

Dunsbury Park Plot 600

Phase 2 Ground Investigation Report

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Executive Summary

Site Information and setting

Objectives	To resolve any geotechnical and geoenvironmental uncertainties identified in the Phase 1 desk study and provide preliminary geotechnical recommendations for design.
Client	Portsmouth City Council
Site name and location	Dunsbury Park, Plot 600, Fitzwygram Way, Portsmouth, postcode PO9 4EE
Site Description	Plot 600, covering 3.05 hectares east of the bridleway, slopes gently from north to south and contains public paths, overhead and underground services, with no prior earthworks; it lies within a historically landfilled area likely filled with inert materials from A3(M) construction.

Ground model proven by investigation

Ground and groundwater conditions encountered by investigation	<p>The ground conditions as proven by the investigation undertaken at the site comprise:</p> <p>Groundwater was encountered at depths between 0.98m bgl and 11.50m bgl during the investigation.</p> <ul style="list-style-type: none">• Made Ground – between 0.30m and 0.60m below ground level (bgl), comprising clay with flint gravel and a redundant clay pipe• Head Deposits - between• Bognor Sand Member – between 0.30m to 4.00m bgl, comprising firm sandy clay/silt with organic pockets• London Clay Formation (Weathered) – Present from 0.60m to 4.00m bgl (average of 1.85m), comprising firm silty clay with fine sand.• London Clay Formation – Extends from 2.80m to >20.45m bgl, described as firm to very stiff silty clay with occasional shell fragments <p>Water levels recorded post-fieldwork ranged from 1.87m bgl to 2.74m bgl (40.77m OD to 36.58m OD).</p> <p>There is shallow groundwater in the London Clay Formation (0.98m bgl)</p> <p>There was no visual and olfactory evidence of contamination on site.</p>
Further work	<p>Following the ground investigation works undertaken to date, the following further works will likely be required:</p> <ul style="list-style-type: none">• Supplementary ground gas risk assessment, inclusive of an additional round of ground gas monitoring;• Engagement with relevant regulatory authorities;• Development of geotechnical design solutions for Category 2 structures;• Preparation of a Remediation Strategy and Verification Plan;• Formulation of a Materials Management Plan;• Implementation of remediation and mitigation measures;• Verification of the completed earthworks.

This Executive Summary forms part of Stantec Hydrock Limited report number 01960-STN-XX-XX-RP-GE-1012 and should not be used as a separate document.



1 Introduction

1.1 Terms of reference

In July 2021, Hydrock Consultants Limited (Hydrock) was commissioned by Portsmouth City Council (the Client) to undertake a Phase 2 ground investigation at Dunsbury Park, Plots 100, 400, 600 and 700, Fitzwygram Way, Portsmouth, postcode PO9 4EE.

In October 2025, Hydrock now Stantec was commissioned to re-issue and update these reports on a plot by plot basis with this report focussing solely on Plot 600

Dunsbury Park comprises a commercial development comprising 7 plots of industrial/ warehouse units. The Dunsbury Park Masterplan (reference DHF-BMD-MP-XX-DR-A-10004-p19) is presented in Appendix A. Plot 200 is completed and occupied by Fat Face, Plots 300a and 300b are completed and occupied by DPD and Volkswagen, Plot 400a is completed and occupied by Biopure Technology, Plot 500 has been recently completed construction is in progress, comprising the construction of three steel framed warehouse buildings and associated parking and landscaping.

Remaining areas designated for development comprise Plot 100 (unit 100: hotel conference and gymnasium), Plot 400 (unit 400: warehouse and offices), Plot 600 (units 600-601: warehouse and offices) and Plot 700 (unit 700: warehouse and offices). The entire development comprises approximately 16.44 Ha in area and is set at various levels. Plots 100, 400, 600 and 700 areas are currently unoccupied and undeveloped. A site location plan (19453-HYD-XX-XX-DR-GE-1001) is provided in Appendix A. The contents of this report are solely focused on Plot 600.

The works have been undertaken in accordance with Hydrock's proposal referenced (19453-HYD-XX-XX-SP-G-1000 dated 09/06/2021 and 19453-HYD-XX-XX-SP-G-1001 date 11/06/2021) and the Client's instructions to proceed (PO3004424 dated 12/07/2021).

The updates and re-issue have been undertaken in accordance with Stantec proposal referenced 21082025-STN-FP-ACGEO-00003 dated August 2025.

1.2 Objectives

The works have been commissioned to assist with the design of the proposed Plot 600.

The objectives of the Phase 2 Ground Investigation are:

- To resolve any geotechnical and geo-environmental uncertainties identified in the Phase 1 Desk Study by refining and updating the preliminary Ground Model, based on the conditions met in accordance with the principles of Environment Agency (EA) 'Land Contamination: Risk Management' (LCRM) (2021);
- To identify any geo-environmental mitigation requirements to enable development to progress; and
- To provide preliminary geotechnical recommendations for design.



1.3 Scope

The scope of the Phase 2 Ground Investigation comprises:

- a ground investigation including trial pitting, windowless sampling, and cable percussive boring, to:
 - obtain data on the ground and groundwater conditions of the site;
 - allow collection of samples for geotechnical and chemical laboratory analysis;
 - install gas and groundwater wells;
- gas concentration and groundwater level monitoring;
- gas and groundwater sampling;
- geotechnical and chemical laboratory analysis;
- updating of the preliminary Ground Model;
- preparation of a geotechnical risk register;
- presentation of an initial geotechnical design recommendations;
- formulation of an updated Conceptual Site Model (CSM), including identification of any plausible contaminant linkages;
- completion of a generic quantitative risk assessment of any identified chemical contaminants to establish 'suitability for use' under the current planning regime;
- discussion of any potential environmental liabilities associated with land contamination (soil, water and gas); and
- identification of outline mitigation requirements to ensure the site is 'suitable for use'.

1.4 Available information

The following documents, reports etc have been provided to Hydrock by the Client for use in the preparation of this report:

- Hydrock, March 2022. 'Dunsbury Park Plots 500-502. Controlled waters and ground gas risk assessment' undertaken for Portsmouth City Council. Reference: 19453-HYD-XX-XX-RP-GE-1006.
- Hydrock, December, 2021. 'Dunsbury Park Plots 500-502. Ground Investigation Report' undertaken for Portsmouth City Council. Reference: 19453-HYD-XX-XX-RP-GE-1004.
- Hydrock, June, 2021. 'Dunsbury Park Plots 100, 400, 600 and 700. Ground Investigation Factual Report' undertaken for Portsmouth City Council. Reference: 19453-HYD-XX-XX-RP-GE-1003.
- 1st Line Defence, July, 2021. 'Dunsbury Park - Detailed Unexploded Ordnance (UXO) Risk Assessment' undertaken for Avison Young Holdings Limited. Reference: DA13636-00.
- Hydrock, June, 2021. 'Dunsbury Park Phase 1 Desk Study' undertaken for Portsmouth City Council. Reference: 19453-HYD-XX-XX-RP-GE-1001.
- UMC Architects, June 2021. 'Dunsbury Park Masterplan, Portsmouth'. Drawing reference: 20179 F0009 A.
- Murphy Geospatial, June 2021. 'Dunsbury Park – Topographical survey'. Drawing reference: MGS42248-T-RevB- 01 to 14.
- Avison Young, March 2021. 'Project Brief Dunsbury Park Portsmouth PO9 4EE';



- Bam design. 17th May 2017. 'Dunsbury Park Masterplan'. Drawing reference: DHF-BMD-MP-XX-DR-A-10014-S2-P19.
- Bam design. 11th May 2017. 'Dunsbury Park – Site infrastructure: External works Eastern access road construction details'. Drawing reference: DHF-BMD-ZZ-XX-DR-S-20511 RD.
- Bam design. October 2014. 'Dunsbury Hill Farm – Below ground drainage strategy'. Drawing reference: 4330.

The Client has commissioned or obtained assignment of the above documents and Hydrock and Hydrock is entitled to full reliance upon their contents.

The following documents have been reviewed by Hydrock from publicly available sources for use in the preparation of this report:

- Havant Borough Council. Ordnance Survey Map. Havant Borough Conservation areas. Recovered from <https://www.havant.gov.uk/conservation-areas-and-listed-buildings/details-conservation-areas>.
- British Geological Survey. England and Wales. Sheet 316 Fareham. Recovered from <https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001806>
- Havant Borough Council. February 2018. 'Draft Havant Borough Local Plan 2036'.

Hydrock acknowledge that these documents are not assigned to The Client, and have been used for information purposes only. No formal reliance has been placed upon their contents.

1.5 Regulatory context and guidance

The investigation work has been carried out in general compliance with recognised best practice, including (but not limited to) BS 5930:2015+A1:2020, BS 10175:2011+A2:2017 and the AGS (2006) 'Good Practice Guidelines for Site Investigations'.

The geo-environmental section of this report is written in broad accordance with BS 10175:2011+A2:2017, EA Land Contamination Risk Management LCRM (2021) and the AGS (2006) 'Good Practice Guidelines for Site Investigations'.

The methods used follow a risk-based approach, the first stage of which is a Phase 1 desk study and field reconnaissance, with any potential geo-environmental risks assessed qualitatively. This is done using the 'source-pathway-receptor contaminant linkage' concept to assess risk as introduced in the Environmental Protection Act 1990 (EPA, 1990). Any potential geotechnical risks are also assessed from the Phase 1 desk study and site reconnaissance stage.

Phase 2 comprises intrusive ground investigation work and testing. The factual information from the desk study and the ground investigation are used to develop the Conceptual Site Model (CSM). This CSM is based on a ground model of the site physical conditions and an exposure model of the possible contaminant linkages. The CSM forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines. This GQRA might lead to more Detailed Quantitative Risk Assessment (DQRA).

Professional judgement is then used to evaluate the findings of the risk assessments and to provide recommendations for the development.

The geotechnical section of this report is prepared in general accordance with BS EN 1997-1+A1: 2013, BS EN 1997-2:2007 and BS 8004:2015. This report constitutes a Ground Investigation Report (GIR) as described in Part 2 of Eurocode 7 (BS EN 1997-2) (EC7). However, it is not intended to fulfil the requirements of a Geotechnical Design Report (GDR) as specified in EC7.



The geo-environmental and geotechnical aspects are discussed in separate sections. Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements). The term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. Designers should take all aspects of the investigation into account.

Remaining uncertainties and recommendations for further work are listed in Section 9 and Section 10.



2 Desk study review

2.1 Introduction

Hydrock has undertaken a previous desk study in June 2021 (reference 19453-HYD-XX-XX-RP-GE-1001) which has been updated in 2025 as part of the same package of works and this is provided in Appendix B. The following section is a summary of the pertinent information presented in that Desk Study, and relevant information gathered after the Desk Study.

2.2 Site location

The site is located at Fitzwygram Way, Havant, Hampshire, nearest postcode PO9 4EE, at the east of A3 (M), adjacent to junction 3, approximately 8 miles north of Portsmouth. The National Grid Reference of the approximate centre of the site is 470044E, 109383N.

A site location plan (Hydrock Drawing 19453-HYD-XX-XX-DR-GE-1001) is presented in Appendix A.

2.3 Site description

Plot 600 comprises Units 600 and 601 and is located to the east of the bridleway. The area has not been subject to any terracing or earthworks. The topography is sloping gently from north at approximately 43m AOD to south at approximately 36m AOD with slight undulations in between. A number of recognised and informal public pathways were noted across the area. A high-pressure service asset is known to run north south in the east of the site. Overhead services were noted also span the site running north to south across the site. The centre of the Plot is at approximate NGR 470136E, 109481N. This area comprises approximately 3.05 Ha.

The area is recorded to fall within an area recorded as landfilled in the past (assumed to contain inert products from the construction of A3 (M)).

2.4 Site history

The site has previously remained predominantly undeveloped, with the exception of the road traversing roughly across the centre of the site, which was first noted in 1867, later named as Park Lane (1897). A footpath was noted across the northern area of the site. Portsmouth City Council has been engaged in development of infrastructure since 2014 (including site roads, site levelling/plateaus and utility connections). The construction of the roundabout and main road infrastructure (Fitzwygram Way) at the south boundary of the site appeared to be completed in 2016. Plots 200, 300, 400a and 500 are now completed.

With regards the surrounding areas, some features such as a clay pit, brick and tile works and brick kiln were noted within 200m of the site between 1859 and 1867. In 1970s the construction of residential developments across the surrounding area started and continued to increase until 1985. Earthworks were noted along the west boundary of the site between 1980 and 1991 related to the construction of A3 (M).

One historical tank record was noted to the west of the site in 1970 over 100m away. No historical records related to historical garages or military land was identified within 500m of the site during the desk study research. Eight records of electricity substations were identified within 167m to 500m of the site between 1970 and 1993. One record of a gas governor was identified at 478m west of the site between 1984 and 1992.



2.5 Geology

The superficial geology comprises Head Deposits within the east and southwest areas of the site, which is recorded as clay, silt, sand and gravel.

The solid geology is formed by Bognor Sand Member, comprising glauconitic bioturbated or cross-bedded fine- and medium-grained partially cemented sands (with an average thickness of 5-10m according to BGS records), overlying the London Clay Formation, comprising blue-grey or grey-brown bioturbated or poorly laminated slightly calcareous, silty to very silty clay/ clayey silt and sometimes silt, with some layers of sandy clay (with a thickness up to 150m according to BGS records).

2.6 Hydrogeology

The Superficial Head Deposits are classed by the Environment Agency as Secondary Undifferentiated Aquifer. The Bognor Sand Member is classed as Secondary A Aquifer and the London Clay Formation as Unproductive.

The site is within a Zone 1C Source Protection Zone for a confined aquifer body, assumed to be the underlying (at depth) Chalk. There are no groundwater abstractions within 2km of the site.

2.7 Hydrology

There are two surface water features located at the east (unnamed) and southwest (Hermitage Stream) boundaries of the site, flowing south and southwest respectively.

Reference to the Environment Agency web site shows the site is located within the catchment of the East Hampshire Rivers, with the specific river water body being the Hermitage Stream - source to confluence with Langstone Harbour. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.

The nearest licensed surface water abstraction is 1558m northeast of the site corresponding to direct spray irrigation.

2.8 Flood risk

The desk study information indicates the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea). However, a partial area of the east boundary is considered as Flood Zone 2 (1 in 1000 (0.1%) chance of flooding each year) and Flood Zone 3 (with a 1 in 100 (1%) or greater chance of flooding each year from rivers)

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.9 Mining or mineral extraction

In summary, the risk associated with mining or mineral extraction within the site boundary is considered low. The desk study information indicates several records of surface mining and surface groundworks in the vicinity of the site, as listed below:

- Cuttings, between 28m to 211m west, probably associated with the construction of the A3 (M).
- Ponds, approximately at 30m west and 90m east, probably related to old surface mining.
- Brick kiln and tile works are recorded at 155m east and 124m south of the site.



2.10 Natural ground instability

The majority of the site lies within Bognor Sand Member, and the risk of shrink swell clay is negligible to low due to its likely non-plastic condition. However, trees and hedges are present around the site boundaries and sporadically across the site within Plots 600 and 700 areas, and the presence of shallow cohesive deposits of the London Clay Formation may be affected by potential for shrink-swell ground movements in clays as a result of changes in moisture content from removal or growth of trees. This can pose a significant risk of shrink swell clays. Head Deposits containing cohesive soils may also represent a potential shrink swell risk.

The Groundsure report indicates risk of running sands, landslides, compressible and collapsible deposits within site boundary is very low to low. However, due to the unknown composition and extend of the made ground and landfill, risk of running sands cannot be discounted.

2.11 Waste management

There is one historical landfill record which covers a large proportion of the east and northern area of the site, between Plots 600 and 700, classed as inert waste (assumed to be from construction activities of the A3 (M)).

2.12 Regulatory Information

Information provided in the previous desk study indicate the following significant regulatory controls in the vicinity of the site:

- Two entries of discharge consent for sewage discharge to an unnamed tributary of the River Wallington located 219m north.

2.13 Natural soil chemistry

Information provided in the previous desk study gives indicative (estimated) concentration values for the natural soils at the site for a selection of Contaminants of Potential Concern (CoPC). These have been reproduced in Table 2-1 below:

Table 2-1: Natural soil chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	15	1.8	60 - 90	100	15 - 30

2.14 Radon and ground gas

The previous desk study indicated that the site is not in a Radon Affected Area (less than 1% of homes are above the action level). A recent review of the BGS radon mapping updated in December 2022 confirmed this conclusion. Therefore, no radon protection measures are required.

2.15 Unexploded ordnance (UXO)

A specialist UXO risk assessment was undertaken by 1st Line Defence in July 2021. The full report (reference DA13636-00) is presented in Appendix B. This indicates a Low-Medium Risk from items of



German aerial delivered UXO and Low from Allied UXO across the site. However, it is recommended that all works have:

- A written site-specific site management plan for UXO.
- Site specific UXO awareness briefings to all personnel conducting intrusive works.

2.16 Environmental and agricultural designations

There are 39 entries related to areas with environmental designations within 2,000m from the site boundary, relating to Local Natural Reserve, Ancient and Semi-Natural Woodland and Ancient Replanted Woodland. There are 3 entries related to agricultural land, one open access land record, one nitrate vulnerable zone record, one environmental and countryside stewardship schemes record.



3 Initial conceptual site model

3.1 Introduction

The initial Conceptual Site Model (iCSM) incorporates evidence from the site walkover, the Desk Study and previous investigations carried out at the site. The formulation of an initial Conceptual Site Model is a key component of the LCRM methodology. The iCSM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

3.2 Ground model

The preliminary ground model presented in Section 2 provides an understanding of the ground conditions and is the basis for preparing the preliminary geotechnical hazard assessment (Section 3.3) and the preliminary geo-environmental exposure model (Section 3.4).

3.3 Geotechnical hazard identification

3.3.1 Context

The preliminary geotechnical hazard identification has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622.

The following section sets out the identified geotechnical hazards and the development elements potentially affected (see Table H.1 in Appendix H for further information).

3.3.2 Plausible geotechnical hazards

Plausible geotechnical hazards identified at the site are:

- Uncontrolled Made Ground (variable strength and compressibility).
- Soft / loose compressible ground (low strength and high settlement potential).
- Shrinkage / swelling of the clay fraction of soils under the influence of vegetation.
- Variable lateral and vertical changes in ground conditions.
- Attack of buried concrete by aggressive ground conditions.
- Shallow groundwater.
- Changing groundwater conditions.
- Running sands and / or loose Made Ground, leading to difficulty with excavation and collapse of side walls.
- Risk from erosion.
- Obstructions.
- Slope stability issues – general slopes.



- Slope stability issues – retaining walls.
- Earthworks – settlement (due to placement of fill on soft / loose ground).
- Earthworks – poor bearing capacity of new fill.
- Earthworks – unsuitability of site won material to be reused as fill.

3.3.3 Potential development elements affected

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- General slopes.
- Retaining walls.
- Public open spaces (POS).
- Construction staff, vehicles and plant operators.
- Concrete below ground.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

The above plausible geotechnical hazards and development elements affected have been carried forward for investigation and assessment. The investigation is presented in Section 5 and the assessment is presented in Section 6.

3.4 Geo-environmental exposure model

3.4.1 Context

The preliminary exposure model is used to identify geo-environmental hazards and to establish potential contaminant linkages, based on the source-pathway-receptor (SPR) approach.

A viable contaminant linkage requires all the components of an SPR to be present. If only one or two are present, there is no linkage and no further assessment is required.

3.4.2 Potential contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

3.4.2.1 Potential on-site sources of contamination

The following potential on-site sources of contamination have been identified:



- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

3.4.2.2 Potential off-site sources of contamination

The following potential off-site sources of contamination have been identified:

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

3.4.3 Potential receptors

The following potential receptors in relation to the proposed land use have been identified:

- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the southeast area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

3.4.4 Potential pathways

The following potential pathways have been identified:

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).



- Root uptake by plants (P4).
- Migration of contaminant via leachate migration through the unsaturated zone in Head Deposits / Bognor Sand Member (P5).
- Surface water via overland flow (P6).
- Surface water, via drainage discharge (P7).
- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

The above sources, pathways and receptors have been considered as part of the Preliminary Risk Assessment in accordance with LCRM (2021), are considered to be plausible in the context of this site and have been carried forward for investigation and assessment. The investigation is presented in Section 5 and the assessment is presented in Section 7. An assessment of the Source – Pathway – Receptor linkages is undertaken following the assessment (Section 7) and is presented in Appendix I (Table I.1).

3.4.5 Potential implications of climate change

Climate change has the potential to change the risk profile for conceptual site models and associated contaminant linkages. The impact of climate change on the CSM is site-specific, and a qualitative assessment of the potential impact of climate change on the CSM for this site is summarised below. The assessment has primarily utilised the guidance in Environment Agency (2010)¹ and SoBRA (2022)² which set out the UK context to climate change and land contamination. Both guidance documents advocate a “what if” scenario approach in the context of changes in ambient temperatures, an increase in the frequency of extreme rainfall/storm events and heatwaves/droughts, and long-term changes in groundwater and sea levels.

Those “what if” scenarios that are relevant to this CSM are:

- Increased long-term rainfall leading to increased infiltration and seasonally higher groundwater and water levels in surface waters.
- Increased frequency and/or magnitude of extreme rainfall events leading to short-term surface flooding, surface water run-off, groundwater flooding, and/or land-based erosion.
- Increased frequency and/or magnitude of storm events leading to short-term drops in barometric pressure and/or high winds.

¹ Environment Agency, 2010. *Guiding Principles for Land Contamination. Part 2. FAQs, technical information, detailed advice and references*, March 2010.

² SoBRA, 2022. *Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change*, Society of Brownfield Risk Assessment, August 2022.



- Occurrence of extreme cold and hot weather events leading to changes in ground conditions such as soil temperature, evapo(trans)piration, and soil moisture (for example freeze-thaw effects and desiccation), decreased infiltration and fall in groundwater and surface water levels.
- Long-term decrease in rainfall leading to lower infiltration and fall in groundwater and surface water levels.



4 Ground investigations

4.1 Investigation rationale

The ground investigation rationale was based on the findings of the preliminary risk assessment and is summarised in Table 4-1.

Table 4-1: Investigation rationale

Location	Purpose
TP6.01 - TP6.08	To assess shallow ground conditions. To allow collection of samples for contamination testing. To allow collection of samples for geotechnical characterisation. Targeting the areas of the proposed road and car parking/ loading areas.
WS6.01 - WS6.07	To assess shallow ground conditions and to allow SPTs to be undertaken. To allow collection of samples for geotechnical characterisation. To allow collection of samples for contamination testing. Installation of gas and groundwater monitoring and sampling wells. Targeting the proposed building footprints and car parking/ loading areas.
BH6.01 - BH6.03	To assess deeper ground conditions and to allow SPTs to be undertaken. To allow collection of samples for geotechnical characterisation. To allow collection of samples for contamination testing. Installation of gas and groundwater monitoring and sampling wells. Targeting the proposed building footprints.

4.2 Constraints

No specific constraints were noted.

4.3 Site works

The ground investigation works, including the rationale which was based on the findings of the fieldwork took place between 19/07/2021 and 26/08/2021 and is summarised in Table 4-2. The ground investigation locations were surveyed in using a Total Station GPS survey instrument or a topographic survey quality GPS in areas of difficult access and are shown on Hydrock Drawings 19453-HYD-XX-XX-DR-GE-1004-P2 and 19453-HYD-XX-XX-DR-GE-1012, in Appendix A.

The logs, including details of ground conditions, soil sampling, in situ testing and any installations, are also presented in Appendix C.

The weather conditions during the Hydrock fieldwork and for the previous week were sunny and hot with occasional showers.



Table 4-2: Summary of site works

Activity	Method	No.	Depth Maximum (m bgl)	In situ tests	Notes (e.g. installations)
Plot 600					
Boreholes	Cable Percussive	3	20.45	SPT	63mm HDPE wells with gas taps in 2 holes.
	Windowless Sampler	7	5.45	SPT	50mm HDPE wells with gas taps in 5 holes
Trial Pits	Machine (JCB 3X)	9	3.80	HSV	-
SPT denotes Standard Penetration Test HSV denotes Hand Shear Vane Test					

Wells for monitoring groundwater levels and ground gas concentrations, and to facilitate the sampling of groundwater, were installed in a number of the windowless sampler and cable percussion boreholes. A summary of the monitoring well installations is presented in Table 4-3.

Table 4-3: Summary of monitoring installations

Activity	Method	No.	Depth Maximum (m bgl)	In situ tests	Notes (e.g. installations)
Plot 600					
BH6.02	39.84	63	1.00 to 10.00	38.84 to 29.84	London Clay Formation (Weathered) / London Clay Formation
BH6.03	39.21	63	1.00 to 10.00	38.21 to 29.21	
WS6.01	42.90	42	1.00 to 5.00	41.90 to 37.90	
WS6.06	39.68	42	1.00 to 5.00	38.68 to 34.68	
WS6.02	42.97	42	1.00 to 5.00	41.97 to 37.97	Bognor Sand Member / London Clay Formation
WS6.03	41.32	42	1.00 to 5.00	40.32 to 36.43	
WS6.04	39.94	42	1.00 to 5.00	38.94 to 34.94	

4.4 Geo-environmental testing

4.4.1 Sampling strategy and protocols

Exploratory hole positions were determined by reference to the site conditions and uncertainties identified in the Initial Conceptual Site Model.

No specific sampling statistics or grid were utilised in this instance.

Samples were taken, stored and transported in general accordance with BS 10175:2011+A2:2017.



4.4.2 Geo-environmental monitoring

Ground gas and groundwater monitoring boreholes have been monitored on 9 occasions. The results are presented in Appendix E.

4.4.3 Geo-environmental laboratory analyses

The chemical test certificates for testing undertaken by a specialist laboratory in behalf of Hydrock are provided in Appendix F. Wherever possible, UKAS and MCERTS accredited procedures have been used.

The geo-environmental analyses undertaken on soils are summarised in Table 4-4.

Table 4-4: Geo-environmental analyses of soils

Determinand Suite	Made Ground	Topsoil	Head Deposits	Bognor Sand Member	London Clay Formation
Plot 600					
Hydrock minimum suite of determinands for solids*	1	3	3	4	-
Hydrock Tier 2 TPH Suite	1	2	1	4	-
WAC Full Solid Suite	-	-	-	2	-
*Hydrock minimum soil suite comprises: As, B (water soluble), Be, Cd, Cr (total), Cr (VI), Cu, Hg, Ni, Pb, S (elemental), Se, V, Zn, cyanide (total), sulfide, pH, asbestos fibres, speciated polynuclear aromatic hydrocarbons (PAH, by GC-FID), total phenols and fraction of organic carbon					
** Hydrock Tier 2 TPH Suite comprises: speciated aliphatic and aromatic banding Total petroleum hydrocarbons by HS-GC/MS and GC/FID					

The soils chemical test data are interpreted and assessed in Sections 7.3 and 7.4.

The geo-environmental analyses undertaken on waters for testing undertaken by a specialist laboratory on behalf of Hydrock are summarised in Table 4-5.

Table 4-5: Geo-environmental analyses of waters

Determinand Suite	Groundwater
Plot 600	
Hydrock Minimum Suite of Determinands for Water	4
Hydrock Tier 2 TPH Suite - Water	4
Hydrock Tier 2 TPH Suite - Water comprises: speciated aliphatic and aromatic banding Total petroleum hydrocarbons by HS-GC/MS and GC/FID	

The groundwater chemical test data are interpreted and assessed in Section 7.5.



4.5 Geotechnical testing

The geotechnical tests undertaken by a specialist laboratory in behalf of Hydrock are summarised in Table 4-6 and the test certificates are provided in Appendix D. Wherever possible, UKAS accredited procedures have been used.

Table 4-6: Summary of sample numbers for geotechnical tests

Test	Made Ground	Head Deposits	Bognor Sand Member	London Clay Formation weathered	London Clay Formation
Plot 600					
Natural moisture content	-	2	5	5	4
Atterberg limits	-	2	3	2	2
Particle size distribution (wet sieve)	-	-	5	-	-
Sulfate and aggressive chemical environment classification for buried concrete classification (BRE SD1 suite)	-	1	2	3	2
One dimensional oedometer consolidation	-	-	-	1	1
Optimum Moisture Content / Maximum Dry Density Relationship (vibrating hammer)	-	1	-	-	-
Optimum Moisture Content / Maximum Dry Density Relationship (4.5kg hammer)	-	-	1	-	-
Remoulded California Bearing Ratio at natural moisture content (soaked)	-	1	-	1	-
Remoulded California Bearing Ratio at natural moisture content (unsoaked)	-	1	-	-	-
Quick shear box 60mm	-	-	1	-	-
Single stage undrained triaxial compressive strength	-	-	-	1	5

The geotechnical test data are summarised in Section 4.5 and interpreted in Section 6.



5 Ground investigation records and data

5.1 Physical ground conditions

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

All relevant data from the Hydrock investigation discussed in Section 4 are used from this point forward.

Details of the Hydrock ground investigation works are provided in the logs in Appendix C, a summary of the ground model is presented in Table 5-1 to Table 5-4 and the individual strata are described in the sections below. Relevant cross-sections are presented in Appendix A.

5.1.1 Summary of strata encountered

A summary of the ground model for Plot 600 is presented in Table 5-1 and the individual strata are described in the sections below.

Table 5-1: Strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Thickness (m) (range)	Thickness (m) (average)
Plot 600				
Topsoil	0.00	0.30 - 0.50	0.30 - 0.50	0.33
Made Ground - General	0.30	0.60	0.30	0.30
Head Deposits	0.30 - 0.40	0.55 - 3.00	0.25 - 2.70	1.10
Bognor Sand Member	0.30 - 1.30	1.20 - 4.00	0.70 - 3.70	1.94
London Clay Formation (weathered)	0.60 - 3.00	3.20 - 4.00	0.60 - 2.60	1.85
London Clay Formation	2.80 - 4.00	>3.50 - >20.45	>17.15	Not proven

5.1.1.1 Topsoil

Topsoil was encountered across the entire area of Plots 600, between ground level and 0.50m bgl, with an average thickness of 0.33m. It generally comprises long grass and scrub vegetation over soft, brown slightly sandy silt or silty fine to medium sand abundant roots and rootlets and rare rounded to subangular fine to medium gravel of flint.

For the purposes of this report, topsoil is defined as the upper layer of an in-situ soil profile, usually darker in colour and more fertile than the layer below (subsoil), which is a product of natural chemical, physical, biological and environmental processes, but does not imply compliance with BS 3882:2015. Reuse of topsoil as a growing medium at the site should be determined by the landscape architect or the landscape Contractors.



5.1.1.2 Made ground - General

Made Ground was locally encountered below the topsoil in the southern area of Plot 600, at location TP6.09, between 0.30m and 0.60m bgl comprising firm, orangish brown, slightly gravelly, slightly sandy clay. Gravel is rounded fine to medium of flint. A redundant clay pipe was encountered at 0.50m bgl.

5.1.1.3 Head Deposits

Head Deposits was encountered underlying the topsoil at locations TP6.01, TP6.02, TP6.03, TP6.04, TP6.05, TP6.06, TP6.07, TP6.08, WS6.01, WS6.02 and WS6.04, between 0.30m and up to 3.00m bgl, with an average thickness of 1.10m. The deepest Head Deposits were encountered at the northeast of Plot 601 at locations TP6.01, TP6.02 and TP6.03 (with thickness of approximately 3.00m). It generally comprises brown to orange brown, silty sandy to very sandy clay or silty clayey fine sand with rare to occasional rounded to subangular fine to coarse gravel of flint, occasional roots and rootlets and rare black mottling.

5.1.1.4 Bognor Sand Member

Bognor Sand was encountered below the topsoil or head deposits between 0.30m and 4.00m bgl, with an average thickness of 1.94m. This generally consisted of soft to firm, orange brown and grey brown with occasional light grey mottling sandy clay/silt or silty clayey fine sand with rare rootlets and locally pockets of organic material.

5.1.1.5 London Clay Formation (Weathered)

A weathered fraction of the London Clay Formation was encountered underlying the Bognor Sand Member or Head Deposits across the entire area between 0.60m and up to 4.00m bgl, with an average thickness of 1.85m. It generally comprises firm, orangish brown and light grey mottled silty clay with various proportions of fine sand.

5.1.1.6 London Clay Formation

The London Clay Formation was encountered underlying the Bognor Sand Member and weathered London Clay Formation across the entire area of Plots 600, between 2.80m and to a maximum depth of 20.45m bgl. The base of the strata was not proven. This generally consisted of firm to stiff, dark grey to grey, sandy silty clay with rare to occasional white shell fragments. Becoming very stiff and generally silty clay from 12.00m / 15.00m bgl.

5.2 Obstructions

No obstructions were encountered during ground investigation works.

5.3 Groundwater

5.3.1 Groundwater observations and levels

Groundwater encountered during the investigation is listed in Table 5-2. A groundwater observation represents the depth at which groundwater was first observed and is likely to be deeper than the actual water table level at that location.



Table 5-2: Groundwater occurrence

Stratum	Date	Location	Fieldwork				Comment
			Groundwater observation		Rose to after 20 min		
			m bgl	m AOD	m bgl	m AOD	
Head Deposits	23/07/21	TP6.05	2.70	37.72	-	-	Slow seepage.
London Clay Formation (Weathered)	29/07/21	WS6.01	1.73	41.17			Soil recovered wet.
		WS6.03	3.00	38.32			
		WS6.04	0.98	38.96			
London Clay Formation	17/08/21	BH6.01	8.50	34.37	8.20	34.67	Slow seepage.
	17/08/21	BH6.01	11.50	31.37	11.10	31.77	Slow seepage.
	19/08/21	BH6.02	9.20	30.64	8.80	31.04	Slow seepage.
	19/08/21	BH6.02	6.30	33.54	6.10	33.74	Slow seepage.
	18/08/21	BH6.03	11.40	27.81	11.00	28.21	Slow seepage.
	18/08/21	BH6.03	6.40	32.81	6.10	33.11	Slow seepage.
	22/07/21	TP6.02	3.10	36.61			Slow seepage.
	23/07/21	TP6.09	3.70	32.96			Slow seepage.
	29/07/21	WS6.02	5.00	37.97			Soil recovered wet.
	29/07/21	WS6.06	5.00	34.68			Soil recovered wet.

Groundwater levels recorded during post-fieldwork monitoring are summarised in Table 5-3.

Table 5-3: Groundwater level data summary

Stratum	Date range	Location	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
London Clay Formation (weathered) / London Clay Formation	27/08/21 - 24/09/21	BH6.02	2.57 - 2.66	37.18 - 37.27
		BH6.03	2.63 - 2.74	36.47 - 36.58
	11/08/21 - 24/09/21	WS6.06	2.43 - 2.58	37.10 - 37.25
		WS6.01	1.87 - 2.13	40.77 - 41.03
		WS6.06	2.43 - 2.58	37.10 - 37.25
		WS6.03	2.13 - 2.30	39.02 - 39.19
Bognor Sand Member / London Clay Formation		WS6.04	2.16 - 2.49	37.45 - 37.78

5.3.2 Infiltration tests

The result of the infiltration testing undertaken at location SA401 summarised in Table 5-4.

Testing was carried out in accordance with Hydrock's 1-day assessment methodology. This is in general accordance with BRE Digest 365 (BRE DG 2016) where infiltration rates allow three test runs during a working day (or where there is no infiltration), but where low infiltration rates were encountered the available time may not have been sufficient to fully comply with the BRE test method (i.e. three runs of the test).



Table 5-4: Infiltration test results

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)			
			Run 1	Run 2	Run 3	Range
London Clay Formation	SA401	1.70	No infiltration*			-

*Test was aborted due to no infiltration rates recorded.

5.3.3 Groundwater summary

Groundwater was encountered during fieldworks within the Head Deposits at 2.70m bgl (37.72m AOD), and within the London Clay Formation between 0.98m to 5.0m bgl (34.68 m to 41.17m AOD). A deeper groundwater body was identified within the London Clay between 3.70m to 11.50m bgl (27.81m to 33.54m AOD). Groundwater flows in a northwest to southeast direction and appears to be topographically controlled.

It is thought likely that groundwater within the London Clay Formation is hosted within sand rich units or lenses and as such may be confined.

Soakaway infiltration tested was aborted due to negligible infiltration.

5.4 Ground gases (carbon dioxide and methane)

Records from the gas monitoring boreholes are presented in Appendix E and summarised in Table 5-5.

A total of nine monitoring visits have been undertaken and the monitoring programme is complete. The data are assessed in Section 7.6.

