Hulbert Road, Havant

Phase 1 Geoenvironmental Assessment
Desk Top Study
A096474

Trustees of the GHM Jackson 1972 Settlement
July 2020
Prepared by WYG Environment Planning Transport Limited

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DOCUMENT CONTROL

Document:	Phase 1 Desk Top Study Report
Project:	Hulbert Road, Havant
Client:	Trustees of the GHM Jackson 1972 Settlement
Job Number:	A096474
File Origin:	H:\Projects\Projects\A096474 - Hulbert Road, Havant\Report\A096474_Hulbert Road Havant_DTS Rpt_DRAFT 14.7.20 cbp verification SR.docx

Revision:	V3		
Date:	July 2020		
[redacted]			
Geoenvironmental Consultant	Principal Consultant	Technical Director	
Description of revision: Revision following NB comments.			

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EXECUTIVE SUMMARY

The Site	**Site Address:** Hulbert Road, Havant, Hampshire. **Site Description:** The site is approximately 3.8 ha in area and located on the outskirts of Bedhampton adjacent to the A3(M) approximately 2.5km from Havant train station. The site is accessed off Hulbert Road via a padlocked gate in the northeast corner. Vehicular access to this gate has been blocked by concrete barriers. The site is largely comprised of a fenced field covered by long grass with dense vegetation around the fenced boundary. There is a worn asphalt track along the northern and western edges of the site which leads to a raised platform consisting of hardcore in the south west quadrant of the site. This area is bound to the north, east, and south with lined man-made drainage trenches and an approximately 2-3m high bund to its north. Within the raised platform are three concrete slabs. It is likely this development relates to the hydrocarbon exploration previously conducted on the site.
Site History	Historical mapping shows the site to be undeveloped throughout the recorded mapping, the current areas of hardstanding are not recorded within the most recent historical mapping. However, aerial photos from June 2017 show groundwork in the south west corner of the site. A search on the Havant Council planning portal identified that hydrocarbon exploration was granted permission from February 2009 for 36 months (Ref:08/53384/002). This was extended to 60 months in November 2012 (Ref: APP/12/01061). Significant fly-tipping is known to have occurred on the site following the completion of the exploratory drilling, however fly tipped materials have now been removed from the site. The wider area surrounding the site remained predominantly undeveloped until 1930 and comprised of fields, woodlands, several farms, cottages, and the small villages of Stakes and Waterloo to the northwest and Purbrook to the southeast by 1895. Development significantly increases and by 1980 the surrounding area is mostly developed. The A3(M) was completed between 1975 and 1984 traversing north south adjacent to the western boundary of the site.
Geology	**Made Ground:** BGS records none, however, localised areas of Made Ground are anticipated in relation to the previous hydrocarbon exploration on site. **Superficial:** None recorded on site. **Bedrock:** London Clay Formation
Hydrogeology and Hydrology	The bedrock geology onsite is designated an Unproductive Aquifer. The site is not situated within an EA defined groundwater Source Protection Zone; however, it is within a SPZ (confined aquifer) described as 'inner catchment within confined aquifer'. The risk of flooding at surface from groundwater varies from negligible in the southwest corner, low risk through the centre of site, to moderate risk in the northeast of the site. The risk of flooding from surface waters is recorded as negligible.
Radon	The site is in a low probability radon area as less than 1% of homes are above the action level.
Unexploded Ordnance (UXO)	Based on freely accessible Zetica UXO Risk mapping the site is in an area of Moderate Risk. A pre desk study assessment was obtained from Zetica and it is recommended that a detailed desk study is commissioned to assess, and potentially zone, the UXO hazard level on the site.

Environmental database search	One record of surface ground workings for A3(M) related cutting abutting the western site boundary. The site is within a Nitrate Vulnerable Zone. Six records for designated ancient woodland within 250m of the site. Two Habitat Networks onsite; Network Enhancement Zone 1 across the site and Priority Habitat (lowland meadows) abuts the far southwest corner of the site. Six current industrial land uses within 250m of the site. Nearest is an electrical substation 113m south.
Preliminary geotechnical assessment	The site has a varied topography with a raised platform, bunding of varying heights and several drainage trenches however significant cut and fill is not anticipated to facilitate any future development. Given the anticipated ground conditions it is considered possible that traditional shallow foundations may be suitable however larger buildings may require piled foundations into the London Clay. There is the potential for shallow groundwater and there is the possibility of inground obstructions associated with the previous hydrocarbon exploration on the site. This should all be confirmed through ground investigation in due process.
Preliminary ground contamination assessment	The previous hydrocarbon exploration in the south west quadrant of the site, and associated access tracks, indicate the potential for varying thicknesses of Made Ground and the potential presence of localised contamination associated with the hydrocarbon exploration works and infrastructure. Localised contamination associated with historical fly-tipping may potentially also be present. The Made Ground, where present, may represent a risk from land gas, although is likely to be of limited source potential.
Conclusions and Recommendations	Ground investigation will be required in due course to confirm ground conditions and identify suitable founding strata across the site. Investigation will also be required to assess the thickness of made ground across the site, confirm extents of potential constraints, and to identify the nature and extent of any localised areas of contamination associated with previous hydrocarbon exploration. A detailed UXO Desk Study will be required to confirm the risk associated with UXO on the site. Recommendations within this report will inform the need for a UXO specialist to be present on the site during any future site works. Attempts should be made to contact Northern Petroleum to confirm the nature and extent of any decommissioning works undertaken on the site.

1.0 INTRODUCTION

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) was commissioned by Trustees of the GHM Jackson 1972 Settlement (the client) to undertake a Phase 1 Geo-Environmental Desk Top Study for a site known as Hulbert Road (known hereafter as "the site").

The location of the site is shown on **Figure 1**.

1.2 Brief

The brief for this report was to provide a Phase 1 Geo-environmental Desk Study assessment report including a preliminary qualitative geotechnical and contamination risk assessment to support a planning application for the potential residential development proposals.

1.3 Proposed Development

The development masterplan comprises a mixture of apartment blocks and housing. A copy of the masterplan is presented at the end of this report and are current at time of reporting.

1.4 Report Scope

This report includes the following key elements:

- A discussion of the current site status and key associated environmental influences observable by general visual inspection around the site;
- An historical site and area review, primarily referring to past editions of Ordnance Survey Maps;
- A discussion of the general expected ground and groundwater conditions within the topographical and area context referring to our own geological and hydrogeological maps library;
- Details of an Environmental database search (Groundsure Insight report) of key relevant agencies, including Local and Statutory Authorities such as the Environment Agency;
- A geotechnical and ground contamination assessment discussing the results of the research above not only concerning potential on-site conditions/constraints and

contamination but also an overview of the potential for migration onto or off-site with respect to the surrounding neighbouring sites;

- A baseline UXO risk assessment using free on-line databases to classify the site with regards to UXO risk;
- Development of a preliminary conceptual site model;
- Preliminary geotechnical hazard assessment;
- Qualitative ground contamination risk assessment (compliant with CIRIA 552 (CIRIA, 2001) methodology);
- An executive summary of the report to allow a rapid, layman's overview.

1.5 Limitations

The recommendations and opinions expressed in this report are based on information obtained as part of the desk study or provided by others. Information provided from other sources is taken in good faith and WYG cannot guarantee its accuracy.

This report is subject to the report conditions presented in **Appendix A**.

The information contained in this report is intended for the use of Trustees of the GHM Jackson 1972 Settlement and WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.

2.0 SITE INFORMATION

2.1 Location

The site is located on the outskirts of Bedhampton on Hulbert Road, Havant, Hampshire. It is located approximately 2.5km from Havant train station and the A3(M) is located directly east.

The site is approximately 3.8ha in area and is centred on National Grid Reference (NGR) 469437, 108092. The nearest approximate postcode of the site is PO9 3QJ.

A site location plan is presented in **Figure 1**.

2.2 General Area Context

Table 1 - Surrounding land uses

	Description
North	Woodland (Nevilles Park)
East	Hulbert Road with woodland beyond and residential developments 450m from the site.
South	Woodland (Nevilles Park) with hardware store and supermarket complex beyond.
West	A3(M) with woodland and school / residential development beyond.

2.3 Site Description

A Site walkover was completed on 24th June 2020.

A Site layout plan with photos is attached as **Figure 2**, photo-plates are attached as **Appendix B**, and the site walkover proforma is attached as **Appendix C**.

The majority of site is a field covered by long grass except for an area in the southwest of the site which will be referred to as the south west quadrant. There is a worn asphalt track leading from Hulbert Road around the north and western edges of the site that leads to this area.

