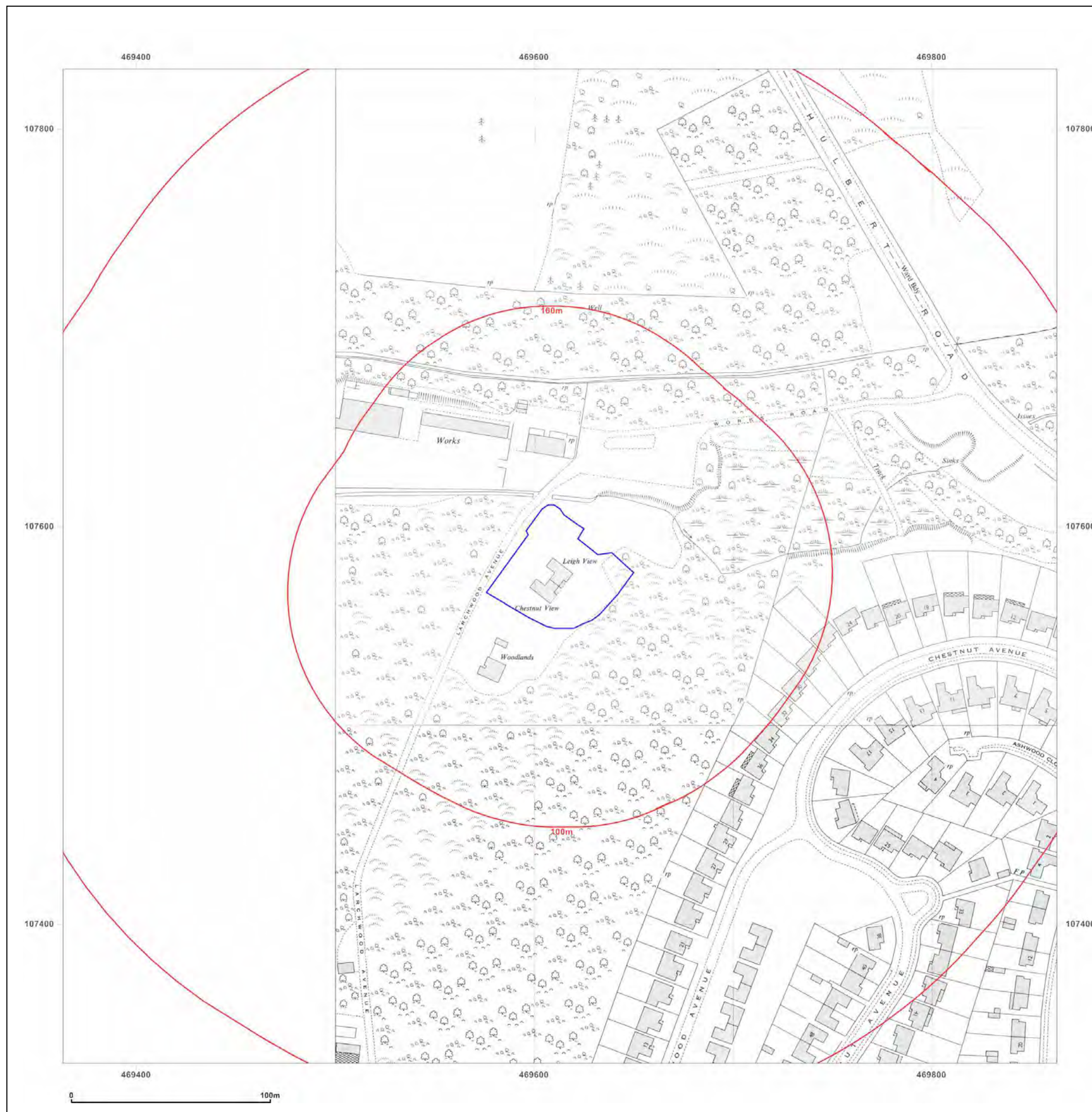


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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1965

Scale: 1:2,500

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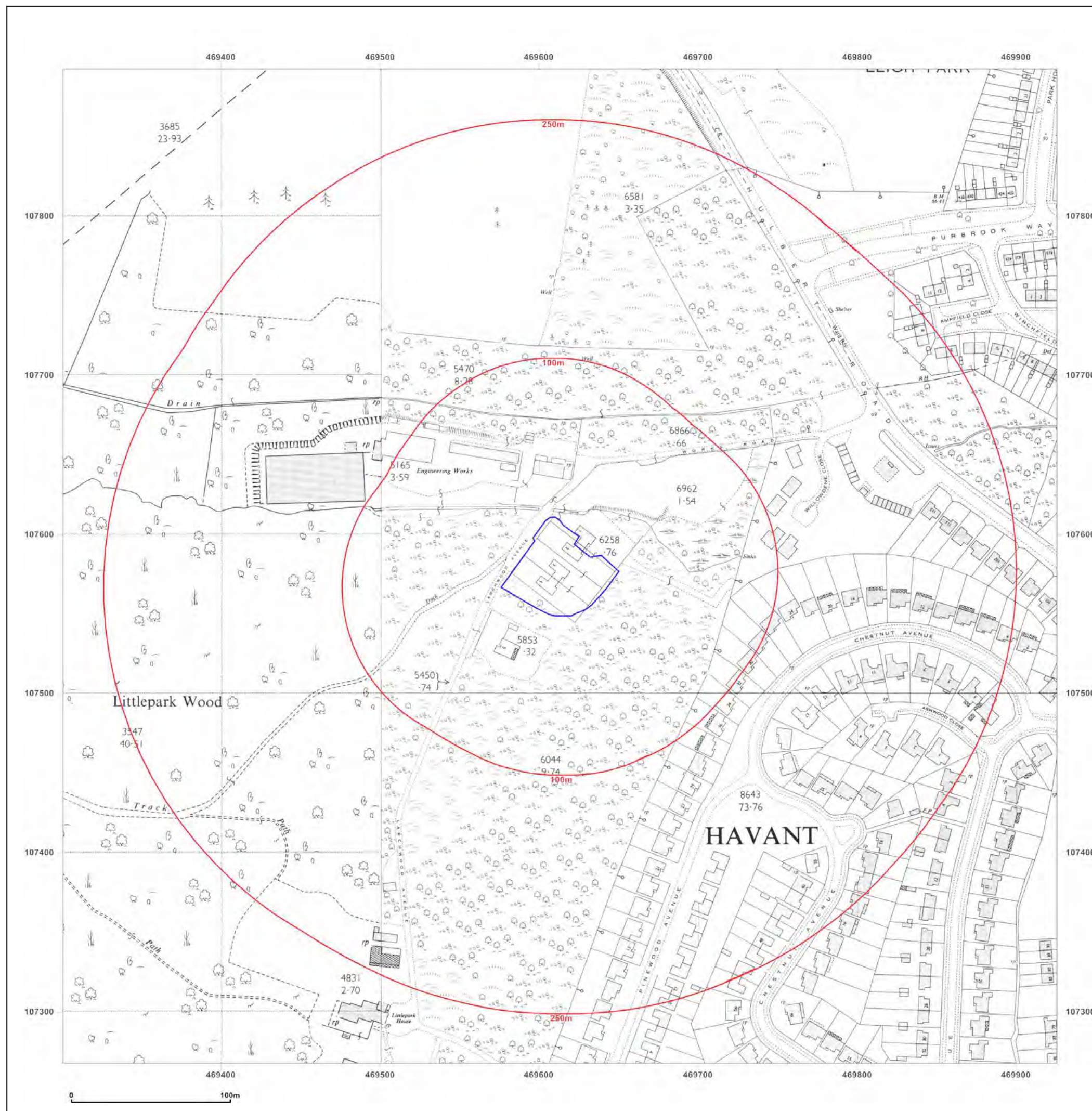


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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1973-1975

Scale: 1:1,250

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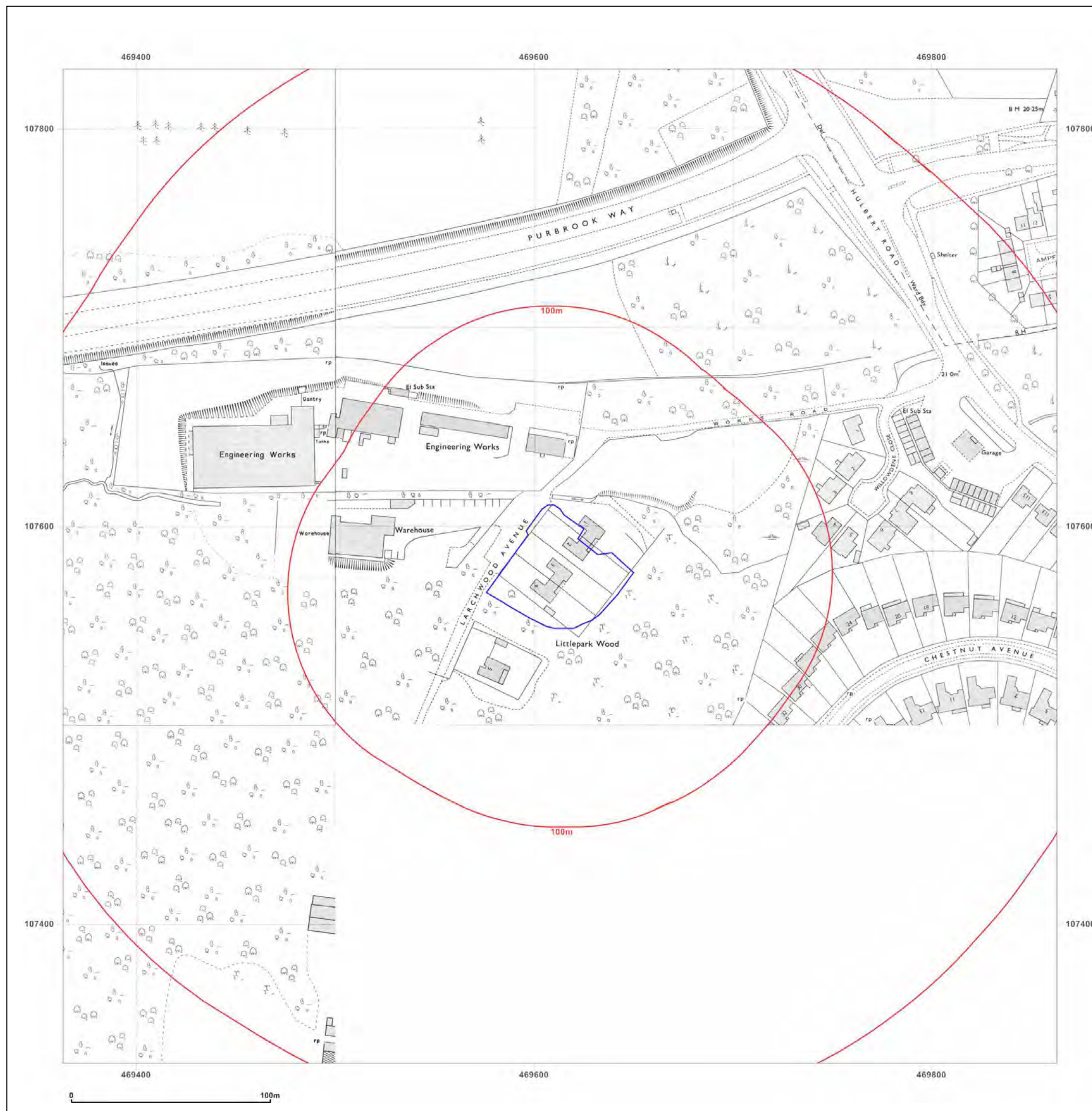


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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1979-1982

Scale: 1:1,250

Printed at: 1:2,000



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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1985

