

LAND AT POUND FARM, ICKLEFORD, HERTS SG5 3XN

Flood Risk Assessment and Drainage Strategy

34362/CS

January 2026



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Disclaimer

It should be noted that any discrepancies in calculations are a result of rounding and therefore the individual figures may not directly add up to the total.

The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. DHA Environment cannot guarantee the reliability of any data from third parties and no liability can be accepted for any erroneous information or the conclusions drawn from it.

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1 EXECUTIVE SUMMARY

1.1 OVERVIEW

- 1.1.1 The proposals comprise of a Hybrid planning application for the construction of 100 units and ISS school and sports pitch in detail in phase 1 with up to a further 130 dwellings and a 65-bed care home and space for 2 further sports pitches in outline in phase 2 on Land West of Bedford Road, Ickleford, Herts SG4 7JX.
- 1.1.2 The site-specific Flood Risk Assessment determined that the area of the site to be developed is located entirely within Flood Zone 1; low risk of flooding from rivers.
- 1.1.3 Based on the online Environment Agency online mapping, part of site is shown to be at risk from surface water flooding. These areas of flooding can be seen to be associated with localised low points and existing watercourses.
- 1.1.4 NPPF Annex 3: "Flood Risk Vulnerability Classification", states that sites used for residential and education uses can be classified as "more vulnerable". The site is considered to have passed the Sequential Test. More vulnerable development is appropriate in Flood Zone 1 and an Exception Test is not required.
- 1.1.5 The online British Geological Survey maps indicate that the site is underlain by superficial deposits comprising of sand and gravel over bedrock comprising of the Gault Formation – Mudstone. Site specific infiltration testing showed that infiltration will not be suitable for the use of infiltration-based SuDS for draining all the surface water on the site.
- 1.1.6 A Sustainable urban Drainage System (SuDS) has been provided as part of the surface water drainage layout to deal with the surface water generated from the development to ensure that flood risk is not increased elsewhere.
- 1.1.7 Based on the phasing and site topography, the drainage for the development has been split into two catchments, each with a controlled discharge into the watercourse located to the North of the site.
- 1.1.8 For Phase 1, roof areas will drain to a network of gravity surface water sewers which discharge into an above ground attenuation basin with a controlled discharge into the watercourse. Areas of private hardstanding will be constructed as porous paving. For the part of the school, areas of hardstanding will be constructed as a porous pavement which will discharge into an underground cellular storage tank located under the all-weather sports pitch before connecting into the attenuation basin described above.
- 1.1.9 For Phase 2, roof areas will drain to a network of gravity surface water sewers into several above ground attenuation basins with a controlled discharge into the watercourse. The attenuation basins will be linked via new swales. Areas of private hardstanding will be constructed as porous paving.
- 1.1.10 The foul drainage for the development has been shown draining to a proposed foul water pumping station with a connection to the existing foul water drainage network where available capacity can be provided.

2 INTRODUCTION

2.1 GENERAL

- 2.1.1 This Flood Risk Assessment (FRA) has been prepared by DHA on behalf of Bugler Homes Limited in support of a Hybrid Application for the construction of 100 units and a ISS school and sports pitch in detail in phase 1 with up to a further 130 dwellings and an 65-bed care home in outline in phase 2, on Land West of Bedford Road, Ickleford, Herts SG4 7JX. The description of development is as follows.

"Hybrid application for a mixed-use development to provide a total of up to 230 dwellings, a residential care home (Use Class C2), an Independent Special School (ISS) and new sports pitch, with access from Bedford Road, landscaping, parking and SuDS comprising: Phase 1 – Application for full planning permission for the erection of 100 dwellings, an ISS, new sports pitch and associated parking, landscaping, open space and SuDS; Phase 2 – An outline application on the remaining part of the site for the erection of up to 130 dwellings, a residential care home (Use Class C2) and associated works with access from Bedford Road (all matters reserved apart from access)".

2.2 SCOPE AND OBJECTIVES

- 2.2.1 The site-specific flood risk assessment determined that the entire site is in Flood Zone 1; low risk of flooding from rivers. Part of site can be seen to be at risk from surface waterflooding.
- 2.2.2 This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF). The NPPF requires an FRA to be prepared for all development located in Flood Zone 1 with a site area greater than one hectare and for development located on land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- 2.2.3 The proposals are classed as major development and as such this report has been prepared to outline the surface water drainage for the site to support the planning application. This report provides the following information.
- (a) An assessment of the flood risk to the site based upon flood data and the flood maps provided by the Environment Agency and Strategic Flood Risk Assessment.
 - (b) An assessment of the impact of the proposed development in terms of surface water runoff.
 - (c) Proposals for measures to mitigate the generation of surface water runoff from the proposed development in the form of a surface water drainage strategy incorporating SuDS.
 - (d) Details of the disposal of foul water from the development; and
 - (e) Proposals to mitigate any residual flood risks to the development.

3 EXISTING CONDITIONS

3.1 SITE LOCATION

- 3.1.1 The site is located on Land West of Bedford Road, Ickleford, Herts SG4 7JX and is centred on approximate grid reference 517466,231665. The site occupies a total area of approximately 20 hectares. At present, the site comprises entirely of fields.

3.2 EXISTING SITE

- 3.2.1 A topographical survey of the site is shown on drawing 34362-TS-01 contained within **Appendix A**.
- 3.2.2 The southern part of the site falls from a high point of 64.7m AOD on the western boundary to a low point of 60m AOD on the eastern boundary adjacent to Bedford Road. The northern part of the site falls from a high point of 64.3m AOD on the western boundary to a low point of 55.2m AOD on the northeastern boundary adjacent to Bedford Road. The site has the following boundary conditions:
- North - Watercourse with Pound Farm/Fields beyond.
 - East - Watercourse with Bedford Road beyond.
 - South - Dwellings/Fields.
 - West - Fields.

3.3 EXISTING DRAINAGE REGIME AND SURFACE WATER RUN-OFF

- 3.3.1 There is no positive surface water outfall from the site, so any rainfall will infiltrate to ground with any residual surface water flowing overland following the existing topography into the watercourses that run along the northern and eastern boundaries and away to the North.
- 3.3.2 Reference has been made to paragraph 3.19 of the National Standards for Sustainable Drainage Systems (SuDS) dated July 2025 which sets out the maximum allowable discharge rates from the site when runoff volumes are greater than the existing.
- 3.3.3 The guidance states that the peak allowable discharge rate from the development for the 1 in 100-year rainfall event shall be limited to the 1 in 2-year greenfield runoff rate or 3l/s/ha, whichever is the greater. The 1 in 2-year greenfield runoff rate can be considered equivalent to the calculated QBAR (mean annual flood) for the site.
- 3.3.4 The entire development area that could potentially drain to the proposed surface water drainage system in an extreme rainfall event including both permeable and impermeable surfaces has been used for the calculation of the greenfield rate.

- 3.3.5 The site has been split into five sub-catchments based on the site phasing and topography. The existing green field (pre-development) peak discharge rates have been calculated by using the Flood Studies Report ICP (SuDS) method based on each catchment contributing to the proposed drainage system. The calculations can be seen in **Appendix B** and have been summarised in table 3.1 below:

Catchment Reference	Area (Ha)	Qbar (l/s)	1 in 1 year	1 in 30 years	1 in 100 years
Catchment 1A	5.07	17.2	14.7	39.1	55.0
Catchment 1B	1.33	4.5	3.8	10.3	14.4
Catchment 2A	2.08	7.1	6.0	16.0	22.6
Catchment 2B	2.58	8.8	7.5	19.9	28.0
Catchment 2C	1.66	5.6	4.8	12.8	18.0

TABLE 3.1 – SUMMARY OF PRE-DEVELOPMENT GREENFIELD RUNOFF RATE

- 3.3.6 Based on the development area of each sub-catchment and a greenfield rate of 3l/s/hectares, the peak greenfield runoff rate can be calculated as indicated in table 3.2.