The south west quadrant is a large area of hardcore with three concrete slabs located within it. The area is bound on the north, east, and south with lined drainage trenches which contained algae covered standing water. The lining of the drainage trenches is comprised of black plastic mesh, over textile, over heavy-duty black plastic sheeting. It is not possible to identify if the lining continues beneath the entire south west quadrant. Beyond the lined drainage trenches directly to the north there is a roughly 2-3m high mound which is partly covered by long grass and part by dense vegetation (including brambles). The mound appears to be comprised of

reworked natural ground, likely to be derived from a topsoil strip prior to the placement of the hardcore in the south west quadrant. Directly beyond the lined drainage trench in the east of the south west quadrant the bund is approximately 1m high.

Three concrete slabs are located within the south west quadrant. A rectangular 3.5m by 6m slab is located in the north of the area and has a manhole with a 150mm diameter white plastic pipe visible on the surface. There was some blackened staining on the concrete surface. Two 7.5m square concrete slabs with infilled geometric shaped holes within them are located in the west of the area. There is some dark 'splash' like spotting to the ballast gravel surround the slabs. The eastern of these two geometric holes is not completely infilled and a ladder rung is visible on the inside wall. It is assumed that these relate to the hydrocarbon exploration that occurred previously on the site, this is discussed further in Section 3.0.

2.3.1 Current Site Usage

The site is currently disused.

2.3.2 Access and Boundaries

Access to the site is off Hulbert Road in the northeast corner of the site. The site entrance is secured by concrete barriers forming a roadblock and a metal fence with padlocked gate that is approximately 2m high.

A 2m high metal fence forms the eastern boundary, the rest of the site is bounded by dense vegetation and a wooden post and barbed wire fence

2.3.3 Topography

The topography varies by approximately 8-10m across the site. Generally, the site slopes from west to central east area of the site, with the north, west, and south edges of site being at a higher elevation.

The south west quadrant is formed by a raised level development platform with the eastern edge sloping steeply down in to the lower lying eastern half of the site.

An approximately 2-3m high mound directly north of the south west quadrant slopes steeply on its north, east, and south faces, however, it has a moderate slope on its west face that is easily walked up.

2.3.4 Ground Cover and Vegetation

The majority of the site covered by long grass with very sparsely spaced bushes. Under foot, hidden by the long grass, the field area is rutted and uneven.

The track that follows around the north and western site edges is comprised of a worn asphalt with compacted gravel utilised in places.

The south west quadrant is covered by compacted hardcore and there are also three concrete slabs located within this area.

The edges of the site are covered by dense vegetation which includes brambles and some trees. Woodlands are situated directly north and south of the site and in the north, some of these trees overhang the site.

2.3.5 Drainage

Three lined drainage trenches bound the south west quadrant to the north, east, and south. It is unknown if these ditches discharge on the site, , however water was noted to be stagnant at the time of the site walkover. A gully strip-drain ran north to south across the site entrance adjacent to Hulbert Road.

2.3.6 Services

Services are not known to be present. A manhole was visible within the concrete slab in the north of the south west quadrant and as such services beneath the site cannot be discounted.

2.3.7 On-Site Structures and Fuel Tanks

There were three concrete slabs present in the south west quadrant of the site and are described in **Section 2.3**.

A manhole and 150mm white plastic pipe were visible in the northern concrete slab.

2.3.8 Asbestos Containing Materials

The site is known to have been subject to extensive fly tipping and as such the presence of asbestos containing materials cannot be discounted.

2.3.9 Signs of Contamination

Blackened staining is present on the surface of the concrete slab in the north of the south west quadrant. Dark 'splash' spots are present on the ballast gravel surrounding the two concrete slabs in the west of the south west quadrant.

2.4 Previous Investigations

No previous geo-environmental assessment reports relating to the site have been provided to WYG for review as part of this desk-based study.

3.0 HISTORICAL HYDROCARBON EXPLORATION

WYG have been informed that the site was formerly used as a hydrocarbon exploration site under the management of Northern Petroleum (GB) Limited. The infrastructure within the south west quadrant of the site is assumed to be associated with this former development and matches drawings and layouts referred to in reports associated with the exploration site.

WYG have not been provided with any information relating to the former use of the site, however several reports relating the site were available on the Hampshire County Council and Havant Council planning portals.

These records are detailed in the table below and reports deemed to be important to this report are summarised in the following sections.

Table 2 – Summary of Planning Applications pertaining to the site

Reference Number	Details
08/53384/002 (site reference: HV047)	Temporary permission to construct a hydrocarbon exploration site, mobilisation of a drilling rig, setting up and drilling of an exploratory well including flow testing, permission to include new highway access, access track, and passing place. - Applicant: Northern Petroleum (GB) Ltd - Granted on 16/03/2009 for 36 months. - 28 related documents available, including: o Supporting Statement (12/2008) o Drilling report (12/2008), o Proposed Restoration Report (12/2008), o ecological appraisal (10/2008), o Archaeological Evaluation (12/2008), o Tree Survey (02/2009), o Noise Survey & Predictions (06/2007), o several general layout and location plans, o photograph files, o decision notices, o various policies, articles & licensing.
APP/12/01061	Variation of condition 2 of planning permission 08/53384/002 (extend the development from the permitted 36 months to the 60 months). - Applicant: Northern Petroleum (GB) Ltd. - Withdrawn by applicant 11/07/2013. - 11 related documents available.

3.1 Planning Application 08/53384/002

3.1.1 Northern Petroleum (GB) Ltd - Summary Statement

This document outlines the intent to drill an exploratory well on the site to identify if commercially viable reserves of hydrocarbons are present beneath the site. The statement indicates the potential for oil reserves to be present to the south of the Horndean Field associated with geological structures identified to be present underlying the wider site area.

The document states the planning application relates to the advancement of an exploratory well only, with the potential for flow testing in the event that hydrocarbons are encountered during the works. It also notes that on completion of the investigations the exploratory wells will be decommissioned.

Any fluids removed from the well were scheduled to be removed from site by tanker to an authorised establishment.

3.1.2 Northern Petroleum (GB) Ltd – Drilling Programme (December 2008)

In the front end of the programme an example of the drilling process and procedure are defined. Images of an example site, the drill rig, borehole casing set up, and well headworks set up, are shown. An example schedule of vehicle movements and deliveries during site set-up and drilling operation is presented.

The report also presents a plan outlining the proposal to create the working platform and bunds current observed on site in the southwest quadrant.

A License (reference: PEDL 155) is presented identifying the Well Name as Havant 1 with a provisional target depth of 6,839.5 ft MD BRT (circa 2,085m bgl) targeting the Oil bearing Carbonates if the Great Oolite Formation. The well type was proposed to be a deviated exploration well and side-tracking the well was being considered.

The document provides detailed information on the reasoning for the target, information on the reservoir potential, as well as detailed information on the expected geology.

A summary of well plan is provided on page 25 detailing the drill size, expected formation type, and azimuth at specified approximate depths based on geological formation intersections. Drill hole diameter decreases downhole from 17.5" to 6". Proposed trajectory information is presented in Figure 5 on page 40 of the document.

Drilling was anticipated to intersect twenty-one stratigraphic makers starting from the London Clay, through stratum including Cretaceous Chalks, Gault Clay, Purbeck Formations, Kimmeridge

Clay, Corallian Beds, Oxford Clay, Kellaway Beds, Cornbrash Formation, Forest Marble to the target strata of the Great Oolite Formation.

3.1.3 Northern Petroleum (GB) Ltd – Site Restoration Plan (December 2008)

The document describes the proposed reinstatement of the site to former usage. Including the following:

- The well will be plugged, hydrostatically tested, and abandoned with an agreed method approved by the Health and Safety Executive and the Department of Trade and Industry whilst the drilling rig was onsite.
- The wellhead and valve assembly unit will be removed, and the well casing cut off at a level not less than 1.83m (6ft) below finished ground level, a metal plate welded on top, and a concrete slab placed on top.
- Remaining plant, equipment, buildings, fencing, surface installations will be dismantled and removed from the site. The ditches, sumps, cellars, and cess tanks, present on site will be drained with contaminated materials removed from the site. All pipes, cables, ducting, and items above the impermeable lining will be disconnecting and removed from site.
- If weather conditions permit, all uncontaminated hardcore and stone will be removed. Concrete installations will be broken up and removed, stabilising membrane and sand will then be lifted and the membrane disposed of and then the impermeable lining will either be lifted or ripped in-situ. Any installations, cables, and pipes below the linings level will then be excavated and removed from the site. The cellar, sump, and ditching voids will be filled with any sub-soil stored on site ready for the area to be regraded
- Any weed growth on sub-soil stockpiles will be eliminated by non-persistent contact weed-killer such as 'roundup', prior to regrading of the sub-soil to reform the falls and gradients of the site prior to occupation to the sites' original contours. Works will be carried out in dry conditions, and as far as practical at right angles to the field drainage system. Topsoil to be replaced and cultivated.
- Removal of site boundary fencing if required, reinstatement of any fencing or gates that were removed during the use of the sites. If necessary, a field drainage scheme will be prepared and carried out if agreed with landowner. Annual aftercare inspections for a period of three years.