Scale: 1:1,250

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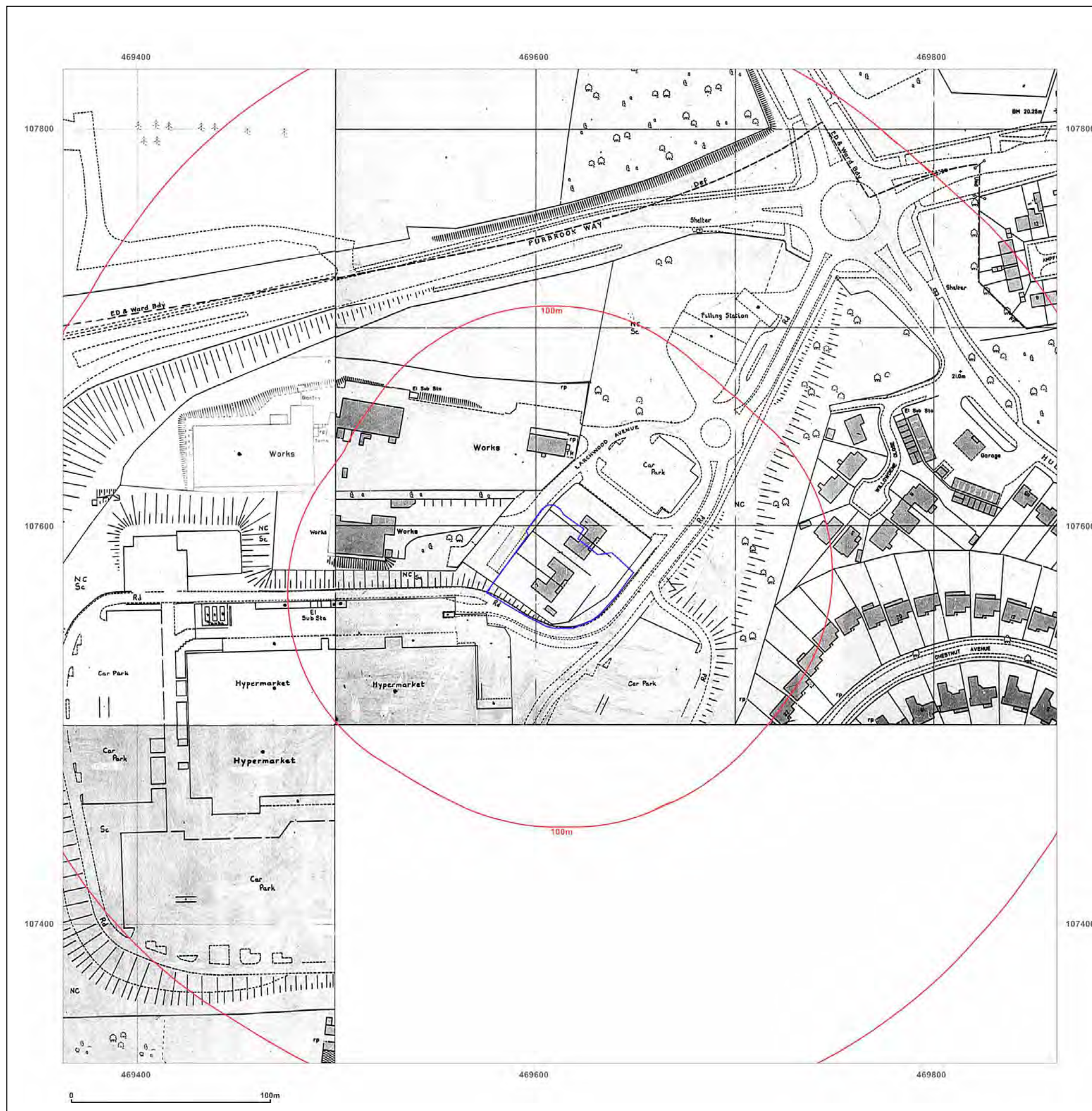


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Client Ref: EMS_351309_471846
Report Ref: EMS-351309_471846
Grid Ref: 469613, 107580

Map Name: National Grid

Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000



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APPENDIX II

APPENDIX II – DESK STUDY INFORMATION

GroundSure Environmental Database

Enquiries were made to the GroundSure Environmental Database regarding the site and surrounding area. This database includes collated and continuously updated information from a variety of sources and includes entries that cover Environment Agency permits, waste sites, hazardous substances, geological data, industrial landuse, groundwater vulnerability, source protection zones and floodplains.

A report is included in this Appendix for a search radius of 1 km around the site and this report includes a summary table of the search results. Detailed information contained in the report has been included only if it is relevant to the geotechnical and environmental assessment. All other pages have been omitted. A full copy of the GroundSure Report can be provided on request.

Groundsure Enviroinsight

Address: CCL02834-Bedhampton,KFC Larchwood Avenue,Bedhampton,PO9 3QW,

Date: 9 Mar 2016

Reference: EMS-351309_471847

Client: EmapSite

NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 20-Aug-2013

Grid Reference: 469613,107576

Site Size: 0.26ha

Report Reference: EMS-351309_471847

Client Reference: EMS_351309_471847

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	2	3	4
1.2 Additional Information – Historical Tank Database	0	3	3	0
1.3 Additional Information – Historical Energy Features Database	0	1	16	8
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	3	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	5	0
1.6 Potentially Infilled Land	0	0	2	4
Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	1	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	0	2
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency Historic Landfill Sites	0	0	0	1	0	0
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency Licensed Waste Sites	0	0	0	0	0	5

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	2	13	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	2	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m					
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes					
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes					
	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	3
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	3
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	1	0	0	1	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	0	1	0	0	Not searched	Not searched
	On-site	0-50m	51-250	251-500	501-1000	1000-1500

Section 6: Hydrogeology and Hydrology

0-500m

6.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	0	0	0	16	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	No
7.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site	No
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	Very Low
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

Section 8: Designated Environmentally Sensitive Sites

On-site 0-50m 51-250 251-500 501-1000 1000-2000

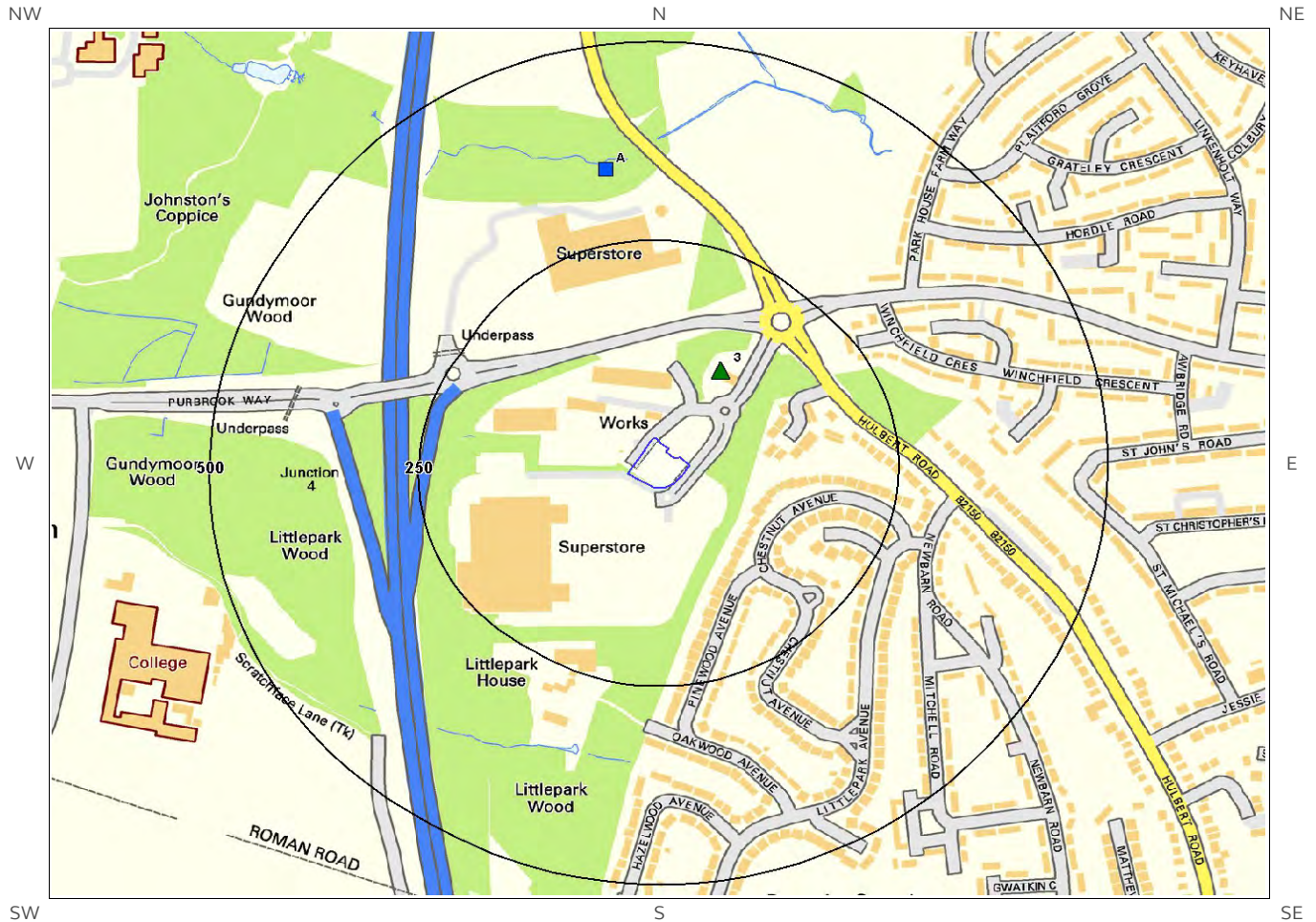
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	1	4	10	5
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	1	0	0	1	0	0
8.14 Records of Green Belt land	0	0	0	0	0	0

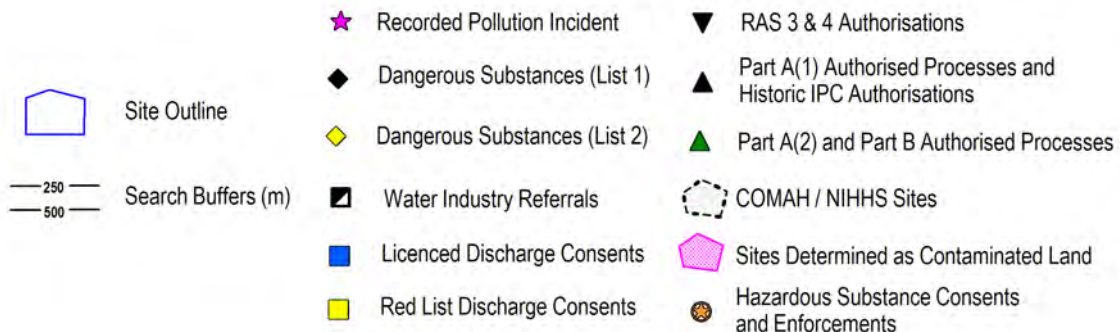
Section 9: Natural Hazards	
9.1 What is the maximum risk of natural ground subsidence?	Low
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Negligible
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Very Low
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining	
10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	No
10.3 Are there any brine affected areas within 75m of the study site?	No

2. Environmental Permits, Incidents and Registers Map



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2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
3	113	NE	469687 107695	Address: ASDA Stores Ltd, ASDA Havant PFS, Larchwood Road, Bedhampton, Havant, Hampshire, PO7 3QW Process: Unloading of Petrol into Storage at Service Stations (Stage 2) Status: Current Permit Permit Type: Part B Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

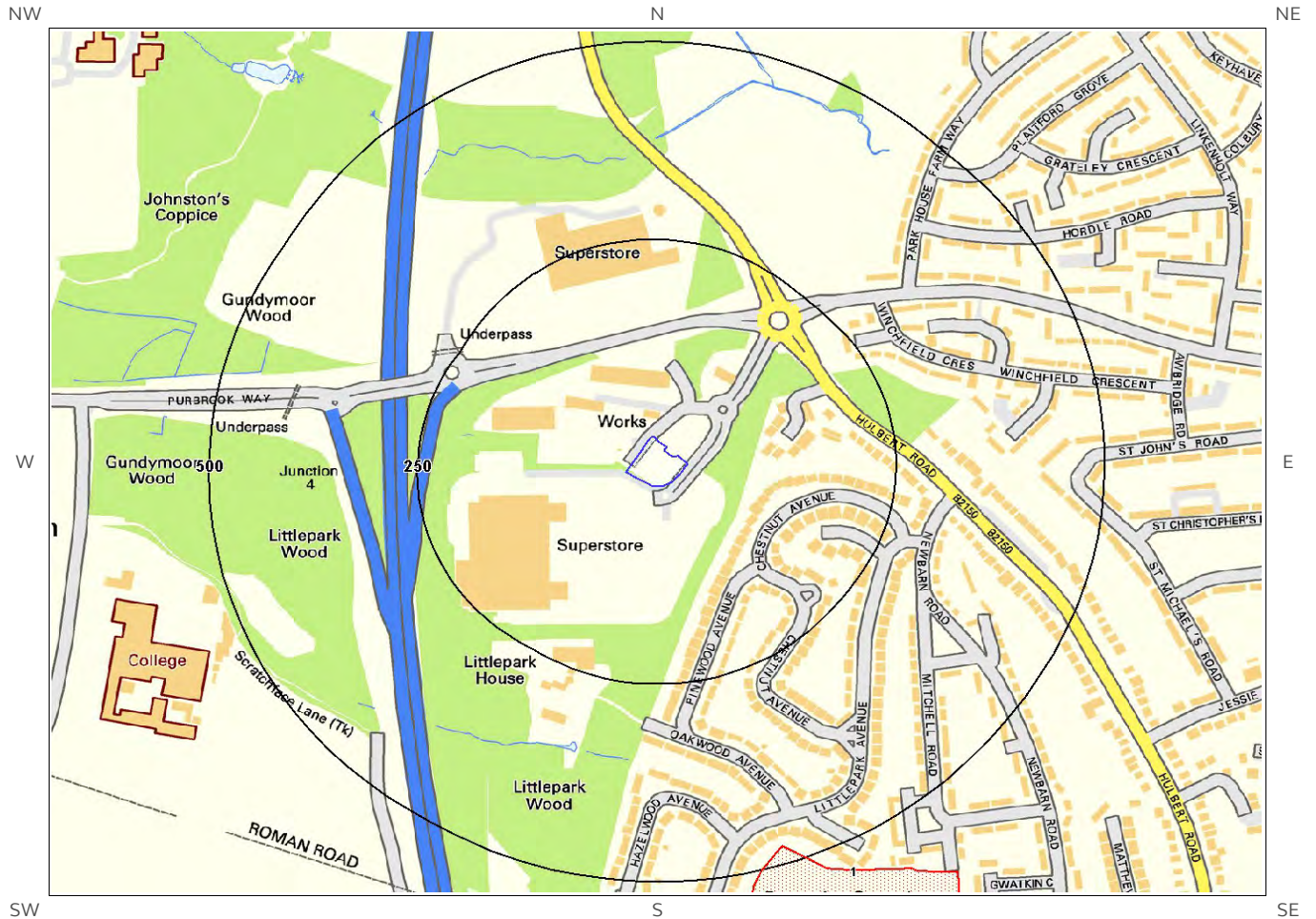
2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

