



Hawridge Strategic Land Ltd

LAND SOUTH OF TURNPIKE LANE, ICKLEFORD

Flood Risk Assessment and Drainage Strategy

Volume 1 of 2

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Flood Risk Assessment and Drainage Strategy

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Outline Surface Water Drainage Strategy	3474-CCE-XX-XX-DR-D-0001-S2-P02
Site Location Plan	HAWR.250207 SLP-01 R3
Plan of Tree Constraints	Ickleford Manor – PTC – Rev B – June 2025
Arboricultural Impact Assessment	Ickleford Manor – AIA – Rev C – Aug 2025

1.0 INTRODUCTION

- 1.1 Create Consulting Engineers Ltd were instructed by Hawridge Strategic Land Limited to undertake a Flood Risk Assessment (FRA) and surface water drainage strategy (SuDS) for a proposed development at the Land at Ickleford Manor, located in the town of Ickleford.
- 1.2 The site area measures approximately 6.9 ha and is located south of Turnpike Lane, east of Bedford Road, west of Arlesey Road. The site is at Ordnance Survey grid reference 517973E, 231258N the red-line boundary is shown in Figure 1.1.
- 1.3 The site falls under the jurisdiction of both Hertfordshire County Council (HCC) and North Hertfordshire District Council (NHDC), with the former acting as the Lead Local Flood Authority (LLFA). HCC is responsible for flood water on the road network or pavement. NHDC manages flood risks from surface water, groundwater and smaller streams.
- 1.4 The Site exceeds 1.0 ha and proposes over ten dwellings; therefore, in line with the NPPF and the Town and Country Planning (Development Management Procedure) (England) Order 2015, an FRA and outline SuDS assessment are required at this stage.

Objectives

- 1.5 The following objectives for this report are to:
 - Provide an FRA of the Site, compliant with the guidelines set out in the National Planning Policy Framework (NPPF)¹ and associated Planning Practice Guidance (PPG)²;
 - Assess the risk and implications of flooding on the Site including flooding from tidal, fluvial, groundwater, surface water runoff, and artificial sources,
 - Provide advice on the Site layout and design that will ensure the safe operation of the site in any flood event,
 - To undertake surface water calculations for the Site in its current and post-development state with the most current hydrology available,
 - Provide advice and guidance on the management of surface water runoff at the site to ensure the risk of surface water flooding on the site and on nearby sites does not increase post development,
 - To develop a suitable outline SuDS scheme for the proposed development, and
 - Consider the potential future impacts of climate change over the lifetime of the proposed development.

Planning Policy Requirements

National Policy

- 1.6 The National Planning Policy Framework (NPPF) is the primary planning policy for England. It outlines the government's planning policies and provides guidance on their application by developers and assessment by Local Planning Authorities (LPAs).

¹ Ministry of Housing, Communities and Local Government National Planning Practice Framework, February 2025

² Ministry of Housing, Communities and Local Government, Flood Risk and Coastal Change Planning Practice Guide: <https://www.gov.uk/guidance/flood-risk-and-coastal-change> [Accessed August 2025]

1.7 The NPPF¹ requires that developments must consider flood risk and that:

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

1.8 The supporting documents to the NPPF are the Planning Practice Guidance (PPG)² and recent case law³ which state that the PPG holds the same legal status as the NPPF. As such, developers must adhere to both the NPPF and the PPG during the planning stage. The PPG on flood risk and coastal change specifies when an appropriate FRA must be undertaken to demonstrate how flood risk from all sources, both to the development and to others, will be managed now and in the future.

1.9 The NPPF includes Government policy on development and surface water management (SuDS) stating that:

Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:

- *Take account of advice from the Lead Local Flood Authority;*
- *Have appropriate proposed minimum operational standards; and*
- *Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.*

1.10 The NPPF and PPG states that an FRA and SuDS Assessment should be appropriate to the scale, nature and location of the development and should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

1.11 The NPPF and PPG requires that SuDS should be considered and included where practicable for new developments and follow the DEFRA Non-Statutory Technical Standards⁴.

1.12 The Non-Statutory Technical Standards are therefore a key reference document and should be used in the formulation of the surface water drainage strategy for a scheme of this nature.

Local Policy

1.13 The NHDC Local Plan⁵ provides a broad development strategy for the Region up to 2031.

1.14 Relevant policy is ENV4, which states:

³ Judgement Ruling R (Mead and Redrow) v SoS LUHC [2024] EWHC 279 (Admin)

⁴ Department for Environment and Rural Affairs (DEFRA). 2025, National Standards for *Sustainable drainage systems (SuDS)* [Online]. Available at: <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems> [Accessed August 2025].

⁵ North Hertfordshire, 2011 –2031. Local Plan. [Online]. Available at: <https://www.north-herts.gov.uk/sites/default/files/2022-12/North%20Hertfordshire%20Local%20Plan%202011-2031.pdf> (Accessed August 2025).

'Mitigate the effects of climate change by encouraging the use of sustainable construction techniques, the appropriate use of renewable energy technologies and reducing the risk of flooding.'

Policy SP11: Natural resources and sustainability – This Plan seeks to meet the challenges of climate change and flooding.

b) Take a risk based approach to development and flood risk, directing development to areas at lowest risk in accordance with the NPPF and ensuring the provision of Sustainable Drainage Systems (SuDS) and other appropriate measures;

c) Support the principles of the Water Environment (Water Framework Directive) Regulations 2017 and seek to protect, enhance and manage the water environment;

1.15 Policy D1: Sustainable design – Planning permission will be granted provided that development proposals:

ii. optimise the potential of the site by incorporating Sustainable Drainage Systems (SuDS);

1.16 Policy NE7: Reducing flood risk – Planning permission for development proposals will be granted provided that (as applicable):

a) Development is located outside of medium and high-risk flood areas (flood zone 2 and 3) and other areas affected by other sources of flooding where possible;

b) Where (a) is not possible, application of the sequential and exception tests is demonstrated where development is proposed in areas of flood risk using the Strategic Flood Risk Assessment (SFRA) and Environment Agency flood maps;

c) A FRA has been prepared in accordance with national guidance that considers the lifetime of the development, climate change impacts and safe access and egress;

d) It will be located, designed and laid out to ensure the risk of flooding is reduced whilst not increasing flood risk elsewhere;

e) The impact of any residual flood risk will be minimised through flood resistant, resilient design and construction;

f) Any flood protection and mitigation measures necessary will not cause harm to nature conservation, heritage assets, and/ or landscape and recreation and, where possible, will have a positive impact in these respects; and

g) Overland flow routes and functional floodplain areas are protected from all development other than that which is "water compatible" and this must be designed and constructed to remain operational and safe for users during flood events, resulting in no net loss of flood plain storage and not impeding water flows or increasing flood risk elsewhere.

1.17 Policy NE8: Sustainable drainage systems – Planning permission for development will be granted provided that:

a) The most appropriate sustainable drainage solution is used taking into account technical, viability and design issues to reduce the risk of surface water flooding, enhance biodiversity, water quality and provide amenity benefits;

b) It aims to mimic the natural drainage patterns and processes as far as possible; and

c) Drainage solutions follow the SuDS hierarchy.

- 1.18 Policy NE9: Water quality and environment: Planning permission for development proposals will be granted provided that they make appropriate space for water, including (as applicable):

*a) Maintaining a minimum 8 metre wide undeveloped buffer zone from all designated main rivers; b) Maintaining a minimum 5m wide undeveloped buffer zone for ordinary watercourses; and
c) River restoration and resilience improvements where proposals are situated close to a river or considered to affect nearby watercourses.*

All development proposals will be required to manage surface water through Sustainable Drainage Systems (SuDS) or techniques to limit run-off and reduce the existing rate of run-off on previously developed sites⁶. Surface water runoff should be managed as close to its source as possible, in line with the following drainage hierarchy.

- a) store rainwater for later use; then:*
- b) discharge into the ground (infiltration); then:*
- c) discharge to a surface water body; then:*
- d) discharge to a surface water sewer, highway drain or other drainage system; and finally:*
- e) discharge to a combined sewer.*

Constraints and Limitations

- 1.19 The copyright of this report is vested in Create Consulting Engineers Ltd and the client, Hawridge Strategic Land Ltd. The client, or their appointed representatives, may copy the report in connection with the development described herein. It may not be copied by any other party or used for any other purpose without the written consent of Create Consulting Engineers Ltd or the client.
- 1.20 Create Consulting Engineers Ltd accepts no responsibility whatsoever to any other parties to whom this report, or any part thereof, is made known. Any such parties rely on the report at their own risk.
- 1.21 The Flood Risk Assessment addresses the flood risk posed to and from the proposed development, the extent of which is shown by the site boundary, as indicated on the attached drawings. This report also covers an outline SuDS Strategy for the red line boundary.
- 1.22 This report has been undertaken assuming that the site will be developed according to the proposals outlined above, without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.
- 1.23 Create Consulting Engineers Ltd has endeavoured to assess all information provided during this appraisal. The report summarises information from several external sources and cannot offer any guarantees or warranties regarding the completeness or accuracy of the information relied upon. Information from third parties has not been verified by Create Consulting Engineers Ltd unless otherwise stated in this report.

⁶ McCloy Consulting & Robert Bray Associates., 2018. Oxford City Council SuDS Design and Evaluation Guide. [Online]. <https://www.oxford.gov.uk/downloads/file/996/cover-pages-and-overview> (Accessed August 2025)

- 1.24 The revised Construction (Design and Management) Regulations 2015⁷ (CDM Regulations) came into force in April 2015 to update certain duties for all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities is to ensure that the client organisation, in this case, Hawridge Strategic Land Limited is made aware of their duties under the CDM Regulations. Further information on the CDM Regulations is provided in the client guide and is available online. It is assumed for this assessment that the lead designer will be responsible for advising the client.
- 1.25 The approach to this FRA and SuDS Report follows the ethos of the CDM Regulations. During the assessment process, the development is considered, and any foreseeable associated health and safety flood risks are identified. It is then considered how these flood risks can be eliminated or mitigated to reduce or control them. The outcome of this assessment process is presented in this report. While preparing this report, no other noteworthy or significant health and safety risks have been identified.

⁷ Health and Safety Executive., 2015. *Construction (Design and Management) Regulations*. [Online]. Available at: <http://www.hse.gov.uk/pubns/indg411.pdf> [Accessed August 2025].

2.0 SOURCES OF INFORMATION

- 2.1 The information contained in this report is based on a review of existing information and consultation with interested parties.
- 2.2 Key reports and websites reviewed as part of this study are listed in Table 2.1 below.

Document/Website	Author/Publisher	Date
Flood Map for Planning - https://flood-map-for-planning.service.gov.uk/	GOV.UK	Accessed August 2025
Long Term Flood Risk Maps - https://flood-warning-information.service.gov.uk/long-term-flood-risk/map	GOV.UK	Accessed August 2025
BGS GeoIndex – Geology and borehole records – https://mapapps.bgs.ac.uk/geologyofbritain/home.html	British Geological Survey	Accessed August 2025
North Hertfordshire Local Plan	North Hertfordshire District Council	2011 – 2031
SuDS Design Guidance for Hertfordshire	Hertfordshire County Council	March 2015
North Hertfordshire District Surface Water Management Plan	WSP	March 2017
North Hertfordshire District Council Strategic Flood Risk Assessment Level 1	North Hertfordshire District Council	September 2016
Hertfordshire County Council Local Flood Risk Management Strategy	Hertfordshire County Council	February 2019
Concept Masterplan (HAWR.250207 CMP-01 R4)	Insitu Design Ltd.	July 2025
Topographic Survey (35976)	Mksurveys	June 2025
Plan of Tree Constraints (Ickleford Manor – PTC – Rev B – June 2025)	Merewood Arboriculture Consultancy Services	June 2025
Ground Investigation	CKConsulting and Geotechnical	July 2025
Foul Water Asset Plans	Anglian Water	April 2025
Clean Water Asset Plans	Affinity Water	April 2025
EA Data (Product 4 – NE3PAD6U3HER)	Environment Agency	May 2025
Site Location Plan (HAWR.250207 SLP-01 R3)	Insitu Design Ltd.	July 2025
Proposed Access Arrangement (8550-IMI-RGP-XX-XX-DR-T-005(P03))	RGP	July 2025

Table 2.1: Key Information Sources

3.0 SITE SETTING AND PROPOSED SCHEME

Site Location and Description

- 3.1 The site spans approximately 6.9 ha, and is located to the south of Turnpike Lane, east of Bedford Road, west of Arlesey Road. The red-line boundary is shown in Figure 1.1.
- 3.2 The Site lies to the south of Ickleford a village, which is north of Hitchin, a larger town in the region.
- 3.3 The Site is located at Ordnance Survey grid reference 517973E, 231258N.
- 3.4 The Site area is currently greenfield, with residential areas to the north, east and west and forested areas to the south. Immediately south of the site boundary is the River Oughton is a two-mile-long tributary of the River Hiz in Hitchin, Oxfordshire. It rises at Oughtonhead and flows in a north-easterly direction.
- 3.5 The River Oughton is classified as an Ordinary Watercourse and therefore is managed by the LLFA, which in this case is North Herefordshire Council. To the East of the site boundary lies the River Hiz, which flows through Ickleford and Hitchin. The River Hiz is designated as a Main River and is managed by the Environment Agency.
- 3.6 The nearest Environment Agency Main River to the site is the River Hiz, located to the east of the site's boundary, with the River Oughton, to the south, is classified as an Ordinary watercourse (see Figure 4.1).

The Proposed Scheme

- 3.7 The proposed development involves an outline planning application for up to 100 residential dwellings, including up to 50 affordable homes (50%). The development will offer a mix of house types, sizes, and tenures, with vehicular and pedestrian access from Turnpike Lane. Proposals include public open space for recreation and amenity use, landscaping, sustainable drainage (SuDS), car parking, and associated infrastructure. Access is submitted for consideration at this stage, with all other matters reserved for future approval.
- 3.8 Green space and SuDS features are proposed to be located to the eastern side of the Site with a SuDS basin proposed in the southern western extent of the site.
- 3.9 Vehicle and pedestrian access to the site will be from Turnpike Lane. Additional pedestrian access points will be provided along the eastern boundary (south of Lodge Court), at two locations along the south-eastern boundary adjacent to the Ickleford Mill scheme, and on the far western boundary, where a further pedestrian and cycle connection is proposed.
- 3.10 The proposed scheme is shown on drawings in the Appendix.

Site Levels

- 3.11 A topographic survey of the Site has been undertaken by Mksurveys and has been undertaken in Newlyn Ordnance Datum (m AOD) and is appended to this report.

- 3.12 The ground levels of the northern extent of the site range from 55.30 m AOD to 57.39 m AOD, in the central extent ground levels range from 58.78 m AOD to 59.53 m AOD and in the southern extent level range from 56.66 m AOD to 58.23 m AOD. The eastern area has ground levels of 54.00 m AOD to 56.00 m AOD and the western area has levels ranging from 55.42 m AOD to 58.85 m AOD.
- 3.13 This means the Site is generally flat, with slightly lower levels in the east and higher levels in the north. Generally, the site falls to the south.

4.0 FLOOD RISK ASSESSMENT

Scope of Work

- 4.1 The scope of this FRA was refined to meet the brief outlined in Chapter 1 of this report and considers the following:
- Flood risk to the development from all sources over the lifetime of the development.
 - The potential for the design, construction, and operation of the site to increase the risk of flooding to neighbouring properties.
 - Any necessary mitigation measures to address identified potential flood risks.
- 4.2 This FRA has reviewed the NHDC Strategic Flood Risk Assessment¹⁰, HCC Local Flood Risk Management Strategy⁸ and HCC Preliminary Flood Risk Assessment⁹ (PFRA).
- 4.3 The design flood event is the 1% Annual Exceedance Probability (AEP) in any given year, plus an allowance for climate change. Climate change uplifts vary depending on the source of flooding. This is outlined in the PPG and explained in this report.
- 4.4 The approach is consistent with the NPPF¹ and its associated PPG² as well as the requirements of local planning policy.

Flood History

- 4.5 The level 1 SFRA¹⁰ provides limited information on historical flood events in the area. The only detailed recorded historic flood event affecting Ickleford occurred in February 2014, when a succession of storms and overland flow led to flooding in Ryder Way, as reported through the media coverage. This area is to the northwest of the site and did not impact the site boundary. It should be noted that the previous SFRA¹¹ references a significant flood event in March 147, which affected Ickleford and was caused by a combination of heavy rainfall and snow melt, resulting in out of bank flows from the River Hiz. The 1947 event is included in the EA's recorded flood outlines as being due to exceeded channel capacity; however, it is not sown to have affected the Site.
- 4.6 Since this event, the catchment would have changed in terms of habitation levels, uses within the catchment and also catchment flood defences may have been incorporated. It is likely that the 1947 flood event, would not mimic flood events that would occur today.

⁸ Hertfordshire County Council. [Online]. Available at: <https://www.hertfordshire.gov.uk/media-library/documents/environment-and-planning/water/flood-risk-management/lfrms-for-hertfordshire-full-report.pdf> [Accessed August 2025].

⁹ Hertfordshire County Council. Preliminary Flood Risk Assessment. [Online]. Available at: <https://www.hertfordshire.gov.uk/media-library/documents/environment-and-planning/water/flood-investigations/archive-consultations/hcc-preliminary-flood-risk-assessment.pdf> Apr 1 [Accessed August 2025].

¹⁰ North Hertfordshire District Council. 2016. [Online]. Strategic Flood Risk Assessment Level 1 Available at: <https://www.north-herts.gov.uk/sites/default/files/NHE12a%20-%20North%20Hertfordshire%20District%20Council%20SFRA%20Update%202016%20%28p1-26%29.pdf> [Accessed August 2025].