3.2 Planning Application APP/12/01061

This planning application relates to the potential extension of the three-year time limit which was applicable to the initial application.

The application was withdrawn; however a number of documents are presented in the online portal.

A Preliminary (Qualitative) Groundwater Risk Assessment dated June 2013 is referenced, however; it was not available for download.

3.2.1 Northern Petroleum (GB) Ltd - Havant Exploration Site Restoration Scheme – December 2012

This document states;

> *'The well was plugged, hydrostatically tested, and abandoned with an agreed programme and method approved by the Health & Safety Executive and the Department of Trade and Industry whilst the drilling rig was on site.'*

It also details the proposed removal of the remaining infrastructure and reinstatement of the site as per the details presented above.

3.3 Summary

Based on the information presented above and observations made on site, two boreholes were potentially sunk on the site within the south western quadrant. These are deep boreholes designed for hydrocarbon exploration drilled by specialist contractors.

Prior to drilling, WYG understand that the raised platform was constructed in the southwest quadrant of the site to provide a stable drilling platform with associated surface water ditches and visual bunds to screen works. The structures remaining onsite, concrete pads with geometrical sumps are similar to those identified on other on shore exploration sites and as such are considered to represent the potential drilling locations.

No information is provided regarding the decommissioning of the works undertaken following the completion of the works, other than the Proposed Restoration Report.

No information has been provided regarding the potential for contamination to be present on the site.

4.0 GEOLOGY, HYDROGEOLOGY, HYDROLOGY AND RADON

4.1 Geology

Details of the geology underlying the site have been obtained from the following sources:

- Geology of Britain Viewer (British Geological Survey, 2020), 1:50 000 scale;
- Environmental database (Groundsure Insight; June 2020) presented in **Appendix D**.

4.1.1 Made Ground

The BGS does not record any Made Ground on the site, however Made Ground was noted to be present during the site walkover.

4.1.2 Superficial Geology

No superficial geology is recorded on site by BGS mapping.

BGS mapping shows head deposits comprised of clay, silt, sand, and gravel 4m northeast and to the south of the site associated with adjacent stream valleys.

4.1.3 Solid Geology

The BGS records the bedrock geology onsite to be the London Clay Formation. The London Clay Formation is comprised of clay, silt, and sand.

The Wittering Formation comprised of sand, silt, and clay is recorded 239m west of the site.

4.1.4 Historical Borehole Logs

British Geological Survey (BGS) logs within 100m of the site have been referred to for information only. A summary of reported ground conditions is presented in the table below with copies of the boreholes logs presented in **Appendix C**.

Table 3 – Summary of BGS Borehole Logs

Reference Number	Hole Type and Depth	Distance and Direction from Site	Details
SU60NE27	BH – 8m	Onsite	A3 Horndean-Broadmarsh (BH175). London Clay to depth. Dry.
SU60NE25	BH – 4m	13m W	A3 Horndean-Broadmarsh (BH173). Soft to Firm & Firm London Clay. Water struck at 3.2mbgl.
SU60NE28	BH – 10m	19m W	A3 Horndean-Broadmarsh (BH176).

Reference Number	Hole Type and Depth	Distance and Direction from Site	Details
			Firm London Clay. Dry.
SU60NE58	Shell & Auger – 8m	21m W	A3 Horndean-Broadmarsh (10). Firm and Stiff London Clay. Groundwater seepage noted from 2mbgl.
SU60NE26	Shell & Auger – 8m	37m W	A3 Horndean-Broadmarsh (BH174). Firm London Clay, Water seepage from 3mbgl.
SU60NE24	Shell & Auger – 6m	61m SW	A3 Horndean-Broadmarsh (BH172). Head deposits to 2mbgl over Stiff London Clay. Water seepage from 2.6mbgl.
SU60NE29	Shell & Auger – 20m	73m N	A3 Horndean-Broadmarsh (BH177). Top soil and head deposits to 0.95mbgl over soft to firm and firm London Clay. Water struck at 0.95mbgl.
SU60NE193	Hand Auger – 3m	88m NW	Stakes Hill/Southleigh Rd (BH18). Peat to 0.3mbgl over silty peat to 0.9 over organic clayey silt with traces of peat to 2.4mbgl over stiff London Clay. Water struck at 0.8 and 2.9mbgl.

4.1.5 BGS Soil Chemistry

The Groundsure Insight Report provides Estimated Background Soil Chemistry Averages for the site (source: Soil Chemistry data provided by the British Geological Survey). The information is summarised in the table below.

Table 4 – Estimated Background Soil Chemistry Averages

Determinand	Soil Concentration Range	
	Minimum (mg/kg)	Max (mg/kg)
Arsenic	15	
Cadmium	1.8	
Chromium	60	90
Lead	100	
Nickel	15	30

4.2 Hydrogeology

4.2.1 Aquifer Classification

The Groundsure Insight Report records no superficial aquifer on the site. The superficial geology 4m northeast and south of the site is reported as a Secondary Undifferentiated aquifer. This is

defined as: *'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.'*

The Groundsure Insight report records the bedrock geology onsite to be an Unproductive Aquifer. A Secondary A aquifer is recorded 239m west of the site.

4.2.2 Groundwater Vulnerability

Guidance released by the EA (Envionment Agency , March 2017) states that activities that have the potential to affect the quality or quantity of groundwater must prevent groundwater pollution. All groundwater is vulnerable to pollution, and some geological formations are more vulnerable than others. The risks of groundwater pollution from any given activity depend in part on:

- The physical, chemical and biological properties of the underlying soil and rocks;
- Depth and quality of soil;
- The presence of glacial sediment and other materials – known as 'drift' deposits; and,
- Depth of the unsaturated zone.

All of the above affect how groundwater is more or less vulnerable to pollution, with type of vulnerability generally one of the following:

- Intrinsic vulnerability – this relates to the physical characteristics, it includes soil type, presence of superficial soils, or rock type; and,
- Specific vulnerability – this relates to the effect of the proposed activity including any contaminant and consequent risk to groundwater.

The Groundsure Insight report records that the soil / surface on site is of low leaching class and the groundwater vulnerability in site is unproductive. The groundwater vulnerability of the superficial geology 4m north east and to the south is medium of a low leaching class.

4.2.3 Groundwater Source Protection Zones

The EA defines groundwater Source Protection Zones (SPZs) around identified abstractions to aid the assessment of risk to groundwater or abstraction sources from development. SPZs have three subdivisions and bespoke SPZs are defined for all major abstraction sources intended for human consumption or food use, e.g. boreholes and springs. These sub-divisions are defined as follows:

- SPZ1 – Inner protection zone - defined as the 50-day travel time from any point below the water table to the abstraction source. This zone has a minimum radius of 50 metres;
- SPZ2 – Outer protection zone - defined by a 400-day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the abstraction source, depending on the size of the abstraction;
- SPZ3 – Source catchment protection zone - defined as the area around an abstraction source within which all groundwater recharge is presumed to be discharged at the abstraction source.

The site is not shown to be situated within an EA defined groundwater SPZ associated with the near surface strata, however, it is recorded to be within a SPZ (confined aquifer) described as 'Inner catchment within confined aquifer'. This is assumed to relate to the underlying chalk aquifer.

4.2.4 Depth to Groundwater and Anticipated Groundwater Flow Direction

Historical borehole logs recorded within 100m of the site (**Appendix E**) record groundwater seepage or groundwater strikes between 0.8 – 3.2m bgl. However, SU60NE27 drilled on the western edge of the site was dry at 8m bgl.

Groundwater direction is unknown.

4.2.5 Groundwater Abstractions

The Groundsure Insight report records there are no groundwater abstractions are recorded within 250m of the site.

4.3 Hydrology

Details of the hydrology of the area have been obtained from the following sources:

- MAGIC interactive mapping website (DEFRA, 2020); and,
- Environmental database (Groundsure Insight – June 2020).

4.3.1 Watercourses

No watercourses are recorded on site.