2

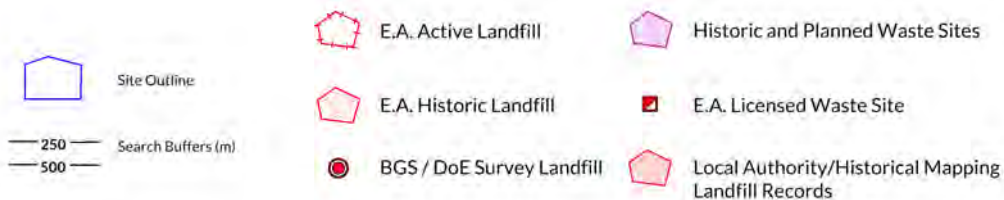
The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
1A	344	N	469550 107950	Address: SITE AT PURBROOK WAY, SITE AT PURBROOK WAY, HUBERT RD, HAVANT, HAMPSHIRE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: N01079 Permit Version: 1 Receiving Water: Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 15/11/1984 Effective Date: 15-Nov-1984 Revocation Date: 28/09/2000
2A	344	N	469550 107950	Address: SITE AT PURBROOK WAY, SITE AT PURBROOK WAY, HUBERT RD, HAVANT, HAMPSHIRE Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: N01079 Permit Version: 2 Receiving Water: Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 28/09/2000 Effective Date: 28-Sep-2000 Revocation Date: -

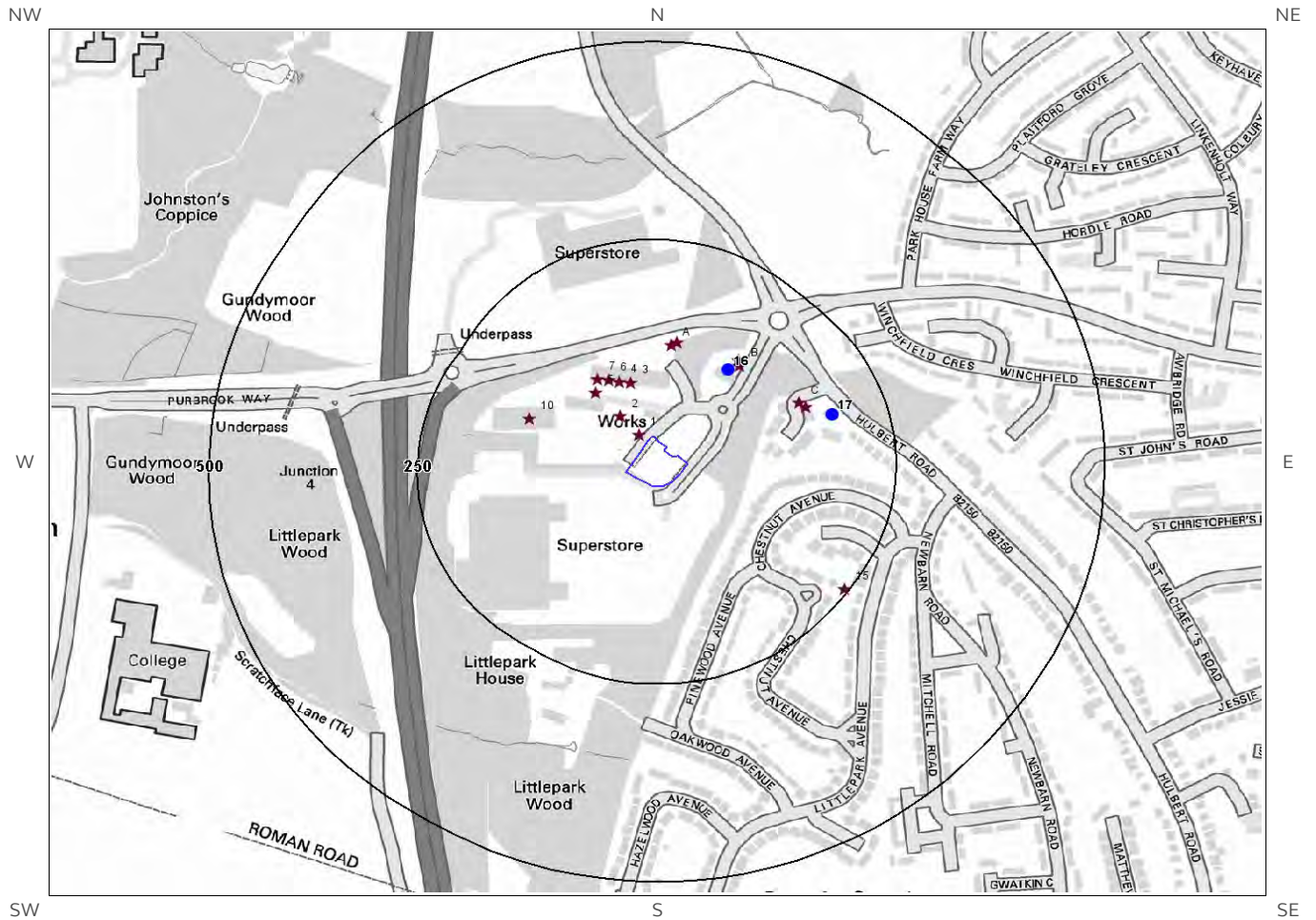
3. Landfill and Other Waste Sites Map



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4. Current Land Use Map



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Site Outline

★ Current Industrial Sites

— Electricity Transmission Cables

— 250 — Search Buffers (m)
— 500 —

● Petrol & Fuel Sites

— Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site:

15

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	13	NW	Electricity Sub Station	469592 107615	PO9	Electrical Features	Infrastructure and Facilities
2	45	NW	Works	469569 107638	PO9	Unspecified Works Or Factories	Industrial Features
3	74	N	Mitchell & James Caravans Ltd	469581 107680	Unit 4 6, Larchwood Avenue, Havant, PO9 3BE	Sports and Leisure Equipment Repair	Repair and Servicing
4	81	NW	C & S M O T Testing Ltd	469568 107682	Unit 5 Larchwood Avenue, Havant, PO9 3BE	Vehicle Repair, Testing and Servicing	Repair and Servicing
5	88	NW	Electricity Sub Station	469539 107668	PO9	Electrical Features	Infrastructure and Facilities
6	90	NW	Printer Graphics Ltd	469554 107684	Unit 6 6, Larchwood Avenue, Havant, PO9 3BE	Published Goods	Industrial Products
7	99	NW	Town & Country Covers Ltd	469541 107685	Unit 7 6, Larchwood Avenue, Havant, PO9 3BE	Vehicle Components	Industrial Products
8A	119	N	Electricity Sub Station	469630 107728	PO9	Electrical Features	Infrastructure and Facilities
9A	123	N	Gas Governor Station	469637 107731	PO9	Gas Features	Infrastructure and Facilities
10	134	NW	Works	469460 107635	PO9	Unspecified Works Or Factories	Industrial Features
11B	135	NE	Asda Petrol	469712 107702	Larchwood Avenue, Havant, PO9 3QW	Petrol and Fuel Stations	Road and Rail
12B	140	NE	Asda Havant	469711 107709	Willowdene Close, Bedhampton, Havant, Hampshire, PO9 3QP	Petrol and Fuel Stations	Road and Rail
13C	154	NE	Electricity Sub Station	469783 107655	PO9	Electrical Features	Infrastructure and Facilities
14C	159	NE	Sparshatts of Havant	469791 107650	Hulbert Road, Havant, PO9 3RH	Secondhand Vehicles	Motoring
15	244	SE	Electricity Sub Station	469838 107420	PO9	Electrical Features	Infrastructure and Facilities

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site:

2

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
16	121	NE	469698 107696	Asda	Asda Havant, Willowdene Close, Willowdene Close, Bedhampton, Havant, Hampshire, PO9 3QP	No	Open
17	184	E	469823 107640	Texaco	Victory Garage, Hulbert Road, Hulbert Road, Bedhampton, Havant, Hampshire, PO9 3RH	Not Applicable	Obsolete

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site:

0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site:

0

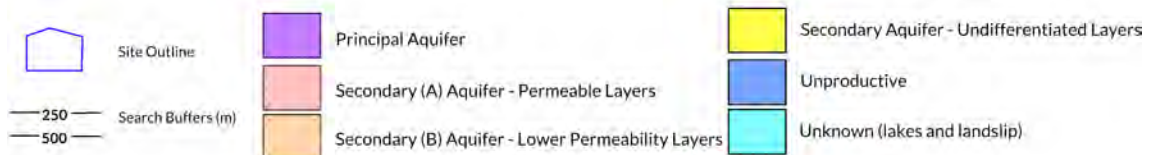
Database searched and no data found.

