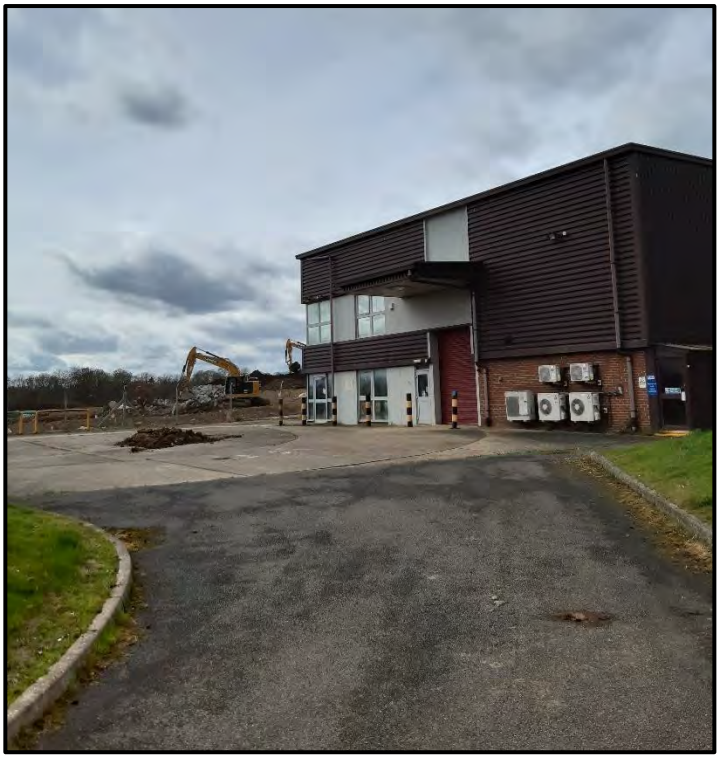
FORMER MSD FACILITY, BREAKSPEAR ROAD SOUTH, ICKENHAM



GROUND INVESTIGATION REPORT

STATUS	DRAFT ISSUE
DATE OF ISSUE	MAY 2022

Our Ref: WB307-01/DOP/SAG/MAK

FORMER MSD FACILITY, BREAKSPEAR ROAD SOUTH, ICKENHAM

GROUND INVESTIGATION REPORT

This report was carried out in accordance with JPB Quality Assurance procedures.

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Date	Issue / Revision	Details of Amendment	Authorised by:
May 2022	Draft	Draft awaiting completion of the groundwater and gas monitoring programme.	MAK
July 2022	Final	Final after completion of the groundwater and gas monitoring programme.	MAK

C O N T E N T S

Drawings Appendix 1

Client Supplied Proposed Development Layout (Drawing no.D003 revision A)

WB307-01/R/F/01	Site Location Plan
WB307-01/R/F/02	Site Features Plan
WB307-01/R/F/03	Extract from the British Geological Survey Map - Drift
WB307-01/R/F/04	Extract from the British Geological Survey Map - Solid
WB307-01/R/F/05	Approximate Locations of Site Investigations

EXECUTIVE SUMMARY

Johnson Poole & Bloomer Limited (JPB) were commissioned by Keltbray Development Limited, to prepare a Ground Investigation Report for the site at the Former MSD Facility, Breakspear Road South, Ickenham. The site is centred on National Grid Reference 507060, 187410 and occupies an area of approximately 4.87ha. The purpose of the report was to appraise the ground conditions at the site and to determine what impact these may have on proposed commercial land use for the site.

This section provides a brief summary of the investigation findings in relation to the geotechnical, mining, chemical contamination and gas emissions constraints at the site.

Historical Background

On Site	Off Site
Greenfield/Research Farm/Veterinary Pharmaceutical Premises	Greenfield/Veterinary Pharmaceutical Premise/HS2 construction site

Invasive Plants

An invasive plant survey was not carried out during the investigation works and a survey of the site by an ecologist is recommended prior to commencement of works at the site.

Geology

The investigation has indicated the site to be underlain by limited made ground (encountered in 25/32 exploratory holes) between 0.3m and 1.5m thick. This was typically described as topsoil/tarmac/concrete over sand and gravels including flint, brick fragment, concrete, rare plastic and ceramic, as well as reworked natural soft to firm sandy gravelly clay.

The underlying London Clay Formation was encountered at between 0.3m and 1.5m bgl down to the maximum termination depths (5.0m bgl). This generally comprised firm slightly silty sandy clay with chalk and flint gravels, which becomes stiff to very stiff with depth. Some localised pockets of very clayey sand were encountered within this strata.

Foundation Solution

Deposit Type	Foundation Option	Allowable Bearing Capacity based
Made Ground	Not suitable as founding horizon	N/A
London Clay Formation	Pad foundation at 2m depth (Based on 1.5m x 1.5m).	83 kPa

Chemical Contamination and Gas Emissions

Based on the risk assessments carried out and in recognition of the validated conceptual site model the following measures are required to address risks posed by chemical contamination and ground gas emissions.

The following recommendations are based on current site levels, it is recommended that they are reviewed, and if necessary revised, should significant earthworks be envisaged at the site, or once the cut/fill balance has been identified.