Several watercourses identified from OS MasterMap Water Network mapping are recorded within 250m of the site boundary. The closest watercourse is a nameless stream 22m north of

the site running roughly west to east and under Hulbert Road. A nameless stream is located 49m south of the site and runs roughly west to east under Hulbert Road. These two streams converge approximately 200m east of the site.

The Water Framework Directive (WFD) records the site to be within Hermitage Stream River Catchment which is part of the East Hampshire Rivers operational catchment.

4.3.2 Surface Water Abstractions

No surface water abstractions are recorded within 250m of the site boundary.

4.3.3 Surface Water Discharge Consents

There are no current discharge consents to surface water within 250m of the site.

There are two revoked or historical discharge consents to surface water within 250m of the site. These are summarised in the table below.

Table 5 – Summary of Surface Water Discharge Consents within 250m of the site.

Location	Details
63m South	Site at Purbrook Way, Hubert Road, Havant, Hampshire. Permit: N01079 (version 1). Miscellaneous effluent type. Discharge to freshwater river. Issued 15/11/1984. Revoked 28/09/2000. (Pre NRA Legislation, Historic Only)
63m South	Site at Purbrook Way, Hubert Road, Havant, Hampshire. Permit: N01079 (version 2). Trade site drainage effluent type. Discharge to freshwater river. Issued 28/09/2000. (Pre NRA Legislation, Historic Only)

4.3.4 Pollution Incidents and Prosecutions

No pollution incidents or prosecutions are recorded within 250m of the site.

4.4 Radon

The BRE document 211 (Scivyer, 2015) mapping coverage for the site area was consulted on 25th June 2020 and indicates that the site is located within an area where no radon protection measures are required for new developments. This statement is supported by the Groundsure Insight Report (**Appendix D**) which confirms that the site is in a low probability radon area as less than 1% of homes are above the action level.

4.5 Historical Mining

According to the Groundsure Insight report there are no underground workings, no coal mining, or non-coal mining activities within 1km of the site.

One surface ground working is recorded on site and several surface ground workings are recorded within 250m of the site. These are summarised in the table below.

Table 6 – Summary of Surface Ground Workings within 250m of the site.

Location	Details
Onsite	Cuttings related to A3(M) abutting western site boundary. 1980, 1991 mapping.
121m S	Cuttings related to A3(M). 1980, 1991 mapping.
155m NW	Pond. 1898 mapping.
163m NW	Pond. 1963 mapping.
164m NW	Pond. 1866, 1895, 1907, 1930, 1938, 1980, and 1991 mapping.
168m W	Ponds. 1991.
224m N	Cuttings related to A3(M). 1980, 1991 mapping.

4.6 BGS Recorded Mineral Sites

The Environmental Database (Groundsure Insight, June 2020) and the BGS Geoindex database record no BGS recorded mineral sites within 1km of the site.

Details of the previous hydrocarbon exploration investigations on the site are presented in Section 3.0.

5.0 UNEXPLODED ORDNANCE

Based on freely available mapping data from Zetica UXO (Zetica UXO, 2008), accessed on 22nd June 2020, the site is located within a Moderate Risk Area with regards to Unexploded Ordnance (UXO).

A pre desktop study assessment (PDSA) was requested from Zetica and the following records of note have been identified within the vicinity of the site.

- Two strategic WWI targets were located within 5km of the site.
- British and American troops were stationed at Stake's Hill, in the immediate vicinity of the site, in 1944 during D-Day preparations.
- Three strategic WWII targets were located within 5km of the site; including military barracks and training areas, and AA and anti-invasion devices.
- During WWII the urban district of Havant and Waterlooville officially recorded 423 High Explosive (HE) bombs with a bombing density of 35 bombs per 405 hectares. Records have been found to indicate that several HE bombs fell within close proximity to the site.

Zetica recommend that a detailed desk study is commissioned to assess, and potentially zone, the UXO hazard level on the site. The full PDSA is attached as **Appendix F**.

6.0 SITE HISTORY

6.1 Introduction

The historical development of the site and surrounding area has been assessed using information available from historical Ordnance Survey (OS) maps within the Groundsure Insight Report for the site which is presented in **Appendix D** of this report.

In the context of the summary of historical development of the surrounding area, the descriptions are limited to within approximately 500m of the site boundary, unless specified in the following section.

6.2 Site History

6.2.1 Detailed Analysis of Site History

The table below provides a detailed account of the review of available OS mapping coverage and historical aerial imagery for the site and general area dating back to 1859.

Table 7 – Summary of Historical Data

Map Date & Scale	Within Site Boundary	Surrounding Area
1859 (1:2500) 1866 (1:10560) 1868 (1:2500) 1869 (1:2500)	The site remained undeveloped, agricultural land.	Majority of the area is woodland, agricultural fields, farms, and cottages. A sand pit is recorded approximately 300m west of site. Village of Stakes is around 600m northwest and Waterloo (now known as Waterlooville) is around 1.5km northwest of the site.
1895 (1:10560) 1897 (1:2500) 1898 (1:10560) 1907 (1:10560) 1909 (1:2500)		By 1895 Hulbert Road is present to the east of site and the sand pit is no longer recorded. Purbrook is present approximately 750m west of the site.
1930 (1:10560) 1932 (1:2500) 1938 (1:10560) 1939 (1:2500)		By 1930 mapping Purbrook is slightly more developed and there is significant new development approximately 800m southeast of the site.
1963 (1:10560) 1963-1966 (1:10560) 1966 (1:2500) 1967 (1:2500) 1973-1975 (1:1250)		Substantial development has occurred in the wider area to the west, east, and southeast of the site.
1974-1979 (1:1250) 1975-1980 (1:10000) 1984-1985 (1:1250)		A3(M) has been developed immediately to the west of the site running north south. Further residential development is also recorded.

1987-1990 (1:1250) 1990-1993 (1:1250) 1991 (1:10000) 1993 (1:1250) 2001 (1:10000) 2003 (1:1250) 2010 (1:10000) 2020 (1:10000)		A superstore is developed approximately 200m south of the site. The wider area is almost completely developed.

6.2.2 Summary of Site History

The site remains undeveloped though out the available mapping with a gradual development within the surrounding area predominantly residential in nature from the 1960s onwards.

The A3(M), located immediately to the west of the site is first recorded in mapping from the 1970s.

7.0 ENVIRONMENTAL DATABASE SEARCH

7.1 Introduction

Regulatory authority information relevant to the site and its surroundings has been obtained from the undertaking of an environmental database search (Groundsure Insight, June 2020). The information is summarised below, and the environmental database records are enclosed in **Appendix D**. Distances stated are approximate and are taken from the boundary of the site to the database recorded entries.

The following summary is generally limited to locations within 250m of the site boundaries unless it is considered that installations or activities beyond that range could potentially have an impact on the site or be affected by the redevelopment of the site.

7.2 Online Search

An online search was completed on the site using the Havant and Hants planning portals (accessed 22nd and 26th June 2020). Several records of information were found and are detailed in the table below.

Table 8- Summary of Online Search Records

Record	Date	Details
08/53384/002	Issued 16/2/2009	Temporary permission to construct hydrocarbon exploration site, mobilising drilling rig, setting up, and drilling of an exploratory well including flow testing. Permission to include new highway access, access track, and passing places. No objections. Documents available included a drilling plan and restoration plan.
APP/12/01061	Issued 8/11/2012	Variation to Condition No2 of planning permission 08/53384/002 to alter from 36 months to 60 months from the start of development. Thirteen associated documents.

Further details are presented in Section 3.0.

7.3 Pollution Controls

The Groundsure Insight report identifies no Pollution Controls within 250m of the site.

7.4 Waste

The Groundsure Insight report records no waste disposal, management, or transfer facilities are located within 250m of the site.

7.4.1 Fly Tipping

WYG have been provided with information relating to extensive fly-tipping on the site. Photographs of the site dated November 2018 indicate waste deposited across the access track and adjacent to the bund in the south western quadrant. Material appears to consist of a mixture of rubble, furniture and bagged black waste.

The fly tipped materials have subsequently been removed from the site by the landowner and no evidence of fly tipped materials were noted on the site during the site walkover.

This is not recorded within the Environmental Database.

7.5 Hazardous Substances

There are no records relating to the storage and use of Hazardous Substances within 250m of the site boundary.

7.6 Environmentally Sensitive Areas

A list of the environmentally sensitive areas within 250m of the site are summarised in the table below.

