


## TECHNICAL NOTE


**Job Name:** Land at Calcott Hall Farm, Brentwood  
**Job No:** 42579  
**Note No:** 4001/TN001 Rev B  
**Date:** 8 February 2019  
 (Rev B - 04<sup>th</sup> March 2019)  
**Prepared By:** Leila Farhan  
**Subject:** **Surface Water and Foul Drainage Feasibility Study**

Item	Subject
1.	<p><b>Introduction</b></p> <p>Peter Brett Associates (PBA), now part of Stantec, has been commissioned to undertake a Feasibility Study of the Surface Water and Foul Drainage for the proposed residential development for approximately 800 dwellings on land at Calcott Hall Farm, south of Ongar Road Brentford.</p> <p>The site has a total area of approximately 47.6ha and is bounded by the A128 Ongar Road to the north, the A12, to the east, Weald Road to the south and Sandpit Lane to the west.</p> <p>The complex of existing farm buildings and some surrounding land will be excluded from the proposed development and will also form part of the eastern boundary of the development site. To the north and east of the site are the existing residential areas of Pilgrims Hatch and Brentwood. The site is largely surrounded by agricultural fields to the south and west. There is an area of designated ancient woodland, High Wood, to the northeast of the site, adjacent to Ongar Road.</p> <p>The land is currently arable farm land with some woodland and lakes. The highest point is within the centre of the site, which slopes gently to the north and more steeply to the south east.</p> <p>The proposed development is indicated on fpcr drawing 8363-L-01 contained in Appendix A. The site will have an access road running north-south through the site (Community Link Road) giving access to the residential development parcels, and over 50% of the overall development site area will be "Green Infrastructure".</p> <p>The Technical Note gives an overview of the current drainage constraints and set out potential strategies for draining the surface water and foul water flows from the site. It also identifies the current policies and strategies relating to the surface water and foul drainage of the development.</p>

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Item	Subject
2.	<p data-bbox="240 293 347 322"><b>The Site</b></p> <p data-bbox="240 353 1497 416">The site is situated to the north-west of Brentwood and to the south-east of Pilgrim's Hatch. A site location plan is contained shown in Figure 2.1.</p> <div data-bbox="772 445 983 474" style="text-align: center;"> <p>Figure 2.1 Site Location</p> </div>  <p data-bbox="539 1603 1214 1632" style="text-align: center;">Contains Ordnance Survey data © Crown Copyright and database right 2018</p> <p data-bbox="240 1630 485 1659"><b>2.1 Site Description</b></p> <p data-bbox="240 1691 1497 1753">The site comprises approximately 47.6 hectares of mainly agricultural land. There are several woodlands, trees and hedges within the site.</p> <p data-bbox="240 1785 1497 1966">The site has a relatively steep topography, with levels ranging between approximately 102m AOD and 75m AOD within the development boundary. Falls are generally in a west to east direction towards the A12. OS mapping data suggests that the site is split into two distinct drainage catchments. The area north of Calcott Farm falls towards Ongar Road to the North and forms the headwaters of the River Wid catchment; and the area to the south of the farm falls towards Weald Road to the South and subsequently into the Inglebourne River catchment.</p> <p data-bbox="240 1966 507 1995"><b>2.2 Existing Drainage</b></p>

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	<p>A site walkover was carried out in October 2018. The key drainage features are shown on PBA Drawing number 42579/4001/001 contained in Appendix B.</p> <p>The site comprises arable fields, with hedgerow field boundary features. There are several farm tracks and a network of field drains/ditches across the site. The main drainage features are described in more detail in Sections 2.3 and 2.4.</p> <p><b>2.3 <u>The Bogs/The Spinney</u></b></p> <p>This area, to the south of Calcott Hall Farm, encompasses a distinct valley with two lakes with plan areas of approximately 3,000m<sup>2</sup> for the upper northerly lake and 4,000m<sup>2</sup> for the lower southerly lake. There is also a smaller pond at the head of the valley which connects via a channel down the valley to the upper lake. Each lake is retained by an earth embankment dam and are connected by a channel. The lakes' natural drainage catchment is restricted to the central section of the site, including the Cricket Club and Calcott Hall Farm. The rest of the site discharges directly to the outfall points described in Section 2.4.</p> <p style="text-align: center;">Figure 2.2 The Bogs/The Spinney Aerial View</p>  <p style="text-align: center;">Contains Google Maps data © Crown Copyright and database right 2018</p>

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	<p>Immediately downstream of the larger, southern lake is a large 'hollow', which may have been the 'borrow pit' for the material used to construct the dam. There is no evident overflow structure from either of the lakes, although a 300mm diameter pipe emerges into a section of open channel within the 'hollow' downstream of the southern lake. This channel then connects into a 450mm diameter outfall pipe within the 'hollow' which takes flows towards the site boundary with the A12. There was no flow in the pipe during the site walkover.</p> <p>2.4 <u>Existing outfalls</u></p> <p>As well as the 450mm diameter outfall pipe running towards the A12, there is a 225mm diameter pipe carrying flows from the watercourse on the southern boundary of the site with Weald Road to pass under Weald Road. There are also 2 No. 450mm diameter outfall pipes laid in parallel carrying flows from the watercourse on the northern boundary of the site with Ongar Road and running under Ongar Road in the North. From reference to Anglian Water's sewer records, contained in Appendix C, these pipes connect into an Anglian Water maintained sewer network.</p> <p>There is an existing pump house adjacent to the lower lake which it appears is used to abstract water from the lakes to irrigate the land associated with Calcott Hall Farm.</p> <p>A detailed topographical survey of the site, including a detailed bathymetric survey of the lakes will be required to confirm drainage features as part of any future planning application.</p>

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### 3. Legislation, Policies and Guidance

#### 3.1 Flood Risk and Drainage

The site is situated in Flood Zone 1, an area with a low probability of flooding from rivers or the sea, as indicated on The Environment Agency Flood map for the site is contained in Appendix D. A flood risk assessment (FRA) will be required to support any planning application, as the site area is greater than 1Ha. The assessment should be prepared in accordance with guidance published by the Environment Agency.

The FRA will assess the risk to the development from all sources of flooding as well as surface water runoff on and from the site. The surface water drainage strategy should comply with:

- guidance on managing surface water runoff in the local planning authority's Strategic Flood Risk Assessment (Brentwood Level 1 SFRA, 2011);
- guidance from the lead local flood authority (LLFA), which is Essex County Council (ECC); and,
- sustainable drainage principles.

The development proposals should also consider the requirements of the river basin management plans:

- Anglian river basin district RBMP: 2015 for the River Wid catchment to the north; and,
- Thames river basin district RBMP: 2015 for the Inglebourne River catchment to the south.

