

PROPOSED RESIDENTIAL DEVELOPMENT
PHASE 2
MANOR FARM
BEDHAMPTON
HAMPSHIRE

FLOOD RISK ASSESSMENT & DEVELOPMENT DRAINAGE STRATEGY

BARGATE HOMES LTD

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- Appendix H – SUDS Management and Maintenance Plan

References

- Environment Agency Flood Map Information © and database right www.environment_agency.gov.uk
- Contains British Geological Survey materials © NERC (2018)
- National Planning Policy Framework (Department for Communities and Local Government, March 2012)
- PPG Flood risk and coastal change (Department for Communities and Local Government, March 2014)
- Havant Borough Council Strategic Flood Risk Assessment, 2018 (SFRA) (HBC, November 2018)
- Hampshire County Council Preliminary Flood Risk Assessment (PFRA) (HCC, April 2011)



1 Executive Summary

SITE INFORMATION	CLIENT	Bargate Homes Ltd
	SITE NAME	Phase 2 Manor Farm
	SITE LOCATION	SU 69849 05991 Bedhampton Havant Hampshire
	SITE AREA	3.67 ha
	CURRENT LAND USE	Greenfield – Arable / Agricultural grassland
	PROPOSED LAND USE	No.43 Residential Dwellings (Class C3A)
	SITE GEOLOGY – Superficial	River Terrace Deposit – Sand, Silt, Clay
	SITE GEOLOGY - Bedrock	Lewis Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations – Chalk
	SOIL INFILTRATION RATE	Superficial: Insufficient. Underlying Chalk: 1×10^{-4} m/s
	GROUNDWATER LEVELS	~3.8m Below Ground Level
	GROUNDWATER SPZ / AQUIFER	SPZ 1 close by/ Principle (Bedrock), Superficial (Secondary A) Vulnerable
	GROUND CONTAMINATION	TBC – None anticipated
FLOOD RISK	ENVIRONMENT AGENCY FLOOD ZONE	Flood Zone 1 - Lowest Risk < 0.1% (<1:1000)
	FLUVIAL (RIVERS & WATERCOURSES)	Not a risk
	PLUVIAL (SURFACE WATER)	Not a risk
	GROUNDWATER	Not a risk
	EXISTING/PROPOSED SEWERS & MAINS	Not a risk
	ARTIFICIAL	Not a risk
	TIDAL	Not a risk
FOUL & SURFACE	PROPOSED SURFACE WATER STRATEGY	Gravity – Infiltration via deep borehole soakaways
	PROPOSED SUDS TYPE	Swales, Filter Trenches, Reed Bed, Attenuation Basin
	EXISTING SW PEAK FLOW RATE	Greenfield QBar: 3.3 l/s
	PROPOSED SW PEAK FLOW RATE	N/A – Infiltrating
	FOUL WATER STRATEGY	Pumped to Phase 1 Foul Sewer
	EXISTING FW PEAK FLOW RATE	N/A
	PROPOSED FW PEAK FLOW RATE	2.0l/s (SFA 4000 l/unit/d) for 43 Units
MISC	FURTHER INVESTIGATIONS	N/A

2 Introduction

2.1 Scope

Bargate Homes is seeking outline planning permission for the construction of up to No.43 residential dwellings, associated landscaping, open space and allotments with access from Lower Road. The 36,709m² (3.67ha) site is located at land adjacent to Lower Road, Bedhampton. Refer to Appendix A for site layout.

2.2

MJA Consulting has been appointed to provide a Flood Risk Assessment & Drainage Strategy suitable to submit as part of the planning application for the disposal of foul and surface water from the proposed development.

2.3 Report Structure

The National Planning Policy Framework (NPPF) and the Flood Risk and Coastal Planning Practice Guidance (PPG) is the current guidance on development and flood risk in England and Wales. The Flood Risk technical guidance for the National Planning Policy Framework requires a Flood Risk Assessment (FRA) to be carried out on sites over 1ha to consider all potential forms of flooding including that from river, sea, estuarial, land drainage, groundwater, overland flow, surface water run-off, sewer systems, and artificial water bodies (lakes, reservoirs, canals etc.) to both the development site and to offsite parties and land.

2.4

This report will take the structure of a 'Flood Risk Assessment' in accordance with the National Planning Policy Framework, the Flood Risk and Coastal Planning Practice Guidance, Environment Agency's Flood Risk Assessment Guidance and CIRIA Report 624 'Development and Flood Risk.

2.5

The objectives of this report are:

- To confirm whether the proposed development site is affected by current or anticipated future flooding from all sources for the lifetime of the site.
- To confirm that this development will not increase the risk of flooding to any offsite properties and land or increase the population within a floodplain.
- To undertake calculations to establish the foul and surface water runoff rates from the existing site and to assess the potential foul and surface water runoff from the proposed development.
- To detail a suitable strategy for the management of foul and surface water generated from the proposed development allowing for future climate change.
- To satisfy the approving planning authority that the most sustainable foul and surface water drainage solutions have been considered, in line with Environment Agency guidance, The Building Regulations (Document H 2002) and government legislation such as the Flood and Water Management Act 2010 (Defra) and The National Planning Policy Framework (NPPF & PPG).