Receptor		Measures required
Chemical Contamination		
Human Health	Contact with soil	Risk assessment found no significant risks to human health. However, chrysotile asbestos (hard cement type material) was identified in one shallow sample of the made ground within WS05 at 0.3m-0.5m bgl. It is recommended that a minimum clean capping layer of 300mm underlain by a anti dig membrane is installed beneath the proposed area of soft landscaping within the vicinity of WS05. In addition, the made ground in this area during construction should either be encapsulated beneath proposed areas of hardstanding or removed for off-site disposal. The risk to construction workers can be mitigated using the appropriate PPE.
Human Health	Inhalation of Dust and Vapours	
Plant Growth		No remedial measures are required.-

Receptor		Measures required
Chemical Contamination		
Invasive Plants		An invasive plant survey of the site by an ecologist is required.
Building/ Services	Concrete	pH values and sulphate concentrations indicate that the ground conditions fall within design sulphate class DS-4 and ACEC class AC-4 as defined in BRE Special Digest 1. Therefore, an appropriate concrete specification is required to protect building elements in contact with these conditions.
Building/ Services	Water supply pipes	Given the presence of phenols, PE and PVC are not considered appropriate for use at the site. In addition, due to the conductivity and pH values of the soil, wrapped steel, wrapped ductile iron and copper pipes are not considered to be suitable. The water pipe assessment suggests that barrier pipe would be suitable for the proposed development. In addition, due to the presence of localised asbestos in the made ground at WS05 we would recommend that services must be placed within **oversized** trenches lined with coloured Terram and backfilled with clean/inert material to ensure that all future maintenance personnel will only be in contact with clean material at this location. *Backfill Materials* We would recommend that clean backfill is used around the pipes as this will both protect the pipes from contaminants in the surrounding soil and reduce the risk of contamination to personnel making any repairs to the pipes in the future.
Surface Water		No remedial measures required.
Groundwater		No remedial measures required.
GWDE/ Wetland		No remedial measures required.
Ground Gas Emissions		
Human Health & Buildings/ Services		No remedial measures required.
Radon		
Human Health		Inspection of the detailed radon map based on HPA/BGS information indicates that the site is not within an area where radon protection is required, and, therefore, no radon protective measures are required.

Road Construction

Prior to the construction of any adoptable roads CBR testing would be required at 25m centres along the route of these in order to ascertain the requirements for a capping layer. It should be noted, however, that any road built on areas of made ground or any upfilled areas would require a full capping layer.

Eighteen CBR tests were carried out along the proposed road service yard paving areas, and these indicated CBR values in the range of 1.2% to 4.6%. As natural soils with a CBR value with less than 2% were encountered together with made ground deposits, a full capping layer will be required.

Eleven of the recorded CBR values were below 2.5%, and therefore the material is a soft sub-grade as per Interim Advice Note 73/06 Revision 1 (2009) Design Guidance for Road Pavement Foundations (Draft Hd25) then the measures outlined in that document should be undertaken to address these issues.

Site Verification

If Local Authority certification is to be sought for the proposed development, then the following remedial works which can be supervised by JPB are likely to require verification.

Constraint	Action
Remedial Strategy	Produce Remedial Strategy based on the findings of the site investigation in accordance with LCRM and obtain approval from the Local Authority.
Asbestos Containing Materials	Verification of 300m clean capping layer with biobarrier within proposed soft landscaping.
Verification Statement	Produce verification statement in accordance with LCRM and obtain approval from the Local Authority.

PART ONE – INTRODUCTION

1.0 INTRODUCTION AND OBJECTIVES

1.1 Introduction

Keltbray Development Limited are assessing the potential of a site located at the Former MSD Facility, Breakspear Road South, Ickenham, Newyears Green, Uxbridge, UB9 6LS (JPB Drawing WB307-01/R/F/01). It is understood that the intended land use is for commercial warehouses with associated storage yards, access roads, car parking and landscaping. It is understood that as part of the proposed development, an existing building is to be retained and refurbished for office use. A client supplied drawing showing the current development proposals is given in Appendix 1.

Previous reports associated with the site were provided by the client and are listed below. It is assumed that copies of these are available to the reader of this report. Information from these reports have been used where appropriate and the reader is referred to the original documentation for information which is not repeated here.

- Phase II Environmental Site Assessment by ERM dated January 2012 (Ref: 0140249).
- Phase I Environmental Site Assessment by ERM dated 15th August 2018 (Ref: 0470953).
- Preliminary Land Quality Assessment was undertaken by SLR dated October 2018 (Ref: 427.08618.00002).
- Decommissioning Report by AECOM dated 3rd July 2019 (Ref: 60583288).

Due to the presence of existing buildings and services investigations were not undertaken in some areas of the site. Consequently, the findings of this report are only for the areas accessible during this investigation.

This report has been prepared and written on behalf of Keltbray Development Ltd in the context of the purpose stated above and should not be used in any differing context. No duty of care extends to any third party that may make use of the information unless written confirmation has been provided by Johnson Poole & Bloomer. In addition, 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, it should be referred to us for reassessment and, if necessary, amendment. No action or proceedings can be commenced against JPB after the expiry of 6 years from the date of this report.

1.2 Objectives

JPB were commissioned by Andrew Burnside, on behalf of Keltbray Development Ltd, to undertake site investigation works. The aim of the investigation was to provide information to identify environmental and geotechnical constraints which may have consequences in the design of the development and to provide information to be submitted as part of the planning process and in obtaining regulatory approvals.

Therefore, the investigations had the following objectives:

- To identify any chemical contamination constraints;
- To characterise the groundwater regime and identify any risks posed to water resources;
- To examine the ground gas regime and any constraints posed by gas emissions;
- To determine a foundation horizon and potential foundation solution; and

The investigation of the geotechnical, mining, chemical contamination conditions and gas emissions is now complete and this report presents the factual investigation data and JPB's interpretation of the existing ground conditions. Potential development constraints are identified and appropriate remedial actions are recommended. Foundation design considerations are also discussed.