¹¹ North Hertfordshire District Council. 2008. [Online]. Strategic Flood Risk Assessment Level 1 Available at: <https://www.north-herts.gov.uk/sites/default/files/NHE13a%20-%20North%20Hertfordshire%20District%20Council%20SFRA%20Report%202008%20%28p1-83%29.pdf> [Accessed August 2025].

Flood Risk from Fluvial and Tidal Sources

- 4.7 The closest river to the Site is the River Oughton, an Ordinary Watercourse situated immediately south of the Site boundary. It flows into the River Hiz, a Main River located approximately 425 m east of the Site.
- 4.8 The Flood Map for Planning shows the risk of fluvial flooding from EA Main Rivers. The site is located wholly in Flood Zone 1 as is shown in Figure 4.1.
- 4.9 For context, Flood Zone 1 is land assessed as having less than a 0.1% AEP (Annual Exceedance Probability) risk of flooding from rivers or the sea in any given year. Flood Zone 2 comprises land assessed as having a 1% AEP (1 in 100 years) to 0.1% AEP (1 in 1000 years) chance of flooding from rivers, or between a 0.5% AEP (1 in 200 years) and 0.1% AEP chance of flooding from the sea in any given year. Flood Zone 3 is land with a 1% AEP or greater chance of flooding from rivers or a 0.5% AEP or greater risk of flooding from the sea in any given year. These zones are often referred to contextually as 'High,' 'Medium,' and 'Low' flood risk, respectively.
- 4.10 From this information, the Site is therefore considered to be at a low risk of fluvial and tidal flooding and these sources are not considered further in this report.

Flood Risk from Surface Water (Rainfall)

- 4.11 Flooding from surface water can occur during intense local rainfall events when floodwaters cannot infiltrate into the ground or discharge into natural or artificial drainage systems. As a result, the floodwater follows the topography of the local area. In an urban environment, the risk of flooding from surface water and overloaded sewers is closely related, and both are included in the relevant surface water flooding datasets. Flooding events are typically of short duration (unless there is a blockage in the drainage system) but can be severe.
- 4.12 The EA has recently updated the Risk of Flooding from Surface Water (RoFSW) mapping dataset¹². This data assesses where surface water flooding may occur when the volume of rainwater exceeds the capacity of the existing drainage network (with a default loss rate of 18 mm/hr to model and replicate on-site drainage systems) or exceeds the infiltration capacity of the receiving soils, causing water to flow overland instead. The data includes information about flood extents and depths, produced using national-scale modelling, enhanced with locally produced modelling from some LLFAs.
- 4.13 The recently updated RoFSW now includes a climate change representation based on the latest UK Climate Projections (UKCP18) from the MET Office, using the Representative Concentration Pathway (RCP) 8.5. The RoFSW shows a near-term epoch (2040–2060, the “2050s” epoch), with central allowances used to support short- and medium-term decisions informed by the highest flood likelihood projections.
- 4.14 The current scenario RoFSW Extent Map (Figure 4.2) indicates two areas of surface water flooding within the site. The first is a small area of ‘low’ risk ponding in the south-eastern extent, near an existing cluster of trees. The second is located in the south-western part of the site, where an isolated area of ‘low’ to ‘high’ surface water flood risk is present, also within a forested area. Both instances are

¹² Environment Agency., 2025. *Risk of Flooding from Surface Water Extent, Depths and Plus climate change* [Online]. Available at: <https://www.data.gov.uk/dataset/0d6fa1f4-0c82-4c91-8667-a549e8e3ca2d/risk-of-flooding-from-surface-water3> [Accessed August 2025]

associated with localised ponding in low-lying areas, rather than being connected to defined flow paths.

- 4.15 The future-plus-climate-change scenario RoFSW mapping (Figure 4.3) closely follows the present-day scenario. However, the extent of surface water pooling is increased due to the impact of climate change.
- 4.16 The new RoFSW dataset includes the predicted risk of flooding for a series of depths in incremental steps of 0.2 m, 0.3 m, 0.6 m, 0.9 m, and 1.2 m. This data uses the same 'high,' 'medium,' and 'low' risk categories as set out in the above extent mapping for each return period. The depth mapping shows the risk of a specific depth of flooding in either the current or future event. We have reviewed these maps, and the worst-case depths have been included in the appendix of this report, as described below.
- 4.17 Figure 4.4 presents the risk of surface water flooding up to a depth of 0.3 m on the site in the present-day event. The data shows that a depth of 0.3 m would potentially be classified as "Low" to "Medium" risk in that isolated area to the south-western part of the site, indicating less than 1% AEP but greater than or equal to 0.1% AEP chance of flooding in any given year. This correlates to surface water runoff collecting in low-lying areas, as confirmed by the topographic survey.
- 4.18 Figure 4.5 presents the risk of surface water flooding up to a depth of 0.6 m on the Site in the climate change event. This is located in an isolated area in the south-western extent of the site as displayed in the surface water extent mapping. The data closely follows the present-day scenario and remains within the "Low" risk category. While greater depths of flooding are expected due to climate change, this does not significantly alter the expected extent of flooding on-site.
- 4.19 The isolated surface water flooding in the middle of the Site, is located in a landscaped area and would not affect the built development proposed.
- 4.20 There is a small amount of "Low" risk of surface water flooding in Turnpike Lane (to the north of the Site), however, ground levels currently mean that this water will not encroach onto the Site. It is recommended that the ground levels for the proposed development should be retained or raised, ground levels should not be lowered as this could affect surface water encroaching onto the site.
- 4.21 Given the nature of the site, the risk of surface water flooding to the proposed development is considered low. This is due to the design of the proposals and the isolated nature of the surface water flood areas, which are located at a distance from any planned built development.
- 4.22 Flooding from surface water remains a residual risk due to the potential for rainfall to exceed the design standard of the proposed drainage system and the effects of climate change on the frequency and severity of rainfall events.

Geology and Flood Risk from Groundwater

- 4.23 Groundwater flooding occurs when groundwater rises through permeable strata to reach the surface.
- 4.24 The Department for Environment, Food, and Rural Affairs (DEFRA) Magic Maps¹³ defines the site's underlying bedrock as an 'Unproductive' aquifer. These aquifers are classified by the Environment Agency as having:

¹³ DEFRA., 2024. Magic Map. [Online]. Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed August 2025].

'Unproductive strata are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.

- 4.25 The Site also lies within a 'Secondary A' superficial deposit aquifer, as defined by the Environment Agency¹⁴.
- 4.26 British Geological Survey (BGS) mapping (1:50,000 scale)¹⁵ identifies the bedrock geology (Figure 4.6) at the site as Gault Formation – Mudstone.
- 4.27 The BGS mapping shows that the superficial deposits on the site (Figure 4.7) are composed of Glaciofluvial Deposits, mid Pleistocene (Sand and Gravel) Alluvium (Clay, Silt, Sand, and Gravel).
- 4.28 BGS borehole records¹⁶ indicate that the closest borehole record (TL13SE62), located approximately 180 m east of the Site, reveals the geological sequence: 1.15 m of Made Ground, underlain by various strata of clay till the borehole end at 7m below ground level. The scan stated that the well was dry whilst drilling meaning no water was struck. Borehole record (TL13SE61) confirms the above sequence.
- 4.29 The Site investigation results can be seen in the Appendix. Overall, ten exploratory boreholes were undertaken, and three trial pits were analysed. These are briefly detailed below.
- 4.30 BH01-03 were located in the centre of the site, BH04 is in the northern central area of the site, BH05-08 are all in the northeastern extent of the site and BH-10 is in the southern extent of the site.
- 4.31 BH01 states that there is brown gravelly clay from 0-0.9m, soft orange slightly coarse sandy slightly gravelly clay from 0.9m-1.2m, Soft, orange, brown, slightly coarse sandy, slightly gravelly Clay. Gravel is angular to sub-rounded, fine to coarse flint (1.2m-1.4m bgl), Light orange brown, gravelly, coarse Sand (1.4m-2.0m bgl), Yellow brown, gravelly, coarse Sand (2.0m-2.1m bgl), Firm, light brown, slightly gravelly Clay (2.1m-3.0m bgl), Firm, light brown, slightly coarse sandy, slightly gravelly Clay (3.0m-3.8m bgl), Firm, light brown, gravelly Clay (3.8m-4.0m bgl), Firm, light brown, slightly coarse sandy, slightly gravelly Clay (4.0m-4.9m bgl) and Firm, grey, slightly gravelly Clay (4.9m-5.0m bgl). It is also noted that water was struck at a depth of 3.0m bgl.
- 4.32 BH02/03 showed similar results to BH01 but no water was detailed within the boreholes.
- 4.33 BH08 detailed Soft, dark brown, slightly fine sandy, slightly gravelly Clay (0-0.4m bgl), Soft, orange, brown, slightly fine sandy, slightly gravelly Clay (0.4m-1.0m bgl), then Stiff, light brown mottled grey, slightly gravelly Clay (1.0m -5.0m bgl). No water depth is noted. BH09 and BH10 state similar lithologies to BH08.
- 4.34 TP01 is located in the southern extent of the site, in the approximate location of the proposed SuDS Basin, TP02 is located in the centre of the site and TP03 is in the northeast extent of the site.

¹⁴ Department for Environment and Rural Affairs (DEFRA) Magic Website., 20224. [Online]. *Environment Agency Aquifer Designation Data*. Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed August 2025].

¹⁵ British Geological Survey (BGS) Onshore GeoIndex., 2021. *DiGMapGB-50 Bedrock Geology and Superficial Deposits*. [Online]. Available at: <https://mapapps.bgs.ac.uk/geologyofbritain/home.html> [Accessed August 2025].

¹⁶ British Geological Survey (BGS) Onshore GeoIndex., 2021. *Borehole records*. [Online]. Available at: <https://mapapps.bgs.ac.uk/geologyofbritain/home.html> [Accessed August 2025].

- 4.35 TP01 –03 share a similar lithology. This is Soft, dark brown, slightly sandy Clay from 0.0–0.6m bgl, Soft, dark orange, brown, slightly sandy Clay from 0.6m–1.1m bgl and Soft to firm, light orange, brown, slightly sandy, slightly gravelly Clay from 1.1m – 2.1 m bgl
- 4.36 Infiltration testing was undertaken at the site by CKConsulting and Geotechnical, the Geotechnical Director, Mr Paul Ettinger made the following comments in relation to the infiltration testing carried out at the site.
1. The depth to water within TP01 was initially measured at 1.34m below ground level with no drop recorded over the following 5-hour monitoring period. The infiltration rate would be considered to be effectively zero.
 2. At the location of TP02, the water level only dropped 40mm over a monitoring period of 4 hours. It is not possible to calculate the infiltration rate as the water did drop by more than 75% of the effective depth of water within the excavation. For practical reasons the infiltration rate would be considered to be impractical for the discharge of surface water into the natural soil at this location.
 3. At the location of TP03, the water level only dropped 100mm over a monitoring period of 3 hours. It is not possible to calculate the infiltration rate as the water did drop by more than 75% of the effective depth of water within the excavation. For practical reasons the infiltration rate would be considered to be impractical for the discharge of surface water into the natural soil at this location.
- 4.37 The River Oughton to the south is the main driver for dictating groundwater levels. This is because groundwater can form part of the baseflow of the river. As such groundwater is intrinsically linked to the River Oughton.
- 4.38 The proposed built development is located away from the River Oughton and is approximately 130 m above the river channel level. This reduced the risk of groundwater emergence occurring with the proposed built development.
- 4.39 If groundwater was to emerge at the surface, it would follow the surface water flow routes shown within the surface water flooding section or be intercepted by private or adopted surface water drainage.
- 4.40 It is recommended that any threshold or finished floor levels are set 75–150 mm above the surrounding ground level to reduce the risk of flood water ingress. This is in line with CIRIA Designing for Urban Exceedance.
- 4.41 The risk of flooding from groundwater to the site and proposed development is low.

Flood Risk from Sewers and Water Mains

- 4.42 Sewer flooding occurs when sewers surcharge due to reaching capacity within the network. This typically happens during intense rainfall events that exceed the capacity of the sewers (whether private, adopted, or highway sewers). Flooding from sewers and highways is closely linked to surface water in urban areas, with the source of flooding being the same: surface water/rainfall events.
- 4.43 Anglian Water is the statutory sewerage undertaker for the area and is responsible for the operation and maintenance of the public sewers serving the site.

- 4.44 According to the Anglian Water asset plans (Appendix A), there is a 6 inch foul water sewer running west to east along Turnpike Lane (just north of the north site boundary). There are also adopted foul sewers to the east of the Site which run through Ansell Grange and the properties to the east of A 600 and to the south of the River Oughton.
- 4.45 There are surface water sewer in close proximity to the Site but these are to the south of the River Oughton and discharge to the River Oughton.
- 4.46 There is a private foul sewer which runs from Ickleford Mews across the northern edge of the Site. This converges onto the Anglian Water foul sewer in Turnpike Lane. This sewer has been surveyed and is shown in the topographic survey attached to this report.
- 4.47 There is also a private surface water sewer which runs from Ickleford Mews to the River Oughton which crosses the Site. The headwall, catchpit, and manholes are recorded on the topographic survey. A freedom of Information request was submitted to the LLFA to understand any further details on this sewer. The LLFA were able to provide the detailed drainage design provided to discharge planning conditions. This sewer is a 150 mm sewer with a 2l/s flow control. No as-built drawing has been found to date. This sewer has been surveyed and is shown in the topographic survey attached to this report.
- 4.48 Affinity Water is the statutory undertaker for clean water services, asset plans (Appendix B). A 3 inch CI/SI water distribution main runs along Turnpike Lane with various fittings along the road. There is also a 3 inch CI/SI distribution main serving the residential development to the west of the Ickleford Manor and one running north to south along Bedford Road.
- 4.49 If any sewers were to surcharge, the floodwater would follow the local topography and likely remain within the highways surrounding the site or drain across the site towards the adjacent watercourses.
- 4.50 The site and development are at low risk of sewer flooding.

Flood Risk from Artificial Water Bodies

- 4.51 The Long-Term Flood Risk maps for Reservoirs (Figure 4.8) indicates the site is not within an area at risk of flooding in the event of a reservoir embankment failure.
- 4.52 All reservoirs are regularly inspected, and essential maintenance is carried out in accordance with the Reservoirs Act 1975. The Environment Agency (EA) is the governing body responsible for ensuring the safety of reservoirs in England. Specialist engineers, known as Panel Engineers, must carry out these surveys. Due to these procedures, there have been no fatalities from reservoir failures in the UK since 1925.
- 4.53 The risk of reservoir failure and subsequent flooding is considered a residual risk.

Flood Risk Sequential and Exception Test

- 4.54 As per the NPPF legislation.

"...the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test."

And

“The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).”

- 4.55 Following the NPPF Annex 3 and the PPG, the proposed development is for dwellings which is classed as “More Vulnerable” and the Flood Zone classification for the Site is Flood Zone 1, as per Table 1 of the PPG.
- 4.56 Following Diagram 2 of the PPG, the proposed development can be allocated to areas of low risk of flooding from all sources of flooding, now and in the future. This has been outlined in the above FRA.
- 4.57 Table 2 of the PPG states that for the More Vulnerable development in Flood Zone 1, that the Exception Test is not required.
- 4.58 Following the guidance on the Sequential and Exception Test, outlined in the NPPF, PPG and the LPA SFRA, the development is deemed to have been sequentially designed in relation to flood risk and is passed.

5.0 OUTLINE SURFACE WATER DRAINAGE STRATEGY

Surface Water Drainage

Drainage Discharge Hierarchy

5.1 Analysis has been undertaken to propose an outline SuDS strategy, in accordance with sustainable drainage principles, which limits the surface water runoff from the proposed development and includes climate change.

5.2 The discharge hierarchy should be considered and the relevant PPG states:

“Generally the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

- 1. Into the ground (infiltration);*
- 2. To a surface water body;*
- 3. To a surface water sewer, highway drain or another drainage system;*
- 4. To a combined sewer.”*

5.3 As discussed in Chapter 4 the geology at the Site is not conducive to infiltration techniques, with one testing demonstrating a lack of feasible rates between the three trial pits analysed.

5.4 There is a watercourse directly south of the Site boundary, which surface water will discharge to.

5.5 Therefore, in line with the drainage hierarchy it is proposed to discharge surface water from the Site to this watercourse and utilise the current private surface water sewer, which we have legal rights to connect to.

SuDS Potential Summary

5.6 The aim of SuDS is to mimic the natural drainage process and reduce the impact of urbanisation on the frequency and size of floods. SuDS should also protect and enhance the environment.

5.7 A summary of the potential SUDS options which led to the above drainage strategy is included in Table 5.1.

	SuDS Techniques	Practicable	Proposed	Site and Development Specific Notes
Most Sustainable	Rainwater Harvesting	Y	TBC	TBC, to be incorporated if possible.
	Green Roof	N	N	No flat roofs proposed.
	Rain gardens	N	N	Rain gardens are not viable due nature of the layout and maintenance issues.

	SuDS Techniques	Practicable	Proposed	Site and Development Specific Notes
	Basins and Ponds	Y	Y	Detention basin proposed.
	- Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	Y	N	Not suitable on the site due to space requirements for these SuDS features.
	Filter Strips and Swales			
	Permeable Surfaces - Gravelled areas - Permeable pavers	Y	N	Lined permeable paving to be confirmed at detailed design stage for car parking bays/private paved area.
Least Sustainable	Tanked Systems	Y	Y	Storage crates provided for surface water pump.
	- Oversized pipes - Crated storage			

Table 5.1: SuDS Techniques and Application to the Development

- 5.8 Rainwater harvesting techniques such as rainwater butts (for watering gardens etc.) and rain gardens are encouraged within the final SuDS design, however these have not been included within any calculations as a conservative measure because it cannot be guaranteed these will be empty during a storm event. If they were to be empty at the time of a storm, they would be able to contain storm water.
- 5.9 The proposed outlined SuDS strategy has been determined following the SuDS hierarchy which helps to steer developers to ensure surface water is managed as close to its source as possible. There should be a preference for green over grey features, in line with the SuDS hierarchy.