Catchment Reference	Area (Ha)	(l/s)
Catchment 1A	5.07	15.2
Catchment 1B	1.33	4.0
Catchment 2A	2.08	6.2
Catchment 2B	2.58	7.7
Catchment 2C	1.66	5.0

TABLE 3.2 –SUMMARY OF PRE-DEVELOPMENT GREENFIELD RUNOFF RATE BASED ON 3L/S/HA

- 3.3.7 Based on the above, the greater greenfield rates shown in table 3.1 will be used in the design of the surface water drainage system.

3.4 EXISTING PUBLIC SEWERS

- 3.4.1 Reference has been made to Anglian Water asset plans found at **Appendix C** which indicate the location of any public sewers in the area. These records do not indicate any private drainage that may be present.

- 3.4.2 In October 2011 the ownership of any private sewer serving more than one property was automatically transferred to the Water Authority although many of these sewers are yet to be recorded on the asset plans.

Foul Water Sewers

- 3.4.3 Anglian Water asset plans show the residential development to the South and southeast to be drained by a network of foul water sewers which drain away along Turnpike Lane to the East.

Surface Water Sewers

- 3.4.5 Anglian Water asset plans show there to be no surface water sewer either within the site or general vicinity.

Combined Water Sewers

- 3.4.6 Anglian Water asset plans show there to be no combined water sewers within the site or general vicinity.

3.5 GEOLOGY AND HYDROGEOLOGY

- 3.5.1 The online British Geological Survey maps indicate that the site is underlain by superficial deposits comprising of sand and gravel over bedrock comprising of the Gault Formation – Mudstone.
- 3.5.2 Site specific infiltration testing was carried out by GES in November 2025 a copy which is contained within **Appendix D**.
- 3.5.3 Testing was carried in three locations at depths of between 0.5 and 1.5m below ground. Geology was found to comprise of clay and sand. Infiltration rates of between 9×10^{-7} m/s (0.0004m/hr) to 1×10^{-6} m/s (0.004m/hr) were obtained in these tests.
- 3.5.4 Based on this geology it is not considered that the site will be suitable for the use of infiltration-based SuDS to drain the whole site but can be utilised to deal with the first 5mm of rainfall as required in National Standards for Sustainable Drainage Systems (SuDS)
- 3.5.5 The site is located outside any Source Protection Zone.

4 SITE SPECIFIC FLOOD RISK ASSESSMENT

4.1 PROPOSED DEVELOPMENT

- 4.1.1 The proposals comprise of the construction of 100 units and a ISS school and sports pitch in detail in phase 1 with up to a further 130 dwellings and a 65-bed care home in outline in phase 2 on Land West of Bedford Road, Ickleford, Herts SG4 7JX. A proposed site layout is contained in **Appendix E**.

4.2 FLOOD RISK ZONES

- 4.2.1 The National Planning Policy Framework provides guidance on assessing flood risk and seeks to guide development away from areas at risk of flooding from all sources. Planning Practice Guidance defines several Flood Zones based on the probability of flooding and provides guidance on the most appropriate form of development within each zone. The flood risk zones can be summarised in table 4.1 as follows:

Zone	Annual probability in any year	
	River Flooding	Sea Flooding
Zone 1 : Low probability	Less than 1:1000 (<0.1%)	Less than 1:1000 (<0.1%)
Zone 2: Medium probability	Between 1:1000 and 1 in 100 (0.1% -1%)	Between 1:1000 and 1 in 200 (0.1% - 0.5%)
Zone 3a : High probability	Greater than 1:100 (>1%)	Greater than 1:200 (>0.5%)
Zone 3b: Functional floodplain	Greater than 1 in 20 (>5%)	N/A

TABLE 4.1 – PPG GUIDANCE ON FLOOD ZONES

- 4.2.2 Reference has been made to the Environment Agency flood risk maps, a copy of which is contained within **Appendix F**. This shows the area of the site to be developed be located entirely within Flood Zone 1.

4.3 OTHER SOURCES OF FLOODING

- 4.3.1 Reference has been made to the Environment Agency flood risk maps which provide references on the risk of flooding from all sources including fluvial, surface water, groundwater and artificial sources.

Surface water flooding

- 4.3.2 The Environment Agency surface water flooding maps shows the site to be generally at very low risk from surface water flooding however there are some isolated areas as indicated in figures 4.1 to 4.3 below, which have a high to low risk of surface water flooding



FIGURE 4.1 – EXTENT OF 1 IN 30 YEAR SURFACE WATER FLOODING (HIGH)



FIGURE 4.2 – EXTENT OF 1 IN 100 YEAR SURFACE WATER FLOODING (MEDIUM)

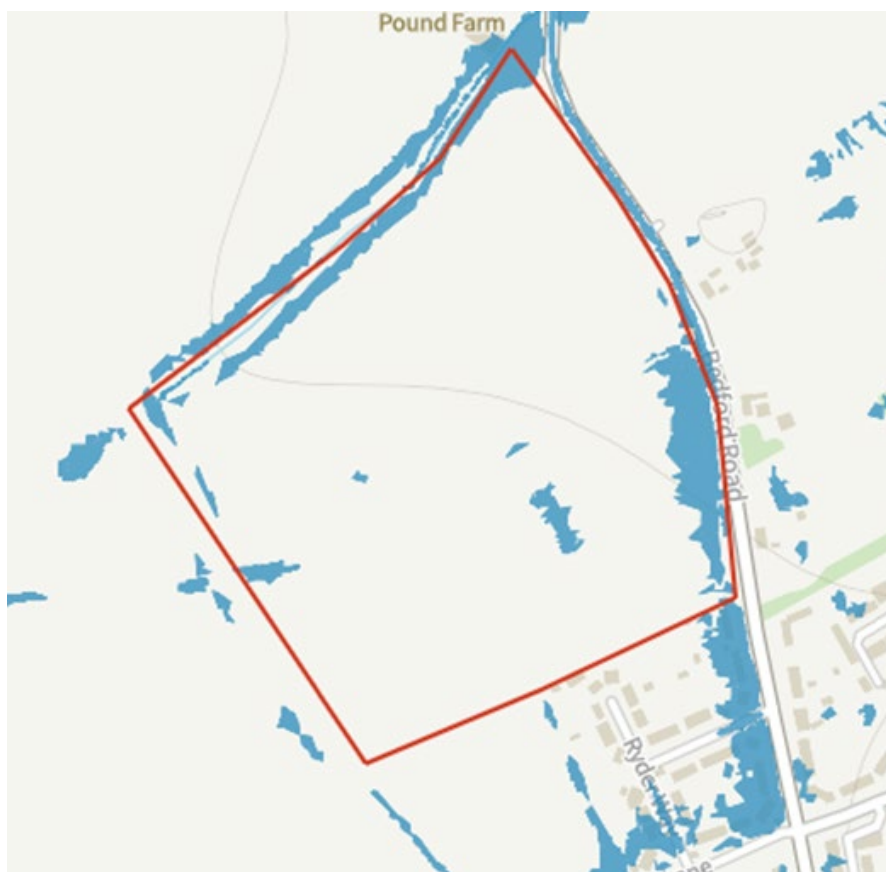


FIGURE 4.3 – EXTENT OF 1 IN 1000 YEAR SURFACE WATER FLOODING (LOW)

- 4.3.3 Surface water flooding is sometimes known as flash flooding. It happens when rainwater cannot drain away through normal drainage systems.
- 4.3.4 Looking at the topographical survey, the area of surface water flooding to the East of site is due to overland surface water flood routes following the topography and draining to the low point.
- 4.3.5 The Area of surface water to the North of the site is along the line of an existing water course.
- 4.3.6 Following the development the area of the site contributing to the risk of surface water flooding will be positively drained removing the risk of surface water flooding to the East and reducing the risk of surface water flooding to the North.
- 4.3.7 Based on the above it is considered that following development, the residual risk of surface water both now and for the lifetime of the development is considered low.