It is anticipated that during the course of any redevelopment works various local authority departments will become involved. We, therefore, advise that, where appropriate, our report and associated information are submitted to the regulatory bodies and approval obtained before detailed design, site works or other irrevocable actions are embarked upon.

PART TWO – STAGE 1 INVESTIGATION

2.0 SITE RECONNAISSANCE

2.1 Site Walkover

The site is located to the north-west of Ickenham approximately centred on Ordnance Survey National Grid Reference 507060, 187410 and covers an irregular shaped area of land of approximately 4.87 hectares. A selection of site photographs is presented in Appendix 2.

At the time of the site walkover on 4th April 2022 the site comprised a vacant commercial premises with 20 buildings including empty offices, laboratories, livestock accommodation, cold stores, a workshop and a boiler room, with associated roads, car parks, outdoor storage areas, concrete surfaced areas, soft landscaping and ancillary structures such as disused above ground storage tanks. The northern area of the site was occupied by undeveloped fields with an area of woodland in the north-east.

Access to the site was granted from Breakspear Road South to the south-east, via a tarmac surfaced road. The site was bound to the north, west and east by greenfield, and to the south by a construction site associated with the highspeed rail development (HS2). For ease of reference, the existing site buildings are tabulated below, together with a brief description of their former use. Please note that this is not a structural survey and cannot be construed as such.

A site features plan is included as JPB Drawing WB307-01/R/F/02, which also labels each building with their relevant building number.

Building No.	Former Use	On Site Location	Description
16	QC Testing Laboratories and office	South-west	Empty laboratory and office space, with air conditioning units located externally on the eastern elevation. Single storey building of brick construction.
17	Offices associated with 'technical operations'	Central	Empty office space, with air conditioning units located externally along the north-eastern elevation. Single storey building of brick construction.
18	Cold stores	West	Formerly used for the storage of radioactive substances (radioactive isotopes used as tracers in research projects). Small single storey building of brick construction.
20	Restaurant and office space	South-east	Empty large canteen area and office space. Single storey building of brick construction.
22	Barn storage	North-east	Large open barn area with corrugated asbestos roofing. Area surfaced by concrete hardstanding. Some empty refuse bins and fire extinguishers were observed in this area.
23	GB commercial offices	South-east	Empty office space. Medium sized two storey building of brick construction.
24	Telesales offices	South-east	Empty office space. Small single storey building of brick construction.
25	Animal facilities	South	Small single storey building of brick construction.
27	LV substation	South-east	Small single storey building of metal portal frame construction which houses a LV substation.
28	Boiler plant	South-east	Small single storey building of concrete and metal portal frame construction which houses the boiler.
29	Engineering department/ H&S	South	Empty office space. Small sized single storey building of brick construction.
30	Animal facilities	South	Large 'L' shaped two storey building of brick construction, comprising empty offices. Empty cages are located adjacent to the east of this building, which were previously used for containing clinical wastes
31	Engineering workshop	Central-east	Empty workshop. Small elongated single storey building of brick construction.
33	Archive	Central-east	Small elongated single storey building of brick construction.
34	Barn storage	North-east	Medium sized empty barn of concrete block and timber construction, with a corrugated asbestos roof.
35	Barn storage	North-east	Medium sized empty barn of concrete block and timber construction, with a corrugated asbestos roof.

Building No.	Former Use	On Site Location	Description
36	Hazardous materials store	Central	Small square building of brick construction with a corrugated metal roof.
40	Offices	Central	Empty office space. Small single storey 'L' shaped temporary modular building.
43	Main production warehouse	West	Large two to three storey warehouse building of brick and portal frame construction.
N/A	Cold stores and hazardous waste storage	South-west	Former cold storage building. Small square single storey building of brick construction. Adjacent to the cold stores were empty yellow chemical waste bins.

Four above ground heating oil storage tanks with a total storage volume of 40,000 litres were located behind the boiler house (building 28). The tanks were located within a masonry bund and have been permanently decommissioned. The boilers and all oil supply pipework between the boilers and tanks have been removed. An additional small above ground fuel tank which was formerly used for fuelling road vehicles was located directly to the north-west of the boiler house, which had been emptied and decommissioned.

A bund of soil (approximately 440m^3) of unknown origin was present at the eastern site boundary.

The site topography generally dipped downward towards the south-east, with several flat terraced areas such as car parking, soft landscaping and concrete surfaced areas, which had been constructed as part of the existing development.

In the western area of the site there was a north-west to south-east orientated drainage ditch.

Several semi-mature and mature trees were located in areas of soft landscaping across the site, with a densely wooded area in the north-east, which was inaccessible at the time of the walkover. The site was also surrounded by perimeter fencing of metal construction.

2.2 Invasive Plant Survey

An invasive plant survey was not carried out during the investigation works and a survey of the site by an ecologist is recommended prior to commencement of works at the site.

3.0 APPRAISAL OF EXISTING INFORMATION

3.1 General

Initial research undertaken prior to the site investigation works included a routine examination of available geological maps, past and present editions of the Ordnance Survey and relevant in-house data. A summary of information obtained from our researches is presented in the following section.

3.2 UXO Assessment

A Zetica Map has been obtained with regards to the assessment of any risks which may or may not be posed by Unexploded Ordnance (UXO) at the site. The map indicates the site to be in an area of low risk (London Bomb Risk) which are areas indicated as having less than 10 bombs per km^2. A copy of this map can be found in Appendix 3.

