

BELLWAY HOMES LTD

PARCEL 4, MOWBRAY DEVELOPMENT

OLD HOLBROOK, HORSHAM, WEST SUSSEX

DRAINAGE TECHNICAL NOTE

**REPORT REF.
2500120_A-ACE-XX-XX-RP-C-0301**

July 2026

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Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT ISSUE	DC	TR	JM	13/02/26
A	FINAL SUBMISSION	DC	TR	JM	20/02/26
B	SITE LAYOUT UPDATED	JTM	DC	JM	25/05/26
C	REVISED TO LLFA COMMENT	JTM	DC	JM	30/07/26

Revision C: Appendix I added to Appendix C

Distribution

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1. Introduction

Scope

- 1.1. Ardent Consulting Engineering (ACE) has been appointed by Bellway Homes to prepare a Drainage Technical Note and Drainage Strategy in respect of the development proposals for the land know as "Parcel 4, Mowbray Development" in Old Holbrook, Horsham, West Sussex (herein referred to as 'the Site').
- 1.2. The Site benefits from Outline planning and this report has been prepared to demonstrate a suitable drainage strategy can be implemented for the Site.

Development Proposal

- 1.3. The development is for "*Reserved matters application (internal access, appearance, landscaping, layout and scale) pursuant to Condition 5 of Outline Planning Permission reference DC/16/1667 for Phase 1 RM Area 4 comprising 82 (C3 Use) residential units, car and cycle parking, new landscaping, drainage, access and internal roads and associated infrastructure.*"

Planning Consent History

- 1.4. Prior planning approvals and associated conditions relevant to the site are contained withing the following Decision Notices, which together establish the planning context for the development:
 - i) Outline Planning Permission DC/16/1677, granted on 1st March 2019
 - ii) Non-Material Amendment DC/19/0984, approved on 12th June 2019
 - iii) Discharge of Condition 17 (Site-Wide Surface Water Drainage Strategy), DISC/19/0214, approved on 20th September 2019
 - iv) Reserved Matter Approval DC/24/0446, approved 4th October 2024
- 1.5. These approvals collectively define the evolution of the site-wide and parcel-specific drainage requirements.
- 1.6. Where planning conditions have been varied, amended, or supersede through subsequent approvals, the most recent approved wording takes precedence.

Accordingly, this Drainage Strategy has been prepared to demonstrate compliance with the currently extant and relevant drainage-related conditions, namely

1.7. Outline Planning Permission DC/16/1677, as amended by DC/19/0984, including:

- i) Condition 17 (as amended) – Site-Wide Surface Water Drainage Strategy
- ii) Condition 54 – Detailed Surface Water Strategy for Reserved Matters
- iii) Condition 55 – Foul Water Drainage
- iv) Condition 56 – Restrictions of Infiltration Drainage

1.8. The proposals within this report are consistent with the principles established in the approved Site-Wide Surface Water Drainage Strategy (PBA Consulting, August 2019) and with the approved drainage arrangement forming part of Reserved Matter approval DC/24/0446, where relevant.

1.9. This submission therefore addresses the latest applicable condition requirements insofar as they relate to the Parcel 4 Reserved Matters Application.

2. Existing Site

Site Description

- 2.1. The Site is located directly North of Horsham, in the district of Horsham District Council (HDC). The Site is a parcel part of a wider development, named Mowbray Development.
- 2.2. The total area of the site is circa 3.44 hectares (ha) and is centres approximately at Ordnance Survey 518589mE, 125056mN
- 2.3. Refer to **Figure 2-1** for an extract of the site layout and to **Appendix A** for the full plan.



Figure 2-1: Extract of the Site Layout

- 2.4. The development site area is primarily consists of open grass land pasture. The boundaries consist of hedgerows with the following features: a ditch along the eastern boundary; an existing farm, "Rapelands Farm", adjacent to the north western boundary; Moat Road adjacent to the north eastern boundary.
- 2.5. The topography slopes from gently to steeply, from the northern to the southern boundary. The highest point on-site found within in the north-eastern corner at 67.35m AOD. The land falls south towards the lowest point of the field, 56.60m AOD with gradients of ranging from of 1:13 to 1:50. The topography can be found in **Appendix B**.
- 2.6. A ground investigation report has been produced by Endeavour Drilling, ref. END20-007, dated March 2020. This report can be found in **Appendix C**.

- 2.7. As per the reports, the boreholes and trial pits show the site is underlain by stiff silty clays (Weald Clay Formation). The topsoil is found to be at an average depth of 0.34m bgl.
- 2.8. Within the ground investigation report, trial pit ref. TP204 shows the groundwater level is approx. 2.2m bgl in the southern part of the site.

Existing Drainage

- 2.9. As part of Mowbray development, within the vicinity of the proposed site, foul and surface water sewers have been designed, approved and constructed under the S104 agreement. In the south east corner of the site, a surface water spur and a foul water spur has been provided for the Site. In the northern part of the site, a foul water spur is in Phase 1 Primary Road. As shown in Glanville's Moat Road Drainage Layout, ref. MOW-GLA-MRE-PH1-D-C-1201-P7; as part of Glanville's Drainage Statement, approved part of DC/24/0446, refer to **Appendix D**.