Table 5-5: Range of ground gas data

Stratum	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Steady flow rate (l/hr)	Comment
Plot 600					
Bognor Sand Member / London Clay Formation	ND - 0.0	0.2 - 10.4	9.3 - 20.9	-4.4 to 3.2	CH4 readings were below detection limits or below 1%. CO2 concentrations were above 5% in eight out of 21 readings (at locations WS6.03 and WS6.04)
London Clay Formation	ND - 0.1	0.1 - 6.5	14.2 - 20.7	0.0 - 5.3	CH4 readings were below detection limits or below 1%. CO2 concentrations were slightly above 5% in three out of 32 readings (at locations WS6.01 and WS6.06)
ND denotes Not Detected					



5.5 Geotechnical data

5.5.1 Introduction

Laboratory test results are contained in Appendix D with in situ test results shown on the relevant exploratory hole log or datasheet in Appendix C. The following sections summarise the main findings and provide interpretation where appropriate.

5.5.2 Plasticity

The volume change potentials in terms of BRE Digest 298 with respect to building near trees have been determined from the results of plasticity index tests on samples of soil. These are summarised in Table 5-6.

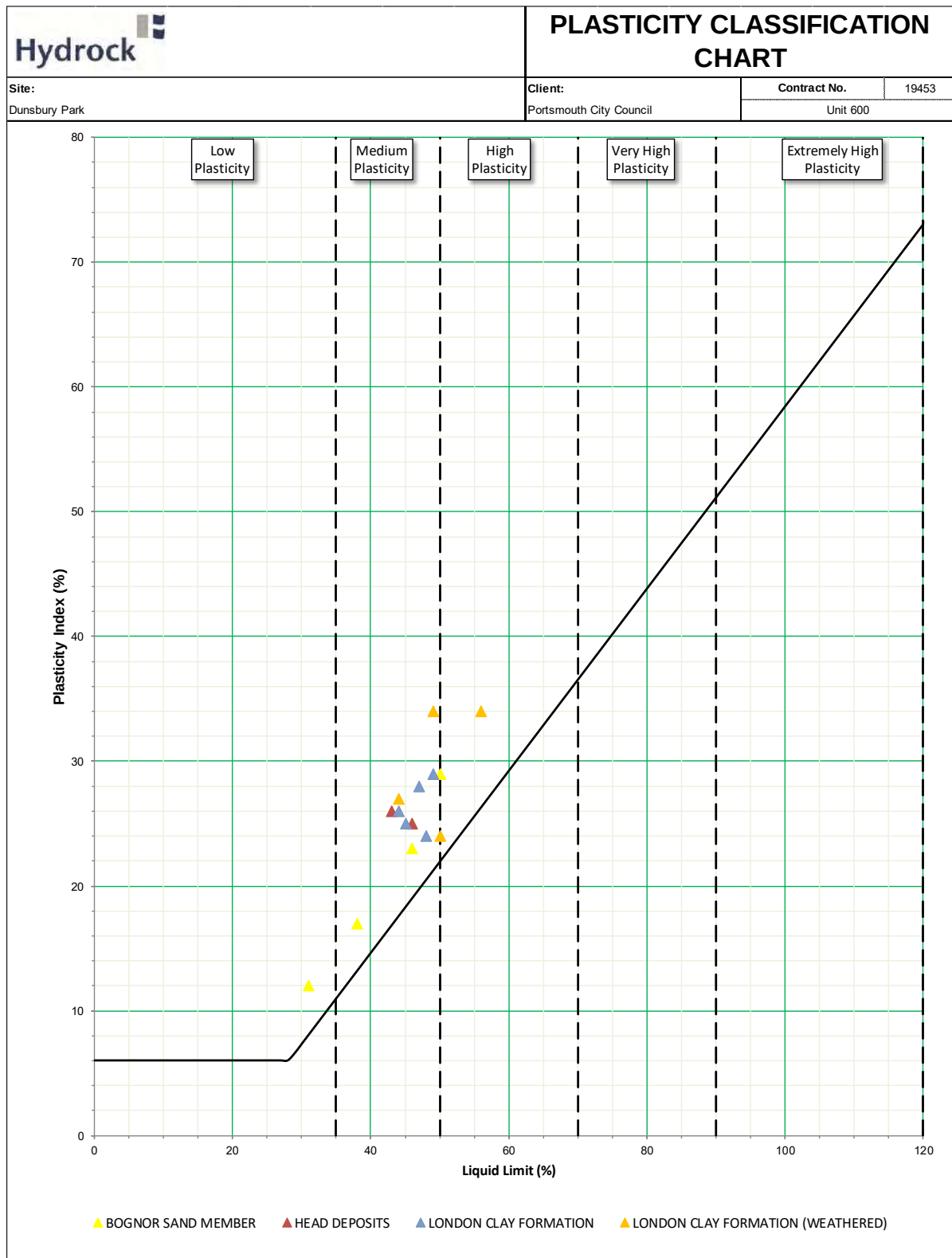
Table 5-6: Volume change potential

Stratum	No. of tests	Plasticity Index			Modified Plasticity Index			Plasticity designation	Volume Change Potential
		Min.	Max	Av.	Min.	Max	Av.		
Plot 600									
Head Deposits	2	25	26	26	25	26	26	Medium	Medium
Bognor Sand Member	5	12	29	21	12	29	21	Low to medium	Low to medium
London Clay weathered	4	24	34	30	24	34	30	Medium to high	Medium
London Clay	5	24	29	26	24	29	26	Medium	Medium

Plasticity charts for each unit are presented in Figure 5.1 below;



Figure 5.1: Plasticity Chart



5.5.3 Particle size distribution

Particle Size Distribution test (PSDs) results are summarised in Table 5-7 and summary descriptions and PSD Plots of the material analysed are presented in Appendix D.

Table 5-7: PSD results summary

Stratum	No. of tests	Silt/Clay %	Sand %	Gravel %	General description
Plot 600					
TS/ BSM	1	35	49	16	Brown fine to coarse gravelly silty clayey fine to coarse SAND.
BSM	3	6 - 32	68 - 94	0 - 1	Brown silty clayey fine to coarse SAND.
Head	3	38 - 59	35 - 62	0 - 31	Brown fine to coarse gravelly silty clayey fine to coarse SAND.

5.5.4 Soil strength

Table 5-8 summarises information pertaining to the shear strength of the soils according to geological stratum. Factual results are summarised for laboratory tests, field tests (e.g. hand shear vane) and uncorrected Standard Penetration Tests (SPT). Where the SPT is used to infer shear strength by published correlation, this is also tabulated. Plots presenting soil strength versus depth for each unit are shown in Figure 5.2 below.

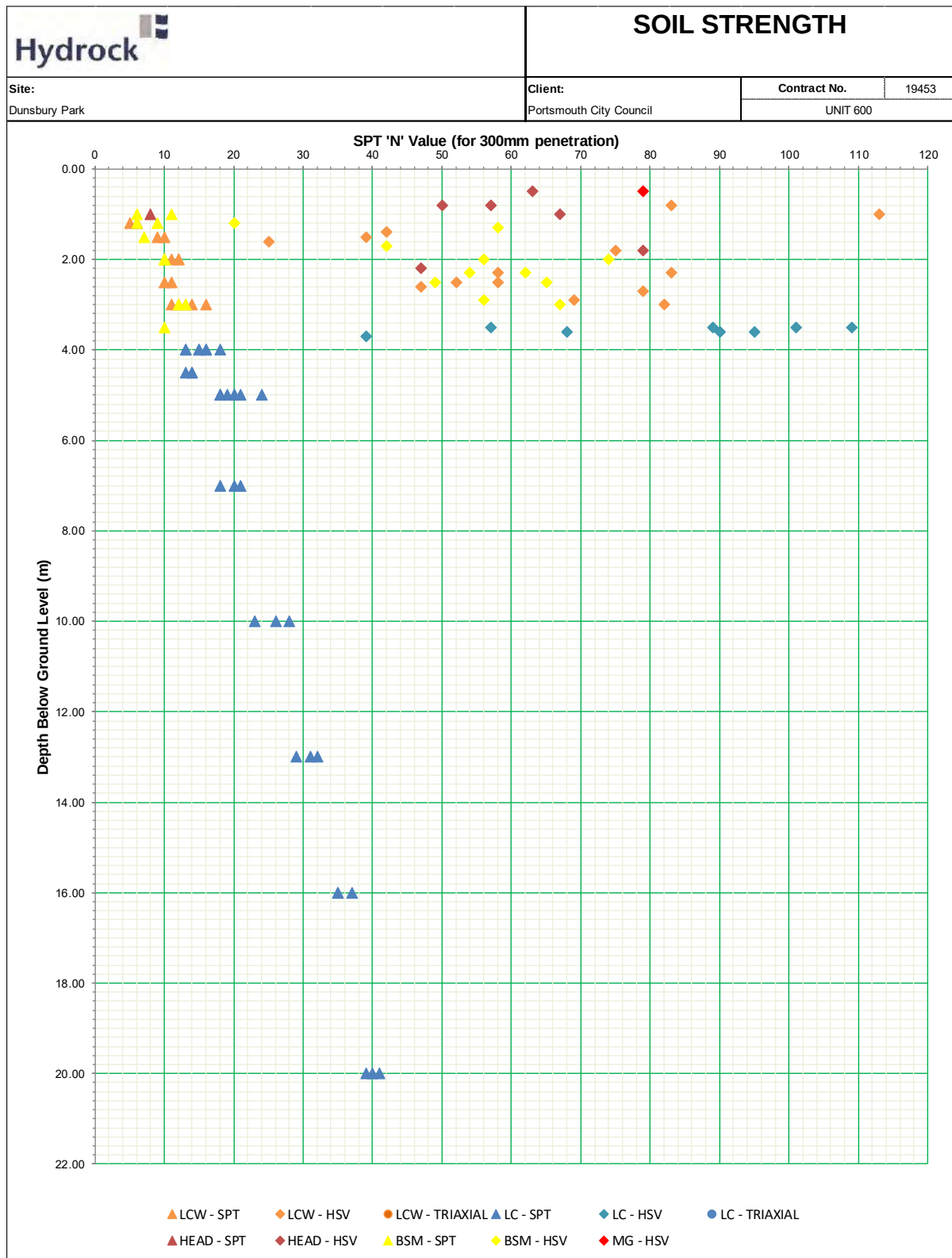
Table 5-8: Soil strength results and derived values

Stratum	No. of tests	SPT (N-value) (range)	cu (kPa)	c' (kPa)	phi' (°)	Method
Plot 600						
Made Ground	1	-	79	-	-	Hand shear vane
Bognor Sand Member - Cohesive	11	6 - 12	27 - 54	-	-	SPT - cable percussion and windowless sampler boreholes.
	11	-	20 - 74	-	-	Hand shear vane
		-		4.12	13.9	Laboratory Shearbox
Head	6	-	47 - 79	-	-	Hand shear vane
	2	6 - 8	27 - 36	-	-	SPT - cable percussion and windowless sampler boreholes.
Weathered London Clay	14	5 - 16	23 - 72	-	-	SPT - cable percussion and windowless sampler boreholes.
	14	-	25 - 113	-	-	Hand Shear Vane
	1	-	57	-	-	Laboratory Triaxial
London Clay Formation	32	13 - 41	59 - 185	-	-	SPT - cable percussion and windowless sampler boreholes.
	8	-	39 - 109	-	-	Hand Shear Vane
	7	-	31 - 177			Laboratory Triaxial

Undrained Shear strength from SPT - N derived using Stroud & Butler 1975 and a F1 value of 4.5.



Figure 5.2: Soil strength versus depth



5.5.5 Relative density

Table 5-9 summarises information pertaining to the relative density of the granular soils according to geological stratum. Factual results are summarised for laboratory tests, field tests (e.g. SPT, CPT, dynamic probe correlation).

Table 5-9: Relative density results and derived values

Stratum	No. of tests	Method	SPT (N-value) (Range)	phi' (°)
Plot 600				
Bognor Sand Member	5	SPT – cable percussion windowless sampler boreholes (Peck et. al. (1967).	6 - 11	26 - 30

5.5.6 Compressibility

Table 5-10 presents a summary of the derived parameters for coefficient of consolidation and compressibility.

Table 5-10: Summary of compressibility

Stratum	No. of tests	Method	Pressure range2 (kN/m²)	Coefficient of volume compressibility (mv) (m²/MN)	Coefficient of consolidation (Cv) (m²/yr)
Bognor Sand Member - Cohesive	8	Correlation with SPT*	NA	0.15-0.3	NA
Weathered London Clay	17	Correlation with SPT*	NA	0.05-0.44	NA
	1	One Dimensional Oedometer Testing	0-75	0.4	5.5
			75-150	0.22	1.5
			150-300	0.16	2.3
			300-600	0.1	1.5
			Unload	0.034	1.5
London Clay	32	Correlation with SPT*	NA	0.05-0.17	NA
	1	One Dimensional Oedometer Testing	0 - 50	0.4	3.7
			50 - 100	0.22	4.2
			100 - 200	0.15	2.7
			200 - 400	0.1	3
			Unload	0.031	8.1

* All f2 values have been used based on a 'average' plasticity index with Mv calculated using the relationship $Mv=1/F2*N$. (Tomlinson (2001), after Stroud)).

All oedometer tests carried out on remoulded samples

5.5.7 Compaction and moisture content

A total of 4 No. compaction tests were carried out on samples collected from Plot 600 with Table 5-11 presenting a summary of the moisture content tests and compaction tests undertaken at the site.



Table 5-11: Compaction study results

Stratum	No. tests	Method	Natural moisture content (%) (range)	Optimum moisture content (%) (range)	Particle density (Mg/m ³) (range)	Maximum dry density (Mg/m ³) (range)
Head	1	Vibrating Hammer	16	13	2.65*	1.82
Bognor Sand Member	3	Vibrating Hammer	16 - 29	12 - 15	2.65*	1.82 – 1.96

* Assumed

5.5.8 Subgrade stiffness

The subgrade stiffness (CBR and Subgrade Surface Modulus) results are summarised in Table 5-12.

Table 5-12: CBR results and derived values

Stratum	No. tests	Method	Subgrade Surface Modulus (MPa) ^a (Range)	CBR (%) (Range)
Head Deposits	1	Laboratory remoulded sample (not soaked)	38.5	3.4
	1	Laboratory remoulded sample (soaked)	7.4	0.26
LC (weathered)	1	Laboratory remoulded sample (soaked)	32.4	2.6

^a From CD225 revision 1 (2020)

According to Table 5-12, laboratory CBR values are above 2.5% for all stratum, with some exceptions on the Head Deposits and Bognor Sand Member, which present values of CBR of 0.26% and 0.22% respectively.

5.5.9 Sulfate content

In accordance with BRE (Special Digest 1), the Design Sulfate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in Table 5-13. The assessment summary sheets are presented in Appendix D.

Table 5-13: Aggressive chemical environment concrete classification

Stratum	No. tests	DS	ACEC
Head	1	DS-1	AC-1
BSM	2	DS-4	AC-4
LC	5	DS-4	AC-4



6 Geotechnical assessment

6.1 Geotechnical categorization of the proposed development

Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structures to establish the design requirements.

For the purposes of this investigation, the proposed structures have been classed as Geotechnical Category 2.

For Category 2 structures, the Geotechnical Category should be re-assessed at the design stage and specific geotechnical design (in addition to this investigation), is required.

Following ground investigation and as part of the assessment provided in the following section, the preliminary geotechnical hazard identification undertaken in Section 3.3 has been updated.

Assessment has been undertaken in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622. The preliminary Geotechnical Risk Register following investigation is provided in Appendix H (Table H.3) and will need to be updated during future design works.

6.2 Characteristic design values

In accordance with BS EN ISO 1997-1 (EC 7), Hydrock consider the proposed structures would be classified as Category 2 structures. As part of the separate geotechnical design, the designer should determine the geotechnical design values.

Table 6-1 provides characteristic geotechnical values to assist the designer. These are based on laboratory testing, *in situ* testing and by professional judgement using published data together with knowledge and experience of the ground conditions. Care should be exercised in using these assumed soil strength parameters for any purpose beyond the scope of this report because it may be that additional sampling and testing are required for certain purposes. The reader should refer to the original test results summarised in Section 5 and provided in Appendix C and Appendix D.



Table 6-1: Characteristic geotechnical values

Parameter	Bulk unit weight kN/m³	Effective angle of internal friction °	Effective cohesion kN/m²	Undrained shear strength kN/m²	Modulus of subgrade reaction (IAN73/06) MN/m²/m
Stratum	γ^a	$\varphi'^{b\ c}$	c'^d	c_u^e	k^f
Made Ground - General	17.0	-	-	-	-
Bognor Sand Member	19.0	32	-	-	35.6
London Clay Formation (weathered)	18.0	23	0	Min 45kPa between 0-5mbgl ^g	35.6
London Clay Formation	19.0	23	2.5	Cu=7z+45.6	35.6

^aLaboratory data and BS8004-2015.

^bTomlinson 2011 after Peck et al 1967

^cSorensen & Ockels (2013)

^dBS8002:1994 Code of Practice for Earth Retaining Structures, BSI

^eLaboratory data and SPT (After Stroud & Butler 1974)

^fCD225 Rev1 (2020) assuming CBR of 3

^gSignificant scatter above 5mbgl.

6.3 Groundwork

6.3.1 Site preparation

The site is previously undeveloped and no buried man-made obstructions were encountered by this investigation. The possibility of buried obstructions being encountered is low.

It should be noted that areas of previously placed engineered fill have been identified and that these materials may have been stabilised with lime/cement. These areas may require the use of heavier plant to excavate and process.

Topsoil should be removed from beneath all building and hardstanding areas.

6.3.2 Groundworks

As no breaking out of hardstanding or obstructions is anticipated, excavation of shallow soils should be readily undertaken by conventional plant and equipment.

Trial pit faces within the Made Ground – Engineering Fill and both weathered and unweathered London Clay Formation, were noted to remain generally vertical without collapse, while excavations within the general Made Ground and Bognor Sand suffered small scale collapse and spalling.

The faces of shallow, near vertically sided excavations put down within the Engineered Fill and London Clay Formation at the site are likely to remain stable for short periods of time.

Temporary trench support, or battering of excavation sides, is recommended for all excavations that are to be left open for any length of time and will definitely be required where man entry is required.



A risk assessment of the stability of any open excavation should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from the Construction Design and Management Regulations (2015); Construction Information Sheet 47: Inspections and Reports (2005) and HSG47: Avoiding Danger from Underground Services.

To ensure no loads are imposed on the sides of the excavation, spoil should not be placed immediately adjacent to the excavation. Spoil should be placed a suitable distance from the side of the excavation (as assessed by a competent person).

Based on site observations, the rate of water ingress to the proposed excavations is likely to be slow. In these circumstances, groundwater control by sump pumping is likely to be sufficient.

However, it should be recognised that groundwater levels may vary from those at the time of the investigation, for example in response to seasonal fluctuations and the timing of construction may dictate the extent of groundwater control required.

Any water pumped from excavations may need to be passed via settlement tanks (to reduce suspended solids) before being discharged to the sewer. Discharge consents may also be required.

6.3.3 Earthworks/reuse of site-won materials

The classification of materials depends on both the proposed end use and whether the material will meet the performance requirements of that end use. Based on Hydrock's understanding, the following assessment is based on General Fill for external yard areas and Structural Fill for the building footprint.

An initial assessment of classification data has been completed based on Hydrock's understanding of the development and the potential to reuse site-won materials as an engineered fill material. This is summarised in Table 6-2.

The presence of sulfates, or the potential for sulfates to form within the London Clay (weathered and unweathered) in combination with water and natural minerals may allow for the formation of expansive materials if soils are to be modified or stabilised with lime and/or cement. Current guidance suggests that:

- Values of total sulfate (as SO₄) below 0.2% may be acceptable.
- Values recorded between 0.2% and 1.0% require careful consideration and may require further testing, and
- Values in excess of 1.0% indicate that sulfates may make the soil unsuitable for modification/stabilisation.

In addition to these values for total sulfate, stabilised soils are required to be designed in accordance with HA 74/07 (Treatment of fill and capping materials using either lime or cement or both)



Table 6-2: Preliminary earthworks assessment

Stratum	Proposed end use	Preliminary classification (SHW Series 600)	Comment	Suitability for improvement by the inclusion of binders
Made Ground - General	Open Space	Class 4 (Landscape Fill) Subject to contamination screening	Unsuitable for General Fill due to its heterogeneity. Can only be used in areas which are not sensitive to settlement.	Unlikely to be suitable
Bognor Sand Formation	External Areas	Class 1A General Fill Class 1B General Fill	May be dry of OMC – may require moisture conditioning.	May be suitable subject to further detailed design and testing.
	Below Structures	Class 6 Structural Fill	May be dry of OMC – may require moisture conditioning.	May be suitable subject to further detailed design and testing.
London Clay Formation (weathered)	Below Structures	Class 2 General Fill & 7A Select Fill	Subject to testing in accordance with a suitable EWS	Unlikely to be suitable due to the high sulfate concentrations.
London Clay Formation	Below Structures	Class 2 General Fill & 7A Select Fill	Subject to testing in accordance with a suitable EWS	Unlikely to be suitable due to the high sulfate concentrations.

The earthworks may need to be undertaken under a Materials Management Plan (see Section 8).

Before the use of hydraulic binders is approved, comprehensive testing will need to be completed by a specialist Contractor to satisfy both themselves and the Engineer of the suitability of the soils for treatment and to confirm that the requisite end-performance of the material is achievable. In all instances where improvement by the inclusion of binders is considered, a mix design is required and as part of this design, samples should be checked for swelling, even where very low sulfate values are recorded.

Where it is proposed to reuse site won materials as an engineered fill it will be necessary to develop an appropriate Site-Specific Earthworks Specification. The basis for the Specification should be BS 6031:2009 and the latest version of the SHW, Series 600 Earthworks. Once site proposals have been further defined more specific consideration will need to be given to the reuse of materials and reference should be made back to Hydrock.

6.4 Foundation recommendations

In accordance with EC7, BS EN 1997-1+A1 (2013), the proposed structures are considered to be Geotechnical Category 2. As such, foundation recommendations are presented to aid development proposals only and separate geotechnical design will be required.

6.4.1 Foundation Types

The exact nature of the proposed development is unknown but is thought likely be similar to the works carried out on Plot 500, with the construction of a series of level development platforms.

The Made Ground (surface covering and general) is considered unsuitable in its present condition for use as founding soils on the basis of its unpredictable nature and likely deposition in an uncontrolled manner. The Made Ground - Engineered Fill is considerable suitable although further assessment is necessary to avoid differential settlement between the foundations built in natural strata and in Engineering Fill.



The Bognor Sand Member, where present is considered suitable in its present condition for use as founding soils.

On the basis of the ground conditions indicated from the current investigation, the foundations will likely comprise spread foundations across the site. The pad foundations should be founded at least 300mm into the re-engineered Structural Fill, Bognor Sand Formation which comprise medium dense (or better) sands and firm (or better) clay from the London Clay Formation.

On the basis that an appropriate Earthworks Specification is followed, including all comments relating to over-excavation, proof-rolling and removal of soft spots, then a permissible net bearing pressure (for a pad foundation of 2.5m by 2.5m) of 100kN/m² for the re-engineered fill and 150kN/m² for the Bognor Sand formation and the London Clay Formation is likely achievable.

If enlarging the foundations is considered (for example because loads are such that the quoted permissible bearing pressure is inadequate) this could lead to increased settlements and the above recommendations should be reviewed.

If trees are to be removed, the roots should be grubbed out and foundations extended to below the zone of disturbance created by this activity and to below any remaining root hairs.

Deepening of foundations in accordance with BRE 240 and BRE 298 will be required where pad foundations are within the zone of influence of existing, removed or proposed trees and proposed shrub planting. A tree survey should be undertaken by an arboriculturist in accordance with BS 5837:2012 to identify the type, and height of existing trees on the site and including any off-site trees, that could have an effect on foundation design.

Where it is not practical to deepen individual pads beyond the influencing distance of the desiccated soils, it is recommended that bulk excavation of the affected area be undertaken and, following moisture conditioning, the soils are replaced to an Engineered Specification.

Where foundations are within the zone of potential desiccation from trees and are deeper than 1.5m bgl, a suitable compressible material or void former will be required on the inside faces of foundations to external walls, and beneath piled ring beams and ground bearing floor slabs.

Foundation formations should be inspected by a geotechnical engineer or other suitably competent person to ensure the founding conditions are suitable and as indicated in this report. Any formation materials deemed as unsuitable should be excavated and replaced with lean mix concrete or deepened to suitable strata.

Foundation excavations should be protected from rain and snow and inflow of surface water, frost and freezing conditions. They should also be protected from drying out in hot dry weather.

Groundwater monitoring indicates a shallow groundwater table. Alternative methods of groundwater control may be required as fast groundwater ingress is anticipated, which could result in softening of the ground and unstable excavations.

London Clay Formation is an over consolidated clay, which can swell and soften in contact with water. Therefore, care will be required to ensure that foundation excavations are kept as free of water as practicable. Foundation concrete should be poured as soon as practicable after excavation.

Subject to detailed geotechnical design, the permissible bearing pressures for foundations detailed in this report take into consideration the risk of shear failure of the ground (ultimate limit state). However, they do not assess acceptable limits of settlement (serviceability limit state). Serviceability limit state assessment will need to be undertaken as part of the separate geotechnical design.



6.5 Ground floor slabs

Subject to geotechnical design and on the basis that excavation and replacement of the softer soils will be undertaken and all structural fill will be placed strictly in accordance with an appropriate Earthworks Specification, then ground bearing floor slabs may be adopted.

The floor slab should be designed by a structural engineer and a limit state assessment undertaken as part of the geotechnical design.

Prior to the placement of the founding materials and the construction of the ground bearing floor slab, the sub-formation and formation will need to be inspected and checked by a competent person to ensure the ground conditions at time of construction are consistent with the Specification and the design parameters derived from this ground investigation. Testing should be undertaken in accordance with The Concrete Society Technical Report 34 (The Concrete Society 2013) and DMRB IAN 73/06. It is recommended that the verification of the sub-formation and formation include, as a minimum, the measurement of modulus of sub-grade reaction (k) determined by static plate load testing.

6.6 Roads and pavements

Based on the test results and subject to in situ testing during construction, it is considered likely an equilibrium CBR of 3% will be achievable over the majority of the site.

Proof rolling of the formation level will be required and any loose or soft spots should be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration; all slopes should be trimmed to falls to shed rain water and the surface sealed to limit infiltration.

Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable specification to ensure the ground conditions are as expected. All testing should be carried out in accordance with DMRB IAN 73/06 to confirm that the ground conditions at time of construction are consistent with the previous design parameters.

Where the CBR is found to be less than 2.5%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5. In summary, consideration may be given to the following potential remedial techniques:

- excavation and re-engineering or replacement of weaker soils;
- the inclusion of geosynthetic reinforcement within the unbound layers of the capping and sub-grade;
- where cohesive soils are present and they are deemed suitable for treatment with hydraulic binders, to employ modification and/or stabilisation techniques on the formation.

6.7 Drainage

Indicative infiltration rates for the ground investigation are presented in Appendix D and are summarised in Table 5-4.

Soakaways are considered unsuitable for the site based on the low infiltration rates obtained from testing. However, the infiltration rates recorded may assist with attenuation as part of a Sustainable Urban Drainage System (SUDS).



6.8 Buried concrete

Based on guidelines provided in BRE Special Digest 1 (BRE 2005) and the information presented in Section 5.5.9 (Table 5-13):

1. The shallow soils of the Head can be classified as Design Sulfate Class DS-1 and ACEC Class AC-1.
2. The shallow soils of the Bognor Sand Formation can be classified as Design Sulfate DS-4 and ACEC Class AC-4.
3. The deeper soils of the London Clay Formation can be classified as Design Sulfate Class DS-4 and ACEC Class AC-4 for strip / trench fill / pad foundations.

This equates to a Design Chemical Class of:

1. DC-1 for the Head;
2. DC-4 for the shallow Bognor Sand;
3. DC-4 for the deeper soils (clays of the London Clay Formation).



7 Geo-environmental assessment

7.1 Updated conceptual site model

7.1.1 Updated ground model

The initial conceptual site model developed from the desk study and field reconnaissance survey (Section 2) has been updated using the findings of the ground investigation and is presented in (Section 5). This CSM is the basis for the geo-environmental assessment presented in this section.

7.1.2 Updated exposure model

Following the ground investigation, the plausible contaminant sources, receptors and pathways identified in the preliminary geo-environmental exposure model (Section 3.4) have been updated or confirmed as follows.

7.1.2.1 Sources

The following off-site source of contamination has been removed from the exposure model:

- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6). This is due to the distance to the site and no evidence of contamination encountered in relation with petroleum hydrocarbon spillages during the ground investigation.

7.1.2.2 Receptors

No potential receptors have been removed from, or added to, the exposure model.

7.1.2.3 Pathways

The following pathway has been removed from the exposure model:

1. VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).
2. Using the updated ground model and updated exposure model, generic risk assessment is undertaken as presented below.

7.2 Risk assessment approach

Generic risk assessments have been undertaken in accordance with the principles of LCRM (Environment Agency, 2021) using the CSM that has been updated following the ground investigation.

Firstly, the risks associated with the identified potential contaminant linkages have been estimated using standardised methods (typically involving comparison of site data with published 'screening values'). Secondly, where screening values are exceeded, the result has been evaluated in an authoritative review of the findings with other pertinent information to determine whether or not the exceedance is or is not acceptable in the site-specific circumstances.

The data sets used in the assessment comprise the analytical results obtained by Hydrock as listed in Section 4.



In cases where potentially unacceptable risks are indicated and/or the land is potentially unsuitable for its intended use, actions such as more advanced stages of risk assessment (Tier 3, detailed quantitative risk assessment (DQRA)) or remediation are proposed in Section 7.10.

7.3 Human health risk assessment

This is a Tier 2 assessment using soil screening values applicable to commercial / industrial CLEA land use scenario.

The soil screening values used are generic assessment criteria (GAC). It should be noted that Category 4 Screening Levels (C4SL) for lead have been used as there is no recognised GAC for lead and the use of the term 'GAC' in this report includes the C4SL for lead.

Statistical testing is used where data sets are suitable. The critical issue is sample numbers. For data sets with low sample numbers and/or where sampling is targeted at specific areas, individual sample test results are compared directly with the screening values. Larger and non-targeted data sets are subject to statistical testing.

The phrase 'further assessment required' is used to denote soil concentrations that are equal to, or exceed, a GAC. This does not necessarily mean that the soil is 'contaminated' or not otherwise suitable for use. The assessment and any mitigation required are to ensure the site does not pose an 'unacceptable risk'.

The results of the assessment are presented in Appendix F.

7.3.1 Averaging areas

The 'averaging area' used in this report is based on the conceptual site model and the proposed development, and is taken to be the entire area of the site, with the data separated into Made Ground, and natural soils for each of the Plots.

7.3.2 Risk estimation (without statistical testing)

7.3.2.1 Hydrock default list of determinands

Based on individual test results that exceed the GAC, the chemicals of potential concern (CoPC) which require further assessment are summarised in Table 7-1.

Table 7-1: CoPC in soils which require further assessment (human health)

CoPC	GAC (mg/kg)	GAC Source	No. samples	Min. (mg/kg)	Max. (mg/kg)	No. samples >GAC
Made Ground = No Exceedances						
Natural soils = No Exceedances						

The individual analytical results have been compared with the relevant GAC in the summary table in Appendix F. From this, there no exceedances on any of the chemicals of potential concern. Therefore, the risk for human health in regards chemicals of potential concern is considered very low.

7.3.2.2 Asbestos

There was not visual evidence of Asbestos Containing Materials (ACM) in any of the exploratory hole locations during site works. In addition, laboratory test results indicate no asbestos fibres were detected



in any of the samples tested. Therefore, the risk for human health in regards asbestos is considered very low.

7.3.2.3 Petroleum hydrocarbons (PHC)

There was not visual or olfactory evidence of petroleum hydrocarbons in any of the exploratory hole locations during site works. In addition, laboratory test results indicate no exceedances on petroleum hydrocarbons were detected when compared to the corresponding GAC in any of the samples tested. Therefore, the risk for human health in regards petroleum hydrocarbons is considered very low.

7.3.3 Risk evaluation

The screening exercise has not identified any chemicals, asbestos, or petroleum hydrocarbons at concentrations above the GAC. Therefore, no further assessment is required.

7.4 Phytotoxicity risk assessment

7.4.1 Risk estimation

Priority phytotoxic chemical concentrations have been screened against published values to determine the likely risk to plant growth and the findings presented in Appendix F. As with human health, statistical testing is used where data sets are suitable, otherwise individual sample test results are compared directly with the screening values.

Based on test results that exceed the GAC, the chemicals of potential concern which require further assessment are summarised in Table 7-2.

Table 7-2: Chemicals of potential concern for which further assessment is required (risk to plants)

CoPC	GAC (mg/kg)	Basis for GAC	No. samples	Min. (mg/kg)	Max. (mg/kg)	No. samples >GAC
Plot 600						
Made Ground = No exceedances						
Natural soils = No exceedances						

7.4.2 Risk evaluation

No exceedances were reported on samples from Plot 600.

7.5 Pollution of controlled waters risk assessment

7.5.1 Risk estimation

The risks to groundwater and surface water from contaminants on site have been assessed in accordance with the Environment Agency (2006) Remedial Targets Methodology (RTM).

Site contaminant loadings are compared with relevant screening values (Water Quality Targets), which are linked to the Conceptual Site Model.

Acceptable WQT are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)).



The choice of WQT is presented in Table 7-3 below, with the justification for the WQT selected explained in the following text:

1. Head Deposits is classed as Secondary Undifferentiated Aquifer. Bognor Sand Member is a secondary Aquifer A and may provide base flow to the Hermitage Stream located at the southwest and to the (unnamed) surface water feature located at the east boundary of the site.
2. There is a low risk of surface water runoff or contaminants leached from the Made Ground entering the secondary Aquifer A of the Bognor Sand Member.
3. Although there are no groundwater abstractions within 2km of the site, and the nearest surface water abstraction located at 1.5km of the site corresponds to spray irrigation, a conservative scenario is used to compare water samples with Drinking Water Standards.

Table 7-3: Summary of water quality risk assessment protocol

Hydrock scenario	Water body receptors	Secondary receptors	Example contaminant linkages	RTM level and data used	Water quality targets
D	Groundwater. Surface water.	Human health (abstraction) Aquatic ecosystem.	Contaminants from site leach or seep into a groundwater body that feeds inland surface water by base flow. The surface water may be used for human consumption and is an aquatic ecosystem.	RTM Level 2 - Groundwater. Direct comparison of surface water samples	DWS EQS (inland)

Notes:

- Some EQS are water hardness dependent. This is measured either in the receiving surface water or in groundwater (if it is part of the pathway), or is estimated from national maps.
- Inland waters EQS applicable to freshwater, 'other' waters EQS applicable to coastal or transitional waters.
- This table and the results of the assessment are considered as a first screening for potential risks of pollution of Controlled Waters. More specific requirements may be stipulated by the relevant Agency.

The results of the screening assessment are summarised in Table 7-4.

There are no WQT for petroleum hydrocarbon fractions in water. However, because of the sensitivity of the water environment to petroleum hydrocarbons, an initial screening exercise is also included in Table 7-4 irrespective of the assessment scenario(s) stated in Table 7-3.

In some instances, the reporting limit (or detection limit) quoted by the laboratory may be greater than the WQT that it is being assessed against. As the current exercise is an initial screening assessment, further assessment of these elements has not been undertaken.



Table 7-4: Chemicals of potential concern for which further assessment is required (controlled waters)

CoPC	WQT (µg/l)	Basis for WQT	No. samples	No. samples above LoD	Min. (µg/l)	Max. (µg/l)	No. samples exceeding WQT and above LoD
Cobalt	3	EQS	4	4	0.3	3.8	1
Chromium IV*	3.4	EQS	4	4	<5		0
Copper+	1	EQS	4	4	0.8	4.8	2
Manganese+	50 123	DWS EQS	4	4	40	310	3 3
Nickel+	4	EQS	4	4	1	6.1	1
Benzo(a)pyrene*	0.0001 7	EQS	4	0	<0.01		0
Fluoranthene*	0.0063	EQS	4	0	<0.01		0

Note: the maximum recorded value is compared with the water quality target.

† The EQS for these substances represents a bioavailable concentration, which will be a proportion of the actual dissolved concentrations in water. No site-specific bioavailability testing was undertaken at the site and therefore the EQS bioavailable represents a conservative screening approach.

* Laboratory detection limit exceeds EQS. Contaminants with concentrations recorded below the laboratory detection limit, where the limit exceeds the EQS (such as chromium VI, chromium III, benzo(a)pyrene and fluoranthene) are not considered a significant risk.