3 The Development Site

Figure 1: Site location

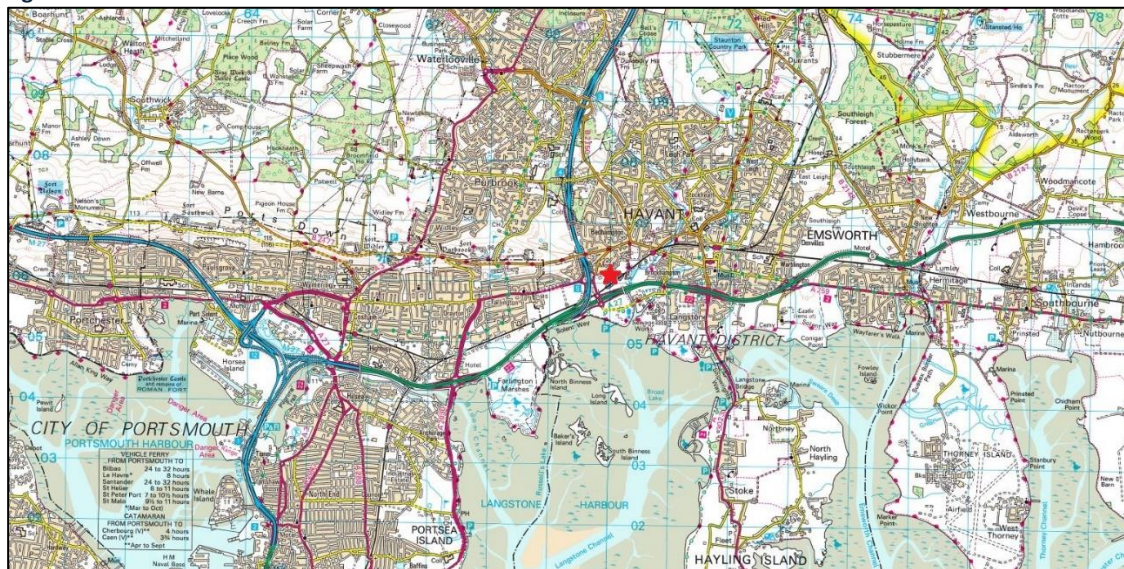


Image courtesy of: Bing Maps, 2021 Microsoft Corporation Image courtesy of Ordnance Survey

Figure 2: Development boundary



Image courtesy of: Google Maps, 2021 Microsoft Corporation

3.1 Site Location and Description

The application site is located at land south west of Bedhampton in Hampshire and directly south west of Phase 1 of the development. The site is centred on National Grid Reference SU 69849 05991 and is bound by Lower Road to the north and the railway line to the south. The A27/A3(M) lies to the west and arable land to the east of the site. The 36,709m² (3.67ha) parcel of land comprises an arable field.

3.2 Topography

A topographical survey of the site was undertaken by Encompass Surveys in March 2021 which indicates the site falls to the south at 1 in 55 with levels ranging from 8.19mAOD to 3.73mAOD (metres above Ordnance Datum). Refer to Appendix B for a Topographical Survey of the existing site.

3.3 Geology

Information published by the British Geological Society (BGS) indicates the underlying geology at the site as Lewis Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations – Chalk, with superficial deposits of River Terrace Deposits – Sand, Silt and Clay.

- 3.4 Ground investigations were carried out in September 2017 for the adjacent phase 1 site and confirmed that site is underlain by sandy, silty clay over chalk substrata. The Clay is circa 1-3m thick. The clay is at its thinnest in the south west corner. It is assumed that the geology underlying this phase 2 land is of similar nature.

3.5 Soil Permeability

Soil infiltration testing in accordance BRE 365 methodology was carried out in eight trial pits On the adjacent phase 1 site. The tests failed to achieve 75% drain and therefore failed to comply with BRE 365 “soakaway design”. Additional testing in the chalk just below the clay layer also showed low insufficient infiltration rates. Falling head tests in boreholes circa 14-15m below ground level showed higher soakage rates of 1.4×10^{-4} m/s, likely due to fissures in the chalk. It is also assumed that the infiltration rates will be similar on the phase 2 land.

3.6 Groundwater

Groundwater levels were taken during the intrusive investigation on the phase 1 parcel. These tests were carried out in 2017, 2018 and 2019 during and after the winter recharge periods when groundwater levels are typically at their maximum.

- 3.7 Groundwater was encountered at various depths across the site but on average was 3.8m BGL, with a maximum level recorded at 3.52m BGL. Due to the topographical differences between the parcels, it is assumed that groundwater at phase 2 will be at least 2m below ground level.

- 3.8 Historic BGS borehole records in the *vicinity* of the site are available and show the highest water level as circa 1.2m BGL.

3.9 **Hydrogeology**

The Environment Agency's mapping website (<http://magic.defra.gov.uk/MagicMap.aspx>) has classified the site as not within a Source Protection Zone but it is located 250m south (downstream) of a Zone 1 Source Protection Zone. The flow of water from the site is away from the abstraction point, towards the coast.

- 3.10 The bedrock Chalk formations are classified as 'Principle' aquifers. These are layers of rock that provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

- 3.11 The superficial deposits are classified as a 'Secondary A' aquifer. These are permeable layers of rock that can support water supplies on a local rather than strategic scale. They may be an important source for base flows to rivers.

3.12 **Hydrology and existing site drainage characteristics**

The existing site is undeveloped grassland, as such rainfall that lands on the site firstly infiltrates directly at source and into the underlying soils. It is likely the site has relatively poor surface water drainage with some overland flow due to the relatively steep topography.

- 3.13 The closest watercourse is located approximately 85m east of the site and the site is located approximately 730m north of Langstone Harbour.

3.14 **Ground Contamination**

The available environment data does not indicate the presence of any significant sources of contamination risk on site and no visual or olfactory evidence of soil contamination was identified during a site walkover.

4 Flood Risk

4.1 The assessment of flood risk to the site requires that all potential forms of flooding are considered. In accordance with the Environment Agency's Flood Risk Assessment Guidance, NPPF, PPG and CIRIA Report 624, sources of flooding to be assessed include tidal, fluvial (rivers, streams and watercourses), pluvial (overland rainfall runoff), groundwater, artificial sources (canals and reservoirs) and existing / proposed sewerage and water mains infrastructure.

4.2 History of Flooding

During the data collection process it is important to consider the information which already exists for the site location with respect to flood risk. The main sources of data for flood risk and recorded incidents of flooding for this site has been the *Havant Borough Council Strategic Flood Risk Assessment (SFRA) (HBC, November 2018)* and the *Hampshire County Council Preliminary Flood Risk Assessment (PFRA) (HCC, April 2011)*. Additional information has been obtained from The Environment Agency, British Society Chronology of Extreme Hydrological Events, local news and media outlets.

4.3 Within the SFRA/PRFA studies, consultation was carried out with all appropriate authorities and organisations including the Environment Agency, Portsmouth Water, Havant Borough Council and local community stakeholders to identify known or perceived problem areas with respect to flooding.