Groundwater

- 4.3.8 Groundwater flooding occurs as excess water emerges at the ground surface. The Environment Agency online mapping indicates that flooding from groundwater is unlikely in the area.

Flooding from artificial sources

- 4.3.9 Flooding from reservoirs is extremely unlikely. An area is considered at risk if peoples' lives could be threatened in the event of a dam or reservoir failure. Reference has been made to the Environment Agency online mapping which indicate that flooding from reservoirs is considered unlikely.

4.4 VULNERABILITY CLASSIFICATION

- 4.4.1 NPPF Annex 3: "Flood Risk Vulnerability Classification", states that sites used for residential use can be classified as "more vulnerable".
- 4.4.2 NPPF Annex 3: "Flood Risk Vulnerability Classification", states that sites used for educational establishments can be classified as "more vulnerable".
- 4.4.3 NPPF Annex 3: "Flood Risk Vulnerability Classification", states that sites used for care homes can be classified as "more vulnerable".

4.5 SEQUENTIAL TEST

- 4.5.1 Paragraph 175 of the NPPF states that 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).
- 4.5.2 As set out above, although the site is in Flood Zone 1 there are some isolated areas of surface water flooding. Paragraph 027 of the Planning Policy Guidance note states "that in applying paragraph 175 of the NPPF a proportionate approach should be taken. Where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development (therefore addressing the risks identified e.g. by Environment Agency flood risk mapping), without increasing flood risk elsewhere, then the sequential test need not be applied".
- 4.5.3 Given that following development the risk of surface water flooding will be removed it is considered that the Sequential Test has been passed.
- 4.5.4 All development is appropriate in Flood Zone 1 and an Exception Test is not required.

5 MANAGEMENT OF SURFACE AND FOUL WATER ON THE DEVELOPMENT

5.1 PROPOSED DEVELOPMENT

- 5.1.1 The proposals comprise of the construction of 100 units and a ISS school and sports pitch in detail in phase 1 with up to a further 130 dwellings and a 65-bed care home in outline in phase 2 on Land West of Bedford Road, Ickleford, Herts SG4 7JX.

5.2 AIMS

- 5.2.1 Sustainable urban Drainage Systems (SuDS) techniques will be used to deal with the surface water generated by the development. This will replicate the existing drainage regime by dealing with the surface water at source, to prevent increasing the risk of downstream flooding.

5.3 PROPOSED SURFACE WATER DRAINAGE STRATEGY

- 5.3.1 The proposed drainage scheme is shown on drawings 34362-D-01-04 contained in **Appendix G**.
- 5.3.2 The site has been split into two catchments based on the proposed development phasing with each catchment being split further into several sub-catchments based on the site layout and topography.

Catchment 1 (Phase 1)

- 5.3.3 This comprises of the detailed element of the scheme and can be split into two sub-catchments as follows.

Catchment 1A

- 5.3.4 This area comprises of the residential parcel and the main school buildings. Roof and roads areas will discharge to a network of gravity surface water sewers into an above ground attenuation basin with a controlled discharge of 21 l/s into the watercourse located to the North of the site. Areas of private hardstanding will be constructed as porous paving.

Catchment 1B

- 5.3.5 This area comprises of the school parking area and all-weather pitch. Areas of hardstanding will be constructed as a porous pavement which will discharge into an underground cellular storage tank located under the all-weather sports pitch. Flows from the tank will be controlled to 7l/s before discharge into the attenuation basin described above and part of phase 1A.

Catchment 2 (Phase 2)

- 5.3.6 This comprises of the outline element of the scheme and can be split into three sub-catchments as follows.

Catchment 2A

- 5.3.7 This area comprises of part of the southwestern residential parcel. Roof and roads areas will discharge to a network of gravity surface water sewers into an above ground attenuation basin with a controlled discharge of 2 l/s into a new swale which will connect into catchment 2C. Areas of private hardstanding will be constructed as porous paving.

Catchment 2B

- 5.3.8 This area comprises of part of the southwestern residential parcel and the care home. Roof and roads areas will discharge to a network of gravity surface water sewers into an above ground attenuation basin with a controlled discharge of 8l/s into a new swale which will connect into catchment 2C. Areas of private hardstanding will be constructed as porous paving.

Catchment 2C

- 5.3.9 This area comprises of the northwestern residential parcel and the care home. Roof and roads areas will discharge to a network of gravity surface water sewers into an above ground attenuation basin with a controlled discharge of 21l/s into a new swale which will connect into the watercourse located to the North of the site. Areas of private hardstanding will be constructed as porous paving. The attenuation basin will receive flows from catchments 2A and 2B.
- 5.3.10 The total flow from the site will be 42l/s which is less than the existing greenfield rate of 43l/s.
- 5.3.11 The surface water drainage strategy for the site has been based on the seven-core standards and 11 underpinning principles set out in the National standards for Sustainable Drainage Systems (SuDS) dated July 2025. Compliance to the seven standards can be summarised as follows.

STANDARD 1 : RUNOFF DESTINATIONS

- 5.3.12 This standard states that runoff from the development should be discharged to the following final destinations, to the maximum extent practicable, in accordance with the following hierarchy:

Priority 1: collected for non-potable use.

Priority 2: infiltrated to ground.

Priority 3: discharged to an above ground surface water body.

Priority 4: discharged to a surface water sewer, or another piped surface water drainage system.

Priority 5: discharged to a combined sewer.

Priority 1

Water butts will be provided to store rainfall to be used for private irrigation. This has not been considered as part of the surface water calculations but provides an additional benefit to rainwater harvesting.

Priority 2

- 5.3.13 At stated in section 3.5, infiltration rates on the site can be seen to be circa 1×10^{-6} m/s. Whilst this is not sufficient to deal with the entire surface water generated from site, leaving any SuDS features unlined will accommodate the first 5mm of rainfall as required in Standard 2 (see below).

Priority 3

- 5.3.14 As described in Section 3.3.1 the site currently drains into a network of watercourses that bound the site to the North and East. It is proposed that any water not draining via infiltration will continue to discharge into these watercourses at the greenfield rate (Q_{bar}).
- 5.3.15 Based on the above, a mixture of priority 1,2 and 3 measures will be implemented to dispose of the surface water on the site and as such it is considered that this standard has been met in full.