The 'Sustainable Drainage Systems, Design Guide' published by ECC in 2016 gives guidance on the LLFA's requirements and advice on how to design high quality SuDs to maximise benefits to the community and environment. ECC also sets out the drainage information required to support planning applications. The Outline drainage design checklist is included in Appendix E for reference.

The following documents also provide guidance on the design sustainable drainage schemes:

- LASOO Non-statutory technical standards for sustainable drainage systems
- The CIRIA SuDS Manual (C753)
- BS8582 Code of practice for surface water management for development sites.

#### 3.2 Implications of The Reservoirs Act 1975

The Reservoirs Act 1975 (the Act) sets out certain requirements for the owners or operators of reservoirs. If a reservoir holds 25,000 m<sup>3</sup> or more of water (including mobile silt) above ground level, it must be registered under the act.

An initial assessment suggests that if each of the two lakes at The Bogs is considered separately then the Act is unlikely to apply. However, it is likely that a failure on the upper lake would lead to an uncontrolled release from the lower lake, so the two waterbodies should be considered together. In this case depending on the depth of the lakes, it is possible that the Act will apply. Also, under Schedule 4 of the Flood and Water Management Act 2010 (FWMA) there is future potential for the threshold to be reduced to 10,000m<sup>3</sup>, in which case the Act would almost certainly apply.

The Undertaker for the reservoirs has an overall duty under the Health and Safety at Work Act 1974 to prevent injury to those using or downstream of the site, regardless of whether the Reservoirs Act 1975 applies or not.

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	<p>It is recommended that an All Reservoirs Panel Engineer is appointed to review the application of the Reservoirs Act 1975 in this case. At this stage the following provisions should be considered in the development proposals:</p> <ul style="list-style-type: none"> <li>• Adapting the dams to safely pass the safety check flood;</li> <li>• Further investigations and advice required into the integrity of the embankments to act as dams;</li> <li>• Carry out hydrology and hydraulic modelling exercise to confirm suitability and capacity</li> <li>• Checking the required freeboard on the crest of the dam;</li> <li>• Introducing a low-level drawdown facility;</li> <li>• Preparation of On and Off-Site Plans.</li> <li>• Appointing a Qualified Civil Engineer (QCE) to oversee and check the design and construction.</li> <li>• Consider if development can be avoided immediately downstream of the dams and within the modelled flood extent of a potential breach.</li> </ul>
4.	<p><b>Surface Water Management Development Strategy</b></p> <p>Current Planning Policy recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites. It recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development.</p> <p>The Lead Local Flood Authority (LLFA), ECC, is responsible for the approval of surface water drainage systems within new major development, and clearly sets out their requirements for SuDs in the Design Guide Early consultation with the Flood and Water Management Team is essential. The principles of the proposed surface water system are set out below.</p> <p><b>4.1 <u>Drainage Hierarchy</u></b></p> <p>The surface water drainage system will fully encompass sustainable drainage techniques. As required by current policy and guidance, including the Building Regulations and NPPF, surface water must discharge to the following, listed in order of priority:</p> <ul style="list-style-type: none"> <li>• to ground in an adequate soakaway or some other adequate infiltration system,</li> <li>• a watercourse,</li> <li>• a surface water sewer, highway drain or other drainage system,</li> <li>• a combined sewer.</li> </ul> <p>Therefore, the following options should be considered;</p> <p><b>Option 1 – Infiltration</b></p> <p>Based on the site characteristics and a desk study of the information available on ground conditions, draining the entire site by infiltration into the ground is unlikely, however further investigation will be required. The surface water drainage strategy must take account of ground permeability, ground water levels and any potential contamination risks. Any proposals for infiltration will need to be supported by infiltration tests and agreed with the LLFA and the EA. For the purpose of this report, infiltration drainage is discounted, subject to further investigation.</p> <p><b>Option 2 – Discharge into the Existing Watercourses</b></p> <p>Given that Option 1, infiltration, is unlikely to be suitable due to ground conditions, but that there is a network of existing watercourses within the site, Option 2 – forms the basis of the proposed surface water drainage strategy. This is illustrated in Drawing 42579/4001/002 contained in Appendix B.</p>

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	<p>To replicate the existing greenfield drainage regime, the northern area of the development site will discharge to the exiting watercourse on the northern site boundary with Ongar Road. As noted in Section 2.3 above from this watercourse there are 2 No 450 pipes laid parallel under Ongar Road. A smaller catchment from the northeast of the site could discharge to the existing watercourse on the southern edge of High Wood. The points of discharge from the northern area would be within the River Wid Catchment.</p> <p>The southern part of the site will discharge to the watercourse on the southern boundary of the site with Weald Road, and to the existing 450mm diameter located downstream of the existing lakes flowing towards the A12. This would be into the Inglebourne River Catchment.</p> <p>Discharge rates from the site should be restricted to the equivalent 1 in 1 year greenfield runoff rates. All flows above these rates will be attenuated within the development and attenuation ponds/basins will be provided with flow control mechanisms to restrict the discharge to the respective watercourses.</p> <p>Options 3 &amp; 4– Discharge into Public/Private Sewer(s)</p> <p>Since there are existing watercourses within the site, these options have been discounted. It should be noted that under the Water Management Act 2010, there is no longer an automatic right of connection to the existing surface water sewer network.</p> <p><b>4.2 Design Parameters</b></p> <p>The existing greenfield runoff rates have been calculated using the ICP SuDS method and catchment specific rainfall parameters derived from the Flood Estimation Handbook (FEH).</p> <p>The limiting discharge rates for the development should, where possible, be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. An alternative approach would be for discharge rates to be limited to a range of greenfield rates, based on the 1 in 1, 1 in 30 and 1 in 100 year storm events. However, the use of this method to restrict discharge rates would also require the inclusion of online long-term storage, sized to take account of the increased post development volumes, discharging at no greater than 2l/s/ha.</p> <p>The design of surface water attenuation provision will be undertaken using catchment specific rainfall parameters derived from the Flood Estimation Handbook (FEH). A volumetric runoff coefficient (cv) of 0.85 will be used in the sizing of the surface water attenuation provision.</p> <p><b>4.3 Impermeable Areas</b></p> <p>The proposed impermeable areas for the development have been estimated based on fpcr Initial Capacity Plan. ECC standards request that a 10% additional area be included to allow for the effects of Urban Creep. Table 3 below shows the total impermeable area:</p> <p style="text-align: center;">Table 3: Summary of Phase 1 Impermeable Area</p> <table border="1" data-bbox="347 1585 1406 1760"> <thead> <tr> <th>Land Use</th> <th>Development Area (ha)</th> <th>Total Imp Area (ha)</th> <th>Total Imp Area inc. 10% Urban Creep Allowance (ha)</th> </tr> </thead> <tbody> <tr> <td>Residential</td> <td>20.26</td> <td>13.17</td> <td>14.49</td> </tr> </tbody> </table> <p><b>4.4 Piped Surface Water Drainage System</b></p> <p>In order that the piped surface water drainage systems serving the development can be brought forward for adoption by the local sewerage undertaker the proposed surface water drainage systems will be designed in accordance with Sewers for Adoption 6th Edition. The proposed piped surface water drainage system will be designed to ensure self-cleansing velocities are achieved in the 1 in 1 year event utilising:</p>	Land Use	Development Area (ha)	Total Imp Area (ha)	Total Imp Area inc. 10% Urban Creep Allowance (ha)	Residential	20.26	13.17	14.49
Land Use	Development Area (ha)	Total Imp Area (ha)	Total Imp Area inc. 10% Urban Creep Allowance (ha)						
Residential	20.26	13.17	14.49						