4.4 With reference to the above, and in the context of the proposed development, there are no historic issues of flooding from the following potential sources including:

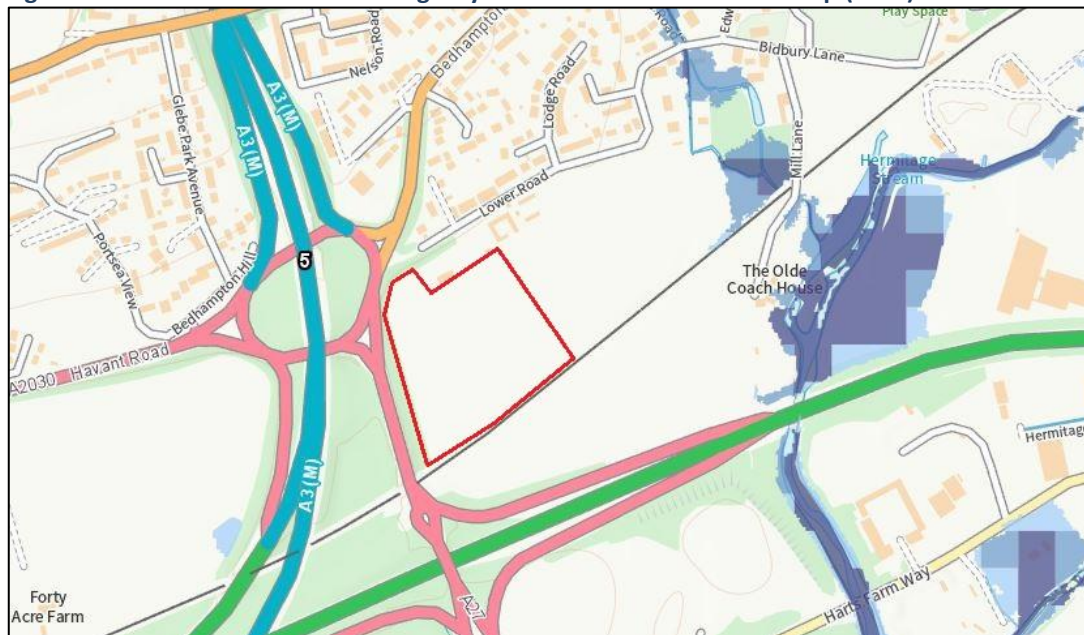
- Fluvial (Rivers)
- Tidal.
- Groundwater.
- Pluvial (Surface water runoff).
- Existing foul, storm and combined sewers or potable water main infrastructure.
- Artificial infrastructure.

4.5 Fluvial

The closest stream, also a main river classification, to the site runs north to south ~340m to the east and flows into Langstone Channel and the Solent. The Environment Agency confirms that no incidents of flooding from main rivers or ordinary watercourses have been recorded within the site boundary.

4.6 The Environment Agency (EA) is the principal flood risk management operating authority in England. The EA have carried out a national flood risk assessment (NaFRA) which assesses the probability of flooding to land from all main rivers in England. The results of this modelling are combined and calibrated against data from recorded flood events to produce the Environment Agency's Flood Zone Map (Figure 3).

Figure 3: Extract from Environment Agency River and Sea Water Flood Map (2021)



Contains Environment Agency information © Environment Agency 2021

Key:

 Main Rivers

Dark Blue : (Flood Zone 3)

Shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded: from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light Blue : (Flood Zone 2)

Shows the additional extent of an extreme flood from rivers or the sea.

These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

Clear : (Flood Zone 1)

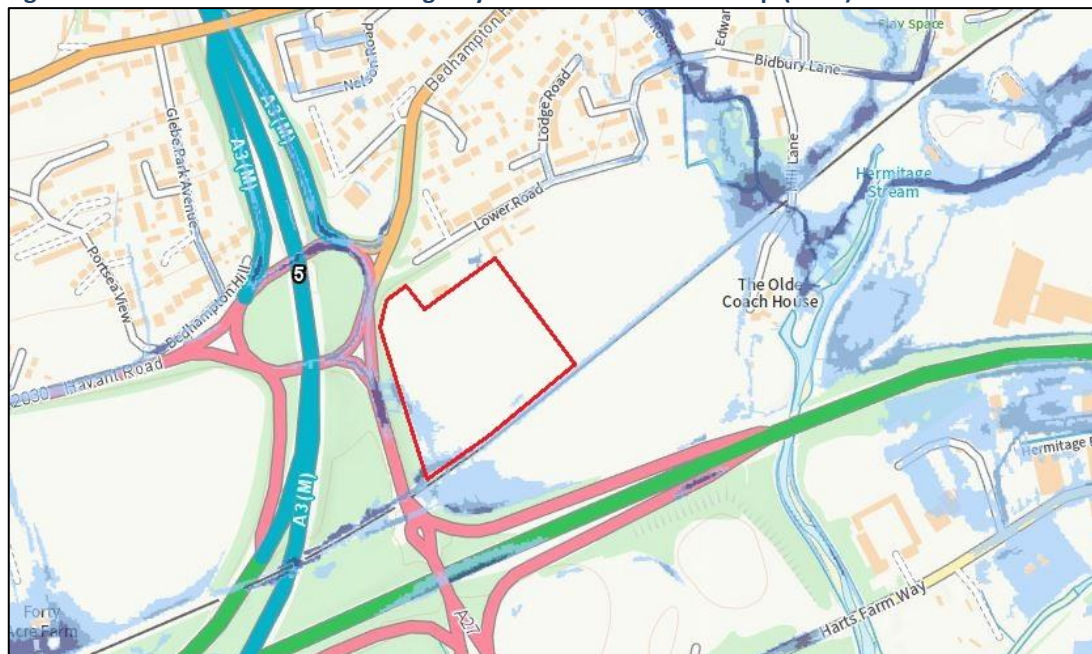
Shows the area where flooding from rivers and the sea is very unlikely.

There is less than a 0.1% (1 in 1000) chance of flooding occurring each year.