3. Surface Water Drainage

Technical Standards

3.1. The surface water drainage strategy for the proposed development is in accordance with the following technical standards and best practice guidance, which are referred to throughout this section:

- West Sussex Local Flood Risk Management Strategy: 2025 – 2030
- West Sussex Sustainable Drainage Guidance
- The CIRIA SuDS Manual (C753) 2015
- Non-statutory technical standards for sustainable drainage. A Best Practice Guidance was published by the Association of SuDS Authorities (ASA), formerly known as the Local Authority SuDS Officer Organisation (LASOO), in July 2015 to accompany this document
- BS8582 Code of practice for surface water management for development site; and
- The National Planning Policy Framework.

Sustainable Drainage Systems (SuDS)

3.2. The SuDS management train has been set in the sitewide strategy for outline planning, DC/16/1677. The Site's runoff discharges into a basin, prior to discharging to the wider Mowbray development watercourses.

Drainage Strategy at Reserved Matters (DC/24/0446)

3.3. The following section covers the Drainage Statement, outlined in Glanville Consulting's Drainage Statement, dated 6th March 2024, agreed as part of the Reserved Matters Application (DC/24/0446), shown in **Appendix D**.

3.4. The Drainage Statement proposed for the site to discharge the surface water to the southern spur, via an attenuation basin, restricted to flow matching rates.

3.5. The Drainage Statement outlines the following greenfield rates, which were approved at outline planning (DC/16/1677), shown in **Table 3-2**:

Table 3-2: Greenfield Rates Per Hectare agree at Outline Planning (DC/16/1677)

	1 in 1 YEAR	Q_{Bar}	1 in 30 YEAR	1 in 100 YEAR
GREENFIELD RATE PER HECTARE (l/s/ha)	4.40	5.20	11.80	16.5

3.6. On 26th May 2024, the LLFA provided no objection to the reserved matter application and confirmed the Drainage Statement follows the Reserved Matters application (DC/24/0446).

3.7. The attenuation volumes were based on a 20% Climate Change, with 40% for sensitivity analysis, for the 1-in-100 year return period and FEH 2022 data.

3.8. Glanville's Attenuation Basin & Newt Pond Section drawing, ref. MOW-GLA-MRE-PH1-D-C-1202, show the area's required for the attenuation basin.

3.9. Glanville's General Arrangement drawing, ref. MOW-GLA-MRE-PH1-D-C-1101, shows the volume provided from the basin and the maintenance strip allowed.

3.10. Stantec's Section 38 Construction details, ref. 25216/2001/PH1/MHR/570, shows the headwall details required at the attenuation basin.

Proposed Surface Water Drainage Strategy

3.11. The greenfield runoff rates have been approved at outline planning (DC/16/1677), as shown in **Table 3-2**.

3.12. As approved at Reserved Matters (DC/24/0446), it is proposed to discharge the surface water into the site-wide drainage network at flow matching greenfield rates. A spur has been provided as a point of connection, located south-west of the site.

3.13. Surface water design calculations have been carried out for the storm events for the following storm events; 1 in 2, 1 in 30 and 1 in 100 plus climate change allowance.

3.14. The model has been simulated using 20% climate change with a 40% sensitivity analysis, in line with the Site-Wide Drainage Strategy for the discharge of Condition 17 (DISC/19/0214). As shown in **Appendix F**.

3.15. The model has also been simulated using a 45% climate change, for a sensitivity analysis, in line with Arun and Western Streams Management Catchment's current peak rainfall allowance. As shown in **Appendix F**.

3.16. The sensitivity analysis model has also been simulated with a CV value of 1, in line with WSCC's drainage requirements. As shown in **Appendix F**.

3.17. The impermeable area of the proposed development has been based upon the site layout, shown in **Appendix A**. The proposed impermeable area has been measured as 1.827ha (70% of the developable area). This accounts for an allowance for 10% of urban creep, in line with West Sussex County Council preferences.

3.18. The size and volume of the attenuation basin has been approved with Glanville's Moat road Extension Attenuation Basin & Newt Pond Section, ref. MOW-GLA-MRE-PH1-D-C-1202, as shown in **Appendix D**. The total attenuation approved for the site is 1,321 m³.

3.19. The proposed strategy has been summarised in **Table 3-3** below.

Table 3-3: Drainage Design Summary

Application	Impermeable Area (ha) + Urban Creep	Discharge rate (l/s)			Attenuation Storage Required (m ³)		
		1 in 2 year	1 in 30 year	1 in 100 year	20% CC	40% CC	45% CC
DC/24/0446	1.827	3.4	20.0	28.0	1225	1,321	-
PROPOSED					931	1,103	1,404

3.20. The Surface Water Drainage Strategy is shown in **Appendix E** and indicated how the site will be drained, including the location of the attenuation features and the discharge locations.

3.21. Flow Network modelling has been undertaken to demonstrate that the proposed drainage strategy can be restricted the site to equivalent greenfield runoff rates and accommodate the surface water runoff on site. Copies of the surface water drainage calculations are included in **Appendix F**.

3.22. As part of WSCC's recommendations, Surface Water Drainage Proforma has been completed to support the application; refer to **Appendix G**.