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	<ul style="list-style-type: none"> <li>FSR rainfall data (industry standard practice);</li> <li>A volumetric runoff coefficient (cv) of 0.75 in accordance with industry standard practice;</li> <li>MicroDrainage design software, such that the piped drainage network will have no above soffit surcharging in the 1 in 1 year rainfall event and no above ground flooding in the 1 in 30 year rainfall event as per requirements of the Sewers for Adoption (SfA).</li> </ul> <p>All sustainable drainage system (SuDS) features will be designed in accordance with guidance given by Essex County Council. Highway drainage will be designed in accordance with the requirements of the Local Highway Authority and any private systems will comply with the requirements of Building Regulations: Approved Document Part H.</p> <p><b>4.5 <u>Climate Change</u></b></p> <p>The capacity of the proposed surface water attenuation features has been assessed to accommodate a 1 in 100 year event with an additional allowance of 40% for an increase in peak rainfall intensity due to climate change in accordance with EA guidance published 19th February 2016: Flood Risk Assessments: Climate Change Allowances and confirmed in ECC Design Guide.</p> <p><b>4.6 <u>Attenuation Proposals</u></b></p> <p>The storage volume requirements have been estimated based on the measurement of the impermeable areas within the drainage catchments and using MicroDrainage Source Control software based upon the limiting greenfield run off rate. These are included in Appendix F.</p> <p>Each natural catchment area has been considered separately. Based on the disposition of proposed development areas in the fpcr Initial Capacity Plan, it is anticipated that the site may form 4 catchments each of which would be served by its own attenuation pond/basin. These are shown indicatively on PBA drawing 42579/4001/002 contained in Appendix B. The maximum allowable discharge rate and storage volume required are summarised in Table 4 below.</p> <p style="text-align: center;">Table 4: Summary of Surface Water Attenuation Requirements</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #003366; color: white;"> <th>Catchment Ref</th> <th>Maximum allowable Discharge (l/s)</th> <th>Contributing Impermeable Area (ha)</th> <th>Maximum Water Depth (m)</th> <th>Attenuation Volume (m<sup>3</sup>)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>7.61</td> <td>3.42</td> <td>1.2</td> <td>3,800</td> </tr> <tr> <td>2</td> <td>6.12</td> <td>2.75</td> <td>1.2</td> <td>3,100</td> </tr> <tr> <td>3</td> <td>5.37</td> <td>2.41</td> <td>1.2</td> <td>2,700</td> </tr> <tr> <td>4</td> <td>13.17</td> <td>5.91</td> <td>1.2</td> <td>6,600</td> </tr> </tbody> </table>	Catchment Ref	Maximum allowable Discharge (l/s)	Contributing Impermeable Area (ha)	Maximum Water Depth (m)	Attenuation Volume (m <sup>3</sup> )	1	7.61	3.42	1.2	3,800	2	6.12	2.75	1.2	3,100	3	5.37	2.41	1.2	2,700	4	13.17	5.91	1.2	6,600
Catchment Ref	Maximum allowable Discharge (l/s)	Contributing Impermeable Area (ha)	Maximum Water Depth (m)	Attenuation Volume (m <sup>3</sup> )																						
1	7.61	3.42	1.2	3,800																						
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3	5.37	2.41	1.2	2,700																						
4	13.17	5.91	1.2	6,600																						
<b>5.</b>	<p><b>Foul Drainage Strategy</b></p> <p>The incumbent waste water authority for the area is Thames Water, but Anglian Water have confirmed that the northern part of the site adjacent to Ongar Road, sits within their Sewerage Services Area. It will be necessary to seek approval of the foul drainage strategy, including the proposed connection point from both authorities, unless otherwise agreed at the planning application stage. A pre-planning enquiry has been sent to both Thames Water and Anglian Water, but responses had not been received at the time of writing.</p> <p>The nearest public Waste Water Treatment Works (WwTW) is the Nag's Head Lane Sewage Works, located to the southwest of Brentwood, and is operated by Thames Water.</p>																									



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	<p>Asset location records show a 300mm diameter Anglian Water foul sewer in Ongar Road to the north of the site. The sewer crosses under the existing Calcott Hall Farm access road, as shown in Figure 5.1. This is considered likely to be the most suitable point of connection to the public sewer for the development site. Records also indicate a 300mm foul sewer located to the south east of the site, to the east of the A12. A connection to this location would pose significant challenges because it involves crossing the Weald Road Bridge over the A12.</p> <p>Based on the site levels and considering the proposed areas of development indicated on the illustrative Capacity Plan layout, the foul drainage strategy will require a foul pumping station in south eastern corner of the site. This would pump sewage effluent back to the north where it would discharge to the proposed on-site gravity foul sewer network serving the northern part of the site.</p> <p>Figure 5.1 Extract from Anglian Water Sewer Asset Records</p>  <p>Contains Ordnance Survey data © Crown Copyright and database right 2018</p>

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Item	Subject
6.	<p><b>Conclusions</b></p> <p>There are viable solutions to provide surface water and foul drainage for the proposed Calcott Hall Farm development.</p> <p>The proposed strategy for surface water drainage for the development of Calcott Place is to discharge to existing watercourses restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. Attenuation will be provided by onsite ponds/basins.</p> <p>Foul drainage will discharge to existing Public Foul Sewers. Based on this initial assessment, the preferred point of connection will be to the existing Public Foul Sewer in Ongar Road. Due to the site topography, a foul pumping station will be required to serve the southern part of the site.</p>

### DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
42579/4001/TN001	-	08.02.19	LF	SLG	PE	RSH
	A	25.02.19	PE		PE	RSH
	B	04.03.19	SR	PE	PE	RSH

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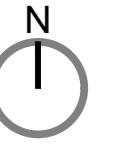
Peter Brett Associates LLP 11 Prospect Court Courteenhall Road, Blisworth Northampton NN7 3DG

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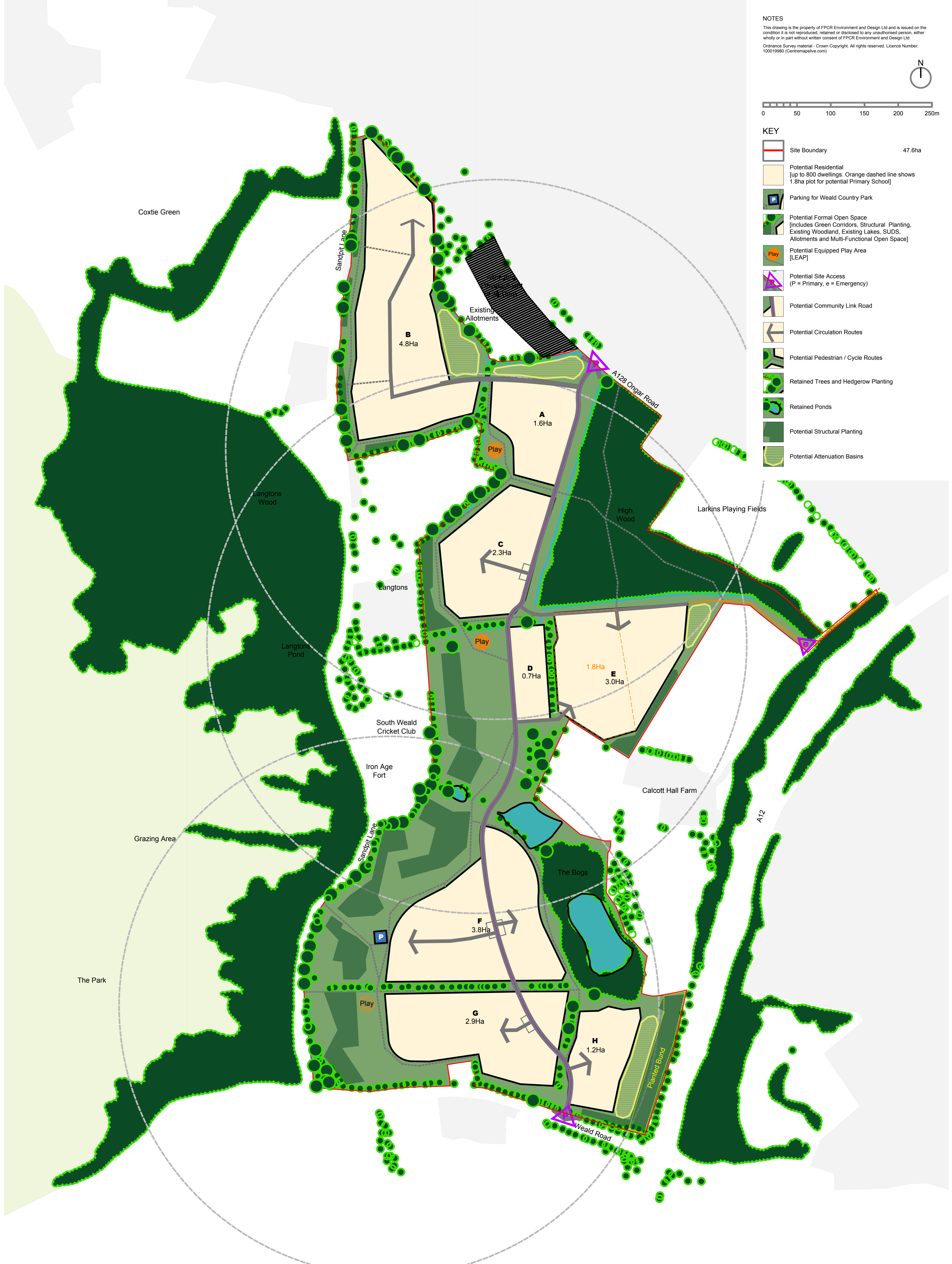
## Appendix A

fpcr drawing 8363-L-01 - Initial Capacity Plan

**NOTES**  
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- KEY**
- Site Boundary 47.6ha
  - Potential Residential [up to 800 dwellings. Orange dashed line shows 1.8ha plot for potential Primary School]
  - Parking for Weald Country Park
  - Potential Formal Open Space [includes Green Corridors, Structural Planting, Existing Woodland, Existing Lakes, SUDS, Allotments and Multi-Functional Open Space]
  - Potential Equipped Play Area [LEAP]
  - Potential Site Access (P = Primary, e = Emergency)
  - Potential Community Link Road
  - Potential Circulation Routes
  - Potential Pedestrian / Cycle Routes
  - Retained Trees and Hedgerow Planting
  - Retained Ponds
  - Potential Structural Planting
  - Potential Attenuation Basins