Table 9 – Summary of Environmentally Sensitive Areas

Designation	Location	Details
Nitrate Vulnerable Zone (Surface Waters)	Onsite	Chichester, Langstone, and Portsmouth Harbours Eutrophic NVZ. ET2.
Designated Ancient Woodland	11m E 28m NE 66m N 97m NE 150m W 217m W	Ancient Replanted Woodland Ancient and Semi Natural Woodland Ancient and Semi Natural Woodland Ancient and Semi Natural Woodland Ancient and Semi Natural Woodland Ancient Replanted Woodland
SSSI Impact Risk Zone	Onsite	Consultation required for various types of development.
Agricultural Land Classification	Onsite	Grade 4. Poor quality agricultural land.
Habitat of Principal importance	Onsite	Deciduous woodland (abuts the southern boundary). 39 more records within 250m of the site.
Habitat Networks	Onsite Onsite	Network Enhancement Zone 1. Priority Habitat (Lowland meadows). 6 more records within 250m of the site.

A nitrate vulnerable zone is described in the Groundsure Report as *'areas at risk from agricultural nitrate pollution* designated *under the EC Nitrate Directive (91/676/EEC). These are areas of*

land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture'.

7.7 Flooding

The table below summarises the absence or presence of flooding potential obtained from information recorded in the Groundsure Insight report and the government flood map for planning website accessed 25th June 2020 (Gov.Uk, 2020).

Table 10 - Summary of Flooding Potential

Designation	On Site	Detail
Flooding at Surface (from Groundwater)	Yes	Varies from negligible in the southwest of the site to moderate risk in the northeast of the site. Risk is high within 50m of site associated with the unnamed streams north and south of the site.
Flooding below Ground Level (from Groundwater)	Yes	
Flooding from Surface Waters	No	Negligible risk onsite. 1 in 30year; 0.3m – 1.0m within 50m of site associated with the unnamed streams north and south of the site.
River and Coastal Flooding	No	-

7.8 Industrial Land Use

The following section outlines the surrounding and onsite industrial land uses within 250m that are relevant to the site and the proposed development.

Table 11 - Summary of Historical Industrial Land Use

Land Use	Location	Land Use	Details
Historical Industrial Land Use	Onsite	Cuttings abutting the western site boundary	Maps; 1980, 1991
	121m S	Cuttings associated with the A3(M) construction	Maps; 1980, 1991
	127m S	Unspecified Store	Maps; 1991
	224m N	Cuttings associated with the A3(M) construction	Maps; 1980, 1991

Table 12 - Summary of Industrial Land Use

Land Use	Location	Category	Detail
Recent Industrial Land Use	113m S	Electrical Substation	Electrical Features
	119m S	Pylon	Electrical Features
	148m S	Hertz Car Hire	Vehicle Hire and Rental
	168m N	Consumer Products	Furniture
	225m W	Recycling Services	Recycling, reclamation, disposal,
	244m W	Repair and services	Vehicle repair, testing, and servicing.

8.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the information identified in the preceding sections, the section below summarises the anticipated ground conditions and associated geotechnical assessment for the site, including highlighting the potential constraints for future development. Actual ground conditions may need to be confirmed through ground investigation in due course.

8.1 Anticipated Ground Conditions

The following ground conditions are anticipated underlying the site:

- Localised Made Ground (associated with previous hydrocarbon exploration and A3(M) cuttings abutting the western site boundary);
- London Clay Formation

8.1.1 Shrinking and Swelling Clay

The Groundsure report recorded the shrink swell clay hazard risk is recorded as low. However, the London Clay Formation is known to comprise of high to very high plasticity clay soils that are susceptible to volume change with moisture content variation.

8.1.2 Running Sands

Given the anticipated ground conditions, the potential for running sands to be present is considered to be very low as recorded within the Groundsure report for the site and based on the anticipated geology.

8.1.3 Dissolution Features

The risk from ground dissolution of soluble rocks is considered to be negligible.

8.1.4 Compressible Ground

Compressible ground hazard risk for the site is considered to be negligible.

8.2 Slope Stability,

The site has a variable topography with manmade bunds and trenches. The ground beneath the site is recorded to be London Clay Formation.

Significant issues with slope stability are not anticipated.

8.3 Enabling Works

8.3.1 Anticipated Cut and Fill

Significant cut and fill is considered unlikely to be required to support the proposed development, however given the varying topography localised reprofiling may be required to facilitate individual structures. Existing raised areas will need to re-profiled, should the material be suitable to be retained on site

8.3.2 Ground Improvement

Given the anticipated ground conditions, significant ground improvement works are not anticipated.

8.4 Anticipated Foundation Requirements

8.4.1 Foundations

Given the anticipated ground conditions it is considered likely that traditional shallow foundations may be suitable within the context of the proposed development, however larger structures may require piles to be advanced into the London Clay.

Depth to suitable founding strata should be confirmed through ground investigation in due course. Given the presence of London Clay at shallow depth and its likely plasticity, foundations will need to be deepened below the likely depth of moisture content variation, include heave protection and all floor slabs will likely need to be suspended.

8.5 Temporary Works

8.5.1 Excavations

Due to the anticipated ground conditions excavations should most likely be stable, however this should be confirmed through ground investigation in due course.

8.5.2 Groundwater

Based on historical drill logs there is the potential for shallow groundwater on the site, whereby localised dewatering may be required during the development. This should be confirmed through ground investigation.

8.5.3 Inground Obstructions

The site walkover identified several concrete slabs with possible associated underground

infrastructure. Documents on the Hampshire County Council planning portal report the potential presence of two deep Northern Petroleum (GB) Ltd hydrocarbon exploration boreholes in the south west quadrant of the site. The proposed restoration plan indicates that these boreholes were not backfilled, but the well casing cut off at a level not less than 1.83m (6 feet) below the finished ground level, a metal plate welded on top, and a concrete slab placed on top of the plate. This plan reported that if weather permits uncontaminated hardcore and stone will be removed, concrete installations broken up and removed, impermeable membrane, services, and structures beneath the impermeable membrane would be removed from the site. The concrete installations and impermeable membrane have not been removed from site and as such the presence of foundations for the concrete slabs, underground storage tanks, and services associated with the hydrocarbon exploration site cannot be discounted.

Attempts should be made to contact Northern Petroleum to determine the nature and extent of any decommissioning works in the area of the site used for hydrocarbon exploration as well as information on the diameter of boreholes and any directional drilling undertaken on the site.

The presence or absence of potential inground obstructions should be confirmed prior to future development.

8.6 Drainage

The bedrock soils of the London Clay underlying the site are anticipated to exhibit low permeabilities.

8.7 Potential Constraints

Within the context of this geotechnical assessment and based on the information above, the following potential constraints have been identified with respect to the proposed development.

- Variable topography.
- Potential for inground obstructions (foundations associated with the concrete slabs, underground storage tank/soakaway associated with manhole cover present in one concrete slabs, services).
- High plasticity shallow clay soils susceptible to volume change with moisture content variation
- Shallow groundwater.

- Low permeabilities.

It should, however, be noted that the actual ground conditions will need to be confirmed through intrusive investigation and laboratory testing in due course to inform foundation design.

9.0 SITE CONCEPTUAL MODEL AND PRELIMINARY GROUND CONTAMINATION RISK ASSESSMENT

9.1 Overview

The information presented in the previous sections of this report have been collated and evaluated to establish an initial qualitative risk assessment for the site. A conceptual model of the site has been generated based on information derived from this Phase 1 Geo-environmental Assessment, supplemented by information attained during the WYG site walkover.

The site has been considered with regard to current UK legislation and guidance, namely Part 2A of the Environmental Protection Act 1990 and the Contaminated Land (England) Regulations 2006, as amended, and in accordance with current UK good practice guidelines (for example BS10175:2011).

In general, ground contamination can occur through several causes, particularly from historical operations and activities. Contamination can result from either on-site sources or from on-site migration from off-site sources, leading to long term liabilities under recent legislation for any site owner.

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

- Source, i.e. a substance that is capable of causing pollution or harm;
- Pathway, i.e. a route by which the contaminant can reach a target; and
- Receptor (target), i.e. something which could be adversely affected by the contaminant.

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

9.2 Current Site Usage and Proposed Development

The site is currently unoccupied and disused, however, it is recorded on the Havant and Hants planning portals and confirmed in a site walkover that the south west quadrant of the site has had hydrocarbon exploration conducted on it. There are structures above and below ground associated with that work. Significant fly-tipping is known to have occurred on the site, the fly-

tipping was subsequently removed, and the site was secured. No fly-tipping was present on the site during the site walkover.

It is understood that the current masterplan for the site comprises a mixed development of apartment blocks and housing and associated green space. A copy of the masterplan is presented at the end of this report.

9.3 Conceptual Site Model

The key source, pathways and receptor model is outlined below within the context of potential residential development of the site.