3.3 History of Land Use

An investigation of the past usage of the site can often provide an indication of the presence of potentially contaminated soils arising from processes associated with former land uses. These researches can help to identify any potential constraints to developments upon which physical investigations can then concentrate. Past copies of Ordnance Survey Maps and air photos were examined, with particular attention being given to the industrial heritage of the study area and the changing land use of the site. The summary of the historical land uses identified on and adjacent to the site are described below.

Ordnance Survey Edition (Appendix 4)	On Site	Surrounding Area
1868	The site is greenfield, with an unnamed road running along the north-eastern site boundary.	The surrounding area is predominantly rural, with Brackenbury Farm shown approximately 200m south of the site. The River Pinn is shown approximately 110m south-east of the site.
1881-1883	No significant changes.	No significant changes.
1897	No significant changes.	Gatemead Farm is shown approximately 20m south-east of the site.
1900	No significant changes.	No significant changes.
1914	No significant changes.	A south-east to north-west orientated railway line on top of an embankment (Great Western & Great Central Joint Railway) has been constructed approximately 100m south of the site.
1934	No significant changes.	A Sewage Works and associated tanks is shown approximately 500m northeast of the site.
1935	No significant changes.	A pumping station (Rickmansworth & Uxbridge Valley Water Co) with a large circular tank is shown approximately 200m north-east of the site. Large scale residential development (associated with Ickenham to the south-west) has occurred between 500m and 1km to the south-west of the site.
1960	No significant changes.	Further residential development has occurred between 500m and 1km south of the site. The sewage works is shown as a residential area and the tanks are no longer present.
1962	Numerous buildings and associated roadways are shown on site associated with a “Research Farm”. A south-east to north-west orientated drain is also shown in the north-western area of the site.	Numerous buildings associated with the “Research Farm” are located immediately south of the site. A tank is shown approximately 20m south of the site. The large circular tank to the north-east is no longer shown, and two long elongated tanks have been constructed.
1992	No significant changes.	No significant changes.
1999	Further buildings associated with the “Research Farm” are shown in the north-eastern and central area of the site. A small building in the western area of the site has been demolished.	No significant changes.
2006	One of the buildings in the central area of the site had been demolished and is no longer	No significant changes.

Ordnance Survey Edition (Appendix 4)	On Site	Surrounding Area
	shown. The northern area of the site is shown as grassland with trees.	
2021	A large rectangular building had been constructed and is shown in the south-western area of the site.	The buildings associated with the "Research Farm" immediately south of the site had been demolished and are no longer shown.

3.4 Geology and Mining

The objective of this part of the assessment was to undertake a desk study review of the indicated site geology and the underlying mining conditions with a view to assessing the risk to the proposed development arising from the possible presence of mining. The report takes cognisance of the information contained in the guidance documents "Risk Based Approach to Development Management – Resources for Developers" published by the Coal Authority and CIRIA C758D "Abandoned Mineworkings Manual".

An initial appreciation of the general geological conditions underlying the site was made from the available Geological Survey sheets (JPB Drawings WB307/R/F/03 and WB307/R/F/04), BGS supplied borehole logs (Appendix 3), geological and mining memoirs, mine plan catalogues and information held by the Coal Authority. The following is a summary of the indicated conditions as interpreted from the above information by JPB.

Made Ground	Made ground associated with the present site development and previously demolished buildings is anticipated to be present beneath the majority of the site.
Natural Superficial Deposits	According to the published geological plan and BGS online viewer, superficial deposits are not indicated to be present beneath or in the vicinity of the site.
Rock Strata	The underlying rock strata are indicated to belong to the Paleogene London Clay Formation which generally comprises bioturbated or poorly laminated blue-grey or grey-brown slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions and disseminated pyrite. Available borehole records on site indicate that the London Clay Formation was encountered at between 0.15m and 1.2m depth, down to between 8.8m and 13m. This generally comprised stiff to very stiff slightly fissured very silty clay with some gypsum crystals and occasional black carbonaceous patches and shell debris with depth. At depth (beneath 7.2m to 12m), this becomes more silty with some horizons of sand with shell fragments. The Lambeth Group (Woolwich and Reading Beds) was encountered beneath the London Clay at depths of between 8.8m and 13m, down to the termination depth of the boreholes at 15.5m. This strata is described as very stiff to hard silty clay with occasional fine limestone gravel and white silt patches. No groundwater was encountered during the drilling of these boreholes.
Quarrying	There is no indication of quarrying on site.
Mining	Examination of historical records shows no evidence of underground mining within the vicinity of the site and there is no current mining within influencing distance. The Coal Authority indicates the property is not within an area that could be affected by past recorded underground workings. The geological maps, and memoirs, the mine plans catalogues and Department of the Environment Report "Mining Instability in Great Britain", 1991 and BGS record on non-coal mining plans contain have no records of any mineworkings or mine entries beneath the site. Therefore, based on our researches **mining is not a constraint.**

3.5 Hydrology and Hydrogeology

The available information, including the Environment Agency's online water environment data for the site vicinity (Appendix 5), indicates that the following hydrological and hydrogeological conditions are present at the site.