7.5.2 Risk evaluation

In regards to groundwater, it is considered that:

- The inland waters EQS for copper, manganese, nickel, and zinc are exceeded across the entire site.
- EQS concentration for chromium VI, benzo(a)pyrene and fluoranthene are below the laboratory detection limit, and as such, further assessments of these substances have not been undertaken.
- Cadmium concentrations were detected above the EQS at Plots 100 and 700 (0.16 and 0.17 µg/l when compared to a EQS of 0.08 µg/l).
- Cobalt concentrations were detected above the EQS across all the Plots, with values between 3.5 and 10 µg/l (when compared to a EQS of 3 µg/l).
- A single exceedance on Chromium III was detected at Plot 700 (9.7 µg/l when compared to a EQS of 4.7 µg/l).
- Concentrations of iron, selenium and nitrite were detected above the DWS at Plot 700.
- Groundwater samples collected from Plot 600, located down gradient to Plot 700, have shown no exceedances in Chromium III, iron, selenium or nitrite, indicating these substances are not migrating through the ground and as such are thought unlikely to pose a risk to the groundwater body.
- There are no registered groundwater abstraction for drinking water purposes within 2km of the site, and the nearest registered surface water abstraction (spray irrigation) is located upstream at 1.5km north of the site.
- An additional controlled water risk assessment was carried out as part of recommendations for Plot 500 (Hydrock report reference 19453-HYD-XX-XX-RP-GE-1006), involving the collection of surface water samples from Hermitage Stream, located to the southwest of the site. This assessment indicated that no concentrations in exceedance of the WQT were detected in the surface water samples collected from the Hermitage Stream.

Reported groundwater concentrations above the WTQ are all less than an order of magnitude greater than the WTQ. In the context of the site setting and the absence of an obvious source for the elevated concentrations other than naturally occurring soils (and re-worked natural soils making up the Made



Ground) Hydrock believes that the theoretical risks to Controlled Waters do not need further consideration.

7.6 Ground gases risk assessment

7.6.1 Data

Nine rounds of monitoring were undertaken across the entire site (Plots 100-700), six during August-September 2021 and an additional three monitoring visits during January-February 2022.

7.6.2 Assessment

The risks associated with the ground gases methane (CH₄) and carbon dioxide (CO₂) have been assessed using BS 8485:2015 +A1:2019

The maximum gas concentrations and gas screening values (GSV³) in Appendix D have initially been compared with the published thresholds in Table 2 of BS8454 and the assessment is summarised in Table 7-5. The full assessment is presented in Appendix E.

Table 7-5: Ground gas risk assessment

	Min	Max	Typical (i)	Comment
Steady Flow Rate (l/hr)	-4.4	5.3	<0.1	Maximum flow recorded in WS6.01 on 22/1/22 during high groundwater levels that were just below the top of the slotted section of the monitoring well. Methane <LOD and carbon dioxide at 5.2%. WS6.01 installed in London Clay.
Methane (%)	0.0	0.1	<1	Methane concentrations were below 1%
Carbon Dioxide (%)	0.1	10.4	<5	WS6.03 presents recurrent CO ₂ readings between 5.4% and 10.4%. WS6.01 presents CO ₂ readings between 5.2% and 6.5% in two out of eight occasions. WS6.04 and WS6.06 presents CO ₂ readings of 5.5% and 5.1% in one occasion.
Carbon Monoxide (ppm)	1.0	3.0	1.0	-
Hydrogen Sulphide (ppm)	ND	1.0	ND	-
Oxygen (%)	6.8	20.9		-
Carbon Dioxide GSV (l/hr)	-0.2508	0.2756 0.5512*	<0.7	CS2
Methane GSV (l/hr)	0.0000	0.0000 0.0053*	<0.07	CS1

(i) Hydrock assumes that values are considered to be atypical if 95% or more of the remaining data are less than the value under consideration. For the purposes of the calculation, where the recorded gas flow rate is below the manufacturer's limit of detection for the instrument used, the detection limit has been adopted for the gas flow rate.

*Represents worst case GSV value (using max CH₄/ CO₂ values and worst-case flow from any well during any visit)

³ Note: GSV is synonymous with 'site characteristic hazardous gas flow rate' (Q_{hgs}) of BS 8485:2015 +A1:2019 Table.



As indicated in Table 7-5, Plot 600 presents methane readings below 1% but several carbon dioxide readings above 5% and up to 10.4% at locations WS6.01, WS6.03 and WS6.04. This area is recorded as landfill (classed as inert waste, and presumed to be from construction activities of the A3 (M)). The calculated GSV for methane indicates CS1 conditions; however, the GSV for carbon dioxide (including the worst-case check) indicates CS2 conditions.

There are only 2 occasions when the Qhg for an individual well exceeds the CS1 threshold (WS6.01 and WS6.03 – both on 22/1/22), and therefore whilst Plot 600 area could be classified on a precautionary basis as Characteristic Situation 2, the lack of evidence of a gas source, the high groundwater levels that will likely have artificially affected the higher flow readings from the two wells, and the presence of only naturally occurring strata suggests that the risk level could be reduced to CS1 on the basis of more detailed gas risk assessment.

In conclusion, Plot 600 is provisionally classed as CS2 and mitigation measures may be required. However, no gas source has been identified other than naturally occurring strata, elevated flow readings are affected by high groundwater levels, and the elevated carbon dioxide concentrations detected are reasonably consistent with natural levels for such strata; therefore, the risk level could be reduced to CS1 on the basis of more detailed gas risk assessment, including an additional round of ground gas monitoring.

7.7 Construction materials risk assessment

7.7.1 Water pipelines

A formal water pipe investigation and risk assessment is beyond the scope of this report. However, the findings of this investigation have been compared to the threshold values in Water UK HBF (2014), Table 1 as far as is practicable, to give an indication of the possible restrictions to the use of plastic pipes for water supply to the site.

The majority of the site is previously undeveloped, with a former landfill area covering a large proportion of the east and northern area of the site (between Plots 600 and 700). However, the preliminary risk assessment and ground investigation has not detected organic contamination in exceedance of the threshold values. Therefore, Hydrock believes standard pipework should be suitable for the site. However, confirmation should be sought from the water supply company at the earliest opportunity.

7.7.2 Other construction materials

Plastic pipes for drains and sewers are manufactured from unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) or polyethylene (PE). These materials may be affected by the presence of organic compounds in the soil.

In accordance with the British Plastics Federation Guidance (August, 2018), as the concentrations of PAH, and BTEX are below 100mg/kg and the concentrations of petroleum hydrocarbons (TPH) are below 200 mg/kg, PVC-U, PP or PE pipework is considered suitable.

The implications for buried concrete are discussed in Section 6.8.

7.8 Contamination risk to groundworkers

7.8.1 Introduction

Whilst risks to construction workers are not discussed in detail, the following section discusses potential risks that should be considered.



Information presented in this document is provided to assist in managing the risk associated with contamination in soil and groundwater at the site but is not definitive. The Contractors are responsible for undertaking their own assessments and assessing what risks are present and what control measures are required.

Task specific risk assessments and method statements should be in place, and risks and required mitigation measures communicated to all relevant personnel prior to the works commencing. Appropriate PPE and, if required, RPE should be provided and utilised.

7.8.2 Metals, metalloids, PAH and petroleum hydrocarbons

The soils do not contain significantly elevated concentrations of metals, metalloids, PAH or petroleum hydrocarbons and standard PPE is considered suitable for the handling of soils.

7.8.3 Ground Gas

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure and / or 0.5% for long term exposure. Furthermore, soil concentrations of oxygen are below the HSE recommendations of 18%.

Soil gas concentrations are not necessarily reflective of those in the breathing zone, as such, all Contractors and maintenance workers should be made aware of the possible presence of carbon dioxide and should take all necessary health and safety precautions when working in trenches or confined spaces.

7.8.4 Asbestos

As no clearly identifiable ACM has been seen during the site walkover or during the ground investigation and no fibres have been detected in soil samples analysed by laboratory testing, CAR2012 does not apply. However, there is always the possibility of unexpected contamination, and the Contractors should undertake a watching brief during the works. If any suspect material is encountered, works in that area of the site should stop, the area fenced off and Hydrock should be notified.

7.9 Findings of the generic contamination risk assessments

The potential sources, pathways and receptors identified in the desk study (Section 2) have been investigated (Sections 4 and 5) and assessed (Sections 7.2 to 7.7). A Source-Pathway-Receptor linkage assessment has been undertaken and is presented in Appendix I (Table I.2).

The final Conceptual Site Model is illustrated on Hydrock Drawings 19453-HYD-XX-XX-DR-GE-1013A to 1013D in Appendix A.

A summary of the Source-Pathway-Receptor (SPR) contaminant linkages for which the risks may be unacceptable and require mitigation (those that are moderate or higher) are discussed in Table 7-6.

Table 7-6 assumes the following SPR linkages which have been discounted (subject to agreement) at the risk evaluation stage are confirmed by the regulators and the warranty provider as not requiring further consideration (mitigation). If these assumptions are not agreed during regulatory discussions, the conclusions as noted in Table 7-6 will need to be updated:

- Concentrations of carbon dioxide above 5% within Plots 600 and 700.



Table 7-6: Residual risks following risk evaluation

Contaminant Linkage				Comments		
Pollutant Linkage		Sources	Pathways	Receptors	General	Mitigation
PL	1	Carbon dioxide in ground in Plots 600 and 700.	Migration through soils or groundwater to indoor air.	End users of new buildings. Users of off-site properties.	Monitoring records indicate elevated GSVs and occasional readings of CO2 above 5% and up to 10.4% at WS6.03, WS6.01, WS6.04, WS6.06 in Plot 600 and up to 8.7% at BH7.03 and WS7.04 in Plot 700. Former landfilled material area in unit 600 and 700.	Gas protection measures to CS2 potentially required and designed in accordance with BS8485. To be installed by specialist installer. To be validated and verified. Subject to additional ground gas risk assessment, including an additional round of ground gas monitoring to support.

7.10 Mitigation measures

The outline remediation strategy presented below is provided for guidance only, and does not represent a 'Remediation Options Appraisal', or a 'Remediation Strategy', prepared in accordance with LCRM (2021).

As shown in Table 7-6 (and subject to regulatory agreement), Hydrock consider the following mitigation is required to ensure the site is suitable for use for the proposed end use. The mitigation measures include:

Potential installation of ground gas mitigation measures to comply with CS2 conditions (as described in Section 7.10.1) (PL1)) within Plots 600 and 700, subject to additional ground gas risk assessment outcome.

The methodology for the remediation should be set out in a Remediation Strategy (which will include the 'Implementation Plan', the 'Verification Plan' and the 'Long Term Monitoring and Maintenance Plan'), which will need to be submitted to the warranty provider and the regulatory authorities for approval.

In addition, the production of a Materials Management Plan and its approval by a Qualified Person will be required to allow reuse of suitable material at the site in accordance with waste regulations.

Verification reports by a competent independent geo-environmental specialist will be required following completion of any remedial works (including ground gas membrane installation).



7.10.1 Gas protection measures

Mitigation of the risk from ground gases needs to be undertaken in accordance with BRE 414, CIRIA 665, BS 8485:2015 +A1:2019, and CIRIA C735. In accordance with BS 8485:2015 +A1:2019, the design of gas protection measures needs to be undertaken in accordance with the Characteristic Situation and the building type.

Plots 600 and 700 are provisionally classified as Characteristic Situation 2, subject to further risk assessment outcome.

The offices are classified as Type C buildings / the warehouse parts of the buildings are classified as Type D buildings.

As such, the offices would potentially require 2.5 points of protection, and the warehouses would potentially require 1.5 points of protection. This is illustrated in Table 7-7.

Table 7-7: Gas protection score by CS and type of building (after BS 8485:2015 +A1:2019)

Characteristic Situation	Minimum gas protection score (points)			
	High risk		Medium risk	Low risk
	Type A building	Type B building	Type C building	Type D building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5 ^(A)	5.5 ^(A)	4.5	3.5
5	— ^(B)	6.0 ^(A)	5.5	4.5
6	— ^(B)	— ^(B)	— ^(B)	6.0

A) Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.

B) The gas hazard is too high for this empirical method to be used to define the gas protection measures.

The final design of any ground gas protection measures that are required is to be specified by the designer (in accordance with CIRIA 665 and BS 8485:2015 +A1:2019) and the protection will need to be achieved by a combination of two or more of the following three types of protection measures:

- the structural barrier of the floor slab;
- ventilation measures; and
- gas resistant membrane.

Where design elements are required to meet certain standards to qualify for the protection points (e.g. cast in situ monolithic reinforced floor slab), it is up to the designer to ensure the minimum requirements of the standards are met.

Where used, gas resistant membranes should be sufficiently impervious to methane and carbon dioxide;

- capable, after installation, of providing a complete barrier to the entry of the relevant gas;
- sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;



- sufficiently strong to withstand in service stresses (e.g. due to ground settlement if placed below a floor slab);
- sufficiently strong to withstand the installation process and following construction activities until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, and dropping tools); and chemically resistant to degradation by other contaminants that might be present.

As preliminary guidance, Hydrock would suggest the following:

For CS2 - Type C - 2.5 points

Either:

- Beam and block or pre-cast concrete floor slab (0 points);
- passive sub floor ventilation e.g. void (good performance 1.5 points); and
- 2000g gas resistant membrane (2.0 points).

Or:

- Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement) (0.5 points);
- 2000g gas resistant membrane (2.0 points).

For CS2 - Type D – 1.5 points

Either:

- Pressure relief pathway (layer of low fines gravel or a geocomposite blanket or strips terminating in a gravel trench external to the building) (0.5 points);
- Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations (1 point); and
- 2000g DPM (0 points).

Or:

- Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement) (0.5 points);
- 2000g gas resistant membrane (2.0 points).

Other variations are possible. It is up to the designer to design and specify ground gas protection measures.

Where a gas resistant membrane is required as part of the design, all joints and penetrations are to be sealed and the installation is to be verified in accordance with CIRIA C735 (Mallet et al 2014) or it will score zero points and will not be deemed to afford any protection. This verification will involve verification by the Contractor and independent verification on a selected number of Plots by Hydrock or alternative qualified independent third-party.

Whilst tape can be utilised to seal the seams Hydrock would recommend the membranes are sealed using welded seams and the use of specialist seals around penetrations (top hats etc.). The installer is to present an installation methodology and a QA/QC plan for installation to Hydrock for comment, with particular attention given to sealing the membrane.

In order to achieve the points specified for ventilation, the architect is to design passive ventilation to meet at least 'good performance', as described in Annex B of BS 8485:2015 +A1:2019.



8 Waste and materials management

8.1 Introduction

- The Waste Framework Directive (WFD) (2009/98/EC) defines waste as ‘any substance which the holder discards or intends to discard.’ In a geo-environmental context, the waste is most often ‘soil’ and the two main scenarios are offsite disposal of the material as a waste and/or reuse of the material on site. For cost and sustainability reasons, reuse is preferred to off-site disposal.
- Section 8.2 below describes the key issues relating to off-site disposal to landfill and Section 8.3 considers requirements relating to reuse of soils and materials management.

8.2 Waste disposal

8.2.1 Principles

Based on the WFD, any material excavated on site may be classified as waste and it is the responsibility of the producer of a material to determine whether or not it is waste. Where off-site disposal is undertaken, the following guidance applies.

Classification is a staged process:

1. A hazardous waste is defined under the WFD as one which possesses one or more of fifteen defined hazardous properties. If a waste is not defined as hazardous, then it is non-hazardous.
2. Where the materials are soil, it is then be assigned using the ‘List of Waste Codes’, which classifies the material as either:
3. hazardous (17-05-03), which is defined as “soil and stones containing hazardous substances”; or
4. non-hazardous (17-05-04), which is defined as “soil and stones other than those mentioned in 17-05-03”.
5. Hydrock utilise the proprietary assessment tool, HazWasteOnline™ to undertake this assessment.
6. Waste Acceptance Criteria (WAC) testing is then undertaken if required, and are only applicable following classification of the waste, and only where the waste is destined for disposal to landfill. The WAC are both qualitative and quantitative. The WAC and the associated laboratory analyses (leaching tests) are not suitable for use in the determination of whether a waste is hazardous or non-hazardous.

It should be noted that some non-hazardous wastes may be suitable for disposal at an inert landfill as non-hazardous waste, subject to meeting the appropriate waste acceptance criteria.

It should be noted that classification must be undertaken on the waste produced, by the waste producer. Necessary sampling frequency to adequately characterise a soil population is defined within WM3.

Further discussion with regards to the characterisation process for different scenarios and waste types is provided below.

Topsoil and Peat



Topsoil and peat are biodegradable, therefore if they are surplus to requirements and cannot be re-used in accordance with a Materials Management Plan, they cannot be classified as inert. As such, topsoil and peat need to be classified by a staged assessment and sampling process and would either be classified as hazardous or non-hazardous, depending upon the results of the assessment.

Greenfield Sites

Waste from completely greenfield sites may be accepted at a landfill as inert waste if it meets the requirements of paragraph 10 (wastes acceptable without testing at landfills for inert waste) of the Landfill (England and Wales) (Amendment) Regulations (2005) ('the Regulations') can be met. Paragraph 10 of the Regulations states, "soils may be able to be classified as inert waste without testing, if:

1. they are single stream waste of a single waste type;
2. there is no suspicion of contamination and they do not contain other material or substances such as metals, asbestos, plastics, chemicals, etc....."

As such, where the site is greenfield and the waste producer is confident about the quality of a soil (i.e. naturally occurring and uncontaminated), further sampling and laboratory testing is not necessary for the Basic Characterisation and this can be undertaken on qualitative Waste Acceptance Criteria testing.

In this instance the waste producer can characterise the waste based on visual assessment and written description of the waste in addition to supporting evidence such as a desk study assessment of the greenfield status. However, it should be noted this characterisation is subject to agreement by the landfill operator who may require testing to be undertaken to confirm classification.

Contaminated or potentially contaminated sites

If the site is brownfield, contaminated or potentially contaminated, the waste must undergo an initial waste classification exercise using background information on the source and origin of the waste and assessment of chemical test data in accordance with Environment Agency Technical Guidance WM3.

If following the initial waste classification exercise, the soils are acceptable for disposal to a non-hazardous landfill, further qualitative Waste Acceptance Criteria (WAC) testing is not required.

However, if soils are potentially able to be disposed to an inert landfill as non-hazardous waste, or require testing to determine if they can be disposed of to a stable non-reactive hazardous or hazardous class of landfill, the next stage of assessment is to undertake qualitative WAC testing. This will determine the Basic Characterisation and the landfill category at which the soils can be accepted.

Hazardous material must be subjected to WAC testing to determine whether it requires treatment before it can be accepted at the hazardous landfill, while non-hazardous material can be tested to determine whether it may be suitable for placement in an inert landfill.

8.2.2 HazWasteOnline™ assessment

As the site is greenfield, HazWasteOnline™ assessment is not technically required. However, it has been undertaken for completeness during the site investigation. The output of the HazWasteOnline™ assessment is provided in Appendix G and a summary of the preliminary waste classification is provided below in Section 8.2.4.

Across the entire site (Plots 100 – 700), a total of 32 samples were assessed using the HazWasteOnline™ assessment tool. The assessment indicates the majority of the samples are classified as non-hazardous, except for two samples obtained within the Made Ground (WS1.02 at 1.5m bgl and WS4.06 at 0.5m bgl) classified as potentially hazardous on account of the designation 'HP8' (with regards to high pH - corrosive).



8.2.3 WAC Testing

The qualitative WAC tests are provided in Appendix G and a summary of the preliminary disposal options are provided below in Section 8.2.4.

A total of 2 soil samples between 0.40m bgl to 1.00m bgl were analysed for Plot 600 (BH6.01 at 0.40m bgl and WS6.06 at 0.50m bgl) and were classed as suitable for disposal as 'Inert Landfill Waste'.

8.2.4 Preliminary waste disposal options

The site is generally greenfield. WAC testing and the HazWasteOnline™ assessment have been undertaken. As long as no unexpected contamination is encountered and if suitable segregation of different types of natural waste streams is put in place, for soils to be disposed of, it is considered that:

- The topsoil generally has a low organic content (as proven by the Loss on Ignition and Total Organic Carbon tests) and is likely to be classified as non-hazardous waste for disposal at a non-hazardous landfill.
- The Made Ground is likely to be classified as non-hazardous waste (with exception of the two samples classified as potentially hazardous and stable non-reactive hazardous waste in non-hazardous landfill).
- The natural uncontaminated subsoils are likely to be classified as 'inert' waste and based on the WAC testing should be able to be disposed of at an 'inert' landfill.

8.2.5 General waste comments

It should be noted that:

- It is the waste producer's responsibility to segregate the waste at source and waste producers must not mix waste materials/streams or dilute hazardous components, for example by mixing with less or non-hazardous waste on site to meet WAC limit values.
- The above preliminary assessment has been made on the basis of the soils tested as part of the ground investigation, using WAC testing and the HazWasteOnline™ assessment. However, the formal classification of waste can only be undertaken on the material to be disposed of, and by the waste producer and the receiving landfill as license conditions vary from landfill to landfill.
- Basic Characterisation should be undertaken in accordance with Environment Agency guidance by the waste producer. Hydrock can assist if required and this report will assist the characterisation. However, Basic Characterisation does not form part of the current commission and would require further assessment and testing on the wastes actually to be disposed.
- Once the waste producer has undertaken an initial Basic Characterisation on each waste stream, they can manage the soils as part of the on-site processing programme (for example, stockpiling, treatment, screening and separation). The waste producer and landfill operator will then need to agree the suite of compliance testing for regularly generated waste to demonstrate compliance with the initial Basic Characterisation prior to disposal.
- At the time of disposal, additional testing on the excavated soils to be disposed of, will likely be necessary.
- Non-hazardous and hazardous soils require pre-treatment (separation, sorting and screening) prior to disposal.



- The costs for disposal of non-hazardous and hazardous soils are significant compared to disposal of inert material.
- In addition to disposal costs, landfill tax will be applicable. Non-hazardous and hazardous waste will generally be subject to the Standard Rate Landfill Tax. Inert or inactive waste will generally be subject to the Lower Rate Landfill Tax. The landfill tax value changes each April and can be found at <https://www.gov.uk/government/publications/rates-and-allowances-landfill-tax/landfill-tax-rates-from-1-april-2013>.
- Before a waste producer can move waste to a landfill site for disposal, they need to check the landfill site has the appropriate permit and must have completed the following⁴:
 - Duty of care transfer note / Hazardous Waste consignment note, including comment as to if pre-treatment has been undertaken; and
 - Basic Characterisation of the waste, to include: description of the waste; waste code (using list of wastes); composition of the waste (by testing, if necessary) and; WAC testing (if required).

8.3 Materials management

8.3.1 Introduction

Soils that are to remain on site, should be managed and reused in accordance with a Materials Management Plan (MMP), prepared in accordance with 'The Definition of Waste: Development Industry Code of Practice', Version 2 (CL:AIRE), known as the DoWCoP. Where all aspects of the DoWCoP are followed the soils are considered not to be waste, because they were never discarded in the first place.

Version 2 of the DoWCoP clearly sets out the principles and an outline of the requirements of a MMP. The following compliance criteria must be seen to apply to the MMP for the site:

- Factor 1: Protection of human health and protection of the environment.
- Factor 2: Suitability for use, without further treatment.
- Factor 3: Certainty of Use.
- Factor 4: Fixed Quantity of Material.

The reuse of soils at sites should be considered during the planning and development design process so that compliance with issues such as fixed quantity and certainty of use clearly relate to agreed site levels. Suitability of Use is normally evident from the remediation strategy or the design statement, which form an integral part of a MMP. However, some soils may need to be tested post-excavation to prove they are suitable for use.

Once the MMP is finalised, it must be declared by a Qualified Person (QP). The Declaration is an on-line submission as part of which the QP is required to confirm that the declaration is being made before the relevant works have commenced (i.e. it is not a retrospective application).

⁴ ENVIRONMENT AGENCY. November 2010. Guidance on waste acceptance procedures and criteria. Waste acceptance at landfills. The Environment Agency.



Once all material movements have been completed in accordance with the MMP a verification report must be produced, kept for 2 years and provided to the EA on request.

It should be noted that failure to comply with the requirements of the DoWCoP when re-using materials has potentially significant consequences for the waste holder. The risk is that the reused materials are still regarded as a waste that has been illegally deposited. From 1 April 2018, the scope of Landfill Tax has been extended to sites operating without the appropriate environmental disposal permit, and operators of illegal waste sites will now be liable for Landfill Tax. Further information is available at: <https://www.gov.uk/government/publications/landfill-tax-disposals-not-made-at-landfill-sites/landfill-tax-disposals-not-made-at-landfill-sites>.

If soils are excavated and reused on sites (or moved to another site) without a MMP, exemption, or appropriate Permit in place, anyone who knowingly facilitates the disposal may be 'jointly and severally liable' to any assessment of tax, fines or prosecution.

8.3.2 Materials management scenarios

The materials management scenarios present on site are discussed below. It should be noted that more than one scenario may apply, dependent upon where the soils are proposed for reuse.

8.3.2.1 Clean, naturally occurring materials – reused on the site of origin

Where soils are naturally occurring, uncontaminated and are reused on the site they are excavated (i.e. greenfield site with documented site history, with no Made Ground), they will fall outside the Waste Framework Directive (WFD) (i.e. they will not be a waste when reused on the site of origin).

However, there needs to be certainty of that reuse, and evidence is necessary to support this strategy, for example through information provided during the planning process. The onus is on the developer to demonstrate that the materials are not a waste and will never become a waste. As such, a Materials Re-use Strategy is recommended to show certainty. Alternatively, if the volume of material is under 1,000 tonnes, then a U1 waste exemption may be applied for from the Environment Agency.

It may be noted that some 'clean naturally occurring materials' may still fail the 'suitable for use' test, for example, soils with a naturally high organic content may not be suitable for use because of their propensity to produce ground gases such as methane. Rules regarding other more unusual circumstances such as where natural soils contain an unacceptably high mineral content are described in the DoWCoP.

8.3.2.2 Clean, naturally occurring materials – transferred to other sites

Where soils are naturally occurring, uncontaminated and are transferred to other sites (i.e. direct transfer), they will not become waste as long as the transfer is undertaken in accordance with the DoWCoP. A MMP must be prepared for the receiving site and the materials movement must be noted in the MMP of the Donor site. This movement must have been declared to CL:AIRE prior to the works commencing.

8.3.2.3 Made Ground and other contaminated soils

On sites where Made Ground or contaminated soils are present, any soils excavated will be a waste as soon as they are excavated (even if they are clean, naturally occurring materials), unless they are subject to reuse in accordance with the DoWCoP. As such, for any brownfield site or a site where Made Ground is present and soils are being moved and reused, the materials could be deemed a waste, subject to either:



1. a Materials Management Plan (MMP), to prevent the material being classified as a waste following reuse; or
2. an exemption (for limited volumes); or
3. an environmental permit, dependant on its status.

Other commonly occurring circumstances are:

If Made Ground is being moved between sites, it must be ensured that appropriate permits are in place to ensure the soils are not classified as a waste. Made Ground cannot be moved between sites under DoWCoP alone and would require relevant permits as part of the MMP documentation for the Hub site the material is being treated at.

8.3.2.4 Geotechnical improvement requirements

Construction activities carried out on uncontaminated soils solely for the purpose of improving geotechnical properties e.g. lime / cement modification, are not generally regarded as waste treatment operations and do not require a permit.

However, should processing be needed (such as screening, treatment or improvement), that would constitute a waste activity and require a mobile treatment permit. This may be as simple as removing oversize material with an excavator bucket, to using a riddle bucket to remove hardcore to full mechanical screening.



9 Uncertainties and limitations

9.1 Site-specific comments

The initial gas monitoring programme was completed between August/ September 2021. However, as it did not reach falling / low pressure conditions, additional monitoring was recommended within ground investigation report Plots 500-502 (reference: 19453-HYD-XX-XX-RP-GE-1004). The supplementary monitoring was undertaken between January/ February 2022. It is considered that falling/ low pressure conditions were achieved during the supplementary gas monitoring exercise and therefore, it is considered that the site is been fully characterised in accordance with CIRIA Report 665.

Plots 600 and 700 are potentially classified as CS2; however, the lack of evidence of a gas source, the high groundwater levels that will likely have artificially affected the higher flow readings, and the presence of only naturally occurring strata suggests that the risk level could be reduced to CS1, subject to additional detailed gas risk assessment.

9.2 General comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of Portsmouth City Council (the Client), by purchase order number PO3004424 dated 12/07/2021 under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

This report details the findings of work carried out between July/ August 2021 and January/ February 2022. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Hydrock has used reasonable skill, care and diligence in the design of the investigation of the site and in its interpretation of the information obtained. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Unless otherwise stated, the recommendations in this report assume that ground levels will remain as existing. If there is to be any re-profiling (e.g. to create development platforms or for flood alleviation) then the recommendations may not apply.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

Where the existing report(s) prepared by others have been provided by the Client, it is assumed that these have been either commissioned by the Client, or can be assigned to the Client, and can be relied upon by Hydrock. Should this not be the case Hydrock should be informed immediately as additional work may be required. Hydrock is not responsible for any factual errors or omissions in the supplied data, or for the opinions and recommendations of others. It is possible that the conditions described may have since changed through natural processes or later activities.



The work has been carried out in general accordance with recognised best practice. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

The chemical analyses reported were scheduled for the purposes of risk assessment with respect to human health, plant life and controlled waters as discussed in the report. Whilst the results may be useful in applying the Hazardous Waste Assessment Methodology given in Environment Agency Technical Guidance WM3, they are not primarily intended for that purpose and additional analysis will be required at the time of disposal to fully classify waste. Discussion and comment with regards to waste classification are preliminary and do not form the requirements of 'Basic Characterisation' as required.

Assessment and testing for the presence of coal tar has only been completed at the locations of exploratory holes undertaken for risk assessment purposes. This investigation is not designed to provide a definitive assessment of the risk from coal tar, nor the waste classification for bituminous bound pavement arisings at the site.

Unless otherwise stated, at the time of this investigation the future routes of water supply pipes had not been established. This investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling and chemical testing may be required at a later date once the routes of the supply pipes are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

Whilst the preliminary risk assessment process has identified potential risks to construction workers, consideration of occupational health and safety issues is beyond the scope of this report.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.



10 Recommendations for further work

Following the ground investigation works undertaken to date, the following further works will be required:

- provision of additional ground gas risk assessment for Plot 600, including an additional round of ground gas monitoring;
- discussions with regulatory bodies regarding the conclusions of this report;
- provision of geotechnical design for the Category 2 structures (earthworks, retaining, floor slabs, foundations);
- production of a Remediation Strategy and Verification Plan (and agreement with the regulatory bodies);
- production of a Materials Management Plan relating to reuse of soils at the site (if required);
- remediation and mitigation works; and
- verification of the earthworks, remediation and mitigation works.



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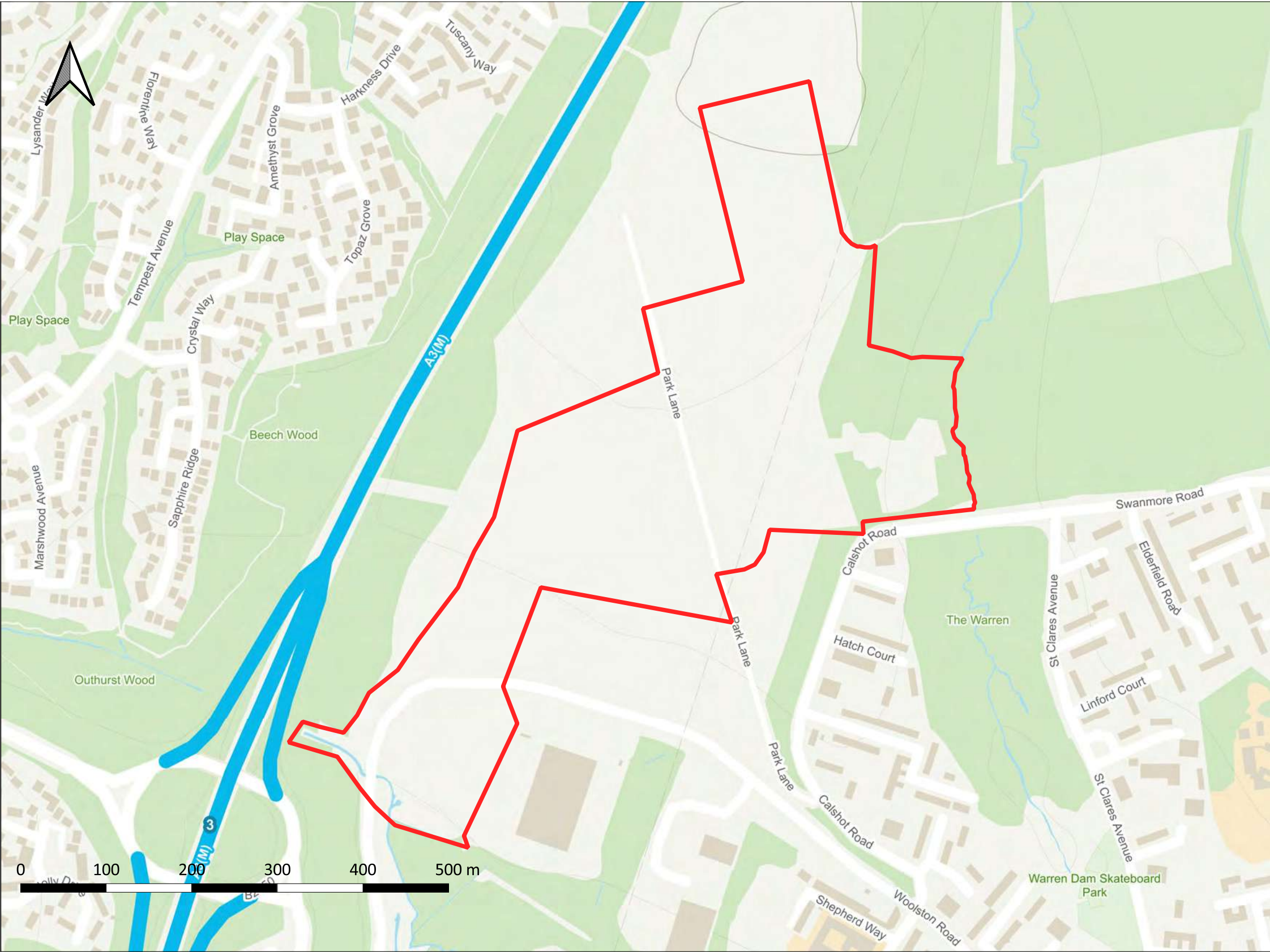
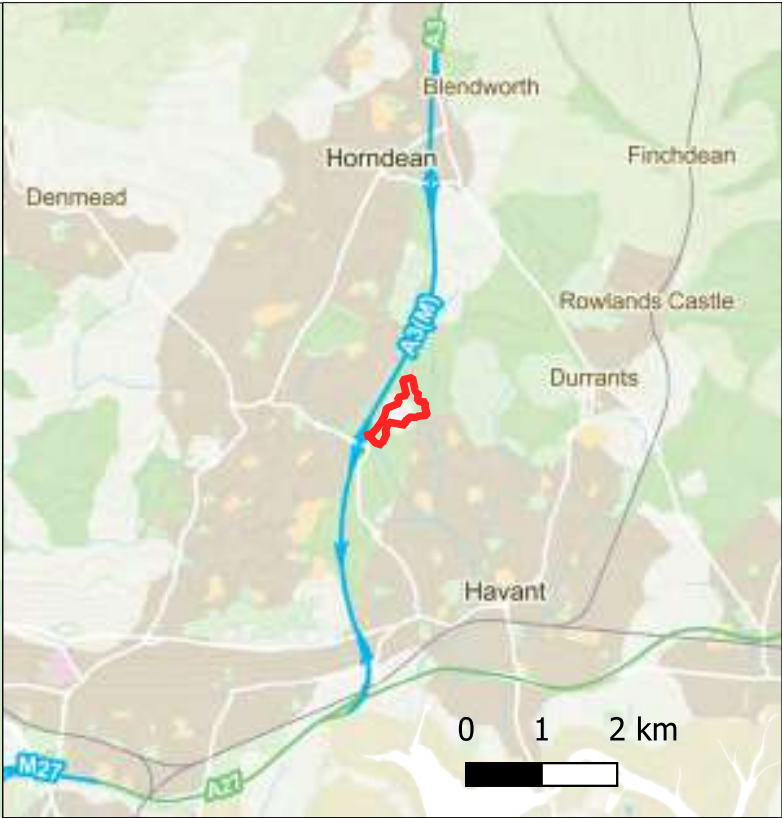