STANDARD 2: MANAGEMENT OF EVERYDAY RAINFALL (INTERCEPTION)

- 5.3.16 The proposed impermeable areas are shown on drawings 34362-D-05 - 08 contained in **Appendix G**. This shows that of the total site area of approximately 20 hectares and total area of 6.4 hectares will be developed in phase 1 and a further 6.3 hectares in phase 2. The total impermeable area is 4.3 hectares for Phase 1 and 3.6 hectares for phase 2. The remaining site will be left as green space.
- 5.3.17 An urban creep uplift factor of 10% has been applied to the areas of impermeable area within the property curtilages (private areas).
- 5.3.18 A simple approach has been applied to demonstrate that the first 5mm of rainfall from the development has been accommodated on site based on the development draining to several attenuation basins.
- 5.3.19 Based on an infiltration rate of 1×10^{-6} , the standard can be seen to be met given the impermeable area draining to the basin is less than 25 times area of the base of the basins.
- 5.3.20 Table 5.1 summaries the varies SuDS features and that the impermeable area that can be accommodated.

SuDS Component	Area	Infiltration Rate	Maximum area that could drain	Actual area draining
Phase 1				
Unlined swale/basin	3,171m ²	1 x 10 ⁻⁶ or greater	79,275m ²	43,137m ²
Phase 2				
Unlined swale/basin	3,005m ²	1 x 10 ⁻⁶ or greater	75,125m ²	36,000m ²

TABLE 5.1 – SUMMARY OF SUDS FEATURES DEALING WITH FIRST 5MM OF RAINFALL

- 5.3.21 Based on the above, it has been demonstrated that the first 5mm of rainfall has been dealt with onsite, so this standard has been met in full.
- 5.3.22 In addition to the attenuation basins, areas of private hardstanding will be constructed as porous paving which will deal with the first 5mm of rainfall for these areas. The proposed swales have also not been considered in the calculations which will provide additional benefit.

STANDARD 3: MANAGEMENT OF EXTREME RAINFALL AND FLOODING

- 5.3.23 The following standards will be adopted in the design of the surface water drainage.
- No flooding for the 1 in 30-year event.
 - Flooding managed for events between 1 in 30 and the 1 in 100-year event + climate change.
 - Reference has been made to the Environment Agency's online mapping guidance for peak rainfall allowance for climate change and shows the site to be located within the Upper and Bedford Ouse Management Catchment. Given the proposed development is to have a design life beyond 2100, a 40% allowance for climate change needs to be considered in the design of the surface water drainage system for the 1 in 100-year event, and 35% allowance for the 1 in 30-year rainfall event. This is based on the upper end allowance for the 2070's epoch.
 - Peak allowable discharge rates have been calculated by using the Flood Studies Report ICP (SuDS) method based on each catchment as summarised in table 3.1.
 - FEH 2022 rainfall parameters have been used in the design of the surface water drainage system
- 5.3.24 The drainage system has been modelled using Windes to accommodate all return periods up to and including the 1 in 100 year + 40% climate change. Calculations are shown in **Appendix G**.

- 5.3.25 Based on the above it has been demonstrated that this standard has been met in full.

STANDARD 4 : WATER QUALITY

- 5.3.26 Reference has been made to the SuDS manual (Cira document 753) to ensure water quality has been considered and suitable water management train provided for within the development that will control water quality to the required standard.
- 5.3.27 Table 26.2 from the SuDS shows residential roofs to have a very low pollution risk and residential roads and driveways to have a low risk and sets out pollution hazard indices for various pollution sources. An extract on the table has been shown in Figure 5-2 below.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Notes

FIGURE 5.2 – TABLE 26.2 FROM SUDS MANUAL (CIRIA DOCUMENT 753)

- 5.3.28 Table 26.3 from the SuDS manual show the mitigation that is provided from each pollution source by various drainage components.

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

Notes

FIGURE 5.3 – TABLE 26.3 FROM SUDS MANUAL (CIRIA DOCUMENT 753)

- 5.3.29 From the above it can be seen that the provision of permeable pavement for the along with the swale and attenuation basin will adequately mitigate the pollution risks generated.
- 5.3.30 Based on the above it has been demonstrated that this standard has been met in full.

STANDARD 5: AMENITY

- 5.3.31 The design of the surface water drainage system has been integrated into the landscape and masterplan and contributes to placemaking and environmental enhancement by keeping surface water runoff at or close to the ground surface.
- 5.3.32 The adopted SuDS approach maximises benefits for amenity by incorporating into the masterplan via a network of footpath to create multi-functional places and landscapes.
- 5.3.33 Based on the above it has been demonstrated that this standard has been met in full.

STANDARD 6 : BIODIVERSITY

- 5.3.34 The scheme will be designed to comply with the BNG requirements. Unlined attenuation basins have been provided to comply with Standard 2 which with add to Biodiversity, however not possible to provide a permanently wet basin.

STANDARD 7: DESIGN OF DRAINAGE FOR CONSTRUCTION, OPERATION, MAINTENANCE, DECOMMISSIONING AND STRUCTURAL INTEGRITY

- 5.3.35 The SuDS proposed on this scheme comprise of porous pavement and shallow swale, attenuation basin and cellular storage tank along site standard gravity sewers.
- 5.3.36 These are considered standard features which can be easily and safely be constructed, operated and maintained. The works will be constructed in phase with the attenuation basins being constructed early in the programme to ensure runoff is controlled during construction.

- 5.3.37 A maintenance plan is included in **Appendix H** which shows the tasks and responsibilities for the various drainage components.

6 FOUL WATER DRAINAGE

6.1 PROPOSED FOUL WATER DRAINAGE

- 6.1.1 The total peak flow rate for the development can be seen to be 4.39 l/s based the following parameters.

Phase1

- 6.1.2 A peak foul water flow for phase 1 of 1.54 l/s.
- 100 dwellings at 125 litres/head/day with an occupancy rate of 2.4 person/dwelling using 10% infiltration and DWF of 2.5 (0.9l/s)
 - ISS school with 37 staff and 30 pupils at 90 litres/head/day using 10% infiltration and DWF of 2.5 (0.39l/s)

Phase 2

- 6.1.3 A peak foul water flow for phase 2 of 2.85l/s.
- 130 dwellings at 125 litres/head/day with an occupancy rate of 2.4 person/dwelling using 10% infiltration and DWF of 2.5 (1.2l/s).
 - 65 bed care home with 15 staff at 350 litres/head/day using 10% infiltration and DWF of 2.5 (1.65 l/s)
- 6.1.4 The foul drainage for the development has been shown draining to a proposed foul water pumping station with a connection to the existing foul water drainage network where available capacity can be provided.
- 6.1.5 A Pre-Planning Assessment Report has been completed by Anglian Water a copy of which is contained in **Appendix I**. Anglian Water have stated that the sustainable point of connection is the 225mm foul sewer in Arlesey Road at MH3601, located at national grid reference (NGR) TL 18317 31696. The cover level is 51.01 and the invert level is 48.02.
- 6.1.6 Any reinforcement of the existing network will be covered by the Infrastructure Charge required for the connection of each property.
- 6.1.7 There are no plans to construct treatment works on the site, nor to discharge any effluent treated or not, to ground water.