3.23. As shown in the Ground Investigation report, groundwater is found at 2.2m bgl, in the proximity of the proposed basin.

Surface Water Runoff Quality

3.24. The runoff from RM4 will be attenuated within a basin, before discharging to the wider Mowbray Development watercourses, with multiple stages of treatment. This has been agreed as part of outline planning (DC/16/1677).

Exceedance Routes

3.25. As a result of heavy or extreme storm events it is sometimes unavoidable for the capacity of sewers and other drainage systems to be exceeded. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, blocked or when the outfall is restricted due to flood levels in the receiving water.

3.26. As the proposed attenuation feature will be located to the lowest lying area of the site, it will be intention to ensure flows are directed away from the residential units. The routes will ultimately mimic the current flow routes associated with the existing site as a result of the topography.

3.27. The exceedance flows paths have been shown in the Proposed Drainage Strategy in **Appendix E** and Glanville's Moat Road Extension Exceedance Flow Plan, ref. MOW-GLA-MRE-PH1-D-C-1203, in **Appendix D**.

Maintenance During Construction

3.28. Once SuDS are constructed, they will not be subjected to construction traffic without appropriate protection. All buried storage will be fenced off. If construction access is required across areas where buried storage is installed, the full depth of cover over will be required, and additional temporary geogrid may be provided if necessary.

Future Maintenance

- 3.29. It is intended for the proposed drainage to be adopted by Southern Water under S104 agreement. This includes the attenuation basin, headwalls and associated piped network.
- 3.30. A maintenance plan for the proposed basin has been included with Glanville's Drainage Statement; in **Appendix D**. There has been informed by the guidance outlines with CIRIA C753 and would be supplemented by manufacturer's specifications.

4. Foul Water Drainage

Drainage Strategy at Reserved Matters (DC/24/0446)

- 4.1. The following section covers the Drainage Statement, outlined in Glanville Consulting's Drainage Statement, dated 6th March 2024, submitted as part of the Reserved Matters Application (DC/24/0446), shown in **Appendix D**.
- 4.2. As per Glanville's Foul Water Drainage Plan, ref. MOW-GLA-PH1-RM4-1105, the foul spur's have been restricted to number of dwellings, as shown in **Table 4-1**.

**Table 4-1: Approved Number of Dwellings Permitted to connect under
DC/24/0446**

POINT OF CONNECTION	SPUR LOCATION	MAXIMUM NUMBER OF DWELLINGS
A	SOUTHERN	80
B	NORTHERN	5

Proposed Foul Drainage Strategy

- 4.3. It is proposed for the foul drainage to be split into two catchments, with a foul water spur located to the Northern and Southern part of the site. **Table 2-2** shows the maximum number of dwellings allocated for each spur.
- 4.4. This falls in line with the approved Glanville's Foul Water Drainage Strategy, ref. MOW-GLA-PH1-RM4-1105, shown in **Appendix D**.
- 4.5. The foul drainage strategy can be found in **Appendix E**.