- 4.7 The latest Environment Agency 'Flood Zone Map' (March 2019) indicates the site is located within the lowest risk category - Flood Zone 1. 'Flood Zone 1' is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding from a main river in each year and is not within an area of recorded river flooding.
- 4.8 Hampshire County Council as the Lead Local Flood Authority (LLFA) are responsible for assessing the flood risk from all other ordinary watercourses (non-main rivers) in the Bedhampton area, with this information detailed in the Havant SFRA. This study has concluded that the site is not at risk of flooding from all ordinary watercourses within the locality of the development.

- 4.9 It is demonstrated that safe and dry access and egress at the site is achievable to a publicly accessible location outside the 1:100 year (plus climate change) flood event extent, in accordance with DEFRA Report FD2320/TR2 - 'Flood Risk Assessment Guidance for New Developments'.
- 4.10 **Tidal**
Lying 1km from the coast, parts of Bedhampton and its local river networks encounter a risk from tidal flooding. However, the site itself is not at risk of tidal flooding as confirmed by the SFRA, PFRA and the Environment Agency.
- 4.11 **Surface Water**
The 'FMfSWF' (Flood Map for Surface Water Flooding) presented within the SFRA confirms that no incidents of flooding from surface water runoff have been recorded within the site boundary. Since the SFRA/PFRA reports were produced, no further evidence of surface water flooding at the site has been identified.
- 4.12 The Environment Agency's 'uFMfSW' (updated Flood Map for Surface Water) (Figure 4) is a theoretical assessment of potential overland flow paths, ground levels and drainage systems using information from Hampshire County Council as the LLFA to indicate areas that may be susceptible to surface water flooding.

Figure 4: Extract from Environment Agency Surface Water Flood Map (2021)



Contains Environment Agency information © Environment Agency 2021

Key:

- High (Greater than 1:30(3.3%) chance of flooding)
- Medium (Between 1:100(1%) and 1:30(3.3%) chance of flooding)
- Low (Between 1:1000 (0.1%) and 1:100 (1%) chance of flooding)
- Very Low (Less than 1:1000 (0.1%) chance of flooding)

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- 4.13 This map indicates that the majority of the existing site has a 'very low' (less than a 1:1000 or 0.1%) risk of flooding from surface water runoff. There is a small section of southwest of the site that has a 'low' to 'medium' (1:1000 to 1:30) risk of flooding from surface water runoff. This is correlated with the low point on the site.
- 4.14 The implementation of a sensible layout and robust SuDS scheme to collect, attenuate and convey the surface water runoff from the proposed development will mitigate any residual risk of surface water flooding to the site in its developed state.
- 4.15 **Groundwater**
The PFRA, SFRA and the Environment Agency confirm that no recorded events of groundwater flooding have been identified at or within the vicinity of the site.
- 4.16 **Artificial Sources**
With reference to the SFRA/PRFA there have been no recorded incidents of flooding to the site or surrounding areas from artificial sources.
- 4.17 There are no additional artificial sources of flooding, such as that from canals, reservoirs and sewage treatment works within a 1 km radius of the site.
- 4.18 **Overland Flood Flow / Exceedance**
The occurrence of overland flooding at the site due to an extreme rainfall event exceeding the design capacity of the drainage system and SuDS, or a failure of the associated flow controls have been considered both during the construction and operational phase of the development.
- 4.19 If SuDS or the piped drainage system becomes overwhelmed by exceptional rainfall then exceedance routes are proposed to protect people and property by providing unobstructed overland flow routes across the development.
- 4.20 The design levels of hard paved and landscaped areas will aim to contain and convey flood flows through areas of the site to cause minimum flood risk to properties and residents such as parking areas and low-lying open space.
- 4.21 All proposed attenuation features within the development are designed to manage the 1 in 100 year return storm (1% chance of occurrence each year) plus an extra allowance of 40% for the potential increase in peak rainfall predicted up to 2115.
- 4.22 Any residual risk of overland flooding to properties is to be mitigated by the provision of raised property slab levels a minimum of 150mm above surrounding ground level.
- 4.23 The described protection measures ensure that properties both within the proposed development and any offsite parties and land will not be affected by overland runoff in the event of a reasonably extreme rainfall event exceeding the design storm or a failure or a blockage of the SuDS structures within the system.

4.24 Existing Sewers & Water Mains

The SFRA confirms that for the area in which the site lies, there have been no incidents of flooding from sewers in the last 10 years.

4.25 With reference to the Portsmouth Water flood register; there have been no recorded incidents of flooding from the existing foul and surface water sewers or potable water mains within the vicinity of the development.

4.26 With reference to Portsmouth Water records and engineering drawings for the surrounding development there is a 225mm foul water sewer that runs along Lower Road to the north of the site.

4.27 Portsmouth Water will be consulted to confirm that there is adequate capacity for the proposed development flows. The proposed development will have a 'no detriment' impact on the local foul sewer system and does not create an increase in flood risk.

4.28 Proposed Site Drainage

A Flood Risk Assessment requires that an evaluation of all proposed artificial drainage systems and infrastructure within, or in close proximity to the site is carried out. In the context of this development, the following systems are to be installed which need to be assessed in terms of potential flooding through the capacity of the systems being exceeded or the structural, hydraulic, mechanical or operational failure of the system occurring during the lifetime of the development:

- Piped foul water sewers, manholes and potable water mains.
- SuDS for the temporary conveyance and attenuation of surface water.
- Foul water pumping station and associated rising main.

4.29 All adoptable foul and surface water drains, sewers and manholes will be designed and constructed to the Sewers for Adoption 7th edition with all private drainage constructed in accordance with *The Building Regulations Part H, BS EN 752 or BS EN 12056-2* as appropriate, ensuring adequate design capacity and robust structural integrity for the

lifetime of the development. This will not only prevent the risk of flooding to both the development and offsite parties, but will avoid the potential contamination of groundwater by preventing the ingress of groundwater into the pipework and egress of sewage into the underlying soils.

4.30 All SuDS within the drainage system will be sized to manage the runoff from the exceptionally rare 1 in 100 storm event (1% AEP), plus an additional 40% allowance for predicted future climate change effects (in accordance with EA recommendations up to the year 2115).

4.31 The new development as a whole must not create or exacerbate existing flood risk elsewhere and in particular to properties, land and highways downstream of the site. During the design of the proposed development careful consideration has been given to the most sustainable method of surface water disposal and strict controls have been imposed to limit the peak rate and volume of runoff generated from the developed site.