Appendices



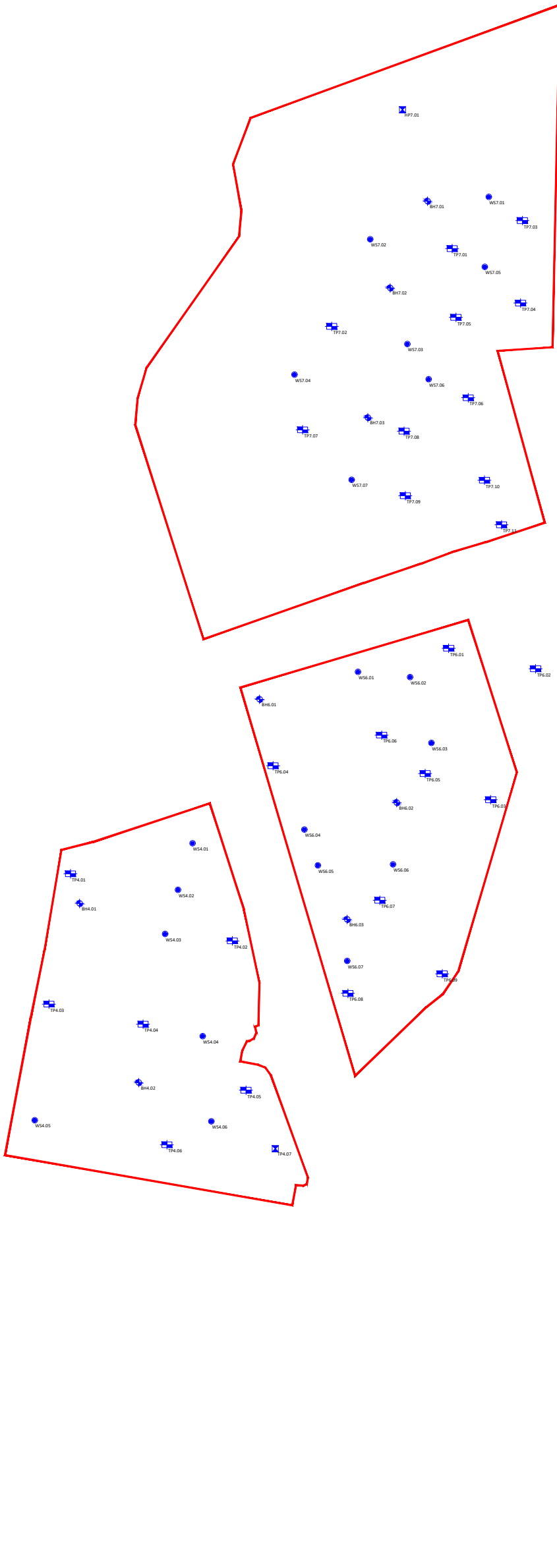
Appendix A Drawings



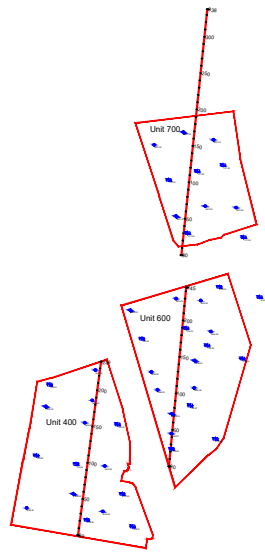


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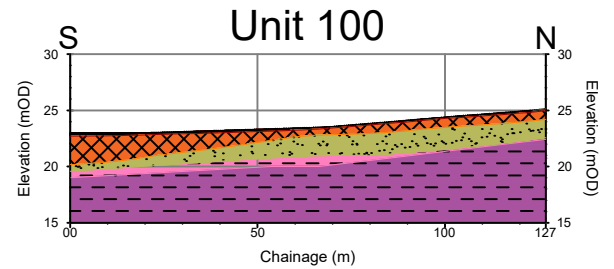
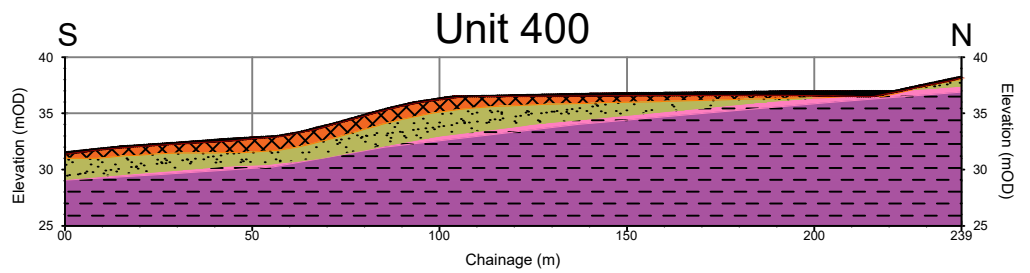
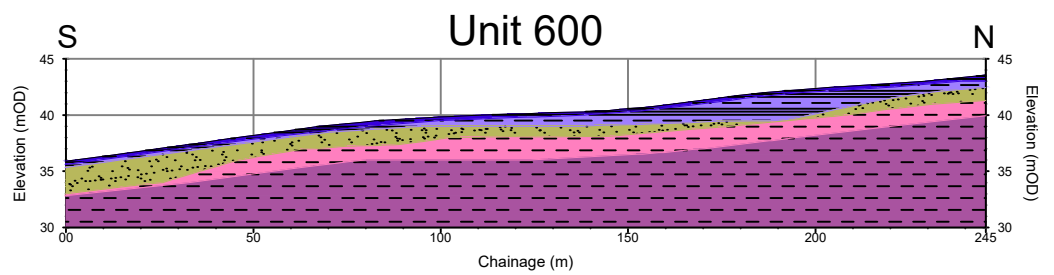
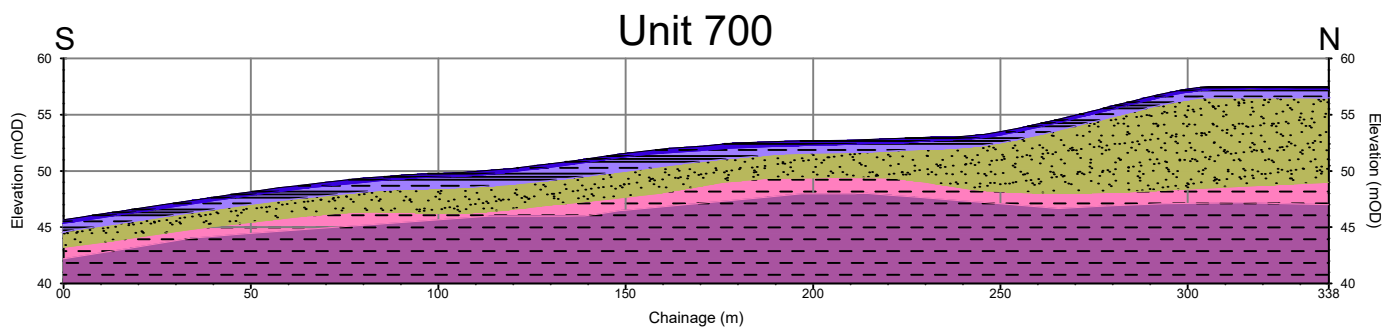
<div>KEY PLAN</div> <div><div></div> Site Boundary</div>	<div>NOTES</div>	<div>REVISIONS</div>				<div><div><div>Hydrock</div><div><div></div><div></div><div></div></div><div>White Building 1-4 Cumberland Place Southampton Hampshire SO15 2NP Tel: +44(0)2382140907 www.hydrock.com</div></div></div>		<div>TITLE</div> <div>Site Location Plan</div>			
						<div>HYDROCK PROJECT NO.</div> <div>19453-GELO</div>		<div>SCALE @ A3</div> <div>1:1</div>			
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<div>REV.</div>	<div>REVISION NOTES/COMMENTS</div>				<div>PROJECT</div> <div>DUNSBURY PARK, PORTSMOUTH</div>		<div>DRAWING NO.</div> <div>19453-HYD-XX-XX-DR-GE-1001</div>		<div>REVISION</div> <div>P01</div>		
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KEY		NOTES				Hydrock		TITLE	
<div>Key:</div> <div><div><div></div><div>BH##</div><div>Borehole</div></div><div><div></div><div>WS##</div><div>Windowless sampler borehole</div></div><div><div></div><div>TP##</div><div>Trial pit - mechanically excavated</div></div><div><div></div><div>TP##</div><div>Trial pit - hand dug pit</div></div></div>						CLIENT		PORTSMOUTH CITY COUNCIL	
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Scale 1:10000

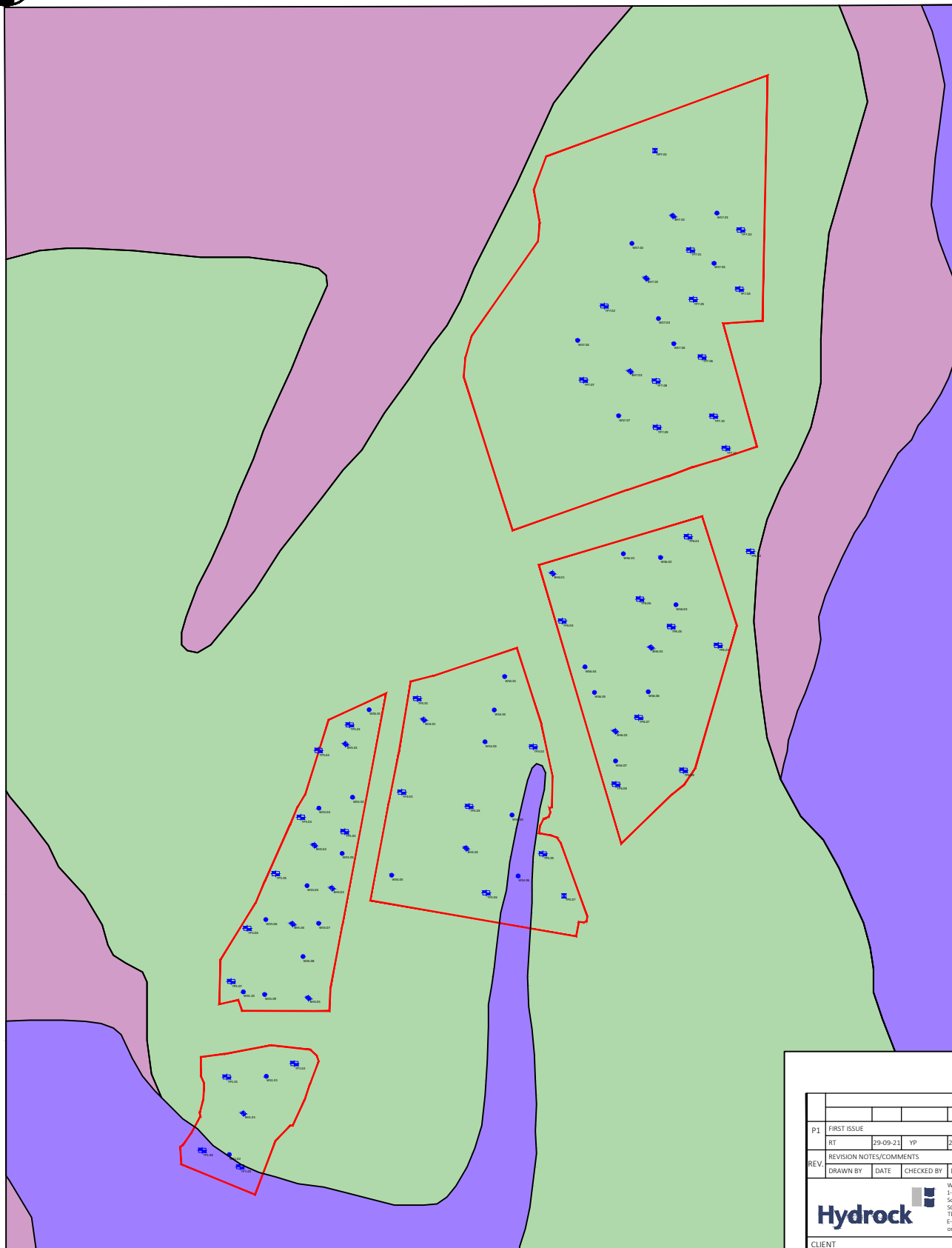


Key:

- BH## Borehole
- WS## Windowless sampler borehole
- TP## Trial pit - mechanically excavated

- Top soil
- Head
- Surface Made ground
- Made ground
- Bognor sand member
- London Clay weathered
- London Clay

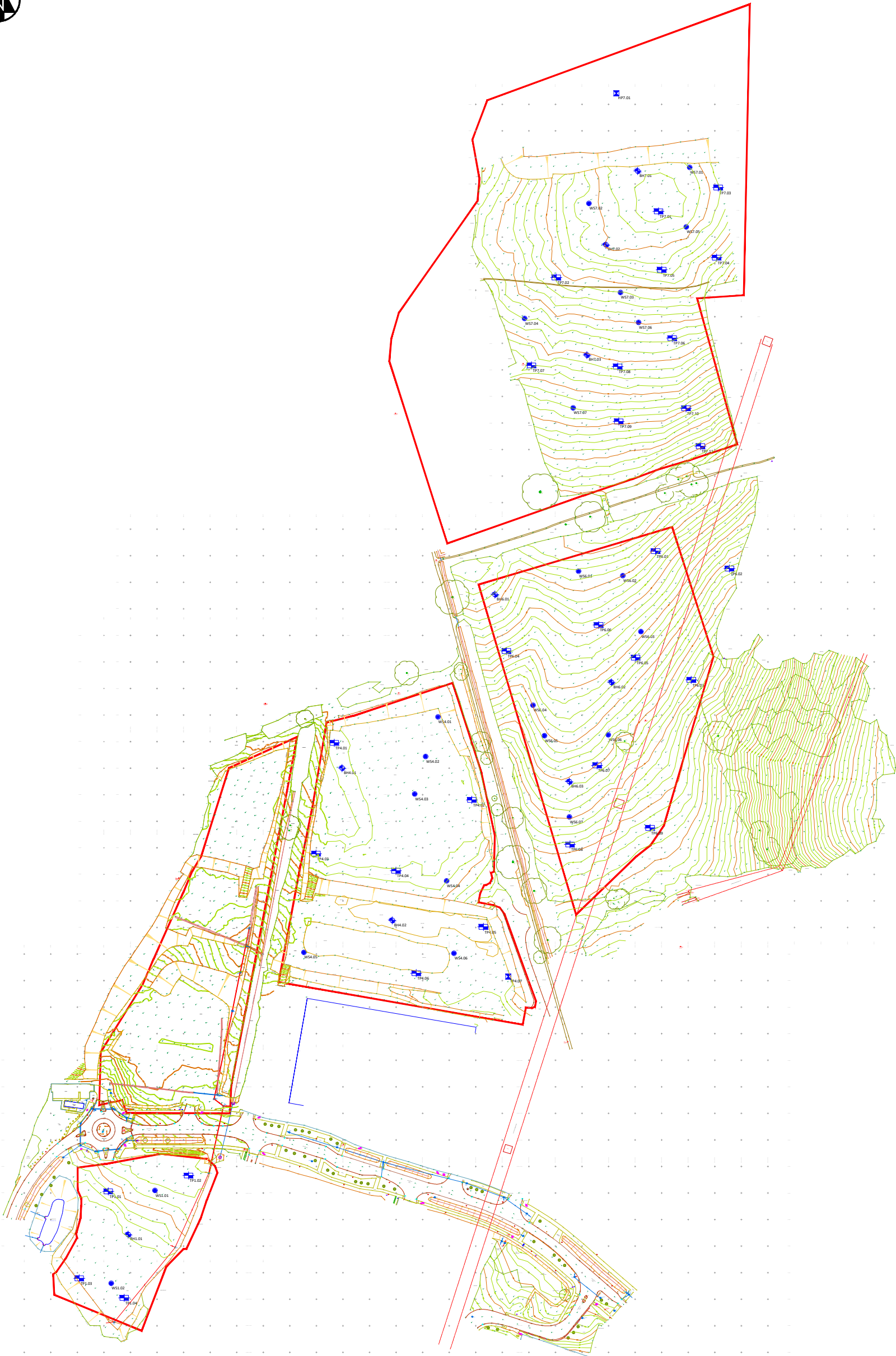
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TITLE					
INDICATIVE CROSS SECTIONS Plots 100, 400, 600s and 700					
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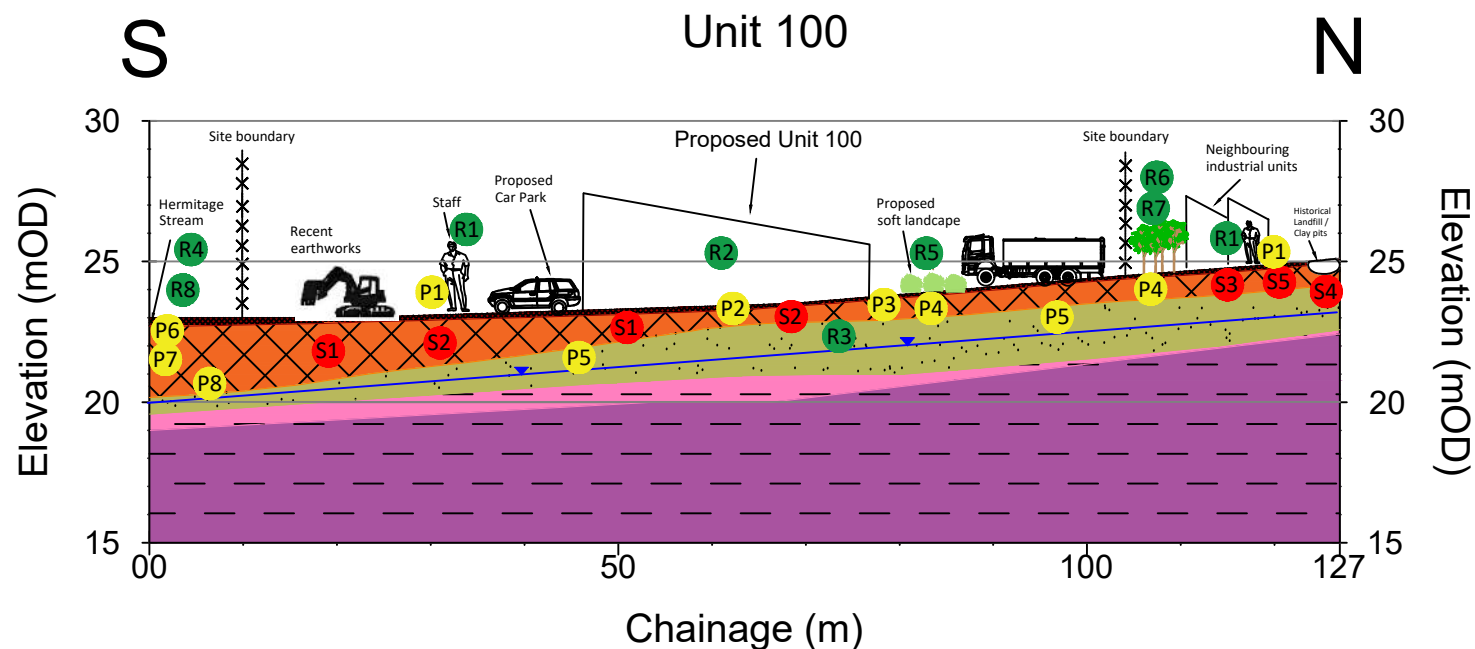
Key:

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|--|------------------------------------|--|--------------------|
| | Borehole | | Head |
| | Windowless sampler borehole | | Bognor sand member |
| | Trial pit - mechanically excavated | | London Clay |
| | Trial pit - hand dug pit | | |

P1	FIRST ISSUE								
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CLIENT									
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PROJECT									
DUNSBUURY PARK									
TITLE									
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KEY		NOTES				<div>Hydrock</div>		TITLE	
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								19453-HYD-XX-XX-DR-GE-1012	P1



LEGEND

- S SOURCE
- P PATHWAY
- R RECEPTOR

NOTE

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing is indicative only.

Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

Potential off-site sources of contamination

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

Potential receptors

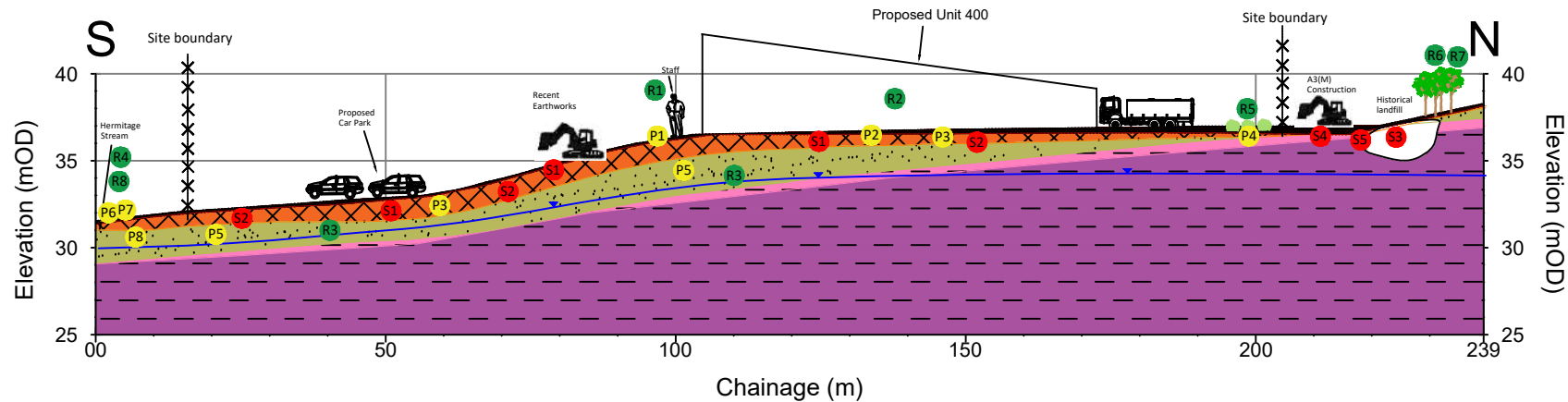
- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

Potential pathways

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).
- Root uptake by plant (P4).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P5).
- Surface water via overland flow (P6).
- Surface water, via drainage discharge (P7).
- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

P1	FIRST ISSUE				
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CLIENT					
Portsmouth City Council					
PROJECT					
Dunsbury Park					
TITLE					
Conceptual Site Model - Plot 100					
HYDROCK PROJECT NO. 19453			SCALE @ A4 NTS		
PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. 19453-HYD-XX-XX-DR-GE-1013A					REVISION P1

Unit 400



LEGEND

S SOURCE

P PATHWAY

R RECEPTOR

NOTE

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing is indicative only.

Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

Potential off-site sources of contamination

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

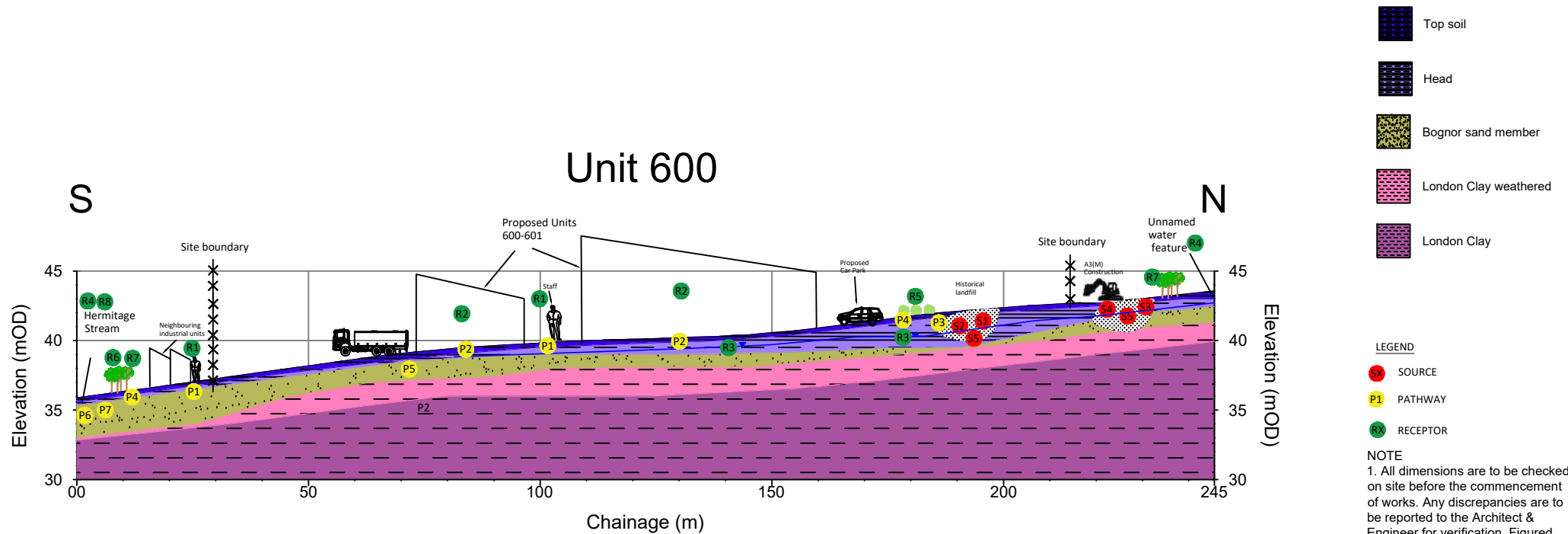
Potential receptors

- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

Potential pathways

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).
- Root uptake by plant (P4).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P5).
- Surface water via overland flow (P6).
- Surface water, via drainage discharge (P7).
- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

P1	FIRST ISSUE				
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CLIENT					
Portsmouth City Council					
PROJECT					
Dunsbury Park					
TITLE					
Conceptual Site Model - Plot 400					
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PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. 19453-HYD-XX-XX-DR-GE-1013B					REVISION P1



Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

Potential off-site sources of contamination

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

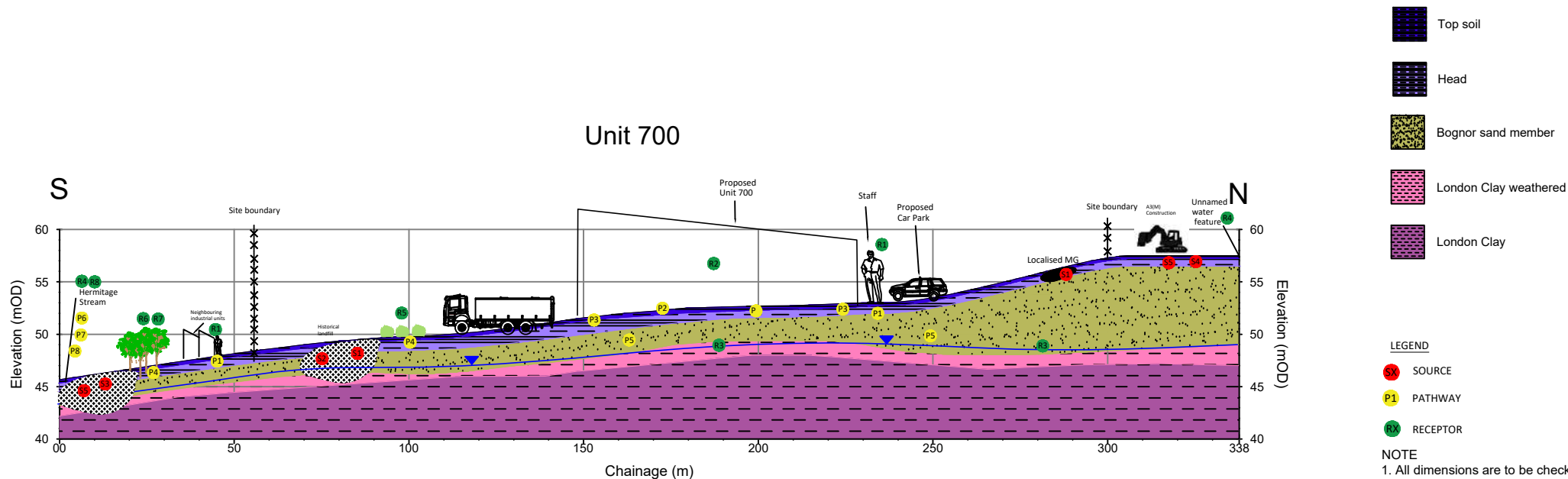
Potential receptors

- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

Potential pathways

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).
- Root uptake by plant (P4).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P5).
- Surface water via overland flow (P6).
- Surface water, via drainage discharge (P7).
- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

P1	FIRST ISSUE				
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CLIENT					
Portsmouth City Council					
PROJECT					
Dunsbury Park					
TITLE					
Conceptual Site Model - Plot 600					
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PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2
DRAWING NO. 19453-HYD-XX-XX-DR-GE-1013C					REVISION P1



NOTE

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing is indicative only.

Potential on-site sources of contamination

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S1).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / earthworks and Head Deposits (S2).

Potential off-site sources of contamination

- Made Ground, associated with landfill, historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S3).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S4).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S5).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S6).

Potential receptors

- People (neighbours, site end users) (R1).
- Development end use (buildings, utilities) (R2).
- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R3).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unnamed stream on the eastern boundary of the site (R4).
- Soft landscaping areas (R5)
- Ecology: Habitat Creation Area at the west side of the site (R6).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R7).
- Aquatic ecosystem in the Hermitage Stream (R8).

Potential pathways

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P1).
- Direct contact with substances deleterious to building materials (P2).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P3).
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- Surface water via base flow from groundwater (P8).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P9).

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Appendix B Previous Desk Study



Dunsbury Park, Plot 600

Phase 1 Desk Study



Prepared for:
Portsmouth City Council

Prepared by:
Luke Evans BSc FGS

Date:
12 January 2026

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Stantec Hydrock Limited has prepared this report in accordance with the instructions of the above named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.



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Phase 1 Desk Study

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1 Introduction

1.1 Terms of reference

Please note that for the purpose of this report, any reference to Hydrock should be regarded as Hydrock, now Stantec.

In April 2021, Hydrock Consultants Limited (Hydrock) was commissioned by Avison Young on behalf of Portsmouth City Council (the Client) to undertake a Phase 1 Desk Study at the site known as Dunsbury Park, Fitzwygram Way, Havant, Hampshire, postcode PO9 4EE, comprising approximately 21 ha of land located adjacent to junction 3, east of the A3(M).

In October 2025 Stantec was commissioned to update and re-issue the Dunsbury Park reporting, with previously combined reports split on a plot by plot basis. This report concerns Plot 600 only.

The site is currently open land covered by grass/scrub vegetation and mature trees predominantly limited to field boundaries with several footpaths crossing the area. A recently built roundabout and main access road (Fitzwygram way) is located in the south west area of the site. Park Lane comprises a bridleway/bicycle path and traverses the central area of the site orientated approximately northwest to southeast.

Hydrock understands the proposed development is to comprise the continued construction of new industrial B1/B2/B8 units with a combined floor area of approximately 45,000 sq. m. (470,000 sq. ft.), including associated site infrastructure works. A proposed development layout (Bam designs 'Dunsbury Park Masterplan' Drawing DHF-BMD-MP-XX-DR-A-10014-S2-P19), is presented in Appendix A.

The works have been undertaken in accordance with Hydrock's proposal referenced (19453-HYD-XX-ZZ-FP-CS-0002 dated 12th April 2021) and the Client's instructions to proceed (confirmation letter sent via email dated 28/04/2021 from Matthew Evans – Portsmouth City Council).

The updating works have been undertaken in accordance with Stantec proposal Ref (21082025-STN-FP-ACGEO-0003-01_) and the Clients instructions to proceed.

1.2 Project background and Objectives

The works have been commissioned as part of the due diligence process and to inform detailed design.

The objective of the Phase 1 Desk Study is to formulate an outline Conceptual Ground Model of the site to identify key geo-environmental and geotechnical risks to the proposed development.

1.3 Available information

The following have been provided to Hydrock by the Client for use in the preparation of this report:

- Avison Young. March 2021. 'Project Brief Dunsbury Park Portsmouth PO9 4EE';



Phase 1 Desk Study

1 Introduction

- Bam design. 17th May 2017. 'Dunsbury Park Masterplan'. Drawing reference: DHF-BMD-MP-XX-DR-A-10014-S2-P19.
- Bam design. 11th May 2017. 'Dunsbury Park – Site infrastructure: External works Eastern access road construction details'. Drawing reference: DHF-BMD-ZZ-XX-DR-S-20511 RD.
- Bam design. October 2014. 'Dunsbury Hill Farm – Below ground drainage strategy'. Drawing reference: 4330.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. General arrangements'. Drawing reference: PB2348-100-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. Proposed visibility splays'. Drawing reference: PB2348-101-01 to 05.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Setting out'. Drawing reference: PB2348-110-01 to 04.
- Royal Haskoning DHV. October 2014. 'Dunsbury Hill Farm – Proposed Drainage'. Drawing reference: PB2348-500-01 to 04.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Statutory undertakers'. Drawing reference: PB2348-510-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Pavement construction'. Drawing reference: PB2348-700-01 to 04.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – road markings, signage and lighting'. Drawing reference: PB2348-1200-01 to 05.
- Royal Haskoning DHV. December 2014. 'Dunsbury Hill Farm – Adoptable Highway Works. Proposed road sign schedules'. Drawing reference: PB2348-1210-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – General arrangement plan, section and setting out plan'. Drawing reference: PB2348-1710-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Abutment foundation details'. Drawing reference: PB2348-1720-01 to 16.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Bridge Deck general arrangement. Drawing reference: PB2348-1730-01 to 07.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge –Kerb drainage and waterproofing details'. Drawing reference: PB2348-1740-01 to 06.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – gas protection slab plan and sections'. Drawing reference: PB2348-1750-01 to 02.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – stream realignment general arrangements'. Drawing reference: PB2348-1760-01 to 10.
- Royal Haskoning DHV. January 2015. 'Dunsbury Hill Farm – Heritage Stream Bridge – Gabion wall adjacent to gas main protection slabs general arrangements '. Drawing reference: PB2348-1770-01.

It is assumed that the Client has commissioned or obtained assignment of the above documents and Hydrock and Hydrock is entitled to full reliance upon their contents.

The following documents have been reviewed by Hydrock from publicly available sources for use in the preparation of this report:

- Havant Borough Council. Ordnance Survey Map. Havant Borough Conservation areas. Recovered from <https://www.havant.gov.uk/conservation-areas-and-listed-buildings/details-conservation-areas>.



Hydrock acknowledge that these documents are not assigned to The Client, and these have been used for information purposes only. No formal reliance has been placed upon their contents.

1.4 Regulatory context and guidance

The geo-environmental section of this report is written in broad agreement with BS 10175:2011+A2:2017, 'Land Contamination: Risk Management' (LCRM, 2020) and the AGS (2006) 'Good Practice Guidelines for Site Investigations'. The methods used follow a risk-based approach, with the first stage being a Phase 1 desk study and field reconnaissance (this report), with the potential geo-environmental risk assessed qualitatively in future report(s) using the 'source-pathway-receptor contaminant linkage' concept to assess risk as introduced in the Environmental Protection Act 1990 (EPA, 1990).

The geotechnical section of this report is prepared in general accordance with BS EN 1997 (EC7) and BS 8004:2015. This report forms the Preliminary Sources Study Report (PSSR) as defined by DMRB CD622.

Where relevant the NHBC Standards (2021), have also been applied.

Remaining uncertainties and recommendations for further work are listed in Section 5 and Section 7.

1.5 Uncertainties and limitations

1.5.1 Site-specific comments

1.5.2 General comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of Portsmouth City Council (the Client), by e-mail dated April 2021 under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties commissioned by them to undertake work where reliance is placed on this report. Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

This report details the findings of work carried out in May to June 2021. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

The work has been carried out in general accordance with recognised best practice. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase 'suitable for use' is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.



Phase 1 Desk Study

1 Introduction

The non-specialist UXO screening has been undertaken for the purposes of ground investigation only (i.e. low risk activity in accordance with CIRIA Report C681). Further assessment should be undertaken with regards to other higher risk activities e.g. construction.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds, this report does not constitute a formal survey of these potential constraints and specialist advice should be sought.

Any site boundary line depicted on plans does not imply legal ownership of land.



2 Desk study and field reconnaissance

2.1 Site referencing

The site is referenced in Table 2.1 and the location is indicated in Figure 2-1 and Figure 2-2. The approximate Plot 600 location is outlined in orange.

Table 2-1: Site referencing information

Item	Description
Site name	Dunsbury Park
Site address	Fitzygram Way, Havant, Hampshire, PO9 4EE
Site location	The site is located at the east of A3 (M), adjacent to junction 3, approximately 8 miles north of Portsmouth. The National Grid Reference of the approximate centre of the site is 470044E, 109383N.



Figure 2-1: Site location



Figure 2-2: Aerial image

A site location plan (Hydrock Drawing 19453-HYD-XX-XX-DR-GE-1001) is presented in Appendix A.

2.2 Site Description and field reconnaissance survey

A field reconnaissance survey was undertaken on 1st June 2021 to visually assess potential geotechnical hazards, contaminant sources and receptors. The weather during the field reconnaissance survey was sunny and warm.