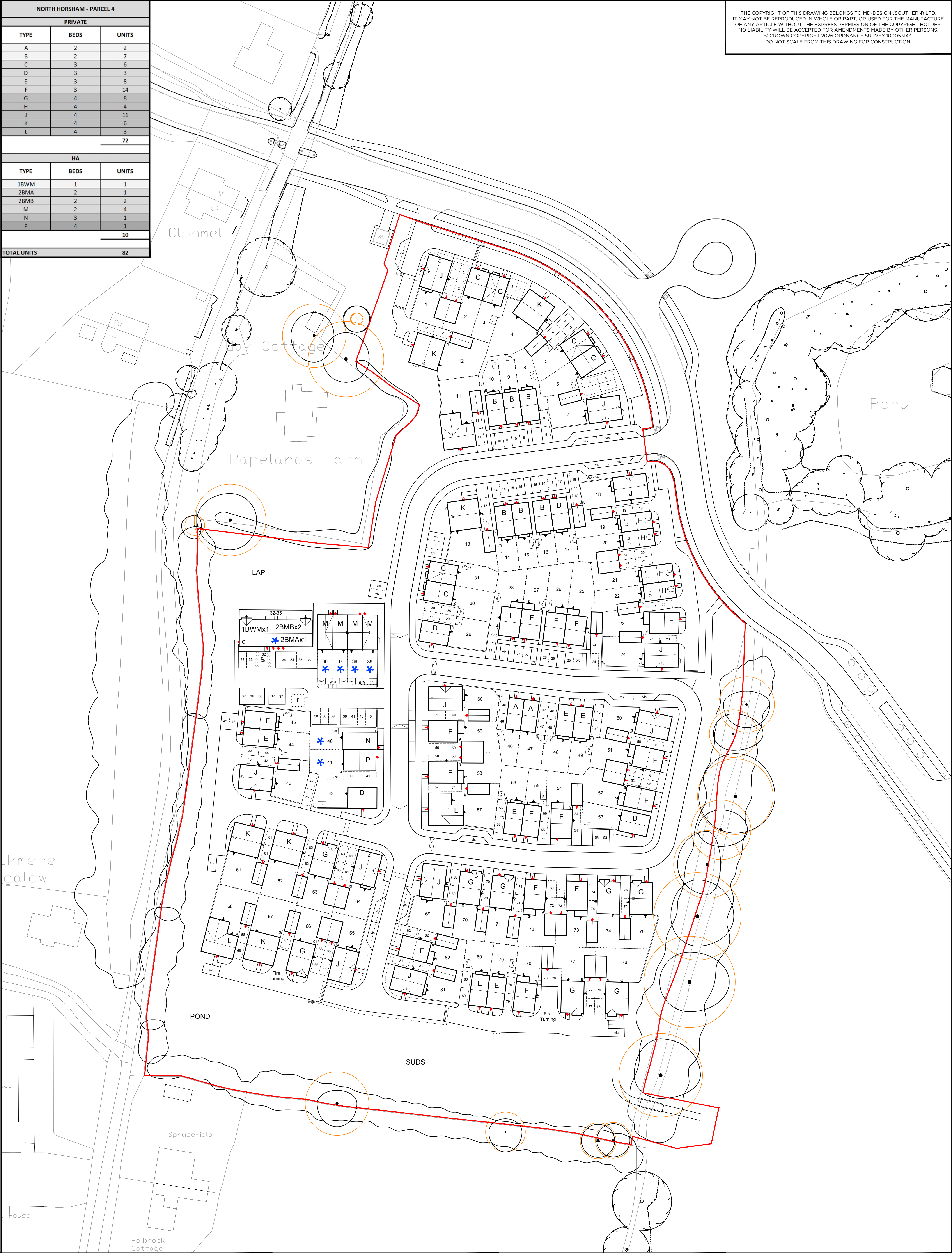
5. Conclusion

- 5.1. The development proposals are to construct a total of 82 residential dwellings and associated infrastructure.
- 5.2. The greenfield rates follow the principles outlined in the outline planning application (DC/24/0446).
- 5.3. The surface water drainage strategy comprises of a pipe surface water network within the roads. The pipe network discharges via an attenuation basin, into the sitewide drainage network, restricted to flow matching greenfield rates.
- 5.4. The SuDS management train has been set in the sitewide strategy for outline planning. The Site runoff discharges into a basin, prior to discharging to the wider Mowbray development watercourses.
- 5.5. Surface water design calculations have been carried out for the 1 in 2, 1 in 30 plus climate change and 1 in 100 plus change allowances storm events using FEH data.
- 5.6. A 20% climate change allowance was applied to the rainfall intensities, with a 40% and 45% climate change allowance for sensitivity allowance.
- 5.7. It is proposed to drainage the foul water sewers, via gravity, into the sitewide drainage network, with spurs located in Primary Road and in the south-east corner of the site.

Appendix A
Site Layout

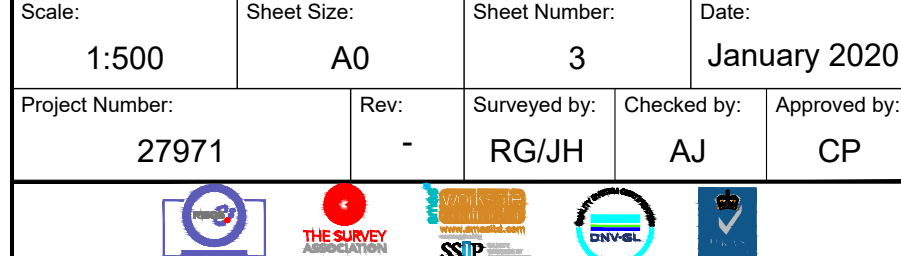
NORTH HORSHAM - PARCEL 4		
PRIVATE		
TYPE	BEDS	UNITS
A	2	2
B	2	7
C	3	6
D	3	3
E	3	8
F	3	14
G	4	8
H	4	4
J	4	11
K	4	6
L	4	3
		72
HA		
TYPE	BEDS	UNITS
1BWM	1	1
2BMA	2	1
2BMB	2	2
M	2	4
N	3	1
P	4	1
		10
TOTAL UNITS		82

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KEY Application Boundary Affordable Housing Proposed New Tree Existing Trees & Hedges Root Protection Zones Primary Entrance g Gate Location B Bin Collection Point CYC Bike Storage	CLIENT: Bellway Homes Southern Counties		010m20m30m40m50m 1:500		SITE: Area 4, North Horsham							
	MDD ARCHITECTURE URBAN DESIGN MDD Architecture & Urban Design 18 Mulberry Walk - Bordon Hampshire - GU35 0UL Email: info@md-design.co.uk		A Planning Issue MD 12.05.26 REV: DESCRIPTION: BY: DATE:		TITLE: Site Layout							
					SCALE AT A1: 1:500		DATE: 12.05.26		DRAWN: MD		CHECKED: MD	
					PROJECT NO: BSC-010		DRAWING NO: SL-01		REVISION: A			