6 Hydrogeology and Hydrology

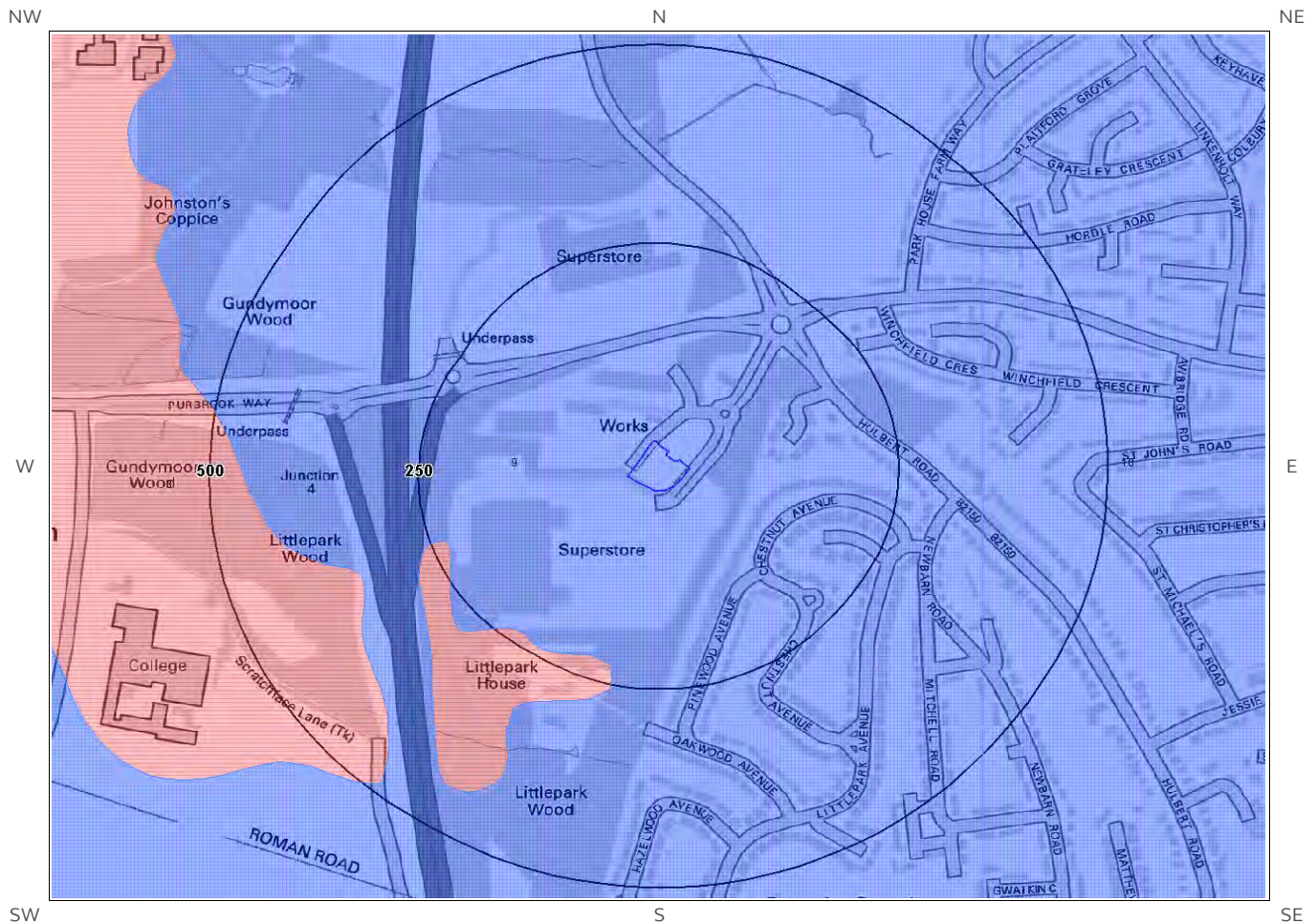
6a. Aquifer Within Superficial Geology



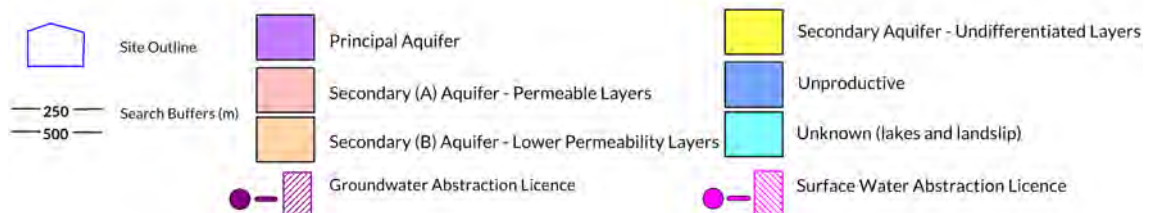
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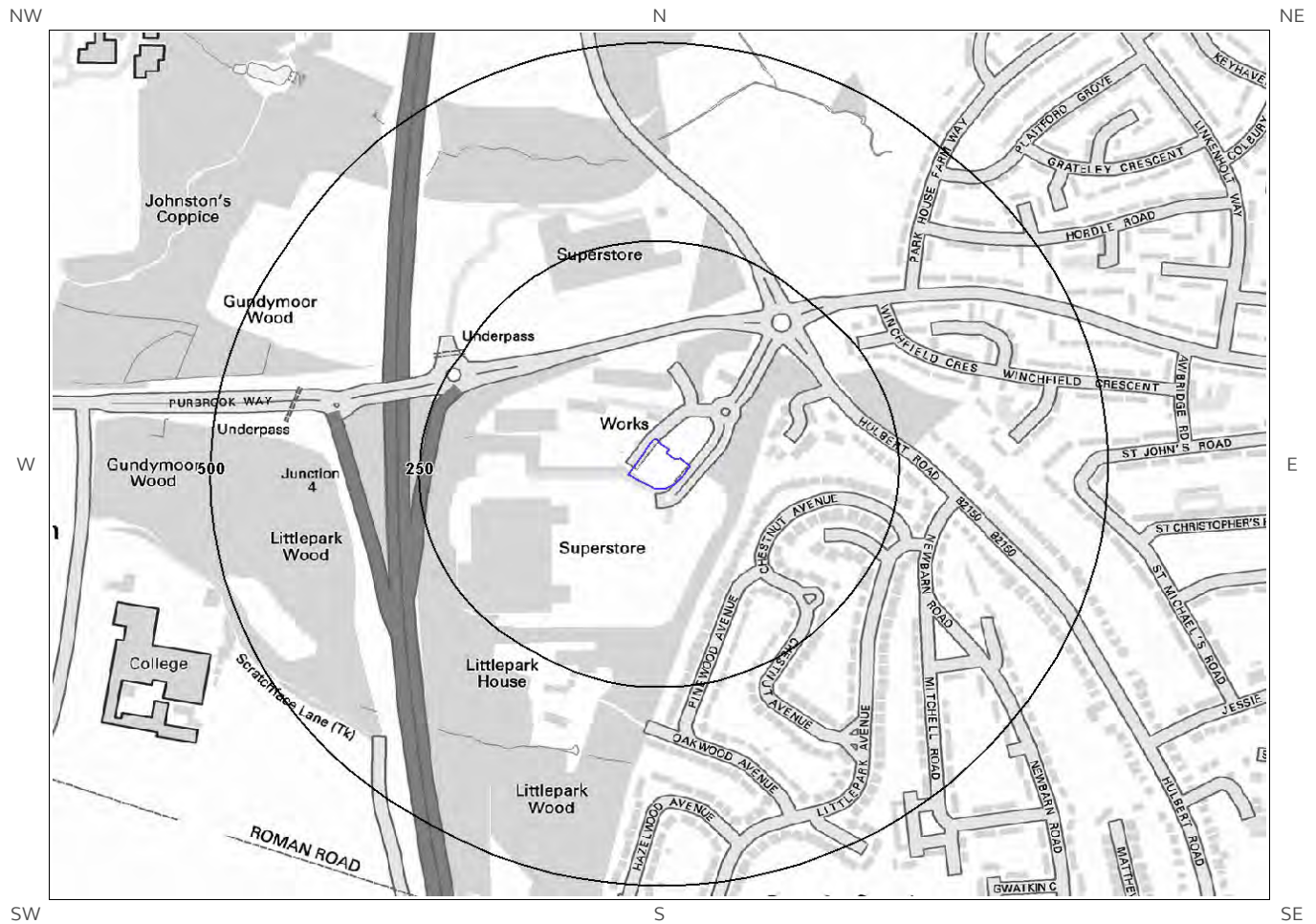
6b. Aquifer Within Bedrock Geology and Abstraction Licenses



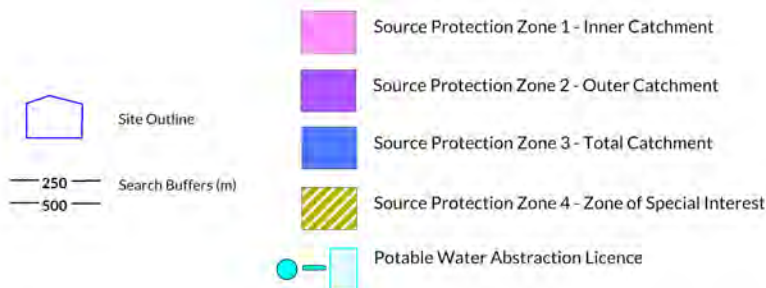
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6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



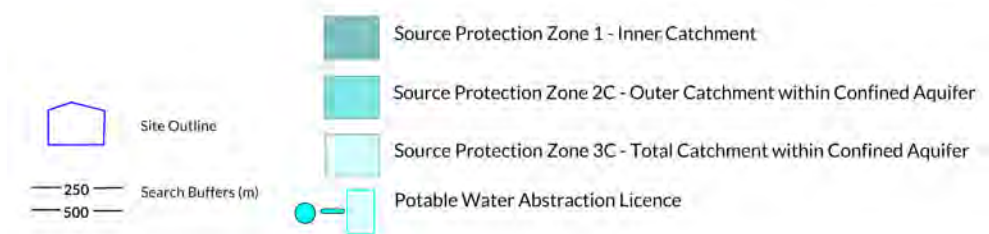
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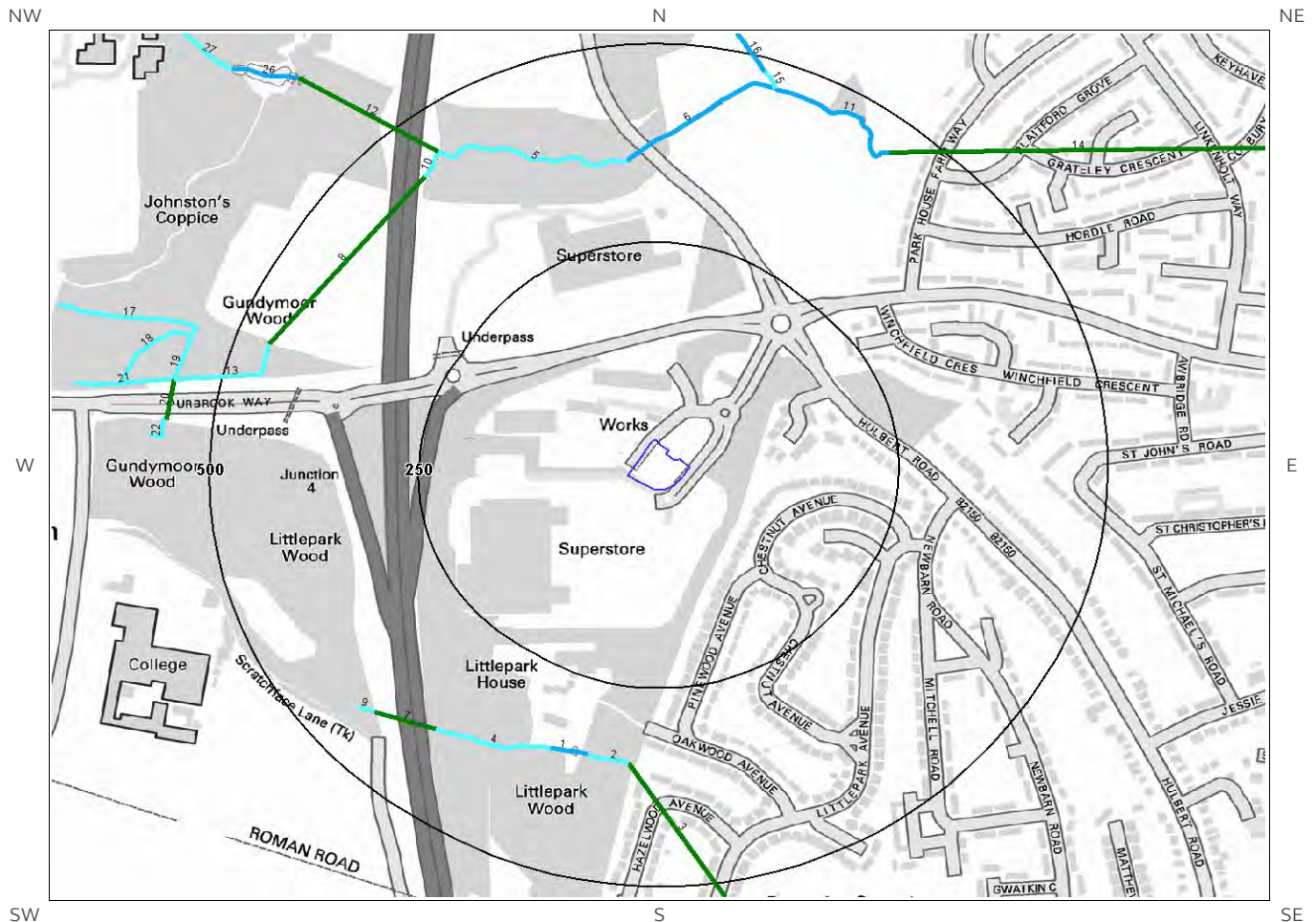
6d. Hydrogeology – Source Protection Zones within confined aquifer



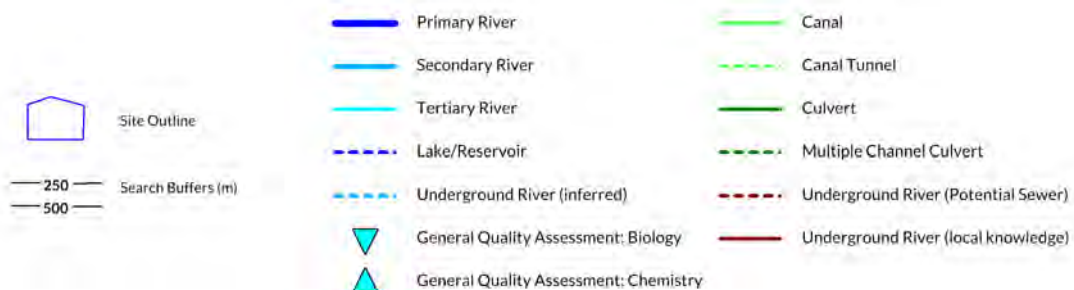
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6e. Hydrology – Detailed River Network and River Quality



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6. Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? **Yes**

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	324	S	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
3	350	E	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? **Yes**

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
9	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	221	S	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	343	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
10	350	E	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? Yes

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

The following Source Protection Zones records are represented on the SPZ within Confined Aquifer and Potable Water Abstraction Map(6d):

ID	Distance	Direction	Type	Description
1	0	On Site	1c	Inner catchment within confined aquifer
2	350	E	1c	Inner catchment within confined aquifer

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency information on groundwater vulnerability and soil leaching potential within 500m of the study site? Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
17	W	Minor Aquifer/Low Leaching Potential	L	Soils in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants.

6.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? No

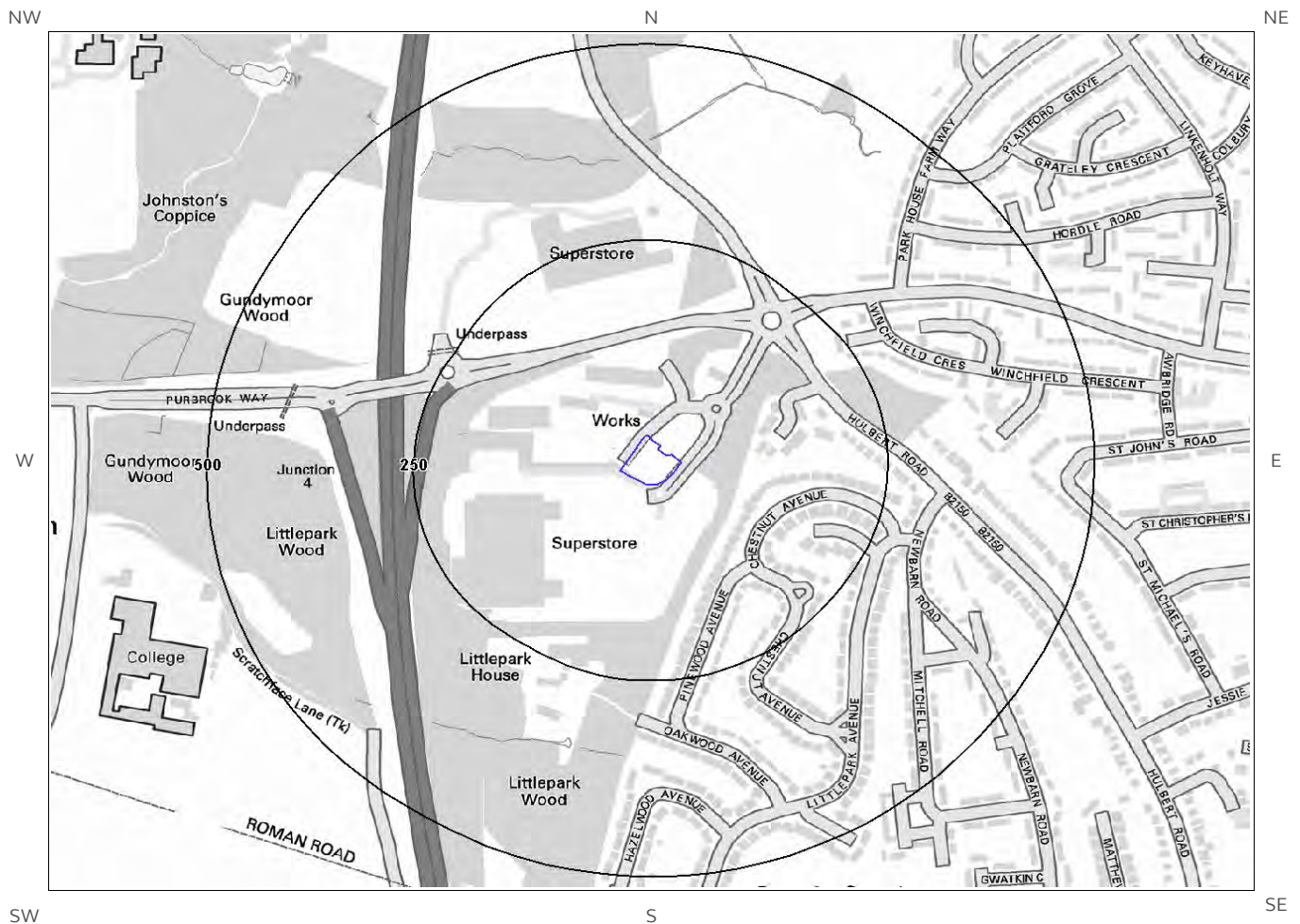
6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