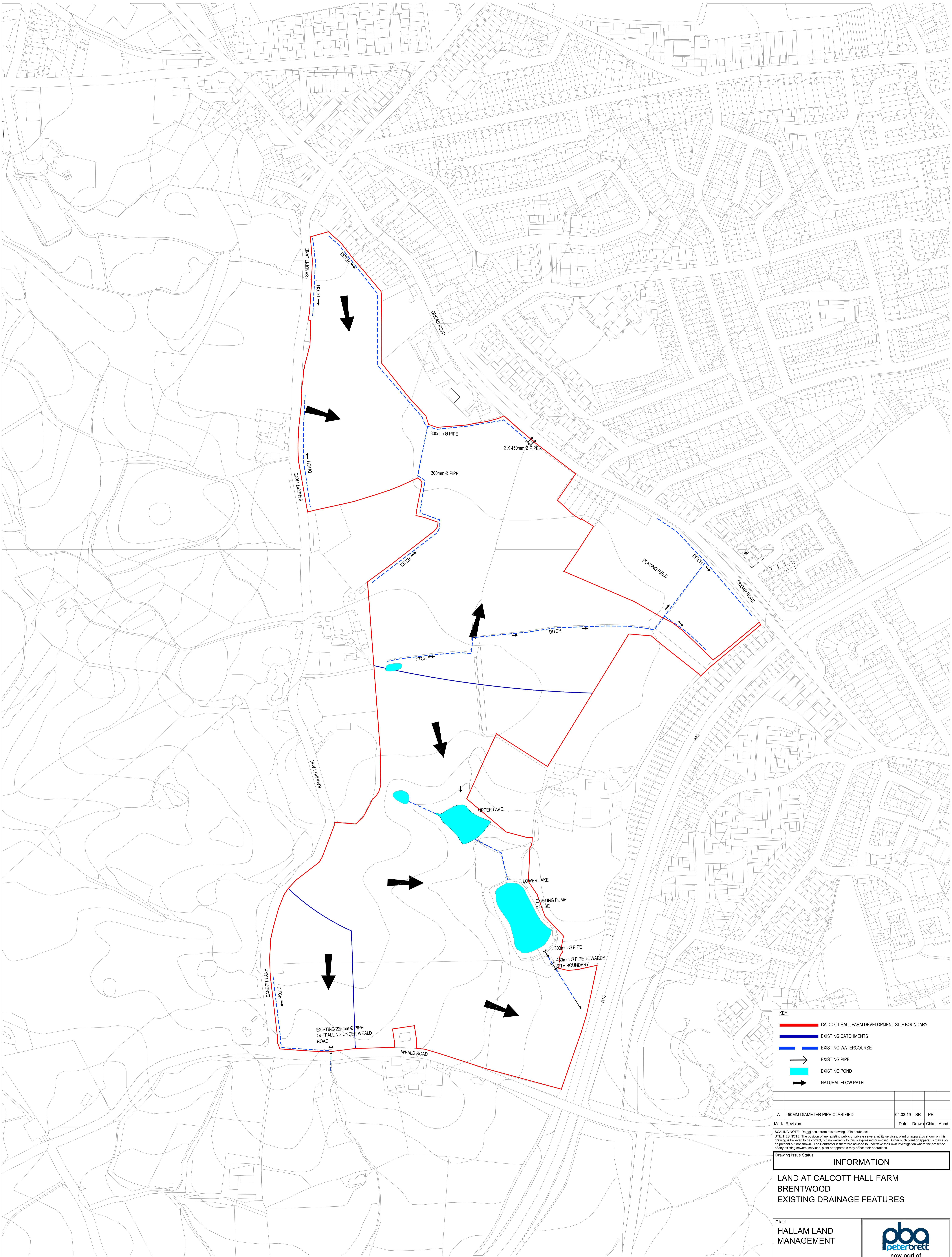
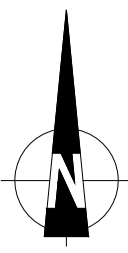


## TECHNICAL NOTE

### Appendix B - Drawings

PBA Drawing no. 42579/4001/001A – Existing Drainage Features

PBA Drawing no. 42579/4001/002A – Surface Water Drainage Strategy



**KEY:**

- CALCOTT HALL FARM DEVELOPMENT SITE BOUNDARY
- - - EXISTING CATCHMENTS
- EXISTING WATERCOURSE
- EXISTING PIPE
- EXISTING POND
- NATURAL FLOW PATH

A	450MM DIAMETER PIPE CLARIFIED	04.03.19	SR	PE
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Mark: Revision Date Drawn Chkd Appd

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing services, plant or apparatus may affect their operations.

**INFORMATION**

**LAND AT CALCOTT HALL FARM  
BRENTWOOD  
EXISTING DRAINAGE FEATURES**

Client  
**HALLAM LAND MANAGEMENT**

Date of 1st Issue: FEBRUARY 2019  
AD Scale: 1:2000

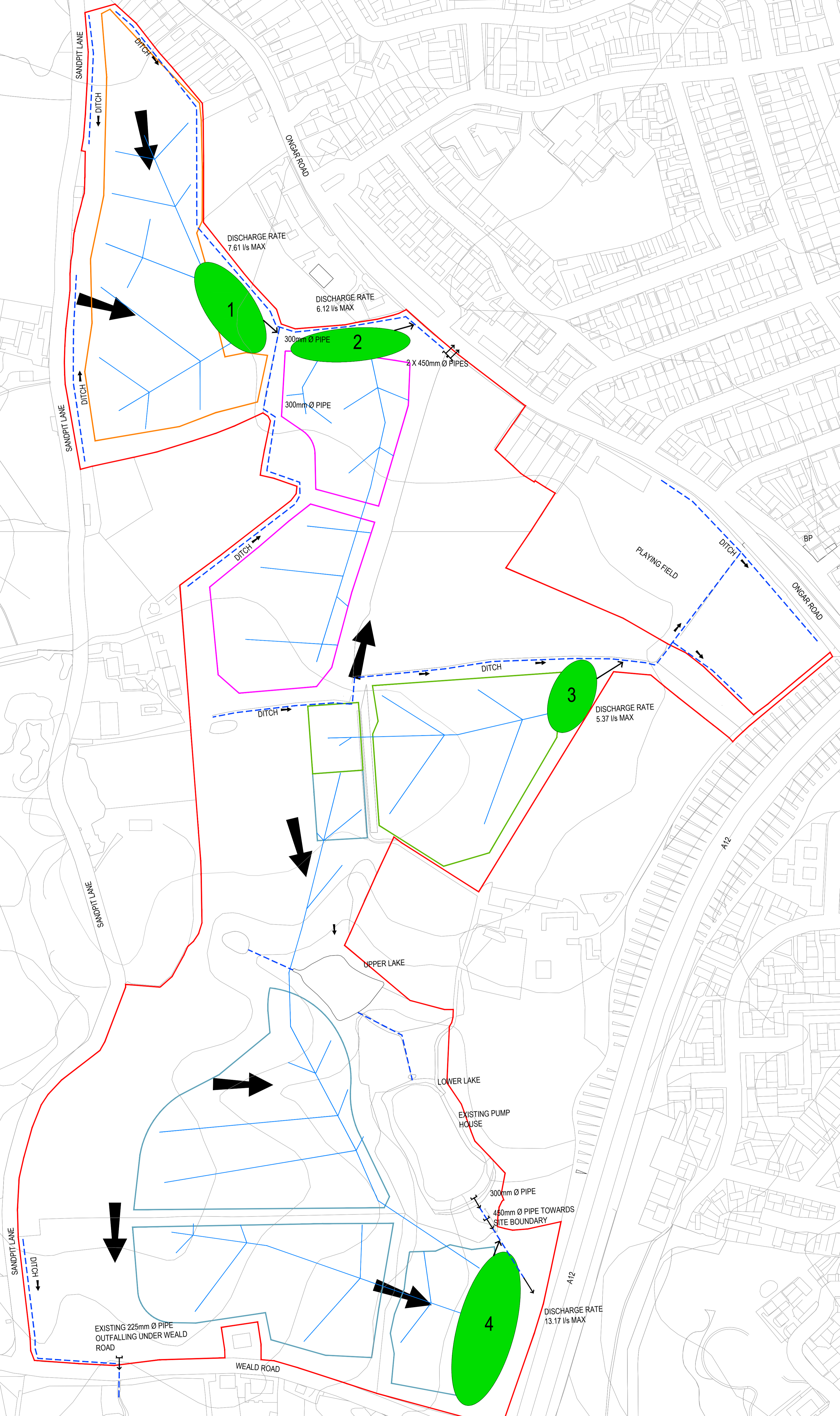
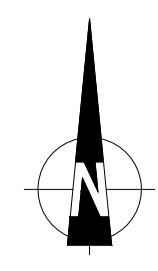
Designed	SR	Drawn	SR
Checked	PE	Approved	PE