Discharge Rates

- 5.10 The Site is currently wholly greenfield in nature. The 1 in 1 year peak greenfield run-off rate (Qbar) for the drained area has been calculated to be 3.1 l/s for the Site. These calculations can be found in the Appendix.
- 5.11 The LLFA guidance states that the surface water discharge rate for a green should be restricted where possible to the greenfield run-off rate (Qbar).
- 5.12 It is proposed to reduce the surface water discharge from the developed Site to a total of 3.1 l/s and attenuate excess flows below surface level up to a 1 in 100 year +CC event.
- 5.13 The PPG requires the climate change uplift to be dependent on the longevity of the development, type of development proposed and the catchment it is located within. According to the GOV.UK 'Peak Rainfall allowances Map' tool for the Upper and Bedford Ouse Management Catchment a residential development which has a design life of 100 years, therefore should use the 'upper end allowance' for rainfall and 2070s epoch. This is in accordance with NPPF, PPG requirements, and the 'Flood Risk

Assessments: Climate Change Allowances'. The climate change allowances for rainfall for the Site are:

- Rainfall uplift for 1 in 30 year event: 35 %
- Rainfall uplift for 1 in 100 year event: 40 %

Proposed SuDS Strategy

5.14 Analysis has been undertaken to propose an outline SuDS strategy, in accordance with sustainable drainage principles, which limits the surface water runoff from the proposed development and includes climate change.

5.15 It is proposed that the SuDS solution to accommodate and store all flows underground up to and including the 1 in 100 year +CC event would include:

- Attenuation Basin
- Storage Crates

5.16 The proposed strategy can be seen on Drawing 3474-CCE-XX-XX-DR-D-0001-S2-P02 within the Appendix.

5.17 The schedule for the respective storage areas can be seen below:

Storage ID	Area (m ²)	Depth/Subbase Depth (m)	Maximum Gradient
Basin	1233	1.5	–
Storage Crates	60	1.6	–

Table 5.2: SuDS Storage Design Schedule as shown on Drawing 3474-CCE-XX-XX-DR-D-0001-S2 P02

5.18 To make the SuDS design as sustainable as possible, as much of the Site's surface water drainage network works on a gravity connection to the basin, with only a small catchment working on a pumped solution, which is lifted to the nearest proposed surface water manhole.

5.19 The preliminary calculation for the proposed SuDS features to control surface water on the Site for the development are included in Appendix and an indicative SuDS schematic plan is also included in the appendix of this report.

5.20 Table 5.3 shows the top water level (TWL) and storage volume for the 1 in 30 year +CC event. The proposed storage does meet the required half drain down time as the basin will half drain down from within 1396 minutes post 1 in 30 year +CC event.

Storage ID	Depth (m)	Volume (m ³)	Post 1in30+CC Event Time to Half Empty (mins)
Basin	1.17	768	1396
Storage Crates	1.46	86	127

Table 5.3: Summary of FLOW results

5.21 The FLOW calculations have used some conservative design decisions. These include:

- The default Cv values have been altered to a value of 1.0 which ensures all the storm water is assessed i.e. 100% of the water is modelled.
- MADD factor has been altered from its default of 20 m³ to zero, to ensure there is no over estimation in the drainage model capacity to attenuate water.
- FEH 22 (Flood Estimation Handbook 2022) point data was also used for the storm event rather than FSR (Flood Studies Report). FEH is more up to date than FSR data and provides a better representation of an actual event.

5.22 As part of the FLOW calculations, we modelled the existing surface water pipe downstream of the proposed connection and this is suitably sized to accommodate the proposed development.

5.23 Detail design of the crates, basin and details of the connections are all part of the detailed design stage of the development. This level of detail can be conditioned as part of the planning permission, if required.

Surface Water Quality

5.24 Pollution control requirements are determined by the using the Simple Index Approach as detailed in the CIRIA SuDS Manual. The pollution indices for this Site as per table 26.2 of the CIRIA SuDS Manual can be seen below:

Land Use	Total Suspended Solids	Metals	Hydrocarbons
Roof area	0.20	0.20	0.05
Adoptable Highway Areas	0.70	0.60	0.70

Table 5.4: Calculated SuDS pollution mitigation indexes for the Site

5.25 The worst-case pollution run-off from the proposed Site is from the adoptable highways this run-off will be treated by a proprietary treatment device, detention basin, prior to discharge. Based on table 26.3 from the CIRIA SuDS Manual, the worst-case area for the Site will provide treatment indices of:

SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Pre-Treatment Pond	0.70	0.70	0.50
Detention Basin	0.50	0.50	0.60
Treatment Train:	0.95	0.95	0.80

Table 5.5: Indicative SuDS mitigation indices

5.26 It can be seen above that the proposed treatment provides the required level of treatment for this Site prior to discharge.

5.27 It should be noted that SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the CIRIA SuDS Manual.

Pump Failure

5.28 A pump failure scenario has been modelled based on the following inputs:

- Pump rate set to 0;

- 1 in 10 and 1 in 30 year events simulated;
- The 6 hour and 24 hour design event durations modelled.

5.29 The results of this model can be found in the appendix, in summary the crates are shown to be able to fully contain a 1 in 30 year event with no flooding predicted.

Exceedance Flow Routes

5.30 Exceedance flow routes may be adapted to suit any proposed changes to the Site layout as the design progresses in line with the following principles:

- Surcharged flows from roads and roof areas will be retained within kerb lines and channelled towards the watercourse to the south;
- External ground levels will be profiled such that no ponding occurs against buildings, with flows directed as above.

Four Pillars of SuDS

5.31 For the purposes of this assessment, it must be demonstrated how the drainage strategy design provided above adheres to the four pillars of SuDS. It is defined that the approaches to manage surface water should take into account water quantity (flooding), water quality (pollution), amenity and biodiversity issues.

5.32 The proposed drainage strategy provides mitigation of water quantity, water quality, amenity and biodiversity all in the forms of the detention basin and permeable paving for all proposed paved and external parking areas.

5.33 The above SuDS features will control the rate of stormwater overflow and provide sufficient water treatment prior to discharge as per the SUDS indices outlined above.

Management and Maintenance of Drainage Assets

5.34 The party or persons ultimately responsible for the management and maintenance of drainage assets will be the freeholder for the site, the shared spaces will be maintained by a private management company (or their successor in title) as part of the wider Site management regime.

5.35 Further detail regarding the exact management and maintenance procedures required will be provided as part of detailed design of the drainage networks, any reserved matters submission once a management company has been instructed and a scope agreed. This will, however, follow the principles set out in Table 5.6 below and any flow control devices would follow manufacturer instructions:

Maintenance Schedule	Required Actions	Typical Frequency
Attenuation Basin		
Regular Maintenance	Inspect inlets and outlets for blockages and clear as required.	Monthly for first year then annually thereafter
	Remove litter and debris. Carry out periodic mowing of grassed surface and inspect for silt accumulation to determine appropriate removal frequency.	Monthly or as required (and through growing season for swales)

Maintenance Schedule	Required Actions	Typical Frequency
Occasional maintenance	Remove sediment from any affected articles including silt traps (most likely via jetting).	As required
	Clear any pipe blockages with appropriate equipment	As required
Remedial Actions	Repair any damage arising from various inspections (by approved engineer where required)	As required
Attenuation Tank		
Regular Maintenance	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Occasional maintenance	Survey the inside of the tank for sediment build-up and remove it if necessary.	Annually
Remedial Actions	Clear any pipe blockages with appropriate equipment.	Every 5 years or as required
	Repair / rehabilitate inlets, outlet outflows, and vents	

Private Package Surface Water Pumping Station:

Regular maintenance to be undertaken in line with the manufacturer's specification

Other General:

Regular Maintenance	Inspect rainwater gutter channels, inlets and outlets for blockages and clear as required.	Monthly for first year then annually thereafter
	Inspect gully drains, channel drains and inspection chambers (including silt traps) for siltation/blockage.	Monthly for first year then annually thereafter
	Inspect for sediment and debris in manhole bases and any blockage of soakaway chamber and geocellular storage.	Bimonthly for first six months then every six months thereafter
	Remove litter and debris from swale. Carry out periodic mowing of grassed surface and inspect for silt accumulation to determine appropriate removal frequency.	Monthly or as required (and through growing season for swales)
	Remove any sediment and debris from base of chambers and cellular storage.	As required, based on inspections
Occasional Maintenance Remedial Actions	Remove sediment from any affected articles including silt traps (most likely via jetting).	As required
	Clear any pipe blockages with appropriate equipment	As required
	Repair any damage arising from various inspections (by approved engineer where required)	As required

Maintenance Schedule	Required Actions	Typical Frequency
	Replacement of permeable surfacing, manhole components.	As required

Table 5.6: Outline SUDS Management and Maintenance Requirements

Foul Water Drainage

- 5.36 The proposed foul water discharge generated by the site is proposed to connect to the existing Anglian Water infrastructure north the site, MH0301 within Turnpike Lane.
- 5.37 A foul water pumping station and rising main will be required for the development at this Site. A predevelopment enquiry with Anglian Water has been submitted and is currently awaiting a reply at the time of writing.
- 5.38 All domestic foul drainage will be designed in accordance with Part H of the Building Regulations.

Flood Risk from the Development

- 5.39 The inclusion of SuDS would not increase the risk of surface water flooding but result in reduction of peak flow rates from the Site. The development would not result in the exacerbation of the current situation as the existing Site discharges unrestricted.
- 5.40 The proposed development has been shown it can incorporate SuDS to ensure there will not be an increase current surface water runoff rates from the Site post-development.

6.0 CONCLUSIONS AND RECOMMENDATIONS

- 6.1 Based on the available data at the time of this report and our assessment, it is considered that the risk of flooding is generally low from most sources with the mitigation measures proposed.
- 6.2 The Flood Map for Planning indicates that the Site area is wholly located within Flood Zone 1, therefore the site is at low risk from fluvial and tidal sources, and this was no considered further within the report.
- 6.3 The Site is subject to surface water flooding up to a depth of 0.3 m during the present-day scenario ("Low" to "High" risk) and 0.6 m during the climate change scenario ("Low" risk). Currently the Site is greenfield in nature, and it is assumed that any surface water runoff will be infiltrated or outfalls to the River Oughton to the south or the ditch network adjacent to the River Oughton.
- 6.4 The proposed development has designed the built development away from the areas shown to be at surface water flooding risk.
- 6.5 The proposed built development is located away from the River Oughton and is approximately 130 m above the river channel level. This reduces the risk of groundwater emergence occurring with the proposed built development.
- 6.6 The FRA has concluded that thresholds and finished floor levels should be set 75-150 mm above surrounding ground levels, in accordance with CIRIA Design for Urban Exceedance to prevent any unforeseen or exceedance events entering dwellings.
- 6.7 A SuDS assessment has been undertaken, and the proposals are to attenuate surface water in a above ground attenuation basin prior to outfall to the River Oughton. The flow rate to the River Oughton will be restricted at 3.1 l/s
- 6.8 The SuDS design has considered the existing private surface water sewer on the site, and the design work undertaken to date indicates that there should be no pipe clash between the existing sewer and the proposed drainage infrastructure. The SuDS basin is proposed to connect to the existing private sewer via a new manhole; therefore, no upgrading works to the riverbank or modifications to the existing sewer are anticipated. However, this will need to be confirmed at the detailed design stage.
- 6.9 The most eastern corner of the development has to be pumped due to the lower levels. Pumping has been restricted to the smallest amount possible.
- 6.10 Additional SuDS measures such a rainwater harvesting for irrigating landscaped areas and biorientation areas has been excluded from the calculations. These can also provide additional attenuation on the Site and can be used as additional storage in exceedance events but have been assumed to be at capacity, at the time of storm for the design work. This means the presented design can fully contain the 1% AEP + CC event on the Site, when these devices are full.
- 6.11 The freeholder will appoint a management company to be responsible for the upkeep and maintenance of the SuDS network for the private areas and a maintenance company will be responsible for the shared areas. The appropriate drainage and highway features will be offered for adoption where applicable.

- 6.12 The inclusion of SuDS reduces flood risk to others by attenuating and managing surface water on the Site. Currently the site would have uncontrolled free discharge of surface water and anything over greenfield rates would flow naturally overland and could cause flooding to others.
- 6.13 The proposed development is compliant with the NPPF, PPG, and local planning policy with regards to surface water management and flood risk. It is therefore considered appropriate development in this location.