Surface Water Features	There are no major surface water features within influencing distance of the site. The nearest minor surface water feature are four small ponds which are located approximately 50m north-west of the site. In addition, the River Pinn, located 110m to the south-east of the site. The Environment Agency's Draft River Basin Management Plan online classifies the River Pinn as being of "Poor

	No surface water abstractions were recorded within 1km of the site.
Superficial Deposits	Made ground deposits are present and may comprise granular materials. It is considered that these will have a medium to high permeability and are therefore susceptible to contamination.
Rock Strata	The Envirocheck Report (Appendix 6) indicates that the bedrock London Clay Formation is classified as 'unproductive' strata.
Groundwater Abstraction	The Envirocheck report indicates that there are twelve groundwater abstraction records within 1km of the site, which relate to 4 different abstraction points for Ickenham Pumping station. Groundwater is abstracted approximately 195m, 205m, 266m and 269m east by Affinity Ward Limited for public water supply (potable water supply) at Ickenham Pumping Station "J1, J2, J3 and K". It is understood that water is abstracted from bedrock at depth. The site is located within an inner zone (Zone 1) groundwater Source Protection Zone (SPZ) associated with these abstraction licences.

3.6 Regulatory Search

Johnson Poole & Bloomer commissioned an "Envirocheck" UK regulatory authority database search (Appendix 6) to obtain information on various operations within a 1 km radius of the centre of the site. A plan showing the location of these operations is included in the Appendix. The key findings of regulatory database search are summarised below. JPB's default distance for commenting on features in the vicinity of the site is 250m with the exception of COMAH and landfills for which it is 1km.

Licence/Data Type	Distance from site measured to the registered location (i.e. centre of the site)	Operation
Regulators		
Contaminated Land Register Entries and Notices	None within 250m	-
Discharge Consents to Controlled Waters	Three entries within 250m 132m SE	All three entries relate to trade effluent discharge (site drainage) into the River Pinn. Issued 27th August 2021. Operators: Skanska Construction Uk Ltd, Costain Limited and Strabag Ag-Uk Branch
Enforcement and Prohibition Notices	None within 250m	-
Integrated Pollution Controls	None within 250m	-
Integrated Pollution Prevention and Control	None within 250m	-
Local Authority Integrated Pollution Prevention and Control	None within 250m	-
Local Authority Pollution Prevention and Controls	One entry within 250m 53m E	Local Authority Air Pollution Control relating to clinical waste incineration processes under 1 tonne an hour. Authorisation has been revoked.
Local Authority Pollution Prevention and Control Enforcements	None within 250m	-
Pollution Incidents to Controlled Waters	Two entries within 250m 100m S 125m E	Category 3 (Minor Incident) on 20th October 1997. No further details given. Category 3 (Minor Incident) on 31st March 1994. No further details given.
Prosecutions Relating to Authorised Processes	None within 250m	-
Substantiated Pollution Incident Register	One entry within 250m 89m E	Recorded as Category 2 (significant) to water and land, and Category 4 (no impact) to air. Relating to

Licence/Data Type	Distance from site measured to the registered location (i.e. centre of the site)	Operation
		contaminated water (suspended solids). Incident date 6th January 2005.
Registered Radioactive Substances	One entry on-site	Name: S-P Veterinary Holdings Ltd Permit Reference: AC5518, dated 31st March 1991 Process Type: Authorisation under S13 RSA for the disposal of Radioactive waste (was RSA60 S7). Authorisation either revoked or cancelled.
Waste		
BGS Recorded Landfill Sites	One entry within 1km 725m NW	New Years Green Lane Landfill. No further information given.
Historical Landfill Sites	Four entries within 1km 388m NW 600m NW 929m NW 972m W	Licence Holder: Mr R E Weeb Location and name: Newyears Green, Hillingdon, London. New Years Farm. Last input date: 31st December 1989. Licence Holder: Greater London Council Location and name: Pinewood Road, Iver Heath. Park Lodge Farm. First input date: 31st December 1944. Last input date: 31st December 1974. Licence Holder: Not supplied. Location and name: South Harefield, Hillingdon. Dews Farm No further information given. Licence Holder: Pioneer Willment Limited Location and name: Harvil Road. Land off Harvil Road. First input date: 31st December 1967. Last input date: 31st December 1973.
Integrated Pollution Control Registered Waste Sites	None within 250m	-
Licensed Waste Management Facilities (Landfill Boundaries)	None within 250m	-
Licensed Waste Management Facilities (Locations)	None within 250m	-
Local Authority Recorded Landfill Sites	None within 250m	-
Registered Landfill Sites	None within 250m	-
Registered Waste Transfer site	None within 250m	-
Registered Waste Treatment or Disposal Sites	None within 250m	-
Hazardous Substances		
Control of Major Accident Hazards Sites (COMAH)	None within 250m	-
Explosive Sites	None within 250m	-
Notification of Installations Handling Hazardous Substances (NIHHS)	None within 250m	-
Planning Hazardous Substance Consents	None within 250m	-
Planning Hazardous Substance Enforcements	None within 250m	-
Industrial Land Use		

Licence/Data Type	Distance from site measured to the registered location (i.e. centre of the site)	Operation
Contemporary Trade Directory Entries	On entry on-site and two within 250m On-site 35m SE 236m E	 gOn-site entry relates to a veterinary pharmacy (M S D Animal Health). Off-site entries relate to a laboratory and an air compressor manufacturers.
Fuel Station Entries	None within 250m	-
Summary	The database search has confirmed that there are limited industrial processes have been identified around the site and significant impact on the site is unlikely. It should be noted that there is an on-site entry regarding registered radioactive substances, which is associated with the Sites former use as a veterinary pharmaceutical company. However, discussions between JPB and the client has revealed that a radioactive survey and decommissioning works were undertaken at the site in the late 1990s, and no radioactive substances have been stored or used since.	

