Flood Risk Assessment & Drainage Strategy

Title	Former Woodlands Hotel
Client	Country Court Care Homes 5 Limited
Location	Coupals Road, Sturmer, Haverhill, Essex
Project number	22-0364
BIM reference	WHCH-BSP-XX-XX-T-W-0001-P06_Flood_Risk_Assessment
Date	6 JUL 2023

Authorisation Sheet & Revisions Record

Project Number:	22-0364
Project Title:	Former Woodlands Hotel
Client:	Country Court Care Homes 5 Limited
Location:	Coupals Road, Sturmer, Havehill, Essex
Document Reference:	WHCH-BSP-XX-XX-T-W-0001-P06_Flood_Risk_Assessment
Office Address:	BSP Consulting, 12 Oxford Street, Nottingham, NG1 5BG
Telephone No:	0345 413 4000

Rev:	Issue Date:	Description:	Prepared:	Checked:	Authorised:
P01	20/02/2023	Initial issue	AKS	SCB	TG
P02	31/03/2023	Updated site plan & drainage strategy	SCB	TG	TG
P03	12/04/2023	Updated site plan	SCB	TG	TG
P04	02/05/2023	Updated landscape strategy plan	SCB	TG	TG
P05	06/07/2023	Updated site plan	SCB	TG	TG
P06	05/01/2024	Updated drainage strategy	FE	TG	TG

AKS	Alysha Searle BSc (Hons) GradCIWEM	 Flood Risk Engineer
SCB	Simon Bond BSc (Hons) MSc MCIWEM	s.bond@bsp-consulting.co.uk Senior Flood Risk Engineer
TG	Tony Goddard BEng (Hons) CEng MICE	t.goddard@bsp-consulting.co.uk Director

Contents

Executive Summary

Introduction	BSP Consulting has been commissioned by Country Court Care Homes 5 Limited to undertake a Flood Risk Assessment and Drainage Strategy for a new older persons care home (Use Class C2) at the Former Woodlands Hotel, Coupals Road, Sturmer, Haverhill, Essex. This Flood Risk Assessment has been prepared in accordance with the Technical Guidance to the National Planning Policy Framework.
Existing Site Conditions	The site currently comprises a vacant hotel which is in a poor state of repair, towards the centre of the site, with an existing tarmac-surfaced car park fronting Coupals Road to the south of the site. The rest of the site currently comprises tall grasses and overgrown vegetation. Site levels are shown to generally fall from around 78.41mAOD in the north to approximately 66.66mAOD in the south-western corner of the site.
Development Description and Planning Context	Development proposals are for a new older persons care home with associated access, car parking, soft landscaped areas, and supporting infrastructure. In accordance with the NPPF, the project falls under the **more vulnerable** category in terms of flood risk.
Definition of Flood Hazard	Stour Brook is the nearest source of fluvial flood risk to the site and is located approximately 240m to the south of the site at its nearest point. Stour Brook is an EA Main River that drains from northwest to southeast and discharges into the River Stour approximately 1.9km to the southeast of the site.
Probability (Rivers/fluvial)	The EA Risk of Flooding from Rivers and Sea mapping indicates that the proposed development site has less than a 1 in 1,000 annual probability of flooding from rivers or the sea. This map shows the indicative extent of the natural floodplain if there were no flood defences or certain other manmade structures.
Climate Change	The implications of climate change of up to 40% have been considered in this assessment and mitigation measures have been determined accordingly.
Development Proposals	The technical guidance to the NPPF states that developments of a more vulnerable category such as the proposed residential use are appropriate within Flood Zone 1, without being subject to the application of the Sequential Test.
Off-Site Impacts	Surface water from the proposed care home development will be retained on-site before being discharged at a rate of 2.5l/s to the existing surface water sewer under Coupals Road. 2.5l/s is less than the site's greenfield run of rate, hence we are offering a betterment of the sites discharge by 30%, reducing the impact of off-site sewers. Therefore, the development will bring about improvements to the surface water regime

	in the area, and hence will not increase flooding adjacent to or downstream of the site for the lifetime of the development.
Residual Risks	The investigations carried out as part of this flood risk assessment and flood risk management measures proposed have demonstrated that the development will be safe, without increasing flood risk elsewhere.
Recommendations	• The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (45%) storm event on site without flooding any buildings. • The proposed care home is proposed to comprise a green roof which will offer water quality benefits and temporary water storage while also encouraging evapotranspiration. Excess surface water runoff from the roofs is then proposed to be harvested for re-use. • The external ground level hard surfaced areas are proposed to be drained to features such as bioretention areas, roadside swales and gravel filter drains which can collect and slow surface water before transferring the surface water into the attenuation tank. • Infiltration testing has demonstrated that drainage via soakaways will not be feasible. Hence, the proposed development is to utilise the surface water sewer in Coupals Road. LLFA have requested a discharge rate of 2.5l/s. This is lower than the sites 1 in 1 year greenfield run off rate. • The proposed development foul water should discharge via gravity to the Anglian Water public foul sewer located in Coupals Road. This sewer is approximately 100m south west of the site at a lower level therefore a gravity connection is proposed subject to Anglian Water approval at the detailed design stage.

1.0 Introduction

1.1 Terms of Reference

1.1.1 BSP Consulting has been commissioned by Country Court Care Homes 5 Limited to undertake a Flood Risk Assessment and Drainage Strategy for a new older persons care home (Use Class C2) at the Former Woodlands Hotel, Coupals Road, Sturmer, Haverhill, Essex.

1.1.2 This Flood Risk Assessment has been prepared in accordance with the Department for Communities and Local Government (DCLG) Planning Practice Guidance website section on 'Flood Risk and Coastal Change' and the Site-Specific Flood Risk Assessment Checklist.

1.1.3 This report has been produced on behalf of the Client, Country Court Care Homes 5 Limited, and no responsibility is accepted to any third party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of BSP Consulting. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

1.2 Legislation & Guidance

National Planning Policy Framework

1.2.1 The National Planning Policy Framework (NPPF) was published on 27 March 2012, with the latest update published in July 2021. This replaces Planning Policy Statement 25: Development and Flood Risk.

1.2.2 Planning Practice Guidance to the NPPF regarding Flood Risk and Coastal Change has been published and this site-specific Flood Risk Assessment is written in compliance with this guidance.

1.2.3 The NPPF, and supporting technical guidance, can be downloaded free of charge from the internet at the following link:

http://www.communities.gov.uk/publications/planningandbuilding/nppf

Flood & Water Management Act

1.2.4 The Flood & Water Management Act (F&WMA) was passed in 2010, and aims to reduce the flood risk associated with extreme weather, compounded by climate change. This act established the EA as responsible for flood risk related to Main Rivers. In this instance, Essex County Council, as Lead Local Flood Authority (LLFA), are responsible for local sources of flood risk (that being from ordinary watercourses, surface water run-off and groundwater). As Local Planning Authority, Braintree District Council has due regard for drainage and flood risk in accordance with local and national guidance and responses from statutory consultees.

2.0 Background Information

2.1 Site Details

2.1.1 Figure 2.1 below indicates the location of the site. A range of sources have been used to assess the local topography, local watercourses and current site use.

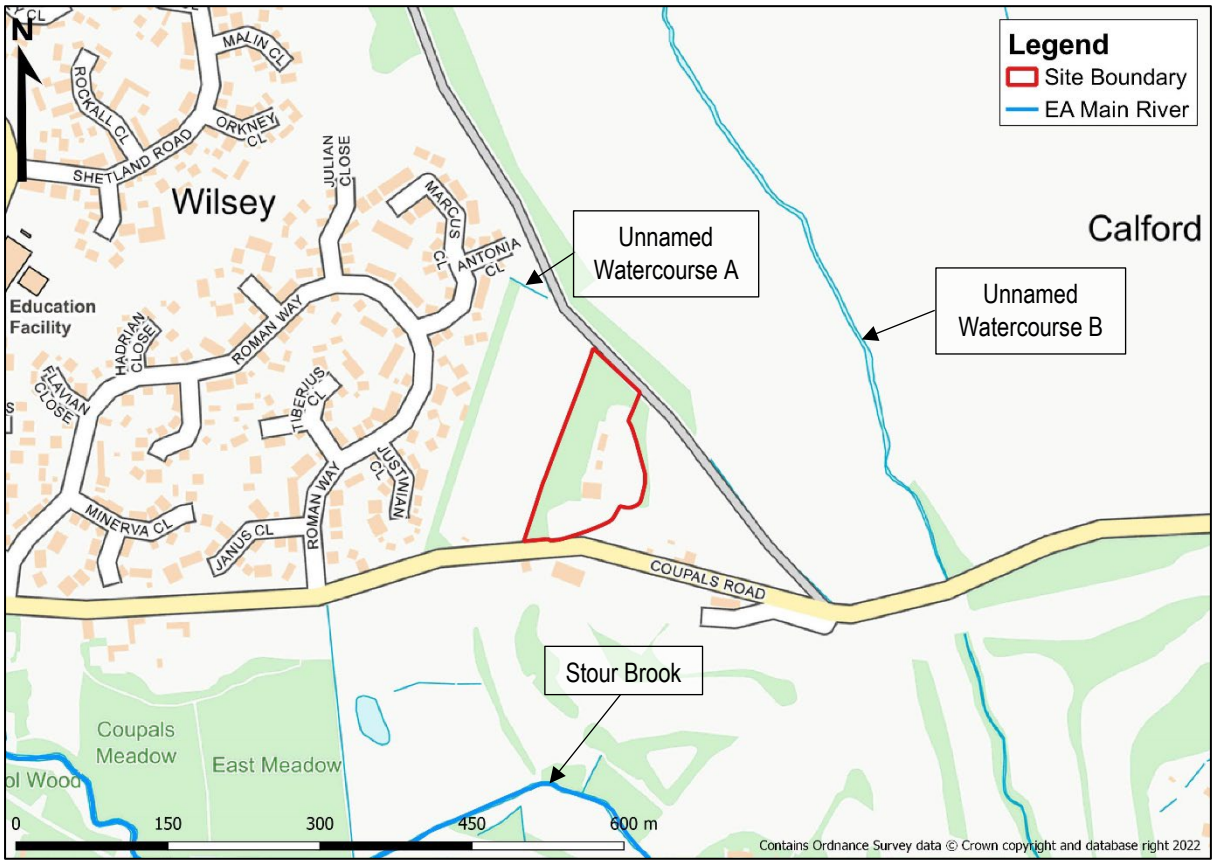


Figure 2.1 Former Woodlands Hotel – Site Location Plan

2.1.2 The proposed development site occupies an area of approximately 1.28 hectares and is located on the south-eastern fringe of the town of Haverhill, to the north of Haverhill Golf Club, centred on OSNGR 569121E, 244967N.

2.1.3 The site is bounded by a farm access track to the north, with greenfield agricultural land beyond, a small grassed area and then an existing residential dwelling to the east, Coupals Road and then Haverhill Golf Club to the south, and a grassed field belonging to Haverhill Golf Club which is used for driving practice to the west, with existing residential development beyond.

2.1.4 The site currently comprises a vacant hotel which is in a poor state of repair, towards the centre of the site, with an existing tarmac-surfaced car park fronting Coupals Road to the south of the site. The rest of the site currently comprises tall grasses and overgrown vegetation.

2.1.5 A topographical survey of the site has been included in **Appendix A.** Site levels are shown to generally fall from around 78.41mAOD in the north to approximately 66.66mAOD in the south-western corner of the site.

Table 2.1: Overall Catchment Context and Local Watercourse Classifications

Classification	Name	Description
Main Rivers	Stour Brook	Stour Brook is an EA Main River located approx. 240m to the south of the site which drains from northwest to southeast and discharges into the River Stour approx. 1.9km to the southeast of the site.
Ordinary Watercourses	Unnamed Watercourse A	Unnamed Watercourse A is an Ordinary Watercourse in the from of a ditch located approx. 70m to the northwest of the site. This watercourse possibly drains under the farm access track, across the neighbouring field and towards Unnamed Watercourse B.
	Unnamed Watercourse B	Unnamed Watercourse B is an Ordinary Watercourse located approx. 230m to the east of the site at it's closest point. This watercourse drains in a general south-easterly direction, discharging into Stour Brook approx. 895m to the southeast of the site.
Manmade Watercourses	N/A	There are no Manmade Watercourses located in close proximity to the site.

2.1.6 The locations of the above watercourses are indicated on Figure 2.1 above.

2.2 Approach to the Assessment

2.2.1 This study has been supplemented by information from the Environment Agency (EA) and Anglian Water (AW), and additional information contained on the British Geological Society (BGS) website, the DEFRA MagicMap website, the Cranfield Soil and Agrifood Institute Soilscapes website and the Ordnance Survey website.

2.2.2 This assessment seeks to draw together the relevant data information from these sources and to collate this with the findings of our investigations and discussions to assess the flood risk and drainage strategy for this site.

3.0 Flood Risk Assessment

3.1 Development Description and Planning Context

3.1.1 Development proposals are for a new older persons care home with associated access, car parking, soft landscaped areas, and supporting infrastructure. The proposed site plan is included in **Appendix B.**

3.1.2 The local area benefits from a Strategic Flood Risk Assessment. This assessment is the West Suffolk Council SFRA (WSCSFRA) (2021). The WSCSFRA recommends that for sites downstream of the A1307, as this site is, the EA's Flood Map for Planning flood zones should be used. This mapping notes the site to be located in Flood Zone 1.

3.1.3 In accordance with the NPPF, the proposed residential use falls under the **more vulnerable** category in terms of flood risk.

3.2 Sequential and Exception Tests

3.2.1 The Sequential Test is designed to steer development towards areas of lower flood risk and is required to be completed for development within Flood Zone 2 and 3. As the site is located within Flood Zone 1 the Sequential Test is not required.

3.2.2 The Exception Test is designed to require evidence of how flood risk will be managed on the proposed development site, ensuring that it is safe for its lifetime and will not increase flood risk elsewhere. Table 3.1 below indicates whether developments, based on their vulnerability classification, are permitted within each Flood Zone and whether the Exception Test is required. The NPPF states that developments of the more vulnerable category are suitable within Flood Zone 1 without the requirement of an Exception Test, as is the case for this site.

Table 3.1: Flood Risk Vulnerability and Flood Zone Compatibility (Source: NPPF)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Zone 3b Functional Floodplain	Exception Test Required	✓	✗	✗	✗

3.3 Definition of Flood Hazard

Historic Flooding

3.3.1 The Environment Agency's Historic Flood Map indicates that the development site has not flooded previously. The dataset shows the maximum extent of all individual recorded flood outlines that have occurred as a result of flooding from rivers, the sea and groundwater sources since records began 1946. The dataset does not account for flooding from other sources, such as sewer flooding or surface water flooding, nor is it exhaustive as it may not include all previous flooding incidents and does not provide information regarding event dates. However, the dataset does provide an insight into the potential for flooding from nearby sources.

The potential sources of flooding in the vicinity of the site are as detailed below:

Fluvial Flood Risk

3.3.2 Stour Brook is the nearest source of fluvial flood risk to the site and is located approximately 240m to the south of the site at its nearest point. Stour Brook is an EA Main River that drains from northwest to southeast and discharges into the River Stour approximately 1.9km to the southeast of the site.

3.3.3 The EA Risk of Flooding from Rivers and Sea mapping, shown below in Figure 2.1, indicates that the proposed development site has less than a 1 in 1,000 annual probability of flooding from Rivers and Sea. This map shows the indicative extent of the natural floodplain, if there were no flood defences or certain other manmade structures, such as surface water sewers, and channel improvements.