FIGURES

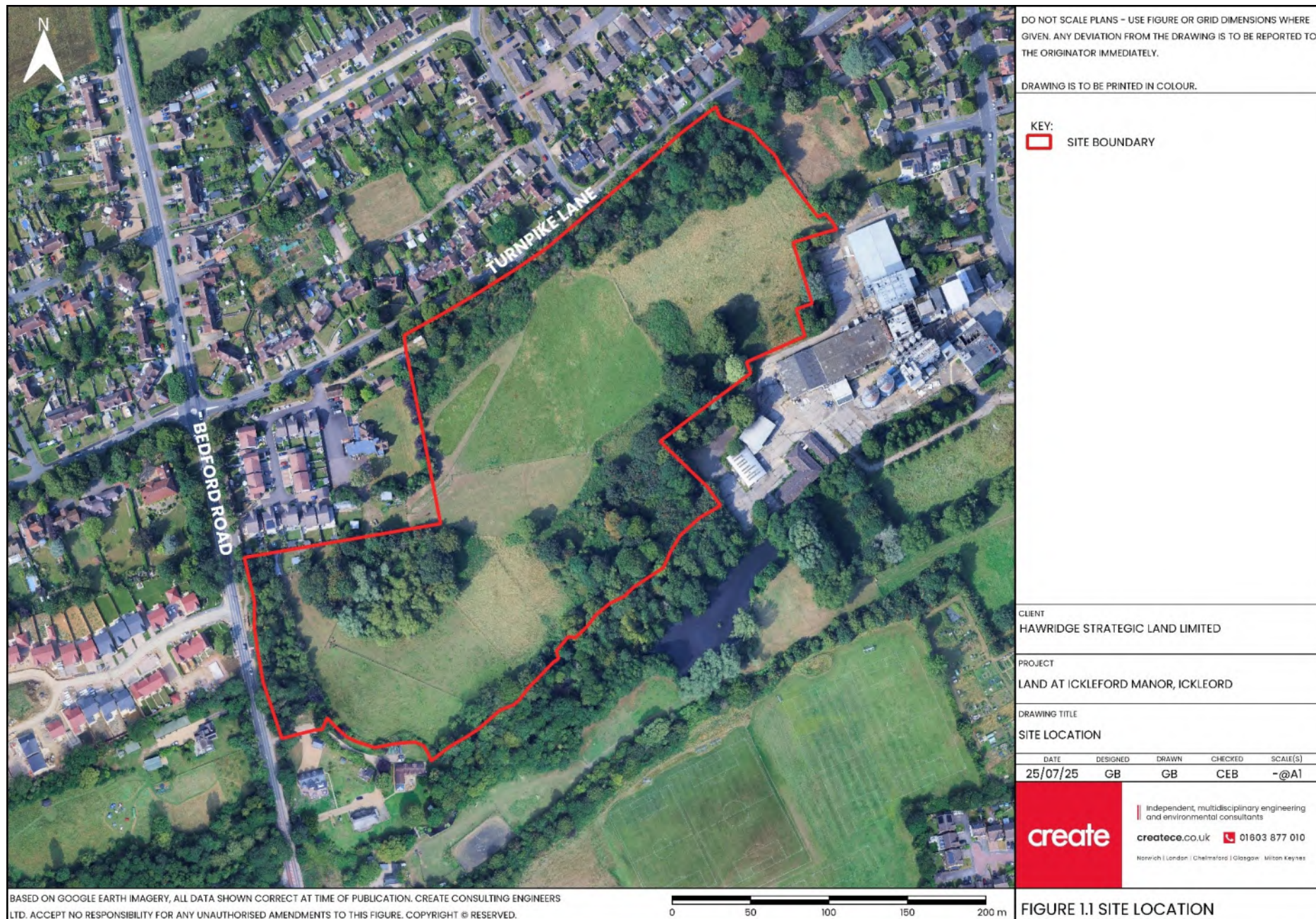


Figure 1.1: Site Location

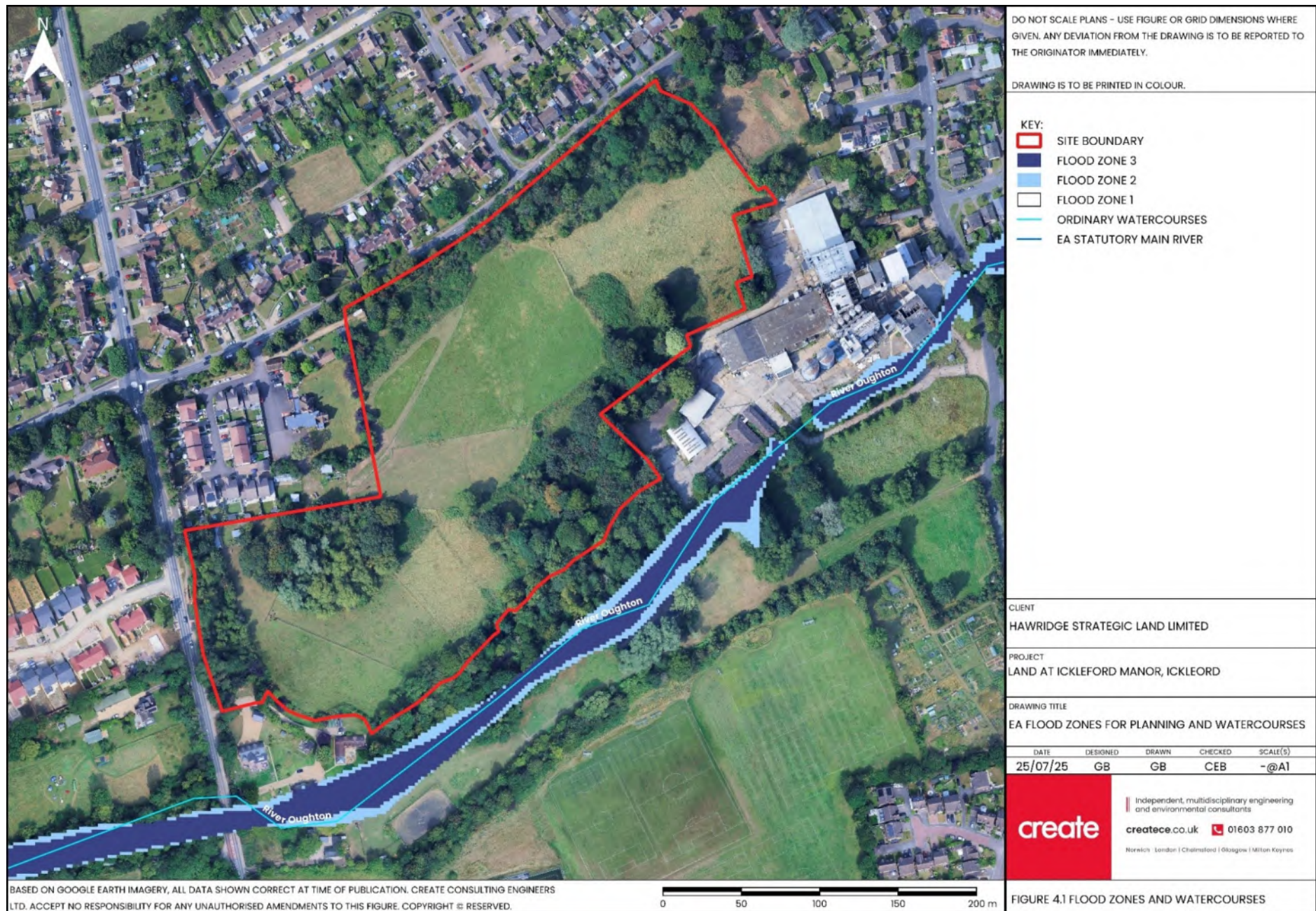


Figure 4.1: Flood Map for Planning

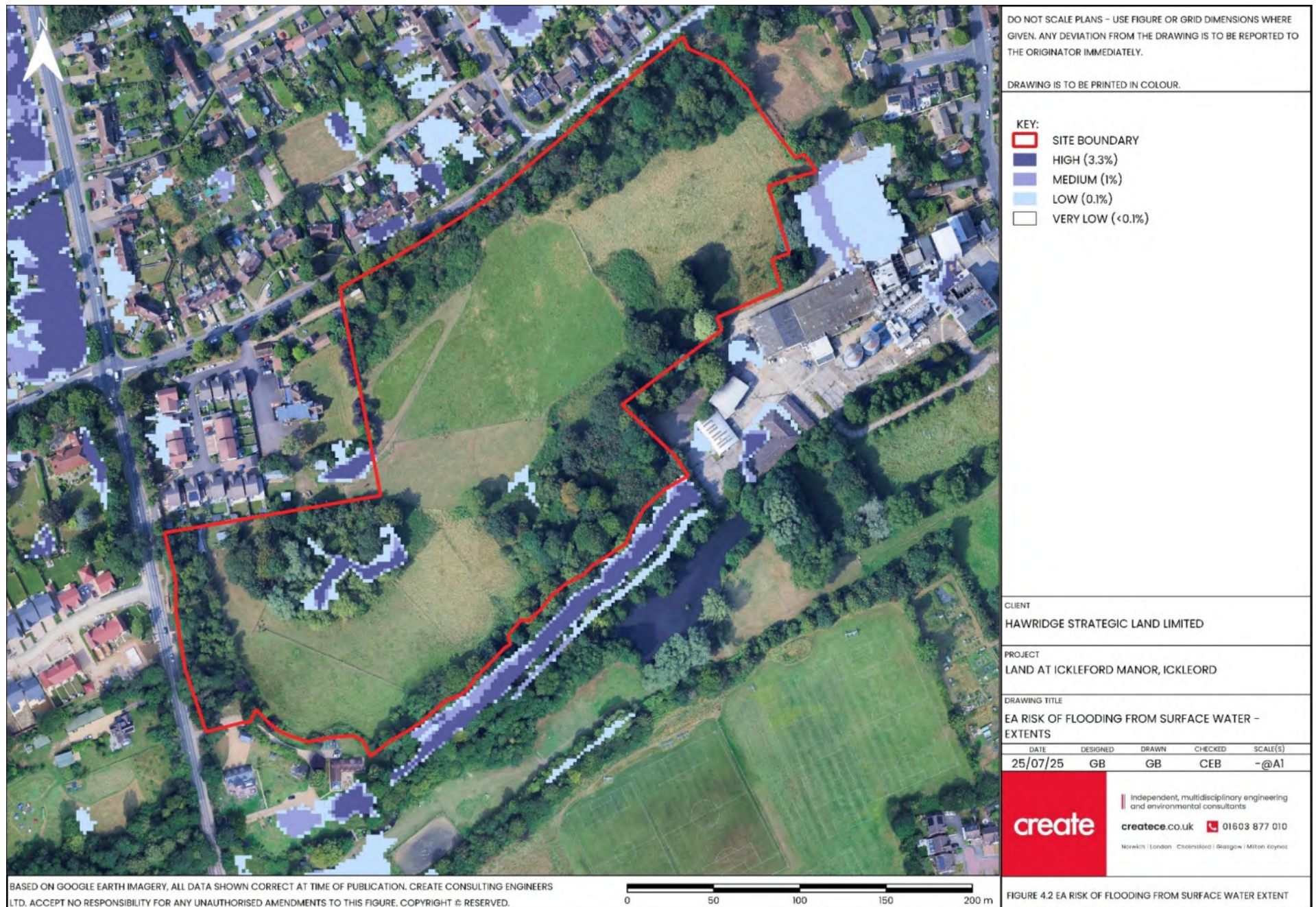


Figure 4.2: EA Risk of Flooding from Surface Water - Extent

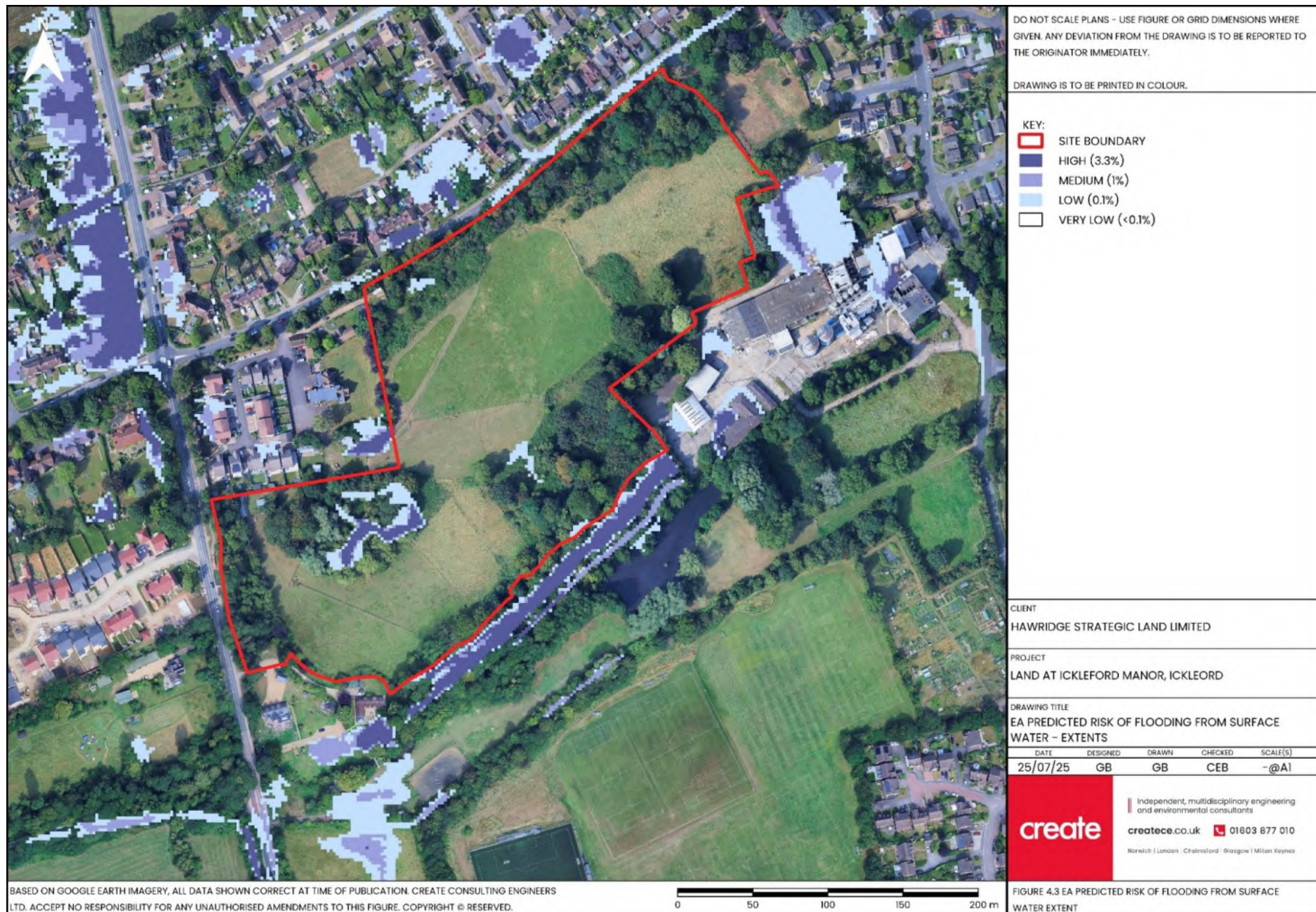


Figure 4.3: EA Predicted Risk of Flooding from Surface Water – Extent

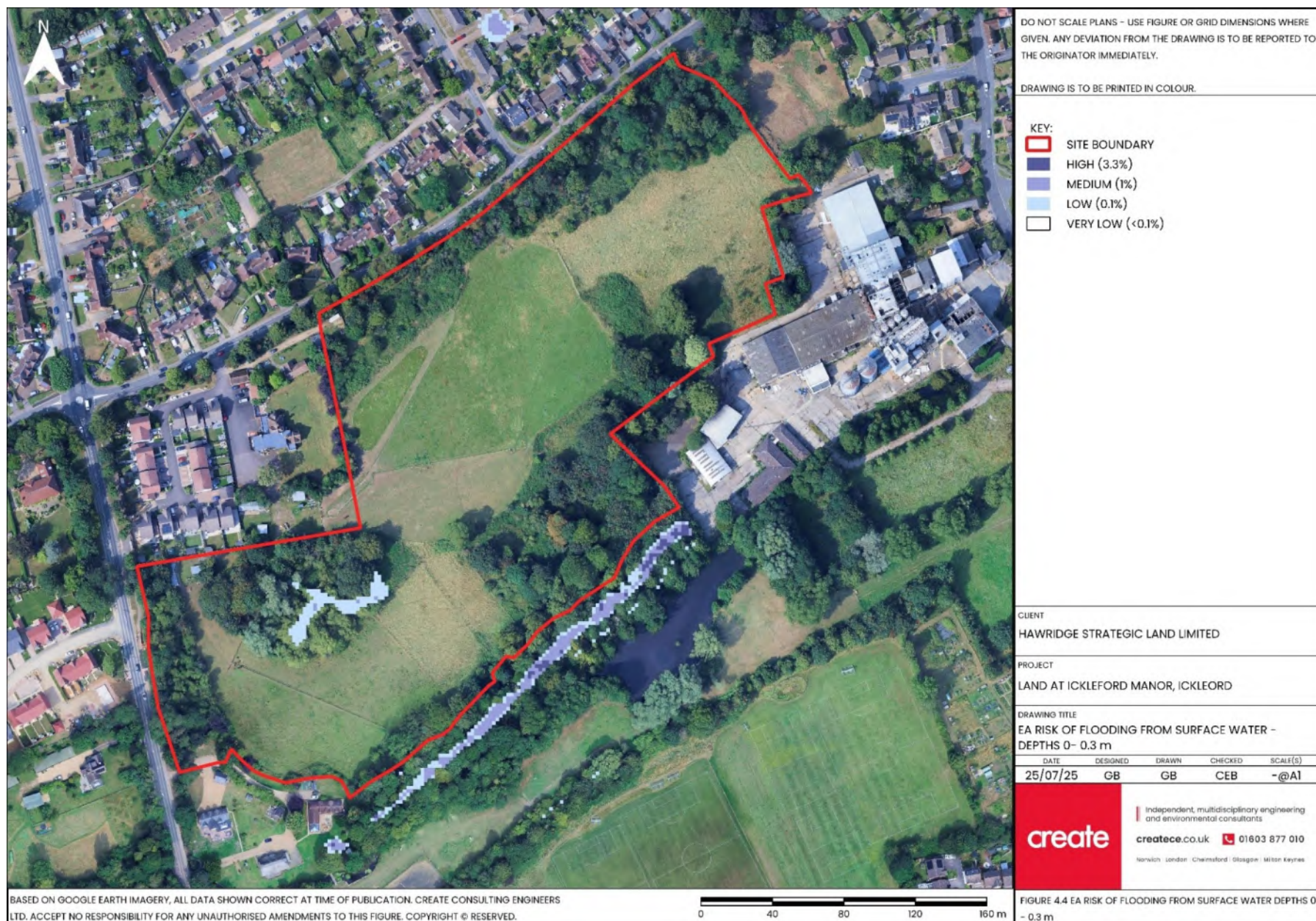


Figure 4.4: EA Risk of Flooding from Surface Water Depths - 0-0.3 m

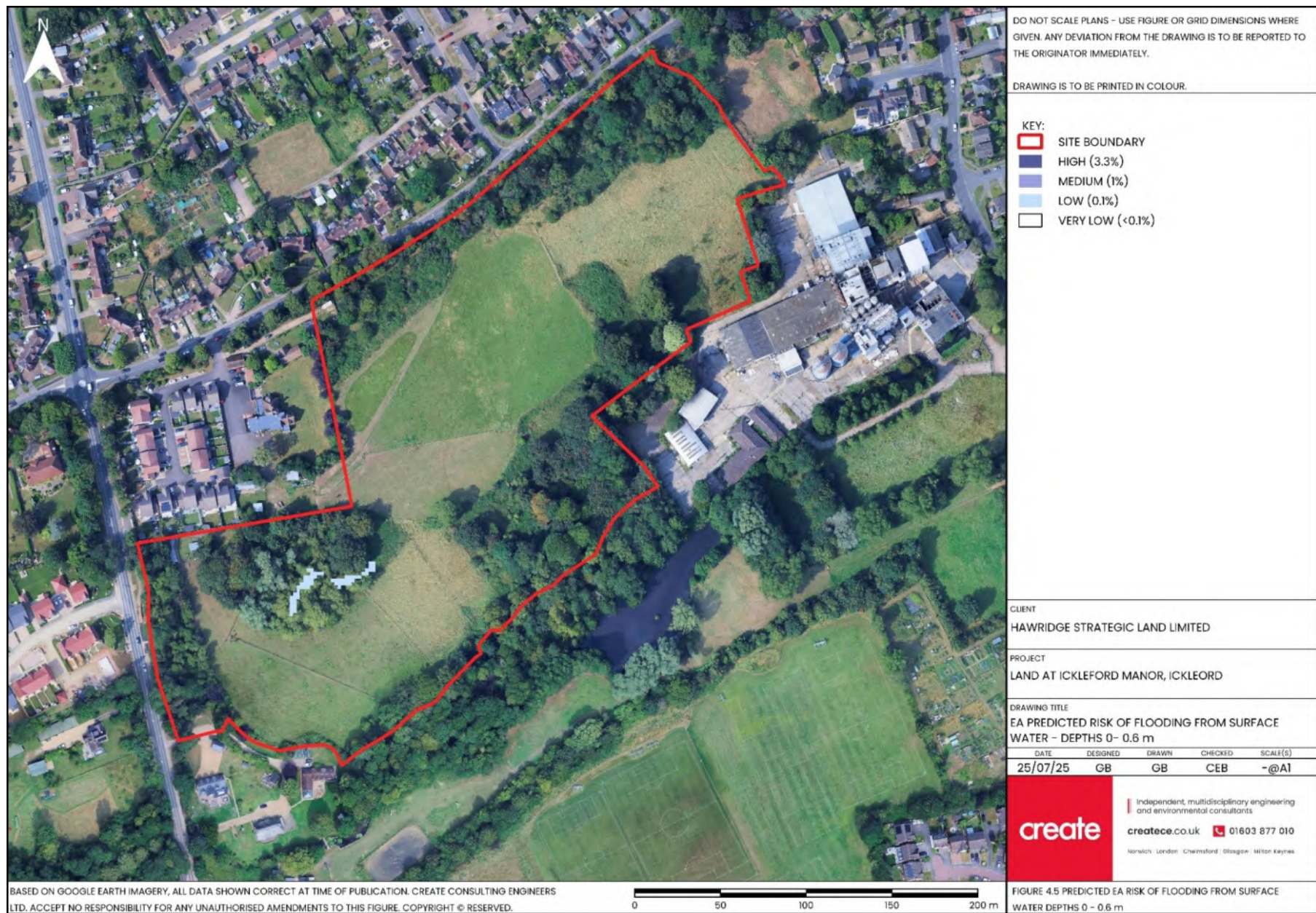


Figure 4.5: EA Predicted Risk of Flooding from Surface Water Depths - 0-0.6 m

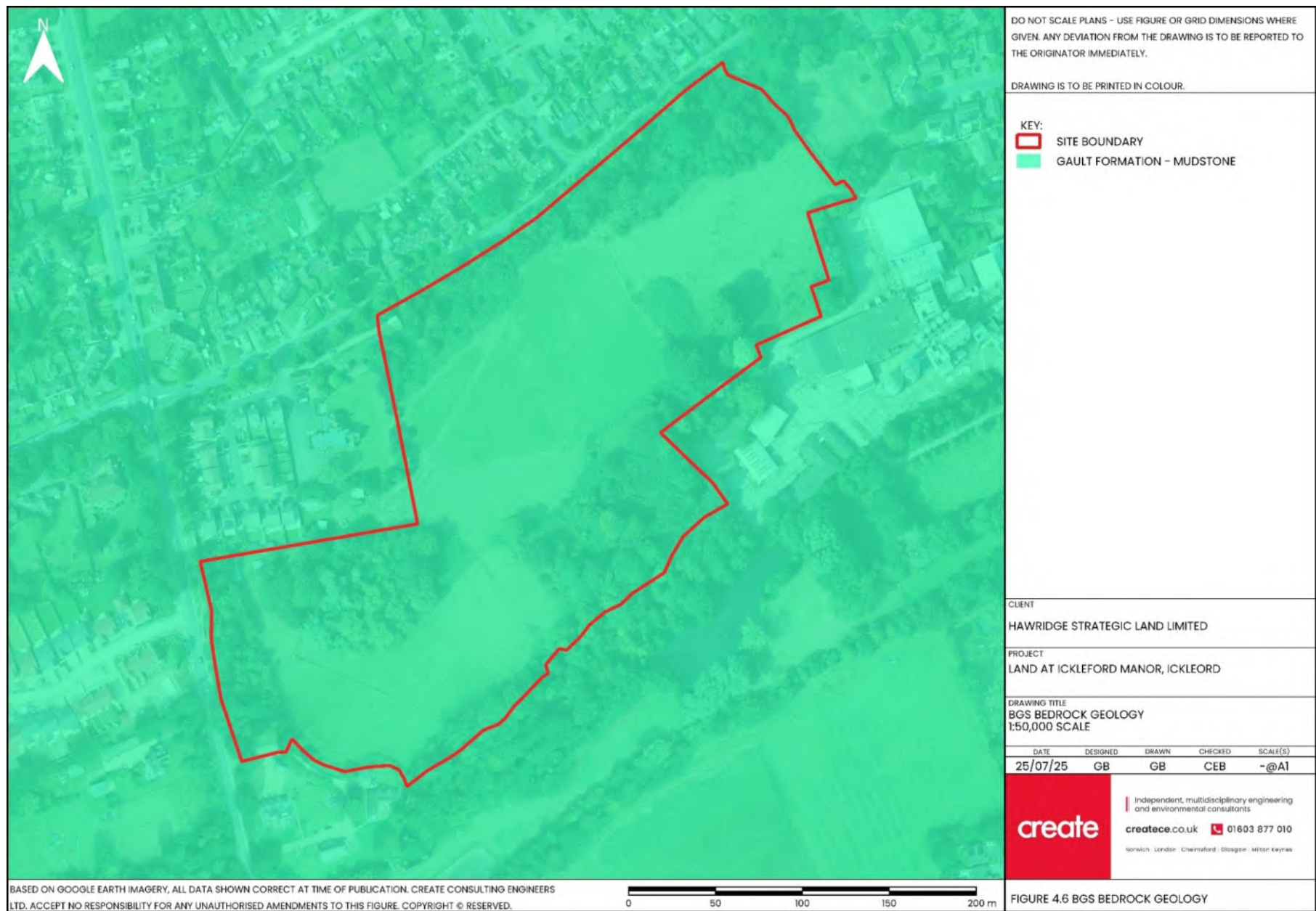


Figure 4.6: British Geological Survey Bedrock Geology Mapping Extract (1:50,000 scale)

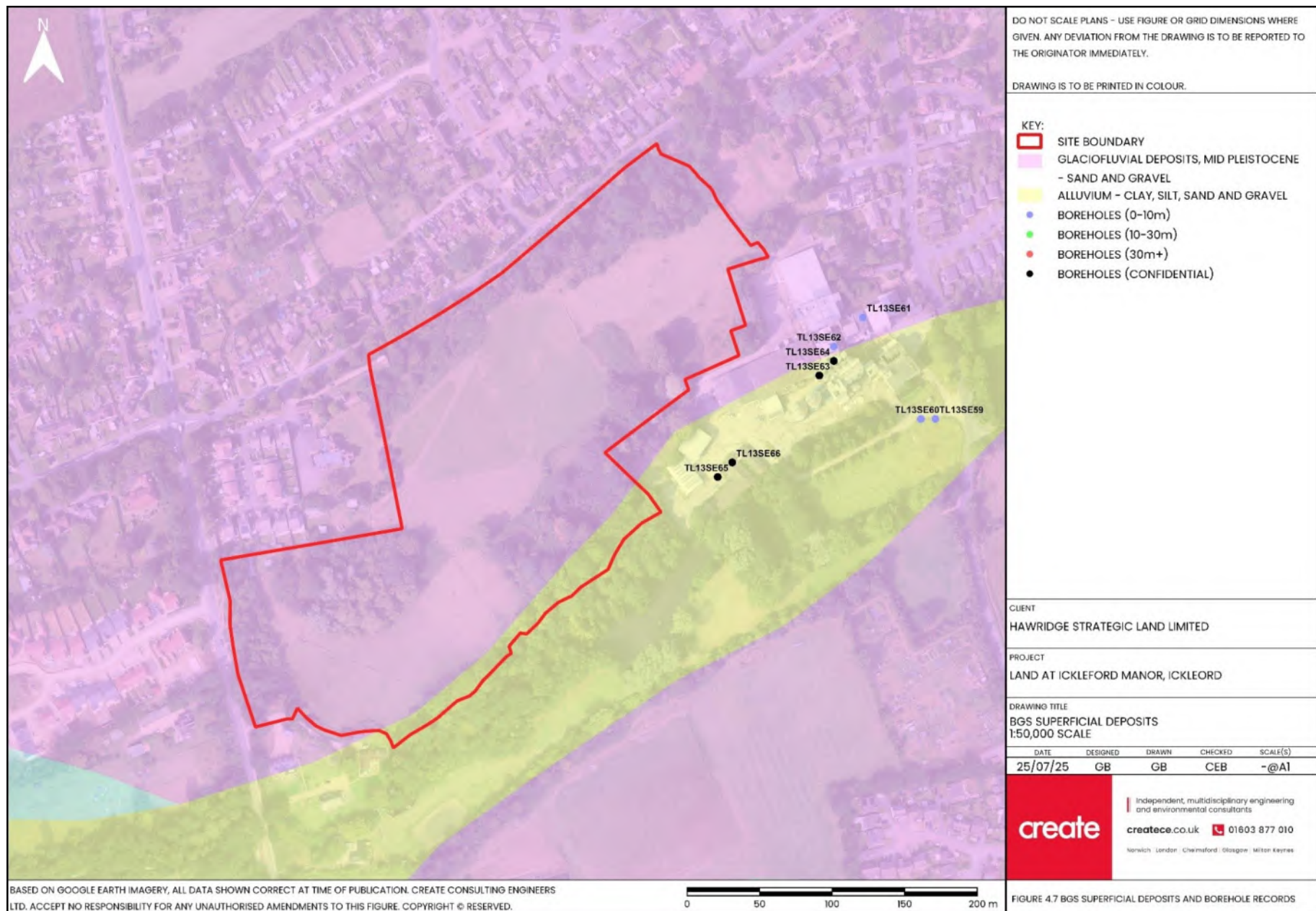