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- 4.32 All surface water runoff from impermeable areas on the proposed development will be and safely disposed at a controlled rate to mimic the existing natural runoff regime for the undeveloped greenfield site. This will ensure that the risk of flooding to properties and land downstream of the site will not increase as a result of this proposed development.
- 4.33 **Sequential Test**
The flood risk technical guidance to the National Planning Policy Framework (NPPF) categorises residential developments as ‘More Vulnerable’ within the risk classification. ‘More vulnerable’ developments located within Flood Zone 1 are considered appropriate under the NPPF.
- 4.34 The NPPF guidance states that planning authorities should complete a risk based ‘Sequential Test’ at all stages of the planning process, to steer new development to areas with the lowest probability of flooding. Under the requirements of the ‘Sequential Test’ and as the proposed development is already located within Flood Zone 1 (lowest risk), there are no more suitable, developable and deliverable alternative sites, better located from a flood risk perspective which could accommodate the proposed development.

5 Existing and Proposed Site Runoff

- 5.1 This section aims to calculate the estimated peak rate and volume of surface water runoff from the existing site. These discharge figures are then used to establish the post-development constraints to inform the preliminary design of the site surface water drainage strategy.

5.2 Catchment Areas

The existing and proposed permeable and impermeable areas are listed in the table below.

Site Catchment	Impermeable	Permeable	Total
Existing Site Area	0 m ²	36,709 m ²	36,709 m ²
Proposed Site Area	9238 m ²	27,471 m ²	36,709 m ²

- 5.3 This development represents an overall approximate increase of 9238 m² in impermeable area post development.

5.4 Existing Surface Water Runoff Peak Runoff Rate & Volume (Greenfield)

An assessment of the estimated current greenfield runoff rate has been carried out using the Institute of Hydrology Report 124 (QBar) methodology.

Catchment: 0.92ha (FSR)

1 in 1 year	2.8 l/s
QBAR	3.3 l/s
1 in 30 year	7.4 l/s
1 in 100 year	10.5 l/s
Volume 100y 6hr	291.4 m ³

- 5.5 Refer to Appendix D for calculations. A 10% allowance for urban creep has been included in the calculations.

5.6 Post Development Surface Water Runoff Peak Runoff Rate & Volume

The procedure for surface water management in accordance within 'Rainfall runoff management for developments' (DEFRA/EA Report – SC030219 E, 2013) states; *“For the range of annual flow rate probabilities up to and including the 1% (1 in 100 year) annual exceedance probability event including an appropriate allowance for climate change, the post-developed rate of run-off into a watercourse, sewer, or other receiving water body, should be no greater than the existing pre-developed rate of run-off for the same event”*.

- 5.7 The National Planning Policy Framework requires that consideration is given to the effect of climate change on the surface water flows generated by any new development. Table 2 of the NPPF - Flood Risk Assessments: Climate Change Allowances – Detailed Guidance (Feb 2016), specifies that an assessment of a 40% increase in rainfall intensity allowance is made when calculating post development runoff rates for residential developments.

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- 5.8 The additional volume of runoff generated from a site should also be limited to the greenfield runoff volume where possible. Where infiltration cannot be utilised to dispose of the additional volume; *“The limiting discharge for any return period up to the 1% AEP (1 in 100 year) event including climate change, shall not be greater than the mean annual peak rate of runoff for the greenfield site – QBar or 2 l/s/ha, whichever is the greatest”*.
- 5.9 As a result of this development and the increase in impermeable areas, the peak rate and volume of surface water that could potentially runoff the proposed site if not effectively managed, could be greater than in its current undeveloped state.
- 5.10 To mitigate this potential increase, it is proposed that all surface water runoff from impermeable areas on the proposed residential development will be attenuated on site and discharged via infiltration.
- 5.11 Where possible permeable paving will be utilised on driveways and shared parking areas. This will function as under-drained, sealed-tank systems and discharge to the positive drainage network. Swales, reed beds and attenuation basins will also serve as additional attenuation and water quality treatment components.

6 Surface Water Drainage Strategy

- 6.1 The National Planning Policy Framework (NPPF) requires that developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to control surface water drainage and overland runoff to ensure there are no increases in peak rates and volumes of runoff as a result of the development.
- 6.2 Environment Agency guidance and government legislation such as the Flood and Water Management Act (Defra 2010) requires surface water drainage strategies for new developments to be in accordance with the ideals of ‘sustainable development’ via the provision of Sustainable Drainage Systems (SuDS).
- 6.3 SuDS are more sustainable than conventional drainage methods because they can mitigate many of the adverse effects of urban stormwater runoff on the environment. This can be achieved through reducing peak runoff rates and volumes to sewer networks and watercourses, reducing the risk of downstream flooding.
- 6.4 The Building Regulations Document H (2015) details the appropriate hierarchy of potential methods for disposing surface water from a development:
1. A soakaway or some other adequate infiltration system, or where that is not practicable;
 2. A watercourse, or where that is not possible;
 3. A sewer.
- 6.5 Soil permeability rates for the superficial clay are insufficient to use conventional infiltration methods to disposing the surface water runoff generated from the proposed development.
- 6.6 There are no watercourses within the vicinity of the development site.
- 6.7 This site lies with Portsmouth Water’s service region. With reference to sewer records, there are dedicated surface water sewers along the northern boundary of the site but would require pumping to reach them.
- 6.8 Therefore, it is proposed to utilise a dry detention basin with deep borehole soakaways into the chalk layer below the clay to dispose of surface water runoff from the proposed development’s hard standing areas including roofs, driveways and roads.
- 6.9 The surface water network will include swales; a reed bed and an attenuation basin, which will all serve as conveyance, storage, and water quality treatment.
- 6.10 Drainage from house and garage roofs, driveways and parking courts, carriageways and footways will drain to swales which convey water to reed beds in the southern landscaped area of the site.
- 6.11 The pond and reedbed will overflow into an attenuation basin which will be dry when not receiving storm water and will attenuate large return period storms via restricted outflow and high-level overflow to borehole soakaway chambers. Infiltration to ground will also occur gradually within the swales and base of the attenuation basin.