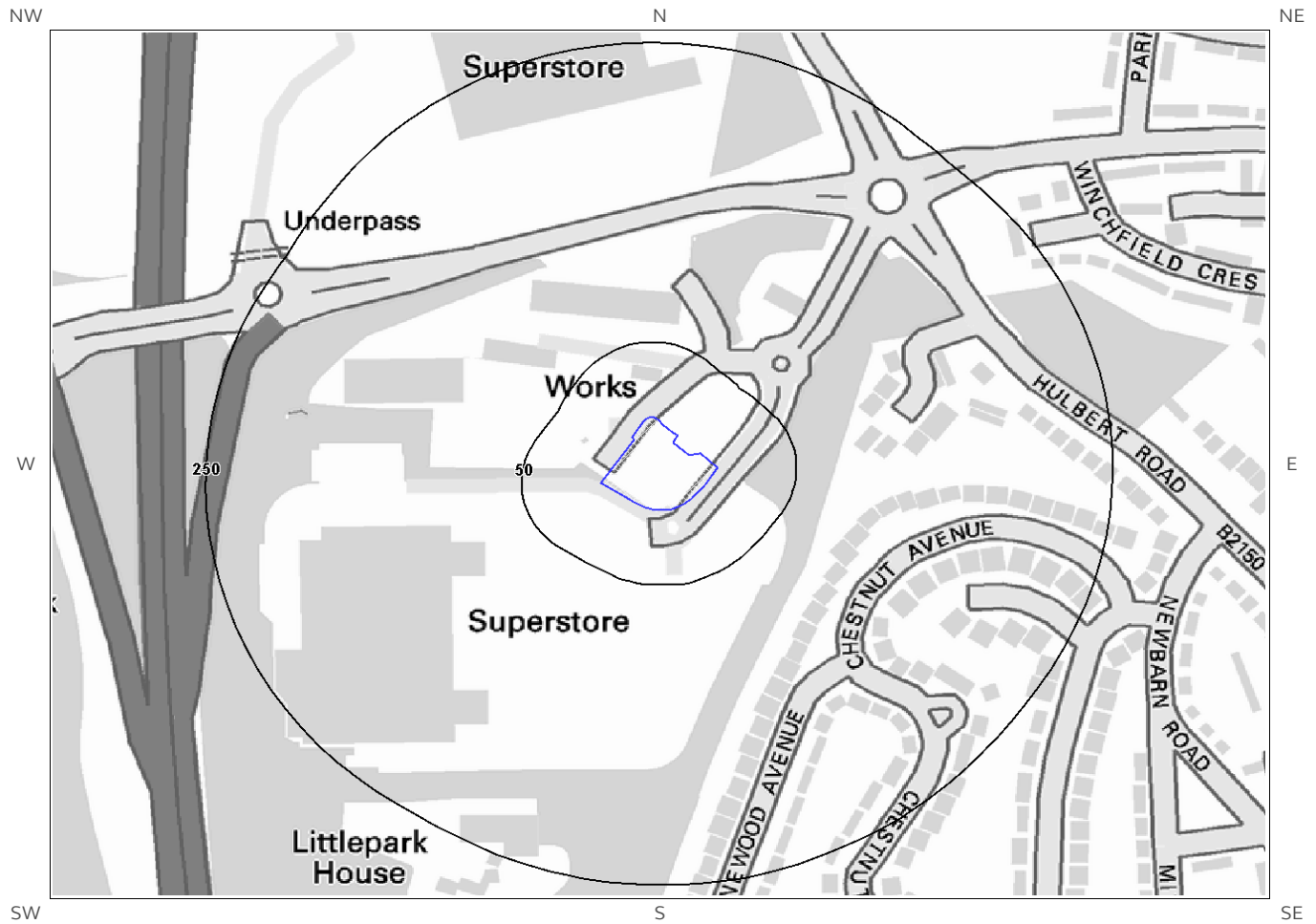
7a. Environment Agency Flood Map for Planning (from rivers and the sea)



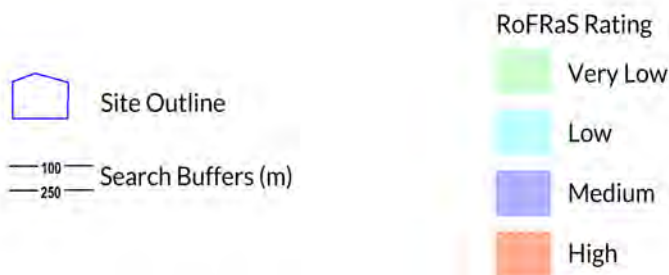
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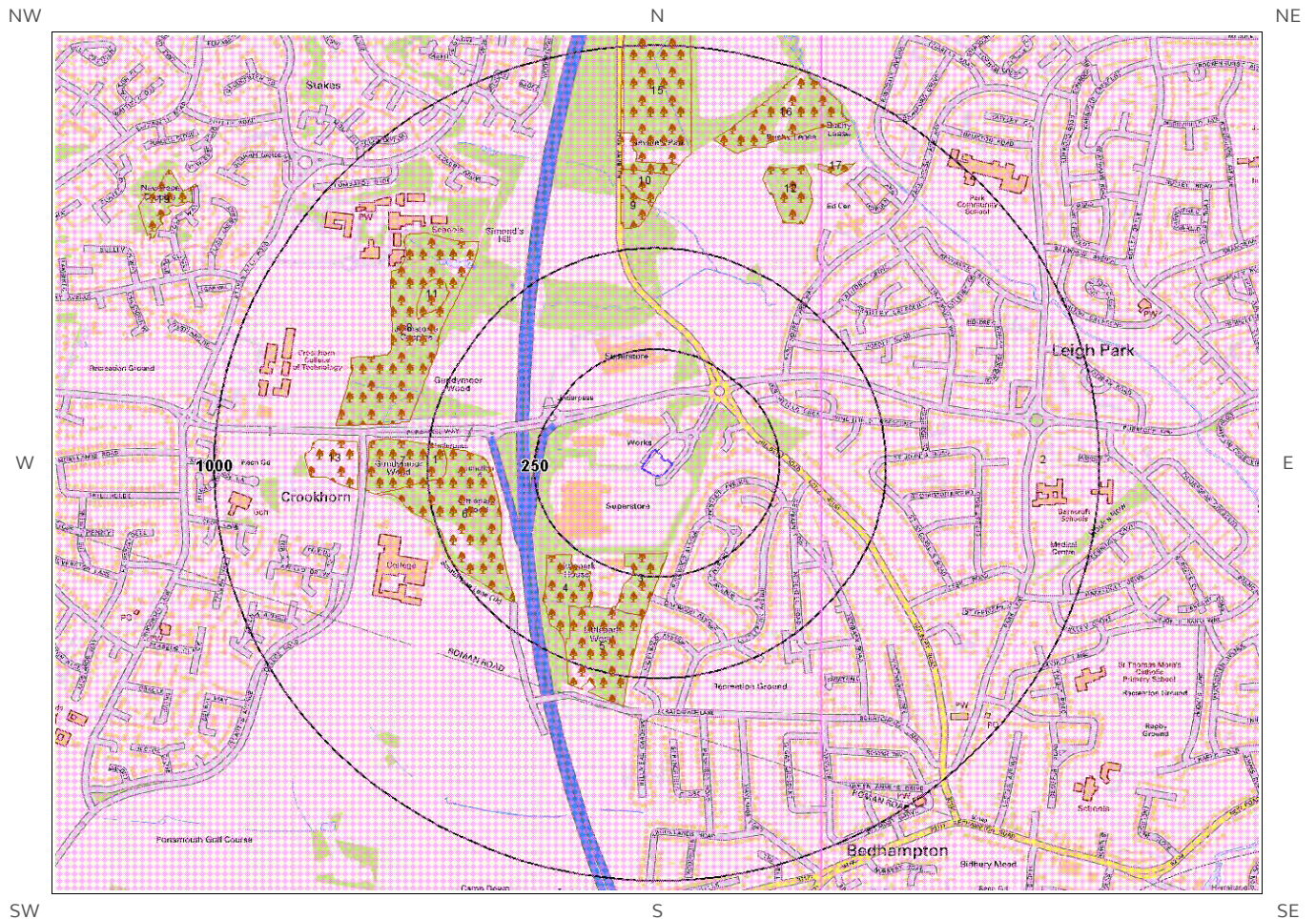
7b. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map



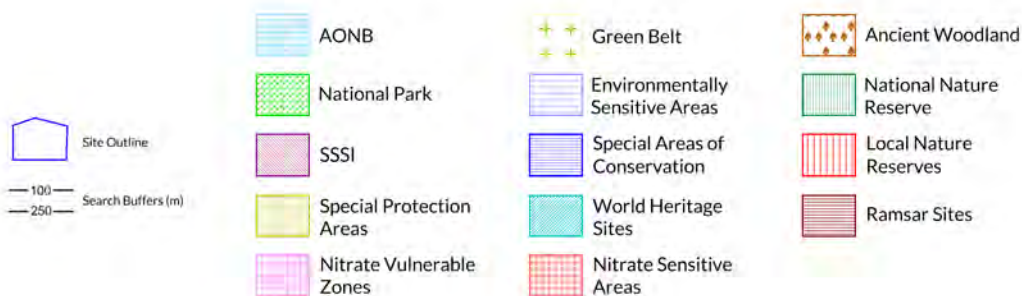
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8. Designated Environmentally Sensitive Sites Map



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8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

2

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
1	0	On Site	Existing	DEFRA
2	350	E	Existing	DEFRA

APPENDIX III

APPENDIX III – GROUND INVESTIGATION

Introduction

This Appendix, together with Sections 2 to 5 of the report, forms the Ground Investigation Report for the development described in the report, in compliance with the requirements of BS 5930:2015, BS EN1997-1:2004(2007) and BS EN1997-2:2007(2007).

The site operations were carried out on 16th March 2016 the supervision of a geotechnical engineer from Crossfield Consulting Limited. The scope and rationale for the design of the investigation is presented in Table III-1.

The ground investigation was designed and supervised by qualified and experienced geo-environmental specialists from Crossfield Consulting Limited. Where appropriate, and as outlined below, specialist drilling/sampling equipment was procured together with trained and experienced operators. Unless otherwise indicated, sampling and logging remained the responsibility of trained staff from Crossfield Consulting Limited and field records were prepared on site, during or immediately following drilling/sampling or in situ measurements/tests. The results of in situ tests are presented on the relevant record sheets in this Appendix.

An exploratory hole location plan is presented as Figure III-1.

Windowless Sampling

Five windowless sampling boreholes, denoted as WS1 to WS5, were sunk by Dynamic Sampling UK Limited, on 16th March up to 5.0 m depth. Dynamic/driven open-tube soil sampling/boring was undertaken using a Premier Compact rig. Using a 1.0 m long thick-walled open-tube sampler (with plastic liner), Category A and B samples were recovered (sample disturbance being influenced by the specific soils encountered). Where appropriate, small disturbed sub-samples were recovered from the materials recovered in the open-tube sampler.

In situ hand vane tests were carried out on fine-grained soils, where appropriate, to provide undrained shear strength data representative of the tested horizon. The tests were carried out using Pilcon hand vane test equipment (with extension rods, where necessary).

Standard Penetration Tests (SPT) were carried out at regular intervals to provide data on the in situ density of coarse-grained strata and an indication of strength within fine-grained strata. The SPTs were carried out in accordance with BS EN ISO 22476-3:2005(2007).

The records from the investigation are presented in this Appendix. These records include the descriptions and depths of the strata encountered, together with sample depths, in situ test results (uncorrected values), groundwater observations, details of installations/backfill within exploratory holes and other pertinent comments.

Soil Samples

All samples for analytical testing were collected in appropriate containers, stored in cool boxes (where appropriate) and sent to the testing laboratory overnight. The sample containers, storage and handling procedures were all compatible with the relevant recommendations of the UKAS accredited testing laboratory for the specific testing proposed.

Samples designated for geotechnical testing were collected, stored and transported in accordance with the published requirements for the specific tests scheduled, such that moisture content and soil structure integrity was maintained, as necessary for the test requirements.