9.3.1 Potential Sources of Contamination

The main potential sources of contamination on the site are associated with existing features as well as historical land uses on the site as summarised below.

On site Sources:

- Made Ground associated with A3(M) cuttings abutting western site boundary, previous hydrocarbon exploration and associated structures, and previous fly-tipping;
- Localised contamination associated with previous hydrocarbon exploration completed on site and associated structures (potential for underground tank or soakaway, drilling footprint);
- Ground gas generation from Made Ground.

Off Site Sources:

- Current industrial land use (A3(M) directly west.

Table 13 –- Potential Sources of Contamination

Potential Hazard	Associated Contaminants	Does hazard form a plausible pollutant linkage?
Made Ground associated with previous hydrocarbon exploration and fly-tipping.	Hydrocarbons, PAH, heavy metals	Yes – localised areas of Made Ground around the site anticipated and substantial made ground anticipated in the south west quadrant (works area, man-made bunds, man-made drainage ditches).
	Asbestos containing materials	Yes – possibility for ACM to be present associated within Made Ground in the south west quadrant of the site where

Potential Hazard	Associated Contaminants	Does hazard form a plausible pollutant linkage?
		residual detritus from fly tipping is visible on the ground surface.
	Landgas	Yes – potential for landgas generation within Made Ground.
Localised contamination associated with former hydrocarbon exploration	Hydrocarbons	Yes – details of the output of the exploration test wells are not recorded. However, the potential for localised contamination cannot be discounted
Current offsite landuse use	Heavy metals, hydrocarbons, PAH	Yes – potential for some contamination from the A3(M) motorway running level to or at a higher elevation along the western boundary of site.

9.3.2 Potential Contaminant Pathways

The following contaminant pathways are considered to be potentially active based on the current site use and proposed development:

Human Exposure Pathways:

- Direct dermal contact or ingestion of soils, or inhalation of dust and/or vapours (i.e. human interaction with surface and sub-surface materials).

Environmental Pathways:

- Leaching and horizontal or vertical migration through the unsaturated ground, either through permeable sub-surface materials and/or preferential pathways such as underground services, drains, or plant roots;
- Lateral and vertical migration of groundwater through permeable sub-surface materials and/ or preferential pathways;
- Leaching to surface water run-off/drainage;
- The migration and accumulation of gases or vapours through permeable sub-surface materials and/ or preferential pathways.

9.3.3 Potential Receptors at Risk

The following potential receptors have been identified:

Human Health

- Current site users (visitors);
- Future site users (residents, workers, visitors);
- Site workers during the redevelopment of the site;

Wider Environment

- Plant up-take;
- Surface Waters / Groundwater (unproductive strata)
- Building Infrastructure and supply pipes; and

9.4 Ground Conditions Risk Assessment

The source, pathway, receptor linkages identified in the previous section are outlined and a qualitative risk assessment shown in the following tables.

The risk assessment considers the site within an area context and assesses potential risks to identified receptors in relation to the existing site setting and the proposed development. CIRIA C552 has been used to define the risk rating presented in the Qualitative Risk Assessment matrix, the methodology for which is presented in **Appendix G**.

Table 14- CIRIA C552 Qualitative Risk Assessment

This matrix is based on CIRIA C552 risk evaluation methodology, definitions for risk ratings is presented in Appendix D						
Source	**Pathway**	**Receptor**	**Consequence of risk being realised**	**Probability of risk being realised**	**Risk Classification**	**Potential risk management requirements**
General Contamination Associated with Made Ground	Direct Dermal Contact or Ingestion of Soils, or Inhalation of Dust or Vapours	Current Site Users	Medium	Unlikely (site is secure, visitors unlikely)	**Low Risk**	Increased exposure to Made Ground deposits are anticipated within the proposed residential development. Ground investigation will be required to confirm the nature and extent of any Made Ground Deposits. The risks to site construction workers should be managed through the use of appropriate PPE and RPE and good site management and hygiene practices.
		Future Site Users		Likely	**Moderate Risk**	
		Construction Workers		Likely	**Moderate Risk**	
	Leaching and horizontal or vertical migration	Surface Waters	Mild	Low Likelihood	**Low Risk**	The site is underlain by unproductive strata of the London Clay; however a confined aquifer is known to be present at depth. Risks to groundwater should be confirmed through ground investigation, including assessing likely depth to groundwater in bedrock strata.
Asbestos containing materials associated with Made Ground	Inhalation	Current site users	Medium	Low likelihood (site is secure, visitors unlikely)	**Moderate/ Low Risk**	The potential presence of asbestos containing materials should be assessed through ground investigation in due course. Risks to site workers if it is present should be controlled through use of appropriate PPE and RPE.
		Future site users		Likely	**Moderate**	

This matrix is based on CIRIA C552 risk evaluation methodology, definitions for risk ratings is presented in Appendix D						
Source	**Pathway**	**Receptor**	**Consequence of risk being realised**	**Probability of risk being realised**	**Risk Classification**	**Potential risk management requirements**
Ground gas	Accumulation of gases	Future site users	Medium	Low likelihood	**Moderate/ Low Risk**	Whilst on small amounts of localised Made Ground deposits are anticipated, assessment of the ground gas potential will be required as part of any future ground investigation.
Localised contamination associated with previous hydrocarbon exploration onsite	Direct Dermal Contact or Ingestion of Soils, or Inhalation of Dust or Vapours	Current Site Users	Medium	Unlikely (site is secure, visitors unlikely)	**Low Risk**	Localised contamination may be anticipated in the south west quadrant of the site associated with the previous hydrocarbon exploration on the site. This could potentially include localised spills from fuel storage and oil drilling. The south west quadrant where the hydrocarbon exploration was completed appears to be lined. That combined with anticipated ground conditions leaching to surface water or groundwater is of a low likelihood. A future ground investigation should be targeted to identify potential sources to assess the nature and extent of any contamination in this area of the site and areas of site surrounding it.
		Future Site Users		Likely	**Moderate Risk**	
		Construction Workers		Likely	**Moderate Risk**	
	Leaching and horizontal or vertical migration	Surface and Ground Waters	Mild	Low Likelihood	**Low Risk**	

This matrix is based on CIRIA C552 risk evaluation methodology, definitions for risk ratings is presented in Appendix D						
Source	**Pathway**	**Receptor**	**Consequence of risk being realised**	**Probability of risk being realised**	**Risk Classification**	**Potential risk management requirements**
Localised contamination from offsite industrial sources (A3M)	Direct Dermal Contact or Ingestion of Soils, or Inhalation of Dust or Vapours	Current Site Users	Mild	Unlikely (site is secure, visitors unlikely)	**Low Risk**	Localised contamination along the western boundary of the site has the potential to be present from vapours, dust, run off from the A3(M), although any impact is likely to be localised and of limited extent.
		Future Site Users		Low Likelihood	**Low Risk**	
		Construction Workers		Low Likelihood	**Low Risk**	
	Leaching and horizontal or vertical migration	Surface and Ground Waters	Mild	Low Likelihood	**Low Risk**	

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

10.1.1 Ground Contamination

The majority of the site has remained largely undeveloped with the exception of the use of the site for hydrocarbon exploration in 2008. This was focussed on the south west quadrant of the site with an access road constructed from Hulbert Road.

Limited information has been provided to WYG regarding the nature and extent of the exploratory works, however information within the public domain suggests that one or potentially two test wells were advanced into the sub-strata to assess the feasibility of the site for hydrocarbon exploration. Works are no longer on going and the majority of the infrastructure has been removed from the site with the exception of three concrete slabs located within a raised platform which appeared to be lined and surrounded by lined surface water drainage ditches. No information has been provided regarding the works undertaken to decommission the site other than proposed works presented as part of the planning application.

It is likely that procedures would be put in place to place to reduce the impact of hydrocarbon spillages and if present these are likely to be located within the raised platform and will have been captured by the basal liner (if present). Hydrocarbon contamination of the wider site is considered unlikely.

Made Ground deposits are associated across the site associated with the raised platform in the south west quadrant and associated access tracks and reprofiling works, although these are anticipated to be limited across the majority of the site. The Made Ground, where present, may represent a risk from land gas, although is likely to be of limited source potential.

The site has been subject to extensive fly tipping, although this material has been removed, fragments of material remain on the site, including the potential for asbestos containing materials.

Risks to current site users is considered to be limited by the minimal interaction with the site, however the proposed development for residential purposes will increase the anticipated interaction with near surface soils and therefore increase potential risks from Made Ground and localised contamination. The potential presence of asbestos within the Made Ground deposits cannot be discounted.

Risks to site construction workers should be limited through the use of appropriate PPE/RPE and

the adoption of good hygiene practices on site during the construction phase.