An updated reconnaissance survey was carried out in October 2025

A basic site description is presented in Table 2-2 and selected photographs are presented in Figure 2-3 and Figure 2-4. Additional photographs are presented in Appendix B.

Table 2-2: Site description

Item	Description
Site access	The site was accessed from Fitzwygram Way.
Site area	The site is irregular in shape and has an area of approximately 7 ha.
Elevation, topography and any geomorphic features	<p>The site is set at various levels and has a history of landfilling activities and earthworks. A number of large earth mounds have been constructed in and around the site.</p> <p>The area drops down sharply towards southern boundary. Beyond is a watercourse (Hermitage Stream) flowing beneath a bridge comprising Fitzwygram Way approximately 5-10m lower than Unit 100 area.</p>
Present land use	<p>Dunsbury Park comprises a commercial development that is partway through construction. Plot 200 is completed and occupied by Fat Face, Plots 300a and 300b are completed and occupied by DPD and Volkswagen, Plot 400 is currently under construction by BAM. The majority of the main infrastructure has been installed including access via the A3(M) comprising Fitzwygram Way which terminates west of Woolston Road. Plot 500 has been redeveloped into three units, which are understood to be occupied.</p> <p>Remaining areas designated for development, including Plot 600 are undeveloped.</p> <p>The Plot 600 area was uneven, predominantly long grass and scrub vegetation, sloping down gently to the south and east.</p> <p>Approximately 5-10m high. Oval shaped track on top.</p> <p>Public Open Space (POS) was shown on the proposed layout to the east of Plot 600. The POS area currently comprised long grass, trees and hedgerows, sloping steeply to the east locally.</p> <p>Park Lane traverses south east to north west along the south eastern edge of the Plot 600 area and is used as a bicycle path and bridleway with no access for plant/motor vehicles. Park Lane gently slopes up to the north.</p> <p>Overhead power lines with pylons and high voltage electricity overhead cables cross the east side of the site from south to north.</p> <p>During the walkover, it was noted that part of the site was used informally for motocross type activities.</p> <p>Deer were identified using the site.</p>
Surface cover and vegetation	Trees and hedges denote the majority of site boundaries. Much of the vegetation within plot areas is scrub or grass. Trees are predominantly deciduous including oak and a variety of other species.
General site sensitivity	The site is within a generally commercial area with residential to the east and west beyond the A3(M).
Site boundaries and surrounding land	The site is bounded to the south and west by woodland. The A3(M) is situated to the west. To the north are further undeveloped areas. Residential properties are present to the east beyond woodland.

Relevant photographs during the site walkover are shown below. The remaining photographs are presented in Appendix B.





Figure 2-3: Access to Plot 600



Figure 2-4: Overview of Plot 600 showing HV power line

2.3 Data sources

A number of desk study sources have been used to assemble the following information. These are presented in Appendix D and include:

- Updated third party environmental report 9Groundsure report reference GS-U4V-2GK-WES-N1B)
- Third-party environmental report (Groundsure report, reference HYD-7919293);
- Historical Ordnance Survey mapping;
- BGS Archive Records;
- Zetica UXB Risk Maps (<https://zeticauxo.com/downloads-and-resources/risk-maps/>);

2.4 Site history

A study of historical Ordnance Survey maps (Appendix C) has been undertaken to identify any former land uses at the site and surrounding areas which may have geotechnical or geo-environmental implications for the proposed development. The key findings are summarised in Table 2-3.

Phase 1 Desk Study
2 Desk study and field reconnaissance

Table 2-3: Site history

Reference	Key Features on-site	Key features off-site
OS Map ¹ 1859: 1:2,500	The site comprises an open land surrounded by trees.	Brick and tile works at 125m S of the site. Clay pit and brick kiln at 100m NE. Dunsbury Hill Farm buildings with pond 25m NW.
OS Map 1867: 1:10,560	Site named as Dunsbury Hill and comprises an open land with a road traversing south east to north west through the approximate centre of the site.	Surrounding area was covered by coniferous and deciduous trees. A clay pit was noted at 95m E of the site. Brick kiln at 155m E of the site.
OS Map 1897: 1:2,500	The road in the central area of the site is shown as Park Lane.	Footpath from W to E within the northern area of the site. The Warren Woodland was noted adjacent to the E boundary of the site. Well was noted in the NE. Middle Park Farm in SE.
OS Map 1931: 1:10,560	No significant changes within the site boundary.	Dunsbury Hill Farm identified at the NW of the site.
OS Map 1933: 1:10,560		Unspecified pit at 46m E of the site. Pond now present over former brick and tile works to S.
OS Map 1939: 1:2,500		Unspecified pit at 75m E of the site. Unspecified pit at 351m S of the site.
OS Map 1963: 1:10,560	Hermitage stream running west to east in the southern area of the site.	Neville's Park on the SW. Drain was noted along S boundary. Residential developments at E boundary. Small ponds noted at E and W sides of the site. Unidentified tank at 110 W. Electricity substation at 167m SE, 175m E and 334m SE of the site.
OS Map 1970 – 1973 1:1,250		
OS Map 1980: 1:1,250		Slopes noted across the W boundary of the site for the construction of A3 (M). Hulbert road built at the S of the site. A3 (M) built on W side of the site. Deciduous trees (Beech wood).
OS Map 1985 1:1,250	No significant changes within the site boundary.	Significant increase in residential developments noted on W side of A3 (M). Electricity substation at 319m NW of the site.
Google Earth© Imagery 1999 ²	Site remained undeveloped.	Significant increase in residential development of the surrounding areas of the site.

¹ Ordnance Survey Historical Map Information provided by Groundsure.

² ©The Geoinformation Group, image date: 1//1999.



Reference	Key Features on-site	Key features off-site
Google Earth© Imagery 2005 ³	Evidence of possible earthworks/ landfill activities on site.	No significant changes.
Google Earth© Imagery 2016 ⁴	Roundabout and Fitzwygram Way built in the southern area of the site linking Hulbert Road (west) and Woolston Road (east)	Industrial unit at the S boundary of the site (comprising Plot 200 currently let by Fat Face).
Google Earth© Imagery 2019 ⁵	Evidence of possible earthworks/ landfill activities on site.	Industrial unit at the SW of the site (comprising Plots 300a and 300b currently let by Breeze Van Centre Portsmouth and DPD Courier Service. Plot 400 is currently under construction by BAM).

2.4.1 Site history summary

In summary, the site has remained predominantly undeveloped, with the exception of the road traversing roughly across the centre of the site, which was first noted in 1867, later named as Park Lane (1897). A footpath was noted across the northern area of the site. Portsmouth City Council has been engaged in development of infrastructure since 2014 (including site roads, site levelling/plateaus and utility connections). The construction of the roundabout and main road infrastructure (Fitzwygram Way) at the south boundary of the site appeared to be completed in 2016. Currently, Plot 400 is under construction.

With regards the surrounding areas, some features such as a clay pit, brick and tile works and brick kiln were noted within 200m of the site between 1859 and 1867. In 1970s the construction of residential developments across the area started and continued to increase until 1985. Earthworks were noted along the west boundary of the site between 1980 and 1991 related to the construction of A3 (M).

One historical tank record was noted to the west of the site in 1970 over 100m away. No historical records related to historical garages or military land was identified within 500m of the site during the desk study research. Eight records of electricity substations were identified within 167m to 500m of the site between 1970 and 1993. One record of a gas governor was identified at 478m west of the site between 1984 and 1992.

2.5 Published Geology

The general geology of the site area is shown on the 1:10,000 and 1:50,000 British Geological Survey (BGS) map extracts reproduced as part of the Groundsure report and is summarised in Table 2-4. Extracts from the map are shown in Figure 2-5 to Figure 2-7. The red line represents the wider Dunsbury Park and the blue line represents the approximate Plot 600 area.

³ ©The Geoinformation Group, image date: 1/1/2005.

⁴ ©The Geoinformation Group, image date: 11/09/2016.

⁵ ©The Geoinformation Group, image date: 23/07/2019.



Table 2-4: Published Geological Sequence

Reference	Location	Stratigraphic Name	Description
Artificial Ground/Topsoil			
Artificial Ground is indicated to be present on site and in the surrounding 343m, generally to the South. The Made Ground was described as undifferentiated artificial deposits.			
Superficial Deposits (Figure 2-6)			
1, 2, 3	On site	Head	Clay, Silt, Sand and Gravel
5	224m NE		
Solid Geology (Figure 2-7)			
1	On site	Bognor Sand Member (Eocene Epoch)	Comprising the majority of the site area, glauconitic bioturbated or cross-bedded fine- and medium-grained sands, partially cemented.
2	On site	London Clay Formation (Ypresian Age)	Encountered at the south and north east boundaries of the site. Comprises blue-grey or grey-brown bioturbated or poorly laminated slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.
3	469m NE	Lambeth Group (Thanetian/Ypresian Age)	Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.

Figures



Figure 2-5: Artificial Made Ground (Reproduced with permission from Groundsure)



Figure 2-6: Superficial Deposits. (Reproduced with permission from Groundsure)



Figure 2-7: Solid geology (Reproduced with permission from Groundsure)

A number of borehole logs from the BGS archive (through GeoIndex) have been reviewed. Selected relevant records are summarised in Table 2-5.

Table 2-5: BGS archive borehole logs

Reference	Location	Strata and Groundwater Observations
SU60NE113	Within the southern boundary	<p>Brown sandy CLAY between ground level and 0.60m below ground level (bgl);</p> <p>Head deposits comprising mottled grey silty sandy CLAY between 0.60m and 2.1m bgl;</p> <p>Grey organic SILT between 2.10m and 2.40m bgl (probable Head Deposits); and</p> <p>Silty sandy fine to medium GRAVEL between 2.40m and 3.35m bgl (probable Bognor Sand Member).</p> <p>Groundwater recorded at 2.40m bgl.</p>
SU60NE317	30m SW	<p>Fill material comprising firm to stiff multicolour mottled to dark grey sandy clay with rare gravel of flint and chalk between ground level and 8.00m bgl (Made Ground);</p> <p>Firm to stiff brown and grey mottled CLAY between 8.0m and 9.0m bgl (probably London Clay Formation);</p> <p>Dense grey SAND between 9.0m and 13.0m bgl (probably London Clay Formation);</p> <p>Stiff grey CLAY between 13.0 and 16.20m bgl (probably London Clay Formation);</p> <p>Strong grey CLAYSTONE between 16.20 to 16.63m bgl (probably London Clay Formation).</p> <p>Groundwater encountered at 9.0m bgl.</p>
SU60NE45	38m W	<p>Firm Brown silty CLAY from ground level to 0.83m bgl;</p> <p>Light brown grey mottled CLAY between 0.83m to 2.0m bgl (possible London CLAY Formation);</p>

Reference	Location	Strata and Groundwater Observations
		Dark grey SILT between 2.0m bgl to 6.24m bgl (possible London CLAY Formation); Grey SILTSTONE between 6.24m and 7.14m bgl (possible London CLAY Formation); Dark grey friable silty CLAY with fossils between 7.14m to 15.0m bgl (possible London CLAY Formation). Groundwater encountered at 3.00m bgl.
SU60NE60	105m NE	Firm mottled grey brown sandy CLAY between ground level and 2.00m bgl; Brown clayey fine SAND between 2.00m and 4.40m bgl (possible Bognor Member); Stiff grey sandy CLAY between 4.40m and 15.00m bgl (possible London Clay Formation); Very stiff becoming hard fissured grey silty CLAY with occasional shell fragments between 15.00 and 30.0m bgl (possible London Clay Formation). Groundwater was encountered at 4.0m, 6.0m, 9.0m and 12.0m bgl.

2.6 Hydrogeology

2.6.1 Aquifer Designations

Based on the inferred geological sequence presented in Section 2.5 and the Environment Agency's interactive aquifer designation map, the aquifer system presented in Table 2-6 applies. Additional information on the hydraulic characteristics of the geological units has been abstracted from Allen et al (1997) and Jones et al (2000).

Table 2-6: Aquifer system

Stratum	Aquifer Designation	Comments
Artificial Ground		
Made Ground	Unclassified	Artificial ground not included in the classification system. Likely to be moderate to high porosity because of unconsolidated nature, but permeability could be constrained to low to moderate because of poor sorting and clay content.
Superficial Deposits		
Head Deposits	Secondary Undifferentiated Aquifer	Intergranular permeability. Dominated by moderate to high permeability layers of sand and gravel, interbedded with low permeability clay. Groundwater flow is likely to be variable and discontinuous as water migrates around low permeability areas.
Solid Geology		
Bognor Sand Member	Secondary A	Intergranular permeability. Dominated by high permeability fine to medium grained sands.
London Clay Formation	Unproductive	Due to its clayey nature, the majority of the London Clay Formation is of little significance as an aquifer.



There are no recorded active licensed groundwater abstractions within 2000m of the site.

2.6.2 Groundwater source protection zones and groundwater vulnerability

The site is within a Zone 1c (Inner) groundwater Source Protection Zone (SPZ1c – inner catchment, confined aquifer), see Figure 2-8.

There is one record of Zone 2 Source Protection Zone (SPZ2 – outer catchment) located at 486m NE of the site boundary.

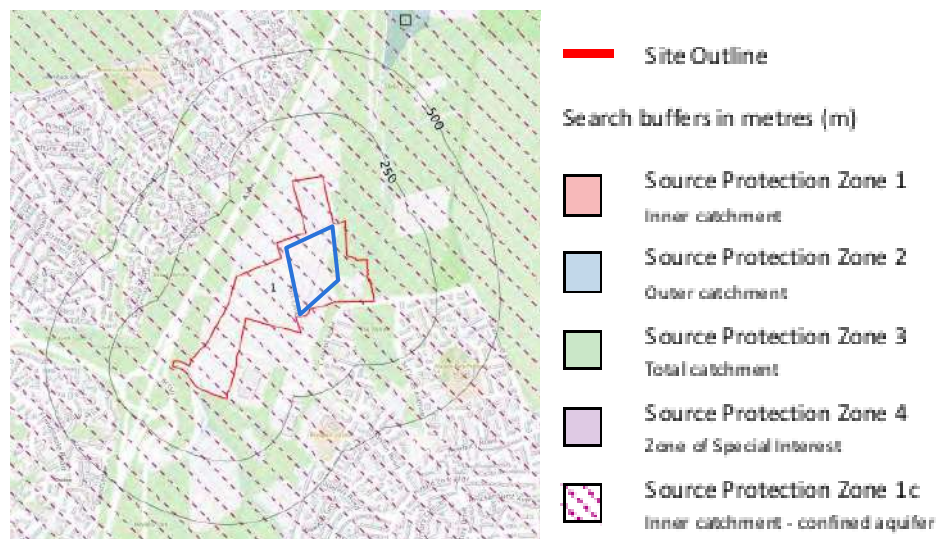


Figure 2-8: Abstractions and source protection zones

2.6.3 Groundwater levels, recharge, and flow

Shallow groundwater is likely to be present within the Artificial Made Ground / Head Deposits, and it is likely to flow towards Hermitage Stream on the southern boundary of the site.

Information from the BGS Hydrogeological Maps and supporting data from BGS historical boreholes indicate groundwater levels within the Bognor Sand Member are likely to be in the order of 2.40 – 4.00m bgl. The groundwater within the sandy clay layers of the London Clay Formation was recorded between 3.0 and 12.0m bgl, and it is likely to be confined by cohesive strata.

2.6.4 Groundwater quality

There are no records related to groundwater quality within site boundary. Down gradient, the East Hants Chalk groundwater body is encountered, which forms parts of the Southeast groundwater catchment area, and its current (2019 cycle 2) overall status under the Water Framework Directive is 'poor'.

2.6.5 Groundwater flooding

The environmental data report indicates a moderate risk of groundwater flooding within the majority of the site area with some high-risk zones in the south and the east due to the presence of surface water features.

2.7 Hydrology

The surface water features in the vicinity of the site are listed in Table 2-7 to 2-9.

Table 2-7: Surface water features

Feature	Location	Flow direction
Unnamed surface watercourse (flowing south)	On site (East boundary)	South
Hermitage Stream (flowing south east)	On site (South boundary)	Southeast
Unnamed surface watercourse	225m N	N/A

Table 2-8: Active licenced surface water discharges

Location	Details
1558m NE	Direct spray irrigation License number: 11/42/36.1/3CA Original start date: 03/07/1987 Expiry date: N/R

Table 2-9: Other surface water information

Item	Details
Surface water quality	Reference to the Environment Agency web site shows the site is located within the catchment of the East Hampshire Rivers, with the specific river water body being the Hermitage Stream - source to confluence with Langstone Harbour. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.
Surface water flooding	The desk study information indicates the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea). However, a partial area of the east boundary is considered as Flood Zone 2 (1 in 1000 (0.1%) chance of flooding each year) and Flood Zone 3 (with a 1 in 100 (1%) or greater chance of flooding each year from rivers) No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.7.1 Surface Water Quality

Reference to the Environment Agency web site shows the site is located within the catchment of the East Hampshire Rivers, with the specific river water body being the Hermitage Stream - source to



confluence with Langstone Harbour. The current (2019 cycle 2) overall status under the Water Framework Directive is 'moderate'.

2.7.2 Surface Water Flooding

The desk study information indicates the majority of the proposed development is in Flood Zone 1 (with a low probability of flooding from rivers or the sea). However, a partial area of the east boundary is considered as Flood Zone 2 (1 in 1000 (0.1%) chance of flooding each year) and Flood Zone 3 (with a 1 in 100 (1%) or greater chance of flooding each year from rivers)

No further consideration of flood risk is undertaken in this report. Specialist flood risk advice should be sought with regard to drainage and flooding.

2.8 Mining and mineral extraction

The Groundsure report indicates that some evidence of surface mineral works within 250m from the site boundary. There are 6 entries related to chalk mining. These are summarised in Table 2-10.

Table 2-10: Mining and mineral extraction

Location relative to site	Mining activity
Surface Mining and surface groundworks	
122m E	A surface mineral working (Brit Pit). Status: Ceased.
Between 23m and 30m W	Pond, possibly related to old surface mining.
Between 84m and 95m E	Pond, possibly related to old surface mining, previously noted as old clay pit.
124m S	Brick and Tile Works
155m E	Brick Kiln
Between 28m to 211m W	Surface works in the west area of the site (Cuttings) related to construction of A3 (M)
Underground Mining	
On site	Small scale chalk mining may have occurred*
Between 166m N to 916m N	Small scale and sporadic chalk mining.

*given the anticipated depth of chalk beneath the site this is considered unlikely.

2.9 Waste management

There is one historical landfill record which covers a large proportion of the east and northern area of the site, as listed in Table 2-11.

Table 2-11: Waste management sites

Site Name	Location	Details
Dunsbury Hill Farm	Cowplain, Hampshire	Waste Licence: Yes Site Reference: 13/3, FHA17 Waste Type: Inert Licence Holder: Gleeson Civil Engineering Limited Operational dates: Not recorded



2.10 Regulatory information

Information in the GroundSure Report (Appendix D), relating to various regulatory controls has been reviewed, with a summary presented below in Table 2-12.

Table 2-12: Regulatory information within 500m of the site

Regulatory Data	Location	Details	Potential Risk	Comment
Waste exemptions	456m NW	Reference: WEX039750 Category: Using waste exemption Description: Use of waste in construction	No	Due to its distance from the site
	465m NW	Site: 8 The Westbrook Centre. PO78SE Reference: EPR/VF0101TS/A001 Category: Treating waste exemption Description: Sorting and de-naturing of controlled drugs for disposal.	No	Due to its distance from the site
	466m NW	Site: 8 The Westbrook Centre. PO78SE Reference: WEX135747 Category: Storing waste exemption Description: Storage of waste in a secure place.	No	Due to its distance from the site
Discharge Consents	219m N	Two entries on the site known as: Rambles Way. PO7 8RE Effluent Type: Sewage discharges –water company. Permit Number: A01276 Receiving Water: Unnamed tributary of River Wallington Status: New consent Issue date: 28/05/2007 Effective Date: 28/05/2007 Revocation Date: -	Yes	May flow into the unnamed surface watercourse on the eastern site boundary.
Registered radioactive substances	N/A	No entries on registered radioactive substances were recorded within 500m of the site.	No	-
Control of major accident hazards sites (COMAH)	N/A	No entries on registered COMAH sites were recorded within 500m of the site.	No	-
Local Authority Pollution Prevention and Controls	N/A	No entries on registered pollutant release were recorded within 500m of the site.	No	-
Pollution Incidents	101m S	March 2004, sewage materials.	No	Event took place over 17 years ago.



Regulatory Data	Location	Details	Potential Risk	Comment
		Water impact Category 2 – significant incident. Land and air impact Category 3 – minor incident.		
	421m SE	December 2002, contaminated water (firefighting run off), Water and air impact Category 3 – minor incident.	No	Due to its distance from the site the Category 3 classification of the incident.
Trade Directory Entries	On site	2 entries on electrical features (Electricity Pole and Pylon)	No	Features considered unlikely to represent a significant risk based on type.
	Between 49m and 221m	9 entries on Electrical features (including substations, poles and pylon)	No	Due to its distance to the site.
	225m S	Gas governor	No	Due to its distance to the site.
Fuel Station Entries	N/A	No entries on registered fuel stations were recorded within 500m of the site.	No	-

2.11 Natural Soil Chemistry

Information contained within the Groundsure report (Appendix D) gives indicative (estimated) concentration values for the natural soils at the site for a selection of Contaminants of Potential Concern (CoPC). These have been reproduced in Table 2-13.

Table 2-13: Natural Soil Chemistry

Element	Arsenic	Cadmium	Chromium	Lead	Nickel
Concentration (mg/kg)	15	1.8	60 - 90	100	15 - 30

2.12 Radon

The radon risk is reported in the Groundsure report. The guidance indicates that the site is not in a Radon Affected Area (less than 1% of homes are above the action level). Therefore, no radon protection measures are required.

2.13 Unexploded ordnance

In general accordance with CIRIA Report C681 (Stone et al 2009) a non-specialist UXO screening exercise has been undertaken for the purposes of ground investigation.

Based on UXO risk mapping available at <https://zeticauxo.com/downloads-and-resources/risk-maps/>, the majority of the site is classified as low risk with regards to UXO. However, due to its proximity to a moderate to high-risk area of UXO, a specialist UXO risk assessment in accordance with CIRIA Report C681 is recommended. The UXO risk map is presented in Appendix D.



2.14 Environmental and Agricultural Designations

There are 39 entries related to areas with environmental designations within 2000m from the site boundary. There are 3 entries related to agricultural land, one open access land record and one environmental and countryside stewardship schemes record. These are summarised in Table 2-14.

Table 2-14: Environmental and Agricultural Designations

Location	Site Classification	Name/ Description
1677m N	Local Nature Reserves (LNR)	Hazleton Common LNR
176m NE	Ancient & Semi-Natural Woodland	Bells Copse
Between 200 to 1825m		20 entries labelled as Unknown
223m E		Cabbagefield Row
418m S		Bushy Lease
755m NW		The Queens Inclosure
927m E		Round Wood
1403m SE		Great Copse
1659m E		Hammond's Lands Copse
1914m E		Wakeford's Copse
438m NE	Ancient Replanted Woodland	Bells Copse
Between 753m to 1762m		5 entries labelled as Unknown
831m NE		Forest Of Bere
907m NW		The Queens Inclosure
On site	Nitrate vulnerable zones	Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC) – Eutrophic water
469m N		Hampshire Chalk - groundwater
On site (centre)	Agricultural land Grade 3	Good to moderate quality agricultural land.
On site (north and south)	Agricultural land Grade 4	Poor quality agricultural land. Land
141m NE	Non agricultural	-
71m E	Section 16 Dedicated Land	Open access land SEE/13852
On site	Environmental Stewardship Schemes	Entry Level plus Higher Level Stewardship from 01/10/2013 to 30/09/2023
223m E	Countryside Stewardship Schemes	Countryside Stewardship (Higher Tier) from 01/01/2017 to 31/12/2026

3 Ground Hazards

3.1 Natural ground instability

The majority of the site lies within Bognor Sand Member, and the risk of shrink swell clay is negligible to low due to its likely non-plastic condition. However, trees and hedges are present around the site boundaries and sporadically across the site and the presence of cohesive deposits of the London Clay Formation within the north and south boundaries of the site may be affected by potential for shrink-swell ground movements in clays as a result of changes in moisture content from removal or growth of trees. This can pose a significant risk of shrink swell clays. Head Deposits containing cohesive soils may also represent a potential shrink swell risk.

The Groundsure reports indicates risk of running sands, landslides, compressible and collapsible deposits within site boundary is very low to low. However, due to the unknown composition and extend of the made ground, risk of running sands can not be discounted. No soluble rocks were identified within the site boundary although will be present at depth beneath the London Clay Formation and subsequently the Lambeth Group; it is considered that the risk of ground dissolution is negligible at the site.

3.2 Preliminary geotechnical hazard identification

Potential geotechnical hazards have been assessed in accordance with the general requirements of ICE/DETR Document 'Managing Geotechnical Risk' and the HE documents HD 41/15 and CD 622. The following pages set out the identified geotechnical risks and hazards which are associated with the proposed development and establish the approach which is to be taken to manage the risks including the geotechnical input and analysis.

Table 3-1 is a preliminary assessment of possible geotechnical hazards at the site at Desk Study stage. This information is used to assist with site investigation design.

Table 3-1: Preliminary geotechnical hazard identification

Hazard	Hazard Plausible	Hazard Unlikely	Comment
Uncontrolled Made Ground (variable strength and compressibility).	X		Artificial made ground and fill material is anticipated to be on site with variable strength and composition.
Soft / loose compressible ground (low strength and high settlement potential).	X		
Shrink swell of the clay fraction of soils under the influence of vegetation.	X		London Clay Formation is expected to be encountered in the north and south areas of the site. Moreover, the presence of mature trees can pose a risk of shrink swell.
Variable lateral and vertical changes in ground conditions.	x		The site is set at various levels and Made Ground and historical landfill may be variable in composition and thickness and this may pose implications to foundation design.



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3 Ground Hazards

Hazard	Hazard Plausible	Hazard Unlikely	Comment
High sulfates present in the soils.	X		Sulfates may be present in soils at the site.
Adverse chemical ground conditions, (e.g. expansive slag).		X	The site has not been previously developed. Therefore, no adverse chemical ground conditions are expected.
Obstructions.	X		The site has not been previously developed. However, obstructions may be present due to the historical landfill activities.
Existing below ground structures to remain (on or off-site tunnels, foundations, basements, and adjacent sub-structures).		X	The site has not been previously developed. Therefore, existing below ground structures are not anticipated.
Shallow groundwater.	X		Shallow groundwater may be present within the Artificial Made Ground / Head Deposits. Groundwater was recorded to be present within the Bognor Sand Member between 2.40 – 4.00m bgl, and at 3.0m bgl within London Clay Formation in BGS borehole data.
Changing groundwater conditions.	X		Phreatic levels can fluctuate seasonally.
Risk from erosion.		X	Steep slopes were seen in the vicinity of the power lines in the east and also on the western boundary of Units 500 to 502. This risk is not relevant to Plot 600
Risk from flooding.		X	The majority of the site is within Flood Zone 1 (with a low probability of flooding from rivers or the sea). Therefore, risk from flooding is considered low.
Running sands and / or loose Made Ground, leading to difficulty with excavation and collapse of side walls.	X		Artificial Made Ground and fill material is anticipated to be on site with variable strength and composition.
Mining.		X	No significant mining activities were identified within the site boundary or surrounding areas.
Slope stability issues – general slopes.	X		The site level is variable and there are some steep slopes and large earth mounds on and around site. General slopes and retaining walls likely to be required.
Slope stability issues – retaining walls.	X		
Earthworks – settlement (due to placement of fill on soft / loose ground).	X		The site level is variable and there are some steep slopes and large earth mounds on site. Earthworks likely to be required.
Earthworks – poor bearing capacity of new fill.	X		
Earthworks – unsuitability of site won material to be reused as fill.	X		



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3 Ground Hazards

Hazard	Hazard Plausible	Hazard Unlikely	Comment
Solution features in Chalk.		X	Chalk geology is present at depth beneath the site below the London Clay Formation and Lambeth Group.
Cavities in the Superficial Deposits due to solution features.		X	Local geology is unlikely to suffer from dissolution.
Dissolution (associated with "wet rock head").		X	
Brine extraction.		X	Unlikely. Brine extraction is not recorded at the site.



3.3 Potential development elements affected

Development elements potentially affected by geotechnical hazards are:

- Buildings – foundations.
- Buildings – floor Slabs
- Roads and pavements.
- Services.
- General slopes.
- Retaining walls.
- Public open spaces (POS).
- Construction staff, vehicles and plant operators.
- Concrete below ground.

Health and safety risks to site Contractors and maintenance workers have not been assessed during these works and will need to be considered separately during design.

The above plausible geotechnical hazards and development elements affected have been carried forward for investigation and assessment.

4 Outline Conceptual Site Model and Preliminary Risk Assessment

4.1 Introduction

The outline Conceptual Model (oCM) incorporates evidence from the site walkover, the Desk Study and previous investigations carried out at the site. The formulation of an outline Conceptual Model is a key component of the LCRM methodology. The oCM incorporates a ground model of the site physical conditions and an exposure model of the possible contaminant linkages; it forms the basis for Generic Quantitative Risk Assessment (GQRA) in accordance with current guidelines.

4.2 Potential contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from an on-site or off-site source.

4.2.1 Potential on-site sources of contamination

The following potential on-site sources of contamination have been identified:

- Made Ground, associated with historical landfill activities and current earthworks/construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S01).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and Earthworks (S02).

4.2.2 Potential off-site sources of contamination

The following potential off-site sources of contamination have been identified:

- Made Ground, associated with historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S03).
- Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S04).
- Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from unspecified tank located at 110m N of the site. (S05).
- Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill / backfilled clay pits/brick works. (S06).

4.3 Potential receptors

The following potential receptors in relation to the proposed land use have been identified.

- People (neighbours, site end users) (R01).
- Development end use (buildings, utilities and landscaping) (R02).



- Groundwater: Secondary A aquifer status of the Bognor Sand Member (R03).
- Surface water: on-site Hermitage Stream in the south east area of the site and an unidentified stream on the eastern boundary of the site (R04).
- Soft landscaping areas (R05)
- Ecology: Habitat Creation Area at the west side of the site (R06).
- Ecology: Designated Ancient and Seminal Woodland / Ancient Replanted Woodland in the surrounding areas of the site (R07).
- Aquatic ecosystem in the Hermitage Stream (R08).

4.4 Potential pathways

The following potential pathways have been identified.

- Ingestion, skin contact, inhalation of dust and outdoor air by people (P01).
- Direct contact with substances deleterious to building materials (P02).
- Ground gas (Methane, carbon dioxide, etc.) ingress via permeable soils and/or construction gaps (P03).
- VOC and petroleum hydrocarbon vapour ingress via permeable soils and/or construction gaps (P04).
- Root uptake by plant (P05).
- Migration of contaminant via leachate migration through the unsaturated zone in Bognor Sand Member (P06).
- Surface water via overland flow (P07).
- Surface water, via drainage discharge (P08).
- Surface water via base flow from groundwater (P09).

Health and safety risks to site development contractors and maintenance workers have not been assessed as part of this study and will need to be considered separately.

4.5 Summary of potential contaminant linkages

Table 4-2 lists the plausible contaminant linkages which have been identified. These are considered as potentially unacceptable risks in line with guidelines published in CLR 11 and additional risk assessment is required.

Source – Pathway – Receptor Linkages have been assessed in general accordance with guidance in CIRIA Report C552 (Rudland et al 2001) but with the addition of a 'no linkage' category.

It should be noted that whilst the risk assessment process undertaken in this report may identify potential risks to site demolition and redevelopment workers, consideration of occupational health and safety issues is beyond the scope of this report and need to be considered separately in the Construction Phase Health and Safety Plan.



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4 Outline Conceptual Site Model and Preliminary Risk Assessment

Table 4-1: Consequences versus probability assessment

Probability	Consequence				
		Severe	Medium	Mild	Minor
	High Likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Low risk	Very low risk
	Low Likelihood	Moderate risk	Low risk	Low risk	Very low risk
	Unlikely	Low risk	Very low risk	Very low risk	Very low risk
	No Linkage	No risk			



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4 Outline Conceptual Site Model and Preliminary Risk Assessment

Table 4-2: Outline Conceptual Site Model

Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment	
Made Ground, associated with historical landfill and current earthworks (metals, metalloids, PAH, hydrocarbons) (S01).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Likely	Medium	Moderate	Made Ground and "inert" landfill materials anticipated to be in some areas across the site and its composition is currently unknown.	Contact with these materials is likely in areas of Public Open Space. Mitigation measures will be required to break the SPR linkage.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low		The risk of significant generation of dust is likely only during site development process and can therefore be controlled.
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	The site has not been developed and no contamination is expected to be significant to water bodies.	
	Surface run-off.	Aquatic ecosystems (R08)	Low likelihood	Medium	Low		
	Base flow from contaminated groundwater (P11)	Surface water (R04)	Low likelihood	Medium	Low		
	Root uptake (P05)	Soft landscape planting (R05) Habitat Creation Area (R06)	Unlikely	Mild	Very Low	Made Ground is anticipated across some areas of the site. Whilst root uptake is possible in areas of Public Open Space (POS) and Habitat Creation area, the concentrations of metals are not expected to be significantly elevated with regard to plant growth.	
Made Ground below the site associated with	Inhalation of fugitive dust (P01)	Site users (R01)	Likely	Medium to Severe	Moderate to High	Composition of Made Ground / landfill is	Contact with these materials is likely in



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
historical landfills and current earthworks (asbestos) (S01)						unknown. Therefore, general contamination may be present.
		Neighbours (R01)	Low likelihood	Medium to Severe	Moderate	gardens and areas of Public Open Space. Mitigation measures will be required to break the SPR linkage. The risk of significant generation of dust is likely only during site development process and can therefore be controlled. Suppression should be included in control measures. If ACM is present on site, works to be undertaken in accordance with CAR 2012.
Made Ground associated with historical landfill and current earthworks hydrocarbons) (S01)	Direct contact (P02)	Water supply pipes (R02)	Low likelihood	Medium	Low	There are landfills in some areas across the site containing unknown fill materials. Landfill noted to accept "inert" materials.
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and earthworks below the site (S02)	Migration, build up and asphyxiation (P03)	Site users (R01)	Likely	Medium to Severe	Moderate to High	Made ground and landfill composition is unknown and significant concentrations of ground gas including carbon dioxide, methane and others may be present. Ground gas monitoring is recommended for the designing mitigation measures if required.
		Neighbours (R01)		Medium	Moderate	
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground /	Migration, build up and explosion (P03)	Buildings on site (R02)	Likely	Medium to Severe	Moderate to High	
		Buildings on adjacent sites (R02)				



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
landfill and earthworks below the site (S02)						
Made Ground, associated with historical mining activities (old clay pit, brick and tile works), possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydro-carbons (S03).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low Likelihood	Medium	Low	Low likelihood to pose a risk due to the significant time elapsed since these activities took place.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	
	Surface run-off.	Aquatic ecosystems (R08)	Low likelihood	Medium	Low	
	Base flow from contaminated groundwater (P11)	Surface water (R04)	Low likelihood	Medium	Low	
	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low likelihood	Medium	Low	
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
Made Ground, associated with earthworks for the construction of A3 (M) in the west boundary on the site, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S04).	Ingestion, inhalation or direct contact (P01)	Site users (R01)	Low likelihood	Medium	Low	Construction of the A3(M) likely involved excavation of natural soils and is considered unlikely to have a significant impact on the site.
	Inhalation of fugitive dust (P01)	Neighbours (R01)	Low likelihood	Medium	Low	
	Leaching through unsaturated zone (P06)	Groundwater (R03)	Low likelihood	Medium	Low	
	Surface run-off.	Aquatic ecosystems (R08) Surface water (R04)	Low Likelihood	Medium	Low	
Hydrocarbon vapours from potential VOC and petroleum hydrocarbon spillages/leaks from	Ingestion, inhalation or direct contact (P01)	Site users (R01)	No linkage	-	No risk	The tank was located at 110m N off-site and it was only recorded on historical mapping in 1970. It is not considered to pose a risk as there is no pathway between source.
		Neighbours (R01)	No linkage	-	No risk	
	Direct contact	Water supply pipes (R02)	No linkage	-	No risk	



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Source	Pathway	Receptor	Probability	Consequence	Risk Level	Comment
unspecified tank located at 110m N of the site. (S05).	Leaching through unsaturated zone.	Groundwater (R03)	No linkage	-	No risk	In terms of migration via leaching to the unsaturated zone, as it lies over London Clay Formation and this comprises generally cohesive soils, of unproductive strata, there is no link between source and receptor; therefore, risk level is considered negligible. Furthermore, the A3(M) is present at low elevation between the former tank and the site.