Analytical Laboratory Testing

The rationale for the analytical testing is set out in Table III-2.

Three shallow soil samples were analysed for Waste Classification and Waste Acceptance Criteria Tests (WAC) to BS EN 12457-3:

Arsenic (Total)	Copper (Total)	TPH bands (C ₆ -C ₁₀ /C ₁₀ -C ₂₅ /C ₂₅ -C ₄₀)
Cadmium (Total)	Nickel (Total)	BTEX *
Lead (Total)	Zinc (Total)	PCB # - Total (7 Congeners)
Chromium (Total)	Cyanide (total)	PAH - (WAC 17) ^Δ
Mercury (Total)	Total Organic Carbon (TOC)	Acid Neutralisation Capacity
Selenium (Total)	Loss on Ignition @ 450°C	pH
(Asbestos ACM/Fibre Screen & Quantification)		
Arsenic (dissolved)	Molybdenum (dissolved)	Chloride
Barium (dissolved)	Nickel (dissolved)	Fluoride
Cadmium (dissolved)	Lead (dissolved)	Sulphate as SO ₄
Chromium (dissolved)	Antimony (dissolved)	Dissolved Solids
Copper (dissolved)	Selenium (dissolved)	Phenols - Total (monohydric)
Mercury (dissolved)	Zinc (dissolved)	Total Organic Carbon (TOC)

* BTEX: Benzene, Ethylbenzene, Toluene, Xylenes and Methyl tertiary-butyl ether (MTBE)

PCB: Polychlorinated biphenyl (congener Nos. 28, 52, 101, 118, 138, 153, 180)

^Δ PAH: Polyaromatic Hydrocarbons (17No. compounds from WAC criteria)

The analyses were carried out by i2 Analytical Limited, a UKAS accredited laboratory, and the results are presented in this Appendix. Soil testing was undertaken in accordance with the Environment Agency's Monitoring Certification Scheme (MCERTS).

Geotechnical Laboratory Testing

The rationale for the geotechnical laboratory testing is set out in the Table III-3.

Selected samples of the soils encountered were submitted for analysis for the following tests:

- Moisture content
- Atterberg Limits
- pH value
- Water soluble sulphate

The analyses were carried out by i2 Analytical Limited and GEO Site & Testing Services Limited, UKAS accredited laboratories, and the results are presented in this Appendix.

TABLE III-1

RATIONALE FOR THE DESIGN OF THE GROUND INVESTIGATION

The scope of the ground investigation was designed with reference to the published geology and ground conditions indicated in the desk study information.

In compliance with the guidance published in BS EN 1997-2:2007, the ground investigation was designed to verify the preliminary ground model, established from the desk study information and to characterise the ground conditions within influencing distance of the proposed structures. In this regard, the exploratory holes were targeted within relevant areas of the site to provide information on the strata profile down to competent materials. With reference to the desk study information and the support requirements of the proposed development, it is evident that adequate support is provided by the strata that continue below the depths of the exploratory holes.

In compliance with the guidance published in BS 10175:2011+A1:2013 and BS 5930:2015, the layout of the exploratory holes and sampling regime also considers the Conceptual Site Model and potential pollutant linkages, such that the spatial arrangement of the investigation provides the necessary information to support a risk assessment of the identified potential pollutant linkages.

Exploratory Hole and Technique	Rationale for Hole Location	Depth (m)	Sampling/In Situ Testing and Monitoring
WS1 to WS5	Exploratory holes were located to provide information on the stratigraphy and soil properties within the proposed development area.	Up to 5.0 m	Soil samples were recovered at regular intervals for geotechnical testing. Standard penetration tests (SPTs) carried out at regular intervals.
WS1 to WS5	Exploratory holes were located to investigate potential pollutant linkages within the proposed development area and to obtain samples to assess waste classification.	Up to 5.0 m	Representative soil samples were recovered for analytical tests.

Key

WS X Windowless Sample Borehole

TABLE III-2

RATIONALE FOR THE ANALYTICAL TESTING SUITE

Exploratory Hole and Samples	Selection Criteria	Analytical Tests
WS1: 0.5 m WS2: 0.7 m WS3: 0.5 m	Representative soil samples of materials that may require disposal from site were collected for waste assessment purposes.	Screening tests for metals, metalloids and common organic compounds Two-stage Eluate Test, BS EN12457-3 WAC Full Solid Suite
WS1: 0.5 m WS2: 0.7 m WS3: 0.5 m WS4: 0.3 m	Samples of Made Ground recovered to assess potential soil contamination by asbestos.	Asbestos (Fibre & ACM) Screen & ID Asbestos Quantification

TABLE III-3

RATIONALE FOR THE GEOTECHNICAL TESTING SUITE

Exploratory Hole and Sample	Selection Criteria	Geotechnical Tests
WS1: 1.5 m WS3: 1.5 m WS4: 3.5 m WS5: 1.5 m	Samples of potential founding strata recovered for soil classification and foundation design purposes.	Moisture content Atterberg Limits
WS1: 1.5 m WS2: 2.5 m WS3: 1.5 m WS4: 3.5 m WS5: 1.5 m WS5: 4.5 m	Samples of potential founding strata recovered for foundation concrete design purposes.	pH Water soluble sulphate

WINDOWLESS SAMPLE RECORDS

KEY

Sampling

J	Disturbed Jar Sample
G	Jar Sample in Glass Container
g	Soil Sample in Glass Vial
W	Water Sample
IC	Nett sample recovery ratio (ratio of length of recovered sample to length of sample run)

In Situ Measurements

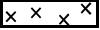
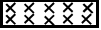
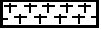
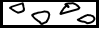
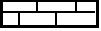
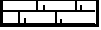
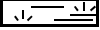
FVT	C_{fv}	Undrained Shear Strength (from hand vane shear vane test)
	C_{rv}	Undrained Remoulded Shear Strength (from hand vane shear vane test)
	C_{fv}^*	Hand Vane Shear Strength Test (on Category A: OS-TK/W soil sample recovered in window sampler)
	S	Standard Penetration Test (SPT: split spoon sampler)
	SPT(C)	SPT carried out with a 60° cone
	'N'	'N' Value from SPT test
	N_{10}	Dynamic Probe Test: Number of blows to drive 100 mm
DPH	N_{H10}	Dynamic Probe Test: Heavy (30 kg mass & 500 mm fall)
DPSH-A	N_{SHA10}	Dynamic Probe Test: Super-Heavy A (63.5 kg mass & 500 mm fall)
DPSH-B	N_{SHB10}	Dynamic Probe Test: Super-Heavy B (63.5 kg mass & 750 mm fall)
	$\frac{x}{y}$	x Blows per y Driving Distance (for non-standard SPT or DP driving distance)
	y mm	
	T	Torque (max) required to turn rods (unit: Nm, unless otherwise shown)

Notes:

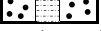
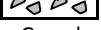
1. All measurement values on record sheets are uncorrected, unless otherwise indicated.
2. For corrected test values, refer to report.
3. Identification and classification of strata is based on the guidance published in the current edition of BS5930 together with BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003
4. Consistency (soft, firm, stiff etc) relates to a manual test/inspection on site (in compliance with BS EN ISO 14688-1:2002 Section 5.14).
5. Undrained shear strength (low, medium, high etc) relates to in situ or laboratory test data and the associated assessed strength of a stratum (in compliance with BS EN ISO 14688-2:2004 Section 5.3 and Table 5).
6. The density of coarse-grained soils is based on SPT N values (or equivalent Dynamic Probe test or CPT data) as outlined in BS5930 and BS EN ISO 14688-2:2004.
7. Rock strength (weak, strong etc) is based on field identification (and/or strength test data), as outlined in BS EN ISO 14689-1:2003 Table 5.

BOREHOLE & DRILLHOLE RECORDS - LEGENDS KEY SHEET

Legend - Strata Encountered in Exploratory Hole

Soil	Rock		
	Sedimentary	Igneous	Metamorphic
 Made Ground	 Mudstone	 Fine-grained	 Fine-grained
 Clay	 Shale	 Medium-grained	 Medium-grained
 Silt	 Siltstone	 Coarse-grained	 Coarse-grained
 Sand	 Sandstone		
 Gravel	 Limestone		
 Peat/Topsoil	 Chalk		
 Organic Sand	 Coal		
 Organic Clay	 Conglomerate		

Legend - Backfill to Borehole and Standpipe Installations

Backfill	Installations
 Soil arisings	 Concrete Cover Over Standpipe
 Bentonite	 Plain Standpipe - Bentonite Surround
 Cement-based Grout	 Perforated Standpipe - Geotextile and Granular Filter Surround
 Gravel	 Perforated Standpipe End Geotextile and Granular Filter Surround

Notes:

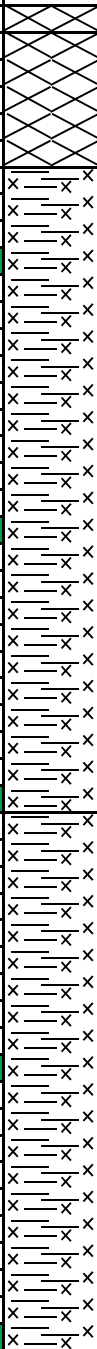
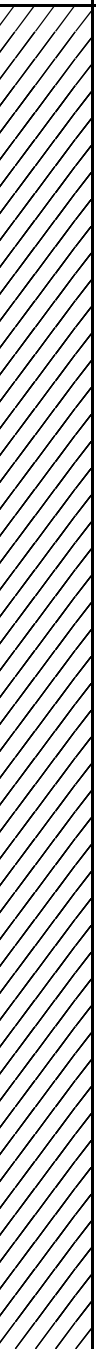
1. A combination of the strata symbols are indicative of mixed soil types.
2. The response zone of a standpipe refers to the section of perforated pipe within a granular surround, where substances may freely enter the standpipe from the surrounding strata.

					Windowless Sample Record Sheet			Hole Ref. WS1	
					Project: Larchwood Avenue, Bedhampton, Havant			Sheet 1 of 1	
					Date: 16/03/2016			Job No. CCL02834	
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110		Ground Level. 27.30 m OD*					
Method 0.0 m to 5.0 m windowless sampling				Co-ordinates					
Boring Diameter 100 mm				Logged by: SC Logged on site during drilling operations Checked by: <i>AMH</i>					
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.50	GgJJ				Tarmacadam surfacing (MADE GROUND)	0.10			27.20
1.00-1.45	S	-	-	N=6	Brown clayey sandy fine to medium angular to sub-angular flint gravel with brick and tarmacadam fragments. Sand is fine to coarse. (MADE GROUND)	0.80			26.50
1.50	JJ				Firm consistency brown mottled grey slightly sandy CLAY with organic content (HEAD DEPOSITS)				
2.00-2.45	S	-	-	N=7		2.00			25.30
3.00-3.45	S	-	-	N=10	Firm to stiff consistency fissured brown mottled orangish brown silty CLAY (WEATHERED LONDON CLAY)				
4.00-4.45	S	-	-	N=14		4.00			23.30
5.00-5.45	S	-	-	N=19	Stiff consistency dark grey mottled brown silty CLAY (LONDON CLAY)				
					End of Hole	5.00			22.30
Core Recovery					Groundwater			Additional Tests	
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	100%	5.00	-	-	None encountered.				
1.00-2.00	100%								
2.00-3.00	100%								
3.00-4.00	50%								
4.00-5.00	100%								
Remarks					Notes				
*Ground levels based on Topographical Survey by CTES Surveys					1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS2	
					Project: Larchwood Avenue, Bedhampton, Havant Date: 16/03/2016			Sheet 1 of 1 Job No. CCL02834	
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110		Ground Level. 27.70 m OD* Co-ordinates Logged by: SC Logged on site during drilling operations Checked by: <i>ASH</i>					
Method 0.0 m to 5.0 m windowless sampling		Boring Diameter 100 mm							
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.70	GgJJ				Tarmacadam surfacing (MADE GROUND)	0.10			27.60
1.00-1.45	S	-	-	N=8	Loose brown slightly clayey sandy fine to coarse angular to sub-angular gravel with brick fragments, rare ash, wood, fabric, plastic and glass fragments. Sand is fine to coarse (MADE GROUND)				
2.00-2.45	S	-	-	N=6	Firm consistency greyish brown slightly gravelly CLAY with rootlet organic content. Gravel is medium rounded flint (HEAD DEPOSITS)	1.60			26.10
2.50	JJ				Firm to stiff consistency fissured orangish brown mottled grey silty CLAY (WEATHERED LONDON CLAY)	2.00			25.70
3.00-3.45	S	-	-	N=11					
4.00-4.45	S	-	-	N=14					
5.00-5.45	S	-	-	N=18	End of Hole	5.00			22.70
Core Recovery				Groundwater			Additional Tests		
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	100%	5.00	-	-	None encountered.				
1.00-2.00	60%								
2.00-3.00	100%								
3.00-4.00	100%								
4.00-5.00	50%								
Remarks *Ground levels based on Topographical Survey by CTES Surveys					Notes 1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS3	
					Project: Larchwood Avenue, Bedhampton, Havant			Sheet 1 of 1	
					Date: 16/03/2016			Job No. CCL02834	
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110			Ground Level. 28.70 m OD*				
Method 0.0 m to 5.0 m windowless sampling					Co-ordinates				
Boring Diameter 100 mm					Logged by: SC		Logged on site during drilling operations		
Checked by: <i>APM</i>									
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.50	GgJJ				Tarmacadam surfacing (MADE GROUND)	0.10			28.60
					Brown clayey sandy fine to coarse angular to sub-angular flint gravel with brick and tarmacadam fragments. Sand is fine to coarse (MADE GROUND)				
1.00-1.45	S	-	-	N=2	Firm consistency grey slightly silty CLAY with rootlet organic content (HEAD DEPOSITS)	0.80			27.90
1.00	C _{IV}	-	-	40, 50					
1.50	JJ								
2.00-2.45	S	-	-	N=7		2.00			26.70
					Stiff consistency orangish brown mottled grey silty CLAY (WEATHERED LONDON CLAY)				
3.00-3.45	S	-	-	N=10					
4.00-4.45	S	-	-	N=15					
5.00-5.45	S	-	-	N=19	End of Hole	5.00			23.70
Core Recovery					Groundwater			Additional Tests	
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	70%	5.00	-	-	None encountered.				
1.00-2.00	70%								
2.00-3.00	100%								
3.00-4.00	100%								
4.00-5.00	100%								
Remarks					Notes				
*Ground levels based on Topographical Survey by CTES Surveys					1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS4			
					Project: Larchwood Avenue, Bedhampton, Havant Date: 16/03/2016			Sheet 1 of 1 Job No. CCL02834			
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110		Ground Level. 28.80 m OD* Co-ordinates Logged by: SC Logged on site during drilling operations Checked by: <i>APM</i>							
Method 0.0 m to 5.0 m windowless sampling											
Boring Diameter 100 mm											
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description		Depth	Legend	Backfill	Level O.D.	
0.30	GgJ				Tarmacadam surfacing (MADE GROUND) Brown slightly clayey sandy fine to medium angular to sub-angular flint gravel with rare brick fragments. Sand is fine to coarse (MADE GROUND) Firm to stiff consistency greyish brown slightly gravelly CLAY with rootlet organic content. Gravel is fine to coarse sub-rounded to rounded flint with cobbles (HEAD DEPOSITS)		0.10			28.70	
1.00-1.45	S	-	-	N=8			0.40			28.40	
1.00	C _v	-	-	55, 50	Stiff consistency orange mottled brown silty CLAY (WEATHERED LONDON CLAY)		1.00			27.80	
2.00-2.45	S	-	-	N=11							
3.00-3.45	S	-	-	N=12							
3.50	JJ										
4.00-4.45	S	-	-	N=15							
5.00-5.45	S	-	-	N=20	End of Hole		5.00			23.80	
Core Recovery				Groundwater				Additional Tests			
Depth		Recovery		Hole Depth		Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value
0.00-1.00		100%		5.00		-	-	None encountered.			
1.00-2.00		100%									
2.00-3.00		100%									
3.00-4.00		50%									
4.00-5.00		50%									
Remarks *Ground levels based on Topographical Survey by CTES Surveys						Notes 1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²					