3.7 Previous Site Works

ERM Phase II Site Assessment (January 2012)

ERM undertook a Phase II Site Assessment (Report reference number: 0140249) for the site and area of land to the south (formerly part of the MSD Animal Health facility) for Merck & Co. Inc, with the objective of reducing uncertainty associated with potential environmental liabilities associated with historical site activities. The scope of the works including the drilling of eleven window sampling boreholes with soil sampling and laboratory testing, targeting specific areas of concern (AOCs). In addition, five of the boreholes were installed with gas and groundwater standpipe installations, which were subsequently monitored. It is understood that previous reports had been prepared prior to this Phase II, however these were not available to JPB at the time of writing. A summary of the key information held within this report is summarised below:

- ERM identified the current operations at the time of the site investigation: manufacturing activities related to Paracox (a poultry vaccine) and the assembly of aquaculture vaccines, QC laboratories, a secondary production unit undertaking small scale blending, filling and distribution, and research and development laboratories undertaking microbiological work. In addition, the following ancillary operations were noted: a boiler house, four above ground storage tanks (ASTs), an engineer's workshop and a security lodge.

- ERM noted that limited made ground consisting of grass or concrete/tarmac over topsoil or gravels was encountered down to between 0.15m and 0.7m bgl, which was in turn underlain by soft becoming firm/stiff with depth, light brown, grey/orange mottled slightly gravelly clay of the London Clay Formation, which was encountered to the termination depths of every borehole (maximum 5m bgl). Occasional sand lenses were noted in this strata.

- The specific AOCs targeted during the investigation included current ASTs, associated underground pipe work, former AST locations, flammable chemical storage, former sheep dip location, former septic tank, ponds and an electrical transformer.

- ERM concluded that a uniform perched groundwater table was not present at the site or within the clay layer encountered at the surface. Only small quantities of localised (discontinuous) groundwater were encountered in four of the five groundwater wells (0.93m to 3.96m bgl).

- Soil and groundwater samples taken during the investigation were subjected to analysis for a range of contaminants including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), phenols, pesticides and metals. In addition, the groundwater samples were tested for PCBs. All tested soil and groundwater samples indicated concentrations below the UK screening criteria of the laboratory detection limits, and ERM concluded that the soil and groundwater quality at the site had not been adversely affected by facility operations.

ERM Phase I Environmental Site Assessment (August 2018)

ERM undertook a Phase I Environmental Site Assessment (ESA) (Report reference number: 0470953) for the site for Merch & Co Inc, in anticipation of a potential transaction involving the site. A summary of the key information held within this report is summarised below:

- ERM stated that at the time of the ESA, the site was owned by Merck & Co Inc (Merck). The southern portion of the wider MSD facility had been sold to HS2 and is currently being redeveloped as such. The site representative for Merck stated to ERM that there are no planning restrictions to housing development, however the original planning documents could not be found. The site representative at the time informed ERM that the subject site will be sold with covenants restricting the use to commercial development.

- ERM stated that the last production activity at the site was manufacturing activities related to Paracox, a poultry vaccine, and quality testing of the vaccine's effectiveness on poultry. These activities ceased in June 2018. Since then, the site had been in building decontamination and decommissioning phase. According to a site interview ERM conducted, this would involve clearing out all the buildings of furniture and fittings, cleaning and decontaminating where required. All buildings present at the time of ERM's 2012 Phase II site investigation were still in place and would remain in place until sold.

- ERM have deduced from the site and historical sources that the site was farmland until the late 1950s when a government research farm consisting of circa 9 building was constructed. This was owned by the Government until 1987 when it was bought by private owners (Pitman Moore). ERM understood that the operations evolved into more laboratory-orientated work since 1970 and that the number of animals kept at the site was reduced.

- According to interviews held between ERM and site representatives at the time, there had been no changes to the processes carried out on the site since the ERM 2012 site investigation.

- At the time of writing, the subject property was in a decommissioning phase during which all hazardous materials are being removed prior to the sale of the property. According to the site representatives at the time, the only below ground storage units are trade effluent interceptors. Site staff reported to ERM that these had not been used since 1999 but were previously used to separate non-hazardous solids from trade effluent discharge. These tanks were reportedly going to be removed from the site prior to any sale.

- Diesel boilers and a generator were historically supplied via four 10,000 litre AST tanks. Site representatives reported to ERM that these have not been used since 1999 but may be left to remain on site. ERM observed that the ASTs have been cut open. The bunding around them was observed as "not well sealed" by ERM, however no visual evidence of historic spills were noted.

- ERM references an asbestos inspection report for the site which was undertaken by Oracle Solutions in March 2018. Most of the asbestos was reported as low or very low risk, with the exceptions of medium risk door and wall panels in building 30 and ceiling panels in building 23, and a high risk insulation debris to pipe work in building 28.

SLR Preliminary Land Quality Assessment (October 2018)

SLR Consulting Limited were instructed by NSS IV (Real Estate) LLP to undertake a Preliminary Land Quality Assessment for the site in October 2018. The scope of the report was to assess the site in respect to environmental setting, land use history and the potential for contamination. The report was prepared to support the proposed acquisition of the site and its continued use for commercial purposes. A summary of the key information held within this report is summarised below:

- Discussion held with SLR consulting and site representatives confirmed that the storage, use and disposal of radioactive isotopes used as tracers in research projects (which were ceased to be used by 1996) and the gas fired animal carcass/laboratory waste incinerator (ceased to be used in 1993) were located to the south of the subject site.

- SLR Consulting Limited determined there to be a low risk with regards to potential onsite contamination, potential migration of contaminants off-site and onto the site. In addition, a low risk had been afforded to pollution of controlled waters, damage to property, harm to human health, likelihood of designation of 'Contaminated Land' under Environmental Protection Act 1990, sale value and/or saleability being affected and liability for owner. A moderate risk was designated for the likelihood of a future purchaser requiring further investigations at purchase stage and likelihood of further work being required to support a planning application or redevelopment. A low to moderate risk was afforded to the potential for 'other environmental issues to give rise to liability.