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- 6.12 Any exceedance overflow will overtop the basin and flow to the southwest at a rate far lower than the predevelopment greenfield run off for a large return period storm.
- 6.13 A 10% allowance for urban creep has been included in the calculations.
- 6.14 The total storage requirement provided by the attenuation basins discharging via deep borehole soakaways is 1262m³. This will provide storage onsite to manage the 1:100year (1% AEP) storm event, plus an extra allowance of 40% for the predicted potential increase in peak rainfall up to 2115.
- 6.15 No.3 deep borehole soakaways, each 16m deep will provide the necessary infiltration to manage the storm water from the development site. Although these deep borehole soakaways would be within groundwater the EA and Portsmouth Water have no concerns with this discharge method in this instance. Quoting from the pre-application advice for phase 1 by the LLFA:

“Whilst there are times when deep bore soakaways may be appropriate, we would consider this as a drainage option of last resort. A suitable assessment should therefore be provided to prove why other systems are not viable. If it is necessary to consider deep bore soakaways, then appropriate silt removal processes/features will be required upstream. We do note that the system proposed for this site does incorporate several SuDS features prior to water entering the bore hole and note that neither Portsmouth Water nor the EA have concerns.”

See Appendix G for the full comments by the LLFA.

- 6.16 A penstock valve within a manhole chamber will be placed upstream of the flow control into the boreholes. This will provide an emergency shut-off system in the event of a pollution event like an oil spillage.
- 6.17 All drains and manholes/inspection chambers will be designed and constructed in accordance with the Building Regulations Part H and BS EN 752, ensuring adequate capacity and robust structural integrity for the lifetime of the development. This will ensure that no polluted discharge from the drainage system to ground will take place.

7 Water Quality and Pollution Prevention

- 7.1 The proposed SuDS scheme has been designed to mitigate against the contamination of the receiving watercourse. The CIRIA SuDS Manual 2015 details an approach for establishing the hazard posed by the intended land use activates and the extent to which the proposed SuDS components can reduce and mitigate the contamination risk to the receiving waterbody.
- 7.2 Referring to Table 26.2 – ‘Pollution hazard indices for different land use classifications’ the proposed development and land use results in a low pollution hazard, therefore a ‘Simple Index’ method can be used to make a qualitative assessment of the proposed SuDS management.

Table 1: Table 26.2 – ‘Pollution hazard indices for different land use classifications’ CIRIA C753, 2015

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

Roof Runoff:

Total SuDS mitigation index $\geq$ pollution hazard index (for each contaminant type)
For the development site: TSS = 0.2, Metals = 0.2, Hydrocarbons = 0.05

Driveway / Parking / Road Runoff:

Total SuDS mitigation index $\geq$ pollution hazard index (for each contaminant type)
For the development site: TSS = 0.5, Metals = 0.4, Hydrocarbons = 0.4

Table 2 - Table 26.3 – ‘Indicative SuDS mitigation indices for discharge to surface waters’ CIRIA C753, 2015

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

Table 3 - Table 26.4 – ‘Indicative SuDS mitigation indices for discharge to groundwater’ CIRIA C753, 2015

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater				
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates¹		TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³		0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³		0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³		0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³		0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³		0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5,6}		These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

7.3 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type). Where the mitigation index of an individual component is insufficient, two or more components in a series is required, where:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5 (\text{mitigation index}_2)$$

- 7.4 The proposed development surface water drainage system consists of the following SuDS component:

Roof Runoff:

Primary Treatment – Swale

Using table 26.3/26.4 – Mitigation Indices

TSS = 0.5 which is > 0.2 therefore ok.

Metals = 0.6 which is > 0.2 therefore ok.

Hydrocarbons = 0.6 which is > 0.05 therefore ok.

+ Secondary Treatment – Detention Basin

Using table 26.3/26.4 – Mitigation Indices

TSS = $0.5 + (0.5 * 0.5) = 0.75$ which is > 0.2 therefore ok.

Metals = $0.6 + (0.5 * 0.5) = 0.15$ which is > 0.2 therefore ok.

Hydrocarbons = $0.6 + (0.6 * 0.5) = 0.18$ which is > 0.05 therefore ok.

Driveway / Parking / Road Runoff:

Primary Treatment – Detention Basin

Using table 26.3/26.4 – Mitigation Indices:

TSS = 0.5 which is ≥ 0.5 therefore ok.

Metals = 0.6 which is > 0.4 therefore ok.

Hydrocarbons = 0.6 which is > 0.4 therefore ok.

- 7.5 The runoff will also pass through filter trenches and a pond with a reed bed which will add to the mitigation indices. The total combination of SuDS will meet the high water quality and silt removal requirements to discharge via deep borehole soakaways.
- 7.6 The total mitigation level exceeds the development pollution risk and would be suitable for both medium and high-risk developments. The proposed drainage strategy incorporates measures to far exceed the water quality target requirements within the SuDS Manual and therefore complies with the Water Framework Directives for discharge of runoff into controlled waters.

8 Foul Water Drainage Strategy

- 8.1 All foul water flows generated from the development will discharge via pumping station and rising main into the Phase 1 foul system located beyond the north eastern boundary of the site.
- 8.2 A package pumping station will be required.
- 8.3 The predicted peak foul sewer discharge from the 43 units based on the Sewers for Adoption guidance of 4000 l/dwelling/day will be 2.0 l/s.
- 8.4 Portsmouth Water will be consulted to confirm that there is adequate capacity for the proposed development flows. The proposed development will have a 'no detriment' impact on the local foul sewer system and does not create an increase in flood risk.