Figure 4.7: British Geological Survey Superficial Geology Mapping Extract (1:50,000 scale)

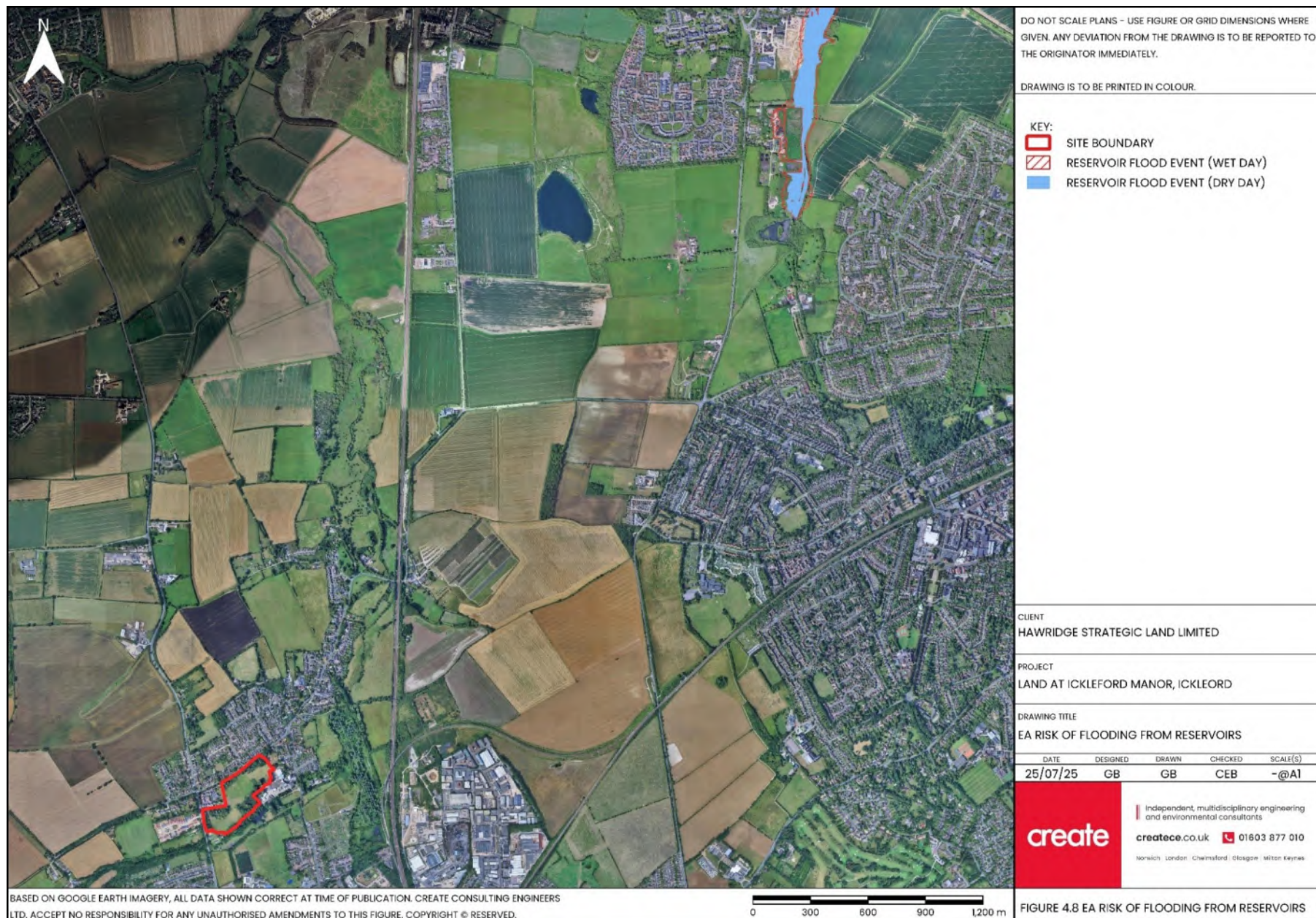
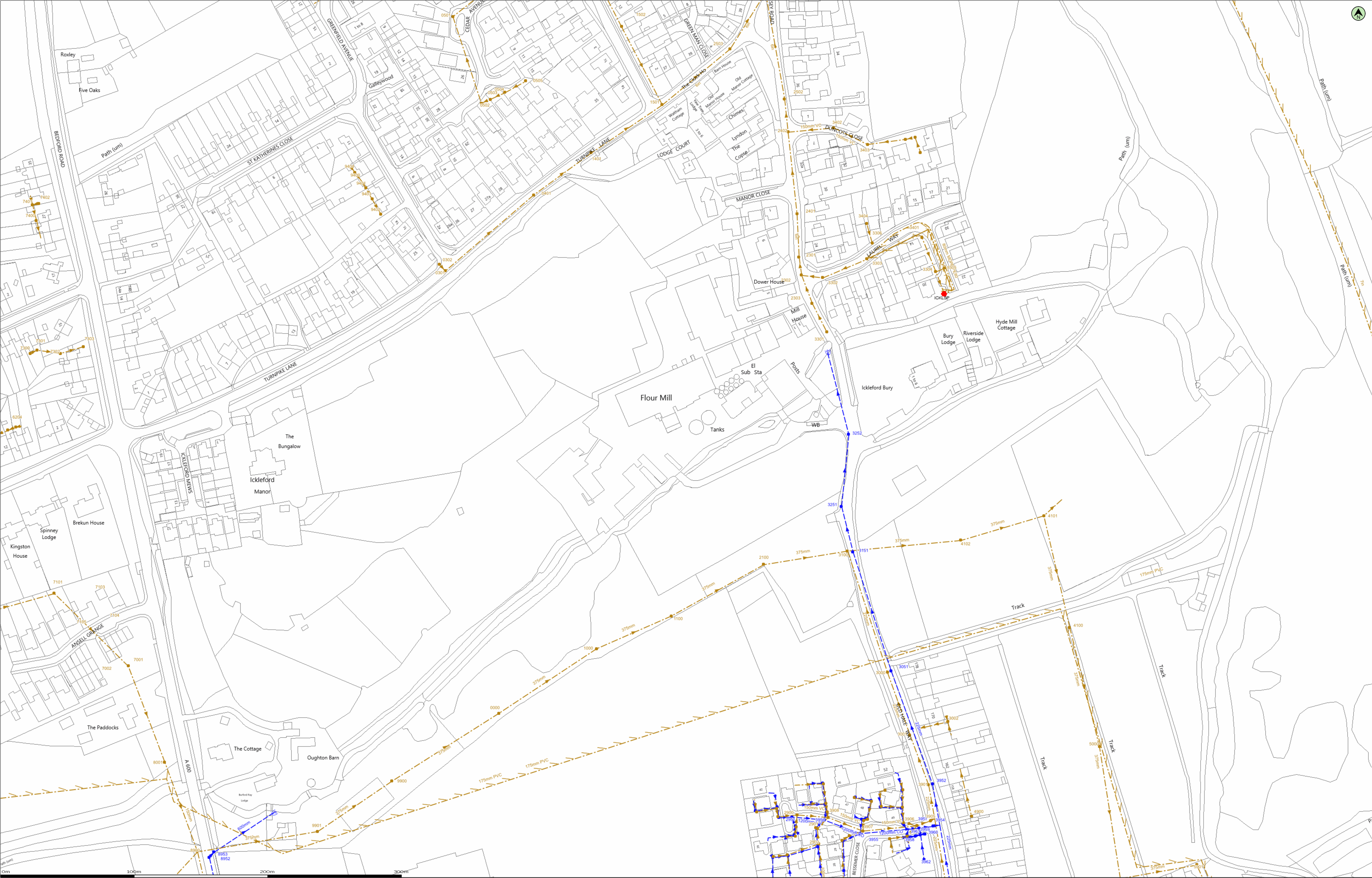


Figure 4.8: EA Risk of Flooding from Reservoirs

APPENDIX A

Anglian Water – Wastewater Plans



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Date: 10/04/25

Scale: 1:1250

Map Centre: 518199,231253

Data updated: 31/03/25

Our Ref: 1740978 - 1

Wastewater Plan A1
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This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2025 Ordnance Survey AC0000813445. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other users of the map data or further copies is not permitted. This notice is not intended to include or restrict liability for death or personal injury resulting from negligence.