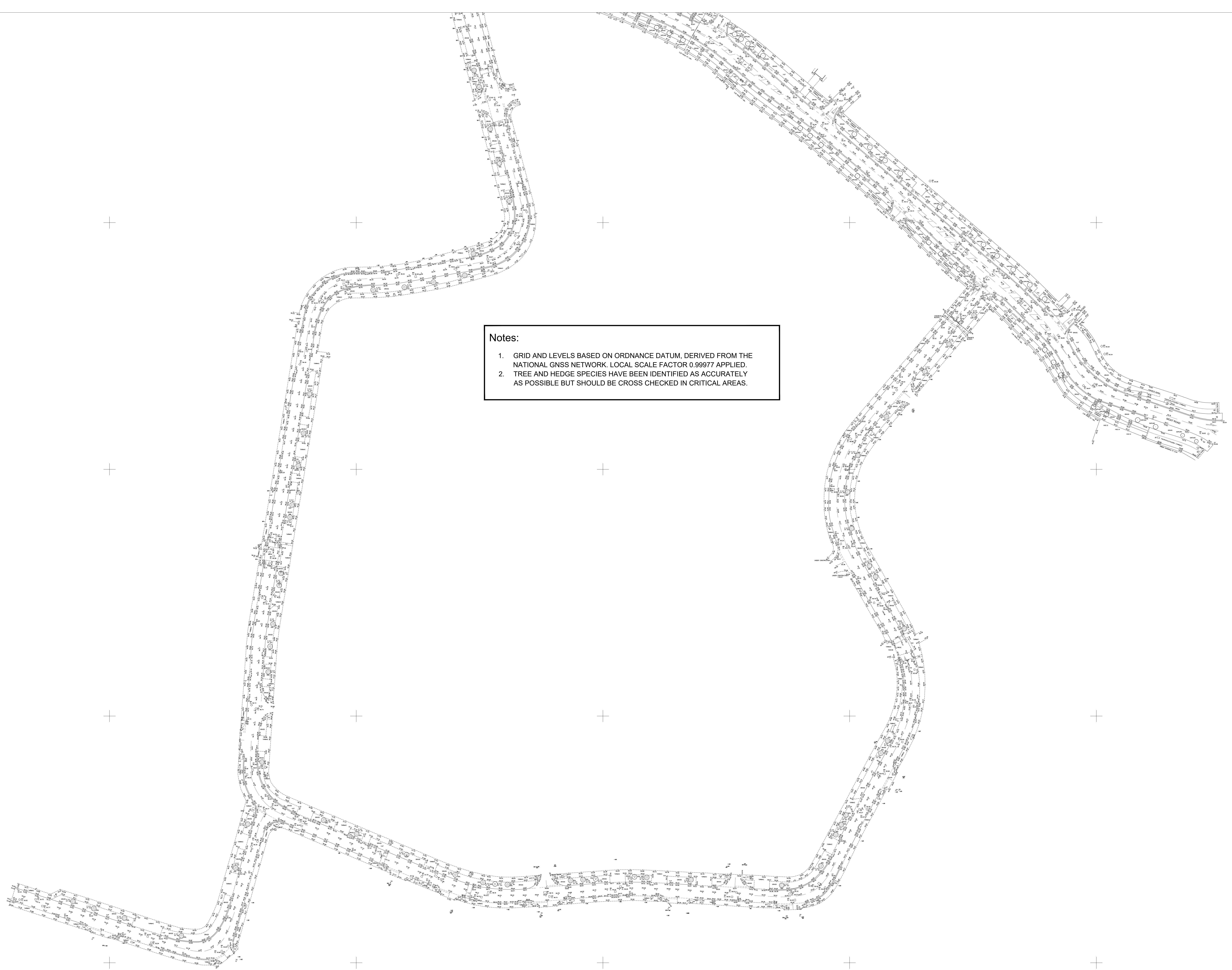
Appendix B
Topography Survey





Notes:

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99977 APPLIED.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.



Notes:

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99977 APPLIED.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

Appendix C
Endeavour Drilling Ground Investigation



GROUND INVESTIGATION REPORT (FACTUAL)

Phase 1- Land North of Horsham, West Sussex
Moathouse Farm,
Rusper Road,
Horsham,
RH12 4QR,

Client: Legal & General (Strategic Land North of Horsham) Ltd

Consultant: Stantec UK Limited

March 2020

Report No: END20-007

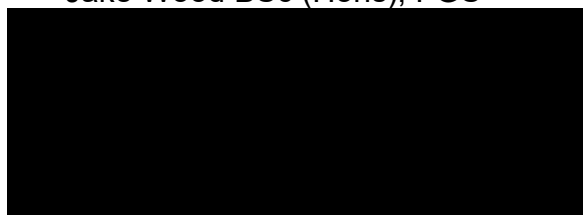
Endeavour Drilling Ltd
Unit 7
Mapledean Industrial Estate
Maldon Road
Latchingdon
Essex
CM3 6LG

GROUND INVESTIGATION REPORT (FACTUAL)

Phase 1 - Land North of Horsham, West Sussex

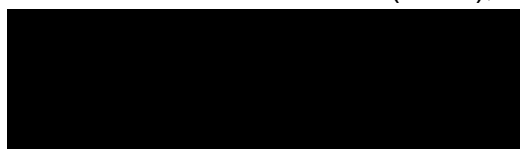
Author: Jake Wood BSc (Hons), FGS

Signed:



Checked By: Oliver Wendland BSc (Hons), FGS

Signed:



Revision	Date	Description	Prepared	Checked
FINAL	19.03.20	Factual Report	JJW	OW

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APPENDIX E:	MACHINE EXCAVATED TRIAL PIT RECORDS
APPENDIX F:	TRL-DCP INSITU TEST RESULTS
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APPENDIX H:	HAND EXCAVATED TRIAL PIT RECORDS
APPENDIX I:	MONITORING RESULTS
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APPENDIX K:	CHEMICAL ANALYSIS RESULTS

1. INTRODUCTION

Endeavour Drilling Limited received instruction to carry out Phase 1 ground investigations to aid in the design and construction of a proposed residential development located on Land North of Horsham, West Sussex. The nearest postcode to the site is RH12 4QR.