Drawing Number: **42579/4001/001**

Revision: **A**

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KEY:				
	CALCOTT HALL FARM DEVELOPMENT SITE BOUNDARY			
	NATURAL FLOW PATH			
	INDICATIVE SURFACE WATER DRAINAGE NETWORK			
	PROPOSED CATCHMENT FOR ATTENUATION BASIN 1			
	PROPOSED CATCHMENT FOR ATTENUATION BASIN 2			
	PROPOSED CATCHMENT FOR ATTENUATION BASIN 3			
	PROPOSED CATCHMENT FOR ATTENUATION BASIN 4			
	CATCHMENT 1 ATTENUATION BASIN ATTENUATION VOLUME = 3,800m <sup>3</sup> (APPROXIMATE AREA = 5,500m <sup>2</sup> )			
	CATCHMENT 2 ATTENUATION BASIN ATTENUATION VOLUME = 3,100m <sup>3</sup> (APPROXIMATE AREA = 4,400m <sup>2</sup> )			
	CATCHMENT 3 ATTENUATION BASIN ATTENUATION VOLUME = 2,700m <sup>3</sup> (APPROXIMATE AREA = 3,600m <sup>2</sup> )			
	CATCHMENT 4 ATTENUATION BASIN ATTENUATION VOLUME = 6,600m <sup>3</sup> (APPROXIMATE AREA = 9,900m <sup>2</sup> )			

A	UPDATED CAPACITY PLAN 01.03.19	04.03.19	SR	PE
Mark	Revision	Date	Drawn	Chkd
			Appd	

**SCALING NOTE:** Do not scale from this drawing. If in doubt, ask.  
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**Drawing Issue Status**

**INFORMATION**

**LAND AT CALCOTT HALL FARM  
BRENTWOOD  
SURFACE WATER DRAINAGE STRATEGY**

Client <b>HALLAM LAND MANAGEMENT</b>			
Date of 1st Issue FEBRUARY 2019	Designed SR	Drawn SR	
AD Scale 1:2000	Checked PE	Approved PE	
Drawing Number <b>42579/4001/002</b>	Revision A	<p><small>© Peter Brett Associates LLP NORTHAMPTON Tel: 01604 878 300</small></p>	

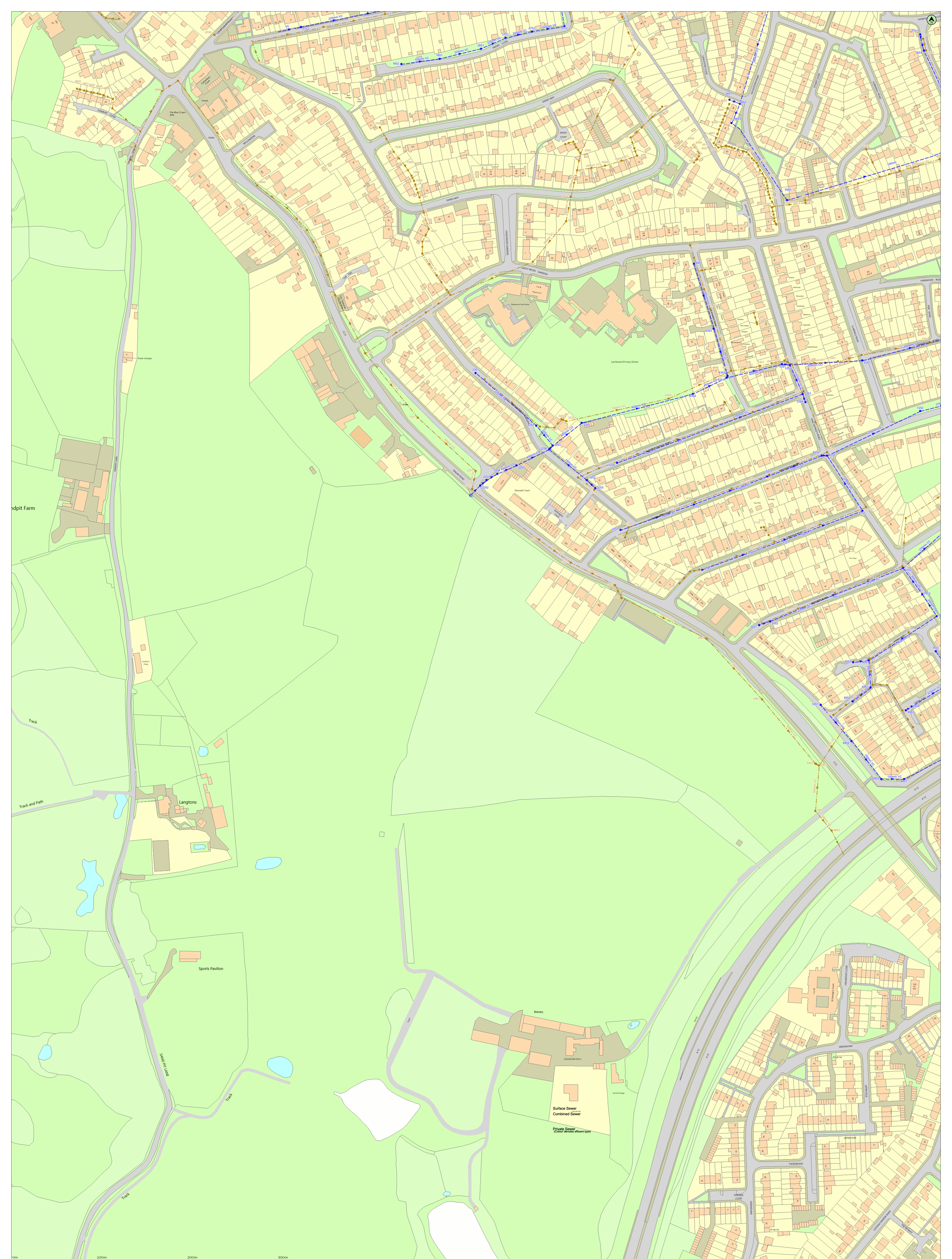
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# TECHNICAL NOTE