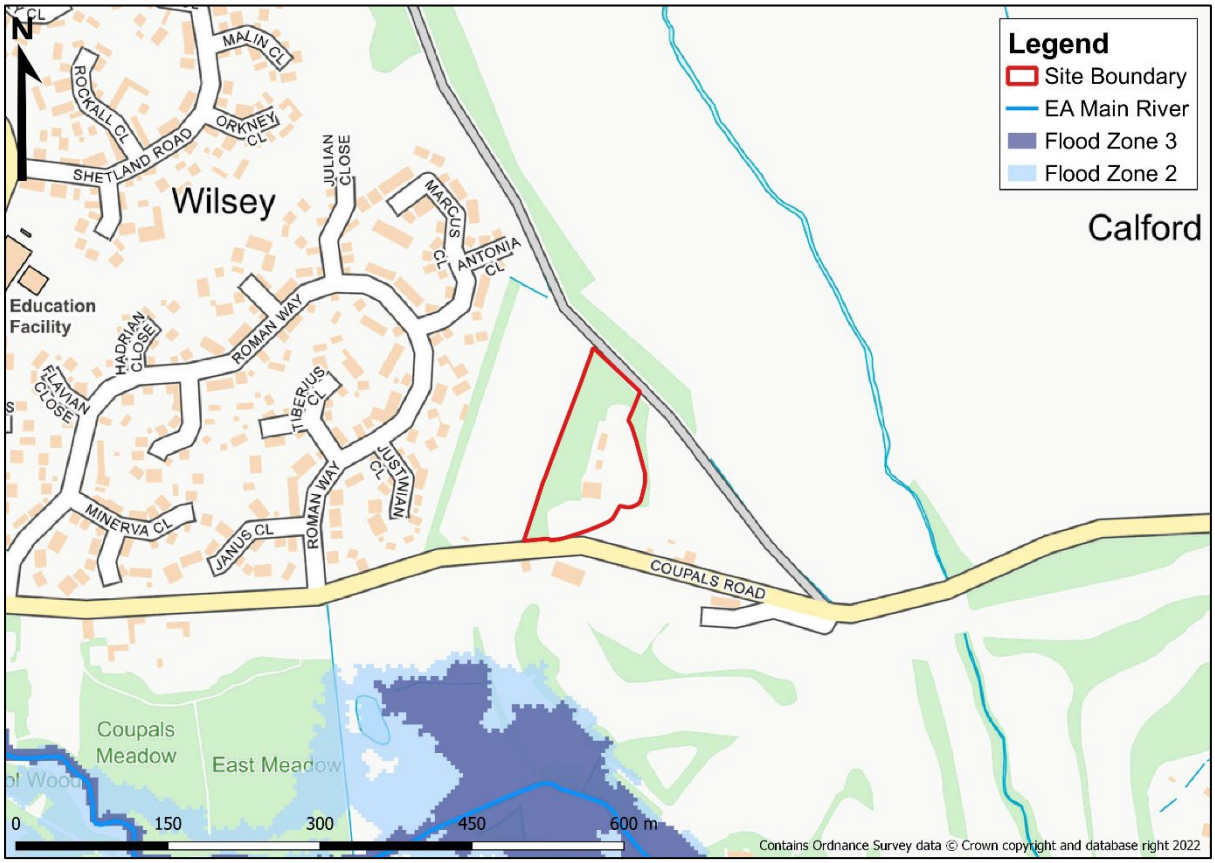


Figure 3.2 Former Woodlands Hotel – Risk of Flooding from Rivers and the Sea (Source: EA)

Tidal Flood Risk

3.3.4 Stour Brook is a non-tidal EA Main River and, therefore, the site is not at risk of flooding from tidal sources.

Surface Water Flood Risk

3.3.5 The site comprises a steady fall in levels from north to south, with the south-western corner of the site being the lowest point. As such, any surface water runoff which exceeds the infiltration capacity of the soils can be assumed to flow across the site in a south to south-westerly direction.

3.3.6 Figure 3.2 below shows the Risk of Flooding from Surface Water mapping and indicates that the whole site and immediately surrounding area is at a very low risk of surface water flooding (<0.1% AEP). A very minor low risk (0.1% AEP) surface water flood flow path is indicated to the north of access track adjacent to the northern boundary of the site. However, this is not shown to affect the site.

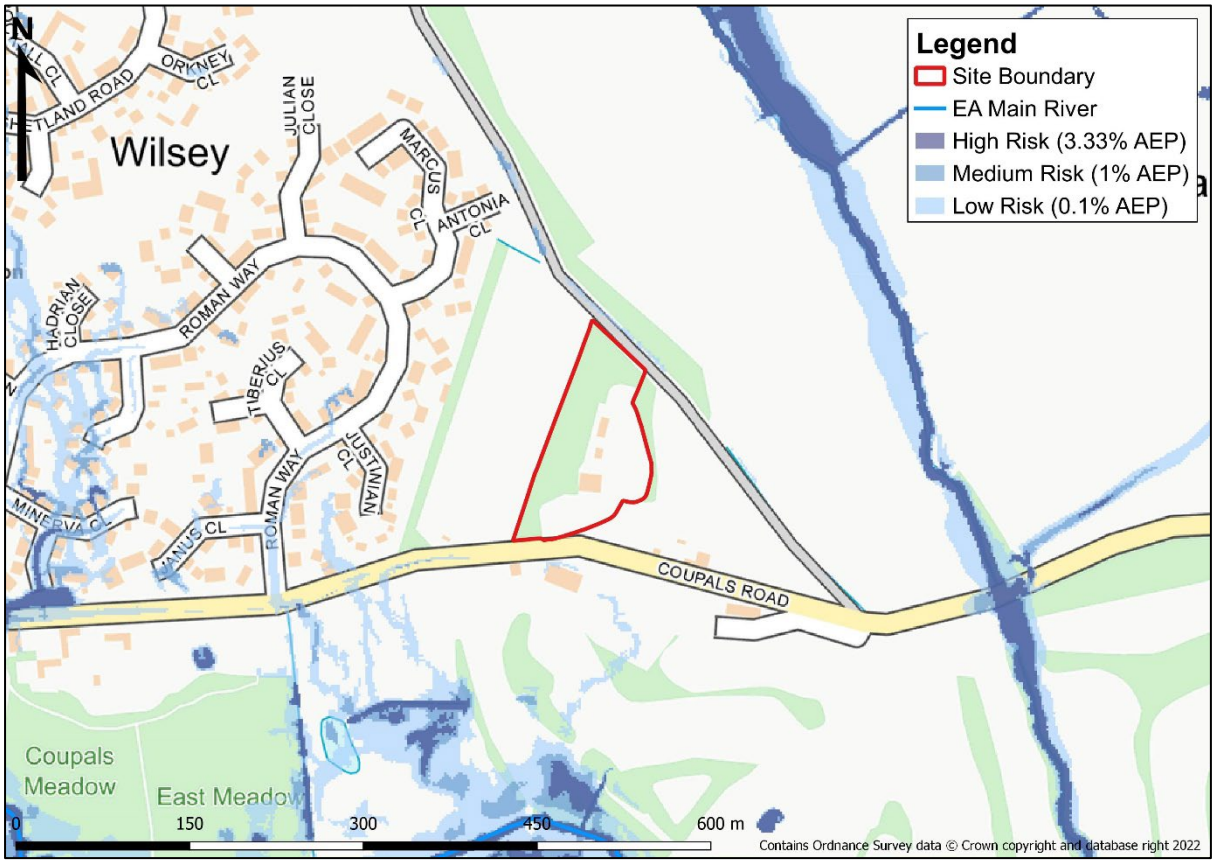


Figure 3.2 Former Woodlands Hotel – Risk of Flooding from Surface Water (Source: EA)

Flood Risk from Ground Water

3.3.7 The British Geological Survey's Geology of Britain mapping indicates that the site lies upon bedrock geology consisting of Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) – Chalk, and superficial deposits consisting of Lowestoft Formation – Diamicton. Lewes Nodular Chalk Formation and Seaford Chalk Formation is generally classed as highly productive aquifer.

3.3.8 The Environment Agency Aquifer Designation Map identifies the site as being situated on bedrock classed as Principal aquifer: geology that exhibit high permeability and/or provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. The superficial drift below the site is classed as Secondary (undifferentiated) aquifer, whereby it has not been possible to attribute either category A or B to a rock type.

3.3.9 The WSCSFRA (2021) does not include mapping of areas which are susceptible to groundwater flooding. However, the SFRA does state that the groundwater susceptibility mapping supplied by the British Geological Society indicates that much of West Suffolk has a low potential for groundwater flooding.

3.3.10 Due to the nature of groundwater flooding, the associated risk is likely to be heavily influenced by the local watercourses, underlying site geology, and topography of the surrounding area. Although the site is indicated to be situated on permeable soils which can provide a high level of water storage, the site lies outside of any fluvial floodplains, as indicated by the EA's Risk of Flooding from Rivers and Sea mapping (Fig. 3.2). Therefore, local watercourses, such as Stour Brook, are considered to have minimal influence on groundwater levels at the site. Moreover, the proposed development site is located on relatively high ground, with levels falling away to the west, east and south. As such, any local rises in groundwater levels are unlikely to permeate to the surface on-site or cause flooding.

3.3.11 Based on the information from the above sources, the site is considered to be at low risk of flooding from groundwater sources.

Flood Risk from Sewers and Infrastructure

3.3.12 The local sewers are operated and maintained by Anglian Water (AW). AW sewer records indicate no public wastewater sewers in the immediate vicinity of the site. The nearest public sewers are located approximately 100m to the southwest of the site, within Coupals Road. At this location, a public surface water sewer of unknown size, and a public foul sewer of unknown size are present, both of which drain in a westerly direction away from the site. Correspondence with AW and a copy of the sewer record plan is included in **Appendix C**. AW have not raised any concerns regarding existing flood issues or capacity problems.

3.3.13 As the site is occupied by a former hotel, there is likely a private wastewater drainage arrangement present on-site. A number of manholes have been identified on the topographical survey included in **Appendix A**. However, no further information regarding the existing drainage infrastructure on-site is available at the time of writing this report. It is likely a private cesspit/septic tank or package treatment plant was previously used by the hotel, although this is likely in a poor state of repair. Nonetheless, as any private drainage system would have been suitably sized for the previous development and is no longer utilised, it does not pose a risk of flooding to this site.

3.3.14 The EA's Flood Risk from Reservoir mapping indicates that the site lies outside of the predicted maximum flood extents in the unlikely event that all upstream large, raised reservoirs and dams simultaneously fail and release the water they hold; both on a 'dry day', if reservoir flooding were to occur when river levels are at normal levels, and on a 'wet day', should reservoir breach occur if a river is already experiencing an extreme natural flood. Therefore, the site is not considered to be at risk of flooding from reservoirs.

3.3.15 Haverhill Water Recycling Centre is located approximately 895m to the west of the site. As this wet process industrial works is located downstream of the site on lower land, this infrastructure does not pose a risk of flooding to the proposed development site.

3.3.16 There are no canals or other Manmade Watercourses within close proximity of the site. The sewers and infrastructure flood risk source can therefore be discounted as a significant source of flood risk to the site.

3.4 Climate Change

3.4.1 The implications of climate change should be taken into account in relation to surface water drainage. Guidance from the EA advises that for longer lifetime residential developments, the upper end allowances for both the 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) events should be assessed, with the development designed to ensure that there is no increase in flood risk elsewhere and the development will be safe from surface water flooding during the 1 in 100-year event when the upper end allowance for climate change is applied. In this instance, peak rainfall intensity for longer lifetime residential developments within the Combined Essex Management Catchment are estimated to increase by 35% for the 3.3% AEP event and 45% for the 1% AEP event. Therefore, it is recommended that the upper end allowance of 45% is applied to design rainfall intensity to allow for the potential implications of climate change.

3.5 Detailed Development Proposals

3.5.1 The proposed development and vulnerability classification are discussed in Section 3.1 above.

3.5.2 The technical guidance to the NPPF states that developments of a more vulnerable category such as the proposed residential use are appropriate within Flood Zone 1, without being subject to the application of the Sequential Test.

4.0 Sustainable Drainage Strategy

4.1.1 The development proposals are for a new older persons care home with associated access, car parking, soft landscaped areas, and supporting infrastructure.

4.2 Surface Water Drainage

Sustainable Drainage Systems

4.2.1 Part H of the Building Regulations 2010 recommends that surface water run-off shall discharge to one of the following, listed in order of priority:

a) an adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable.

b) a watercourse, or, where that is not reasonably practicable.

c) a sewer.

4.2.2 It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

Infiltration Based Systems

4.2.3 The British Geological Survey's Geology of Britain mapping indicates that the site lies upon bedrock geology consisting of Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) – Chalk, and superficial deposits consisting of Lowestoft Formation – Diamicton.

4.2.4 The Cranfield Soil and Agrifood Institute's Soilscapes mapping indicates the entirety of the site to be situated on soils categorised as Soilscape 9: Lime-rich loamy and clayey soils with impeded drainage.

4.2.5 Infiltration testing to BRE 365 specification has been completed by Evolve Geo-Environmental in March 2023 in which three infill tests were carried out at three trial pit locations on-site. Ground conditions at these locations generally comprised made ground underlain by gravelly clays and, as such, each test failed to complete. The results of the infiltration testing are included in **Appendix D**.

4.2.6 Based on the above information, permeable ground conditions are not present at the site. As such, the disposal of surface water runoff via infiltration has been ruled out.

Open Watercourses

4.2.7 There are no open watercourses in close proximity to the site therefore it will not be possible to discharge directly to an open watercourse.

Sewers

4.2.8 As both discharge through infiltration and to an open water course is deemed unachievable, the proposed development should discharged, at an agreed rate to the nearby surface water sewer that is situated under Coupals Road 100m to the south west of the site.

SuDS Option Feasibility

4.2.9 A range of SuDS options have been considered for use within the context of the proposed development site, in-line with CIRIA guidance. Table 4.1 below provides a summary of the options considered for this site.

Table 4.1: Sustainable Urban Drainage Systems Options

SuDS Category	SuDS Technique	Viability	Explanation
Infiltration/ Filtration	Infiltration Trenches	✗	Based upon the results of the infiltration testing, drainage via formal infiltration methods will not be feasible. However, it will still be feasible to achieve high-level filtration for surface water runoff from external surfaces via source control features such as permeable paving or bioretention features.
	Infiltration Basins	✗	
	Soakaways	✗	
	Bioretention/Filter Strips	✓	
	Pervious Pavements	✓	
Source Control	Green Roofs	✓	The proposed care home has been designed to incorporate a green roof, with excess water proposed to be harvested for re-use within the care home itself – e.g., for toilet flushing. As such, rainwater harvesting will reduce the volume of surface water discharging from the site.
	Rainwater Harvesting	✓	
Conveyance	Swales	✓	Conveyance features could be incorporated as part of the surface water drainage design for the site although source control features are preferable. Any conveyance features would serve better as infiltration-devices, for example a bio-swales could be used. However, due to the nature of the proposed development careful consideration will need to be given to the location of these features to ensure they do not pose a health and safety risk to any users of the site. Any features will have to be shallow and located away from the main building and resident gardens.
	Filter Drains	✓	
	Channels/Rills	✓	

Retention/ Detention	Detention Basin	✗	The slope of the site and availability of flat ground at the lower end of the site mean that ponds and wetlands are not viable. Subsurface storage will be used in conjunction with a flow control to regulate off site flows of surface water.
	Retention Pond	✗	
	Subsurface Storage	✓	
	Wetlands	✗	

Runoff Assessment

4.2.10 The proposed development site has an area of 1.28ha which comprises brownfield land. The existing development on-site is in a poor state of repair and is assumed to no longer be positively drained. Therefore, for the purpose of this runoff assessment the site has been treated as greenfield land. As such, the ICP SUDS and IH124 (Flood Studies Report) methods have been used to calculate surface water runoff from a small (<50ha) greenfield site, which are detailed below:

$QBAR_{RURAL} = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$

Where

AREA = Area (ha)

SAAR = Standard Average Annual Rainfall (mm, 1941-1970)

SPR = Standard Percentage Runoff Coefficient

4.2.11 With a site area of 1.28ha and using Flood Studies Report values for SAAR (600mm) and SPR (0.4), this results in a $QBAR_{RURAL}$ rate of **3.6l/s** and discharge rates for the following return periods:

1 in 1-year	3.2l/s
1 in 30-year	8.7l/s
1 in 30-year + 35% Climate Change	11.7l/s
1 in 100-year	12.9l/s
1 in 100-year + 45% Climate Change	18.7l/s

4.2.12 Greenfield runoff calculations are provided in **Appendix E**.

Return Period Design

4.2.13 The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (45%) storm event on site without flooding any buildings.

Drainage Proposals – Main Strategy & Attenuation Volume

4.2.14 The proposed development will comprise of an impermeable footprint of approximately 0.4ha. The proposed care home is proposed to comprise a green roof which will offer water quality benefits and temporary water storage while also encouraging evapotranspiration. Excess surface water runoff from the roofs is then proposed to be harvested for re-use. This strategy is subject to detailed drainage design and input from a Mechanical & Electrical Consultant to provide a suitable design with overflow arrangement to the downstream sewers. The proposed drainage strategy design, levels design and supporting calculations are included in **Appendix F**.

4.2.15 The external ground level hard surfaced areas should be drained to features such as bioretention areas, roadside swales and gravel filter drains which can collect and slow surface water before transferring the surface water into the attenuation tank, before being discharged to the existing sewer. These methods will act to increase the rainfall-runoff response time by intercepting rainfall at or close to source while also providing improvements to water quality.

4.2.16 The surface water discharge rate and proposed drainage strategy will be subject to agreement with Essex County Council as Lead Local Flood Authority (LLFA).

4.3 Water Quality

Simple Index Approach

4.3.1 In order to determine whether the proposed SuDS features for the development will be sufficient at removing pollutants from surface water runoff, the CIRIA SuDS Manual (2015) Simple Index Approach has been applied. This approach provides pollution hazard levels and indices to relevant pollutants based upon contributing hardstanding surfaces.

4.3.2 Table 4.2 below provides an extract of the land use types and pollutant indices from the CIRIA SuDS Manual which are relevant to the proposed development.

Table 4.2: Pollution hazard indices for different land use classifications (Source: CIRIA SuDS Manual 2015)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	Low	0.5	0.4	0.4

4.3.3 Based upon the above, the worst case indices for the development are 0.5 (Total Suspended Solids), 0.4 (Metals) and 0.4 (Hydrocarbons). Table 4.3 below indicates the mitigation indices for different types of SuDS components, with only those relevant to the development included. Under the Simple Index Approach, in order to suitably mitigate surface water pollutants, the total combined indices for any SuDS components will need to be greater than the worst case indices above. Where multiple SuDS components are proposed, the primary component is given its full indices, while subsequent component indices are applied with a factor of 50%.