- SLR's site walkover recorded the secondary containment bund to the ASTs to be in relatively poor condition. SLR recommended a budget of £100,000 be assigned to removal of the existing storage tanks, bunds and any associated hydrocarbon impacted soils

- SLR stated that a soil bund containing soil of unknown origin is located on the east site boundary and have recommended a limited soil sampling investigation to ensure the contents of the bund do not represent a potential environmental liability. SLR recommended a budget of £10,000 be assigned to investigation of the bund.

AECOM Summary Decommissioning Report (July 2019)

AECOM Infrastructure & Environment UK Limited undertook decommissioning works at the site on behalf of Intervet UK Production Ltd, t/a MSD Animal Health in (report dated July 2019). The following site infrastructure at the site was included in the decommissioning: site building rooms, former production equipment, refrigeration systems and air condition systems, air handling systems, specifically heating, ventilation and air conditioning (HVAC) extraction systems, local extraction and site drainage systems and associated manholes and interceptors. All consumables (such as laboratory testing kits, plastic items, glassware etc) were treated as waste for off-site recovery or disposal. A summary of the key information held within this report is summarised below:

- AECOM has stated that between June 2018 and February 2019, a decommissioning programme was successfully undertaken at the MSD Harefield site where equipment, air handling systems/ducting and internal surfaces within former operational rooms/buildings were cleaned and decontaminated (where required).

- Historically, the site undertook work relating to radioisotopes and the site was registered for the use and storage of radioactive substances. It is stated in the report that work with radioactive isotopes ceased in 1994 and decontamination of the areas where radioisotopes were used was reportedly undertaken by external consultants. No radioactive substances are reported to have been used at the site since.

3.8 Chemical Contamination and Gas Emissions

Chemical Contamination

Our researches have indicated that the site has been occupied by a several buildings associated with a 'research farm' and veterinary pharmaceutical company throughout its history. It is likely, therefore, that chemical contamination will be present on site. **JPB examined DoE Industry Profiles for the various site usages where appropriate.** The typical contaminants associated with the historical and current land uses of the site are as follows.

Previous site uses including research farm and veterinary pharmaceutical company	
Metals and metalloids	Toxic metals and metalloids including; arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc
Inorganic	Sulphides, sulphates, cyanides, acids and alkalis
Organics	Petroleum hydrocarbons, PAHs, VOCs, phenols, solvents, PCBs
Others	Asbestos

Ground Gas

On Site Sources

Previous site uses and the site visit indicate the potential for made ground beneath parts of the site, which could contain biodegradable material and could degrade to produce elevated levels of gas including methane, carbon dioxide, hydrogen sulphide and carbon monoxide. This on-site gas source may cause a constraint to any future developments and further intrusive investigations are required to confirm ground gas conditions.

Off Site Source

Made ground associated with the former buildings and tanks immediately south of the site could contain biodegradable material and could degrade to produce elevated levels of gas, which could migrate onto the site. In addition, a historical landfill site is recorded approximately 388m to the north-west of the site. Investigations are required to determine the level of risk posed by these off-site gas sources.

Radon

Risks posed by radon have been assessed in accordance with current authoritative guidance as detailed in JPB's methodology (Appendix 7).

Inspection of the BR 211 Appendix A radon map indicates that the site is not within an area where radon protection is required, and, therefore, **no radon protective measures are required.**

4.0 STAGE 1 PRELIMINARY QUALITATIVE RISK ASSESSMENT

4.1 Stage 1 Preliminary Qualitative Risk Assessment

In assessing the research information a Stage 1 Preliminary Qualitative Risk Assessment has been carried out in order to develop an Initial Conceptual Site Model for the site. The Conceptual Site Model (CSM), is generated in accordance with Guide to Good Practice for the Development of Conceptual Models and the Selection and Application of Mathematical Models of Contaminant Transport Processes in the Subsurface - National Groundwater & Contaminated Land Centre report NC/99/38/2 – Environment Agency 2001.

In the Stage 1 Preliminary Quantitative Risk Assessment the next step in assessing environmental risks and constraints for the site is to use the available research information to develop a Conceptual Site Model (CSM). The CSM describes how potential chemical sources at the site could contribute to increased levels of risk to potentially sensitive receptors. The CSM identifies the sources of contamination, the likely receptors and the potential pathways present which may link them. Where it appears that a pathway links a source to a receptor, this potential significant contaminant linkage should be the focus of site investigations.

The CSM is developed at an early stage and constantly reassessed in light of investigative findings. The first step in producing such a model is to identify whether there are potential hazards on site through desk top research together with the application of professional expertise and judgement. In addition, information regarding the site-specific environmental setting including geology, hydrogeology, hydrology etc., is gathered to identify the environmental resources which could be impacted by potential contaminants at the site. Within this context, a hazard is defined as a property that has the potential to cause harm to a receptor group.

A summary of this preliminary assessment is presented in the following ICSM table which summarises the individual source, pathway and receptors considered to be present.