## Appendix C

Anglian Water Asset Records





0m 100m 200m 300m

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Data updated 01/11/18

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent Sewer
- Rising Main
- Private Sewer
- Decommissioned Sewer

- Outfall
- Inlet
- Manhole
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

ebull@peterfret.com  
Calcutt

Scale: 1:250  
Map Centre: 56218.19646  
Date: 20/11/18  
OU Ref: 20660-1  
Version: Plan A1  
Prepared by: djp



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# TECHNICAL NOTE

## Appendix D

Environment Agency Flood Mapping Plan



# Flood map for planning

Your reference  
**Calcott PLace**

Location (easting/northing)  
**558045/194802**

Created  
**31 Jan 2019 12:30**

**Your selected location is in flood zone 1, an area with a low probability of flooding.**

## **This means:**

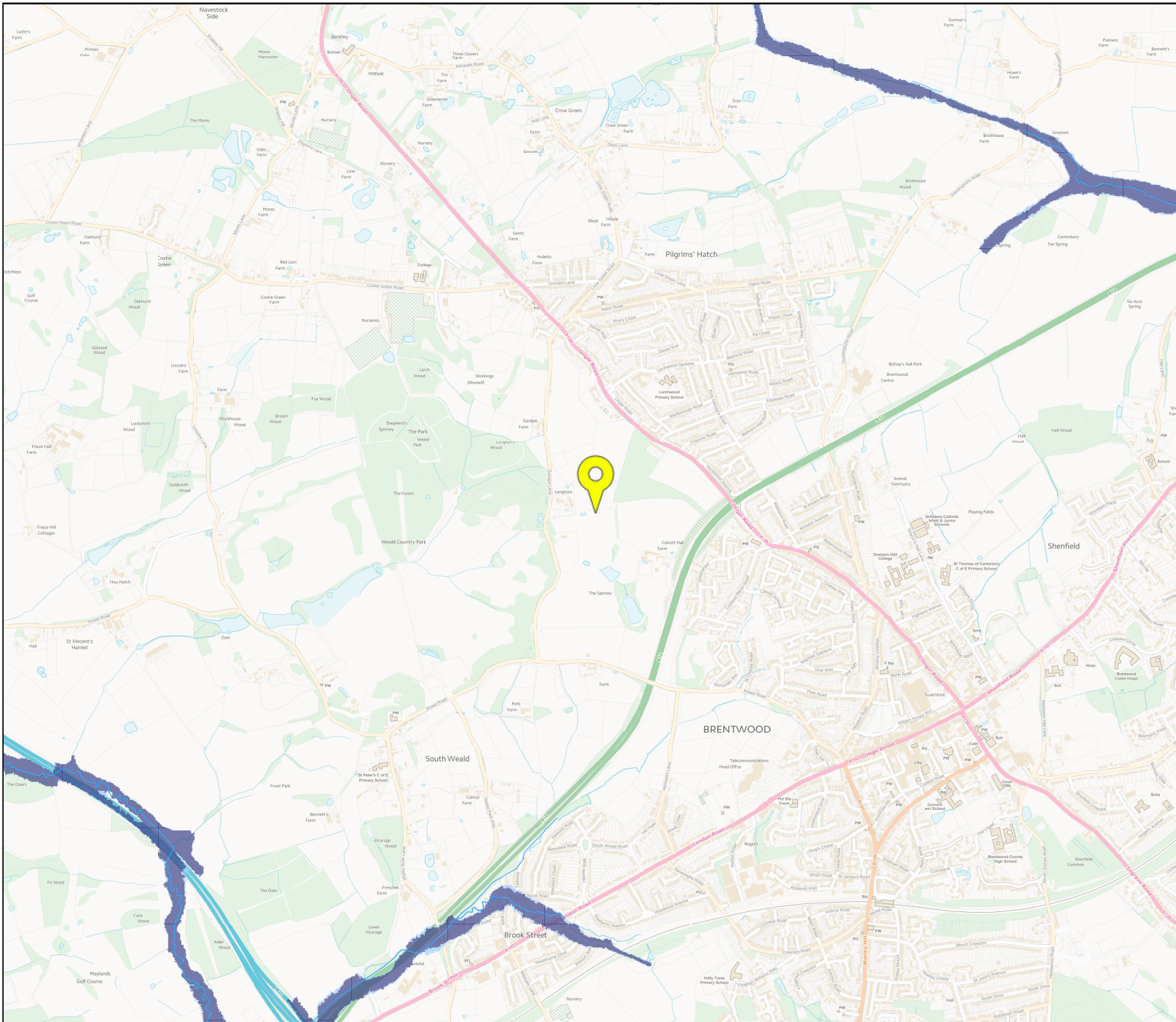
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

## **Notes**

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>











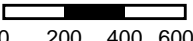
### Flood map for planning

Your reference  
**Calcott PLace**

Location (easting/northing)  
**558045/194802**

Scale  
**1:25000**

Created  
**31 Jan 2019 12:30**

-  Selected point
  -  Flood zone 3
  -  Flood zone 3: areas benefiting from flood defences
  -  Flood zone 2
  -  Flood zone 1
  -  Flood defence
  -  Main river
  -  Flood storage area
-   
 0 200 400 600m

# TECHNICAL NOTE

## Appendix E

Essex County Council Outline drainage design checklist

[Essex flood and water management \(/\) / \[New development advice \\(/new-development-advice/\\)\]\(#\)  
 / \[How to design Sustainable drainage systems \\(SuDS\\) in Essex \\(/new-development-advice/how-to-design-suds-in-essex/\\)\]\(#\)  
 / Outline drainage design checklist](#)

# Outline drainage design checklist

The following checklists should be completed by the applicant and submitted as part of the relevant planning application in order to demonstrate that the necessary information has been supplied to assess the suitability of the proposed sustainable drainage system, in line with Paragraphs 103 and 109 of the National Planning Policy Framework (NPPF).

Failure to provide any of the information requested below may result in the Lead Local Flood Authority (LLFA) making recommendation for refusal of the planning application on grounds of insufficient information.