7 CONCLUSIONS AND RECOMMENDATIONS

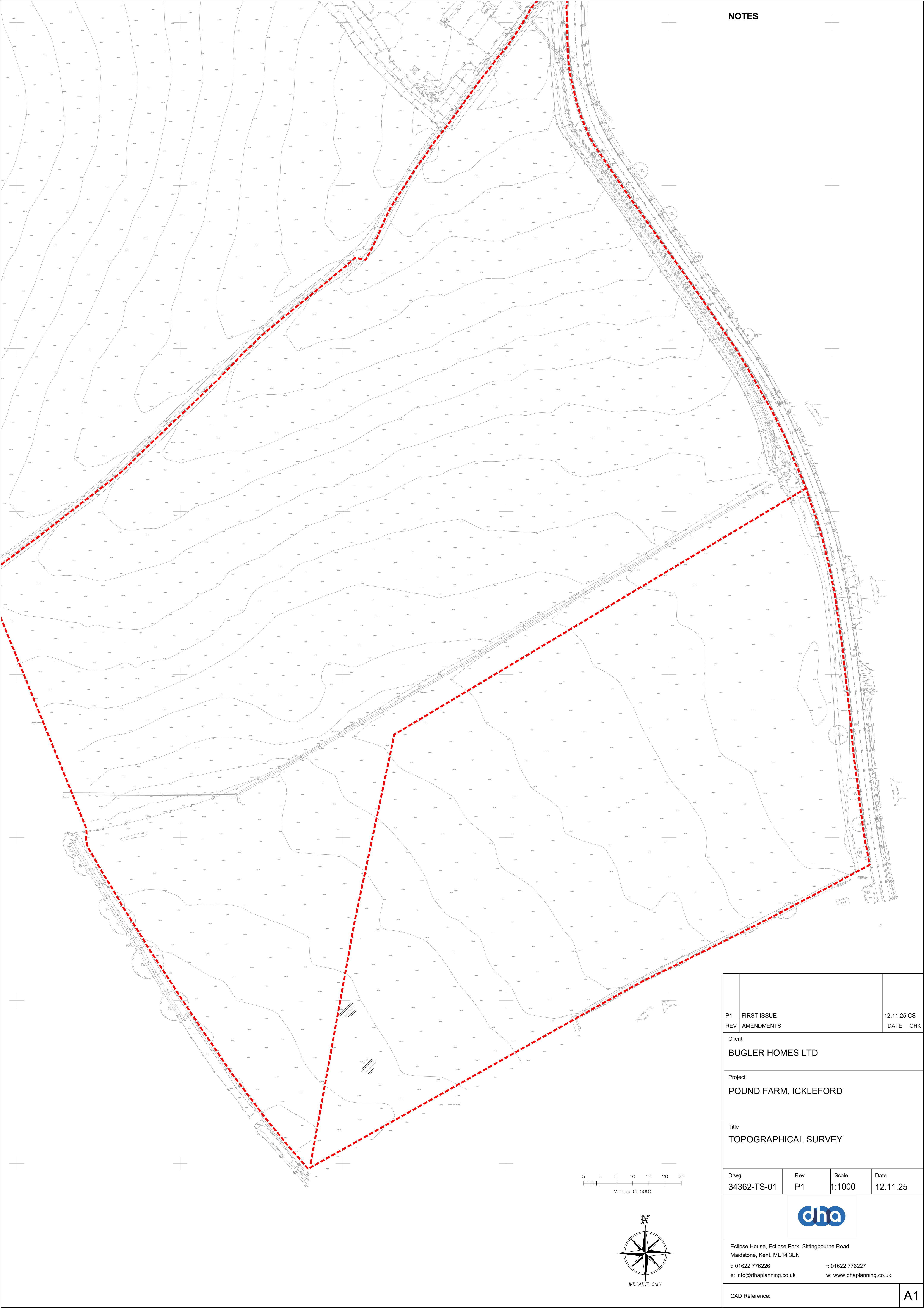
- 7.1.1 The proposals comprise of a Hybrid planning application for the construction of 100 units and a ISS school and sports pitch in detail in phase 1 with up to a further 130 dwellings and a 65-bed care home in outline in phase 2 on Land West of Bedford Road, Ickleford, Herts SG4 7JX.
- 7.1.2 The site-specific flood risk assessment determined that the area of the site to be developed located entirely within Flood Zone 1; low risk of flooding from rivers.
- 7.1.3 Based on the online Environment Agency online mapping, part of site is shown to be at risk from surface water flooding. These areas of flooding can be seen to be associated with localised low points and existing watercourses.
- 7.1.4 NPPF Annex 3: "Flood Risk Vulnerability Classification", states that sites used for residential and education uses can be classified as "more vulnerable". The site is considered to have passed the Sequential Test. More vulnerable development is appropriate in Flood Zone 1 and an Exception Test is not required.
- 7.1.5 The online British Geological Survey maps indicate that the site is underlain by superficial deposits comprising of sand and gravel over bedrock comprising of the Gault Formation – Mudstone. Site specific infiltration show that infiltration will not be suitable for the use of infiltration-based SuDS for all the surface water on the site.
- 7.1.6 A Sustainable urban Drainage System (SuDS) has been provided as part of the surface water drainage layout to deal with the surface water generated from the development to ensure that flood risk is not increased elsewhere.
- 7.1.7 Based on the phasing and site topography the drainage for the development has been split into two catchments each with a controlled discharge into the watercourse located to the North of the site.
- 7.1.8 For Phase 1 roof areas will discharge to a network of gravity surface water sewers into an above ground attenuation basin with a controlled discharge into the watercourse located to the North of the site. Areas of private hardstanding will be constructed as porous paving. For the part of the school, areas of hardstanding will be constructed as a porous pavement which will discharge into an underground cellular storage tank located under the all-weather sports pitch before connecting into the attenuation basin.
- 7.1.9 For Phase 2, roof areas will discharge to a network of gravity surface water sewers into several above ground attenuation basin with a controlled discharge into the watercourse located to the North of the site. The attenuation basins will be linked via new swales. Areas of private hardstanding will be constructed as porous paving.
- 7.1.10 The foul drainage for the development has been shown draining to a proposed foul water pumping station with a connection to the existing foul water drainage network where available capacity can be provided.

- 7.1.11 This report demonstrates that the development proposals can be suitably drained and will not increase the risk of flooding either on or off site. As such the proposals accord with the requirements of the NPPF, PPG and the National standards for sustainable drainage systems (SuDS) in respect of securing a suitable and sustainable drainage strategy for the development.

APPENDIX A



Topographical Survey



NOTES

P1	FIRST ISSUE		12.11.25 CS
REV	AMENDMENTS		DATE CHK
Client			
BUGLER HOMES LTD			
Project			
POUND FARM, ICKLEFORD			
Title			
TOPOGRAPHICAL SURVEY			
Drwg	Rev	Scale	Date
34362-TS-01	P1	1:1000	12.11.25
dha			
Eclipse House, Eclipse Park, Sittingbourne Road Maidstone, Kent. ME14 3EN t: 01622 776226 e: info@dhaplanning.co.uk			
f: 01622 776227 w: www.dhaplanning.co.uk			
CAD Reference:			A1

APPENDIX B



Existing Greenfield Runoff Rates

DHA Transport Ltd		Page 1
Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN	Catchment 1A	
Date 09/01/2026 09:19 File tmp33E4.tmp	Designed by Chris Checked by	
Causeway		Source Control 2019.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.400 Area (ha) 5.070 Urban 0.000 SAAR (mm) 700 Region Number Region 6 Results l/s QBAR Rural 17.2 QBAR Urban 17.2 Q100 years 55.0 Q1 year 14.7 Q30 years 39.1 Q100 years 55.0		
©1982-2019 Innovyze		