Risks to the wider environment are likely to be mitigated through the presence of London Clay underlying the site. This is defined as unproductive strata and is anticipated to be of low permeability. Surface water bodies are located the north and south of the site, however lateral migration is likely to be limited. The site is defined as a SPZ relating to a confined aquifer associated with strata at depth.

10.1.2 Geotechnical

Superficial deposits are not recorded on the site with underlying bedrock geology is anticipated to be the London Clay Formation. This stratum is likely to comprise high plasticity clay soil. Ground investigation will be required in due course to confirm ground conditions and identify suitable founding strata.

It is advised that attempts should be made to contact Northern Petroleum to obtain information Further information will need to be obtained regarding the nature and extent of the decommissioning works undertaken on the site. This should include specific information on the diameter, depth and orientation of the boreholes and the nature of any decommissioning works undertaken. Any available information identified will need to feed into a constraints plan for the final design phase.

10.1.3 Unexploded Ordnance (UXO)

The site has been classified as medium risk with respect to UXO. A Pre-Desk Study Assessment states that readily available information indicates several high explosive bombs fell in close proximity of the site. As such a full UXO DTS is required to assess and potentially zone the unexploded ordnance hazard level at the site.

10.2 Recommendations

The following recommendations are presented within the context of the site and the proposed development:

- Attempts should be made to obtain confirmation from Northern Petroleum regarding the nature and extent of any decommissioning and remedial work undertaken on the site.
- A full UXO DTS should be obtained for the site outlining
    - The hazard level associated with the site.

- Recommendations for any mitigation works which will be required during future ground investigation or development works.

- Prior to the development of the site, ground investigation will be required to confirm ground conditions and identify the nature and extent of any ground contamination.
    - Investigations should assess the general nature of the underlying geology and assess the possibility and thickness of localised made ground across the general site.
    - Investigations should also assess the potential inground obstructions such as foundations, drilling footprint, and underground storage tank/ soakaway associated with the concrete slabs located within the south west quadrant.
    - Assessment should be made of the raised platform to establish the nature of the material used in its construction and identify the possibility of any localised contamination within this material.

10.2.1 Phase 2 Site Investigation

A ground investigation is recommended to support the proposed development and confirm the ground model. The aims of the ground investigation would be:

- Investigation, logging and sampling of general ground conditions (made ground and underlying strata) to assess the variability of soils and assess the depth to competent strata;
- Investigation of soil mounds identified on site, associated infrastructure from the previous hydrocarbon drilling operations including extent on in ground obstructions;
- In-situ California Bearing Ration (CBR) testing to aide pavement design;
- Installation of land gas and groundwater monitoring wells to aid further monitoring and sampling and confirm onsite groundwater level;
- Drainage assessment via trial pit soakaway testing;
- Geotechnical testing of soils (in-situ and laboratory);
- Chemical laboratory testing of soils, soil derived leachate, and groundwater chemistry for a range of contaminants including asbestos, heavy metals, polycyclic aromatic hydrocarbons (PAHs), speciated hydrocarbons;
- Return visits to monitor land gas (in line with CIRIA 665 guidance) and groundwater levels;
- An interpretive land quality assessment including development of a refined conceptual site model (based on site specific data) and a qualitative risk assessment (compliant with

UK CLR guidance and CIRIA 552 methodology) within the context of a residential land use scenario; and

- An interpretive geotechnical assessment of ground properties with respect to the proposed development of the site, including assessment of likely solutions for foundations, floor slabs and hard surface areas, feasibility of soakaway drainage and sulphate chemical attack.

10.2.2 Potential Constraints

There is potential for several constraints in the south west quadrant of the site such as foundations and an underground storage tank/ soakaway tank associated with the concrete slabs currently situated in this area. These structures and the made ground present in the south west quadrant of the site are related to the previous Northern Petroleum (GB) Ltd hydrocarbon exploration known to have occurred on the site.

The information available on Northern Petroleum (GB) Ltd hydrocarbon exploration work were proposed plans only. Therefore, the details of the exact surface extent of the works and the extent of the restoration plan completed in the area is unknown. As such there is also potential for additional unknown constraints.

11.0 GLOSSARY

AOD	above Ordnance Datum
bgl	below ground level
BGS	British Geological Survey
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
C4SL	Category 4 Screening Levels
CIEH	Chartered Institute of Environmental Health
CLEA	Contaminated Land Exposure Assessment
CoC	Constituent of Concern
CSM	Conceptual Site Model
DEFRA	Department of Environment, food and Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
DTS	Desktop Study
DRO	Diesel Range Organics
DWS	Drinking Water Standard
EA	Environment Agency (England)
EPH	Extractable Petroleum Hydrocarbons
EQS	Environmental Quality Standards
FOC	Fraction Organic Carbon
GPR	Ground Penetrating Radar
LOD	Limit of detection
LQM	Land Quality Management
OS	Ordnance Survey
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PPE	Personal Protection Equipment
ppm	parts per million
PRO	Petroleum Range Organics
SGV	Soil Guideline Values
SOM	Soil Organic Matter
SVOC	Semi-volatile organic compounds
TPH	Total Petroleum Hydrocarbon
TSV	Tier 1 Screening Values
VOC	Volatile Organic Carbon
VPH	Volatile Petroleum Hydrocarbons

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DEVELOPMENT MASTER PLANS

(Current at time of reporting)

NOTES

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REV	DESCRIPTION	DATE	AUTHOR	CHK'D
A	Masterplan updated	03/04/20	BA	-
B	Masterplan updated	09/04/20	BA	-
C	Annotations updated	09/04/20	BA	-
D	Title block updated	22/04/20	BA	-

KEY

Indicative Site Boundary

N

0 50m 100m

(1:1000)

wyg Urban & Landscape Design

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PROJECT
Hulbert Road
Havant

For: The Trustees of the GHM Jackson 1972 Settlement

DRAWING
Concept Masterplan - 01

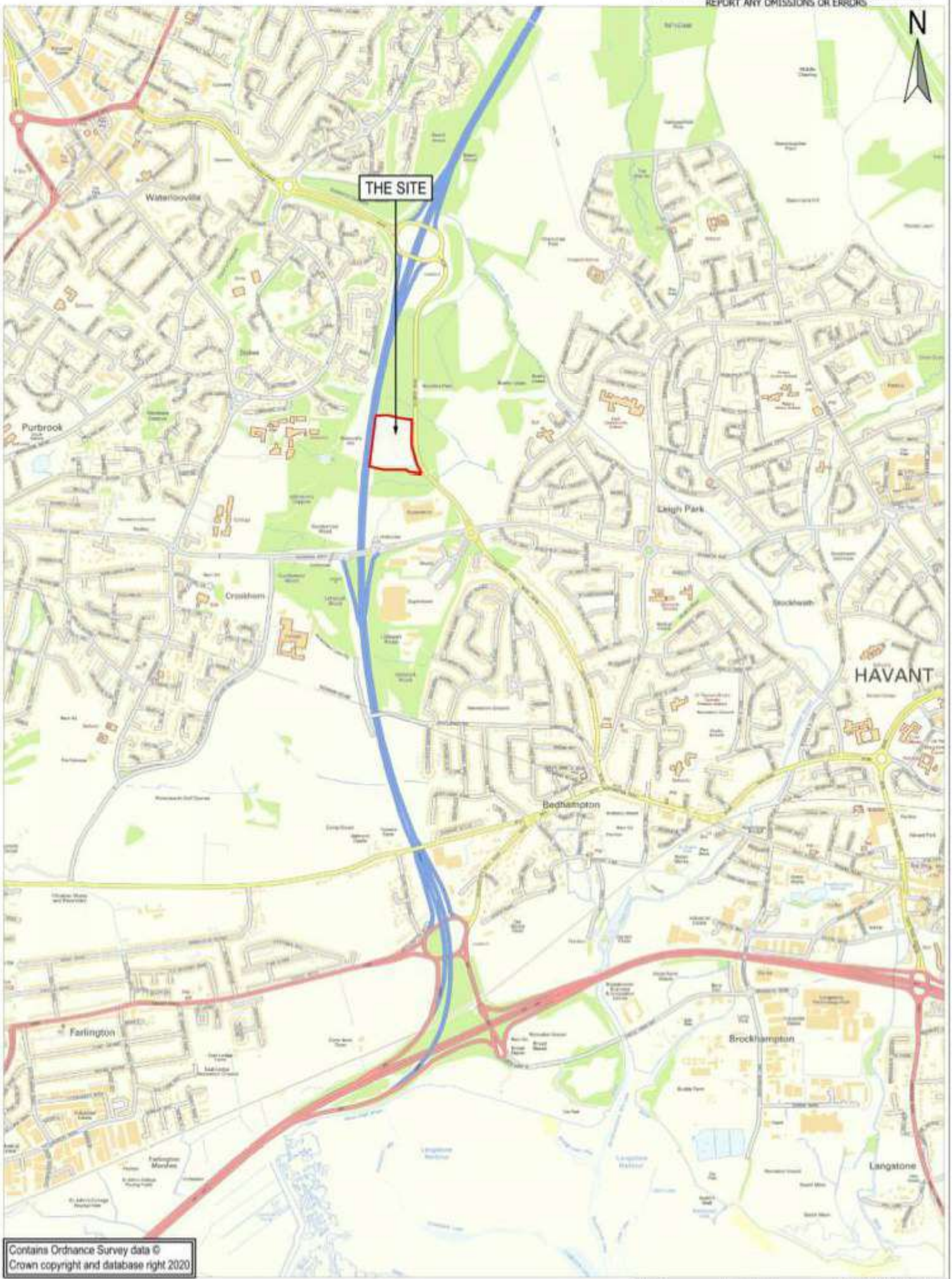
SCALE	DATE	AUTHOR	CHK'D
1:1000 @ A2	11/03/19	BA	CL