5 Preliminary development constraints

Based on the Desk Study information presented above, preliminary development constraints with regards to the development of the site, are presented in Table 5.1.

It should be noted that these recommendations are based on the limited data available from the Desk Study and Hydrock's experience. All preliminary development constraint comments are subject to review and change in the light of the site investigation, assessment and design.

Table 5-1: Preliminary development constraints / recommendations

Element	Potential constraint and recommendation
Site Preparation, Earthworks and Groundworks	<p>Topsoil and any organic Made Ground should be removed from beneath all earthworks, buildings and hardstanding areas. This will generate significant volumes of Topsoil, which will need to be accommodated as part of the proposed development.</p> <p>Obstructions are likely in the landfilled area and may require breaking equipment or heavy-duty plant to remove them.</p> <p>Excavations should be readily achievable using standard plant.</p> <p>Excavations are likely to be stable in the short to medium term. However, collapse of excavation faces in the coarse soils is to be anticipated.</p> <p>Water seepages into excavations is possible. However, significant seepages are unlikely and should be adequately controlled by sump pumping.</p> <p>Excavated soils should be suitable for reuse, if required, subject to chemical testing, earthworks testing and testing in accordance with the British Standard for Topsoil.</p> <p>Excavated soils generally should be suitable for reuse, subject to testing and placement in accordance with a suitable Specification.</p> <p>Some management of soils and remediation will be required with regards to the Made Ground (if present).</p>
Foundations	<p>Strip or trench fill foundations may be appropriate across the majority of the site, founding on the firm or stiffer clays of the London Clay Formation, or medium dense and denser coarse soils within Bognor Sand Member. It is currently considered that the Head Deposits are unlikely to be suitable founding strata, though in-situ testing may prove otherwise. If significant Made Ground is present, traditional foundations may not be feasible.</p> <p>Deepening will be required where construction is in close proximity to trees or locally due to low strength soils. If deepening due to trees means that the foundation depth is >2.5m bgl piling or ground improvement may be required.</p>
Floor Slabs	<p>To be confirmed following appropriate ground investigation. However, if the near surface soils are found to be of medium volume change potential or higher, suspended ground floor slabs would be required.</p>



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5 Preliminary development constraints

Roads	Assume an equilibrium design CBR value of 2.5% on natural clays, sand or earthworks fill. If Made ground is left in place a CBR of <2.5% is recommended.
Soakaways	Soakaway drainage is unlikely to be a viable drainage solution in the Head Deposits or London Clay. However, this will depend on the actual clay content of the soil within the Head Deposits (which will dictate infiltration rate) and water levels. Soakaway drainage may be possible within unsaturated granular soils of the Bognor Sand Formation.
Buried Concrete	Assume a Design Sulfate Class DS- 1 and ACEC Class AC-1 (equivalent to Design Chemical Class DC-2 for a 50-year design); however, this will ultimately depend upon the results of testing. Pyritic strata of the Bognor Sand and London Clay Formation may require a higher DS and ACEC class.
Water Supply Pipework	Likely, based on existing data, to be standard pipework but confirmation should be sought from the water supply company, following completion of intrusive works.
Remediation	<p>Significant, pervasive contamination is not anticipated (historical landfill noted as “inert”) and more likely to be in the form of ‘hotspots’ (if present). If so, localised hotspot removal will be required. This material may be able to be treated and reused on site, or will need to be disposed of off-site.</p> <p>Any Asbestos Containing Materials encountered will need to be disposed of off-site.</p> <p>A Materials Management Plan will be required for the earthworks.</p>
Protection from Ground Gases	<p>Radon protective measures are unlikely to be required.</p> <p>The requirement for ground gas protection measures will be confirmed following the ground investigation, installation of boreholes and gas monitoring programme</p>
Waste Disposal	<p>Topsoil is potentially classified as non-hazardous waste. However, this is dependent upon the organic matter in the soil and if >6% organics could be classified as hazardous waste if disposed.</p> <p>Made Ground soils will need to be tested to determine waste classification.</p> <p>Natural uncontaminated soils are likely to be suitable to be disposed of at an inert landfill.</p>



6 Recommendations for Further Work

6.1 Ground Investigation Objectives

In order to confirm the actual risks to receptors and confirm the ground conditions with respect to potential geotechnical and geo-environmental risks, an appropriate intrusive investigation will need to be undertaken. This investigation will need to:

- determine the depth and distribution of Made Ground and natural strata across the site;
- determine the soil strength/density profile beneath the site;
- determine the depth/level of groundwater beneath the site;
- determine the ground gas concentrations beneath the site;
- determine CBRs to inform pavement design;
- assess trench stability, over break potential and 'dig-ability';
- allow soil infiltration rate testing;
- allow sampling for chemical and geotechnical laboratory testing;
- allow soil classification to allow geotechnical characterisation and determine suitability for reuse of soils within earthworks;
- obtain information in terms of Aggressive Chemical Environment for Concrete Class (ACEC Class).

Provision of a detailed UXO risk assessment is recommended prior to any intrusive investigation works.

Following investigation, assessment will be required to:

- update the Ground Model;
- update the Geotechnical Risk Register;
- provide Geotechnical Design recommendations;
- update the Conceptual Site Model (CSM), including identification of plausible pollution linkages;
- undertake generic quantitative risk assessment of potential chemical contaminants to establish 'suitability for use' under the current planning regime;
- discuss potential environmental liabilities associated with land contamination (soil, water and gas); and
- provide outline mitigation recommendations to ensure the site is 'suitable for use'.

6.2 Geotechnical conclusions

The following plausible geotechnical risks are identified.

- Variable Made Ground - settlement or differential settlement of foundations, floor slabs, roads and infrastructure elements.
- Low strength, compressible ground – risk of shear failure and excessive settlement of foundations, roads and infrastructure elements.
- Shrinkage/swelling of clay – settlement/heave of foundations, especially where located within the influence of trees and vegetation.



- Variable lateral and vertical changes in ground conditions – underlying geology may be variable in depth and composition and pose design implications.
- Attack of buried concrete by aggressive ground conditions – the development site may contain Made Ground and potentially sulfate bearing soils.
- Shallow groundwater – surface watercourses are present on the site's southern and eastern boundaries and the site is recorded to be at a moderate to high risk of groundwater flooding. The groundwater conditions are likely to fluctuate seasonally.
- Running sands, loose Made Ground and shallow groundwater, leading to difficulty with excavation due to trench instability.
- Instability of slopes and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Potential for obstructions and the risk of instability of excavations with the impact on construction staff, vehicles and plant operators.
- Earthworks – Low bearing capacity or settlement of new fill and impact on foundations, floor slabs, roads and infrastructure and construction plant.
- Potential for unforeseen ground conditions and the risks associated with limited data.

These plausible risks require further investigation and assessment.

6.3 Geoenvironmental conclusions

Based on historical and current land uses it is considered that it is unlikely that the site would be classified as Contaminated Land under Part 2A of the EPA 1990.

The overall risk from land contamination at the site is considered to be low with some specific moderate and potentially high risks for the current development. The site is largely Greenfield historically; however, historical landfills and current earthworks / construction works indicate contamination may exist. This would need to be confirmed by appropriate intrusive investigation, testing and assessment of the results of the investigation.

The possible pollutant linkages (for risk levels of moderate or greater) on an unremediated redeveloped site, as determined by the desk study and walk-over, are summarised in Table 6-1:

Table 6-1: Possible Contaminant Linkages (for Risk Levels of Moderate or Greater)

Source(s)	Receptor(s)
Made Ground, associated with historical landfills and current earthworks/ construction works, possibly including elevated concentrations of metals, metalloids, asbestos fibres, Asbestos Containing Materials, PAH and petroleum hydrocarbons (S01).	Site users Neighbours
Ground gases (carbon dioxide and methane) from organic materials in the Made Ground / landfill and Earthworks (S02).	Site Users Neighbours Buildings

These possible pollutant linkages require further investigation and assessment (see recommendations below).



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Phase 1 Desk Study

7 References

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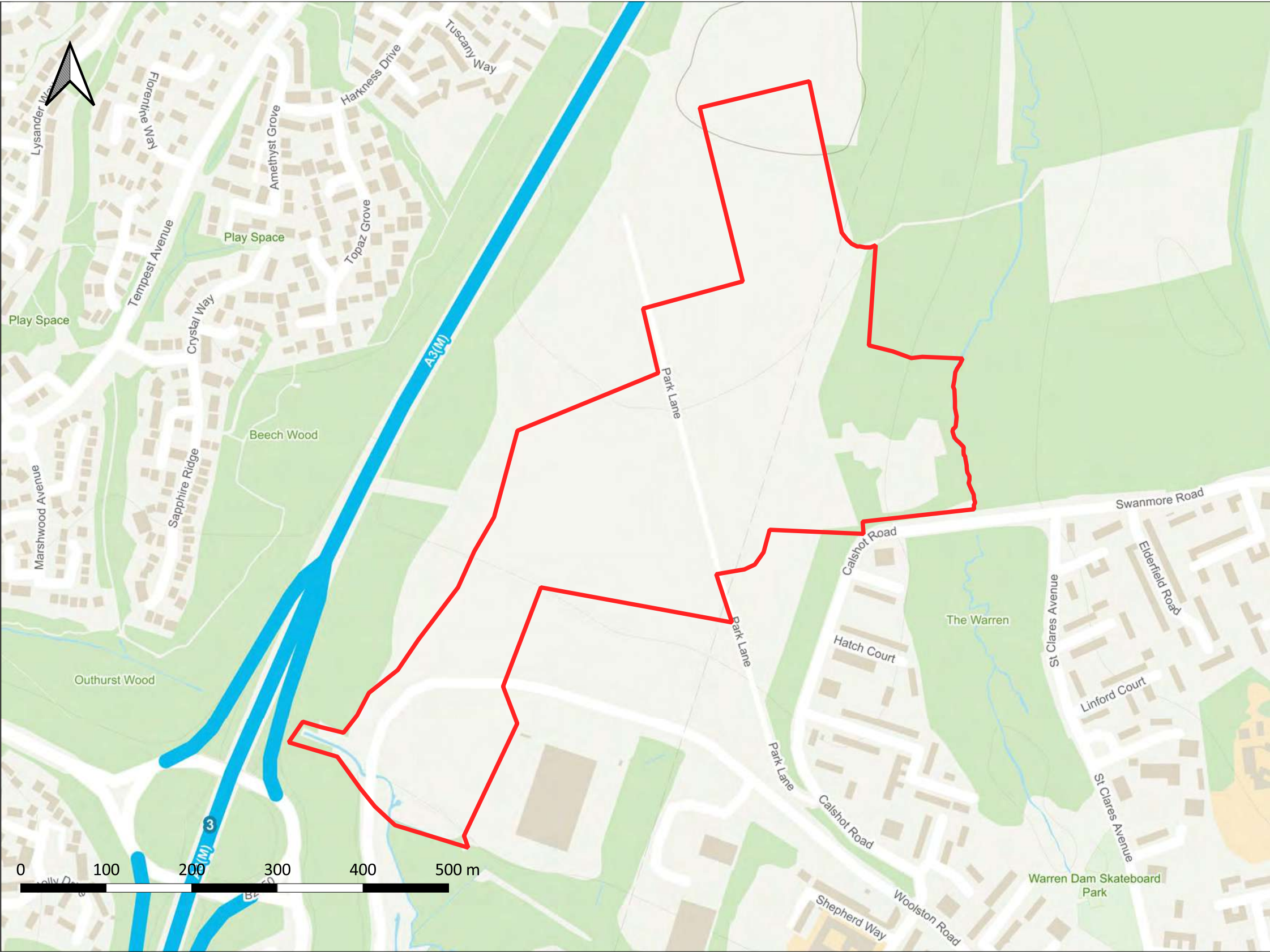
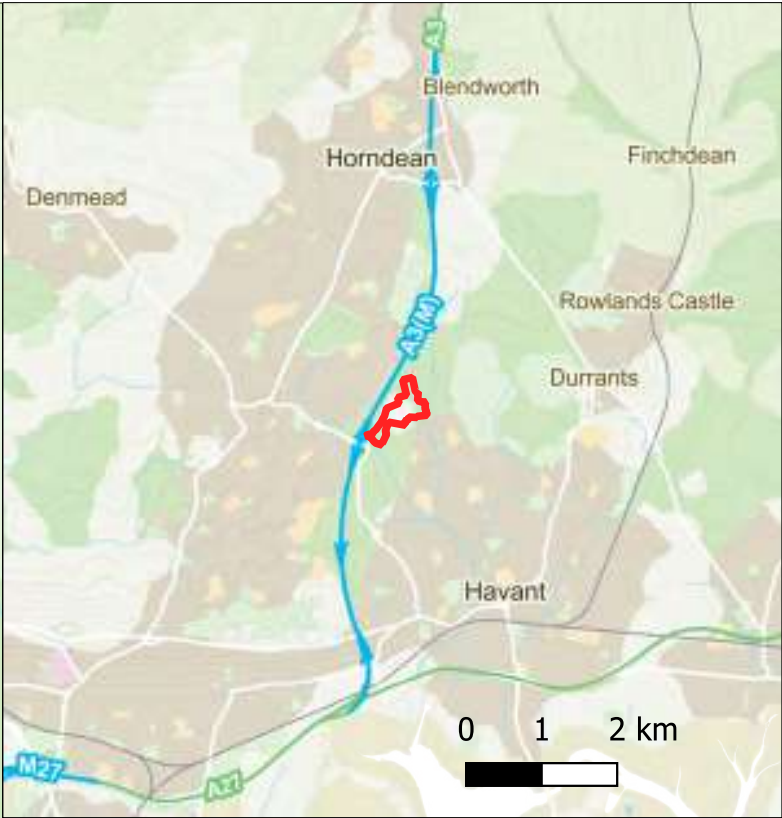


Appendices



Appendix A Drawings





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KEY PLAN		NOTES		REVISIONS		<div>Hydrock</div> <div>White Building 1-4 Cumberland Place Southampton Hampshire SO15 2NP Tel: +44(0)2382140907 www.hydrock.com</div>		TITLE Site Location Plan	
<div><div></div> Site Boundary</div>								HYDROCK PROJECT NO. 19453-GELO	SCALE @ A3 1:1
						CLIENT Portsmouth City Council		PURPOSE OF ISSUE SUITABLE FOR INFORMATION	
						PROJECT DUNSBURY PARK, PORTSMOUTH		DRAWING NO. 19453-HYD-XX-XX-DR-GE-1001	
								STATUS S2	
								REVISION P01	

Appendix B Field reconnaissance photographs





Figure 1: Access to Plot 600 looking N



Figure 2: Burnt vegetation and strong hydrocarbon odour



Figure 3: Looking NE across plot



Figure 4: Looking across plot. Note HV route across plot



Figure 5: Alternative footpath access



Figure 6: Looking N along access track



Figure 7: Looking across plot form northern access route



Figure 8: Gas main marker posts



Figure 9: Abandoned tent



Figure 10: Small brick building in SE corner of site



Figure 11: Inside brick structure



Figure 12: Looking across plot at HV overheads



Figure 13: Looking SW towards Plot 4. Possible water source on site associated with trough

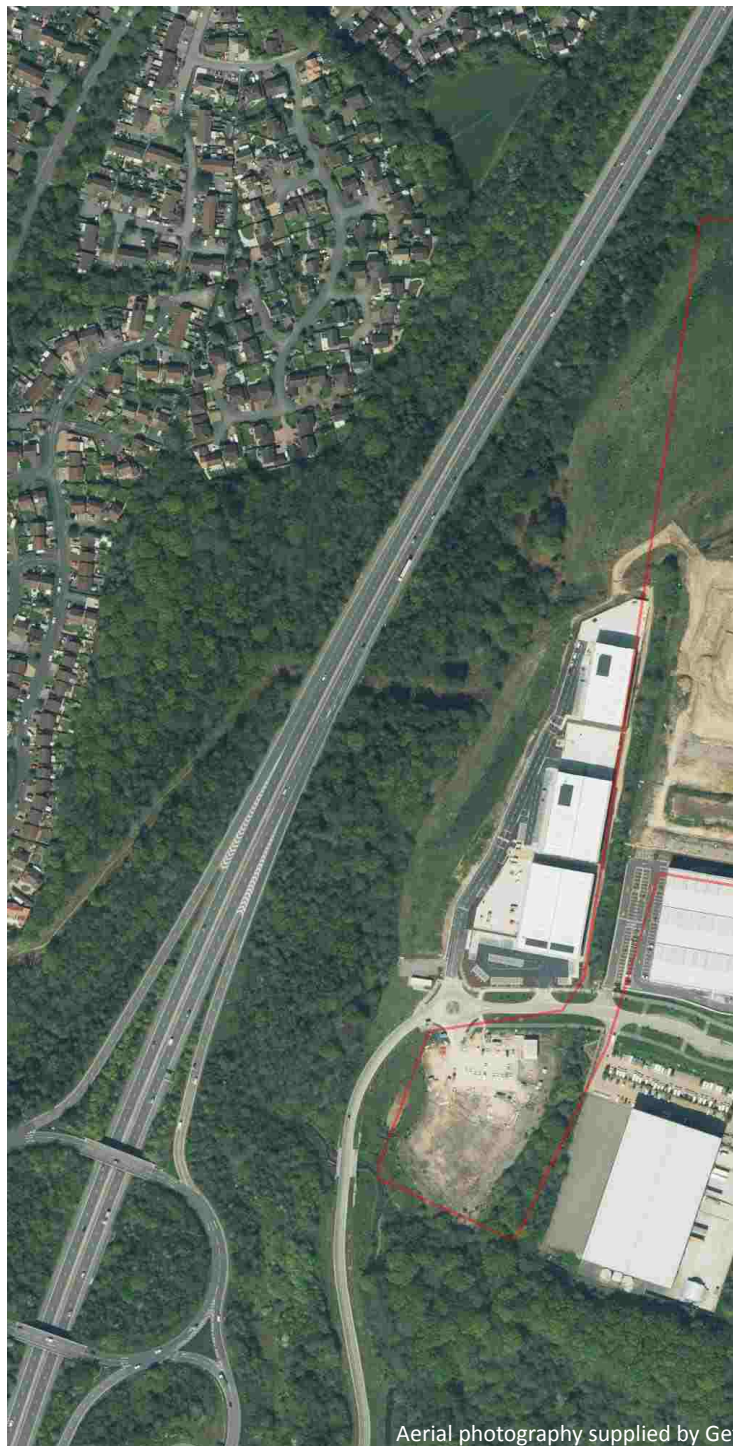


Figure 14: Exit onto Fitzwygram Way

Appendix C Historical Ordnance Survey Maps



Recent aerial photograph



Aerial photography supplied by Geo

Capture Date: 03/05/2023

Site Area: 14.59ha



Recent site history - 2021 aerial photograph



Capture Date: 20/04/2021

Site Area: 14.59ha



Recent site history - 2017 aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2025. All Rights Reserved

Capture Date: 21/06/2017

Site Area: 14.59ha



Recent site history - 2005 aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2025. All Rights Reserved.

Capture Date: 17/04/2005

Site Area: 14.59ha



Recent site history - 1999 aerial photograph



Capture Date: 04/09/1999

Site Area: 14.59ha



Appendix D Desk study research information



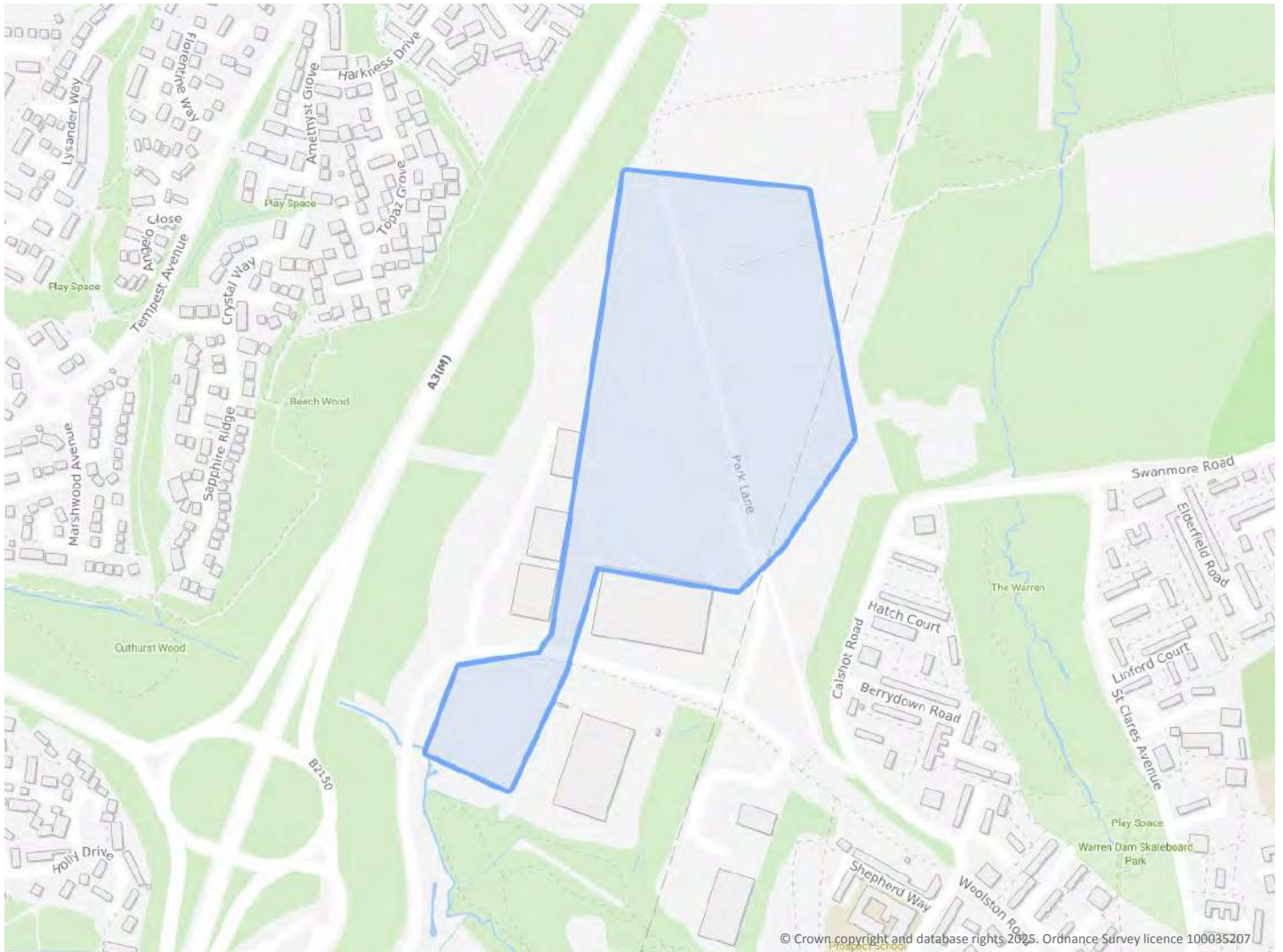
DUNSBURY PARK, FITZWYGRAM WAY, HAVANT, HAMPSHIRE, PO9 4EE

Order Details

Date: 17/09/2025
Your ref: 333701960
Our Ref: GS-U4V-2GK-WES-N1B

Site Details

Location: 470041 109406
Area: 14.59 ha
Authority: [Havant Borough Council](#) ↗



Summary of findings

[p. 2 >](#)

Aerial image

[p. 9 >](#)

OS MasterMap site plan

N/A: >10ha

[Insight User Guide](#) ↗

Contact us with any questions at:

info@groundsure.com ↗

01273 257 755

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
14 >	1.1 >	Historical industrial land uses >	0	1	14	3	-
15 >	1.2 >	Historical tanks >	1	0	0	0	-
16 >	1.3 >	Historical energy features >	0	0	1	6	-
16	1.4	Historical petrol stations	0	0	0	0	-
17	1.5	Historical garages	0	0	0	0	-
17	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped >	On site	0-50m	50-250m	250-500m	500-2000m
18 >	2.1 >	Historical industrial land uses >	0	2	18	4	-
19 >	2.2 >	Historical tanks >	1	0	0	0	-
20 >	2.3 >	Historical energy features >	0	0	3	26	-
21	2.4	Historical petrol stations	0	0	0	0	-
21	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
22	3.1	Active or recent landfill	0	0	0	0	-
22	3.2	Historical landfill (BGS records)	0	0	0	0	-
23	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
23 >	3.4 >	Historical landfill (EA/NRW records) >	1	0	0	0	-
23	3.5	Historical waste sites	0	0	0	0	-
23	3.6	Licensed waste sites	0	0	0	0	-
24 >	3.7 >	Waste exemptions >	0	0	0	1	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
25 >	4.1 >	Recent industrial land uses >	1	2	12	-	-
26 >	4.2 >	National Geographic Database (NGD) - Current or recent tanks >	0	0	2	-	-
27	4.3	Current or recent petrol stations	0	0	0	0	-
27	4.4	Electricity cables	0	0	0	0	-
27	4.5	Gas pipelines	0	0	0	0	-



27	4.6	Sites determined as Contaminated Land	0	0	0	0	-
27	4.7	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
28	4.8	Regulated explosive sites	0	0	0	0	-
28	4.9	Hazardous substance storage/usage	0	0	0	0	-
28	4.10	Historical licensed industrial activities (IPC)	0	0	0	0	-
28	4.11	Licensed industrial activities (Part A(1))	0	0	0	0	-
28	4.12	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-
29	4.13	Radioactive Substance Authorisations	0	0	0	0	-
29 >	4.14 >	<u>Licensed Discharges to controlled waters</u> >	0	0	0	2	-
29	4.15	Pollutant release to surface waters (Red List)	0	0	0	0	-
30	4.16	Pollutant release to public sewer	0	0	0	0	-
30	4.17	List 1 Dangerous Substances	0	0	0	0	-
30	4.18	List 2 Dangerous Substances	0	0	0	0	-
30 >	4.19 >	<u>Pollution Incidents (EA/NRW)</u> >	0	0	1	0	-
31	4.20	Pollution inventory substances	0	0	0	0	-
31	4.21	Pollution inventory waste transfers	0	0	0	0	-
31	4.22	Pollution inventory radioactive waste	0	0	0	0	-
Page	Section	<u>Hydrogeology</u> >	On site	0-50m	50-250m	250-500m	500-2000m
32 >	5.1 >	<u>Superficial aquifer</u> >	Identified (within 500m)				
34 >	5.2 >	<u>Bedrock aquifer</u> >	Identified (within 500m)				
36 >	5.3 >	<u>Groundwater vulnerability</u> >	Identified (within 50m)				
38	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
39	5.5	Groundwater vulnerability- local information	None (within 0m)				
40 >	5.6 >	<u>Groundwater abstractions</u> >	0	0	0	0	19
44 >	5.7 >	<u>Surface water abstractions</u> >	0	0	0	0	1
45	5.8	Potable abstractions	0	0	0	0	0
45	5.9	Source Protection Zones	0	0	0	0	-
45 >	5.10 >	<u>Source Protection Zones (confined aquifer)</u> >	1	0	0	0	-
Page	Section	<u>Hydrology</u> >	On site	0-50m	50-250m	250-500m	500-2000m



46 >	6.1 >	Water Network (OS MasterMap) >	1	4	14	-	-
48 >	6.2 >	Surface water features >	1	2	8	-	-
48 >	6.3 >	WFD Surface water body catchments >	1	-	-	-	-
49 >	6.4 >	WFD Surface water bodies >	0	1	0	-	-
49	6.5	WFD Groundwater bodies	0	-	-	-	-
Page	Section	River and coastal flooding >	On site	0-50m	50-250m	250-500m	500-2000m
50 >	7.1 >	Risk of flooding from rivers and the sea >	High (within 50m)				
51	7.2	Historical Flood Events	0	0	0	-	-
51	7.3	Flood Defences	0	0	0	-	-
51	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
51	7.5	Flood Storage Areas	0	0	0	-	-
52 >	7.6 >	Flood Zone 2 >	Identified (within 50m)				
53 >	7.7 >	Flood Zone 3 >	Identified (within 50m)				
Page	Section	Surface water flooding >					
54 >	8.1 >	Surface water flooding >	1 in 30 year, 0.3m - 1.0m (within 50m)				
Page	Section	Groundwater flooding >					
56 >	9.1 >	Groundwater flooding >	High (within 50m)				
Page	Section	Environmental designations >	On site	0-50m	50-250m	250-500m	500-2000m
57	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
58	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
58	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
58	10.4	Special Protection Areas (SPA)	0	0	0	0	0
58	10.5	National Nature Reserves (NNR)	0	0	0	0	0
59 >	10.6 >	Local Nature Reserves (LNR) >	0	0	0	0	1
59 >	10.7 >	Designated Ancient Woodland >	0	0	1	4	30
61	10.8	Biosphere Reserves	0	0	0	0	0
61	10.9	Forest Parks	0	0	0	0	0
61	10.10	Marine Conservation Zones	0	0	0	0	0
61	10.11	Green Belt	0	0	0	0	0



61	10.12	Proposed Ramsar sites	0	0	0	0	0
62	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
62	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
62	10.15	Nitrate Sensitive Areas	0	0	0	0	0
62 >	10.16 >	Nitrate Vulnerable Zones >	1	0	0	0	1
64 >	10.17 >	SSSI Impact Risk Zones >	1	-	-	-	-
65	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
66	11.1	World Heritage Sites	0	0	0	-	-
66	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
66	11.3	National Parks	0	0	0	-	-
66	11.4	Listed Buildings	0	0	0	-	-
67	11.5	Conservation Areas	0	0	0	-	-
67	11.6	Scheduled Ancient Monuments	0	0	0	-	-
67	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
68 >	12.1 >	Agricultural Land Classification >	Grade 4 (within 250m)				
69 >	12.2 >	Open Access Land >	0	0	1	-	-
69 >	12.3 >	Tree Felling Licences >	1	0	16	-	-
70 >	12.4 >	Environmental Stewardship Schemes >	1	0	0	-	-
70	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations >	On site	0-50m	50-250m	250-500m	500-2000m
71 >	13.1 >	Priority Habitat Inventory >	0	5	31	-	-
73	13.2	Habitat Networks	0	0	0	-	-
73	13.3	Open Mosaic Habitat	0	0	0	-	-
73	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
74 >	14.1 >	10k Availability >	Identified (within 500m)				
76 >	14.2 >	Artificial and made ground (10k) >	0	1	1	1	-

77 >	14.3 >	Superficial geology (10k) >	2	1	1	2	-
78	14.4	Landslip (10k)	0	0	0	0	-
79 >	14.5 >	Bedrock geology (10k) >	3	2	1	3	-
80	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
81 >	15.1 >	50k Availability >	Identified (within 500m)				
82 >	15.2 >	Artificial and made ground (50k) >	0	1	1	1	-
83 >	15.3 >	Artificial ground permeability (50k) >	0	1	-	-	-
84 >	15.4 >	Superficial geology (50k) >	1	0	1	0	-
85 >	15.5 >	Superficial permeability (50k) >	Identified (within 50m)				
85	15.6	Landslip (50k)	0	0	0	0	-
85	15.7	Landslip permeability (50k)	None (within 50m)				
86 >	15.8 >	Bedrock geology (50k) >	2	0	0	0	-
87 >	15.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
87	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes >	On site	0-50m	50-250m	250-500m	500-2000m
88 >	16.1 >	BGS Boreholes >	0	2	18	-	-
Page	Section	Natural ground subsidence >					
90 >	17.1 >	Shrink swell clays >	Low (within 50m)				
92 >	17.2 >	Running sands >	Low (within 50m)				
94 >	17.3 >	Compressible deposits >	Very low (within 50m)				
96 >	17.4 >	Collapsible deposits >	Very low (within 50m)				
97 >	17.5 >	Landslides >	Low (within 50m)				
99 >	17.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				
Page	Section	Mining and ground workings >	On site	0-50m	50-250m	250-500m	500-2000m
101 >	18.1 >	BritPits >	0	0	1	0	-
102 >	18.2 >	Surface ground workings >	9	2	20	-	-
103	18.3	Underground workings	0	0	0	0	0
104	18.4	Underground mining extents	0	0	0	0	-

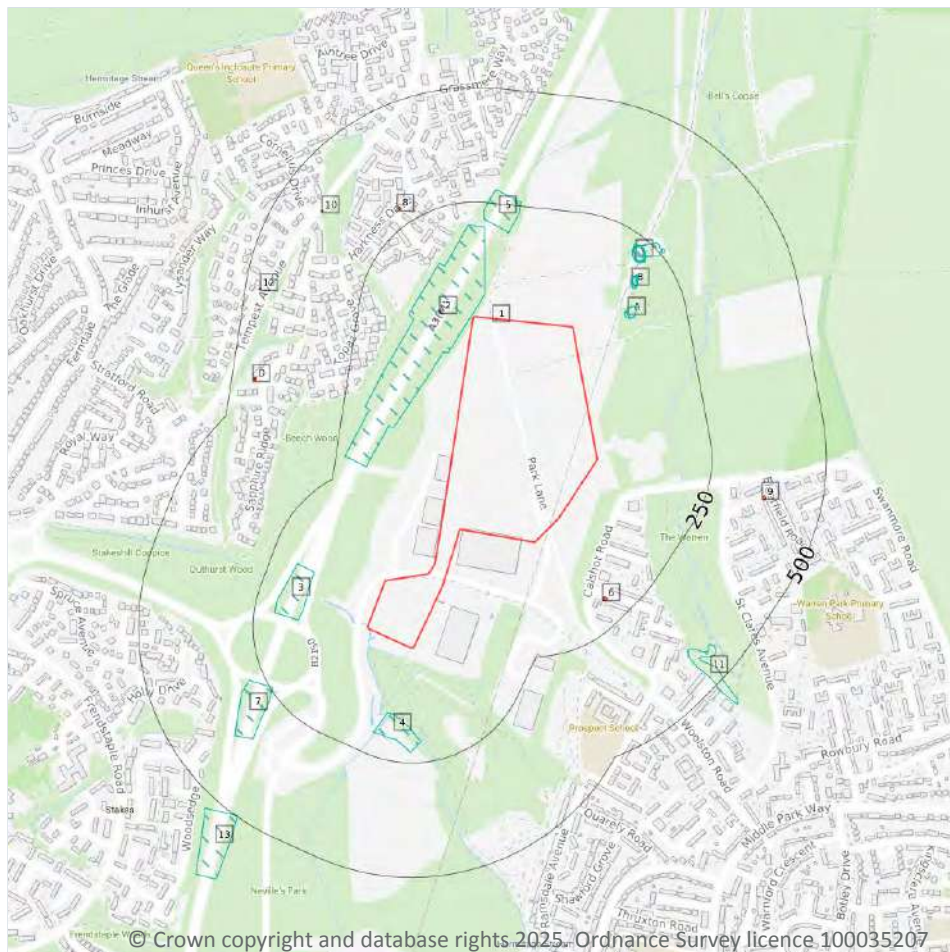


104	18.5	Historical Mineral Planning Areas	0	0	0	0	-
104 >	18.6 >	Non-coal mining >	0	0	1	2	2
105	18.7	JPB mining areas	None (within 0m)				
105	18.8	The Coal Authority non-coal mining	0	0	0	0	-
105	18.9	Researched mining	0	0	0	0	-
106	18.10	Mining record office plans	0	0	0	0	-
106	18.11	BGS mine plans	0	0	0	0	-
106	18.12	Coal mining	None (within 0m)				
106	18.13	Brine areas	None (within 0m)				
106	18.14	Gypsum areas	None (within 0m)				
107	18.15	Tin mining	None (within 0m)				
107	18.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes	On site	0-50m	50-250m	250-500m	500-2000m
108	19.1	Natural cavities	0	0	0	0	-
108	19.2	Mining cavities	0	0	0	0	0
108	19.3	Reported recent incidents	0	0	0	0	-
108	19.4	Historical incidents	0	0	0	0	-
Page	Section	Radon >					
110 >	20.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
112 >	21.1 >	BGS Estimated Background Soil Chemistry >	13	6	-	-	-
113	21.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
113	21.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
114	22.1	Underground railways (London)	0	0	0	-	-
114	22.2	Underground railways (Non-London)	0	0	0	-	-
114	22.3	Railway tunnels	0	0	0	-	-
114	22.4	Historical railway and tunnel features	0	0	0	-	-
114	22.5	Royal Mail tunnels	0	0	0	-	-



115	22.6	Historical railways	0	0	0	-	-
115	22.7	Railways	0	0	0	-	-
115	22.8	Crossrail 2	0	0	0	0	-
115	22.9	HS2	0	0	0	0	-

1 Past land use



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical tanks
- Historical energy features

1.1 Historical industrial land uses

Records within 500m

18

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on [page 14](#) >

ID	Location	Land use	Dates present	Group ID
2	6m NW	Cuttings	1980 - 1991	1934127



ID	Location	Land use	Dates present	Group ID
A	117m E	Unspecified Pit	1942 - 1963	1983603
A	123m E	Unspecified Pit	1933	1937386
3	145m W	Cuttings	1980 - 1991	1928548
4	148m S	Brick and Tile Works	1866	1900935
B	158m NE	Unspecified Pit	1963	1929117
B	162m NE	Unspecified Pit	1933	1973315
B	163m NE	Unspecified Ground Workings	1942	1879936
5	190m N	Cuttings	1991	1885325
C	199m NE	Unspecified Pit	1963	1918603
C	201m NE	Clay Pit	1867	1887163
C	203m NE	Old Clay Pit	1907	1916571
C	203m NE	Old Clay Pit	1895	1918975
C	203m NE	Unspecified Pit	1933 - 1942	1978622
7	246m SW	Cuttings	1980 - 1991	1966032
C	255m NE	Brick Kiln	1867	1909488
11	404m SE	Unspecified Pit	1963	1902185
13	498m SW	Cuttings	1980 - 1991	1965119

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m

1

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on [page 14 >](#)

ID	Location	Land use	Dates present	Group ID
1	On site	Unspecified Tank	1972	326620



This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m

7

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on [page 14 >](#)

ID	Location	Land use	Dates present	Group ID
6	191m SE	Electricity Substation	1971 - 1985	227461
8	284m NW	Electricity Substation	1987 - 1992	223119
9	370m E	Electricity Substation	1971 - 1993	218458
10	402m NW	Gas Governor	1984 - 1992	214352
D	447m W	Electricity Substation	1983 - 1993	233665
D	449m W	Electricity Substation	1989	219766
12	467m W	Electricity Substation	1987 - 1992	215053

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.