DHA Transport Ltd		Page 1
Eclipse House Sittingbourne Road Maidstone ME14 3EN	Catchment 1B	
Date 09/01/2026 09:22 File tmp33E4.tmp	Designed by Chris Checked by	
Causeway		Source Control 2019.1
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DHA Transport Ltd		Page 1
Eclipse House Sittingbourne Road Maidstone ME14 3EN	Catchment 2A	
Date 11/01/2026 12:24 File	Designed by Chris Checked by	
Causeway		
Source Control 2019.1		
ICP SUDS Mean Annual Flood Input Return Period (years) 100 Soil 0.400 Area (ha) 2.080 Urban 0.000 SAAR (mm) 700 Region Number Region 6 Results1/s QBAR Rural 7.1 QBAR Urban 7.1 Q100 years 22.6 Q1 year 6.0 Q30 years 16.0 Q100 years 22.6		
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DHA Transport Ltd		Page 1
Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN	Catchment 2B	
Date 09/01/2026 09:25 File tmp33E4.tmp	Designed by Chris Checked by	
Causeway		Source Control 2019.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.400 Area (ha) 2.580 Urban 0.000 SAAR (mm) 700 Region Number Region 6 Results l/s QBAR Rural 8.8 QBAR Urban 8.8 Q100 years 28.0 Q1 year 7.5 Q30 years 19.9 Q100 years 28.0		
©1982-2019 Innovyze		

DHA Transport Ltd		Page 1																								
Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN	Catchment 2C																									
Date 09/01/2026 09:27 File tmp33E4.tmp	Designed by Chris Checked by																									
Causeway		Source Control 2019.1																								
<u>ICP SUDS Mean Annual Flood</u> Input <table><tr><td>Return Period (years)</td><td>100</td><td>Soil</td><td>0.400</td></tr><tr><td>Area (ha)</td><td>1.660</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>700</td><td>Region Number</td><td>Region 6</td></tr></table> Results l/s <table><tr><td>QBAR Rural</td><td>5.6</td></tr><tr><td>QBAR Urban</td><td>5.6</td></tr><tr><td>Q100 years</td><td>18.0</td></tr><tr><td>Q1 year</td><td>4.8</td></tr><tr><td>Q30 years</td><td>12.8</td></tr><tr><td>Q100 years</td><td>18.0</td></tr></table>			Return Period (years)	100	Soil	0.400	Area (ha)	1.660	Urban	0.000	SAAR (mm)	700	Region Number	Region 6	QBAR Rural	5.6	QBAR Urban	5.6	Q100 years	18.0	Q1 year	4.8	Q30 years	12.8	Q100 years	18.0
Return Period (years)	100	Soil	0.400																							
Area (ha)	1.660	Urban	0.000																							
SAAR (mm)	700	Region Number	Region 6																							
QBAR Rural	5.6																									
QBAR Urban	5.6																									
Q100 years	18.0																									
Q1 year	4.8																									
Q30 years	12.8																									
Q100 years	18.0																									
©1982-2019 Innovyze																										

APPENDIX C



Anglian Water Asset Plans

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Date: 31/10/25

Scale: 1:1250

Map Centre: 517714,231521

Data updated: 30/09/25

Our Ref: 1926429 - 1

Wastewater Plan A1
Prepared by dindat

This plan was prepared 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 any excavation or construction work is undertaken. No liability is accepted by Anglian Water for any error or omission, including the failure to accurately record, or record at all, the location of any water main or sewer. The map is provided for information only. It is not to be used for the purposes of viewing the location of any water main or sewer. © Crown copyright and database rights 2025 Ordnance Survey. All rights reserved. This map is not to be used for the purposes of viewing the location of Anglian Water property. Any other uses of the map data or further copies is not permitted. This notice is intended to exclude or restrict liability for death or personal injury.

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

 Sewage Treatment Works

 Public Pumping Station

● Decommissioned Pumping Station

*(Colour denotes effluent type)

chris.smoker@dhatransport.co.uk

1



APPENDIX D



Site Investigation

10.9 SOAKAWAY DRAINAGE

10.9.1 Investigation Design

In order to complete a 'compliant' infiltration test in accordance with Building Research Establishment (BRE) Digest D365, February 2016, Soakaway Design trial pits should be excavated and then filled and drained with three-cycles of water. The time taken for the water to drain to 25% full within the trial pit is the determining factor in order to complete a successful and compliant infiltration test.

Prior to undertaking the infiltration testing it is near impossible to determine a time-period in which to resource the testing, in terms of attendance of site operatives, technicians and plant machinery. As such a best estimate has to be that a balance is struck between technical and commercial viability.

Following review of the ground conditions it was considered unlikely the full three-cycles of testing would be achieved within the day and thus, in such a situation a default position as described below is taken in order to maximise the value of time over the duration of the plant allocated for the investigation:

-  **Day 1.** Excavate pits and secure with panels to prevent falls. Commence first cycle of filling/draining.
-  **End of Day 1 into evening/night of Day 1 to Day 2.** Commence second cycle of filling/draining on the presumption the first cycle concludes during the first day. The second cycle of draining is likely to occur during the night-time and will not be fully monitored. However, experience tells us that the third cycle of draining more often than not yields the slowest infiltration rate as a result of the test pit being fully saturated/drained on two previous cycles. Therefore, conducting this test in a secured pit, over-night, makes best endeavours to utilise 'time' in an efficient manner and seeks to complete a third cycle of testing within a pit which has been previously saturated on two occasions.
-  **Day 2.** Where applicable, complete monitoring of the second cycle. Commence third cycle of filling/draining and backfill pits.

10.9.2 Investigation Completion

Soil infiltration tests were undertaken within trial pits SP1 to SP3 in general accordance with Building Research Establishment (BRE) Digest D365, February 2016, Soakaway Design in the manner designed within section 10.9.1.

The trial pits were excavated to depths of between 1.0m and 1.5m bgl and tested to determine the suitability for conventional soakaways in the overlying soils encountered at these locations.

Excavation of the trial pits was completed at a steady rate and the trial pits were rapidly filled with a tankered water supply. The subsequent fall in water level was observed over the time period specified within the table of results.