The ground investigation was instructed by Stantec UK Limited, on behalf of the client; Legal and General (Strategic Land North of Horsham) Ltd and comprised of eight (8) rotary core boreholes, six (6) windowless sample boreholes, fifty-six (56) machine excavated trial pits, with associated sampling and insitu testing, one (1) infiltration test, fifty-five (55) TRL-DCP insitu tests, surface water sampling from four (4) selected locations from existing water courses and finally, variable head tests were carried out at the location of two (2) rotary core boreholes. Laboratory testing, comprising of geotechnical and chemical testing was also undertaken.

It should be noted that one (1) windowless sample borehole (WS203) and one (1) machine excavated trial pit (TP209) along with its associated infiltration test was not carried out due to restricted access. Two additional (2) infiltration tests were not carried out at TP247 and TP252 due to groundwater accumulating in the trial pit. One (1) TRL-DCP was abandoned at TP233 due to services in close proximity.

Semi-permanent groundwater standpipes were installed within all of the rotary core boreholes and all of the window sample boreholes for future gas and groundwater monitoring.

This report presents the factual findings of the ground investigation, together with the results of the geotechnical and chemical laboratory testing.

Where applicable, investigation techniques, sampling, logging of soils and insitu testing complied with the requirements of British Standard BS5930: 2015 – ‘Code of Practice for Site Investigations’.

2. LIMITATIONS

This report is based upon the results of the ground investigation and on details of the scheme provided by the consultant; Stantec.

This report has been prepared for the benefit of Legal and General (Strategic Land North of Horsham) Ltd and its contents should not be relied upon by others without the written authority of Endeavour Drilling Limited (ED).

If any unauthorised third party makes use of this report they do so at their own risk and ED owes them no duty of care or skill.

All information provided by others is taken in good faith as being accurate, but ED cannot and does not accept any liability for the detailed accuracy, errors, or omissions within such information.

Subsoils are by their nature hidden from view and no investigation can be exhaustive to the extent that all ground conditions are revealed. Conditions may well be present beneath the site which were not evident from the investigations carried out.

3. FIELDWORK

The fieldwork was undertaken between the 28th November and 20th December 2019 and comprised the following:

- Eight (8) rotary core boreholes formed to final depths of between 8.0mbgl and 19.50mbgl.
- Six (6) windowless sample boreholes drilled to depths of between 1.75mbgl and 4.80mbgl.
- Fifty-six (56) machine excavated trial pits were formed to depths ranging from between 0.50m and 4.0mbgl.
- One (1) soakaway test carried out in accordance with BRE365, within one trial pit.
- Fifty-six (55) dynamic cone penetration tests (TRL-DCPs) were completed from surface.
- Six (6) falling head tests carried out at the location of two rotary core boreholes.
- Four (4) water samples selected locations from existing water courses.
- Groundwater and gas monitoring totalling six (6) visits.

The exploratory hole positions for the ground investigation were predetermined by a representative of Stantec prior to undertaking the fieldwork. An exploratory hole location plan is presented as Figure 1 in Appendix A.

All exploratory positions were service traced with Ground Penetrating Radar and subsequently scanned using a Cable Avoidance Tool (CAT), for the presence of underground buried services by suitably trained ED staff.

3.1. Rotary Cored Boreholes

In total, eight rotary boreholes utilising a Comacchio 205 track-mounted rotary drilling rig, employing a PWF triple tube core barrel utilising a water drilling flush method were completed. This rotary drilling method is designed to maximise core recovery and produces 93mm diameter core retrieved in rigid plastic liners. Dynamic sampling techniques commenced from between 1.20mbgl and 3.00mbgl in cohesive strata, whilst rotary rock coring commenced from between 2.0 and 3.0mbgl once mudstone was encountered and to target depth.

Disturbed and environmental samples were recovered from the cohesive strata for possible future geotechnical and chemical analysis.

Standard or Cone Penetration Tests (SPT / CPT) were undertaken using an automatic trip hammer at 1.00m intervals to 6.0mbgl and at 1.50m centres where possible to target depth. The number of blows required to advance a standard split spoon over the final 300mm of a 450mm total drive was recorded and is shown on the borehole records as the penetration resistance ('N' value).

The retrieved plastic core liners were split open to expose the core and to allow detailed logging and photography by an engineering geologist. In addition, selected sub samples were taken of appropriately sized intact core to allow for laboratory testing.

Upon completion a combination of 19mm and 50mm HDPE standpipes were installed and finished at surface with a raised cover. The design of the standpipes can be summarised in Table 1 below.