APPENDIX A

SITE LAYOUT



- 01 Vehicle access point
- 02 Site subject to a planning application
- 03 Potential pedestrian and cycle link
- 04 New tree and buffer planting
- 05 Swale (SuDS)
- 06 Attenuation basin with meadow planting (SuDS)
- 07 Growing spaces including allotments and community garden
- 08 Children's play area
- 09 Trim trail/path
- 10 Informal open space
- 11 Retained habitat
- 12 Scrub habitat
- 13 Wildflower grassland
- 14 Tall grass habitat
- 15 Proposed hedgerow
- 16 Semi-natural green space
- 17 New tree buffer planting
- 18 Shared surface
- 19 Development blocks



0m 100m (1:2,000)

CLIENT:
Bargate Homes

PROJECT:
Bedhampton, Havant

DRAWING:
Illustrative Masterplan

PROJECT NUMBER:
1217

DRAWING NUMBER: SK002
CHECKED BY: LA/LM

REVISION: A
STATUS: Draft

DATE: 24/03/2021
SCALE: 1:2,000



APPENDIX B

TOPOGRAPHICAL SURVEY

NOTES:

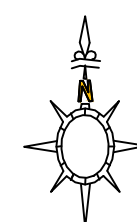
- Invasive Covers are fitted where possible and all drainage invert information has been obtained through visual inspection only, where necessary. The presence of any other drainage inverts has not been guaranteed. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.
- Every effort has been made to identify and detail all trees on the site and to provide a detailed description of each tree.
- A specialist such as an arborist. Time spread and heights are indicative only.
- GPS detail is relative to the time and date of survey. GPS levels and trees are obtained using industry standard guidelines and can vary according to the quality of the GPS network at the time of survey.
- All survey data is collected using a Leica Total Station and Horizontal and Vertical datums are established from a central site fix and positioned to a permanent station using GPS network data.

Survey notes:

- Survey specification is limited to the original purpose of the survey and is not intended to be used for any other purpose. Only a survey is accurate within limitations of the conditions at the time of survey. The survey is not intended to be used for any other purpose. A sight line vegetation, critical dimensions and positions should be verified following suitable clearance.
- Survey detail obtained and shown is relative to the plotting scale.

Copyright:

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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOOUST	LOC
ASP	ASPI	LONDON PLANE	LPI
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OMK	OMK
CHERRY	CHP	PIRE	PIR
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PRS
FIR	FIR	RHODODENDORUS	RDN
FRUIT	FRK	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLH	SWEET CHESTNUT	SCN
HONEY CHESTNUT	HCN	SYCAMORE	SYC
HORNBEAM	HBN	WALNUT	WNT
LARARJAM	LJM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LYME	LYM	SPECIES UNKNOWN	SPU
		COMPED	COP

TREE ANNOTATIONS: Tree Species / Tree Ball Size / No of G

FENCE INFORMATION		LEVEL INFORMATION	
BARBED WIRE FENCE	BWIF	BASEMENT LEVEL	RTL
CORRUGATED IRON FENCE	CIF	BER LEVEL	BL
CLOSE BOARD FENCE	CBF	CED LEVEL	CL
CHAIN LINK FENCE	CLF	DAMP ROOF COURSE	OPC
CHESTNUT PALING	CXP	FLOOR LEVEL	FL
CRASH BARRIER	CRB	INVERT LEVEL	IL
HANDRAIL	HDL	OUTFALL LEVEL	OL
IRON RAILINGS	IRF	THRESHOLD LEVEL	THL
LARCH LAMP FENCE	LFP	FOUL WATER	FW
MISCELLANEOUS FENCE	MFP	SURFACE WATER	SW
PALISADE FENCE	PSF	UNABLE TO LIFT	UTL
PICKET FENCE	PF	WATER LEVEL	WL

SURFACE INFORMATION

TRELLIS FENCING	TUF	CONCRETE	Conc
		BRICK PAVING	BP
		FLOWERBED	FB
		PAVING SLABS	PS
		RETAINING WALL	RWall
		TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BD	MOTORIZED BOLLARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	KANSER FLOWMETER	KFP
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATIC	ROCKING EYE	RE
EARTHING ROD	ER	SECURITY HANDBOOK STOP	SHS
ELECTRICITY CABLE FIT	ELCP	SOIL VENT PIPE	SV
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FLY	FL	TELEPHONE FLY	TF
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCLB
LAMP POST	LP	TRAFFIC SIGNALS	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSLC
LETTER BIN	BN	WATER METER	WM
KERS OUTLET	KO	WATER TAP	WT
WATER GATE	WG		

Level Datum:

Grid:
Grid is related to GCS015, derived from the GCS network.

Northpoint



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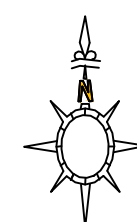
Client:	Bargate Homes
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Survey	Bedhampton P2
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Location:	Bedhampton Havant

Survey type:	Topographical	Scale:	1:200@A0
Project name:	XXXXXXXXXXXXXXXXXXXX	Project no.:	XXXXXXXXXXXX

Drawing ref:	ENC/210221/6NN3/To	Date:	March 2021
Drawn (OA):	CH/CI	Revision:	Plot 1 of 6

[illegible]

LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOQUST	LQ
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MAP
CEDAR	CED	OAK	OAK
CHERRY	CH	PINE	PIN
CYPRESS	CYP	POPULAR	POP
ELM	ELM	PRUNUS	PRN
FIR	FIR	RHODOXYDENDRON	RHY
FRUIT	FR	ROSE	ROS
HAWTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SC
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBM	WALNUT	WNT
LARBARUM	LBN	WILLOW	WIL
LARBOT	LBN	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SP
		COPPED	COP

TREE ANNOTATIONS: Tree Species / Tree Boli Size / No of Boli
Tree Height / Tree Canopy Spread

FENCE INFORMATION LEVEL INFORMATION

BAGGED WIRE FENCE	BWIF	BASEMENT LEVEL
CORRUGATED IRON FENCE	CIF	BD LEVEL
CLOSE BOARD FENCE	CBF	CAMP LEVEL
CHAIN LINK FENCE	CLF	COVER DEEP COURSE
CHESTNUT PALING	CLP	FLOOR LEVEL
CRUSH BARSTER	CBR	INVEST LEVEL
HANDRAIL	HOL	OUTFALL LEVEL
IRON RAILINGS	IRF	THRESHOLD LEVEL
LARCH LAP FENCE	LLF	FOUL WATER
MESELANCROUS FENCE	MSF	SURFACE WATER
PALLISADE FENCE	PSF	UNABLE TO LIFT
PROXY-BENCH	PGB	WATER LEVEL