Foul Sewer		Outfall*
Surface Sewer		
Combined Sewer		
Final Effluent		Inlet*
Rising Main*		
Private Sewer*		Manhole*
Decommissioned Sewer*		

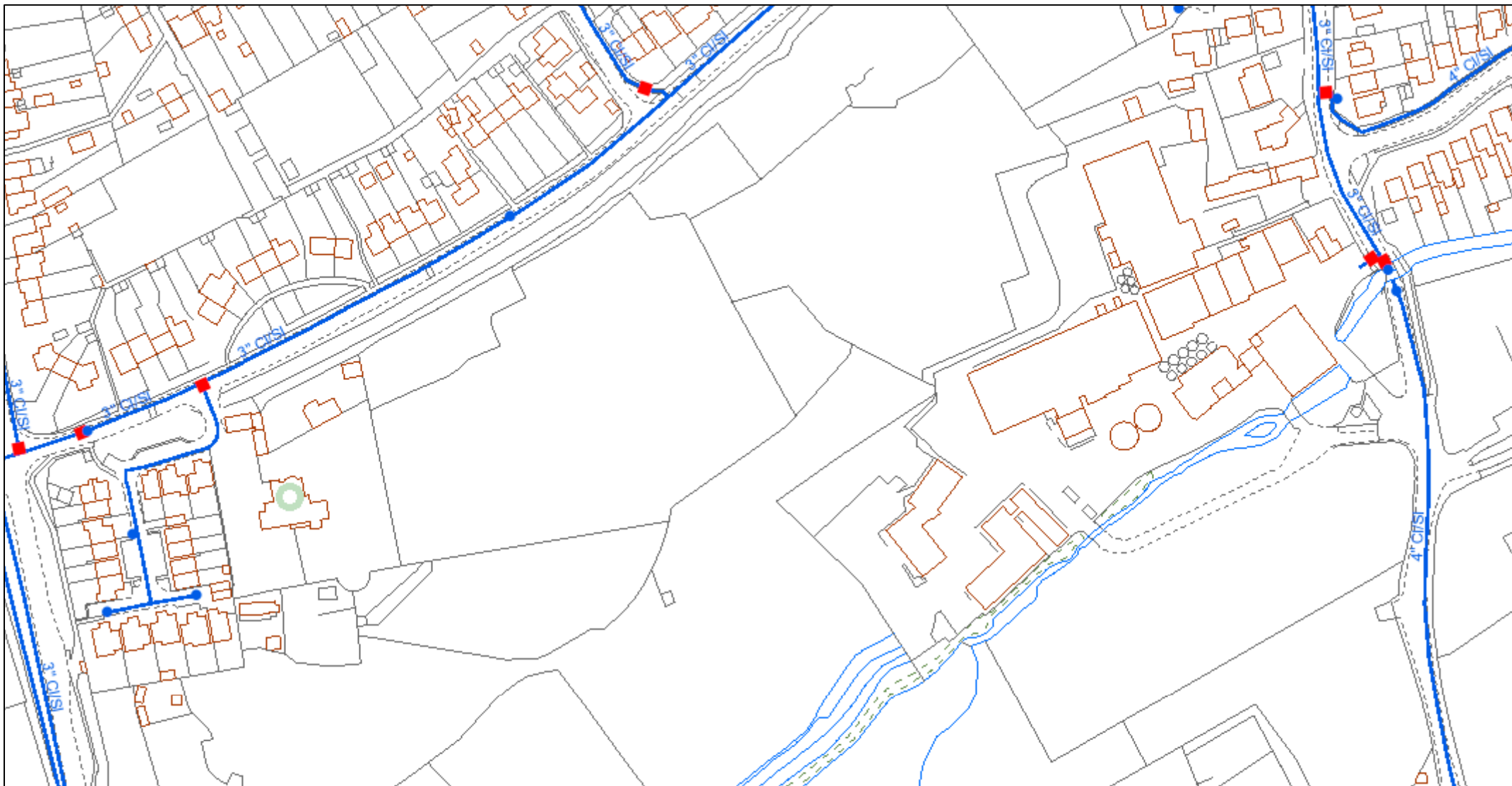
	Sewage Treatment Works
	Public Pumping Station
	Decommissioned Pumping Station
*(Colour denotes effluent type)	

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APPENDIX B

Affinity Water – Clean Water Plans



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Plans are continuously being updated, so out of date plans should be destroyed and not relied upon. The position of apparatus shown on this plan is provided for guidance only and should not be relied upon as being precise. Therefore the Company accepts no responsibility in the event of inaccuracy. Service pipes are not necessarily shown on this plan. Cover is normally 915mm for mains and 750mm for communication pipes but this may vary. The actual position of apparatus must be determined on site by making hand dug trial holes. The Company requires a minimum of two working days notice of the intention to excavate trial holes.

Except where prior written permission has been obtained, it is an offence under Section 174 of the Water Industry Act 1991 to operate or interfere with any valves, hydrants or other apparatus vested in Affinity Water.



1:2,065

	Distribution Main		Hydrant
	Asbestos Distribution Main		Fitting
	Abandoned Main		Easement
	Asbestos Abandoned Main		Company Boundary
	Adit / Tunnel		
	Cable		
	Searched Location		

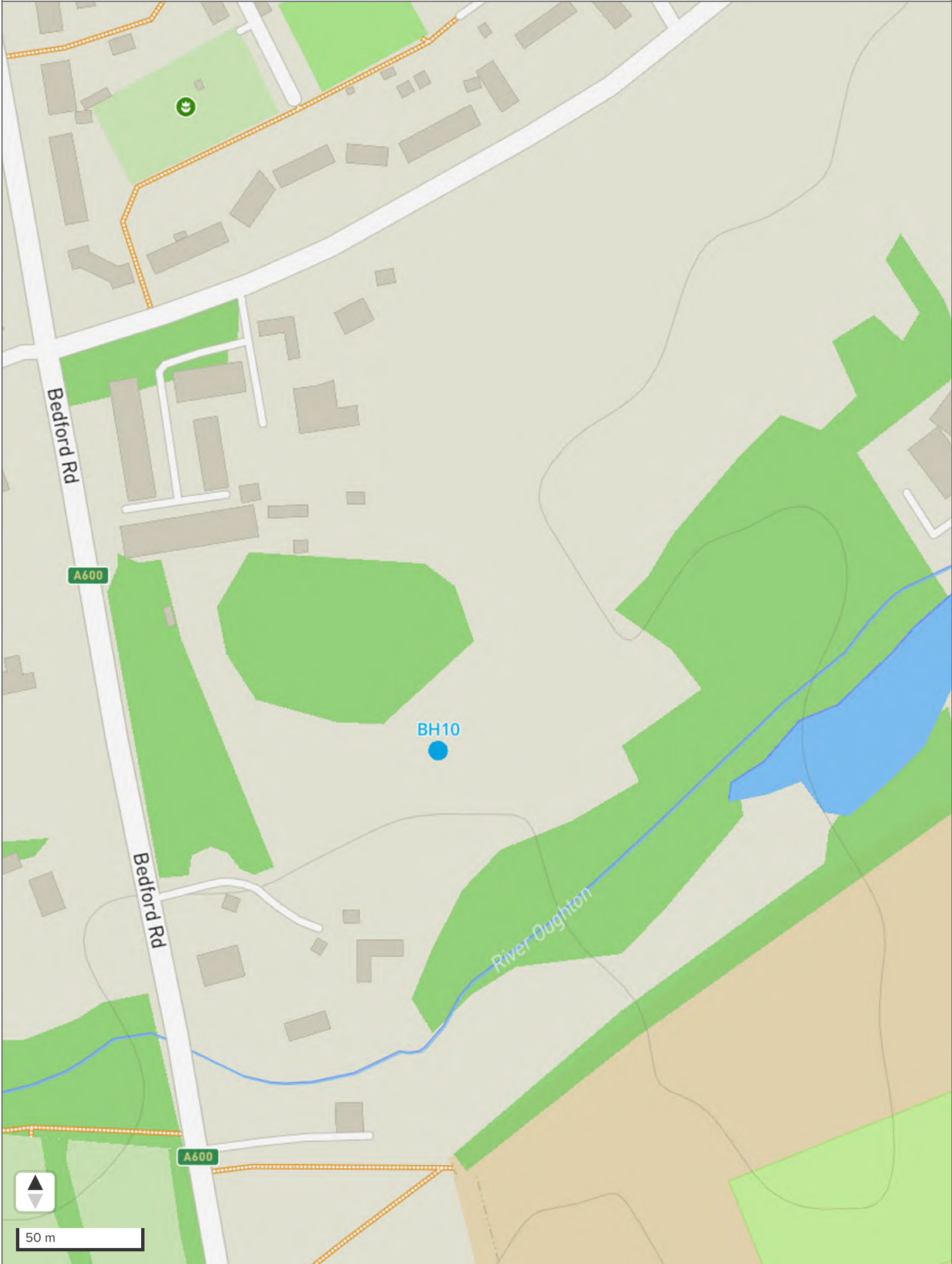
APPENDIX C

Exploratory Borehole Data

LAYOUT MAP



LAYOUT MAP



LAYOUT MAP



Client: Hawridge Strategic Land Limited						BH01			
Date Started: 2025-05-07		Co-ordinates X: 517,947.0 Y: 231,150.0		Ground Level (m) 59.82		Ref. No: ISPT-BH01			
SAMPLE STATUS									
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed									
Elevation	Depth	Lithology	Lithology	Status	Samples	Water depth	Depth	N _{spt}	
59.82	0		Soft, brown, gravelly CLAY. Gravel is angular and sub-angular, fine and medium flint. (Topsoil?)	ES	0 - 0.9 m		0	0	30
58.92	1		0.9 m Soft, orange brown, slightly coarse sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint. Low cobble content of angular flint. (Glaciofluvial Deposits)	ES D	0.9 - 1 m		1	12	
58.62			1.2 m Soft, orange brown, slightly coarse sandy, slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	B	1.2 - 1.4 m				
58.42			1.4 m Light orange brown, gravelly, coarse SAND. Gravel is angular and sub-angular, fine and medium flint. (Glaciofluvial Deposits)						
57.82	2		2 m Yellow brown, gravelly, coarse SAND. Gravel is sub-angular to rounded, fine and medium flint. (Glaciofluvial Deposits)	D	2 m		2	9	
57.72			2.1 m Firm, light brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint and chalk. (Glaciofluvial Deposits)						
56.82	3		3 m Firm, light brown, slightly coarse sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	D	3 m	3 m	3	14	
56.02	4		3.8 m Firm, light brown, gravelly CLAY. Gravel is sub-angular to rounded, fine to coarse flint. (Glaciofluvial Deposits)	D	4 m				
55.82			4 m Firm, light brown, slightly coarse sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)						24
54.92			4.9 m Firm, grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint. (Disturbed Gault Formation?)	D	5 m				26
54.82	5		5 m				5		
Remarks		1. Groundwater encountered at 2m below ground level with no rise upon completion. 2. Borehole progressed to 5m then collapsed back to 3m below ground level.							
Driller	RGI	EXPLORATORY HOLE LOG				CKConsulting and Geotechnical			
Logged	KK								
Checked	PTE	Ickleford Manor				Ground Investigation Data			
Appr'd	PTE								

Client: Hawridge Strategic Land Limited								BH02			
Date Started: 2025-05-07		Co-ordinates X: 517,947.0 Y: 231,162.0			Ground Level (m) 59.97		Ref. No: ISPT-BH02				
SAMPLE STATUS											
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed											
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}				
59.97	0					0	0				40
				ES	0 - 0.5 m						
				ES	0.5 - 1 m						
58.97	1		1 m			1					29
				D	1.2 m						
58.77			1.2 m								
				B	1.2 - 1.7 m						
			1.7 m								
58.27											
	2			D	2 m	2					16
				D	3 m	3					23
	3										
				D	4 m	4					22
55.97	4		4 m								
				D	5 m	5					20
54.97	5		5 m								
Driller	RGI	EXPLORATORY HOLE LOG				CKConsulting and Geotechnical					
Logged	KK										
Checked	PTE	Ickleford Manor				Ground Investigation Data					
Appr'd	PTE										

Client: Hawridge Strategic Land Limited								BH03	
Date Started: 2025-05-07		Co-ordinates X: 517,947.0 Y: 231,174.0		Ground Level (m) 60.57		Ref. No: ISPT-BH03			
SAMPLE STATUS									
ES: Soil sample for environmental testing / B: Bulk disturbed / D: Small bulk disturbed									
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}		
60.57	0		Soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is angular and sub-angular, fine and medium flint. (Topsoil?) 0.3 m	ES	0 - 0.3 m	0	0		
60.27	1		Soft, orange brown, slightly fine sandy, slightly gravelly CLAY. Gravel is angular and sub-angular, fine and medium flint. (Glaciofluvial Deposits) 0.6 m	ES	0.6 - 1.2 m	1			
59.97			Soft, light brown, slightly coarse sandy, slightly gravelly CLAY. Gravel is angular and sub-angular, fine and medium flint. (Glaciofluvial Deposits) 1.2 m						
59.37			Medium dense, yellow brown, gravelly, coarse SAND. Gravel is angular and sub-angular, fine and medium flint. (Glaciofluvial Deposits) 1.8 m	D B	1.2 m 1 - 1.5 m				
58.77			Orange brown, gravelly, medium SAND. Gravel is angular and sub-angular, fine and medium flint. (Glaciofluvial Deposits) 2 m	D	2 m	2	10		
58.57	2		Stiff, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium flint and chalk. (Glaciofluvial Deposits) 3 m	D	3 m	3	9		
57.57	3		Stiff, brown, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium chert and chalk. (Glaciofluvial Deposits) 4 m	D	4 m	4	12		
56.57	4		Stiff, dark grey, slightly gravelly CLAY. Gravel is angular to rounded, fine and medium chert and chalk. (Disturbed Gault Formation?) 5 m	D	5 m	5	15		
55.57	5								
Remarks 1. Groundwater encountered at 4m below ground level with no rise upon completion.									
Driller	RGI	EXPLORATORY HOLE LOG							
Logged	KK								
Checked	PTE	Ickleford Manor				Ground Investigation Data			
Appr'd	PTE								

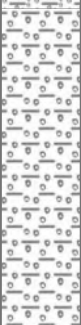
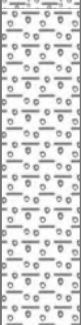
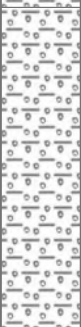
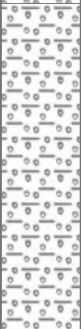
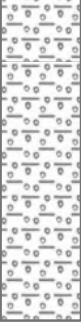
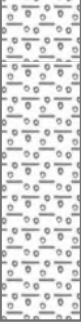
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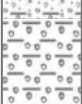
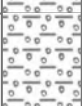
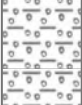
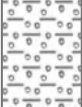
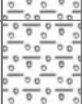
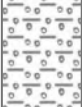
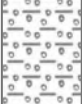
Client: Hawridge Strategic Land Limited								BH05		
Date Started: 2025-05-08		Co-ordinates X: 518,012.0 Y: 231,325.0		Ground Level (m) 59.48		Ref. No: ISPT-BH05				
SAMPLE STATUS										
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed										
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}			
59.48	0		Soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is angular to round, fine to coarse flint, chalk, brick and chert. (Made Ground)	ES	0 - 0.7 m	0				60
			0.7 m							
58.78			Yellow brown, gravelly, fine SAND. Gravel is sub-angular to rounded, fine to coarse flint and chert. (Glaciofluvial Deposits)	ES	0.7 - 1 m					
			1 m							
58.48	1		Dense, yellow brown, gravelly, fine SAND. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	D	1 m	1				36
			1.8 m		B	1 - 2 m				
57.68			Orange brown, gravelly, coarse SAND. Gravel is sub-angular to rounded, fine and medium flint and chert. (Glaciofluvial Deposits)	D	2 m					
			2 m							
57.48	2		Medium dense, light brown, gravelly, coarse SAND. Gravel is angular to rounded, fine to medium flint and chert. (Glaciofluvial Deposits)			2				14
			2.9 m							
56.58			Orange brown, gravelly, coarse SAND. Gravel is sub-angular to rounded, fine and medium flint and chert. (Glaciofluvial Deposits)	D	3 m					
			3 m							50
56.48	3					3				

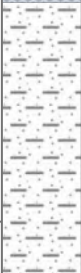
Client: Hawridge Strategic Land Limited						BH06	
Date Started: 2025-05-08		Co-ordinates X: 518,054.0 Y: 231,338.0		Ground Level (m) 59.25		Ref. No: ISPT-BH06	
SAMPLE STATUS							
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed							
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}
59.25	0		Soft, light brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint. (Topsoil?)	ES	0 - 0.5 m	0	
58.45			0.8 m Yellow brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits)	ES	0.8 - 1 m		
58.25	1		1 m Medium dense, light orange brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits)	D	1 m	1	20
58.05			1.2 m Orange brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	B	1 - 1.5 m		
57.45			1.8 m Orange light brown, gravelly, coarse SAND. Gravel is sub-angular, fine and medium flint. (Glaciofluvial Deposits)				
57.35			1.9 m Orange brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	D	2 m	2	13
57.25	2		2 m Stiff, light brown mottled grey, slightly gravelly CLAY. Gravel is sub-rounded and rounded, fine and medium chalk. (Glaciofluvial Deposits)				
			3 m	D	3 m	3	14
56.25	3		Stiff, orange brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint and chert. (Glaciofluvial Deposits)				
			4 m	D	4 m	4	16
55.25	4		Stiff, brown grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint, chalk and chert. (Glaciofluvial Deposit/Disturbed Gault Formation?)				
			5 m	D	5 m	5	18
54.25	5						
Remarks 1. Groundwater encountered at 2m below ground level with no rise upon completion.							
Driller	RGI	EXPLORATORY HOLE LOG			CKConsulting and Geotechnical		
Logged	KK						
Checked	PTE	Ickleford Manor			Ground Investigation Data		
Appr'd	PTE						

Client: Hawridge Strategic Land Limited								BH07	
Date Started: 2025-05-08		Co-ordinates X: 518,079.0 Y: 231,300.0			Ground Level (m) 58.94		Ref. No: ISPT-BH07		
SAMPLE STATUS									
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed									
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}		
							0	20	
58.94	0		Soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint and chalk. (Topsoil?)	ES	0 - 0.4 m	0			
			0.4 m						
58.54			Soft, orange brown, slightly gravelly, slightly fine sandy CLAY. Gravel is sub-angular, medium and coarse flint. (Glaciofluvial Deposits)	ES	0.4 - 1 m				
			1 m						
57.94	1		Soft, orange brown, slightly gravelly CLAY. Gravel is sub-angular, fine and medium flint. (Glaciofluvial Deposits)	D	1 m	1		9	
			1.3 m	B	1 - 1.5 m				
57.64			Orange brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits)						
57.54			1.4 m						
			Soft, light brown, slightly gravelly CLAY. Gravel is sub-rounded and rounded, fine flint. (Glaciofluvial Deposits)						
57.24			1.7 m						
57.14			Orange brown, gravelly, coarse SAND. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits)	D	2 m			16	
			1.8 m						
56.94	2		Firm, orange brown mottled grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits)			2			
			2 m						
				D	3 m			13	
	3					3			
			Medium dense, orange brown, gravelly, coarse SAND. Gravel is sub-angular and rounded, fine and medium flint and chert. (Glaciofluvial Deposits)						
				D	4 m				17
	4					4			
54.14			4.8 m						
			Stiff, grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint and chalk. (Disturbed Gault Formation?)	D	5 m				18
53.94	5		5 m			5			
Remarks 1. Groundwater encountered at 2m below ground level with no rise upon completion.									
Driller		RGI	EXPLORATORY HOLE LOG						
Logged		KK							
Checked		PTE	Ickleford Manor			Ground Investigation Data			
Appr'd		PTE							