Table 4.3: Indicative SuDS mitigation indices for discharges to ground (Source: CIRIA SuDS Manual 2015)

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Constructed permeable pavement underlain by soil with good contaminant attenuation potential of at least 300mm in depth	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.8	0.8	0.8

4.3.5 Based upon the above, either the proposed permeable paving and bioretention areas alone will be sufficient in mitigating surface water runoff pollution from the proposed development. Where further SuDS components are included in the development proposals these will offer even greater mitigation against surface water runoff pollution.

4.4 Maintenance

4.4.1 The proposed surface water drainage system will require routine maintenance to ensure it remains fully operational and effective. The proposed permeable paving, bioretention and rainwater harvesting system will be maintained by a private management company and should be inspected and maintained regularly.

4.5 Foul Water Drainage

4.5.1 The nearest public sewers are located approximately 100m to the southwest of the site, within Coupals Road. Anglian Water have confirmed that the local network can receive the predicted foul flows from the development. However, before connecting to the public foul sewer in Coupals Road a survey of the manhole cover level and invert level should be confirmed. The drainage Strategy Layout contained in **Appendix F** indicates the proposed offsite foul sewer to connect to the adopted Anglian Water sewer.

5.0 Off-Site Impacts

5.1.1 Surface water from the proposed care home development will be attenuated on-site in an attenuation tank, before being discharged into the existing sewer in Coupals Road. By ensuring no flooding during a major storm event, this reduces any impact on neighbouring sites. Moreover, as the limited discharge is less than the greenfield run off rate, the site discharge offers a 30% betterment. Therefore, the development will bring about improvements to the surface water regime in the area, and hence will not increase flooding adjacent to or downstream of the site for the lifetime of the development.

6.0 Overland Flow & Flood Routing Considerations

6.1.1 The routing of potential surface water runoff, should the capacity of the proposed drainage system be exceeded, needs to be built into the layout of the site such that the residual risk of flooding from this element can be easily mitigated.

6.1.2 Careful attention will need to be paid to the proposed site levels to ensure that overland flow routes are maintained, and localised low spots are not created.

7.0 Residual Risks

7.1.1 The investigations carried out as part of this flood risk assessment and flood risk management measures proposed have demonstrated that the development will be safe, without increasing flood risk elsewhere.

8.0 Recommendations

The following recommendations are made to ensure flood risk at this site is minimised:

- The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (45%) storm event on site without flooding any buildings.
- The proposed care home is proposed to comprise a green roof which will offer water quality benefits and temporary water storage while also encouraging evapotranspiration. Excess surface water runoff from the roofs is then proposed to be harvested for re-use.
- The external ground level hard surfaced areas are proposed to be drained to features such as bioretention areas, roadside swales and gravel filter drains which can collect and slow surface water before transferring the surface water into the attenuation tank.
- Infiltration testing has demonstrated that drainage via soakaways will not be feasible. Hence, the proposed development is to utilise the surface water sewer in Coupals Road. LLFA have requested a discharge rate of 2.5l/s. This is lower than the sites 1 in 1 year greenfield run off rate.
- The proposed development foul water should discharge via gravity to the Anglian Water public foul sewer located in Coupals Road. This sewer is approximately 100m away from the site at a lower level therefore a gravity connection is proposed subject to Anglian Water approval at the detailed design stage.

Disclaimer

We would note that all comments made in this report are based on the sources stated in Section 1.1. This report and its recommendations are intended for the use of Country Court Care Homes 5 Limited for the above site only.

Appendix A

Topographical Survey

KEY:

CL	Cover level	ANT	Antenna	PO	Undefined Post
DP	Down Pipe	AV	Air Valve	PX	Crossing Control
DPG	Down Pipe/ Gully	BB	Belisha Beacon	RB	Rubbish Bin
Gy	Gully	BM	Benchmark	RE	Rodding Eye
IL	Invert level	BO	Bollard	SP	Sign Post
INV	Pipe invert	Box	Control Box	ST	Stop Tap
MH	Manhole	BT	British Telecom	SV	Stop Valve
VP	Vent Pipe	CATV	Cable Television	SY	Stay
WL	Water level	EP	Electric Pole	TP	Telegraph Post
BH	Bore Hole	Epy	Electricity Pylon	WM	Water Meter
Eave:	Eaves Level	ER	Earth rod	WO	Wash Out
Flat:	Flat Roof Level	FH	Fire Hydrant	IFL	Internal floor level
Ht	Height	GV	Gas valve	THL	Threshold level
Rdge:	Ridge Level	IC	Inspection Cover	TCL	Tree Canopy Level
D	Trunk Diameter	LB	Letter Box		Gate
MB/MD	Multi Bole Trunk	LP	Lamp Post		
TT	Tactile Paving	Mkr	Service Marker		

Bank Line Lower
Bank Line Upper
Building
Building Canopy
Drop Kerb
Kerb
Fence - Open
Fence- Panel
Fence - Secure
OS Detail
Railing
Tree Canopy
Verge
Verge Concrete
Verge Grass
Verge Tarmac
Wall

Station	Easting (m)	Northing (m)	Level (m)
STN01	569076.863	244913.463	68.590
STN02	569165.371	244894.529	68.101
STN03	569107.606	244920.834	69.171
STN04	569139.657	244974.937	74.014
STN05	569100.313	244896.416	66.962
STN06	569048.017	244884.789	64.692
STN07	569153.829	244931.115	71.139
STN08	569129.020	245088.942	78.690
STN09	569158.496	245060.635	77.684

Survey Coordinates and Grid

Please note that the grid shown on this drawing is as follows;

- ☐ *Arbitrary*
- ☐ *Arbitrary but approx. related to North*
- ☐ *Best fit to an Ordnance Survey Digital Sheet*
- ■ *Related to the Ordnance Survey National GPS Network*

Levels

Please note that the levels shown on this drawing are as follows;

- ☐ *Arbitrary*
- ☐ *Related to an Ordnance Survey Bench Mark*
- ■ *Related to the Ordnance Survey National GPS Network*

Survey Hub
Nottingham | Manchester | London
Head Office: 0115 7141123
mail@surveyhub.co.uk
www.surveyhub.co.uk

Client: Dukesmead Property Holdings

Project: Woodlands Hotel, Coupals Road
Haverhill, CB9 7UW

Title: Topographical Survey

Surveyed: SP/HM Checked: NS Date: 21/08/2019

Sheet No: 1 of 2 Scale: 1:200@A0

Job No. 3931 Rev. -

NOTES:

All critical measurements should be checked on site prior to design.
No liability will be taken for this plan if passed on to 3rd parties.
Some services/data may be omitted in areas of parked vehicles and vegetation.

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS NET).
A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN15 & OSGM15 TRANSFORMATION MODELS.
THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.
NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE COORDINATES SHOWN ARE LOCAL PLANE GRID.
PLEASE REFER TO SURVEY STATION TABLE TO ENABLE ESTABLISHMENT OF THE ON-SITE GRID.

KEY:

Bank Line Lower		OS Detail	
Bank Line Upper		Railing	
Building		Tree Canopy	
Building Canopy		Verge	
Drop Kerb		Verge Concrete	
Kerb		Verge Grass	
Fence - Open		Verge Tarmac	
Fence- Panel		Wall	
Fence - Secure			

Station	Easting (m)	Northing (m)	Level (m)
STN01	569076.863	244913.463	68.590
STN02	569165.371	244894.529	68.101
STN03	569107.606	244920.834	69.171
STN04	569139.657	244974.937	74.014
STN05	569100.313	244896.416	66.962
STN06	569048.017	244884.789	64.692
STN07	569153.829	244931.115	71.139
STN08	569129.020	245088.942	78.690
STN09	569158.496	245060.635	77.684

Survey Coordinates and Grid

Please note that the grid shown on this drawing is as follows;

- ☐ *Arbitrary*
- ☐ *Arbitrary but approx. related to North*
- ☐ *Best fit to an Ordnance Survey Digital Sheet*
- ■ *Related to the Ordnance Survey National GPS Network*

Levels

Please note that the levels shown on this drawing are as follows;

- ☐ *Arbitrary*
- ☐ *Related to an Ordnance Survey Bench Mark*
- ■ *Related to the Ordnance Survey National GPS Network*

Survey Hub

Nottingham | Manchester | London
Head Office: 0115 7141123
mail@surveyhub.co.uk
www.surveyhub.co.uk

Client: Dukesmead Property Holdings

Project: Woodlands Hotel, Coupals Road Haverhill, CB9 7UW

Title: Topographical Survey

Surveyed: SP/HM Checked: NS Date: 21/08/2019
Sheet No: 2 of 2 Scale: 1:200@A0

Job No. 3931 Rev. -

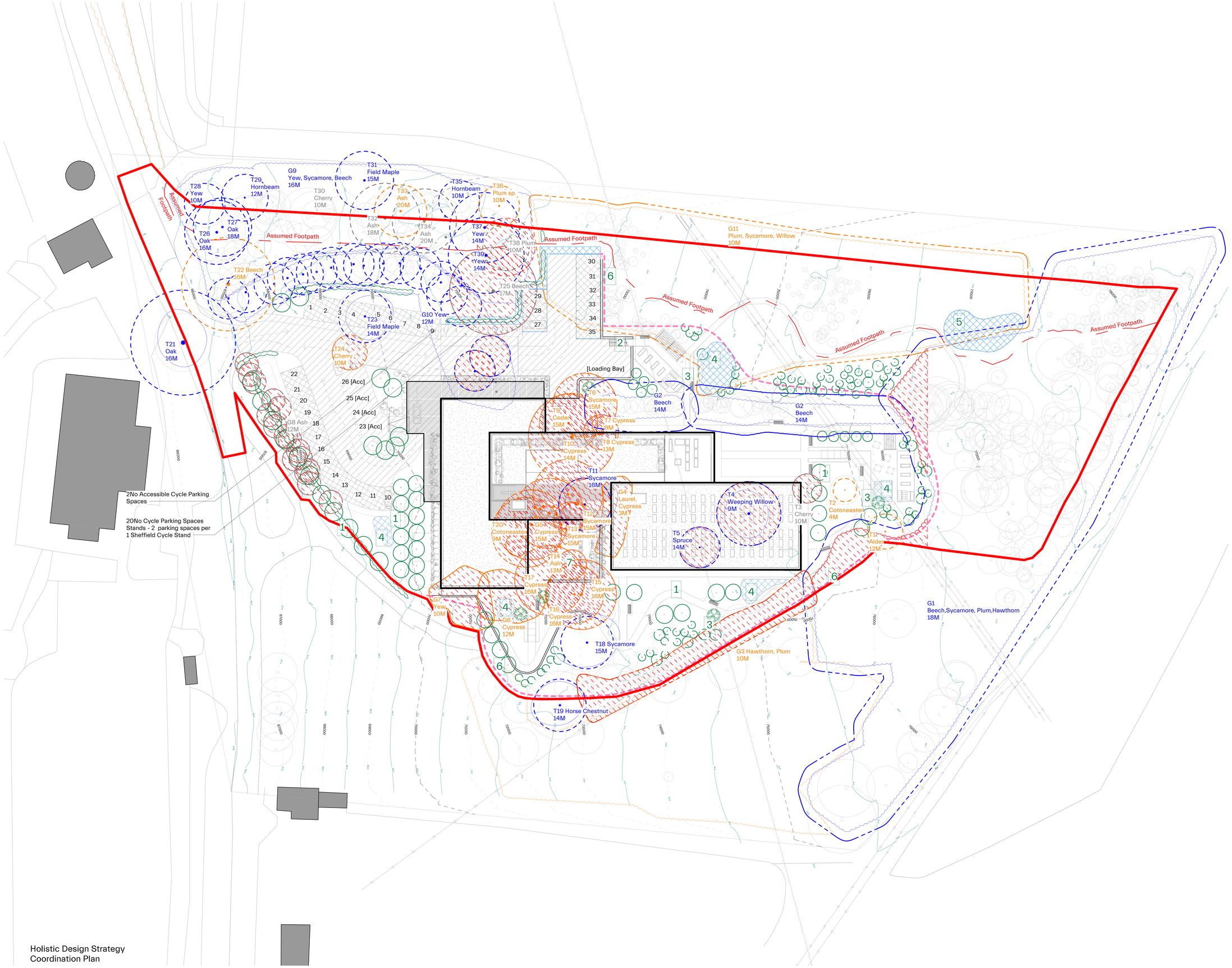
NOTES:

All critical measurements should be checked on site prior to design.
No liability will be taken for this plan if passed on to 3rd parties.
Some services/data may be omitted in areas of parked vehicles and vegetation.

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS NET).
A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN15 & OSGM15 TRANSFORMATION MODELS.
THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.
NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE COORDINATES SHOWN ARE LOCAL PLANE GRID
PLEASE REFER TO SURVEY STATION TABLE TO ENABLE ESTABLISHMENT OF THE ON-SITE GRID.

Appendix B

Proposed Site Plan



Holistic Design Strategy
Coordination Plan

WGP
ARCHITECTS

Project
421 Coupals Road,
Haverhill

Drawing Number: 421 _PL_00_200
Revision: P

Drawing
Holistic Design Strategy
Coordination Plan

Scale
1 : 250 @ A0

Drawing Category
General Arrangement Drawing

Drawing Status
PRELIMINARY

Revision	Date	Drawn	Approved	Notes
-	04.08.22	MS	PW	For information
A	10.08.22	CP	PW	Existing trees
B	06.10.22	CP	PW	Removed trees
C	27.01.23	MS	CP	Updates
D	02.02.23	MS	CP	Updates
E	10.02.23	MS	CP	Coordination
F	07.03.23	MS	CP	Design Updates
G	05.04.23	CP	CP	Design Updates
H	02.06.23	MS	PW	Planning App
J	12.06.23	CP	PW	Planning App
K	22.06.23	MS	CP	Planning App
L	26.10.23	CP	CP	Planning App
M	07.11.23	CP	FA	See Clouds
N	14.11.23	CP	CP	Planning App
P	08.12.23	CP	CP	Revision 20

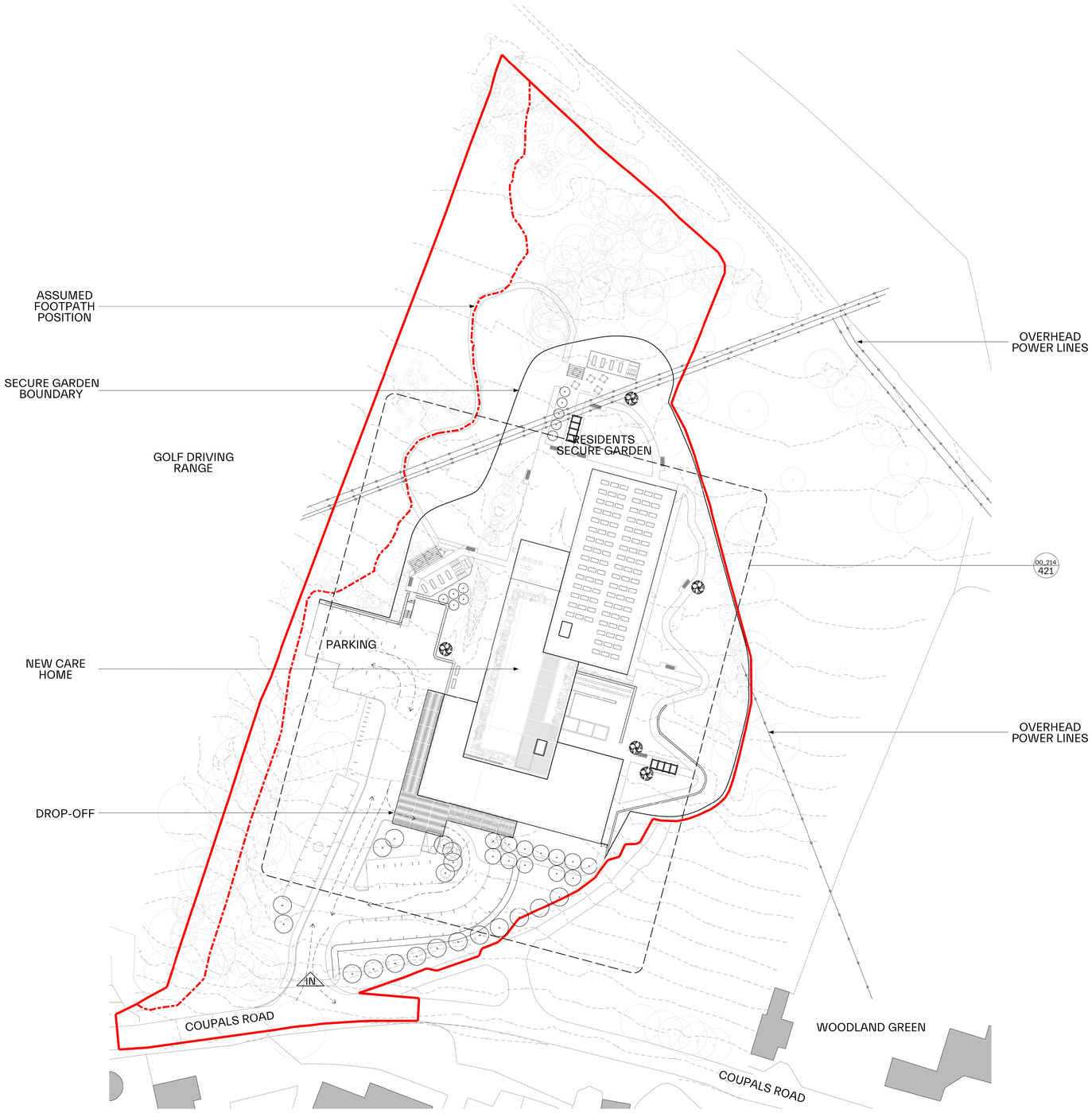
0 2m 4m

Do not scale. Use figured dimensions only. Confirm all dimensions on site

Key

- Site Boundary
- Secure Garden Boundary
- T1 Alder 12m — Tree reference ID, Tree species, Height
- Category U Tree / Tree Group RPA shown dashed
- Category C Tree / Tree Group RPA shown dashed
- Category B Tree / Tree Group RPA shown dashed
- Existing Tree - Retained
- Proposed Tree
- Proposed Feature Tree
- Tree to be removed
- Hard Landscaping / Main vehicle access route
- Soft Landscaping / Shared Surface
- Attenuation Feature
- 1 Tree Avenue as per FPCR information
- 2 External Pedestrian and Maintenance Access to Garden as per FPCR information
- 3 Single Surface Garden Footpath as per FPCR information
- 4 Habitat Swales - with underground connections as per FPCR information
- 5 Wet Habitat Area (according to levels of vegetation) as per FPCR information
- 6 Secure Garden Boundary as per FPCR information
- 7 Rain Garden

WGP ARCHITECTS
27 BULWER STREET
LONDON W12 8AR
+44 (0)20 8735 5367
WGP-ARCHITECTS.COM



Proposed Site / Block Plan

WGP ARCHITECTS

Project
421 Haverhill

Drawing Number
421_PL_00_100

Revision
F

Drawing
Proposed Site / Block Plan

Scale
1:500 @ A1, 1:1000 @ A3

Drawing Category
General arrangement drawing

Drawing Status
PLANNING

Revision	Date	Drawn	Approved
C	25.09.23	FA	PW
Notes	For information		
D	08.11.23	FA	PW
Notes	For information		
E	14.11.23	CP	PW
Notes	Planning Application		
F	08.12.23	CP	PW
Notes	Planning Application		

0 10m 20m

Do not scale, except for planning purposes. Use figured dimensions only; confirm all dimensions on site.