SURFACE INFORMATION

STOCK WIRE FENCE	SWF	CONCRETE
TRELLIS FENCING	TLF	BRICK PAVING
		FLOWERBED
		PAVING SLABS
		RETAINING WALL
		TACTILE PAVING

FEATURE INFORMATION

BOLLARD	DO	NOTICE BOARD
BRITISH TELECOM BOX	BTB	POST
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE
BUS STOP	BS	RASSED FLOWBINDER
CABLE TELEVISION BOX	CB	ROAD SIGN
CABLE TELEVISION IC	CBV	ROOFTOP EYE
CARWASH GOOD	CR	SERVICE MARKER POST
ELECTRICITY CABLE FIT	ELCP	SOIL WENT PIPE
ELECTRICITY CONTROL BOX	ECB	STOP COCK
ELECTRICITY POLE	EP	STOP VALVE
FIRE HYDRANT	FH	TELEGRAPH POLE
INSPECTION COVER	IC	TELEPHONE CALL BOX
LAMP POST	LP	TRAFFIC SIGNAL
LETTER BOX	LB	TRAFFIC SIGNALS IC
LETTER BIN	RB	WATER METTER
NAME PLATE	NP	WATER TAP

Level Datum:
Levels are related to OSGB15 derived from the GPS network

Grid:
Grid is related to OSG815 derived from the GPS network

Northpoint:



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Client:	Bargate Homes
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Survey Location:	Bedhampton P2 Bedhampton
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Havant	
Survey type:	Topographical
Scale:	1:200@A0

Drawing ref:	ENC/210221/6NN3/To	Date:	March 2021
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Drawn/QA:	CH/GL	Revision:	Plot 5 of 6
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NOTES:

Drainage:
Drainage Covers are fitted where possible and all drainage invert information has been obtained through visual inspection only, with no entry into manholes. Therefore the complete accuracy cannot be guaranteed. The drainage is critical information we suggest the services of a specialist drainage expert be used.

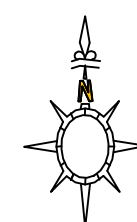
Tree:
Every effort has been made to identify and detail all trees on site but where there are of critical importance we suggest the services of a specialist arboriculturist be used.

GPS:
GPS detail is relative to the time and date of survey. GPS levels and trees are obtained using industry standard guidelines and can vary, depending on the quality of the GPS network at the time of survey. In addition, the surveying instrument used (Trimble) has Horizontal and Vertical Datums are established from a central site fix and the measurement station utilizing GNSS correction data.

Survey notes:
Survey specification is limited to the original purpose of the survey (commissioned purpose) and is not fit for any purpose other. Survey is accurate within limitations of site conditions at the time of survey. The survey is not suitable for use in any other way, such as light or dense vegetation, critical dimensions and positions should be verified following suitable clearance.

Survey detail:
Survey detail is not intended to be conclusive to the plotting scale.

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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPL
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OKA	OKA
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPULAR	POP
ELM	ELM	PRUNUS	PRG
FIR	FIR	RHODOXYDENDRONS	RDN
FRUIT	FRU	ROWAN	RWN
HARTSTROM	HAN	SILVER BIRCH	SRB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	STEEF CHESTNUT	SCN
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBN	WALNUT	WNT
LARBARUM	LAR	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SU
		COPPED	COP

TREE ANNOTATIONS: Tree Species / Tree Boli Size / No. of Boli
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BAGGED WIRE FENCE	BWIF	BASEMENT LEVEL	BTL
CORRUGATED IRON FENCE	CIF	CEILING LEVEL	CL
CLOSE BOARD FENCE	CBF	CONDO LEVEL	CON
CHAIN LINK FENCE	CLF	DAMP PROOF COURSE	DPC
CHASTNET PAULING	CPF	FLOOR LEVEL	FL
CHUBBY BARRIER	CHB	FINISH LEVEL	FIN
HANDRAIL	HDL	OUTFALL LEVEL	OL
IRON RAILINGS	IRF	THRESHOLD LEVEL	THL
LARCH LAMP FENCE	LLF	ROUGH WATER	FW
MISCELLANEOUS FENCE	MSF	SURFACE WATER	SW
PALLISADE FENCE	PSF	UNABLE TO LIFT	UTL
POSTER FENCE	POF	WATER LEVEL	WL

LEVEL INFORMATION

BASEMENT LEVEL	BL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

STOCK VEHICLE THINGS REMOVING	SWF TAC	CONCRETE BRICK PAVING FLOORED PAVING SLABS BETTERING WALL TACTILE PAVING	CONC BP PS RMWd TAC
BOULDER	BD	NOTICE BOARD	NS
BRIEFER TELECOM BOX	BTS	PAINT WATER P	PF
BRIEFER TELECOM BOX	BTS	PAINT WATER P	PF
BUS STOP	BS	PAINTED FLOORBOARD	PF
CHANGING CLOSET	CC	PAINTED FLOORBOARD	PF
CABLE TELEVISION C	CAV	ROCKING EYE	RE
CARPENTRY CLO	CC	SCAFFOLD HANDER POST	SC
ELECTRICITY CABLE FIT	ECF	SOFT LIGHT P	SLP
ELECTRICITY CONTROL BOX	EEB	STOP COCK	SC
ELECTRICITY CLO	ELC	STOP COCK	SC
FIRE HYDRANT	FH	TELEPHONE C	TC
PROPOTION COVER	PC	TELEPHONE CALL BOX	TB
LETTER BOX	LB	TRAFFIC SIGNAL	TSC
LETTER BOX	LB	TRAFFIC SIGNAL T	TSC
NEWS KIOSK	NK	WATER METER	WM
NEWS KIOSK	NK	WATER TAP	TAC

Level Datum:
Level is related to GCG1E derived from the GDS network.

Grid:
Grid is related to OSG815 derived from the GPS network

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Client:	Bargate Homes
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Survey Location:	Bedhampton P2 Bedhampton Havant
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Survey type:	Topographical	Scale:	1:200@A0
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Drawing ref:	ENC/210221/6NN3/To	Date:	March 2021
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Drawn/QA: CH/GL	Revision: Plot 6 of 6
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