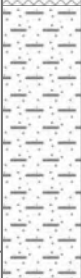
Client: Hawridge Strategic Land Limited						Ground Level (m)		58.45	Ref. No: ISPT-BH08		BH08	
Date Started: 2025-05-08		Co-ordinates X: 518,109.0 Y: 231,321.0										
SAMPLE STATUS												
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed												
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}					
58.45	0		Soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular, fine flint. (Topsoil?)	ES	0 - 0.4 m	0						
58.05			Soft, orange brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular and angular, fine to coarse flint. (Glaciofluvial Deposits)			ES	0.4 - 1 m					
57.45	1		Stiff, light brown mottled grey, slightly gravelly CLAY. Gravel is sub-angular, fine to coarse chalk. (Glaciofluvial Deposits)	D	1 m	1						
				B	1 - 1.5 m							
56.45	2		Stiff, brown, slightly gravelly CLAY. Gravel is sub-rounded and rounded, fine and medium chalk and flint. (Glaciofluvial Deposits)	D	2 m	2						
56.15												
55.45	3		Stiff, dark brown, slightly gravelly CLAY. Gravel is sub-rounded and rounded, fine chalk. (Glaciofluvial Deposits)	D	3 m	3						
54.45	4		Stiff, brown grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint and chalk. (Glaciofluvial Deposit/Disturbed Gault Formation?)	D	4 m	4						
53.45	5		Stiff, grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium chalk. (Disturbed Gault Formation?)	D	5 m	5						
Driller		RGI		EXPLORATORY HOLE LOG								
Logged		KK										
Checked		PTE		Ickleford Manor				Ground Investigation Data				
Appr'd		PTE										

Client: Hawridge Strategic Land Limited								BH09		
Date Started: 2025-05-08		Co-ordinates X: 518,148.0 Y: 231,328.0		Ground Level (m) 57.17		Ref. No: ISPT-BH09				
SAMPLE STATUS										
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed										
Elevation	Depth	Lithology	Lithology	Status	Samples	Depth	N _{spt}			
57.17	0		Soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-round, fine to coarse flint, brick and chert. (Made Ground)	ES	0 - 0.5 m	0				
56.67			0.5 m							
			Soft, orange brown, slightly gravelly, slightly medium sandy CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits)	ES	0.5 - 1 m					
			1 m	D	1 m	1			15	
56.17	1		Stiff, orangey brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint and chalk. (Glaciofluvial Deposits)	B	1 - 1.5 m					
				D	2 m	2			23	
55.17	2		Stiff, orange brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse chalk. (Glaciofluvial Deposits)							
				D	3 m	3			18	
54.17	3		Stiff brown grey, slightly gravelly CLAY. Gravel is sub-angular and angular, fine and medium flint. (Glaciofluvial Deposit/Disturbed Gault Formation?)							
	4		4.2 m			4			19	
52.97			Stiff, dark grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse chalk. (Disturbed Gault Formation?)							
				D	5 m				24	
52.17	5					5				
Driller		RGI	EXPLORATORY HOLE LOG							
Logged		KK								
Checked		PTE	Ickleford Manor			Ground Investigation Data				
Appr'd		PTE								

Client: Hawridge Strategic Land Limited						BH10			
Date Started: 2025-05-07		Co-ordinates X: 517,933.0 Y: 231,104.0		Ground Level (m) 57.86					
SAMPLE STATUS									
ES: Soil sample for environmental testing / D: Small bulk disturbed / B: Bulk disturbed									
Elevation	Depth	Lithology	Lithology	Backfill	Diameter	Status	Samples		
57.86	0		soft, dark brown, slightly fine sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint. (Topsoil?) 0.4 m	Arisings	110	ES	0 - 0.37 m		
57.46			soft, orange brown, slightly gravelly, slightly fine sandy CLAY. Gravel is sub-angular and sub-rounded, fine and medium flint. (Glaciofluvial Deposits) 0.7 m			ES	0.37 - 0.68 m		
57.16			Stiff, orange brown mottled grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint. (Glaciofluvial Deposits) 1 m			D	1 m		
56.86	1		Stiff, light brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium chalk and flint. (Glaciofluvial Deposits) 1.5 m			B	1 - 1.5 m		
56.36			Stiff, dark brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium chalk. (Glaciofluvial Deposits) 2 m			D	2 m		
55.86		2						Stiff, grey brown, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium chalk. (Glaciofluvial Deposit/Disturbed Gault Formation?) 4 m	
53.86	4								Stiff, grey, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine and medium chalk. (Disturbed Gault Formation?) 5 m
									
52.86	5					5 m	5 m	D	5 m
Driller	RGI	EXPLORATORY HOLE LOG							
Logged	KK								
Checked	PTE	Ickleford Manor		Ground Investigation Data					
Appr'd	PTE								

Client: Hawridge Strategic Land Limited						TP01
Date Started: 2025-05-07		Co-ordinates X: 517,949.0 Y: 231,078.0		Ground Level (m) 56.59		
Elevation	Depth	Lithology	Lithology			Backfill
56.59	0		Soft, dark brown, slightly sandy CLAY. (Topsoil?) 0.6 m			Arisings
55.99	1		Soft, dark orange brown, slightly sandy CLAY. (Glaciofluvial Deposits) 1.1 m			
55.49			Soft to firm, light orange brown, slightly sandy, slightly gravelly CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint and chalk. (Glaciofluvial Deposits)			
		2		2.1 m		
54.49						

[illegible]

Client: Hawridge Strategic Land Limited						TP03	
Date Started: 2025-05-07		Co-ordinates X: 518,063.0 Y: 231,320.0		Ground Level (m) 59.13			
Elevation	Depth	Lithology	Lithology				Backfill
59.13	0		Soft, dark brown, slightly gravelly, slightly sandy CLAY. Gravel is angular, fine and medium, red brick. (Made Ground) 0.55 m				Arisings
58.58	1		Soft, dark brown, slightly sandy CLAY. (Glaciofluvial Deposits) 1.05 m				
58.08			Soft to firm, light orange brown, slightly gravelly, slightly sandy CLAY. Gravel is sub-angular and sub-rounded, fine to coarse flint and chalk. (Glaciofluvial Deposits) 1.9 m				
57.23							1.9 m
Remarks 1. Trial pit noted to be dry prior to commencing infiltration test.							
Driller	RGI	EXPLORATORY HOLE LOG					
Logged	PTE						
Checked	PTE	Ickleford Manor			Ground Investigation Data		
Appr'd	PTE						

APPENDIX D

Greenfield Runoff Rates

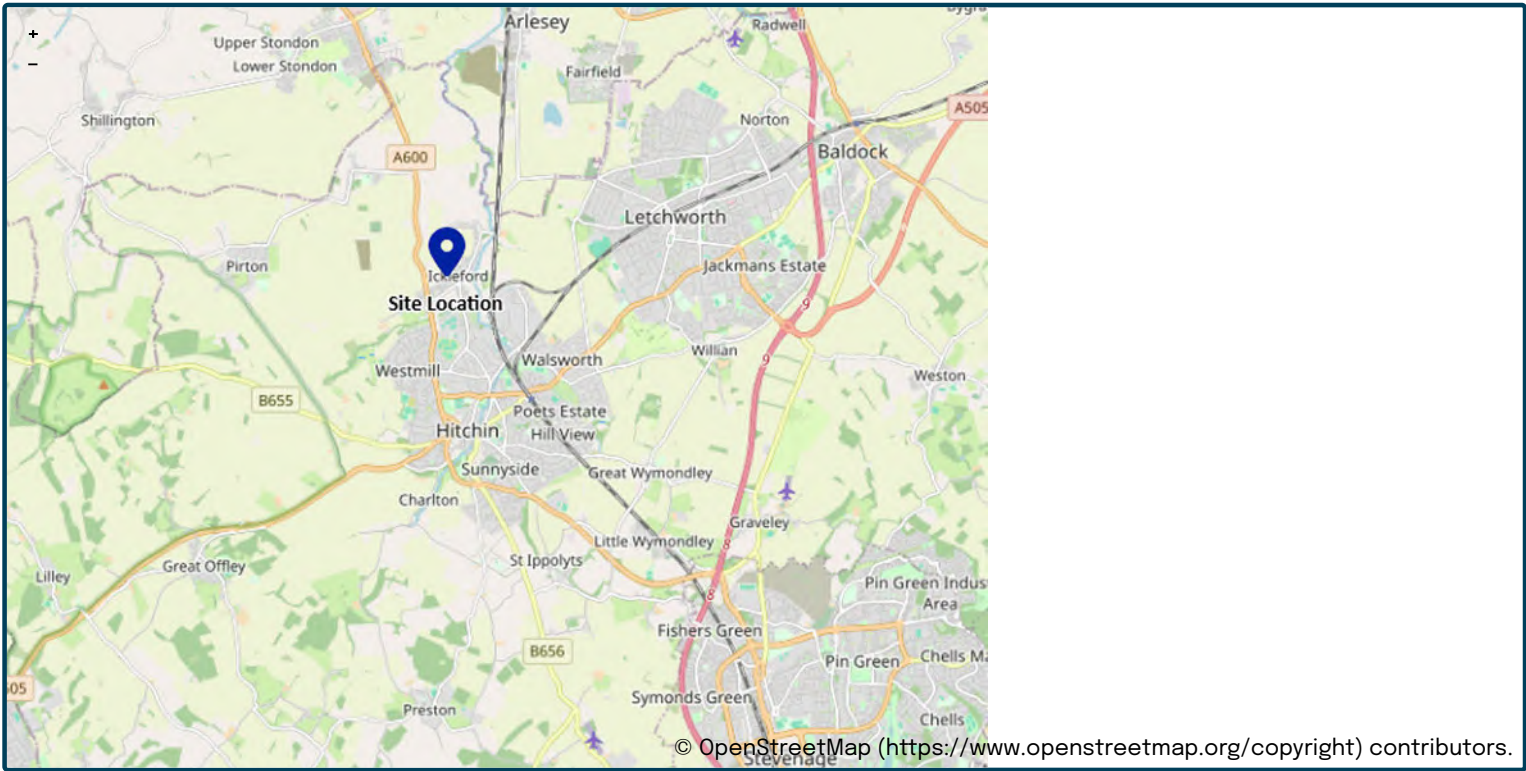
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	22/07/2025
Calculated by	
Reference	
Model version	2.0.1

Location

Site name	Ickleford Manor
Site location	Ickleford



Site easting	518063
Site northing	231318

Site details

Total site area (ha)	3.8	ha
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Greenfield runoff

Method

Method	FEH statistical
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FEH statistical

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	587	mm	587
BFIHOST	0.736		
QMed-QBar conversion	1.124		1.124
QMed (l/s)	2.71	l/s	
QBar (FEH statistical) (l/s)	3.1	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	5		5
1 year growth factor	0.87		
2 year growth factor	0.89		
10 year growth factor	1.65		
30 year growth factor	2.45		
100 year growth factor	3.56		
200 year growth factor	4.21		

Results

Method	FEH statistical	
Flow rate 1 year (l/s)	2.7	l/s
Flow rate 2 year (l/s)	2.7	l/s
Flow rate 10 years (l/s)	5	l/s
Flow rate 30 years (l/s)	7.5	l/s
Flow rate 100 years (l/s)	10.9	l/s
Flow rate 200 years (l/s)	12.8	l/s

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.0.1) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>).

The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX E

FLOW Calculations

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
0	0.138	5.00	55.500	1500	2.000
1	0.034	5.00	56.650	1500	1.220
2	0.130	5.00	57.600	1500	2.500
3	0.416	5.00	58.340	1500	3.620
4	0.300	5.00	59.130	1500	4.580
Outline_Basin			55.900	1500	1.500
Outfall			55.500	1500	1.400
Ex_SW_01		5.00	56.320	1500	1.490
Ex_SW_02			55.000	1500	1.200

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
0	65.000	-23.2	100	Circular	55.500	53.500	1.900	57.600	56.300	1.200
1	80.000	242.4	300	Circular	56.650	55.430	0.920	57.600	55.100	2.200
2	121.000	318.4	600	Circular	57.600	55.100	1.900	58.340	54.720	3.020
3	80.000	470.6	750	Circular	58.340	54.720	2.870	59.130	54.550	3.830
4	70.000	466.7	600	Circular	59.130	54.550	3.980	55.900	54.400	0.900
Outline_Basin	45.000	150.0	150	Circular	55.900	54.400	1.350	55.500	54.100	1.250
Ex_SW_01	17.000	23.3	150	Circular	56.320	54.830	1.340	55.500	54.100	1.250
Outfall	7.000	23.3	150	Circular	55.500	54.100	1.250	55.000	53.800	1.050

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
0	0	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
1	1	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
2	2	1500	Manhole	Adoptable	3	1500	Manhole	Adoptable
3	3	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
4	4	1500	Manhole	Adoptable	Outline_Basin	1500	Manhole	Adoptable
Outline_Basin	Outline_Basin	1500	Manhole	Adoptable	Outfall	1500	Manhole	Adoptable
Ex_SW_01	Ex_SW_01	1500	Manhole	Adoptable	Outfall	1500	Manhole	Adoptable
Outfall	Outfall	1500	Manhole	Adoptable	Ex_SW_02	1500	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

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File: Outline_SW.pfd
Network: Storm Network
Jamie Everitt
25/07/2025

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Surface Water Calc

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	40	0	0

Node Ex_SW_01 Input Hydrograph

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
60	2.0	480	2.0	900	2.0	1320	2.0	1740	2.0	2160	2.0	2580	2.0
120	2.0	540	2.0	960	2.0	1380	2.0	1800	2.0	2220	2.0	2640	2.0
180	2.0	600	2.0	1020	2.0	1440	2.0	1860	2.0	2280	2.0	2700	2.0
240	2.0	660	2.0	1080	2.0	1500	2.0	1920	2.0	2340	2.0	2760	2.0
300	2.0	720	2.0	1140	2.0	1560	2.0	1980	2.0	2400	2.0	2820	2.0
360	2.0	780	2.0	1200	2.0	1620	2.0	2040	2.0	2460	2.0	2880	2.0
420	2.0	840	2.0	1260	2.0	1680	2.0	2100	2.0	2520	2.0		

Node Outline_Basin Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	54.400	Product Number	CTL-SHE-0081-3100-1200-3100
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node 0 Online Pump Control

Flap Valve	x	Invert Level (m)	53.500	Switch off depth (m)	0.010
Replaces Downstream Link	✓	Switch on depth (m)	0.020		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	2.000	5.000	2.000

Node Outline_Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	54.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	2490

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	366.0	0.0	0.900	738.0	0.0	0.901	917.0	0.0	1.500	1233.0	0.0

Node 0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	332

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	0.0	1.600	60.0	0.0	1.601	1.2	0.0	2.000	1.2	0.0

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	105.237	29.778	30 year +35% CC 480 minute summer	34.357	9.079
2 year 15 minute winter	73.850	29.778	30 year +35% CC 480 minute winter	22.826	9.079
2 year 30 minute summer	66.950	18.945	30 year +35% CC 600 minute summer	27.500	7.522
2 year 30 minute winter	46.983	18.945	30 year +35% CC 600 minute winter	18.790	7.522
2 year 60 minute summer	43.790	11.572	30 year +35% CC 720 minute summer	24.022	6.438
2 year 60 minute winter	29.093	11.572	30 year +35% CC 720 minute winter	16.145	6.438
2 year 120 minute summer	31.596	8.350	30 year +35% CC 960 minute summer	19.078	5.024
2 year 120 minute winter	20.992	8.350	30 year +35% CC 960 minute winter	12.637	5.024
2 year 180 minute summer	25.644	6.599	30 year +35% CC 1440 minute summer	13.232	3.546
2 year 180 minute winter	16.669	6.599	30 year +35% CC 1440 minute winter	8.893	3.546
2 year 240 minute summer	20.752	5.484	30 year +35% CC 2160 minute summer	9.090	2.512
2 year 240 minute winter	13.787	5.484	30 year +35% CC 2160 minute winter	6.263	2.512
2 year 360 minute summer	16.009	4.120	30 year +35% CC 2880 minute summer	7.381	1.978
2 year 360 minute winter	10.406	4.120	30 year +35% CC 2880 minute winter	4.960	1.978
2 year 480 minute summer	12.538	3.313	100 year +40% CC 15 minute summer	500.126	141.518
2 year 480 minute winter	8.330	3.313	100 year +40% CC 15 minute winter	350.966	141.518
2 year 600 minute summer	10.177	2.784	100 year +40% CC 30 minute summer	324.189	91.734
2 year 600 minute winter	6.954	2.784	100 year +40% CC 30 minute winter	227.501	91.734
2 year 720 minute summer	8.986	2.408	100 year +40% CC 60 minute summer	214.939	56.802
2 year 720 minute winter	6.039	2.408	100 year +40% CC 60 minute winter	142.800	56.802
2 year 960 minute summer	7.254	1.910	100 year +40% CC 120 minute summer	131.186	34.669
2 year 960 minute winter	4.805	1.910	100 year +40% CC 120 minute winter	87.157	34.669
2 year 1440 minute summer	5.142	1.378	100 year +40% CC 180 minute summer	99.314	25.557
2 year 1440 minute winter	3.455	1.378	100 year +40% CC 180 minute winter	64.557	25.557
2 year 2160 minute summer	3.636	1.005	100 year +40% CC 240 minute summer	77.392	20.453
2 year 2160 minute winter	2.505	1.005	100 year +40% CC 240 minute winter	51.418	20.453
2 year 2880 minute summer	3.024	0.811	100 year +40% CC 360 minute summer	57.553	14.810
2 year 2880 minute winter	2.033	0.811	100 year +40% CC 360 minute winter	37.411	14.810
30 year +35% CC 15 minute summer	381.215	107.871	100 year +40% CC 480 minute summer	44.139	11.665
30 year +35% CC 15 minute winter	267.520	107.871	100 year +40% CC 480 minute winter	29.325	11.665
30 year +35% CC 30 minute summer	245.335	69.421	100 year +40% CC 600 minute summer	35.296	9.654
30 year +35% CC 30 minute winter	172.165	69.421	100 year +40% CC 600 minute winter	24.116	9.654
30 year +35% CC 60 minute summer	161.709	42.735	100 year +40% CC 720 minute summer	30.799	8.254
30 year +35% CC 60 minute winter	107.435	42.735	100 year +40% CC 720 minute winter	20.699	8.254
30 year +35% CC 120 minute summer	100.594	26.584	100 year +40% CC 960 minute summer	24.400	6.425
30 year +35% CC 120 minute winter	66.832	26.584	100 year +40% CC 960 minute winter	16.163	6.425
30 year +35% CC 180 minute summer	76.923	19.795	100 year +40% CC 1440 minute summer	16.856	4.518
30 year +35% CC 180 minute winter	50.002	19.795	100 year +40% CC 1440 minute winter	11.328	4.518
30 year +35% CC 240 minute summer	60.204	15.910	100 year +40% CC 2160 minute summer	11.519	3.184
30 year +35% CC 240 minute winter	39.998	15.910	100 year +40% CC 2160 minute winter	7.937	3.184
30 year +35% CC 360 minute summer	44.769	11.521	100 year +40% CC 2880 minute summer	9.300	2.493
30 year +35% CC 360 minute winter	29.101	11.521	100 year +40% CC 2880 minute winter	6.250	2.493