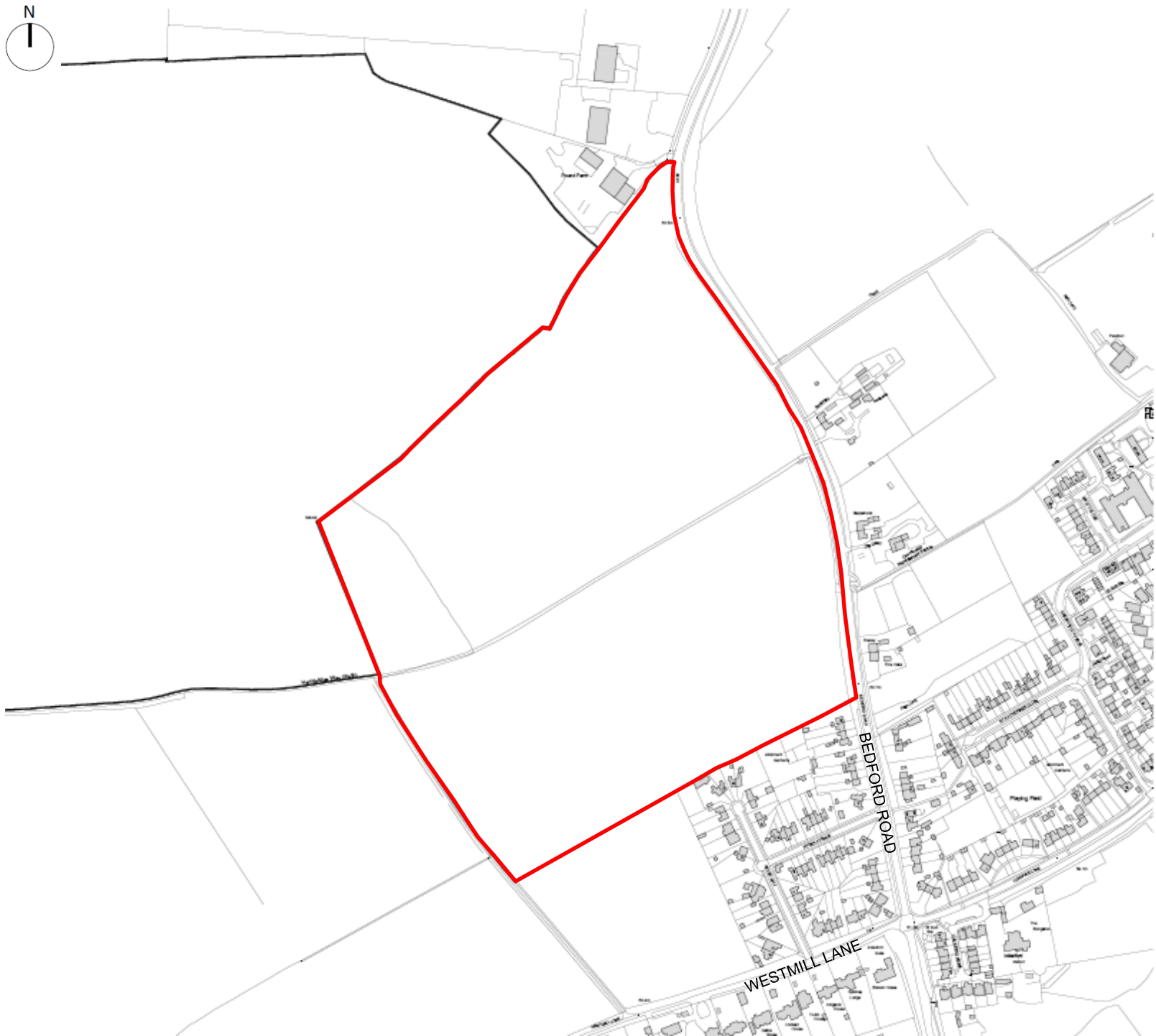
Water filling was completed within each trial pit in the manner described within table 10.9.1 along with infiltration rates and comments.

Table 10.9.1: Soil Infiltration Rates				
Location (Test no.)	Testing depths (bgl)	Strata Tested	Infiltration Rate (m/s)	Comments
SP1 (T1)	0.47m – 1.5m	CLAY/SAND/CLAY	$*1.01 \times 10^{-6}$	Testing commenced on the morning of day 1. By the end of the shift on day-1 (300mins/5hrs) the water level had dropped just past 75% full. It was decided to leave the water in the pit to continue draining overnight whereby after 1294 minutes (21.5 hrs) the water level had dropped to just beyond 50% full. The test was continued during day-2 until the end of the shift. However, following 1751 minutes of testing (29hrs) the fall in water level did not achieve 25% full. By extrapolation (*) of the curve an infiltration rate can be determined. Given the time left on the second and final day of testing and based on the first cycle of testing an attempt at a second cycle of testing was aborted. It is estimated cycle-2 of testing would take >35 hours. It is considered soakaway drainage at this location is unsuitable.
SP2 (T1)	0.35m – 1.0m	CLAY	9.01×10^{-7}	Testing commenced on the morning of day-1. By the end of the shift on day-1 (180mins/3hrs) the water level had dropped past 75% full and was approaching 50% full. It was decided to leave the water in the pit to continue draining overnight whereby after 1228 minutes (20.5 hrs) the water level had dropped close to 25% full. The test was continued during day-2 until the end of the shift. Following 1689 minutes of testing (28hrs) the fall in water level had reached 25% full. Given the time left on the second and final day of testing and based on the first cycle of testing an attempt at a second cycle of testing was aborted. It is estimated cycle-2 of testing

Table 10.9.1: Soil Infiltration Rates				
Location (Test no.)	Testing depths (bgl)	Strata Tested	Infiltration Rate (m/s)	Comments
				would take >30 hours. It is considered soakaway drainage at this location is unsuitable.
SP3 (T1)	0.46m – 1.0m	CLAY	2.09×10^{-6}	Testing commenced on the morning of day-1. By the end of the shift on day-1 (180mins/3hrs) the water level had dropped past 75% full and was approaching 50% full. It was decided to leave the water in the pit to continue draining overnight whereby after 1215 minutes (20hrs) the water level had dropped beyond 25% full leaving ~0.02m of water in the pit.
SP3 (T2)	0.46m – 1.0m	CLAY		The pit was re-filled on day-2, though it was not expected the test would reach the necessary 25% full level. The test was undertaken for 240 minutes (4hrs) where water levels passed 75% full and were approaching 50% full. The test pit was backfilled prior to the end of the day-2 shift. It is estimated the test would take >20hrs to conclude and would yield a slower infiltration rate than cycle/test-1. It is considered soakaway drainage at this location is unsuitable.

Shallow soakage drainage in the soils overlying the site is not considered suitable for the proposed re-development.

Soil infiltration test results are included within **Appendix VI**.



Legend

— Approximate Site Boundary

Notes

Drawing supplied by Client

Figure 1

Drawing Title

Site Location Plan

Project Number 25-267.02

Project Title

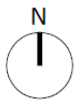
Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Legend