Key

Application Boundary

Assumed footpath position - see separate note prepared by Freeths

WGP ARCHITECTS
27 BULWER STREET
LONDON W12 8AR
+44 (0)20 8735 5367
WGP-ARCHITECTS.COM

Appendix C

Anglian Water Correspondence & Sewer Records

Pre-Planning Assessment Report

Former Woodlands Hotel

InFlow Reference: PPE-0160764

Assessment Type: Used Water

Report published: 24/01/2023

Thank you for submitting a pre-planning enquiry.

This has been produced for BSP Consulting Ltd.

Your reference number is **PPE-0160764**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

---

Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Residential institution	1

The anticipated residential build rate is:

Year	Y1
Build rate	1

Development type: Brownfield

Planning application status: Unknown

Site grid reference number: TL6911244995

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that there are no public water mains/public sewers or other assets owned by Anglian Water within the boundary of your development site. However, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Haverhill Water Recycling Centre, which currently has capacity to treat the flows from your development site.

Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental andregulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer at manhole 9801 in Coupals Road at National Grid Reference NGR TL 68933 44877. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

You indicated on the Pre-Planning Application form that a connection to the public surface water sewer network is not required as infiltration techniques can be utilised. Therefore a capacity assessment has not been made on the public surface water network.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

As the proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an Infrastructure charge for each new property connecting to the public water and sewerage network that benefits from Full planning permission. The infrastructure charge replaces the zonal charge as previously identified.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991.

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

• The Infrastructure Charge is based on the cost of any reinforcement and upgrades to our existing network ("Network Reinforcements"), whether designed to address strategic or local capacity issues. For more information on our Infrastructure Charge, please see the 'Useful Information' section of this report.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage).

The Water Recycling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 490	0	To be confirmed during the connection application stage

Please note that you should also budget for infrastructure charges on non-household premises where applicable and these will be calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge and the relevant multiplier will be applied to the figures set out in our 2022-23 Developer Charging Arrangements to arrive at the amount payable. Details of the relevant multiplier for each fitting can be found on our website.

Section 4 - Map of Proposed Point of Connection(s)

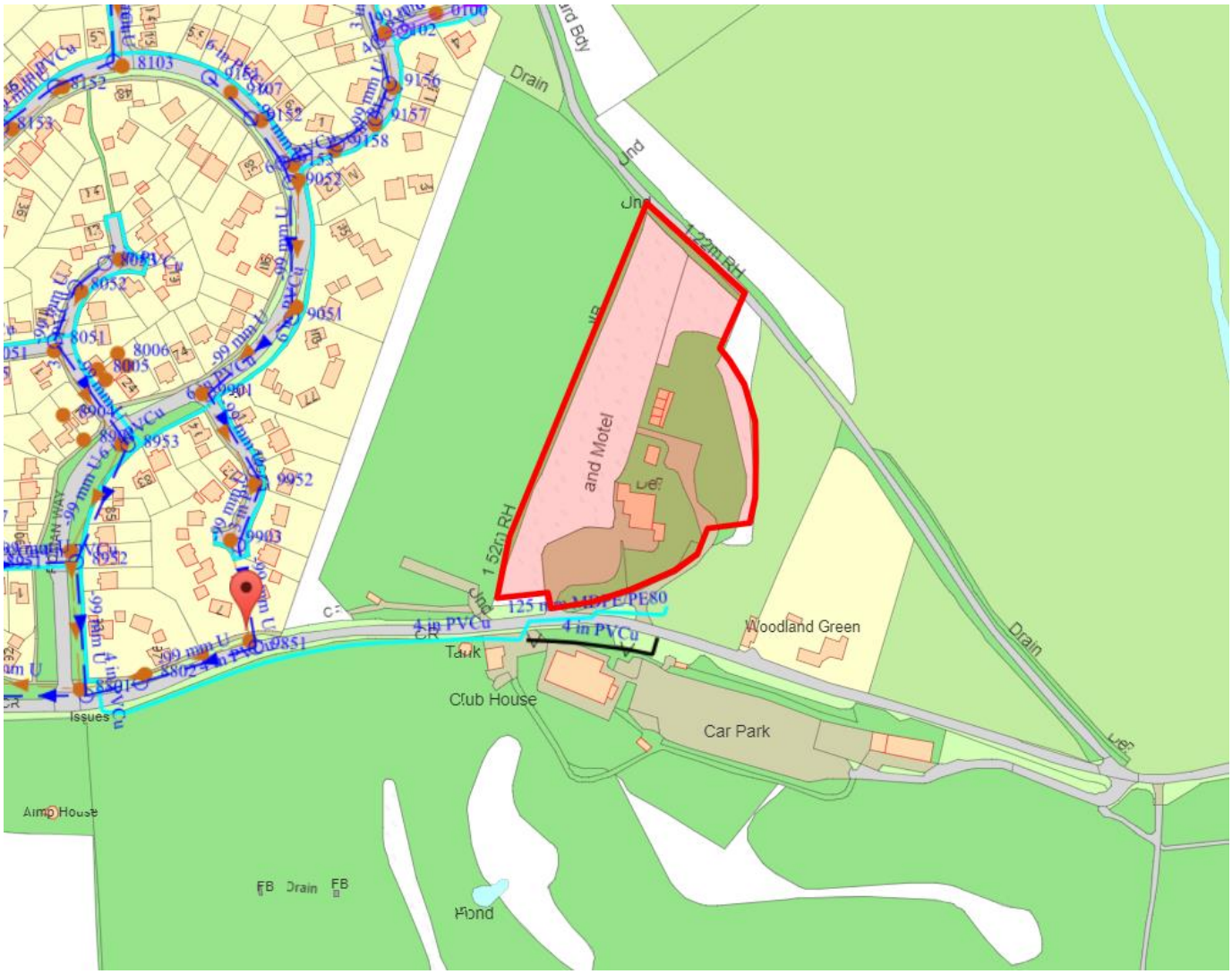


Figure 1: Showing your water recycling foul point of connection.

Section 5 - Useful information

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content.

Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid from the date issued and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s). Our pre-planning reports are valid for 12 months, however please note Anglian Water cannot reserve capacity and available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.

Appendix D

Evolve Infiltration Testing Report

evolve

GEO-ENVIRONMENTAL

BRE365 Factual Infiltration Report

Woodlands, Haverhill

EGE Project No. EGE-23-01-07-01

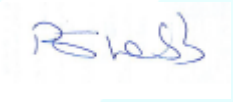
Country Court Care Homes

Evolve Geo-Environmental Limited
C/O 15 Newland, Lincoln LN1 1 XG
www.evolvegeo-env.co.uk

Report Details

Project Name	Woodlands, Haverhill
Client	Country Court Care Homes
Service	BRE365 Infiltration Testing
Date of Issue	21st March 2023
Project number	EGE-23-01-07-01

Author Details

Prepared By	Philip Webb Associate	
Checked By	Paul Huteson Director	
Authorised By	Paul Bennett Director	

Quality Control

Revision	Date	Made by	Description
00	21st March 2023	PW	-

evolve
GEO-ENVIRONMENTAL

Paul Bennett
Director
paulb@evolvegeo-env.co.uk
Tel: 07946 041578

Paul Huteson
Director
paulh@evolvegeo-env.co.uk
Tel: 07946 041571

Table of Contents

evolve
GEO-ENVIRONMENTAL

1.0 Authorisation, Context and Purpose

1.1 Authorisation

Evolve Geo-Environmental Limited (EGE) was instructed by BSP Consulting on behalf of Country Court Care Homes (the 'Client') to undertake soil infiltration testing in general accordance with BRE365 methodology at land known as the Former Woodlands Hotel, Coupals Road, Haverhill (the 'Site').

A Client provided topographical survey is included as Drawing I.

1.2 Context and Purpose

The Site is currently occupied by a former hotel, which is in a poor state of disrepair. Proposals are for the existing hotel to be demolished and replaced by a care home.

As such, the purpose of these works were to provide factual soil infiltration rates to support drainage design, by others.

These works were undertaken in general accordance with BRE Digest 365, Soakaway Design, dated 1991, revised 2016.

1.3 Limitations

The EGE standard limitations are included as Appendix I.

In addition, the following specific limitations were applicable to this investigation:

- The information presented in this Report is factual information only for the infiltration rates of the soils identified beneath the Site to support a third-party drainage design strategy. EGE does not and cannot design soakaways;
- The locations of the infiltration tests were sited in accessible areas of the Site. The buildings and surroundings were fenced off for security purposes which allowed test locations with machinery to be completed within the south of the Site only. Additional hand pits (HP101 and HP102) were undertaken in proposed infiltration test locations in the north to confirm the geology was consistent with that identified as part of the BRE365 infiltration testing completed in the south; and
- All BRE365 infiltration test failed to reach 25% effective depth during the first fill given the cohesive Geology (chalky clays of the Lowestoft Formation). As such, all test locations were deemed failed tests.

2.0 Environmental Setting

Current Site Use	The Site is currently occupied by former hotel buildings and associated woodland/ landscaping. The buildings and surrounding land are bound by a metal fence. The Site is accessed from Coupals Road in the south into the former asphalt car park of the hotel, which was noted to have a number of bulk bags of gravel to prevent unlawful access. The northern part of the Site was overgrown with large trees, brambles and hedgerows.
Anticipated/Known Geology	Reference to the British Geological Survey (BGS) online viewer indicates that the Site is underlain by superficial Lowestoft Formation (Diamicton) which is in turn underlain by Lewes Nodular Chalk Formation and Seaford Chalk Formation bedrock. An historic BGS borehole, ref (TL64SE18), available for the golf course approximately 30 m to the south-west of the Site, identified clay with chalk and flint to 13.00 m underlain by chalk to the base of the hole at 50.00 m.
Hydrology	There is an unnamed watercourse/ stream approximately 300 m east of the Site.

3.0 Scope of Works

EGE attended the Site on the 16th March 2023 to undertake the following scope of works:

- Advancement of three (3 no.) infiltration tests (SA101 and SA103) to maximum depth of 1.50 m bgl;
- Infiltration testing in general accordance with BRE365 methodology;
- Excavation of two (2 no.) hand dug trial pits (HP101 and HP102) to confirm the geology across the wider Site area; and
- Factual Reporting.

An approximate intrusive location plan is included as Figure I.

The trial pit logs are included as Appendix II and the infiltration testing results are included as Appendix III.

4.0 Findings

The findings of the investigation are provided within the following Sections below.

4.1 Ground Conditions

The ground conditions typically comprised a topsoil to a maximum depth of 0.30 m bgl in SA101, underlain by Made Ground of sandstone (SA101 and SA102) to a maximum depth of 0.50 m or clay and bricks (SA103). Underlying the Made Ground was the Lowestoft Formation comprising clay with flint and chalk gravel.

Due to access restrictions, it was not possible to position an excavator in all areas of the Site, and as such two hand dug pits were excavated in the north of the Site to confirm the geology was similar to that in the south. The strata in the pits comprised 0.20 m of Topsoil overlying the Lowestoft Formation comprising gravelly clay. This confirmed that the geology in the northern part of the Site is consistent to that within trial pits SA101 to SA103 in the south.

No groundwater was encountered within soakaway locations.

4.2 BRE365 Infiltration Results

The results of the BRE365 infiltration Testing are presented below:

Infiltration Test Location	Testing Depth (m bgl)	Geology	Calculated infiltration Result (m/s)
SA101	0.70 - 1.50	Lowestoft Formation (Gravelly Clay)	Failed test
SA102	0.70 - 1.50		Failed test
SA103	0.70 - 1.50		Failed test

Drawings

evolve
GEO-ENVIRONMENTAL

Drawing I – Client Provided Topographical Drawing

evolve
GEO-ENVIRONMENTAL

KEY:

CL	Cover level	ANT	Antenna	PO	Undefined Post
DP	Down Pipe	AV	Air Valve	PX	Crossing Control
DPG	Down Pipe/ Gully	BB	Belisha Beacon	RB	Rubbish Bin
Gy	Gully	BM	Benchmark	RE	Rodding Eye
IL	Invert level	BO	Bollard	SP	Sign Post
INV	Pipe invert	Box	Control Box	ST	Stop Tap
MH	Manhole	BT	British Telecom	SV	Stop Valve
VP	Vent Pipe	CATV	Cable Television	SY	Stay
WL	Water level	EP	Electric Pole	TP	Telegraph Post
BH	Bore Hole	Epy	Electricity Pylon	WM	Water Meter
Eave:	Eaves Level	ER	Earth rod	WO	Wash Out
Flat:	Flat Roof Level	FH	Fire Hydrant	IFL	Internal floor level
Ht	Height	GV	Gas valve	THL	Threshold level
Rdge:	Ridge Level	IC	Inspection Cover	TCL	Tree Canopy Level
D	Trunk Diameter	LB	Letter Box		Gate
MG/MD	Multi Bole Trunk	LP	Lamp Post		
TT	Tactile Paving	Mkr	Service Marker		

Bank Line Lower
Bank Line Upper
Building
Building Canopy
Drop Kerb
Kerb
Fence - Open
Fence- Panel
Fence - Secure
OS Detail
Railing
Tree Canopy
Verge
Verge Concrete
Verge Grass
Verge Tarmac
Wall

Station	Easting (m)	Northing (m)	Level (m)
STN01	569076.863	244913.463	68.590
STN02	569165.371	244894.529	68.101
STN03	569107.606	244920.834	69.171
STN04	569139.657	244974.937	74.014
STN05	569100.313	244896.416	66.962
STN06	569048.017	244884.789	64.692
STN07	569153.829	244931.115	71.139
STN08	569129.020	245088.942	78.690
STN09	569158.496	245060.635	77.684

Survey Coordinates and Grid

Please note that the grid shown on this drawing is as follows;

- ☐ *Arbitrary*
- ☐ *Arbitrary but approx. related to North*
- ☐ *Best fit to an Ordnance Survey Digital Sheet*
- ■ *Related to the Ordnance Survey National GPS Network*

Levels

Please note that the levels shown on this drawing are as follows;

- ☐ *Arbitrary*
- ☐ *Related to an Ordnance Survey Bench Mark*
- ■ *Related to the Ordnance Survey National GPS Network*

Survey Hub

Nottingham | Manchester | London
Head Office: 0115 7141123
mail@surveyhub.co.uk
www.surveyhub.co.uk

Client Dukesmead Property Holdings

Project Woodlands Hotel, Coupals Road Haverhill, CB9 7UW

Title Topographical Survey

Surveyed SP/HM Checked NS Date 21/08/2019
Sheet No 1 of 2 Scale 1:200@A0

Job No. 3931 Rev. -

NOTES:

All critical measurements should be checked on site prior to design.
No liability will be taken for this plan if passed on to 3rd parties.
Some services/data may be omitted in areas of parked vehicles and vegetation.

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS NET).
A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN15 & OSGM15 TRANSFORMATION MODELS.
THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.
NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE COORDINATES SHOWN ARE LOCAL PLANE GRID
PLEASE REFER TO SURVEY STATION TABLE TO ENABLE ESTABLISHMENT OF THE ON-SITE GRID.