Table 1: Standpipe Design (Rotary Core)

BH No.	Standpipe Diameter (mm)	Slotted Section (mbgl)	Plain Section (mbgl)	Gravel Surround (mbgl)	Bentonite Seal (mbgl)
BH201	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00
BH202	19	1.00 – 7.00	GL – 1.00	1.00 – 7.00	0.20 – 1.00
BH203	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00
BH204	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00
BH205	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00
BH206	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00
BH207	19	6.00 – 7.00	GL – 6.00	6.00 – 7.00	0.20 – 6.00
BH208	50	1.00 – 6.00	GL – 1.00	1.00 – 6.00	0.20 – 1.00

The rotary cored borehole logs are presented in Appendix B and give both descriptions and depths of strata encountered, together with details of samples taken, in-situ tests, photographs and any other relevant information.

3.2. Falling Head Test

In total, six falling head tests were carried out within rotary boreholes BH202 and BH207, during the drilling process at depths of 2mbgl, 4mbgl and 6mbgl and as specified by the consultant Stantec UK Ltd.

All permeability tests were carried out in accordance with BS 5930:1999. The results of the tests are given within Appendix C.

It should be noted that it was not possible to calculate the permeability due to a low rate of fall.

3.3. Windowless Sample boreholes

In total, six windowless sample boreholes were completed utilising a Dando Terrier rig operated by a two-man crew. These rigs use hydraulics to lift a percussive hammer to drive a series of small diameter tubes into the ground.

It should be noted that all window samples were terminated prior to reaching target depth, were further driving would have caused loss or damage of equipment. Further details are shown in the remarks section on the typed logs.

Three window samples (WS202, WS204, WS205) were terminated due to encountering services whilst hand pitting prior to drilling. These inspection pits were backfilled with arisings and reinstated.

Small disturbed and larger bulk samples were recovered from throughout the window samples for possible future chemical and geotechnical testing. Samples required for chemical analysis were recovered in plastic containers and then stored in refrigerated cool boxes for transport to the analytical laboratory.

Standard Penetration Tests (SPT / CPT), were undertaken at 1.20mbgl at the bottom of each inspection pit and 1.00m intervals to the base of the borehole.

Upon completion 50mm diameter HDPE groundwater standpipes were installed within all window samples and finished at surface with either a flush or raised cover. The design of the standpipes can be summarised in Table 2 overleaf.

Table 2: Standpipe Design (Windowless Samples)

BH No.	Diameter (mm)	Slotted Section (mbgl)	Plain Section (mbgl)	Gravel Surround (mbgl)	Bentonite Seal (mbgl)
WS201	50	1.00 – 2.00	GL – 1.00	1.00 – 2.00	0.20 – 1.00
WS202A	50	0.80 – 1.80	GL – 0.80	0.80 – 1.80	0.20 – 0.80
WS204A	50	1.00 – 2.00	GL – 1.00	1.00 – 2.00	0.20 – 1.00
WS205A	50	0.60 – 1.60	GL – 0.60	0.60 – 1.60	0.20 – 0.60
WS206	50	1.00 – 2.00	GL – 1.00	1.00 – 2.00	0.20 – 1.00
WS207A	50	1.00 – 4.50	GL – 1.00	1.00 – 4.50	0.20 – 1.00

The windowless sample borehole records are presented in Appendix D and give both descriptions and depths of strata encountered, together with details of samples taken.

3.4. **Machine Excavated Trial Pits**

In total, fifty-six trial pits were mechanically excavated utilising both an eight tonne and thirteen tonne tracked excavator. Each trial pit was formed to a depth ranging from 0.50mbgl (TP233) to 4.00mbgl (various).

It should be noted that TP233 was terminated at 0.50mbgl prior to reaching target depth due to encountering a suspected water pipe.

Small disturbed and larger bulk samples were recovered from throughout the window samples for possible future chemical and geotechnical testing. Samples required for chemical analysis were recovered in plastic containers and then stored in refrigerated cool boxes for transport to the analytical laboratory.

A note was made of any groundwater encountered, and of the stability of the trial pit sides during excavation.

The trial pit logs are presented in Appendix E and give both descriptions and depths of the strata encountered, together with details of samples taken, insitu tests, and any other relevant information.

3.5. TRL-DCP Insitu Tests

In total, fifty-five TRL-DCP tests were completed from surface.

The TRL-DCP uses an 8kg hammer dropping over a height of 575mm and a 60° cone that has a maximum diameter of 20mm. The instrument is held vertically. A hammer is lifted to the handle before the operator lets it fall freely to achieve penetration of the ground surface.

Penetration readings are taken in increments of 100mm and the number of blows between each reading is recorded and is proportional to the insitu density of the material encountered.

The results are presented in Appendix F.

3.6. Soakaway Testing

One soakaway test was carried out within one trial pit (TP202) utilising a thirteen tonne tracked excavator. This test was carried out at a targeted depth specified by the Consultant and were undertaken in general accordance with BRE Digest 365 “Soakaway Design” 2007.

The dimensions of the pit were measured and then filled with water, the fall in water level was measured at regular intervals in order that infiltration rates may be calculated.

The results are presented in Appendix G.

3.7. Hand Excavated Trial Pits

In total, three trial pits were hand excavated utilising insulated hand tools to gather additional environmental samples for possible future chemical analysis. Each hand pit was formed to a target depth of 1.20mbgl.