SPR item	SPR item present based on desk study (Yes/No)	Comment
Sources		
S1 – Contamination from former land use	**Yes**	Site recorded to be formerly occupied by a 'research farm' and veterinary pharmaceutical company. In addition, several former buildings associated with these works have been demolished on site. Potentially contaminated made ground is anticipated. Further investigations required to clarify extent and magnitude of risks.
S2 – Contamination from adjacent land use	**Yes**	The immediate area to the south of the site was formerly part of the research farm veterinary pharmaceutical property. Further investigations required.
S3 – Ground gas	**Yes**	Made ground beneath site could contain biodegradable material and could degrade to produce elevated levels of gas. Further investigations required.
S4 – Leachable contaminants	**Yes**	Some potential made ground contaminants may be leachable or mobile. Further investigations required.
S5 – Contamination groundwater in mineworkings	No	Mining is not present under site.
S6 – Contamination from substation	**Yes**	Substation shown to have been present on site.
Pathways		
P1 – Contact with soil	**Yes**	The site is to be a commercial development and contact with the soil is anticipated to be limited to during construction or in landscaping areas.
P2 – Ingestion of vegetables	No	The site is a commercial development and there are no garden areas where produce is grown.
P3 – Inhalation of dusts/vapours	**Yes**	Site occupiers may be exposed to dusts or vapours from any contaminants present.
P4 – Ingestion of groundwater	No	There is no potential for contact with groundwater.
P5 – Building contact with soil	**Yes**	Site is to be developed and, therefore, buildings will be present on site.
P6 – Migration via services	**Yes**	Site is to be developed and, therefore, buildings and associated infrastructure will be present on site.
P7 – Perched groundwater	**Yes**	Researches indicate the potential presence of contaminated made ground overlying cohesive soils, therefore, perched groundwater may be present.
P8 – Vertical migration	No	Vertical migration is unlikely to occur the site is indicated to be underlain by low permeability London Clay.

SPR item	SPR item present based on desk study (Yes/No)	Comment
P9 – Migration of gas	**Yes**	Potentially elevated levels of gas could migrate through granular soils within the made ground.
P10– Groundwater flow through mineworkings	No	No mineworkings present beneath the site.
Receptors		
Human Receptors		
R1 Adults	**Yes**	The site is to be a commercial development and contact with the soil is anticipated to be limited to during construction or in landscaping areas.
R2 – Workers & trespassers	**Yes**	The site is to be developed and, therefore, workers and potentially trespassers will be present on site
R3 – Adjacent land users	No	Adjacent developments include commercial developments or greenfield.
Plant Receptors		
R4 – Plants	**Yes**	The site is to be a commercial development and contact with the soil is anticipated to be limited to during construction or in landscaping areas.
Buildings/services receptors		
R5 – Buildings and infrastructure	**Yes**	The site is to be developed and, therefore, buildings will be present on site.
Controlled Waters – surface waters		
R6 – Major Surface Water Features	No	There are no major surface water features within influencing distance of the site. In view of the distance to a major surface water, the localised nature of the made ground on site and the presence of intervening very low permeability London Clay which would significantly retard contaminant migration, it is considered that there is no significant pathway present. In the absence of a significant pathway there is no significant contaminant linkage present and no further assessment is necessary.
R7 – Ponds/River Pinn	No	The nearest minor surface water feature is the four small ponds 50m north-west of the site and also the River Pinn, located 110m south-east of the site. In view of the distance to this minor surface water, the localised nature of the made ground on site and the presence of intervening very low permeability London Clay which would significantly retard contaminant migration, it is considered that the impact of the site is likely to be minor or negligible.
Controlled Waters – groundwater abstraction		
R8 – Shallow perched groundwater	No	Four groundwater abstraction licences are recorded between 195m and 269m east of the site and the site lies within an inner zone (Zone 1) groundwater source protection zone. However, these abstractions are related to groundwater within an underlying bedrock aquifer at depth, which is overlain by low permeability clay (London Clay and Lambeth Group) to at least 15.5m depth beneath the site. In addition, any perched water in the made ground on site is unlikely to meet the criteria outlined in the WAT-PS-10-01 (Assigning Groundwater Assessment Criteria for Pollutant Inputs) and UKTAG (i.e. that in order to qualify as a body of groundwater an aquifer must be capable of supplying 10m^3/day or 50 people on a continuous basis). **Therefore, in the absence of a receptor or water body no further assessment is required.**
R9 – Continuous groundwater in soil	No	Four groundwater abstraction licences are recorded between 195m and 269m east of the site and the site lies within an inner zone (Zone 1) groundwater source protection zone. However, these abstractions are related to groundwater within an underlying bedrock aquifer at depth, which is overlain by low permeability clay (London Clay and Lambeth Group) to at least 15.5m depth beneath the site. In addition, there are no superficial deposits recorded beneath the site, therefore, **in the absence of a receptor or water body no further assessment is required.**
R10 – Continuous groundwater in rock	No	Four groundwater abstraction licences are recorded between 195m and 269m east of the site and the site lies within an inner zone (Zone 1) groundwater source protection zone. However, these abstractions are related to groundwater within an underlying bedrock aquifer at depth, which is overlain by low permeability clay (London Clay and Lambeth Group) to at least 15.5m depth beneath the site. In addition The underlying London Clay is classified as 'unproductive strata. **It is considered that there is no significant pathway present and in the absence of an intact pathway no further assessment is required.**
Controlled Waters – groundwater resource		
R8 – Shallow perched groundwater	No	Any perched water in the made ground on site is unlikely to meet the criteria outlined in the WAT-PS-10-01 (Assigning Groundwater Assessment Criteria for Pollutant Inputs) and UKTAG (i.e. that in order to qualify as a body of groundwater an aquifer must be capable of supplying 10m^3/day or 50 people on a continuous basis). **The perched water in the made ground is not considered to be a groundwater body and as such is not a receptor.**