KEY:

Bank Line Lower		OS Detail	
Bank Line Upper		Railing	
Building		Tree Canopy	
Building Canopy		Verge	
Drop Kerb		Verge Concrete	
Kerb		Verge Grass	
Fence - Open		Verge Tarmac	
Fence- Panel		Wall	
Fence - Secure			

Station	Easting (m)	Northing (m)	Level (m)
STN01	569076.863	244913.463	68.590
STN02	569165.371	244894.529	68.101
STN03	569107.606	244920.834	69.171
STN04	569139.657	244974.937	74.014
STN05	569100.313	244896.416	66.962
STN06	569048.017	244884.789	64.692
STN07	569153.829	244931.115	71.139
STN08	569129.020	245088.942	78.690
STN09	569158.496	245060.635	77.684

Survey Coordinates and Grid

Please note that the grid shown on this drawing is as follows;

- ☐ *Arbitrary*
- ☐ *Arbitrary but approx. related to North*
- ☐ *Best fit to an Ordnance Survey Digital Sheet*
- ■ *Related to the Ordnance Survey National GPS Network*

Levels

Please note that the levels shown on this drawing are as follows;

- ☐ *Arbitrary*
- ☐ *Related to an Ordnance Survey Bench Mark*
- ■ *Related to the Ordnance Survey National GPS Network*

SurveyHub

Nottingham | Manchester | London
Head Office: 0115 7141123
mail@surveyhub.co.uk
www.surveyhub.co.uk

Client Dukesmead Property Holdings

Project Woodlands Hotel, Coupals Road
Haverhill, CB9 7UW

Title Topographical Survey

Surveyed SP/HM Checked NS Date 21/08/2019
Sheet No 2 of 2 Scale 1:200@A0

Job No. 3931 Rev. -

NOTES:

All critical measurements should be checked on site prior to design.
No liability will be taken for this plan if passed on to 3rd parties.
Some services/data may be omitted in areas of parked vehicles and vegetation.

THIS SURVEY HAS BEEN ORIENTATED TO THE ORDNANCE SURVEY (O.S) NATIONAL GRID (OSGB36) VIA A GLOBAL POSITION SYSTEM (GPS) AND THE O.S. ACTIVE NETWORK (OS NET).
A TRUE OSGB36 COORDINATE HAS BEEN ESTABLISHED NEAR TO THE SITE CENTRE VIA A TRANSFORMATION USING THE OSTN15 & OSGM15 TRANSFORMATION MODELS.
THE SURVEY HAS BEEN CORRELATED TO THIS POINT AND A FURTHER ONE OR MORE OSGB36 POINTS ESTABLISHED TO CREATE A TRUE O.S. BEARING FOR ANGLE ORIENTATION.
NO SCALE FACTOR HAS BEEN APPLIED TO THE SURVEY THEREFORE THE COORDINATES SHOWN ARE LOCAL PLANE GRID
PLEASE REFER TO SURVEY STATION TABLE TO ENABLE ESTABLISHMENT OF THE ON-SITE GRID.

Drawing II – Proposed Development Plan

evolve
GEO-ENVIRONMENTAL

1. Proposed Care Home
2. Proposed Car Park
3. Porous Surface Parking Bays
4. Tree Avenues
5. External Pedestrain and Maintenance to Garden
6. Single Surface Garden Footpath
7. Informal Footpath Route through Woodland
8. Existing Trees / Woodland (retained and enchanced)
9. Varied Grass Mixes and Mowing Regimes
10. Outdoor Shelter and Seating
11. Outdoor Activity Areas (Greenhouse, Seating, Shelter, Raised Beds and Sheds
12. Seating alongside Footpath
13. Habitat Swales - with underground connections
14. Wet Habitat Area (according to levels and vegetation
15. Shrub, Grasses and Perennial Planting
16. Secure Garden Boundary

N

L:\11100\11119\LANDS\Drawings\11119-FPCR-XX-XX-DR-L-0002-P01.01-Illustrative GA.indd

Country Court Care
Former Woodlands Hotel
Haverhill

ILLUSTRATIVE GENERAL ARRANGMENT

nts@A2
03.10.22 JPF/ CEP
11119-FPCR-XX-XX-DR-L-0002 rev -

fpcr
masterplanning
environmental assessment
landscape design
urban design
ecology
architecture
arboriculture

FPCR Environment and Design Ltd
Lockington Hall
Lockington
Derby DE74 2RH

t: 01509 672772
e: mail@fpcr.co.uk
w: www.fpcr.co.uk

Figures

evolve
GEO-ENVIRONMENTAL

Figure I – Approximate Intrusive Location Plan

evolve
GEO-ENVIRONMENTAL

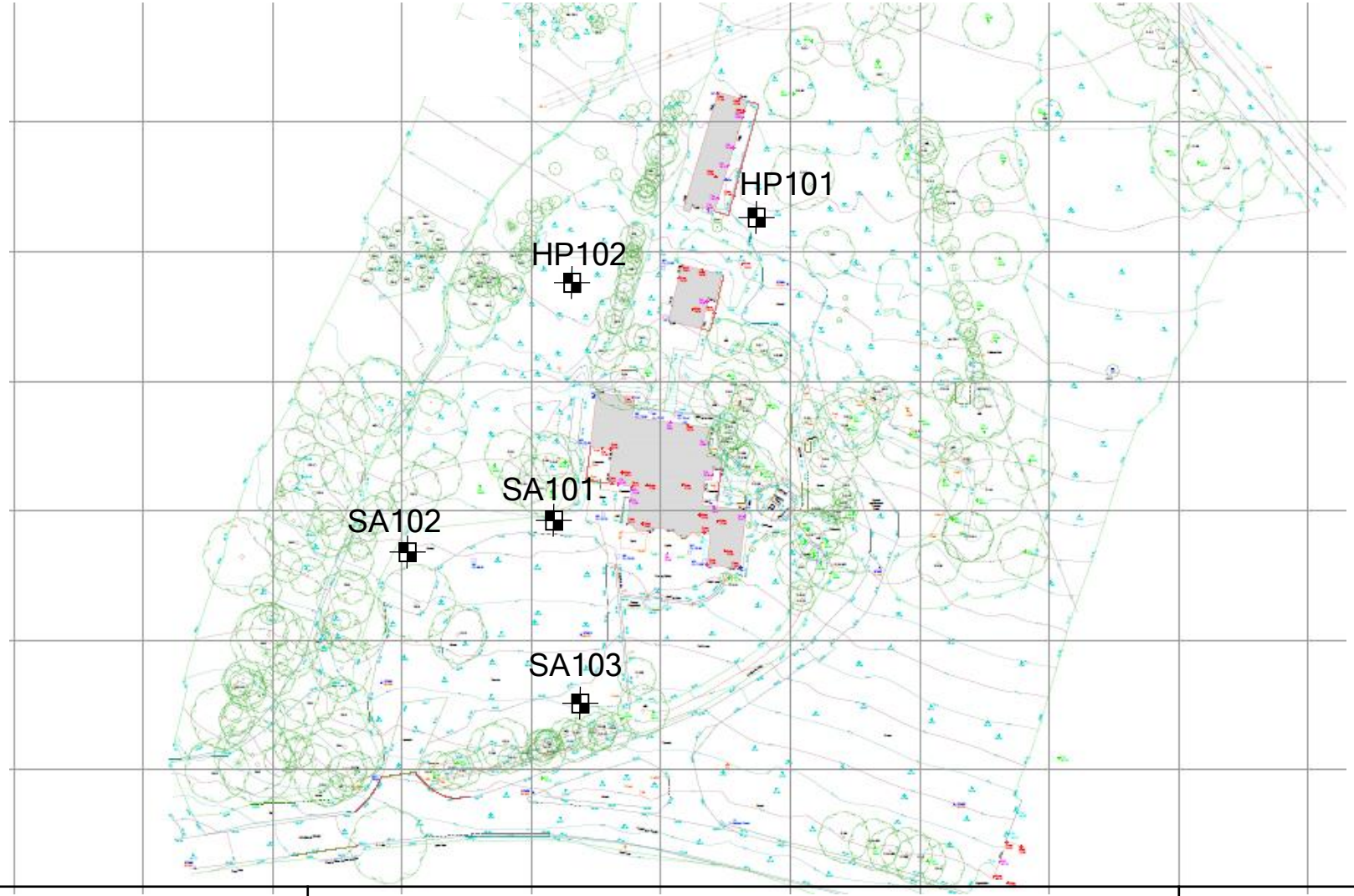


Figure No. and Title	I - Approximate Intrusive Location Plan
Project Name	Woodlands Hotel, Haverhill
Client	Country Court Care Homes 5 Limited
Service	Soakaways
Date of Issue	March 2023
Project number	EGE-23-01-07-01

evolve
GEO-ENVIRONMENTAL

Appendices

evolve
GEO-ENVIRONMENTAL

Appendix I - Standard Limitations

evolve
GEO-ENVIRONMENTAL

Limitations

The conclusions and recommendations made in this Report are limited to those that can be made based on the findings of the investigation and in the context of the proposed development.

Where comments are made based on information obtained from third parties, EGE assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third parties, unless specifically stated.

This Report has been prepared in accordance with our understanding of current best practice. However changes to best practice, guidance or legislation may necessitate revision of this Report after the date of issue.

EGE has prepared this Report for the sole use and reliance of the Client, in accordance with our Standard Conditions and Limitations issued with the proposal. This Report may not be used or relied upon by any unauthorised third party without the explicit written agreement of EGE. Third parties use the information at their own risk.

Appendix II – Intrusive Logs

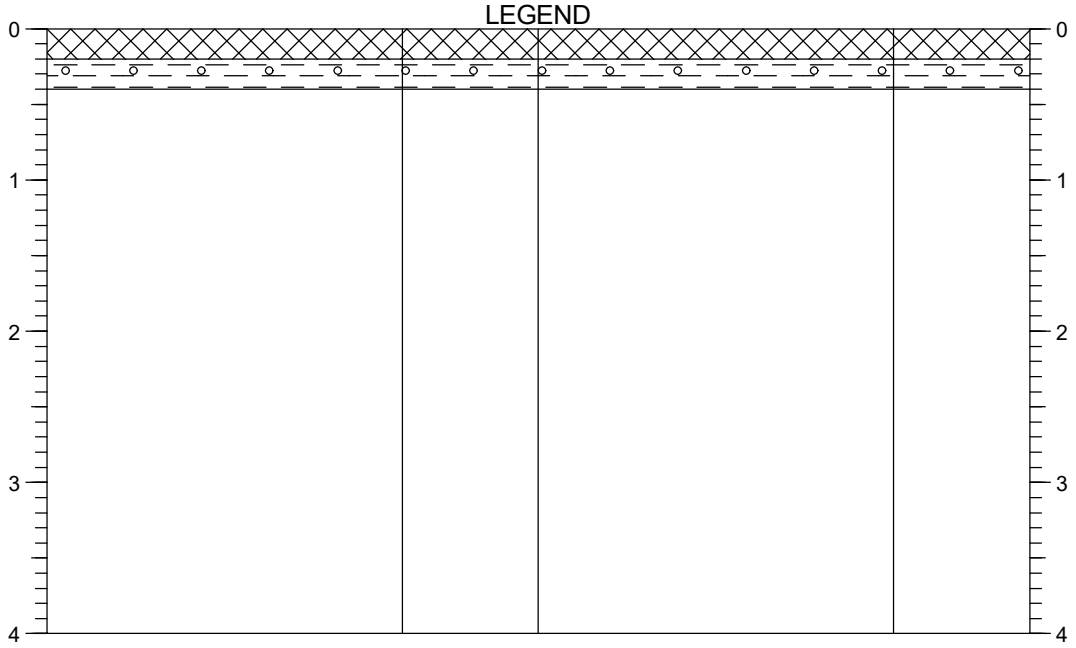
evolve
GEO-ENVIRONMENTAL

Evolve Geo-Environmental
C/O 15 Newland, LN1 1XG
Tel: 07946 041571
Email: paulh@evolvegeo-env.co.uk

evolve GEO-ENVIRONMENTAL

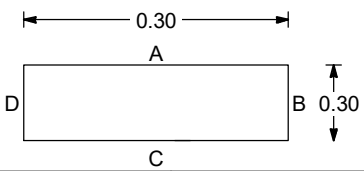
Project:	Project No:	Hole ID:
Woodlands, Haverhill	**EGE-23-01-07**	**HP101**
TRIAL PIT LOG	Date: 16/03/2023	Client: **Country Court Care Homes**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.20		MADE GROUND: Dark brown slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded charcoal				
0.40		Firm light brown gravelly CLAY. Gravel is subangular to rounded fine to medium flint and chalk. (LOWESTOFT FORMATION)				

Shoring/Support:
Stability:



Bearing: °

REMARKS :
1. Hole logged in general accordance with BS5930:2015+A1:2020.
2. Sides stable during excavation.
3. Backfilled with arisings.
4. Coordinates from handheld GPS.

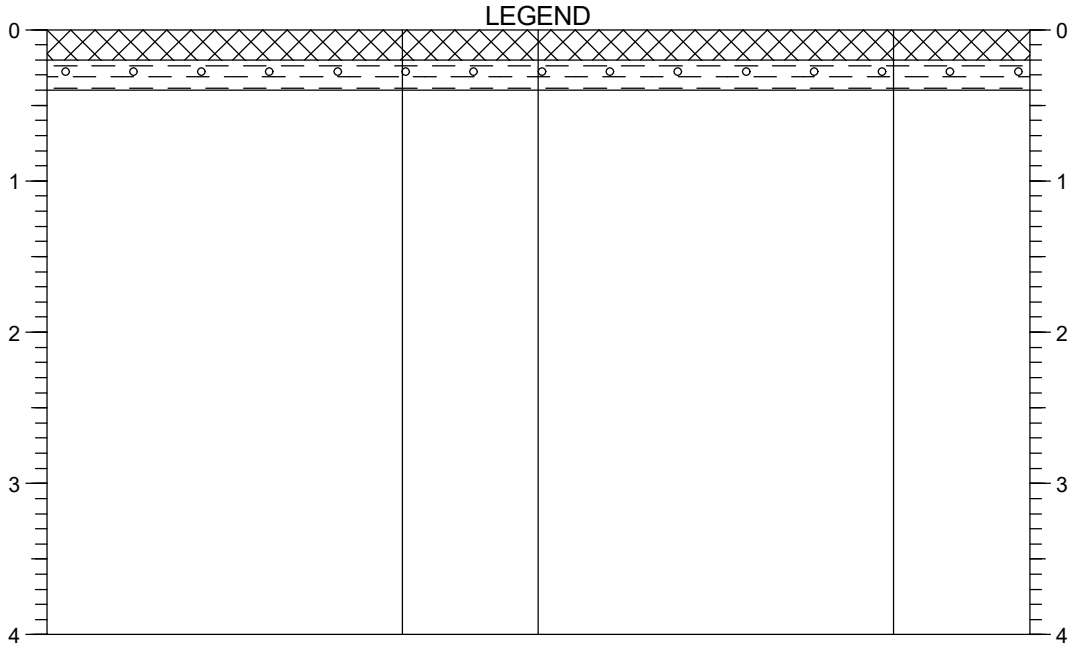
All measurements in metres unless otherwise stated	10m/page Scale: 1:50	Coordinates to Local Grid No Datum Information Available

Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
Hand Tools	E: 244985 N: 569127	PW	PH	PB

Evolve Geo-Environmental
C/O 15 Newland, LN1 1XG
Tel: 07946 041571
Email: paulh@evolvegeo-env.co.uk

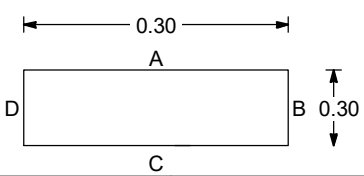
evolve GEO-ENVIRONMENTAL

Project:	Project No:	Hole ID:
Woodlands, Haverhill	**EGE-23-01-07**	**HP102**
TRIAL PIT LOG	Date: 16/03/2023	Client: **Country Court Care Homes**



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.20		MADE GROUND: Dark brown slightly gravelly CLAY. Gravel is angular fine to medium brick and concrete.				
0.40		Firm light brown gravelly CLAY. Gravel is subangular to rounded fine to medium flint and chalk. (LOWESTOFT FORMATION)				

Shoring/Support:
Stability:



Bearing: °

REMARKS :
1. Hole logged in general accordance with BS5930:2015+A1:2020.
2. Sides stable during excavation.
3. Backfilled with arisings.
4. Coordinates from handheld GPS.