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.70%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	0	124	53.711	0.211	9.2	12.4011	0.0000	SURCHARGED
15 minute summer	1	11	55.486	0.056	5.8	0.0990	0.0000	OK
15 minute summer	2	12	55.204	0.104	29.5	0.1846	0.0000	OK
15 minute summer	3	12	54.978	0.258	94.7	0.4560	0.0000	OK
15 minute summer	4	10	54.944	0.394	152.7	0.6964	0.0000	OK
480 minute winter	Outline_Basin	456	54.812	0.412	22.1	186.6129	0.0000	SURCHARGED
360 minute winter	Outfall	240	54.140	0.040	5.2	0.0705	0.0000	OK
360 minute winter	Ex_SW_01	2880	54.854	0.024	2.1	0.0431	0.0000	OK
360 minute summer	Ex_SW_02	544	53.838	0.038	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	0	Pump	2	2.0				
15 minute summer	1	1	2	5.5	0.368	0.078	1.2333	
15 minute summer	2	2	3	26.6	0.435	0.069	8.9910	
15 minute summer	3	3	4	112.4	0.794	0.198	13.7145	
15 minute summer	4	4	Outline_Basin	167.5	2.149	0.529	6.9166	
480 minute winter	Outline_Basin	Hydro-Brake®	Outfall	3.1				
360 minute winter	Outfall	Outfall	Ex_SW_02	5.1	1.423	0.139	0.0253	591.1
360 minute winter	Ex_SW_01	Ex_SW_01	Outfall	2.1	1.100	0.057	0.0476	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.70%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	0	176	54.554	1.054	18.9	61.9665	0.0000	SURCHARGED
15 minute summer	1	11	55.539	0.109	21.2	0.1925	0.0000	OK
960 minute winter	2	960	55.381	0.281	7.8	0.4968	0.0000	OK
960 minute winter	3	960	55.381	0.661	22.4	1.1683	0.0000	OK
960 minute winter	4	960	55.381	0.831	30.3	1.4687	0.0000	SURCHARGED
960 minute winter	Outline_Basin	960	55.381	0.981	28.3	574.6094	0.0000	SURCHARGED
360 minute summer	Outfall	160	54.140	0.040	5.2	0.0705	0.0000	OK
480 minute winter	Ex_SW_01	64	54.854	0.024	2.1	0.0429	0.0000	OK
360 minute summer	Ex_SW_02	160	53.838	0.038	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	0	Pump	2	2.0				
15 minute summer	1	1	2	20.5	0.550	0.289	3.4498	
960 minute winter	2	2	3	7.8	0.345	0.020	24.8817	
960 minute winter	3	3	4	19.8	0.437	0.035	34.0440	
960 minute winter	4	4	Outline_Basin	28.3	0.670	0.089	19.7174	
960 minute winter	Outline_Basin	Hydro-Brake®	Outfall	3.1				
360 minute summer	Outfall	Outfall	Ex_SW_02	5.1	1.423	0.139	0.0253	869.5
480 minute winter	Ex_SW_01	Ex_SW_01	Outfall	2.1	0.921	0.057	0.0476	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.70%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	0	236	54.962	1.462	19.7	85.9261	0.0000	SURCHARGED
15 minute summer	1	12	55.812	0.382	61.3	0.6758	0.0000	SURCHARGED
15 minute summer	2	11	55.856	0.756	181.4	1.3363	0.0000	SURCHARGED
15 minute summer	3	11	55.725	1.005	440.4	1.7763	0.0000	SURCHARGED
1440 minute winter	4	1440	55.573	1.023	27.4	1.8071	0.0000	SURCHARGED
1440 minute winter	Outline_Basin	1440	55.573	1.173	26.4	768.3256	0.0000	SURCHARGED
480 minute summer	Outfall	192	54.140	0.040	5.2	0.0705	0.0000	OK
480 minute winter	Ex_SW_01	64	54.854	0.024	2.1	0.0429	0.0000	OK
480 minute summer	Ex_SW_02	192	53.838	0.038	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	0	Pump	2	2.0				
15 minute summer	1	1	2	35.2	0.564	0.496	5.6335	
15 minute summer	2	2	3	169.2	0.778	0.440	34.0829	
15 minute summer	3	3	4	438.9	0.997	0.774	35.2097	
1440 minute winter	4	4	Outline_Basin	26.4	0.620	0.083	19.7174	
1440 minute winter	Outline_Basin	Hydro-Brake®	Outfall	3.1				
480 minute summer	Outfall	Outfall	Ex_SW_02	5.1	1.423	0.139	0.0253	893.5
480 minute winter	Ex_SW_01	Ex_SW_01	Outfall	2.1	0.883	0.057	0.0476	

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
0	0.138	5.00	55.500	1500	2.000
1	0.034	5.00	56.650	1500	1.220
2	0.130	5.00	57.600	1500	2.500
3	0.416	5.00	58.340	1500	3.620
4	0.300	5.00	59.130	1500	4.580
Outline_Basin			55.900	1500	1.500
Outfall			55.500	1500	1.400
Ex_SW_01		5.00	56.320	1500	1.490
Ex_SW_02			55.000	1500	1.200

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
0	65.000	-23.2	100	Circular	55.500	53.500	1.900	57.600	56.300	1.200
1	80.000	242.4	300	Circular	56.650	55.430	0.920	57.600	55.100	2.200
2	121.000	318.4	600	Circular	57.600	55.100	1.900	58.340	54.720	3.020
3	80.000	470.6	750	Circular	58.340	54.720	2.870	59.130	54.550	3.830
4	70.000	466.7	600	Circular	59.130	54.550	3.980	55.900	54.400	0.900
Outline_Basin	45.000	150.0	150	Circular	55.900	54.400	1.350	55.500	54.100	1.250
Ex_SW_01	17.000	23.3	150	Circular	56.320	54.830	1.340	55.500	54.100	1.250
Outfall	7.000	23.3	150	Circular	55.500	54.100	1.250	55.000	53.800	1.050

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
0	0	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
1	1	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
2	2	1500	Manhole	Adoptable	3	1500	Manhole	Adoptable
3	3	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
4	4	1500	Manhole	Adoptable	Outline_Basin	1500	Manhole	Adoptable
Outline_Basin	Outline_Basin	1500	Manhole	Adoptable	Outfall	1500	Manhole	Adoptable
Ex_SW_01	Ex_SW_01	1500	Manhole	Adoptable	Outfall	1500	Manhole	Adoptable
Outfall	Outfall	1500	Manhole	Adoptable	Ex SW 02	1500	Manhole	Adoptable

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Volume	x

360	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0

create	Create Consulting Engineers	File: Follow On Calc.pfd Network: Storm Network Jamie Everitt 25/07/2025	Page 2 P25-3474 Ickleford Manor Pump Failure Calc
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Node Ex_SW_01 Input Hydrograph

Overrides Design Area x

Depression Storage Area (m²) 0

Evapo-transpiration (mm/day) 0

Overrides Design Additional Inflow x

Depression Storage Depth (mm) 0

Applies to All storms

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
60	2.0	480	2.0	900	2.0	1320	2.0	1740	2.0	2160	2.0	2580	2.0
120	2.0	540	2.0	960	2.0	1380	2.0	1800	2.0	2220	2.0	2640	2.0
180	2.0	600	2.0	1020	2.0	1440	2.0	1860	2.0	2280	2.0	2700	2.0
240	2.0	660	2.0	1080	2.0	1500	2.0	1920	2.0	2340	2.0	2760	2.0
300	2.0	720	2.0	1140	2.0	1560	2.0	1980	2.0	2400	2.0	2820	2.0
360	2.0	780	2.0	1200	2.0	1620	2.0	2040	2.0	2460	2.0	2880	2.0
420	2.0	840	2.0	1260	2.0	1680	2.0	2100	2.0	2520	2.0		

Node Outline_Basin Online Hydro-Brake® Control

Flap Valve x

Objective (HE) Minimise upstream storage

Replaces Downstream Link ✓

Sump Available ✓

Invert Level (m) 54.400

Product Number CTL-SHE-0081-3100-1200-3100

Design Depth (m) 1.200

Min Outlet Diameter (m) 0.100

Design Flow (l/s) 3.1

Min Node Diameter (mm) 1200

Node 0 Online Pump Control

Flap Valve x

Invert Level (m) 53.500

Switch off depth (m) 0.010

Replaces Downstream Link ✓

Switch on depth (m) 0.020

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	5.000	0.000

Node Outline_Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000

Safety Factor 2.0

Invert Level (m) 54.400

Side Inf Coefficient (m/hr) 0.00000

Porosity 1.00

Time to half empty (mins) 0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	366.0	0.0	0.900	738.0	0.0	0.901	917.0	0.0	1.500	1233.0	0.0

Node 0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000

Safety Factor 2.0

Invert Level (m) 53.500

Side Inf Coefficient (m/hr) 0.00000

Porosity 0.95

Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	0.0	1.600	60.0	0.0	1.601	1.2	0.0	2.000	1.2	0.0

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 360 minute summer	26.625	6.852	30 year 360 minute summer	33.162	8.534
10 year 360 minute winter	17.307	6.852	30 year 360 minute winter	21.556	8.534
10 year 1440 minute summer	8.035	2.153	30 year 1440 minute summer	9.802	2.627
10 year 1440 minute winter	5.400	2.153	30 year 1440 minute winter	6.587	2.627

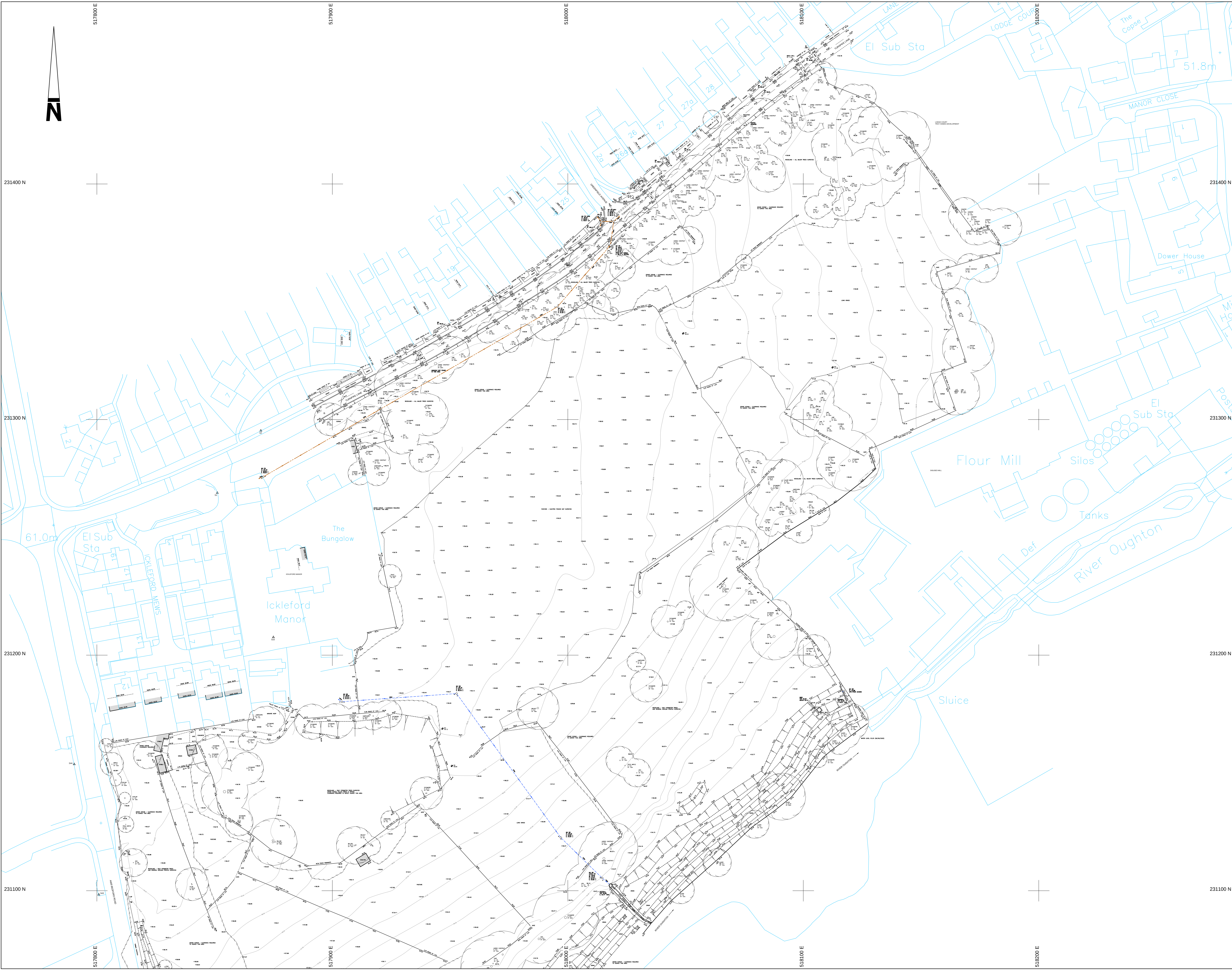
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	0	1470	54.736	1.236	2.1	72.6298	0.0000	SURCHARGED
360 minute summer	1	184	55.468	0.038	2.5	0.0669	0.0000	OK
360 minute summer	2	184	55.171	0.071	12.0	0.1247	0.0000	OK
360 minute winter	3	360	54.963	0.243	27.8	0.4302	0.0000	OK
360 minute winter	4	360	54.964	0.414	42.0	0.7308	0.0000	OK
360 minute winter	Outline_Basin	360	54.964	0.564	39.1	273.0032	0.0000	SURCHARGED
360 minute summer	Outfall	1136	54.140	0.040	5.2	0.0705	0.0000	OK
360 minute winter	Ex_SW_01	2880	54.854	0.024	2.1	0.0430	0.0000	OK
360 minute summer	Ex_SW_02	1136	53.838	0.038	5.1	0.0000	0.0000	OK

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Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	0	Pump	2	0.0				
360 minute summer	1	1	2	3.0	0.303	0.043	0.8235	
360 minute summer	2	2	3	14.6	0.395	0.038	10.9137	
360 minute winter	3	3	4	34.5	0.553	0.061	21.8349	
360 minute winter	4	4	Outline_Basin	48.6	0.871	0.153	19.1196	
360 minute winter	Outline_Basin	Hydro-Brake®	Outfall	3.1				
360 minute winter	Outfall	Outfall	Ex_SW_02	5.1	1.423	0.139	0.0253	787.3
360 minute summer	Ex SW 01	Ex SW 01	Outfall	2.1	1.048	0.057	0.0476	

PLANS





- Notes:
- GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL OSN NETWORK. LOCAL SCALE FACTOR 0.99977 APPLIED.
 - DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAIN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
 - ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS. WITH ROUTES CONNECTIVITY OBTAINED USING ACOUSTIC METHODS ONLY. THESE ARE TO BE CONSIDERED ASSUMED AND SHOULD BE INVESTIGATED FURTHER IN CRITICAL AREAS.
 - TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
 - BACKGROUND DETAIL (SHOWN BLUE) IS ORDNANCE SURVEY DIGITAL DATA.

Coordinate Table				
Station	Description	Easting	Northing	Level
S1	Hill Nail	517851.133	231268.891	60.319
S2	Hill Nail	517869.630	231295.291	59.753
S3	Hill Nail	517929.863	231320.696	58.961
S4	Hill Nail	517992.480	231365.718	58.750
S5	Hill Nail	518047.599	231411.643	57.773
S15	Road Nail	517874.963	231207.616	58.880
S42	Road Nail	517824.145	231046.945	57.199
S43	Road Nail	517800.822	231098.359	59.114
S44	Road Nail	517790.380	231153.709	60.477

TOPOGRAPHICAL KEY	
SURVEY STATION	GENERAL ABBREVIATIONS
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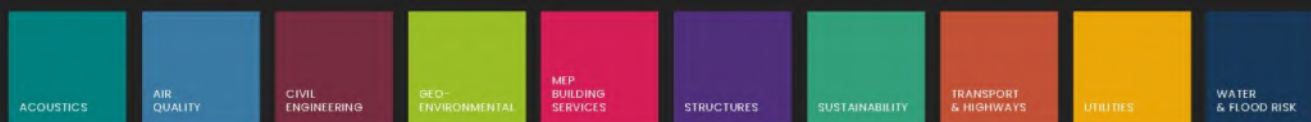


Hawridge Strategic Land Ltd

LAND SOUTH OF TURNPIKE LANE, ICKLEFORD

Flood Risk Assessment and Drainage Strategy

The information contained within this report and any appendices or supporting information provided are to be treated as confidential.



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