1. Demonstrate an understanding of the natural drainage characteristics within and adjoining the site.
2. Provide an outline assessment of existing geology, ground conditions and permeability through desk-based research e.g. a review of geology maps and catchment information and site visit observations. Infiltration tests should be carried out at this stage wherever possible.
3. Prepare a Conceptual Drainage Plan to show the above together with:
  - a. The proposed 'management train'
  - b. Indicative location and type of source control
  - c. Site controls with storage locations
  - d. Conveyance and exceedence routes
  - e. The destination of runoff.
4. Provide a Conceptual SuDS Design Statement describing:
  - a. The SuDS Design Criteria applicable to the site
  - b. Reasoning for inclusion of the selection of SuDS features
  - c. Indicative runoff rate calculations and attenuation volumes for the lifetime of the development
  - d. Integration with landscape design
  - e. Any phasing plan for the development
  - f. Management of health and safety risks
  - g. Explanation of land use decision and how they impact drainage
  - h. Proposed method of flow control
  - i. Information regarding the proposed treatment stages to be applied to each element of the site
  - j. Demonstration that surface water/groundwater entering the development from adjacent land has been taken into account.

For further advice about the information requested in this checklist please contact Essex County Council using the following email address [SuDS@essex.gov.uk](mailto:SuDS@essex.gov.uk) (<mailto:SuDS@essex.gov.uk>) or view our [SuDS guide \(PDF, 15mb\)](#) ([https://www.essex.gov.uk/Environment%20Planning/Environmental-Issues/local-environment/flooding\\_old/Documents/suds\\_design\\_guide.pdf](https://www.essex.gov.uk/Environment%20Planning/Environmental-Issues/local-environment/flooding_old/Documents/suds_design_guide.pdf)).

## Was this page useful?

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## New development advice

[What are sustainable drainage systems \(SuDS\)? \(/new-development-advice/what-are-sustainable-drainage-systems/\)](#)

[How to design Sustainable drainage systems \(SuDS\) in Essex \(/new-development-advice/how-to-design-suds-in-essex/\)](#)

[Outline drainage design checklist \(/new-development-advice/how-to-design-suds-in-essex/outline-drainage-design-checklist/\)](#)  
[Detailed drainage design checklist \(/new-development-advice/how-to-design-suds-in-essex/detailed-drainage-design-checklist/\)](#)

[Apply for SuDS advice \(/new-development-advice/apply-for-suds-advice/\)](#)

What is the SuDS Adoption Policy? (/new-development-advice/suds-adoption-policy/)

## Related Items

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Detailed drainage design checklist (/new-development-advice/how-to-design-suds-in-essex/detailed-drainage-design-checklist/)

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## TECHNICAL NOTE

### Appendix F

Micro Drainage Quick Storage Estimates

## Catchment 1

The screenshot shows the 'Quick Storage Estimate' dialog box with the 'Variables' tab selected. The interface includes a sidebar with navigation options: Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains various input fields for parameters such as rainfall type, return period, version, site coordinates, and infiltration coefficients. At the bottom, there are buttons for 'Analyse', 'OK', 'Cancel', and 'Help', along with a status bar indicating the climate change range.

Parameter	Value
FEH Rainfall	FEH Rainfall
Return Period (years)	100
Version	1999
Site	GB 558300 194000 TQ 58300 94000
C (1km)	-0.021
D1 (1km)	0.278
D2 (1km)	0.276
D3 (1km)	0.229
E (1km)	0.311
F (1km)	2.593
Cv (Summer)	0.850
Cv (Winter)	0.850
Impemeable Area (ha)	3.418
Maximum Allowable Discharge (l/s)	7.6
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

The screenshot shows the 'Quick Storage Estimate' dialog box with the 'Results' tab selected. The main area displays a message regarding the approximate storage required based on the global variables entered. The same sidebar and bottom buttons are visible.

**Global Variables require approximate storage of between 3388 m<sup>3</sup> and 4235 m<sup>3</sup>.**

**These values are estimates only and should not be used for design purposes.**

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

## Catchment 2

Quick Storage Estimate

Micro Drainage

Variables

FEH Rainfall	Cv (Summer)	0.850
Return Period (years) 100	Cv (Winter)	0.850
Version 1999	Impervious Area (ha)	2.746
Site GB 558300 194000 TQ 58300 94000	Maximum Allowable Discharge (l/s)	6.1
C (1km) -0.021 D3 (1km) 0.229	Infiltration Coefficient (m/hr)	0.00000
D1 (1km) 0.278 E (1km) 0.311	Safety Factor	2.0
D2 (1km) 0.276 F (1km) 2.593	Climate Change (%)	40

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 2722 m<sup>3</sup> and 3403 m<sup>3</sup>.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

### Catchment 3

**Quick Storage Estimate**

Micro Drainage

**Variables**

FEH Rainfall	Cv (Summer)	0.850
Return Period (years): 100	Cv (Winter)	0.850
Version: 1999	Impervious Area (ha)	2.410
Site: GB 558300 194000 TQ 58300 94000	Maximum Allowable Discharge (l/s)	5.4
C (1km): -0.021	D3 (1km): 0.229	Infiltration Coefficient (m/hr): 0.00000
D1 (1km): 0.278	E (1km): 0.311	Safety Factor: 2.0
D2 (1km): 0.276	F (1km): 2.593	Climate Change (%): 40

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

**Quick Storage Estimate**

Micro Drainage

**Results**

**Global Variables require approximate storage of between 2385 m<sup>3</sup> and 2983 m<sup>3</sup>.**

**These values are estimates only and should not be used for design purposes.**

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

## Catchment 4

Quick Storage Estimate

Micro Drainage

**Variables**

FEH Rainfall

Return Period (years) 100

Version 1999

Site GB 558300 194000 TQ 58300 94000

Cv (Summer) 0.850

Cv (Winter) 0.850

Impemeable Area (ha) 5.914

Maximum Allowable Discharge (l/s) 13.2

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 40

C (1km) -0.021 D3 (1km) 0.229

D1 (1km) 0.278 E (1km) 0.311

D2 (1km) 0.276 F (1km) 2.593

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Quick Storage Estimate

Micro Drainage

**Results**

Global Variables require approximate storage of between 5858 m<sup>3</sup> and 7325 m<sup>3</sup>.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Catchment Reference	Catchment Area (ha)	Impermeable Area (ha) (65% of Catchment Area)	Allowable Discharge (l/s)	Approximate storage volume (m <sup>3</sup> ) for 10% urban creep and 1 in 100-year (plus 40% climate change) event (m <sup>3</sup> )	Approximate Pond Size (m <sup>2</sup> )
1	4.78	3.11	7.61	3,800	5,500
2	3.84	2.50	6.12	3,100	4,400
3	3.37	2.19	5.37	2,700	3,600
4	8.27	5.38	13.17	6,600	9,900