					Windowless Sample Record Sheet			Hole Ref. WS5			
					Project: Larchwood Avenue, Bedhampton, Havant			Sheet 1 of 1			
					Date: 16/03/2016			Job No. CCL02834			
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110			Ground Level. 29.40 m OD*						
Method 0.0 m to 5.0 m windowless sampling					Co-ordinates						
Boring Diameter 100 mm					Logged by: SC Logged on site during drilling operations Checked by: <i>APM</i>						
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.		
1.00-1.45	S	-	-	N=7	Tarmacadam surfacing (MADE GROUND)	0.10			29.30		
1.00	C _{IV}	-	-	85, 90	Orangish brown fine to coarse sand and fine to coarse angular to sub-angular flint gravel. (MADE GROUND)	0.60			28.80		
1.50	JJ				Stiff consistency orangish brown mottled grey silty CLAY (WEATHERED LONDON CLAY)						
2.00-2.45	S	-	-	N=9							
3.00-3.45	S	-	-	N=12							
4.00-4.45	S	-	-	N=15							
4.50	JJ				Stiff consistency dark grey silty CLAY (LONDON CLAY)						
5.00-5.45	S	-	-	N=20							
End of Hole						5.00					24.40
Core Recovery					Groundwater			Additional Tests			
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value			
0.00-1.00	100%	1.00	0.50	-	Perched water seepage						
1.00-2.00	100%										
2.00-3.00	90%										
3.00-4.00	70%										
4.00-5.00	70%										
Remarks					Notes						
*Ground levels based on Topographical Survey by CTES Surveys Some instability noted in windowless sampling hole after reaching 5.0 m					1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²						



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling uk ltd
6-8 victory parkway
victory road
Derby
DE24 8ZF

Hammer Ref: 110.45LT
Test Date: 26/06/2015
Report Date:
File Name: 110.45LT.spt
Test Operator: TP

Instrumented Rod Data

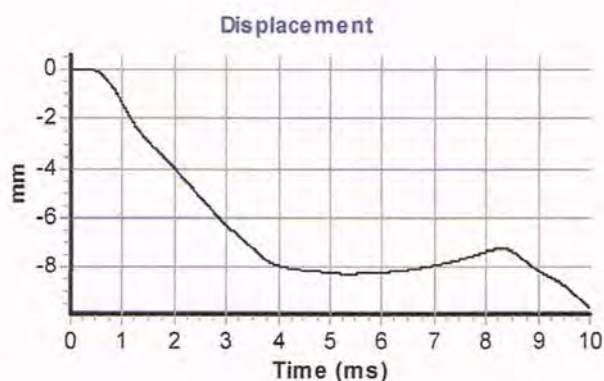
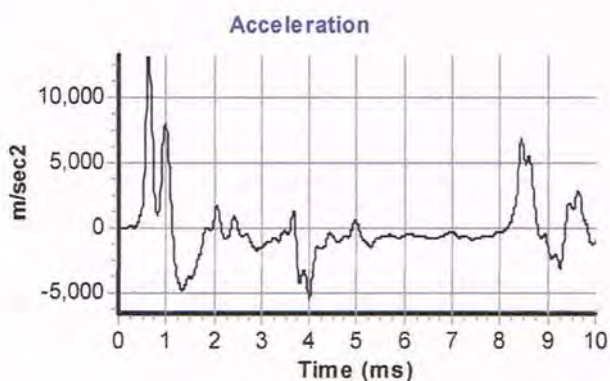
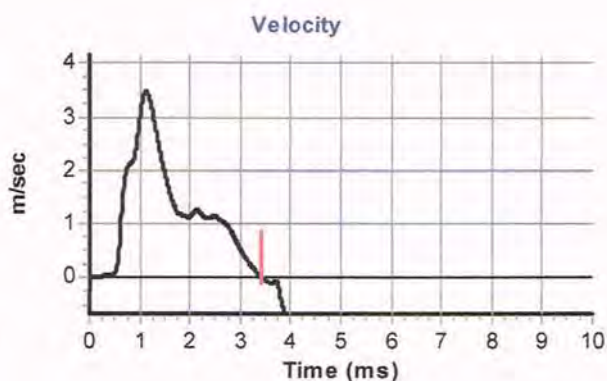
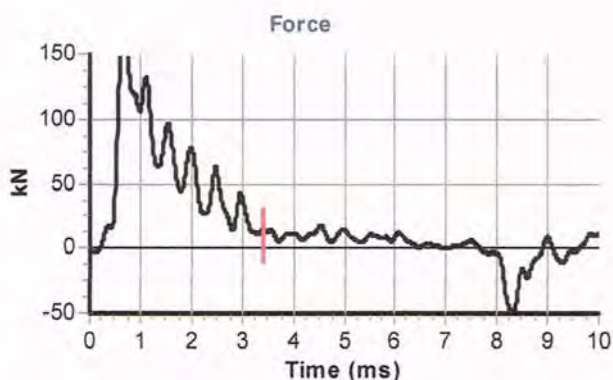
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.9
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 6455
Accelerometer No.2: 6457

Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
String Length L (m): 15.0

Comments / Location

Hammer tested at Dynamic samplings
yard.



Calculations

Area of Rod A (mm^2): 1021
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 387

Energy Ratio E_r (%):

82

Signed: A.parker
Title: Manager

The recommended calibration interval is 12 months



4041



Environmental Science

Samantha Copper
Crossfield Consulting Ltd
The Granary
White Hall Farm
Leamington Road
Long Itchington
Warwickshire
CV47 9PU

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: mail@crossfield-consulting.co.uk

Analytical Report Number : 16-13599

Project / Site name:	Proposed KFCDT Bedhampton, Larchwood Avenue	Samples received on:	17/03/2016
Your job number:	CCL02834	Samples instructed on:	17/03/2016
Your order number:	PO9492	Analysis completed by:	30/03/2016
Report Issue Number:	1	Report issued on:	30/03/2016
Samples Analysed:	10 soil samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
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

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4041



Environmental Science

Analytical Report Number: 16-13599

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

Your Order No: PO9492

Lab Sample Number				550661	550662	550663	550664	550665
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.50	0.70	2.50	0.50
Date Sampled				16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016
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	13	20	7.9	19	11
Total mass of sample received	kg	0.001	NONE	2.0	0.74	2.0	0.83	2.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile & Amosite	-	Chrysotile & Amosite	-	Chrysotile & Amosite
Asbestos in Soil	Type	N/A	ISO 17025	Detected	-	Detected	-	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.002	-	< 0.001	-	< 0.001
Asbestos Quantification	%	0.001	ISO 17025	0.002	-	< 0.001	-	< 0.001

General Inorganics

pH	pH Units	N/A	MCERTS	-	7.6	-	7.4	-
Total Cyanide	mg/kg	1	MCERTS	< 1	-	< 1	-	< 1
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.080	-	0.029	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	-	0.69	-	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	-	1.2	-	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	-	1.5	-	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.21	-	18	-	0.58
Anthracene	mg/kg	0.1	MCERTS	0.10	-	6.9	-	0.28
Fluoranthene	mg/kg	0.1	MCERTS	0.43	-	48	-	2.3
Pyrene	mg/kg	0.1	MCERTS	0.40	-	39	-	2.6
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.22	-	21	-	1.3
Chrysene	mg/kg	0.05	MCERTS	0.20	-	19	-	1.3
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	-	25	-	1.4
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	-	8.2	-	0.69
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.25	-	18	-	1.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.20	-	13	-	0.78
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	-	2.9	-	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.29	-	15	-	1.0
Coronene	mg/kg	0.05	NONE	< 0.05	-	2.9	-	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	1.6	NONE	2.3	-	240	-	13
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.1	-	8.5	-	15
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	-	2.5	-	0.4
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	-	20	-	9.8
Copper (aqua regia extractable)	mg/kg	1	MCERTS	35	-	42	-	15
Lead (aqua regia extractable)	mg/kg	1	MCERTS	77	-	150	-	90
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	-	18	-	9.4
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	-	210	-	160

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	NONE	< 0.1	-	< 0.1	-	< 0.1
TPH (C10 - C25)	mg/kg	10	NONE	< 10	-	660	-	29
TPH (C25 - C40)	mg/kg	10	NONE	18	-	690	-	75



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Environmental Science

Analytical Report Number: 16-13599

Project / Site name: Proposed KFC DT Bedhampton, Larchwood Avenue

Your Order No: PO9492

Lab Sample Number				550666	550667	550668	550669	550670
Sample Reference				WS3	WS4	WS4	WS5	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.50	0.30	3.50	1.50	4.50
Date Sampled				16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016
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
Moisture Content	%	N/A	NONE	18	-	20	19	19
Total mass of sample received	kg	0.001	NONE	0.99	-	0.63	1.0	0.92

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	-	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.004	-	-	-
Asbestos Quantification	%	0.001	ISO 17025	-	0.004	-	-	-

General Inorganics

pH	pH Units	N/A	MCERTS	7.0	-	5.7	7.3	7.9
Total Cyanide	mg/kg	1	MCERTS	-	-	-	-	-
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.039	-	0.061	0.023	0.22

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.1	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.1	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.1	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.1	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.1	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.1	MCERTS	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Coronene	mg/kg	0.05	NONE	-	-	-	-	-

Total PAH

Total WAC-17 PAHs	mg/kg	1.6	NONE	-	-	-	-	-
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	NONE	-	-	-	-	-
TPH (C10 - C25)	mg/kg	10	NONE	-	-	-	-	-
TPH (C25 - C40)	mg/kg	10	NONE	-	-	-	-	-



Analytical Report Number: 16-13599
Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue
Your Order No: P09492

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

"The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
550661	WS1	0.50	101	Insulation Board/Tile	Chrysotile & Amosite	0.002	0.002
550663	WS2	0.70	109	Loose Fibres	Chrysotile & Amosite	< 0.001	< 0.001
550665	WS3	0.50	100	Loose Fibres	Chrysotile & Amosite	< 0.001	< 0.001
550667	WS4	0.30	136	Insulation Board/Tile	Chrysotile	0.004	0.004

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation



Analytical Report Number : 16-13599

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

* 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 *
550661	WS1	None Supplied	0.50	Grey clay and loam with gravel and brick.
550662	WS1	None Supplied	1.50	Light brown clay and sand.
550663	WS2	None Supplied	0.70	Brown clay and loam with gravel.
550664	WS2	None Supplied	2.50	Light brown clay and sand.
550665	WS3	None Supplied	0.50	Light brown loam and clay with gravel.
550666	WS3	None Supplied	1.50	Light brown clay and sand.
550667	WS4	None Supplied	0.30	-
550668	WS4	None Supplied	3.50	Light brown clay.
550669	WS5	None Supplied	1.50	Light brown clay.
550670	WS5	None Supplied	4.50	Grey clay.