— Approximate Site Boundary

Notes

Figure 2

Drawing Title

Existing Site Layout Plan - Aerial View

Project Number 25-267.02

Project Title

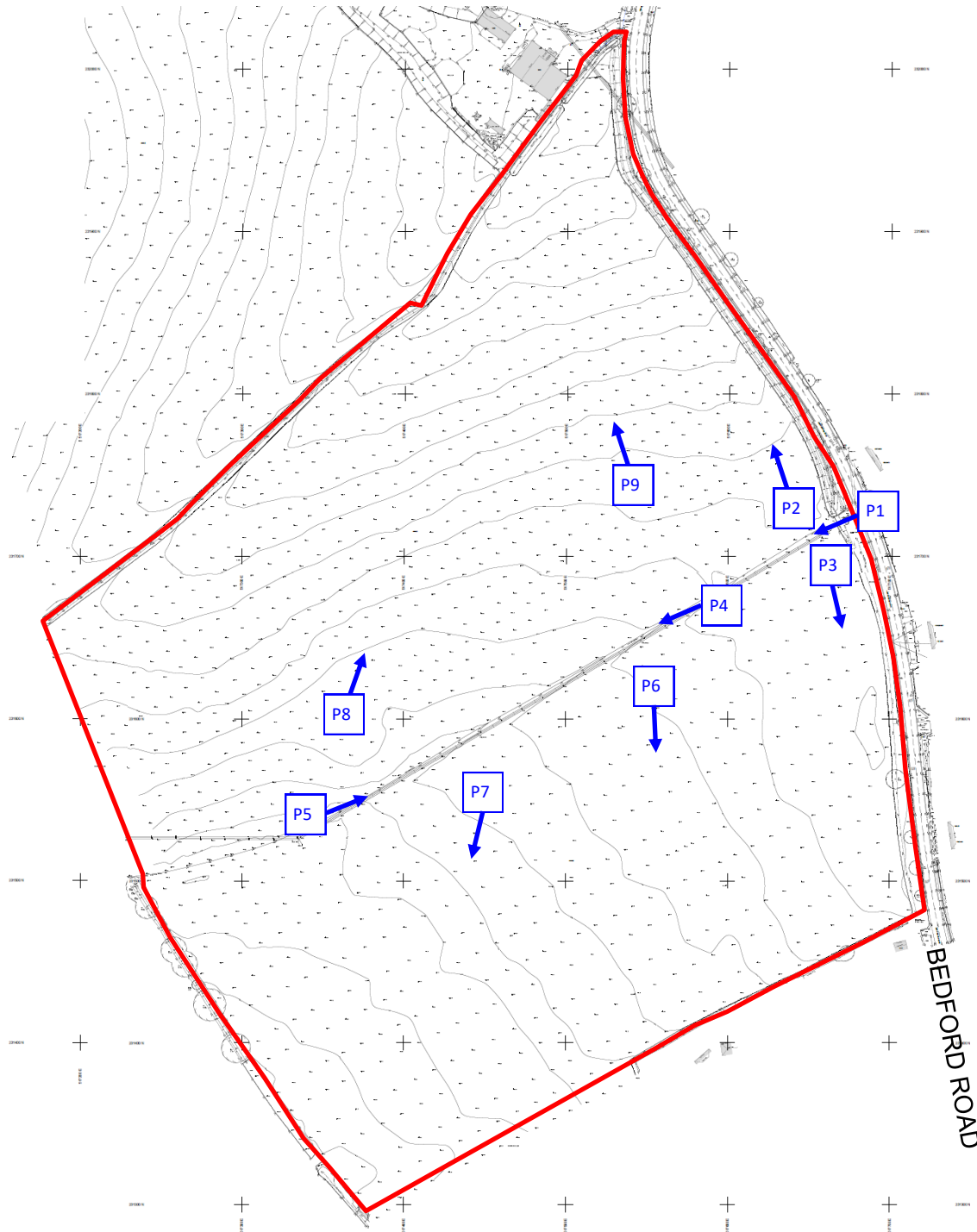
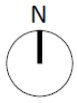
Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Legend

-  Approximate Site Boundary
-  Photo Direction

Notes

Drawing supplied by Client

Figure 3

Drawing Title

Existing Site Layout Plan - Topographical

Project Number 25-267.02

Project Title

Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9

Legend

Notes

Figure 4

Drawing Title

Site Photographs

Project Number 25-267.02

Project Title

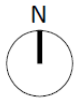
Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Legend

— Site Boundary

Notes

Drawing supplied by Client

Figure 5

Drawing Title

Proposed Development Plan

Project Number 25-267.02

Project Title

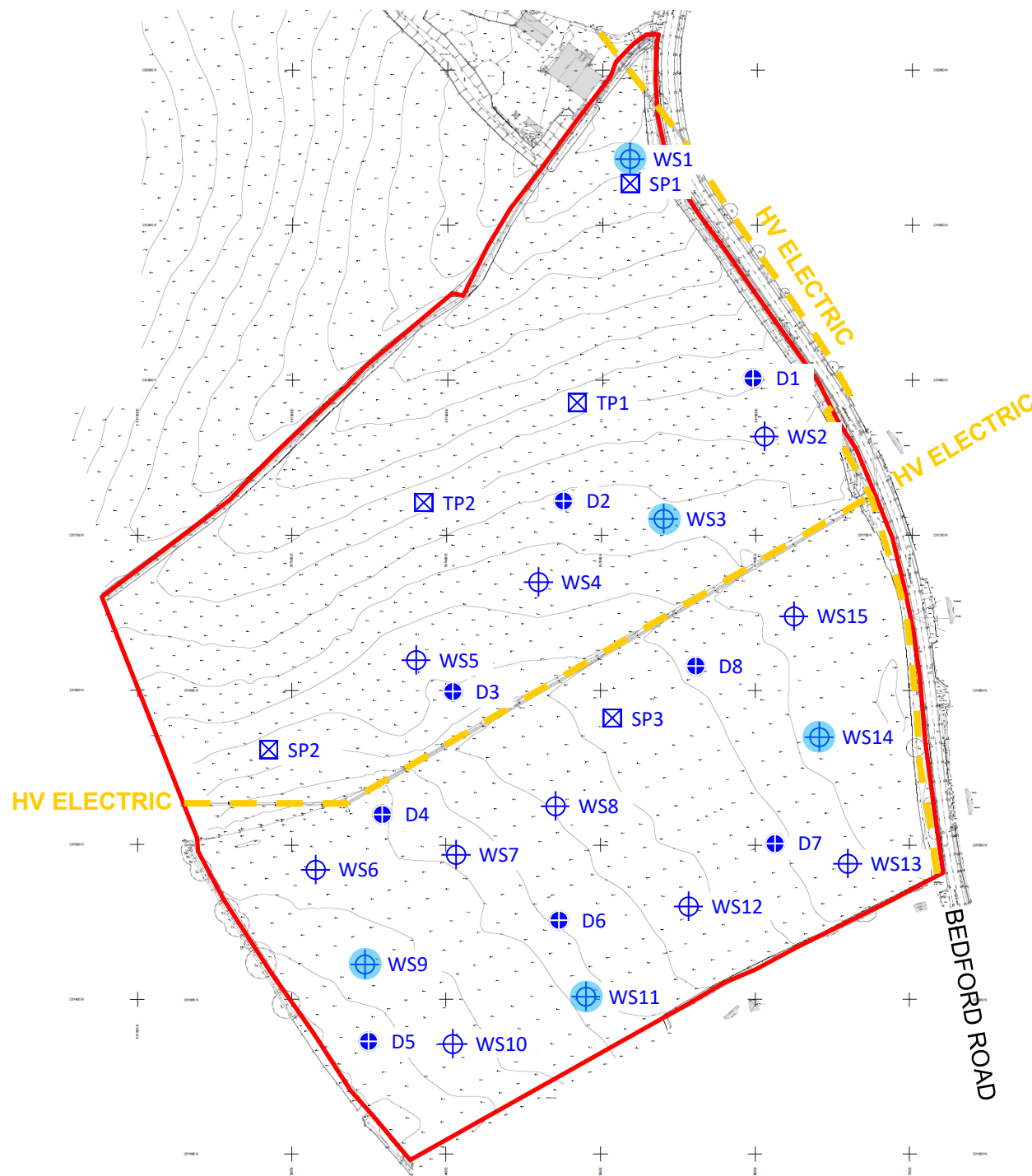
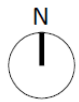
Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Legend

-  Window Sample Borehole
-  Monitoring Well
-  Mechanical Trial Pit
-  DCP/CBR

Notes

Figure 6

Drawing Title

Exploratory Hole Location Plan -
Existing Layout

Project Number 25-267.02

Project Title

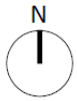
Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS





Legend

-  Window Sample Borehole
-  Monitoring Well
-  Mechanical Trial Pit
-  DCP/CBR

Notes

Figure 7

Drawing Title

Exploratory Hole Location Plan -
Proposed Development

Project Number 25-267.02

Project Title

Land at Pound Farm, Bedford Road,
Ickleford, Hitchin, SG5 3RS

Drawn by DN

Checked by JB

Scale NTS