All measurements in metres unless otherwise stated	10m/page Scale: 1:50	Coordinates to Local Grid No Datum Information Available

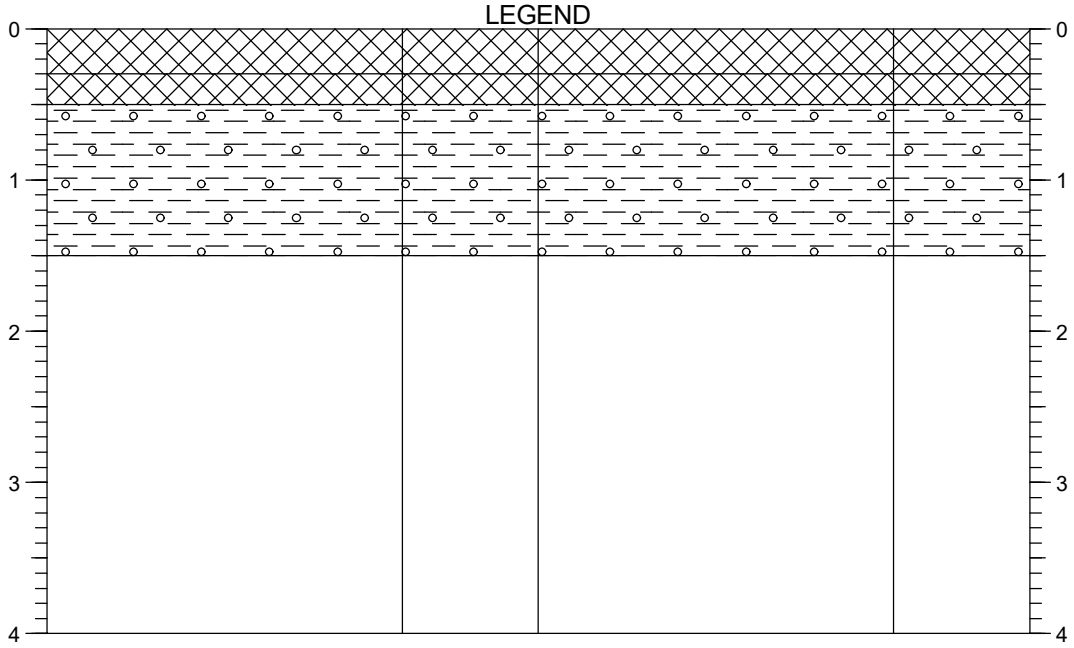
Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
Hand Tools	E: 244978 N: 569109	PW	PH	PB

Evolve Geo-Environmental
C/O 15 Newland, LN1 1XG
Tel: 07946 041571
Email: paulh@evolvegeo-env.co.uk

evolve GEO-ENVIRONMENTAL

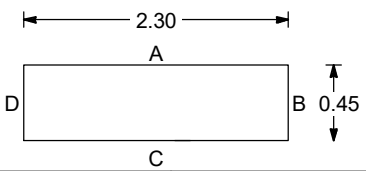
Project:	Project No:	Hole ID:
Woodlands, Haverhill	**EGE-23-01-07**	**SA101**
TRIAL PIT LOG	Date: 16/03/2023	Client: **Country Court Care Homes**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.30		MADE GROUND: Dark brown slightly gravelly silty CLA|Y with frequent roots. Gravel is angular fine to medium brick and concrete.				
0.50		MADE GROUND: Orange gravelly SAND. Gravel is angular tabular sandstone.				
(1.00)		Light grey gravelly CLAY. Gravel is angular to subrounded fine to coarse chalk. (LOWESTOFT FORMATION)				
1.50						

Shoring/Support:
Stability:



Bearing: °

REMARKS :

1. Hole logged in general accordance with BS5930:2015+A1:2020.
2. Hole scanned for services prior to excavation.
3. Sides stable during excavation.
4. Hole turned into soakaway test.
5. Backfilled with arisings, left mounded on completion.

All measurements in metres unless otherwise stated	10m/page Scale: 1:50	Coordinates to Local Grid Ground Level to Local Datum

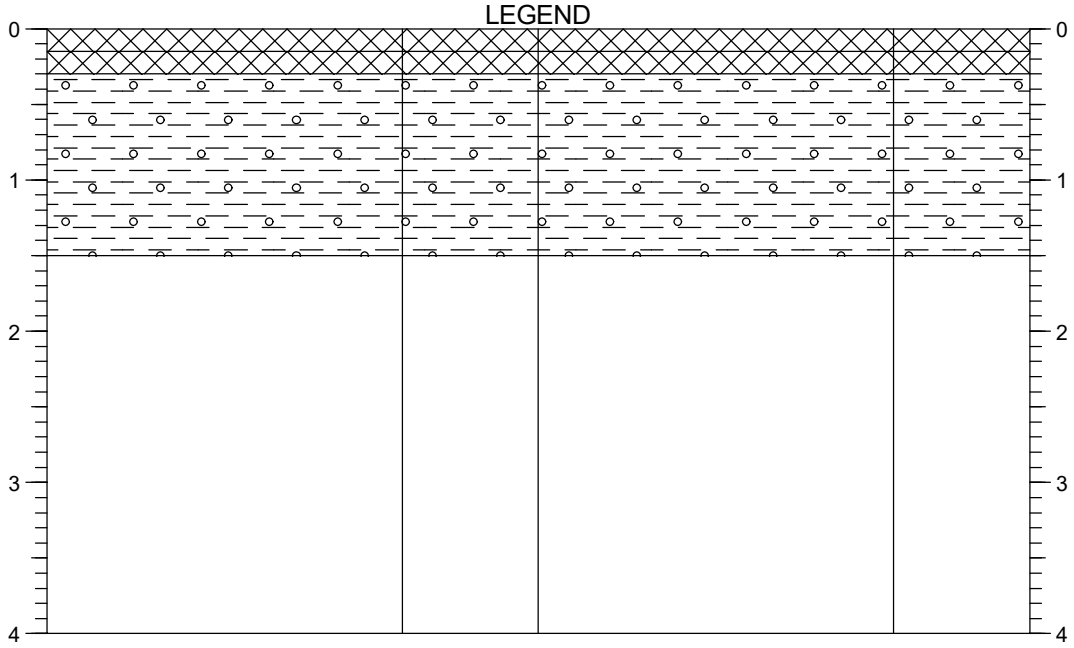
Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
5t Excavator	E: 244939.781 N: 569097.853 Level: 70.633	PW	PH	PB

Evolve Geo-Environmental
C/O 15 Newland, LN1 1XG
Tel: 07946 041571
Email: paulh@evolvegeo-env.co.uk

evolve GEO-ENVIRONMENTAL

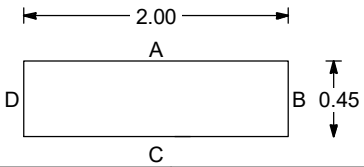
Project:	Project No:	Hole ID:
Woodlands, Haverhill	**EGE-23-01-07**	**SA102**
TRIAL PIT LOG	Date: 16/03/2023	Client: **Country Court Care Homes**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.15		MADE GROUND: Dark brown sandy CLAY with frequent roots.				
0.30		MADE GROUND: Orange sandy GRAVEL of angular tabular sandstone.				
(1.20)		Firm light grey gravelly CLAY. Gravel is angular to rounded fine to coarse flint and chalk. (LOWESTOFT FORMATION)				
1.50						

Shoring/Support:
Stability:



Bearing: °

REMARKS :
1. Hole logged in general accordance with BS5930:2015+A1:2020.
2. Hole scanned for services prior to excavation.
3. Sides stable during excavation.
4. Hole turned into soakaway test.
5. Backfilled with arisings, left mounded on completion.

All measurements in metres unless otherwise stated	10m/page Scale: 1:50	Coordinates to Local Grid Ground Level to Local Datum

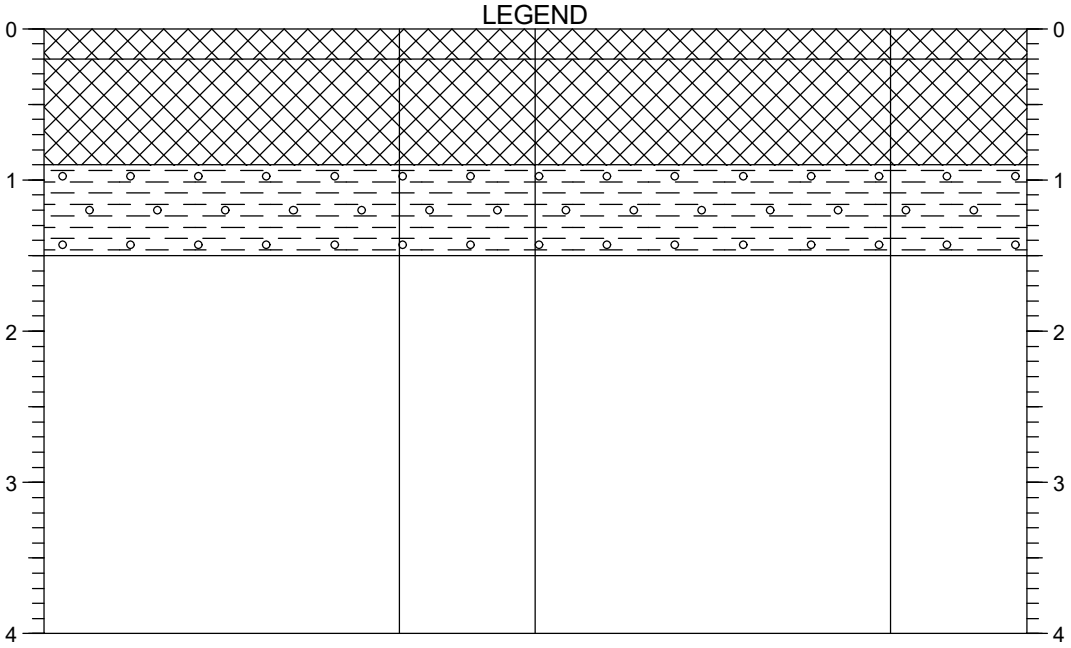
Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
5t Excavator	E: 244933.161 N: 569081.963 Level: 69.96	PW	PH	PB

Evolve Geo-Environmental
C/O 15 Newland, LN1 1XG
Tel: 07946 041571
Email: paulh@evolvegeo-env.co.uk

evolve GEO-ENVIRONMENTAL

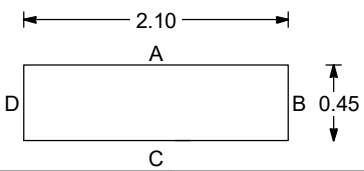
Project:	Project No:	Hole ID:
Woodlands, Haverhill	**EGE-23-01-07**	**SA103**
TRIAL PIT LOG	Date: 16/03/2023	Client: **Country Court Care Homes**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.20		MADE GROUND: Dark brown slightly gravelly clayey SAND with frequent roots.				
(0.70) 0.90		MADE GROUND: Brown slightly sandy gravelly CLAY. Gravel is whole and part bricks				
(0.60) 1.50		Firm light brown gravelly CLAY with rare roots. Gravel is angular to subangular flint and chalk. (LOWESTOFT FORMATION)				

Shoring/Support:
Stability:



Bearing: °

REMARKS :

1. Hole logged in general accordance with BS5930:2015+A1:2020.
2. Hole scanned for services prior to excavation.
3. Sides stable during excavation.
4. Hole turned into soakaway test.
5. Backfilled with arisings, left mounded on completion.

All measurements in metres unless otherwise stated	10m/page Scale: 1:50	Coordinates to Local Grid Ground Level to Local Datum

Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
5t Excavator	E: 244906.638 N: 569103.103 Level: 68.317	PW	PH	PB

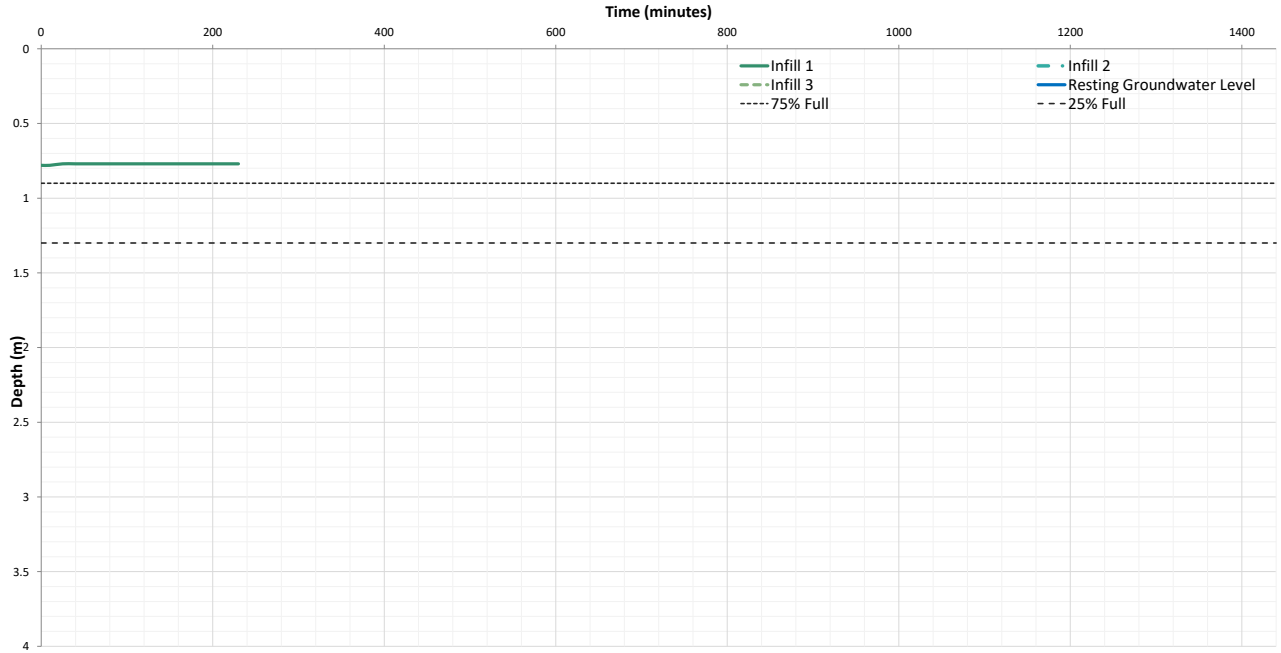
Appendix III – BRE365 Calculation Spreadsheets

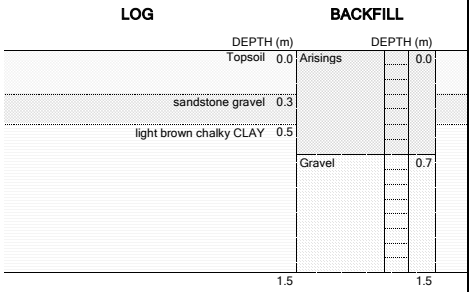
evolve
GEO-ENVIRONMENTAL

	units	Infill 1	Infill 2	Infill 3
Length	m		2.30	
Width	m		0.45	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		5.00	
Depth of first reading	m	0.78	0.00	0.00
Depth of final reading	m	0.78	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.78	0.00	0.00
Depth at 25% full/effective depth	m	0.78	0.00	0.00
Time at 75% full/effective depth	mins	#DIV/0!	#N/A	#N/A
Time at 25% full/effective depth	mins	#DIV/0!	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.00	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m^2	1.04	1.04	1.04
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	#DIV/0!	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate	
Failed Test	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





evolve GEO-ENVIRONMENTAL

TITLE: Soakaway Test Results
The Woodlands, Haverhill
Country Court Care Homes

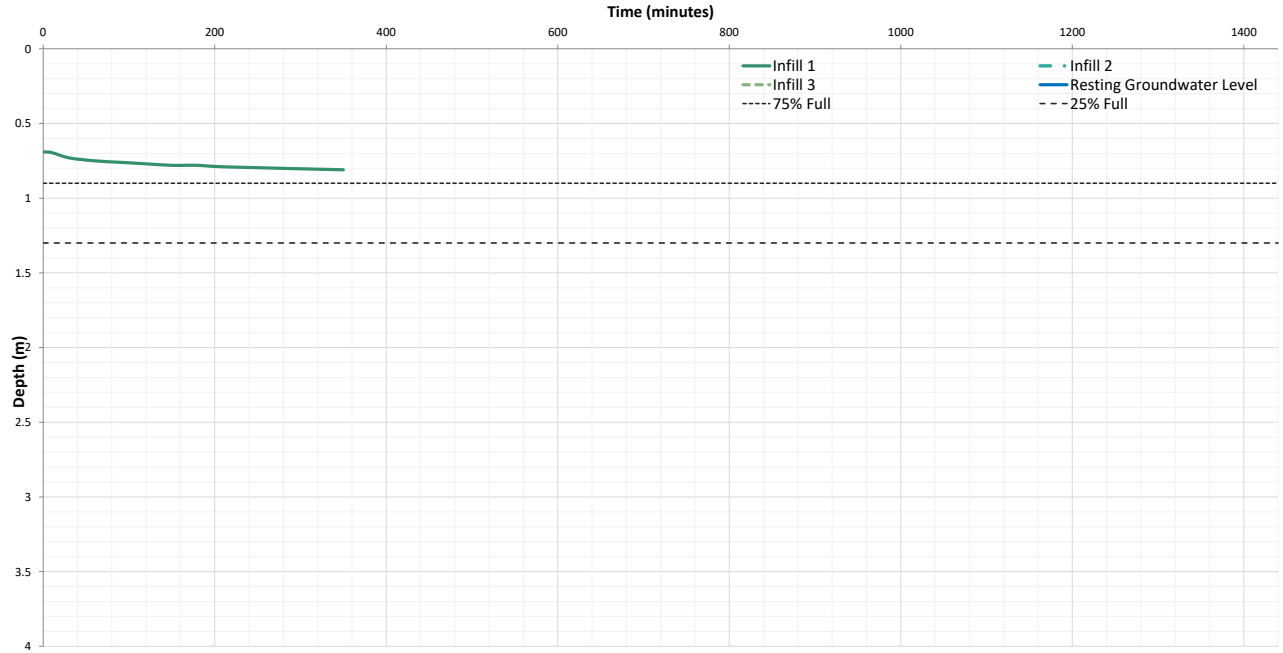
In general accordance with BRE Digest 365 (2016)