1.5 Historical garages

Records within 500m

0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.6 Historical military land

Records within 500m

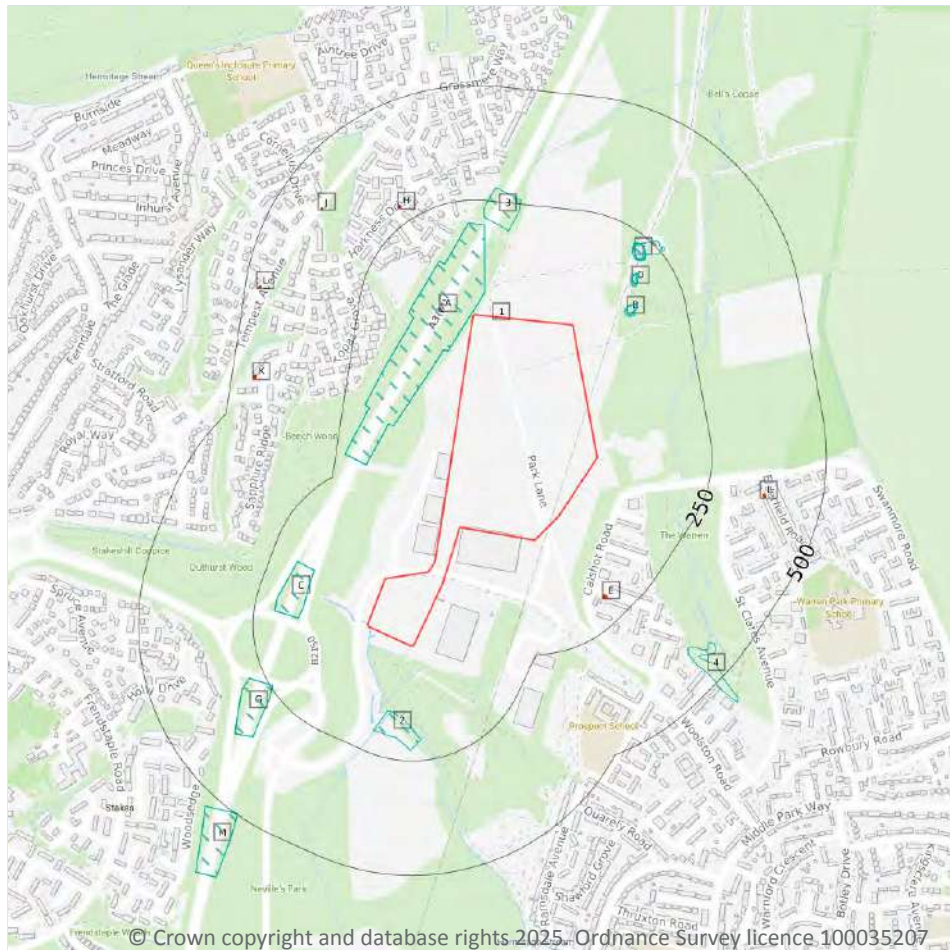
0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.



2 Past land use - un-grouped



- Site Outline
- Search buffers in metres (m)
- Historical industrial land uses
- Historical tanks
- Historical energy features

2.1 Historical industrial land uses

Records within 500m

24

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on [page 18](#) >

ID	Location	Land Use	Date	Group ID
A	6m NW	Cuttings	1991	1934127
A	6m NW	Cuttings	1980	1934127
B	117m E	Unspecified Pit	1963	1983603



ID	Location	Land Use	Date	Group ID
B	122m E	Unspecified Pit	1942	1983603
B	123m E	Unspecified Pit	1933	1937386
C	145m W	Cuttings	1991	1928548
C	145m W	Cuttings	1980	1928548
2	148m S	Brick and Tile Works	1866	1900935
D	158m NE	Unspecified Pit	1963	1929117
D	162m NE	Unspecified Pit	1933	1973315
D	163m NE	Unspecified Ground Workings	1942	1879936
3	190m N	Cuttings	1991	1885325
F	199m NE	Unspecified Pit	1963	1918603
F	201m NE	Clay Pit	1867	1887163
F	203m NE	Unspecified Pit	1933	1978622
F	203m NE	Unspecified Pit	1942	1978622
F	203m NE	Old Clay Pit	1907	1916571
F	203m NE	Old Clay Pit	1895	1918975
G	246m SW	Cuttings	1991	1966032
G	246m SW	Cuttings	1980	1966032
F	255m NE	Brick Kiln	1867	1909488
4	404m SE	Unspecified Pit	1963	1902185
M	498m SW	Cuttings	1991	1965119
M	498m SW	Cuttings	1980	1965119

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m

1

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on [page 18 >](#)



ID	Location	Land Use	Date	Group ID
1	On site	Unspecified Tank	1972	326620

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	29
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Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on [page 18 >](#)

ID	Location	Land Use	Date	Group ID
E	191m SE	Electricity Substation	1972	227461
E	192m SE	Electricity Substation	1971	227461
E	192m SE	Electricity Substation	1985	227461
H	284m NW	Electricity Substation	1992	223119
H	285m NW	Electricity Substation	1987	223119
H	285m NW	Electricity Substation	1988	223119
H	285m NW	Electricity Substation	1989	223119
I	370m E	Electricity Substation	1971	218458
I	370m E	Electricity Substation	1972	218458
I	370m E	Electricity Substation	1993	218458
I	371m E	Electricity Substation	1985	218458
J	402m NW	Gas Governor	1992	214352
J	403m NW	Gas Governor	1984	214352
J	403m NW	Gas Governor	1987	214352
J	403m NW	Gas Governor	1988	214352
J	403m NW	Gas Governor	1989	214352
K	447m W	Electricity Substation	1984	233665
K	447m W	Electricity Substation	1987	233665
K	447m W	Electricity Substation	1988	233665



ID	Location	Land Use	Date	Group ID
K	447m W	Electricity Substation	1989	233665
K	447m W	Electricity Substation	1992	233665
K	449m W	Electricity Substation	1993	233665
K	449m W	Electricity Substation	1983	233665
K	449m W	Electricity Substation	1987	233665
K	449m W	Electricity Substation	1989	219766
L	467m W	Electricity Substation	1987	215053
L	467m W	Electricity Substation	1988	215053
L	467m W	Electricity Substation	1989	215053
L	467m W	Electricity Substation	1992	215053

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m

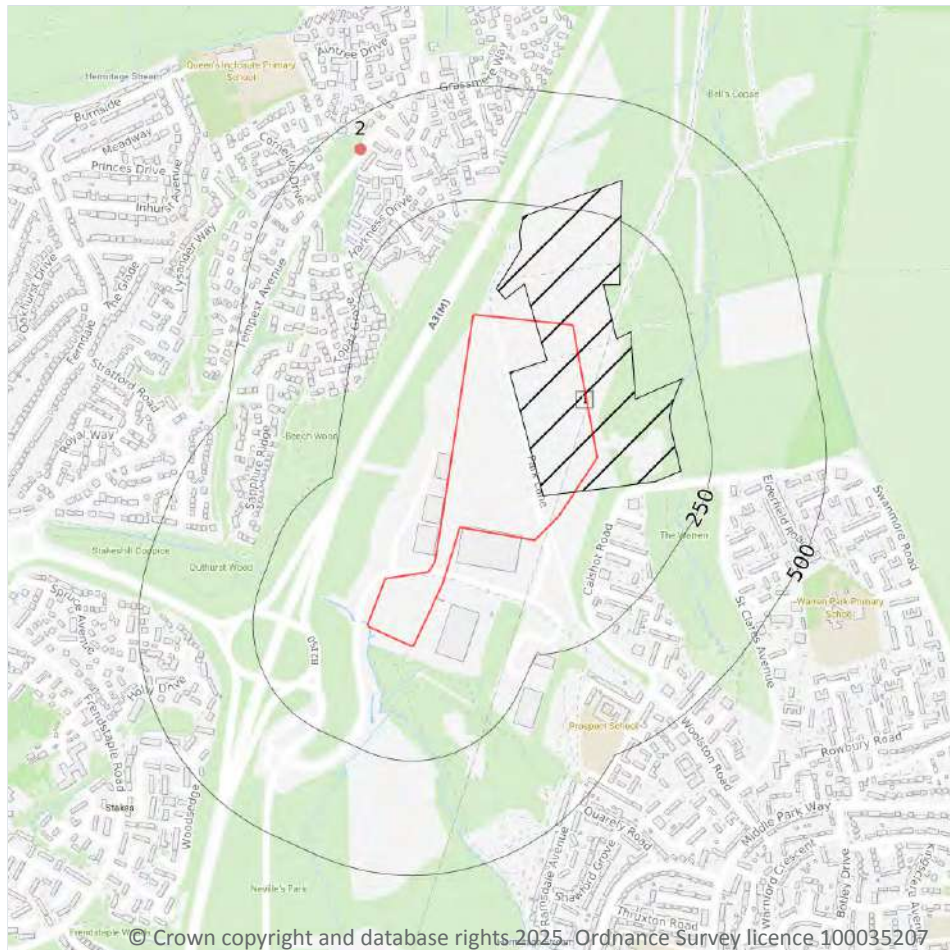
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Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.



3 Waste and landfill



- Site Outline
- Search buffers in metres (m)
- Historical landfill (EA/NRW)
- Waste exemptions

3.1 Active or recent landfill

Records within 500m

0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m

0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.



3.3 Historical landfill (LA/mapping records)

Records within 500m

0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m

1

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on [page 22 >](#)

ID	Location	Details		
1	On site	Site Address: Dunsbury Hill Farm, Cowplain, Hampshire Licence Holder Address: Haredon House, London Road, North Cheam, Sutton, Surrey	Waste Licence: Yes Site Reference: 13/3, FHA17 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: - Licence Holder: Gleeson Civil Engineering Limited First Recorded - Last Recorded: -

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m

0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m

0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.



3.7 Waste exemptions

Records within 500m

1

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

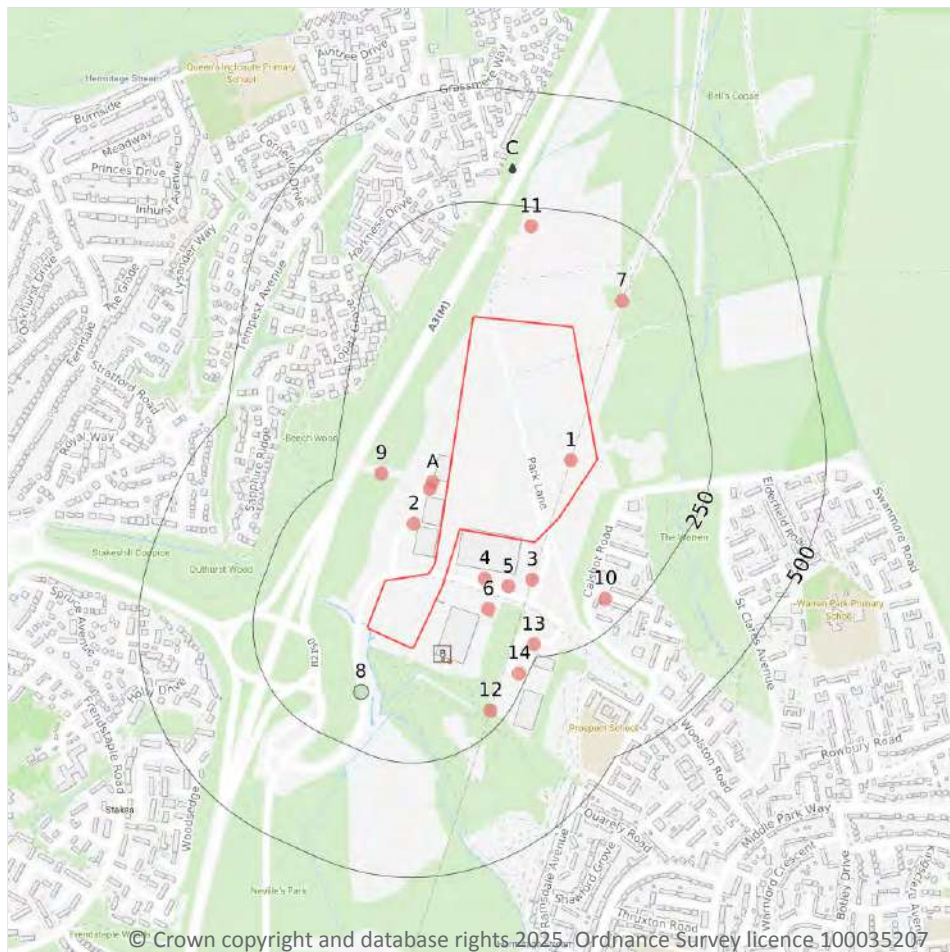
Features are displayed on the Waste and landfill map on [page 22 >](#)

ID	Location	Site	Reference	Category	Sub-Category	Description
2	439m NW	-	WEX039750	Using waste exemption	Not on a farm	Use of waste in construction

This data is sourced from the Environment Agency and Natural Resources Wales.



4 Current industrial land use



- Site Outline
- Search buffers in metres (m)
- Recent industrial land uses
- NGD current or recent tanks
- Licensed Discharges to controlled waters
- Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m

15

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on [page 25 >](#)

ID	Location	Company	Address	Activity	Category
1	On site	Pylon	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
A	33m W	Electricity Pole	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
A	38m W	Electricity Sub Station	Hampshire, PO9	Electrical Features	Infrastructure and Facilities



ID	Location	Company	Address	Activity	Category
2	60m W	Electricity Sub Station	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
3	82m S	Pylon	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
4	84m E	Electricity Sub Stations	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
5	105m S	Gas Governor	Hampshire, PO9	Gas Features	Infrastructure and Facilities
6	112m SE	Electricity Sub Station	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
7	122m NE	Pylon	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
9	146m W	Electricity Poles	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
10	195m SE	Electricity Sub Station	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
11	209m N	Mast (Telecommunication)	Hampshire, PO9	Telecommunications Features	Infrastructure and Facilities
12	217m SE	Pylon	Hampshire, PO9	Electrical Features	Infrastructure and Facilities
13	223m S	Gas Governor	Hampshire, PO9	Gas Features	Infrastructure and Facilities
14	232m SE	Electricity Sub Station	Hampshire, PO9	Electrical Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 National Geographic Database (NGD) - Current or recent tanks

Records within 250m	2
----------------------------	----------

Current or recent tanks identified from the Ordnance Survey NGD.

Features are displayed on the Current industrial land use map on [page 25 >](#)

ID	Location	Tank description	Activity	Date first identified
B	65m SE	Roofed Storage Tank	Commercial Activity: Distribution Or Storage	09/03/2017
B	81m SE	Roofed Storage Tank	Commercial Activity: Distribution Or Storage	09/03/2017



This data is sourced from Ordnance Survey.

4.3 Current or recent petrol stations

Records within 500m	0
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Open, closed, under development and obsolete petrol stations.

This data is sourced from Experian.

4.4 Electricity cables

Records within 500m	0
---------------------	---

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.5 Gas pipelines

Records within 500m	0
---------------------	---

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.6 Sites determined as Contaminated Land

Records within 500m	0
---------------------	---

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.7 Control of Major Accident Hazards (COMAH)

Records within 500m	0
---------------------	---

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.



4.8 Regulated explosive sites

Records within 500m

0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.9 Hazardous substance storage/usage

Records within 500m

0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.10 Historical licensed industrial activities (IPC)

Records within 500m

0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed industrial activities (Part A(1))

Records within 500m

0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.12 Licensed pollutant release (Part A(2)/B)

Records within 500m

0

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from Local Authority records.



4.13 Radioactive Substance Authorisations

Records within 500m

0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Licensed Discharges to controlled waters

Records within 500m

2

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on [page 25 >](#)

ID	Location	Address	Details	
C	330m N	RAMBLERS WAY WATERLOOVILLE CEO, RAMBLERS WAY WATERLOOVILLE CEO, RAMBLERS WAY, WATERLOOVILLE, HAMPSHIRE, PO7 8RE	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: A01276 Permit Version: 1 Receiving Water: UNNAMED TRIB OF R. WALLINGTON	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 28/05/2007 Effective Date: 28/05/2007 Revocation Date: -
C	330m N	RAMBLERS WAY WATERLOOVILLE CEO, RAMBLERS WAY WATERLOOVILLE CEO, RAMBLERS WAY, WATERLOOVILLE, HAMPSHIRE, PO7 8RE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: A01276 Permit Version: 1 Receiving Water: UNNAMED TRIB OF R. WALLINGTON	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 28/05/2007 Effective Date: 28/05/2007 Revocation Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to surface waters (Red List)

Records within 500m

0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.



4.16 Pollutant release to public sewer

Records within 500m**0**

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 1 Dangerous Substances

Records within 500m**0**

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 List 2 Dangerous Substances

Records within 500m**0**

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution Incidents (EA/NRW)

Records within 500m**1**

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on [page 25 >](#)

ID	Location	Details	
8	132m SW	Incident Date: 01/03/2004 Incident Identification: 219859 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 2 (Significant) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.20 Pollution inventory substances

Records within 500m

0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.21 Pollution inventory waste transfers

Records within 500m

0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.22 Pollution inventory radioactive waste

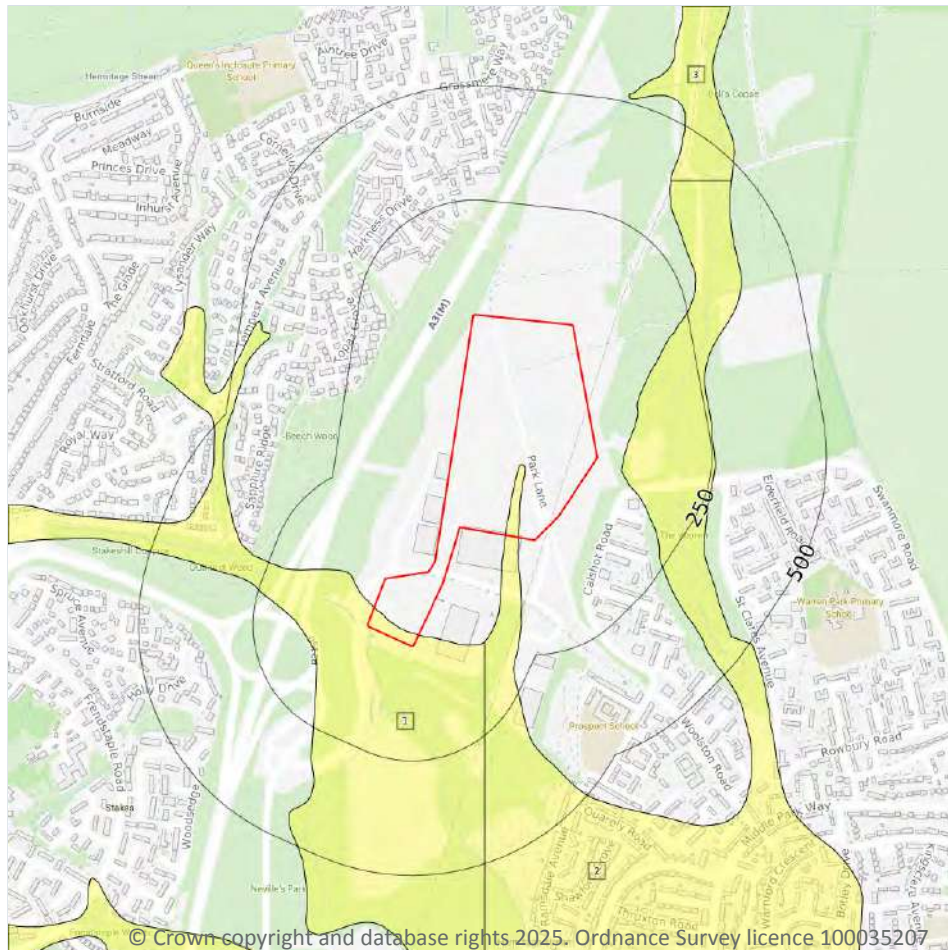
Records within 500m

0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



- Site Outline
- Search buffers in metres (m)
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive
 - Unknown

5.1 Superficial aquifer

Records within 500m

3

Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on [page 32](#) >

ID	Location	Designation	Description
1	On site	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	On site	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

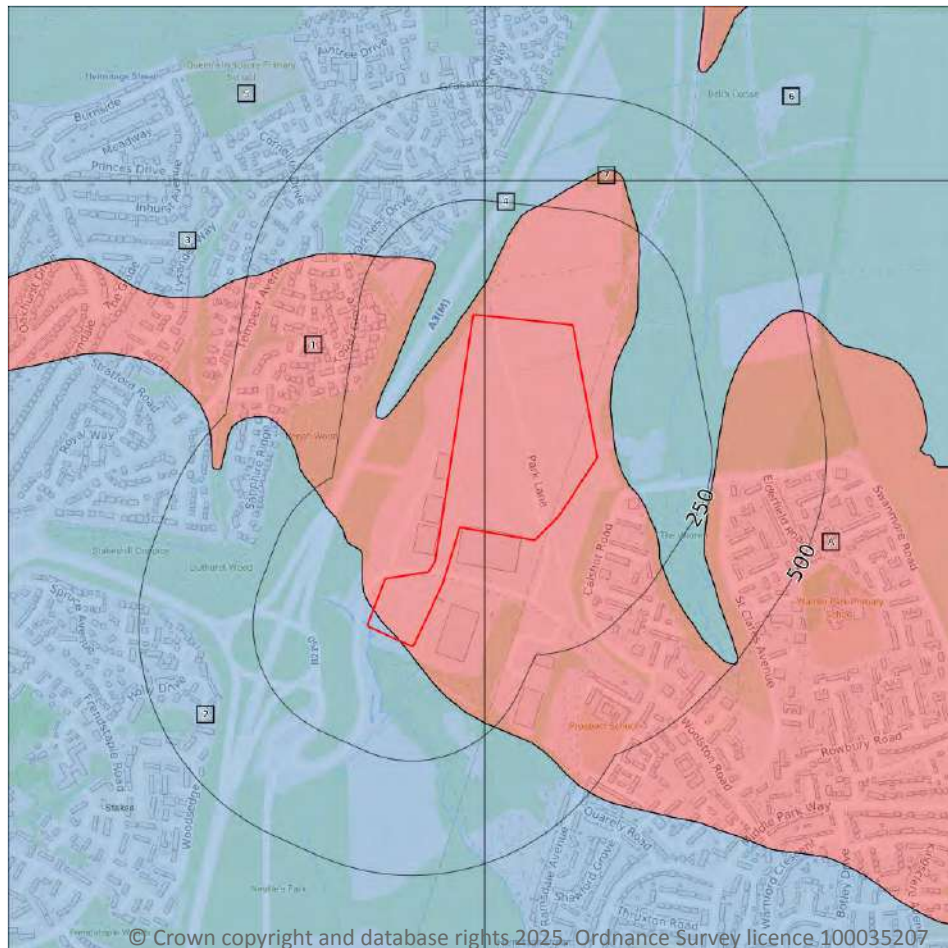


ID	Location	Designation	Description
3	382m NE	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.



Bedrock aquifer



- Site Outline
- Search buffers in metres (m)
- Principal
 - Secondary A
 - Secondary B
 - Secondary Undifferentiated
 - Unproductive

5.2 Bedrock aquifer

Records within 500m

9

Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on [page 34](#) >

ID	Location	Designation	Description
1	On site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	On site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

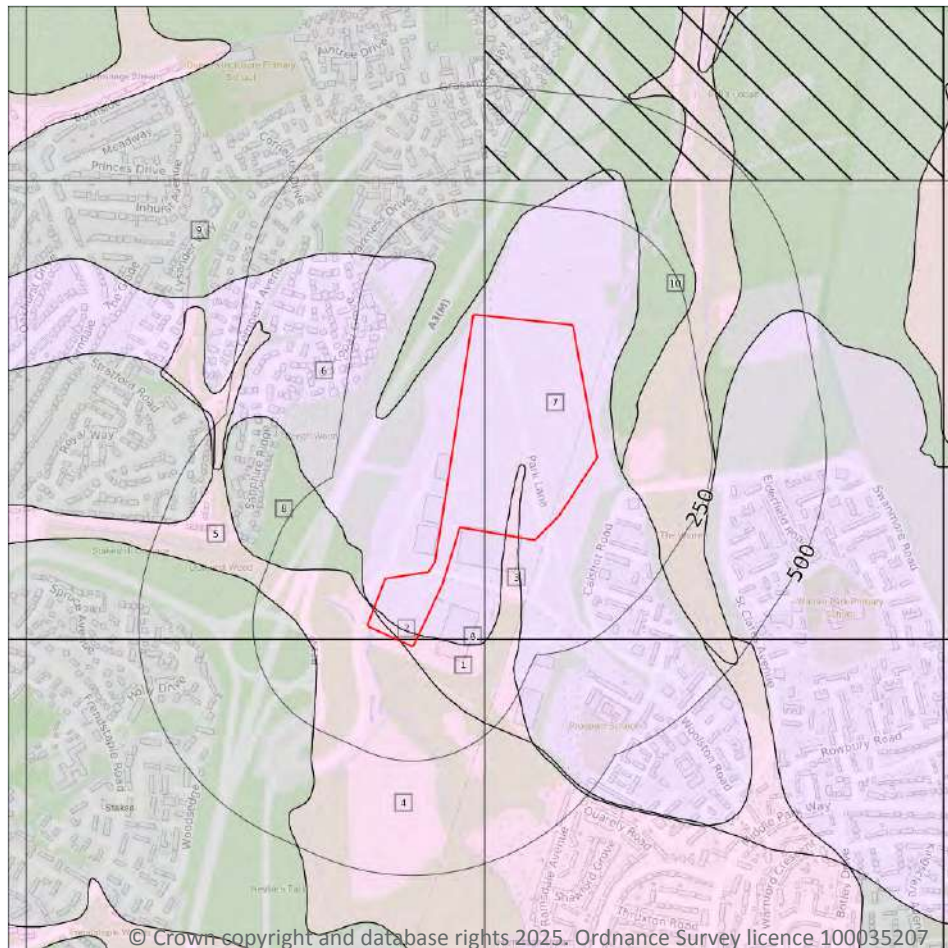
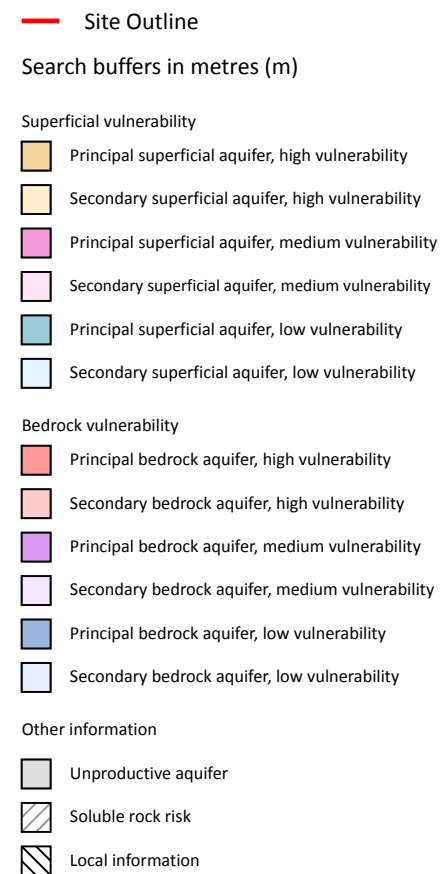


ID	Location	Designation	Description
A	On site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	19m NW	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
A	42m E	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
4	67m N	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
5	293m N	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
6	294m N	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
7	316m N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.



Groundwater vulnerability



5.3 Groundwater vulnerability

Records within 50m

11

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on [page 36](#) >



ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed
2	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed
3	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed
4	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
5	On site	Summary Classification: Secondary superficial aquifer - Medium Vulnerability Combined classification: Unproductive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: Medium Aquifer type: Secondary Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
6	On site	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed



ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
7	On site	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed
8	18m W	Summary Classification: Unproductive aquifer (may have productive aquifer beneath) Combined classification: Unproductive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
9	19m NW	Summary Classification: Unproductive aquifer (may have productive aquifer beneath) Combined classification: Unproductive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
10	42m E	Summary Classification: Unproductive aquifer (may have productive aquifer beneath) Combined classification: Unproductive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Unproductive Aquifer type: Unproductive Flow mechanism: Mixed
A	45m SE	Summary Classification: Secondary bedrock aquifer - Medium Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: 40- 70% Dilution value: 300- 550mm/year	Vulnerability: - Aquifer type: - Thickness: <3m Patchiness value: <90% Recharge potential: No Data	Vulnerability: Medium Aquifer type: Secondary Flow mechanism: Mixed

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site

0

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.



5.5 Groundwater vulnerability- local information

Records on site

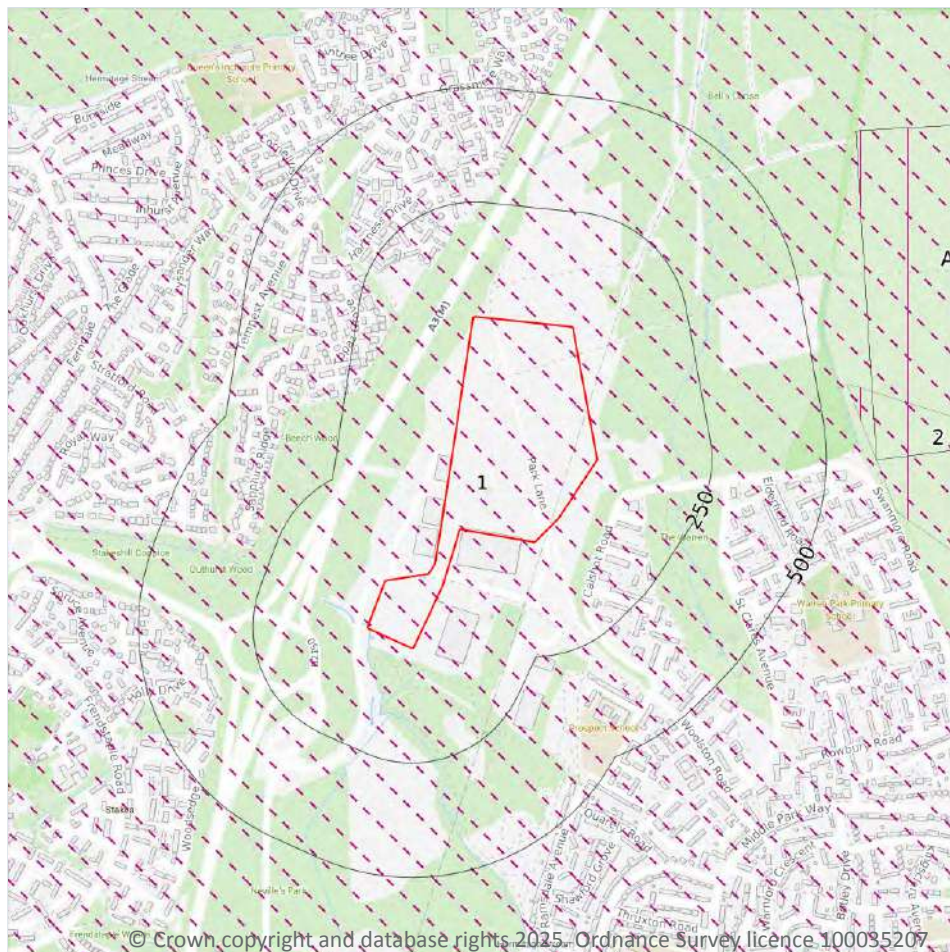
0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk ↗.

This data is sourced from the British Geological Survey and the Environment Agency.