JOB NO.	DRAWING NO.	REV
A096474	CMP-01	D

FIGURES

Figure 1 – Site Location Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS



REV	DESCRIPTION	BY	CHK	APP	DATE

Client: TRUSTEES OF THE GHM JACKSON 1972 SETTLEMENT	Project: HULBERT ROAD, HAVANT	Drawing Title: SITE LOCATION PLAN	Project No. A096474 / Office SH / Type N / Drawing No. 1 / Revision 00

Figure 2 – Site Layout Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

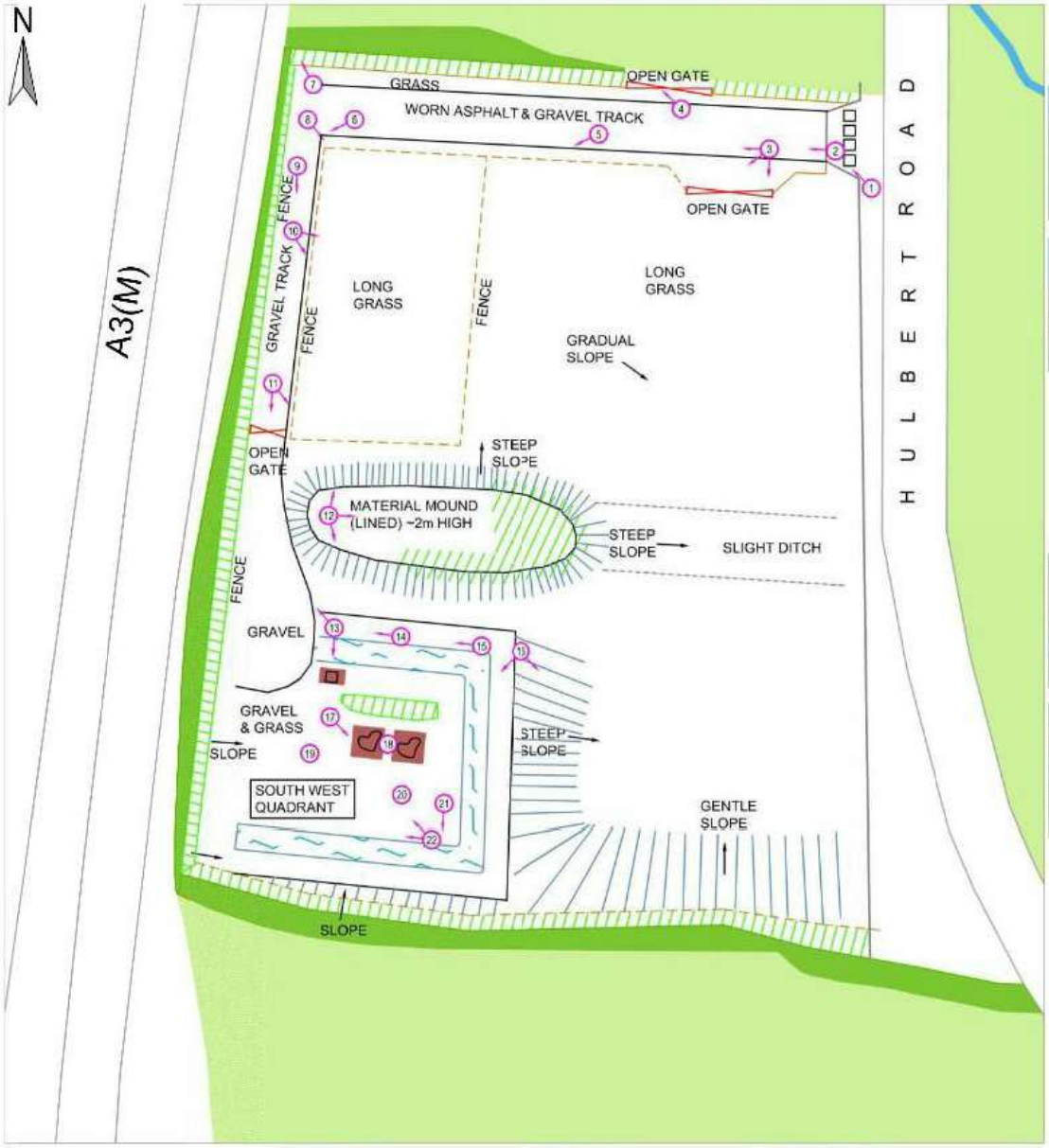


PHOTO 8

PHOTO 9

PHOTO 11

PHOTO 12

PHOTO 13

PHOTO 17

PHOTO 1

PHOTO 3

LEGEND:

- PHOTOGRAPHIC PLATE LOCATIONS
- WOODEN POST & WIRE FENCE
- GATE
- HEAVY TALL METAL FENCE
- WOODLAND
- DENSE VEGETATION & BRAMBLES
- MAN MADE WATER TRENCH
- SLOPE
- MANHOLE
- CONCRETE

PHOTO 15

PHOTO 16

PHOTO 21

PHOTO 22

PHOTO 18

REV	DESCRIPTION	BY	CHK	APP	DATE

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HULBERT RD, HAVANT

Drawing Title:
SITE LAYOUT PLAN

Scale @	Drawn	Date	Checked	Date	Approved	Date
	PP	25.06.20	EH	25.06.20	SR	25.06.20

Project No.	Office	Type	Drawing No.	Revision
A096474	SH	N	2 DRAFT	00

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APPENDICES

APPENDIX A – REPORT CONDITIONS

APPENDIX A - REPORT CONDITIONS
GEO-ENVIRONMENTAL DESK TOP REVIEW

This report is produced solely for the benefit of *Trustees of the GHM Jackson 1972 Settlement* and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a study of readily accessible referenced historical records. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground conditions are discussed but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYG. In time improved practices or amended guidance may necessitate a re-assessment. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites.

APPENDIX B – SITE WALKOVER PHOTO-PLATES

Plate 1	(PLEASE USE SITE LAYOUT PLAN FOR PHOTO LOCATION REFERENCES) 1a - Site Access off Hulbert Road

Plate 2	1b - Site Access off Hulbert Road

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Plate 3 2a - Minor fly-tipping behind concrete barriers in the access area.

Plate 4 2b - Gate to the site

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Plate 5 3a

Plate 6 3b

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Plate 7 3c - Worn asphalt track running along the north and west of the site

Plate 8 4 - Woodland and gate on north boundary of the site

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Plate 9 5

Plate 10 6

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Plate 11 7

Plate 12 8

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Plate 13	9

Plate 14	10 - Site looking southeast from the north of the site. Mound forming the northern bund to the south west quadrant can be seen in the distance.

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Plate 15 11a - Track and open gate into the south west quadrant.

Plate 16 11b

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Plate 17 12a - Overview of the south west quadrant.

Plate 18 12b - Overview of the northern half of the site.

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Plate 19 13a - Concrete slab in the north of the south west quadrant.

Plate 20 13b - Manhole and debris filled plastic pipe (150mm diameter).

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Plate 21 13c - Dark staining (no odour) to concrete slab.

Plate 22 13d - lining visible beneath southwest corner of the mound.

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Plate 23 14 - Lined alage and surface water drainage ditch. Various lining layers visible.

Plate 24 15a

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Plate 25 15b

Plate 26 16a - Looking across the south west quadrant from its northeastern corner.

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