A note was made of any groundwater encountered, and of the stability of the trial pit sides during excavation.

The hand pits logs are presented in Appendix H and give both descriptions and depths of the strata encountered, together with details of samples taken, insitu tests, and any other relevant information.

3.8. Gas & Groundwater Monitoring

The standpipes as detailed in Table 1 and 2 above, have been monitored by a ED technician every two weeks for a period of twelve weeks, totalling six visits for methane, carbon dioxide and oxygen using a GA2000 Infra-Red Gas Analyser. Atmospheric pressure, gas flow rate and water levels were also recorded during each visit. The groundwater monitoring results are presented in appendix I.

3.9. Geology

The British Geological Survey 1:50,000 scale, Solid and Drift Edition, indicates that majority of the site is underlain by the Weald Clay Formation. At Moathouse Farm an ironstone band can be found that runs in an East-West trend and Alluvium is present to the South East of the site near Channels Brook.

4. LABORATORY TESTING

The laboratory testing programme comprised of both geotechnical and chemical testing for use in classifying and assessing the ground conditions encountered.

Laboratory testing was undertaken by UKAS / MCERTS accredited laboratories; the geotechnical testing by I2 Analytical and chemical analysis by ALS Environmental. The results are included in Appendices J and K respectively.

4.1. Geotechnical Testing

The geotechnical laboratory testing was undertaken to provide classification and strength data on selected samples.

Twenty-seven samples were tested for moisture content to enable the material to be classified and its engineering behaviour assessed in accordance with BS1377, Part 2:1990; clause 3.2, 4.4, 5.3 and 5.4.

Atterberg limits were determined for Twenty-seven samples of cohesive material to enable the material to be classified and its engineering behaviour assessed in accordance with BS1377, Part 2:1990; clause 3.2, 4.4, 5.3 and 5.4.

Twenty-five particle size distribution tests were carried out, using the wet sieve method. These tests were undertaken in accordance with BS1377, Part 2:1990; clause 9.

The quantitative determination of the particle size distribution for fine soils, from coarse silt to clay was undertaken on eighteen samples, assessed in accordance with BS1377, Part 2: 1990, clause 9.4, using the sedimentation by pipette method.

Fifty-six samples were tested for shear strength using a calibrated laboratory hand shear vane.

Twelve samples were tested for dry density and moisture content relationship in accordance with BS1377, Part 4:1990; clause 3.5 for heavy compaction using a 2.50kg rammer with a freefall height of 450mm.

Fourteen uniaxial compressive strength tests were performed on suitable samples of rock, with the deformation in uniaxial compression also being recorded together with seventeen point load tests. All tests were undertaken in general accordance with ISRM suggested methods 1981-1985.

4.2. Chemical Testing

Thirty-seven samples of soil were analysed for a comprehensive range of determinants summarised in Tables 3 to 5 presented below:

Table 3: Stantec basic soil suite

<i>Arsenic</i>	<i>Zinc</i>
<i>Cadmium</i>	<i>Water Soluble Sulphate</i>
<i>Chromium</i>	<i>TPH – CWG (C5 - 35)</i>
<i>Copper</i>	<i>Speciated PAH</i>
<i>Lead</i>	<i>Phenols</i>
<i>Mercury</i>	<i>Asbestos Screen</i>
<i>Nickel</i>	<i>Soil Organic Matter</i>
<i>Selenium</i> <i>Polychlorinated Biphenyls (PCB)</i>	<i>pH</i>

Table 4: Stantec herbicides soil suite

<i>Organophosphorus</i>	<i>Triazine Herbicides</i>
<i>Organochlorine</i>	<i>Acid Herbicides</i>

Table 5: Stantec geochemical test suite

<i>Asbestos Quantification by Gravimetric Analysis</i>	<i>Asbestos Quantification by Phase Contrast Optical Microscopy</i>
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In order to evaluate any aggressive tendency of the sub soil to buried concrete, thirteen soil samples were analysed in accordance with the BRE SD1 Suite, comprising pH, total sulphate, total sulphide, water soluble sulphate, chloride, nitrate and magnesium.

A total of eleven water samples were recovered during the second round of monitoring and were analysed for a comprehensive range of determinants summarised in Table 6 and Table 7 below:

Table 6: Stantec basic water suite

<i>Arsenic</i>	<i>Chloride</i>
<i>Cadmium</i>	<i>Water Soluble Sulphate</i>
<i>Chromium</i>	<i>TPH – CWG (C5 - 35)</i>
<i>Copper</i>	<i>Speciated PAH</i>
<i>Lead</i>	<i>Phenols</i>
<i>Mercury</i>	<i>pH</i>
<i>Nickel</i>	<i>Calcium</i>
<i>Selenium</i> <i>Polychlorinated Biphenyls (PCB)</i>	<i>Dissolved Organic Carbon</i>
<i>Zinc</i>	<i>Total Alkalinity</i>
<i>Ammoniacal Nitrogen</i>	<i>Electrical Conductivity</i>

Table 7: Stantec herbicides water suite

<i>Pesticides Suite I</i>	<i>Pesticides Suite III</i>
<i>Pesticides Suite II</i>	

APPENDIX A

Site Location Plan