Abstractions and Source Protection Zones



- Site Outline
- Search buffers in metres (m)
- Source Protection Zone 1
Inner catchment
- Source Protection Zone 2
Outer catchment
- Source Protection Zone 3
Total catchment
- Source Protection Zone 4
Zone of Special Interest
- Source Protection Zone 1c
Inner catchment - confined aquifer
- Source Protection Zone 2c
Outer catchment - confined aquifer
- Source Protection Zone 3c
Total catchment - confined aquifer
- Drinking water abstraction licences
Polygon features
- Drinking water abstraction licences
Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m

19

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on [page 40 >](#)

ID	Location	Details	
2	565m E	Status: Active Licence No: SO/042/0028/023 Details: Dewatering Direct Source: Southern Region Groundwater Point: RED ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 470789 Northing: 109561	Annual Volume (m ³): 67031 Max Daily Volume (m ³): 184 Original Application No: NPS/WR/041028 Original Start Date: 04/07/2024 Expiry Date: 31/12/2029 Issue No: 1 Version Start Date: 04/07/2024 Version End Date: -
A	608m E	Status: Historical Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.1 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 470809 Northing: 110112	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
A	608m E	Status: Historical Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.1 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 470809 Northing: 110112	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
A	608m E	Status: Historical Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.1 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 470809 Northing: 110112	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	935m E	Status: Active Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: BLUE ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471161 Northing: 109583	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -



ID	Location	Details	
-	935m E	Status: Active Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: BLUE ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471161 Northing: 109583	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	935m E	Status: Active Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: BLUE ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471161 Northing: 109583	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	982m E	Status: Active Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: RED ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471085 Northing: 110300	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	982m E	Status: Active Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: RED ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471085 Northing: 110300	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	982m E	Status: Active Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: RED ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471085 Northing: 110300	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -



ID	Location	Details	
-	988m E	Status: Historical Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.2 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471053 Northing: 110361	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	988m E	Status: Historical Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.2 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471053 Northing: 110361	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	988m E	Status: Historical Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: ABSTRACTION AREA 2.2 Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471053 Northing: 110361	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	1103m E	Status: Historical Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: ABSTRACTION REACH Data Type: Line Name: Future Water MJJV Ltd Easting: 471343 Northing: 109504	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	1103m E	Status: Historical Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: ABSTRACTION REACH Data Type: Line Name: Future Water MJJV Ltd Easting: 471343 Northing: 109504	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -



ID	Location	Details	
-	1103m E	Status: Historical Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: ABSTRACTION REACH Data Type: Line Name: Future Water MJJV Ltd Easting: 471343 Northing: 109504	Annual Volume (m ³): 418077 Max Daily Volume (m ³): 1267 Original Application No: NPS/WR/038078 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 1 Version Start Date: 13/12/2023 Version End Date: -
-	1182m E	Status: Active Licence No: SO/042/0028/021 Details: Dust Suppression Direct Source: Southern Region Groundwater Point: GREEN ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471384 Northing: 109736	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	1182m E	Status: Active Licence No: SO/042/0028/021 Details: Process Water Direct Source: Southern Region Groundwater Point: GREEN ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471384 Northing: 109736	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -
-	1182m E	Status: Active Licence No: SO/042/0028/021 Details: Dewatering Direct Source: Southern Region Groundwater Point: GREEN ABSTRACTION AREA Data Type: Poly4 Name: Future Water MJJV Ltd Easting: 471384 Northing: 109736	Annual Volume (m ³): 471051 Max Daily Volume (m ³): 1295 Original Application No: NPS/WR/041104 Original Start Date: 13/12/2023 Expiry Date: 31/12/2028 Issue No: 2 Version Start Date: 04/07/2024 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m

1

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on [page 40 >](#)



ID	Location	Details	
-	1710m NE	Status: Historical Licence No: 11/42/36.1/3CA Details: Spray Irrigation - Direct Direct Source: Southern Region Surface Waters Point: BLENDWORTH COMMON RESERVOIR AT PADNELL FARM Data Type: Point Name: Borrow Investments Ltd Easting: 471000 Northing: 111190	Annual Volume (m ³): 15456 Max Daily Volume (m ³): 1000.1 Original Application No: - Original Start Date: 03/07/1978 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2016 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	0
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Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	0
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Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.10 Source Protection Zones (confined aquifer)

Records within 500m	1
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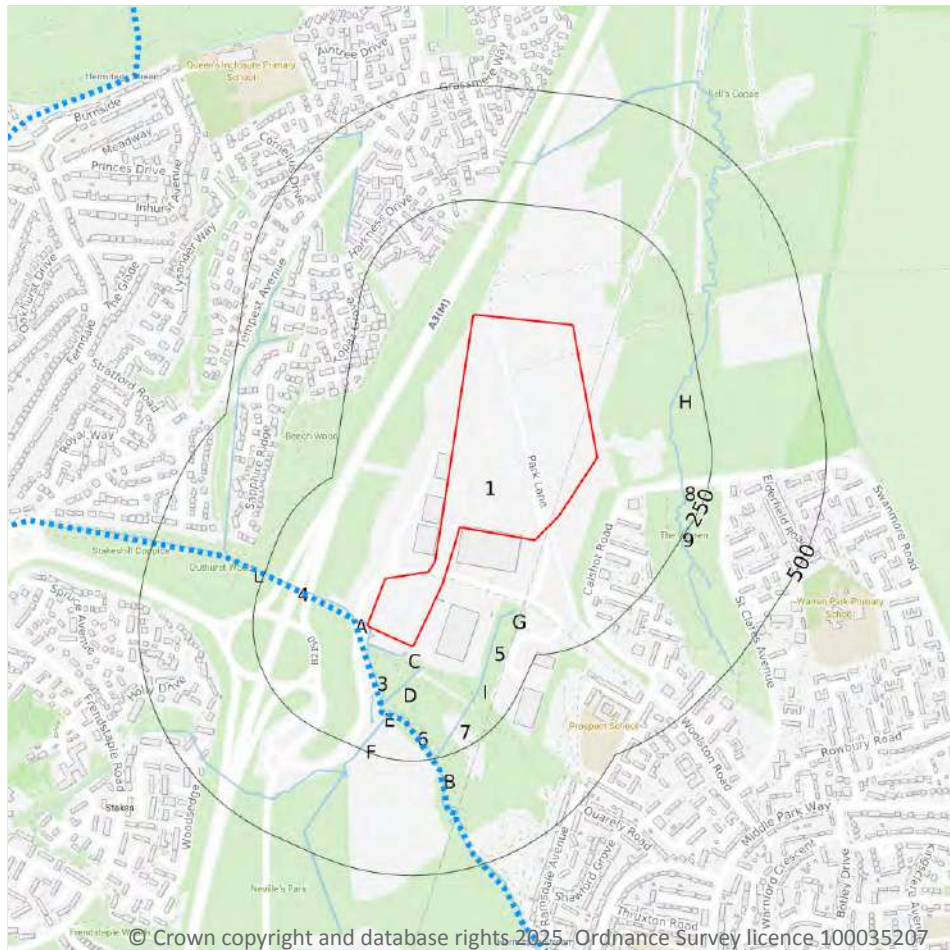
Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

Features are displayed on the Abstractions and Source Protection Zones map on [page 40 >](#)

ID	Location	Type	Description
1	On site	1c	Inner catchment within confined aquifer

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



- Site Outline
- Search buffers in metres (m)
- Water Network (OS MasterMap)
- Surface water features (wider than 5m)
- Surface water features (narrower than 5m)
- ⋯ WFD River, canal and surface water transfer water bodies
- WFD Lake water bodies
- WFD Transitional and coastal water bodies
- WFD Surface water body catchments boundaries
- WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m

19

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on [page 46 >](#)

ID	Location	Type of water feature	Ground level	Permanence	Name
A	On site	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream



ID	Location	Type of water feature	Ground level	Permanence	Name
C	17m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	19m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	32m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
3	35m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream
D	53m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
4	112m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream
5	145m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	146m SW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream
6	149m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream
F	149m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
G	150m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
H	164m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
I	166m SE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-



ID	Location	Type of water feature	Ground level	Permanence	Name
7	173m SE	Inland river not influenced by normal tidal action.	Not provided	Watercourse contains water year round (in normal circumstances)	-
8	190m E	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	-
9	202m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
L	241m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream
B	248m S	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	Hermitage Stream

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	11
----------------------------	-----------

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on [page 46 >](#)

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1
------------------------	----------

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on [page 46 >](#)

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
1	On site	River	Hermitage Stream	GB107042016370	East Hampshire Rivers	East Hampshire



This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified

1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on [page 46](#) >

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
2	25m W	River	Hermitage Stream	GB107042016370 ↗	Moderate	Fail	Moderate	2019

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

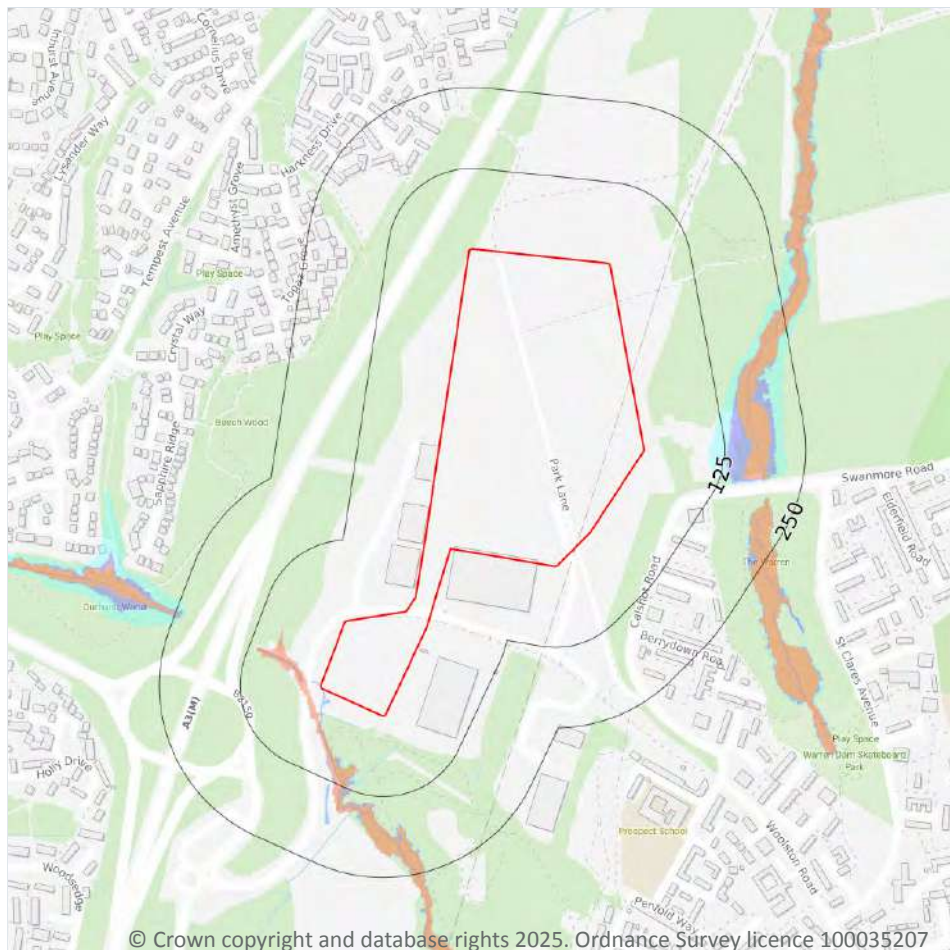
Records on site

0

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding



- Site Outline
- Search buffers in metres (m)
- River and coastal flooding:
- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

7.1 Risk of flooding from rivers and the sea

Records within 50m

10

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

Features are displayed on the River and coastal flooding map on [page 50](#) >



Distance	Flood risk category
On site	N/A
0 - 50m	High

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0
----------------------------	----------

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0
----------------------------	----------

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0
----------------------------	----------

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

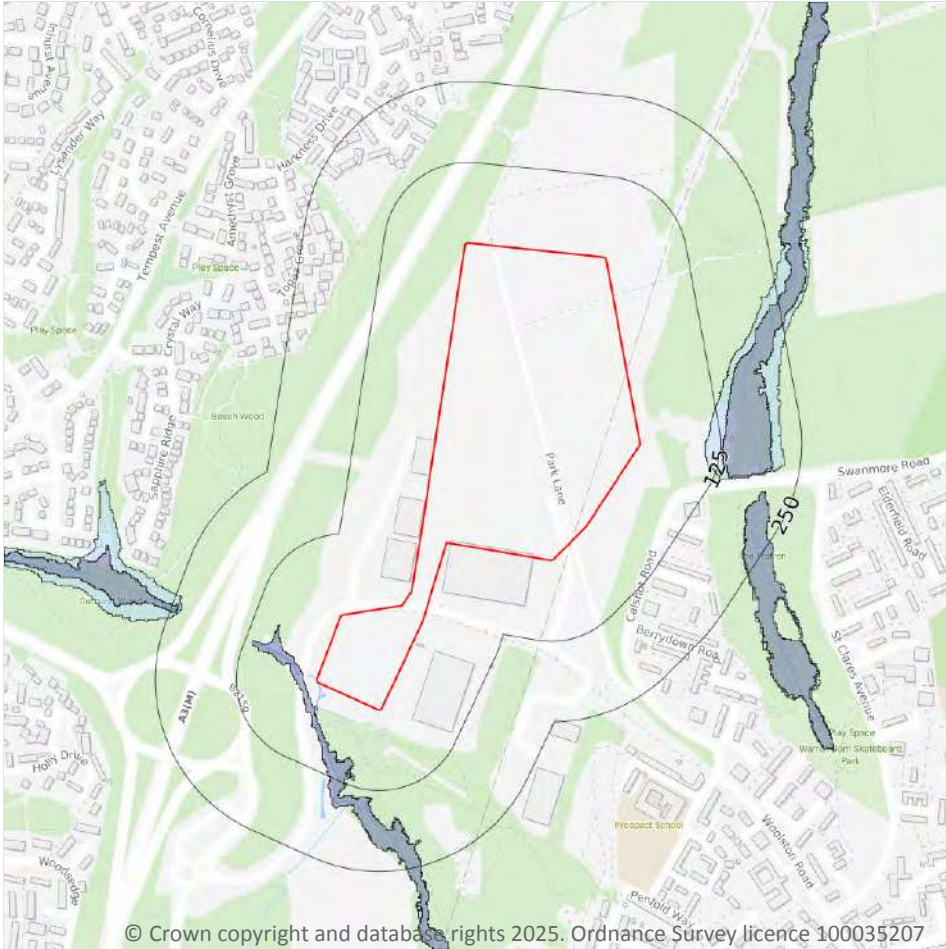
Records within 250m	0
----------------------------	----------

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.



River and coastal flooding - Flood Zones



- Site Outline
- Search buffers in metres (m)
- Flood zone 2
- Flood zone 3

7.6 Flood Zone 2

Records within 50m

1

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

Features are displayed on the River and coastal flooding map on [page 50 >](#)

Location	Type
33m SW	Zone 2 - (Fluvial /Tidal Models)

This data is sourced from the Environment Agency and Natural Resources Wales.



7.7 Flood Zone 3

Records within 50m

1

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

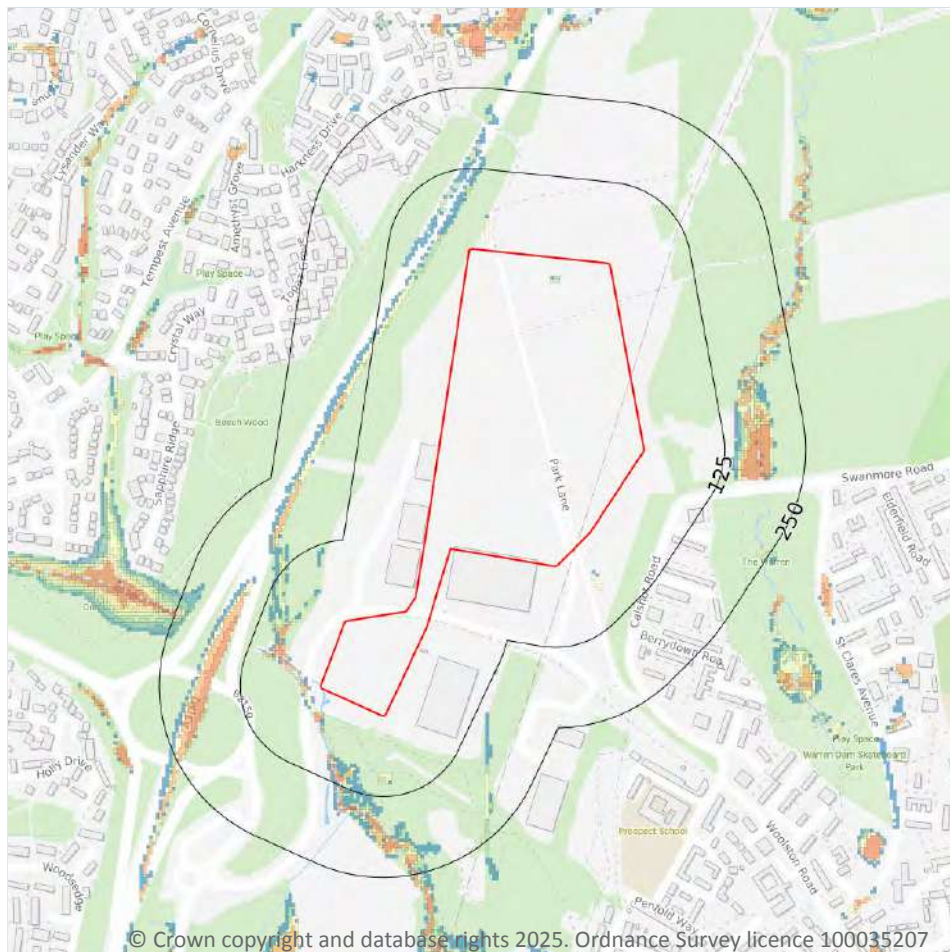
Features are displayed on the River and coastal flooding map on [page 50](#) >

Location	Type
18m W	Zone 3 - (Fluvial /Tidal Models)

This data is sourced from the Environment Agency and Natural Resources Wales.



8 Surface water flooding



— Site Outline

Search buffers in metres (m)

1 in 1000 return period

- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period

- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period

- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period

- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site

1 in 250 year, 0.3m - 1.0m

Highest risk within 50m

1 in 30 year, 0.3m - 1.0m

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on [page 54 >](#)

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

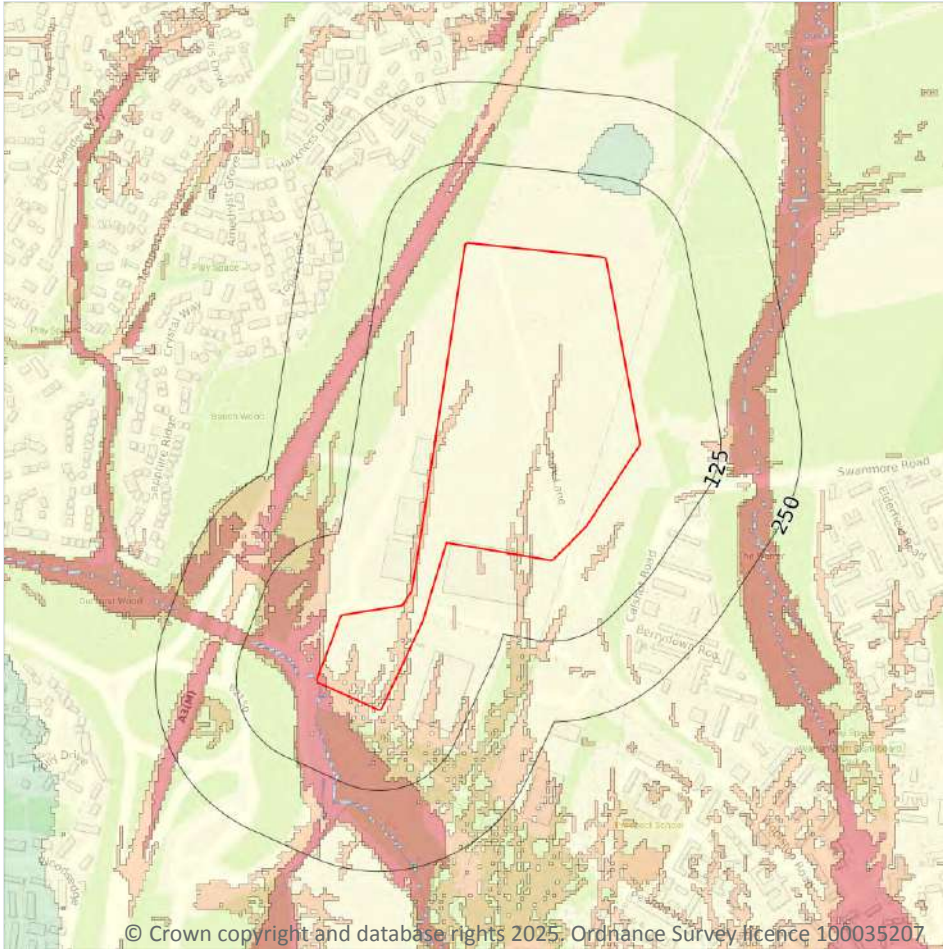
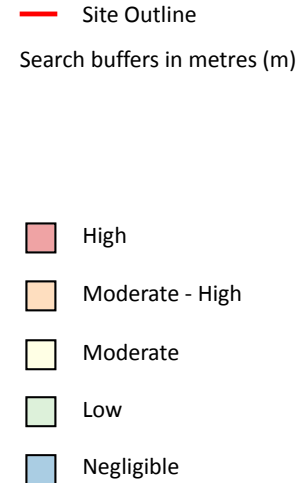
The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.3m and 1.0m
1 in 250 year	Between 0.3m and 1.0m
1 in 100 year	Negligible
1 in 30 year	Negligible

This data is sourced from Ambiantal Risk Analytics.



9 Groundwater flooding



9.1 Groundwater flooding

Highest risk on site

High

Highest risk within 50m

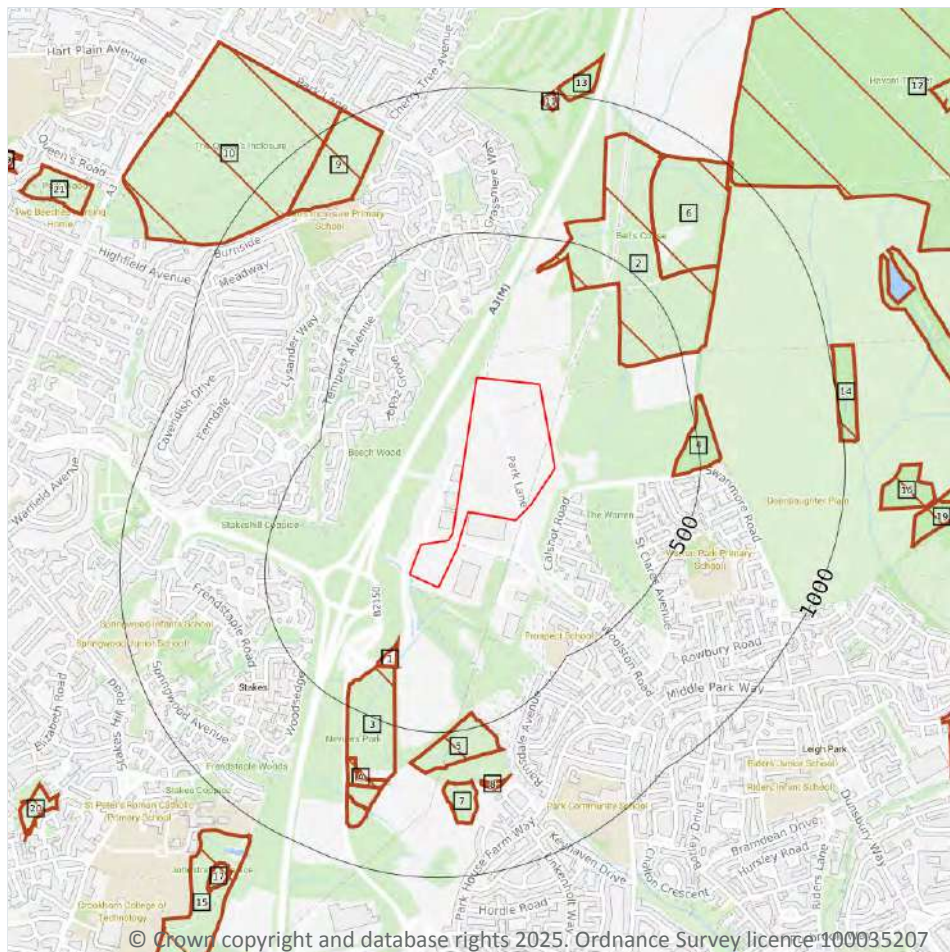
High

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on [page 56](#) >

This data is sourced from Ambiantal Risk Analytics.

10 Environmental designations



- Site Outline
- Search buffers in metres (m)
- + Local Nature Reserves (LNR)
- ▨ Designated Ancient Woodland

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m

0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m**0**

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m**0**

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m**0**

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m**0**

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.



10.6 Local Nature Reserves (LNR)

Records within 2000m

1

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

Features are displayed on the Environmental designations map on [page 57 >](#)

ID	Location	Name	Data source
-	1822m N	Hazleton Common Lnr	Natural England

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m

35

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on [page 57 >](#)

ID	Location	Name	Woodland Type
1	230m SW	Unknown	Ancient & Semi-Natural Woodland
2	286m E	Bells Copse	Ancient & Semi-Natural Woodland
3	311m SW	Unknown	Ancient & Semi-Natural Woodland
4	409m E	Cabbagefield Row	Ancient & Semi-Natural Woodland
5	448m S	Bushy Lease	Ancient & Semi-Natural Woodland
6	559m NE	Bells Copse	Ancient Replanted Woodland
A	655m SW	Unknown	Ancient & Semi-Natural Woodland
7	671m S	Unknown	Ancient & Semi-Natural Woodland
8	683m S	Unknown	Ancient & Semi-Natural Woodland
A	721m S	Unknown	Ancient & Semi-Natural Woodland
9	750m NW	The Queens Inclosure	Ancient & Semi-Natural Woodland
A	781m SW	Unknown	Ancient Replanted Woodland



ID	Location	Name	Woodland Type
10	863m NW	The Queens Inclosure	Ancient Replanted Woodland
11	942m N	Unknown	Ancient & Semi-Natural Woodland
12	964m NE	Forest Of Bere	Ancient Replanted Woodland
13	982m N	Unknown	Ancient & Semi-Natural Woodland
14	988m E	Unknown	Ancient & Semi-Natural Woodland
15	1056m SW	Unknown	Ancient & Semi-Natural Woodland
16	1129m E	Round Wood	Ancient & Semi-Natural Woodland
17	1183m SW	Unknown	Ancient Replanted Woodland
18	1218m E	Unknown	Ancient & Semi-Natural Woodland
19	1253m E	Unknown	Ancient Replanted Woodland
20	1430m SW	Unknown	Ancient & Semi-Natural Woodland
21	1474m NW	Unknown	Ancient & Semi-Natural Woodland
-	1528m SW	Unknown	Ancient & Semi-Natural Woodland
-	1543m SW	Unknown	Ancient Replanted Woodland
24	1589m SE	Great Copse	Ancient & Semi-Natural Woodland
-	1625m SW	Unknown	Ancient & Semi-Natural Woodland
-	1638m S	Unknown	Ancient & Semi-Natural Woodland
-	1686m S	Unknown	Ancient & Semi-Natural Woodland
-	1687m E	Unknown	Ancient & Semi-Natural Woodland
29	1741m NW	Unknown	Ancient & Semi-Natural Woodland
-	1789m S	Unknown	Ancient Replanted Woodland
-	1846m E	Hammond's Lands Copse	Ancient & Semi-Natural Woodland
-	1971m NE	Unknown	Ancient & Semi-Natural Woodland

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.



10.8 Biosphere Reserves

Records within 2000m

0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m

0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m

0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m

0

Areas designated to prevent urban sprawl by keeping land permanently open.

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m

0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.



10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m

0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m

0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m

0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m

2

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.

Location	Name	Type	NVZ ID	Status
On site	Chichester, Langstone and Portsmouth Harbours Eutrophic NVZ (TraC)	Eutrophic Water	2	Existing

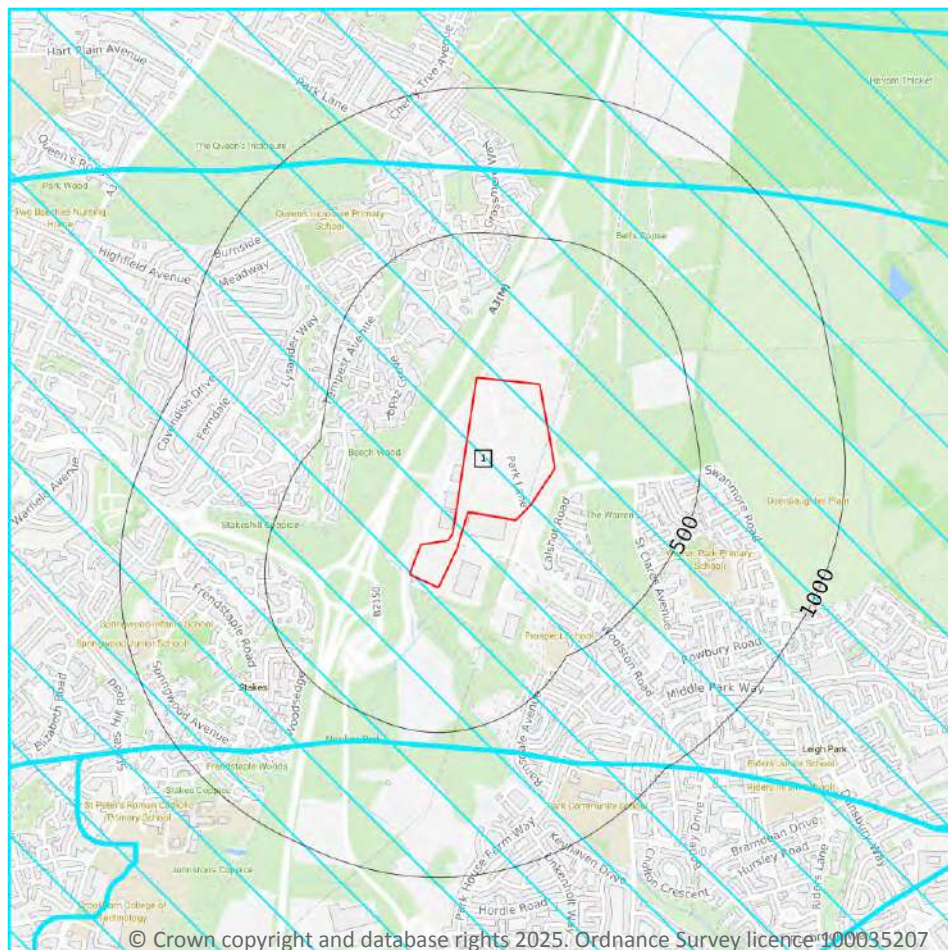


Location	Name	Type	NVZ ID	Status
620m NE	Hampshire Chalk	Groundwater	143	Existing

This data is sourced from Natural England and Natural Resources Wales.



SSSI Impact Zones and Units



- Site Outline
- Search buffers in metres (m)
- SSSI Impact Risk Zones
- SSSI Units
- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site

1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on [page 64](#) >

ID	Location	Type of developments requiring consultation
1	On site	https://irz.geodata.org.uk/IRZ/step2.html?irzcode=0300055430050&notes=11101+11414&location=471425,109304 %20(IRZ%20polygon%20centre)

This data is sourced from Natural England.



10.18 SSSI Units

Records within 2000m

0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.



11 Visual and cultural designations

11.1 World Heritage Sites

Records within 250m

0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m

0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m

0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m

0

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.



This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m

0

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m

0

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.7 Registered Parks and Gardens

Records within 250m

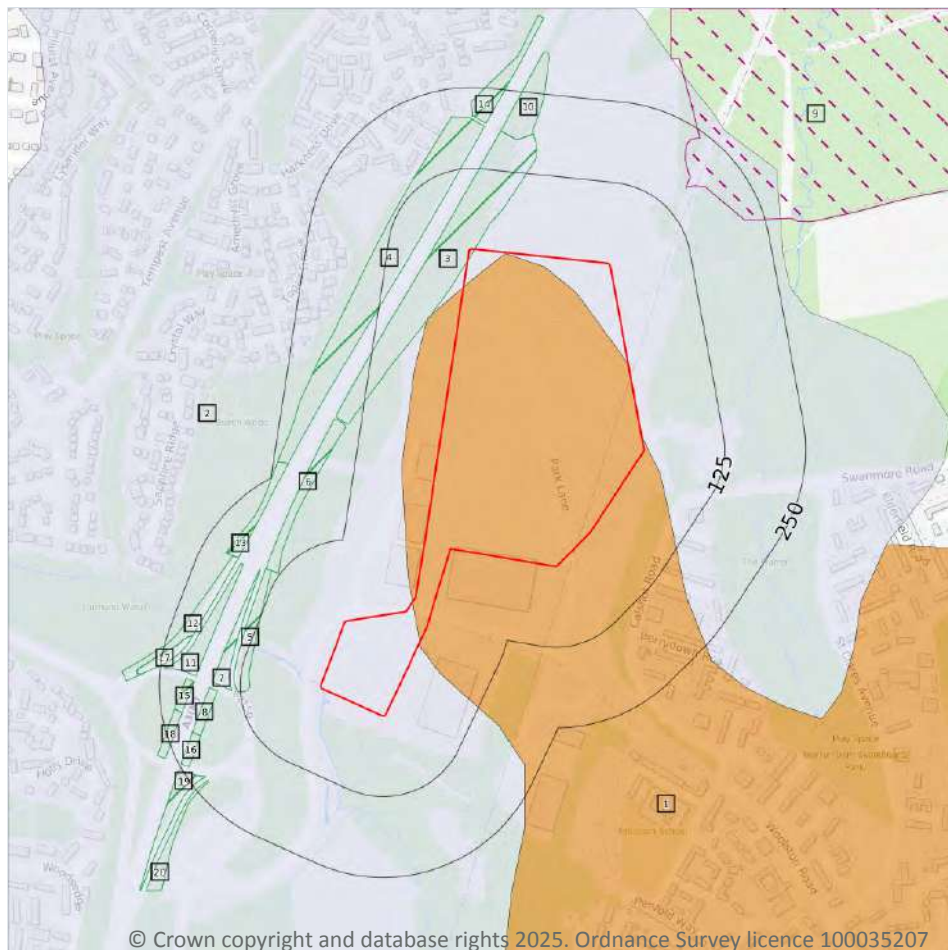
0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.



12 Agricultural designations



- Site Outline
- Search buffers in metres (m)
- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m

2

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on [page 68](#) >

ID	Location	Classification	Description
1	On site	Grade 3	Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

ID	Location	Classification	Description
2	On site	Grade 4	Poor quality agricultural land. Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	1
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The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

Features are displayed on the Agricultural designations map on [page 68 >](#)

ID	Location	Name	Classification	Other relevant legislation
9	168m NE	SEE/13852	Section 16 Dedicated Land	-

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	17
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Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

Features are displayed on the Agricultural designations map on [page 68 >](#)

ID	Location	Description	Reference	Application date
3	On site	Selective Fell/Thin (Unconditional)	018/366/15-16	-
4	75m NW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
5	110m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
6	127m NW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
7	138m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
8	160m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-



ID	Location	Description	Reference	Application date
10	175m N	Selective Fell/Thin (Unconditional)	018/366/15-16	-
11	180m NW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
12	193m NW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
13	193m NW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
14	196m N	Selective Fell/Thin (Unconditional)	018/366/15-16	-
15	196m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
16	201m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
17	213m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
18	219m W	Selective Fell/Thin (Unconditional)	018/366/15-16	-
19	226m SW	Selective Fell/Thin (Unconditional)	018/366/15-16	-
20	226m SW	Selective Fell/Thin (Unconditional)	018/366/15-16	-

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	1
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Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

Location	Reference	Scheme	Start Date	End date
On site	AG00471155	Entry Level plus Higher Level Stewardship	01/10/2013	30/09/2023

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

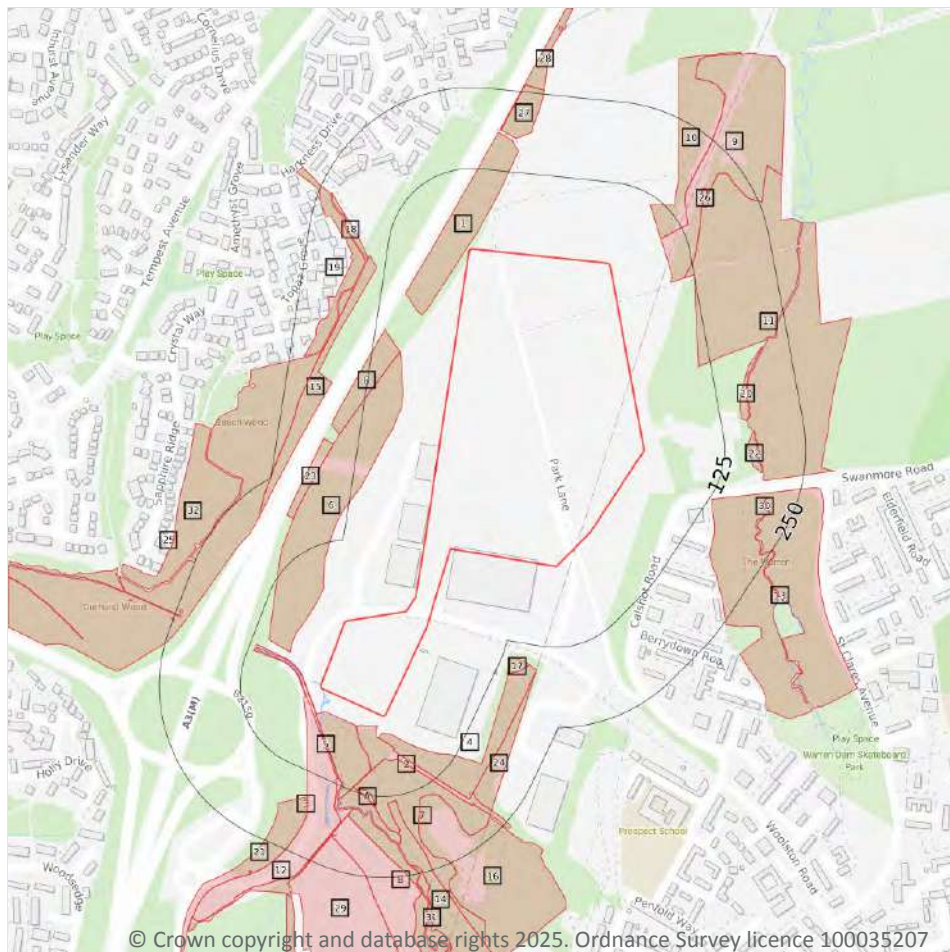
Records within 250m	0
----------------------------	----------

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.



13 Habitat designations



- Site Outline
- Search buffers in metres (m)
- Priority Habitat Inventory
- Open Mosaic Habitat
- Limestone Pavement Orders
- Habitat Networks
- Primary Habitat
- Restorable Habitat
- Associated Habitats
- Habitat Restoration-Creation
- Network Enhancement Zone 1
- Network Enhancement Zone 2

13.1 Priority Habitat Inventory

Records within 250m

36

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

Features are displayed on the Habitat designations map on [page 71](#) >

ID	Location	Main Habitat	Other habitats
1	5m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
2	17m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
3	21m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
4	26m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)



ID	Location	Main Habitat	Other habitats
5	41m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
6	53m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
7	66m S	Good quality semi-improved grassland	Main habitat: DWOOD (INV > 50%); LMEAD (INV > 50%)
8	82m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
9	87m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%); LMEAD (INV > 50%)
10	89m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
11	107m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
12	116m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
A	118m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%); LMEAD (INV > 50%)
A	119m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
13	128m SE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
14	132m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
15	137m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
16	139m SE	Good quality semi-improved grassland	Main habitat: LMEAD (INV > 50%)
17	140m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
B	150m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
18	153m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
19	156m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
20	157m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
21	162m SW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
22	162m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
23	163m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
B	163m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
24	167m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
25	167m W	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
26	171m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%); LMEAD (INV > 50%)
27	178m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
28	188m N	No main habitat but additional habitats present	Additional: DWOOD (INV 50%)