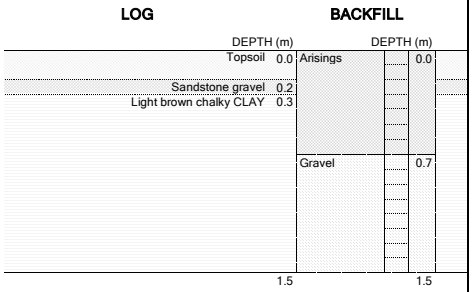
DRAWN BY: PH	SCALE: Not to Scale	PROJECT NUMBER: EGE 23-01-07-01
CHECKED BY: PB	REVISION: 1	SOAKAWAY NUMBER: SA101
DATE: 16/03/2023		

	units	Infill 1	Infill 2	Infill 3
Length	m		2.00	
Width	m		0.45	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		5.00	
Depth of first reading	m	0.69	0.00	0.00
Depth of final reading	m	0.81	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.72	0.00	0.00
Depth at 25% full/effective depth	m	0.78	0.00	0.00
Time at 75% full/effective depth	mins	24.29	#N/A	#N/A
Time at 25% full/effective depth	mins	180.00	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.02	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m^2	1.19	0.90	0.90
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	155.71	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate	
Failed Test	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





evolve GEO-ENVIRONMENTAL

TITLE: Soakaway Test Results
The Woodlands, Haverhill
Country Court Care Homes

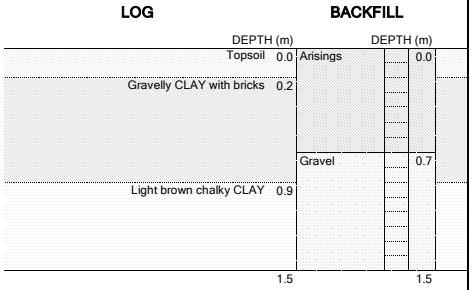
In general accordance with BRE Digest 365 (2016)

DRAWN BY: PH	SCALE: Not to Scale	PROJECT NUMBER: EGE 23-01-07-01
CHECKED BY: PB	REVISION: 1	SOAKAWAY NUMBER: SA102
DATE: 16/03/2023		

	units	Infill 1	Infill 2	Infill 3
Length	m		2.30	
Width	m		0.45	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		5.00	
Depth of first reading	m	0.69	0.00	0.00
Depth of final reading	m	1.03	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.78	0.00	0.00
Depth at 25% full/effective depth	m	0.95	0.00	0.00
Time at 75% full/effective depth	mins	14.00	#N/A	#N/A
Time at 25% full/effective depth	mins	140.00	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.07	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m^2	1.97	1.04	1.04
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	126.00	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate	
Failed Test	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



evolve GEO-ENVIRONMENTAL

TITLE: Soakaway Test Results
The Wood lands, Haverhill
Country Court Care Homes

In general accordance with BRE Digest 365 (2016)

DRAWN BY: PH	SCALE: Not to Scale	PROJECT NUMBER: EGE 23-01-07-01
CHECKED BY: PB	REVISION: 1	SOAKAWAY NUMBER: SA103
DATE: 16/03/2023		

Appendix E

Greenfield Runoff Calculation

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 600 Urban 0.000
Area (ha) 1.280 Soil 0.400 Region Number Region 5

Results l/s

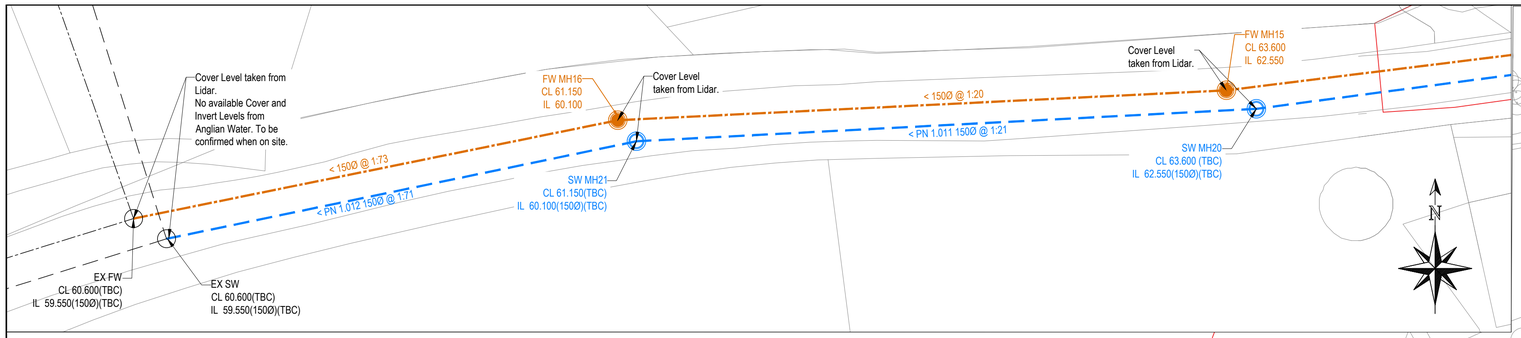
QBAR Rural 3.6
QBAR Urban 3.6

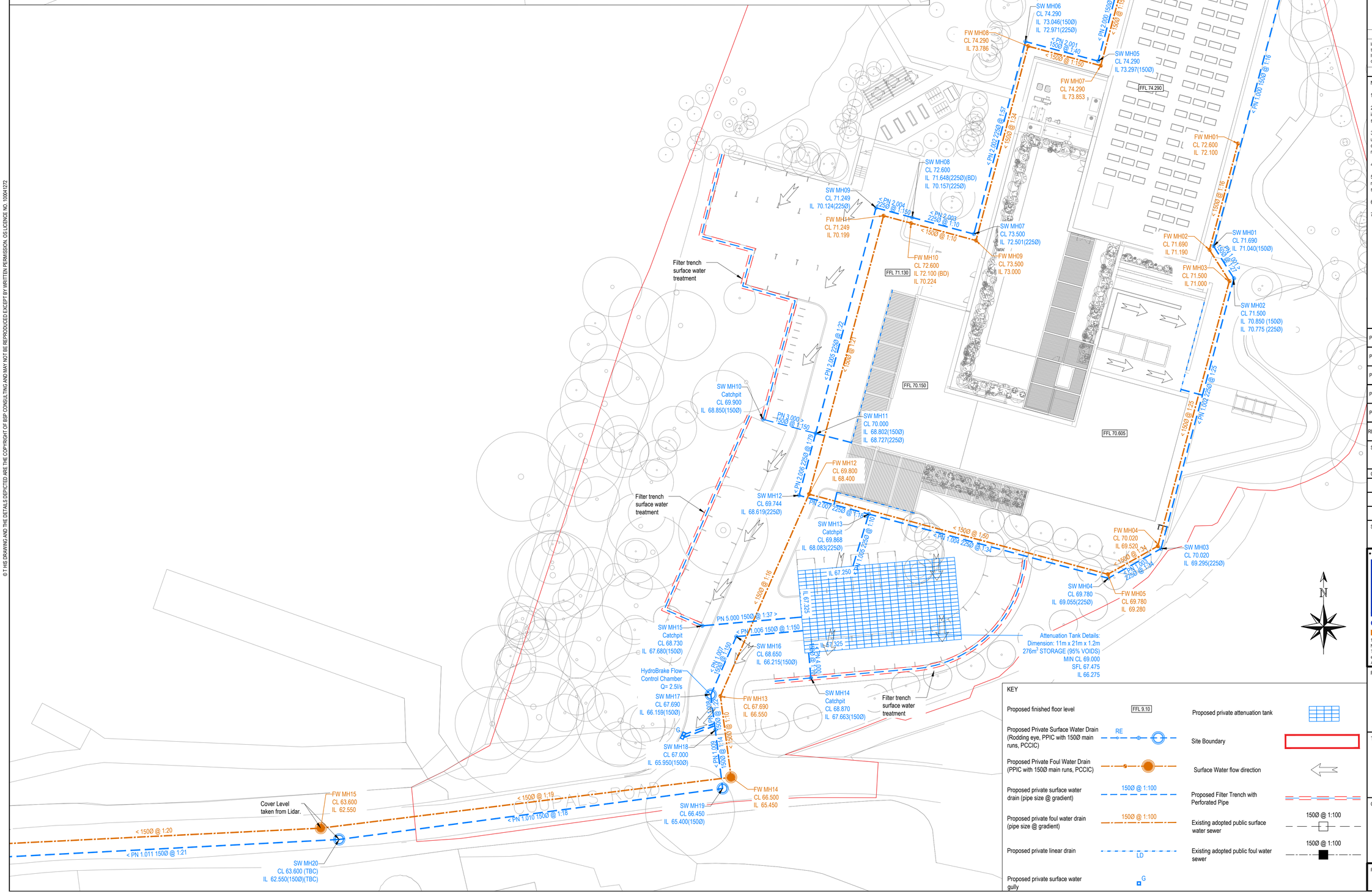
Q1 year 3.2

Q1 year 3.2
Q30 years 8.7
Q100 years 12.9

Appendix F

Drainage Strategy, Levels and Hydraulic Calculations





KEY

Proposed finished floor level	FFL 9.10
Proposed Private Surface Water Drain (Rodding eye, PPIC with 150Ø main runs, PCCIC)	RE
Proposed Private Foul Water Drain (PPIC with 150Ø main runs, PCCIC)	
Proposed private surface water drain (pipe size @ gradient)	150Ø @ 1:100
Proposed private foul water drain (pipe size @ gradient)	150Ø @ 1:100
Proposed private linear drain	LD
Proposed private surface water gully	G
Proposed private attenuation tank	
Site Boundary	
Surface Water flow direction	
Proposed Filter Trench with Perforated Pipe	
Existing adopted public surface water sewer	150Ø @ 1:100
Existing adopted public foul water sewer	150Ø @ 1:100

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the type of works detailed on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES

1. DO NOT SCALE.
2. Should there be any conflict between the details indicated on this drawing and those indicated on other drawings the Engineer should be informed PRIOR to construction on site.
3. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and NOT for construction. Should the contractor commence site work prior to such approval being given, it is entirely at his own risk.
4. All dimensions are in millimetres unless otherwise stated.
5. The BSP Hazard Identification and Risk Assessment information for this project must be reviewed and understood by the contractor PRIOR to the commencement of any works on site.
6. This drawing contains the following model files:
7. This drawing to be viewed in conjunction with:

REV						
P05	Ammendments due to LLFA comments					
	FE	18/12/23	PN	18/12/23	TG	18/12/23
P04	New Site Layout					
	FE	08/12/23	PN	08/12/23	TG	08/12/23
P03	New Site Layout					
	FE	10/11/23	PN	10/11/23	TG	10/11/23
P02	Updated Site Boundary					
	FE	08/11/23	PN	08/11/23	TG	08/11/23
P01	First Issue					
	FE	30/10/23	PN	30/10/23	TG	30/10/23
REV	COMMENT					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

SCALE @ A1	ISSUING OFFICE	PROJECT NUMBER
1:250	NOTTINGHAM	22-0364

CLIENT APPROVAL

	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S1	PRELIMINARY

• CIVIL • STRUCTURAL • TRANSPORTATION • GEOTECHNICAL • ENVIRONMENTAL
bsp CONSULTING
12 Oxford Street
Nottingham. NG1 5BG
Tel: 0345 413 4000
e-mail: info@bsp-consulting.co.uk
Also offices in Derby, Leicester and Sheffield
BIM Design and Construction
KITEMARK™
KM 742833
BS EN ISO 19650

PROJECT

Former Woodlands Hotel, Coupals Road, Haverhill

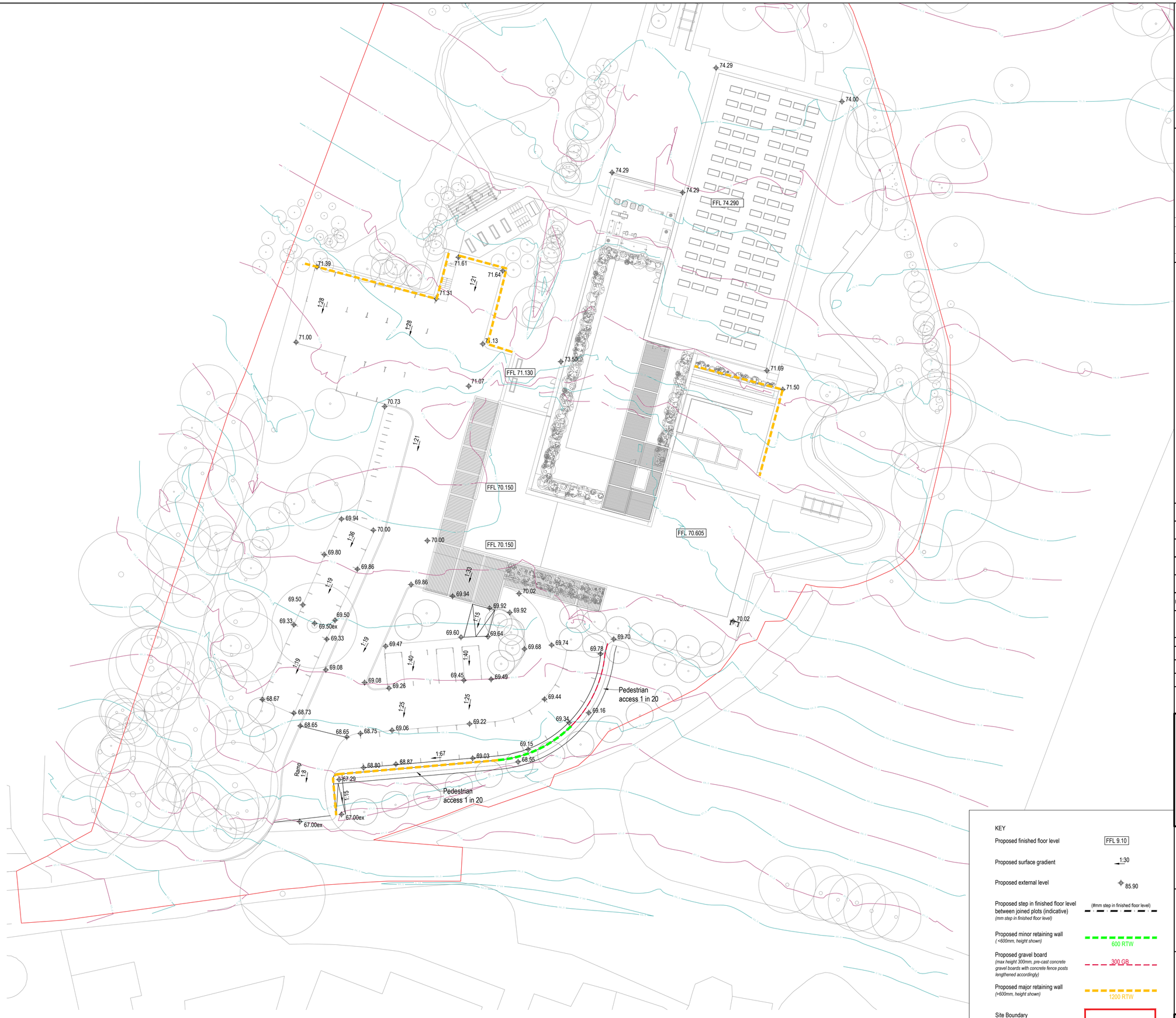
TITLE

Drainage Strategy

CLIENT

Country Court Care Homes

PROJECT	ORIGINATOR	FUNCTIONAL	SPATIAL	FORM	DISCIPLINE	NUMBER	REV
WHCH	BSP	ZZ	XX	D	C	0240	P05



KEY

Proposed finished floor level	FFL 9.10
Proposed surface gradient	1:30
Proposed external level	85.90
Proposed step in finished floor level between joined plots (indicative) *(mm step in finished floor level)*	(#mm step in finished floor level)
Proposed minor retaining wall *(<600mm, height shown)*	600 RTW
Proposed gravel board *(max height 300mm, pre-cast concrete gravel boards with concrete fence posts lengthened accordingly)*	300 GB
Proposed major retaining wall *(>600mm, height shown)*	1200 RTW
Site Boundary	

KEY PLAN

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the type of works detailed on this drawing take note of the above.
It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION BOX

NOTES

1. DO NOT SCALE.
2. Should there be any conflict between the details indicated on this drawing and those indicated on other drawings the Engineer should be informed PRIOR to construction on site.
3. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and NOT for construction. Should the contractor commence site work prior to such approval being given, it is entirely at his own risk.
4. All dimensions are in millimetres unless otherwise stated.
5. The BSP Hazard Identification and Risk Assessment information for this project must be reviewed and understood by the contractor PRIOR to the commencement of any works on site.
6. This drawing contains the following model files:
7. This drawing to be viewed in conjunction with:

REV						
P04	New Site Layout					
	FE	08/12/23	PN	08/12/23	TG	08/12/23
P03	New Site Layout					
	FE	10/11/23	PN	10/11/23	TG	10/11/23
P02	Updated Site Boundary					
	FE	08/11/23	PN	08/11/23	TG	08/11/23
P01	First Issue					
	FE	30/10/23	PN	30/10/23	TG	30/10/23
REV	COMMENT					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

SCALE @ A1	ISSUING OFFICE	PROJECT NUMBER
1:250	NOTTINGHAM	22-0364

CLIENT APPROVAL

	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - DO NOT USE

STATUS	PURPOSE OF ISSUE
S1	PRELIMINARY

• CIVIL • STRUCTURAL • TRANSPORTATION • GEOTECHNICAL • ENVIRONMENTAL

bsp CONSULTING

12 Oxford Street
Nottingham, NG1 5BG
Tel: 0345 413 4000
e-mail: info@bsp-consulting.co.uk
Also offices in Derby, Leicester and Sheffield

BIM Design and Construction KITEMARK™
KM 718353
BS EN ISO 19650

PROJECT

Former Woodlands Hotel, Coupals Road, Haverhill

TITLE

Level Strategy

CLIENT

Country Court Care Homes

PROJECT	ORIGINATOR	FUNCTIONAL	SPATIAL	FORM	DISCIPLINE	NUMBER	REV
WHCH	BSP	ZZ	XX	D	C	0210	P04

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.800	Add Flow / Climate Change (%)	0
Ratio R	0.418	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	36.174	2.310	15.7	0.035	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.103	0.190	26.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	37.358	1.480	25.2	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	8.066	0.240	33.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	33.097	0.972	34.1	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	13.709	0.343	40.0	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	10.042	0.251	40.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.24	73.350	0.035	0.0	0.0	0.0	2.56	45.2	4.7
1.001	50.00	5.28	71.040	0.035	0.0	0.0	0.0	1.95	34.5	4.7
1.002	50.00	5.52	70.775	0.070	0.0	0.0	0.0	2.61	104.0	9.5
1.003	50.00	5.58	69.295	0.070	0.0	0.0	0.0	2.26	90.0	9.5
1.004	50.00	5.82	69.055	0.128	0.0	0.0	0.0	2.25	89.4	17.3
2.000	50.00	5.14	73.640	0.016	0.0	0.0	0.0	1.60	28.2	2.2
2.001	50.00	5.25	73.297	0.016	0.0	0.0	0.0	1.60	28.2	2.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.002	26.587	0.470	56.6	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	8.532	0.853	10.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	4.987	0.033	151.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.005	31.170	1.528	20.4	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	7.263	0.048	151.3	0.064	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.006	8.558	0.108	79.2	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.007	9.647	0.536	18.0	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	8.334	0.833	10.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	3.384	0.338	10.0	0.048	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	13.328	0.355	37.5	0.036	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	8.929	0.060	148.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	8.470	0.056	151.3	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	4.738	0.209	22.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	50.00	5.50	72.971	0.068	0.0	0.0	0.0	1.74	69.3	9.2
2.003	50.00	5.54	72.501	0.068	0.0	0.0	0.0	4.16	165.5	9.2
2.004	50.00	5.61	70.157	0.068	0.0	0.0	0.0	1.06	42.2	9.2
2.005	50.00	5.79	70.255	0.085	0.0	0.0	0.0	2.91	115.7	11.5
3.000	50.00	5.15	68.850	0.064	0.0	0.0	0.0	0.81	14.4	8.7
2.006	50.00	5.89	68.727	0.156	0.0	0.0	0.0	1.47	58.5	21.1
2.007	50.00	5.94	68.619	0.164	0.0	0.0	0.0	3.10	123.2	22.2
1.005	50.00	5.98	68.083	0.292	0.0	0.0	0.0	4.16	165.5	39.5
4.000	50.00	5.02	67.663	0.048	0.0	0.0	0.0	3.20	56.6	6.5
5.000	50.00	5.13	67.680	0.036	0.0	0.0	0.0	1.65	29.1	4.9
1.006	50.00	6.16	66.275	0.376	0.0	0.0	0.0	0.82	14.5«	50.9
1.007	50.00	6.33	66.215	0.390	0.0	0.0	0.0	0.81	14.4«	52.8
1.008	50.00	6.37	66.159	0.390	0.0	0.0	0.0	2.12	37.5«	52.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.009	7.874	0.550	14.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.010	51.643	2.850	18.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.011	50.666	2.450	20.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.012	39.177	0.550	71.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.009	50.00	6.42	65.950	0.390	0.0	0.0	0.0	2.68	47.3«	52.8
1.010	50.00	6.78	65.400	0.390	0.0	0.0	0.0	2.38	42.0«	52.8
1.011	50.00	7.16	62.550	0.390	0.0	0.0	0.0	2.22	39.3«	52.8
1.012	50.00	7.71	60.100	0.390	0.0	0.0	0.0	1.19	21.1«	52.8

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.012		60.600	59.550	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.800	Storm Duration (mins)	30
Ratio R	0.418		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW MH17, DS/PN: 1.008, Volume (m³): 1.9

Unit Reference	MD-SHE-0071-2500-1300-2500
Design Head (m)	1.300
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	66.159
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	2.5	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.7	7.000	5.5
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.7	9.000	6.2
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.3		

Storage Structures for Storm

Filter Drain Manhole: SW MH10, DS/PN: 3.000

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	500.0
Invert Level (m)	69.300	Cap Volume Depth (m)	0.500
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.000
Trench Length (m)	47.0		

Filter Drain Manhole: SW MH14, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	500.0
Invert Level (m)	68.270	Cap Volume Depth (m)	0.500
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.000
Trench Length (m)	41.0		

Filter Drain Manhole: SW MH15, DS/PN: 5.000

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	500.0
Invert Level (m)	68.130	Cap Volume Depth (m)	0.500
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.000
Trench Length (m)	33.7		

Tank or Pond Manhole: SW TANK, DS/PN: 1.006

Invert Level (m) 66.275

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	230.0	1.200	230.0	1.201	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.417
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW RE01	15 Winter	1	+0%					73.384
1.001	SW MH01	15 Winter	1	+0%					71.084
1.002	SW MH02	15 Winter	1	+0%					70.822
1.003	SW MH03	15 Winter	1	+0%	100/15 Summer				69.351
1.004	SW MH04	15 Winter	1	+0%	100/15 Summer				69.123
2.000	SW RE02	15 Winter	1	+0%					73.671
2.001	SW MH05	15 Winter	1	+0%					73.328
2.002	SW MH06	15 Winter	1	+0%					73.027
2.003	SW MH07	15 Winter	1	+0%					72.539
2.004	SW MH08	15 Winter	1	+0%	30/15 Summer				70.310
2.005	SW MH09	15 Winter	1	+0%					70.303
3.000	SW MH10	15 Winter	1	+0%	30/15 Summer				68.949

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW RE01	-0.116	0.000	0.12		5.2	OK	
1.001	SW MH01	-0.106	0.000	0.19		5.1	OK	
1.002	SW MH02	-0.178	0.000	0.10		9.4	OK	
1.003	SW MH03	-0.169	0.000	0.14		9.4	OK	
1.004	SW MH04	-0.157	0.000	0.20		16.6	OK	
2.000	SW RE02	-0.119	0.000	0.09		2.4	OK	
2.001	SW MH05	-0.119	0.000	0.09		2.3	OK	
2.002	SW MH06	-0.169	0.000	0.14		8.8	OK	
2.003	SW MH07	-0.187	0.000	0.07		8.8	OK	
2.004	SW MH08	-0.072	0.000	0.30		8.8	OK	
2.005	SW MH09	-0.177	0.000	0.10		11.0	OK	
3.000	SW MH10	-0.051	0.000	0.76		9.4	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.006	SW MH11	15 Winter	1	+0%	30/15 Summer				68.834
2.007	SW MH12	15 Winter	1	+0%	100/15 Summer				68.690
1.005	SW MH13	15 Winter	1	+0%	30/15 Summer				68.168
4.000	SW MH14	15 Winter	1	+0%					67.708
5.000	SW MH15	15 Winter	1	+0%					67.725
1.006	SW TANK	240 Winter	1	+0%	1/60 Winter				66.463
1.007	SW MH16	240 Winter	1	+0%	1/15 Winter				66.479
1.008	SW MH17	240 Winter	1	+0%	1/15 Summer				66.482
1.009	SW MH18	120 Winter	1	+0%					65.972
1.010	SW MH19	480 Winter	1	+0%					65.422
1.011	SW MH20	120 Winter	1	+0%					62.573
1.012	SW MH21	240 Summer	1	+0%					60.133

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
2.006	SW MH11	-0.118	0.000	0.45		21.1	OK	
2.007	SW MH12	-0.154	0.000	0.22		22.1	OK	
1.005	SW MH13	-0.140	0.000	0.30		38.9	OK	
4.000	SW MH14	-0.105	0.000	0.19		7.1	OK	
5.000	SW MH15	-0.105	0.000	0.20		5.3	OK	
1.006	SW TANK	0.038	0.000	0.30		3.8	SURCHARGED	
1.007	SW MH16	0.114	0.000	0.27		3.4	SURCHARGED	
1.008	SW MH17	0.173	0.000	0.08		2.2	SURCHARGED	
1.009	SW MH18	-0.128	0.000	0.05		2.2	OK	
1.010	SW MH19	-0.128	0.000	0.05		2.2	OK	
1.011	SW MH20	-0.127	0.000	0.06		2.2	OK	
1.012	SW MH21	-0.117	0.000	0.11		2.2	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.417
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW RE01	15 Winter	30	+35%					73.415
1.001	SW MH01	15 Winter	30	+35%					71.127
1.002	SW MH02	15 Winter	30	+35%					70.868
1.003	SW MH03	15 Winter	30	+35%	100/15 Summer				69.410
1.004	SW MH04	15 Winter	30	+35%	100/15 Summer				69.206
2.000	SW RE02	15 Winter	30	+35%					73.697
2.001	SW MH05	15 Winter	30	+35%					73.354
2.002	SW MH06	15 Winter	30	+35%					73.090
2.003	SW MH07	15 Winter	30	+35%					72.580
2.004	SW MH08	15 Winter	30	+35%	30/15 Summer				70.428
2.005	SW MH09	15 Winter	30	+35%					70.354
3.000	SW MH10	15 Winter	30	+35%	30/15 Summer				69.377

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW RE01	-0.085	0.000	0.39		17.1	OK	
1.001	SW MH01	-0.063	0.000	0.62		17.0	OK	
1.002	SW MH02	-0.132	0.000	0.36		35.1	OK	
1.003	SW MH03	-0.110	0.000	0.51		34.9	OK	
1.004	SW MH04	-0.074	0.000	0.77		65.0	OK	
2.000	SW RE02	-0.093	0.000	0.30		7.8	OK	
2.001	SW MH05	-0.093	0.000	0.31		7.7	OK	
2.002	SW MH06	-0.106	0.000	0.54		34.8	OK	
2.003	SW MH07	-0.146	0.000	0.27		34.7	OK	
2.004	SW MH08	0.046	0.000	1.16		34.7	SURCHARGED	
2.005	SW MH09	-0.126	0.000	0.40		43.4	OK	
3.000	SW MH10	0.377	0.000	2.47		30.5	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.006	SW MH11	15 Winter	30	+35%	30/15 Summer				69.119
2.007	SW MH12	15 Winter	30	+35%	100/15 Summer				68.787
1.005	SW MH13	15 Winter	30	+35%	30/15 Summer				68.484
4.000	SW MH14	15 Winter	30	+35%					67.751
5.000	SW MH15	15 Winter	30	+35%					67.770
1.006	SW TANK	480 Winter	30	+35%	1/60 Winter				67.045
1.007	SW MH16	480 Winter	30	+35%	1/15 Winter				67.048
1.008	SW MH17	480 Winter	30	+35%	1/15 Summer				67.051
1.009	SW MH18	5760 Winter	30	+35%					65.972
1.010	SW MH19	960 Summer	30	+35%					65.422
1.011	SW MH20	240 Winter	30	+35%					62.573
1.012	SW MH21	2160 Winter	30	+35%					60.133

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
2.006	SW MH11	0.167	0.000	1.61		74.3	SURCHARGED	
2.007	SW MH12	-0.057	0.000	0.77		78.5	OK	
1.005	SW MH13	0.176	0.000	1.10		141.2	SURCHARGED	
4.000	SW MH14	-0.062	0.000	0.64		23.5	OK	
5.000	SW MH15	-0.060	0.000	0.66		17.6	OK	
1.006	SW TANK	0.620	0.000	0.28		3.6	SURCHARGED	
1.007	SW MH16	0.683	0.000	0.25		3.1	SURCHARGED	
1.008	SW MH17	0.742	0.000	0.08		2.2	SURCHARGED	
1.009	SW MH18	-0.128	0.000	0.05		2.2	OK	
1.010	SW MH19	-0.128	0.000	0.05		2.2	OK	
1.011	SW MH20	-0.127	0.000	0.06		2.2	OK	
1.012	SW MH21	-0.117	0.000	0.11		2.2	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.417
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW RE01	15 Winter	100	+45%					73.430
1.001	SW MH01	15 Winter	100	+45%					71.150
1.002	SW MH02	15 Winter	100	+45%					70.888
1.003	SW MH03	15 Winter	100	+45%	100/15 Summer				69.965
1.004	SW MH04	15 Winter	100	+45%	100/15 Summer				69.775
2.000	SW RE02	15 Winter	100	+45%					73.708
2.001	SW MH05	15 Winter	100	+45%					73.366
2.002	SW MH06	15 Winter	100	+45%					73.119
2.003	SW MH07	15 Winter	100	+45%					72.596
2.004	SW MH08	15 Winter	100	+45%	30/15 Summer				70.498
2.005	SW MH09	15 Winter	100	+45%					70.376
3.000	SW MH10	15 Winter	100	+45%	30/15 Summer				69.827

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW RE01	-0.070	0.000	0.55		23.9	OK	
1.001	SW MH01	-0.040	0.000	0.87		23.7	OK	
1.002	SW MH02	-0.112	0.000	0.50		49.0	OK	
1.003	SW MH03	0.445	0.000	0.68		47.0	FLOOD RISK	
1.004	SW MH04	0.495	0.000	0.97		81.7	FLOOD RISK	
2.000	SW RE02	-0.082	0.000	0.42		10.9	OK	
2.001	SW MH05	-0.081	0.000	0.43		10.8	OK	
2.002	SW MH06	-0.077	0.000	0.76		48.6	OK	
2.003	SW MH07	-0.130	0.000	0.37		48.5	OK	
2.004	SW MH08	0.116	0.000	1.62		48.4	SURCHARGED	
2.005	SW MH09	-0.104	0.000	0.56		60.6	OK	
3.000	SW MH10	0.827	0.000	3.42		42.3	FLOOD RISK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.006	SW MH11	15 Winter	100	+45%	30/15 Summer				69.578
2.007	SW MH12	15 Winter	100	+45%	100/15 Summer				69.250
1.005	SW MH13	15 Winter	100	+45%	30/15 Summer				68.871
4.000	SW MH14	15 Winter	100	+45%					67.775
5.000	SW MH15	15 Winter	100	+45%					67.794
1.006	SW TANK	600 Winter	100	+45%	1/60 Winter				67.406
1.007	SW MH16	600 Winter	100	+45%	1/15 Winter				67.421
1.008	SW MH17	600 Winter	100	+45%	1/15 Summer				67.424
1.009	SW MH18	600 Winter	100	+45%					65.974
1.010	SW MH19	600 Winter	100	+45%					65.424
1.011	SW MH20	600 Winter	100	+45%					62.575
1.012	SW MH21	600 Winter	100	+45%					60.134

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
2.006	SW MH11	0.626	0.000	1.74		80.6	SURCHARGED	
2.007	SW MH12	0.406	0.000	0.84		85.2	SURCHARGED	
1.005	SW MH13	0.563	0.000	1.29		166.4	SURCHARGED	
4.000	SW MH14	-0.038	0.000	0.90		32.8	OK	
5.000	SW MH15	-0.036	0.000	0.92		24.6	OK	
1.006	SW TANK	0.981	0.000	0.33		4.2	SURCHARGED	
1.007	SW MH16	1.056	0.000	0.29		3.7	SURCHARGED	
1.008	SW MH17	1.115	0.000	0.09		2.4	FLOOD RISK	
1.009	SW MH18	-0.126	0.000	0.06		2.4	OK	
1.010	SW MH19	-0.126	0.000	0.06		2.4	OK	
1.011	SW MH20	-0.125	0.000	0.06		2.4	OK	
1.012	SW MH21	-0.116	0.000	0.12		2.4	OK	

bsp CONSULTING

Nottingham

12 Oxford Street
Nottingham
NG1 5BG

0345 413 4000

Derby

5 Pride Point Drive
Pride Park
Derby
DE24 8BX

0345 413 4000

Leicester

Floor 4
24 De Montfort St
Leicester
LE1 7GB

0345 413 4000

Sheffield

Smithy Wood House
Smithy Wood Cres
Sheffield
S8 0NU

0345 413 4000

www.bsp-consulting.co.uk