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Environmental Science

Analytical Report Number : 16-13599

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

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

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
Asbestos Quantification	The analysis was carried out using documented in-house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006	D	ISO 17025
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.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
Speciated WAC-17 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	NONE
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	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-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
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method	L076-PL	D	NONE

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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Analytical Report Number : 16-13600

Project / Site name:	Proposed KFCDT Bedhampton, Larchwood Avenue	Samples received on:	17/03/2016
Your job number:	CCL02834	Samples instructed on:	17/03/2016
Your order number:	PO9492	Analysis completed by:	30/03/2016
Report Issue Number:	1	Report issued on:	30/03/2016
Samples Analysed:	3 wac multi samples		

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
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.

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Waste Acceptance Criteria Analytical Results

Report No:	16-13600						
					Client: CROSSFCLTD		
Location	Proposed KFCDT Bedhampton, Larchwood Avenue						
Lab Reference (Sample Number)	550671				Landfill Waste Acceptance Criteria		
Sampling Date	16/03/2016				Limits		
Sample ID	WS1				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	3.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg)	27				500	--	--
Total PAH (WAC-17) (mg/kg)	2.3				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	9.0				--	To be evaluated	To be evaluated
Eluate Analysis				2:1	8:1		Cumulative 10:1
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	Limit values for compliance leaching test		
					using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.013	0.013		0.13	0.5	2	25
Barium *	0.16	0.096		1.0	20	100	300
Cadmium *	< 0.0005	< 0.0005		0.0025	0.04	1	5
Chromium *	0.0050	0.0029		0.032	0.5	10	70
Copper *	0.086	0.068		0.70	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.029	0.0043		0.076	0.5	10	30
Nickel *	0.0073	0.0054		0.057	0.4	10	40
Lead *	0.085	0.060		0.63	0.5	10	50
Antimony *	0.018	0.0087		0.099	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.045	0.0199		0.23	4	50	200
Chloride *	4.8	< 4.0		< 15	800	4000	25000
Fluoride	0.23	0.21		2.1	10	150	500
Sulphate *	27	9.3		120	1000	20000	50000
TDS	140	70		790	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	22	8.1		100	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	87						
Moisture (%)	13						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.24						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and do not constitute a guarantee of performance for any specific site or conditions. All results are subject to the current legislation.

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

* = UKAS accredited (liquid eluate analysis only)

** = MCERTS accredited

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Waste Acceptance Criteria Analytical Results							
Report No:	16-13600						
					Client: CROSSFCLTD		
Location	Proposed KFCDT Bedhampton, Larchwood Avenue						
Lab Reference (Sample Number)	550672				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	16/03/2016				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS2						
Depth (m)	0.70						
Solid Waste Analysis							
TOC (%)**	1.1				3%	5%	6%
Loss on Ignition (%) **	3.2				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg)	340				500	--	--
Total PAH (WAC-17) (mg/kg)	240				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	21				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.013	0.020		0.19	0.5	2	25
Barium *	0.17	0.13		1.4	20	100	300
Cadmium *	0.0013	0.0007		0.0083	0.04	1	5
Chromium *	0.0032	0.0037		0.037	0.5	10	70
Copper *	0.030	0.024		0.25	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.037	0.0045		0.092	0.5	10	30
Nickel *	0.0048	0.0041		0.042	0.4	10	40
Lead *	0.059	0.062		0.61	0.5	10	50
Antimony *	0.031	0.015		0.17	0.06	0.7	5
Selenium *	< 0.010	< 0.010		0.052	0.1	0.5	7
Zinc *	0.066	0.0412		0.45	4	50	200
Chloride *	< 4.0	< 4.0		< 15	800	4000	25000
Fluoride	0.48	0.27		3.0	10	150	500
Sulphate *	47	12		170	1000	20000	50000
TDS	140	70		800	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	15	7.1		82	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	92						
Moisture (%)	7.9						
Stage 1							
Volume Eluate L2 (litres)	0.34						
Filtered Eluate VE1 (litres)	0.26						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

* = UKAS accredited (liquid eluate analysis only)

** = MCERTS accredited

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Waste Acceptance Criteria Analytical Results							
Report No:	16-13600						
					Client: CROSSFCLTD		
Location	Proposed KFCDT Bedhampton, Larchwood Avenue						
Lab Reference (Sample Number)	550673				Landfill Waste Acceptance Criteria		
Sampling Date	16/03/2016				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS3						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.6				3%	5%	6%
Loss on Ignition (%) **	2.8				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg)	38				500	--	--
Total PAH (WAC-17) (mg/kg)	13				100	--	--
pH (units)**	8.9				--	>6	--
Acid Neutralisation Capacity (mol / kg)	56				--	To be evaluated	To be evaluated
Eluate Analysis					Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		0.085	0.5	2	25
Barium *	0.12	0.12		1.2	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0064	0.0052		0.054	0.5	10	70
Copper *	0.0087	0.0093		0.092	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	< 0.0030	< 0.0030		< 0.020	0.5	10	30
Nickel *	0.027	0.0031		0.069	0.4	10	40
Lead *	0.016	0.029		0.27	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.021	0.0364		0.34	4	50	200
Chloride *	< 4.0	< 4.0		15	800	4000	25000
Fluoride	0.19	0.16		1.7	10	150	500
Sulphate *	26	10		130	1000	20000	50000
TDS	90	70		730	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	6.5	7.7		75	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	89						
Moisture (%)	11						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.28						
Results are expressed on a dry weight basis, after correction for moisture content where applicable Statutory limits are for guidance only and I2 cannot be held responsible for any discrepancies with current legislation							

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

* = UKAS accredited (liquid eluate analysis only)

** = MCERTS accredited



Analytical Report Number : 16-13600

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

* 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 *
550671	WS1	None Supplied	0.50	Grey clay and loam with gravel and brick.
550672	WS2	None Supplied	0.70	Brown clay and loam with gravel.
550673	WS3	None Supplied	0.50	Light brown loam and clay with gravel.

Analytical Report Number : 16-13600

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Sociated WAC-17 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	NONE
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 in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L004-PL	W	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS

Iss No 16-13600-1 Proposed KFCDT Bedhampton, Larchwood Avenue CCL02834

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

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Analytical Report Number : 16-13600

Project / Site name: Proposed KFCDT Bedhampton, Larchwood Avenue

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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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.



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 30352

Client's Reference: **CCL02834 PO 9493**

Report Date: **05-04-2016**

Client **Crossfield Consulting**
The Granary
White Hall Farm
Long Itchington
Warwickshire
CV47 9PU

Contract Title: **Proposed KFCDT Bedhampton, Larchwood Avenue, Havant, PO9 3QW**
For the attention of: **Samantha Cooper**

Date Received: **22-03-2016**
Date Commenced: **22-03-2016**
Date Completed: **05-04-2016**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	4
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

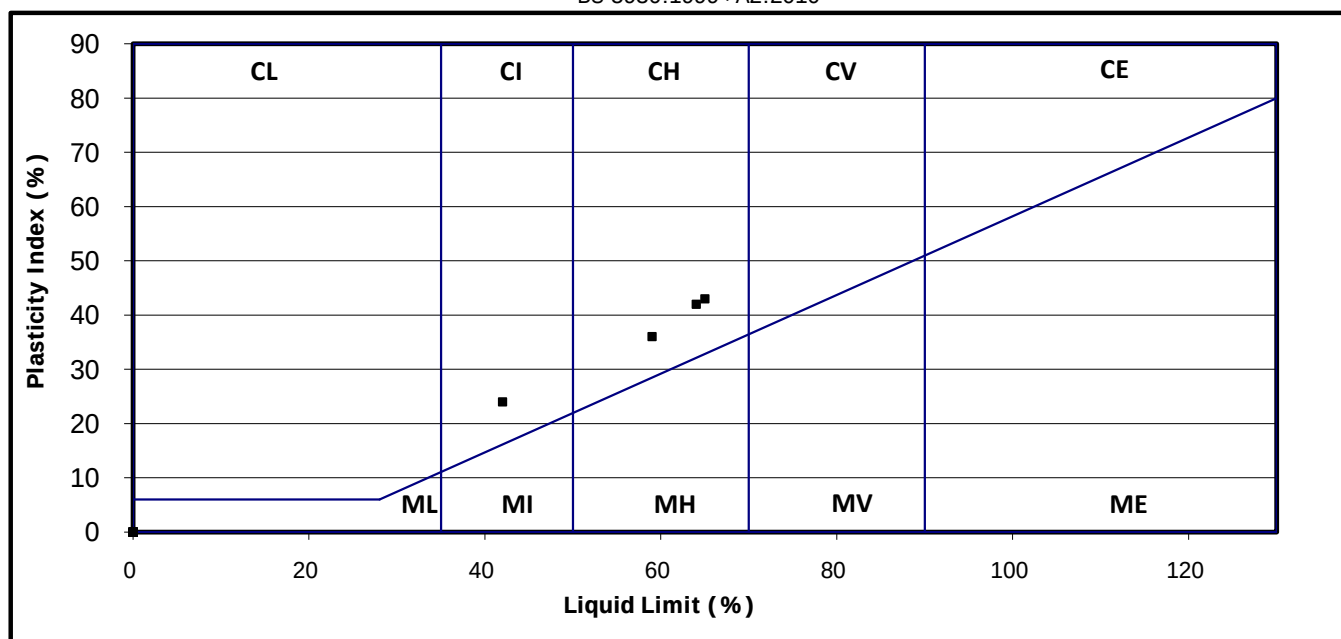
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

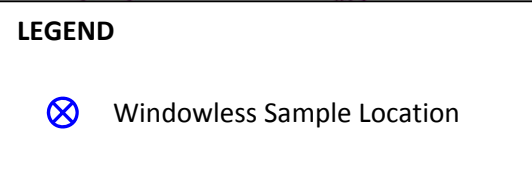
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: CCL02834
Location: Proposed KFCDT Bedhampton
Contract Number: 30352-220316

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS1	J	1.50	31	65	22	43	100	CH High Plasticity
WS3	J	1.50	28	59	23	36	100	CH High Plasticity
WS4	J	3.50	25	42	18	24	100	CI Intermediate Plasticity
WS5	J	1.50	28	64	22	42	100	CH High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010





Based on the Topographical Survey by CTES Surveys, dated January 2016

APPENDIX IV

APPENDIX IV – BASIS OF GEOTECHNICAL ASSESSMENT FOR FOUNDATIONS

Geotechnical Design Category of Structure: 2

Design Working Life: Standard building structure (50 years)

Design Approach: 1

1. Geotechnical Model

On the basis of the ground investigation data, the following model of the ground conditions is considered appropriate for foundation design purposes:

Depth (m)	General Description of Strata (and classification)	Parameter	Characteristic Value & Units	Remarks
0.00 to 0.80	Made Ground	γ	18 kN/m ³	Based on field descriptions
0.80 to 2.00	Medium strength firm consistency silty sandy gravelly clay (Head Deposits)	N	6	Based on site data
		γ	19 kN/m ³	Based on field descriptions
		c_u	50 kN/m ²	Based on site data
		ϕ_u	0°	
		Modified PI	40%	High volume-change potential NHBC (2016)
2.00 to 4.00	Medium strength firm consistency silty clay (Weathered London Clay)	N	10	Based on site data
		γ	20 kN/m ³	Based on field descriptions
		c_u	65 kN/m ²	Based on site data
		ϕ_u	0°	
		Modified PI	40%	High volume-change potential NHBC (2016)
4.00 to >5.00	High strength stiff consistency silty clay (London Clay)	N	15	Based on site data
		γ	20 kN/m ³	Based on field descriptions
		c_u	75 kN/m ²	Based on site data
		ϕ_u	0°	
		Modified PI	40%	High volume-change potential NHBC (2016)

Characteristic Depth to Groundwater (or groundwater level): >5 m

Reference should be made to Sections 8 – 10 of the report for an assessment of overall ground stability, seismic risk, combined failure of the structure/ground, excessive settlements and potential soil-volume changes (including heave).

2. Imposed Actions from Proposed Structure

The following are generic values, based on the development proposed, as described in the report. In compliance with BS EN 1997-1:2004, final designs should include consideration of the calculated imposed loads.

Imposed Load on Foundations: 50 kN

Serviceability Limit Values (associated with above action)

Maximum Total Settlement: 25 mm

Maximum Differential Settlement: 15 mm (individual pad footings)

Maximum Deflection (angular distortion value): 1/1000 (strip footings)

3. Geometry of Proposed Foundation

3.1 Pad or Strip/Trench-fill Foundations

Footing Width (assumed for assessment): Up to 3 m

Footing Depth (assumed for assessment): 1.0 m

3.2 Raft Foundation

Footing Width (assumed for assessment): Approximately 28.0 m by 12.0 m for raft based on current proposed development layout

Footing Depth (assumed for assessment): Minimum 0.6 m

4. Shallow Foundations

In assessing the allowable bearing pressures below structural foundations, a number of methods are used, as outlined below.

4.1. Fine Grained Soils

Where the foundations are to be placed on these soils, the ultimate bearing capacity has been estimated using the method proposed by Terzaghi (1943) using total stress parameters. Partial factors have been considered in this assessment, in accordance with BS EN 1997-1:2004 and the relevant National Annex.

The recommended Net Allowable Bearing Pressure is based on a value less than 0.3 times the ultimate bearing capacity and, therefore, the serviceability limit state will be satisfied where imposed serviceability loading is not greater than this value.