



Land at Bird in Eye Farm South of Bird in Eye Hill, Uckfield

**Flood Risk Assessment
Including Drainage Strategy & SuDS Report**

On behalf of **Croudace Homes Limited and Mr & Mrs Berry**

Project Ref: 48494/2001 | Rev: C | Date: April 2021

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Executive Summary

This Flood Risk Assessment (FRA) has been prepared by Stantec to support an outline planning application for residential development at Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield.

In accordance with the fundamental objectives of the National Planning Policy Framework (NPPF), this FRA demonstrates that:

- i. The development is safe.
- ii. The development does not increase flood risk.
- iii. The development does not detrimentally affect third parties.

The Environment Agency (EA) 'Flood Map for Planning' shows the site lies partly within Flood Zone 1, 2 and 3 as defined in the Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' Table 1 as follows:

Flood Zone 1 – Low Probability: Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

Flood Zone 2 – Medium Probability: Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)

Flood Zone 3a - High Probability: Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding (land shown in dark blue on the Flood Map)

The sequential approach has been applied to the development masterplan. The proposals for residential dwellings constitute a **More Vulnerable** land use, which is considered appropriate within Flood Zone 1 and 2 (reference PPG: Tables 2 in Paragraph 066 Reference ID: 7-067-20140306 and Table 3 in Paragraph: 067 Reference ID: 7-067-20140306).

As all built development lies entirely within Flood Zone 1, the requirements of the Sequential and Exception tests are met.

The flood risk mitigation strategy for the development consists of the following elements:

- The proposed ground floor levels are set at a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change level; and
- Continuous safe access from the site is provided at the 1 in 100 annual probability plus climate change flood level.

The Surface Water Drainage Strategy has been developed using best practice Sustainable Drainage System (SuDS) techniques. Guidance on suitable techniques and methods has been obtained from the EA, the Non-Statutory Technical Standards for Sustainable Drainage Systems, East Sussex County Council's Local Flood Risk Management Strategy and 'The SuDS Manual' (CIRIA C753) amongst other sources.

The proposed development should manage surface water runoff utilising sustainable drainage methods including source control (pervious pavements, water butts and bioretention), conveyance (filter strips and swales), and site control (detention basin). The outfall is be into the existing watercourse with the discharge rate limited to match the existing greenfield runoff rates or less for the site.

Foul water, or effluent, flows from the site will be managed in a new sewer network, which will connect into the existing public foul sewer network in Bird in Eye Hill.

In summary, the FRA demonstrates that the proposed development is safe and in accordance with the requirements of national and local planning policy.

1 Introduction

1.1 Scope of Report

- 1.1.1 This Flood Risk Assessment (FRA) has been prepared by Stantec of behalf of our Clients, Croudace Homes Limited and Mr & Mrs Berry, to support an outline planning application for Land at Bird in Eye Farm, South of Bird in Eye Hill in Uckfield, East Sussex.
- 1.1.2 The report is prepared in accordance with the planning policy requirements set out in **Section 1.3** and based on available information for the site as detailed in **Section 2**, and. The scope of the FRA is consistent with the 'site specific Flood Risk Assessment Checklist' from the National Planning Policy Framework (NPPF) Planning Practice Guidance.

1.2 Sources of Information

- 1.2.1 The FRA has been prepared based on the following sources of information:
- Topographic survey of the site (Drawing reference ENC/020320/6JJ2) undertaken by Encompass Surveys Ltd in March 2020;
 - Development proposals by Paul Brown Architects (Reference PRB/BIE/PA2N – Illustrative Site Layout);
 - Environment Agency (EA) published '**Open Data**' datasets available online, reproduced with OS mapping under licence to Stantec (contains Ordnance Survey data © Crown copyright and database right [2017], contains Environment Agency information © Environment Agency and database right);
 - The **EA Online Flood Maps** for Planning ^[1] and Long Term Flood Risk ^[2];
 - **EA Product 4 data** dated 16th April 2020, reference SSD168006;
 - Flood Estimation Handbook 2013 (FEH13) rainfall data and point descriptors, extracted from the FEH online service;
 - The Preliminary Flood Risk Assessment (PFRA), prepared by East Sussex County Council dated June 2011;
 - The **Level 1 Strategic Flood Risk Assessment** (SFRA), prepared by Wealden District Council dated June 2017;
 - The Local Flood Risk Management Strategy 2016-2026 (LFRMS), prepared by East Sussex County Council dated September 2016;
 - The 'Uckfield Stage 1, Surface Water Management Plan (SWMP)', prepared by East Sussex County Council dated June 2016;
 - The 'Guide to Sustainable Drainage Systems in East Sussex', prepared by East Sussex County Council dated June 2015; and

^[1] <https://flood-map-for-planning.service.gov.uk/>

^[2] <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

- 'Water. People. Places: A guide for master planning sustainable drainage into developments', prepared by the Lead Local Flood Authorities of the South East of England dated September 2013.

1.3 Relevant Planning Policy

1.3.1 This FRA has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance as follows:

- National policy contained within the revised **National Planning Policy Framework (NPPF)** dated February 2019, issued by Ministry of Housing, Communities and Local Government, with reference to Section 14 '*Meeting the challenge of climate change, flooding and coastal change*'.
- The **Planning Practice Guidance (PPG)** for Flood Risk and Coastal Change released in March 2014 and updated in February 2016 to incorporate the EA '**Flood Risk Assessments: Climate Change Allowances**' guidance.
- The **Water Framework Directive (WFD)** (Commission of the European Communities, released 2000) (ref 13.2) establishes a framework for a European-wide approach to action in the field of water policy. Its ultimate aim is to ensure all inland and near shore watercourses and water bodies (including groundwater) are of 'Good' status or better, in terms of ecology, and also chemical, biological and physical parameters, by the year 2027. Therefore, any activities or developments that could cause detriment to a nearby water resource or prevent the future ability of a water resource to reach its potential status, must be mitigated so as to reduce the potential for harm and allow the aims of the Directive to be realised.
- **Design and Construction Guidance, also referred to as Sewers for Adoption 8th Edition (SfA8)**. On 25 October 2019, Ofwat approved the revised adoption documentation submitted by Water UK. The documentation includes the "Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code)". This new sewage adoption arrangement came into effect on 1 April 2020 and wholly replaces previous editions of Sewers for Adoption. For the first time, specific SuDS components are included as adoptable elements of a drainage system.
- The Level 1 **Strategic Flood Risk Assessment** assess the risk of flooding to the area from all sources, now and in the future, taking account of the impacts of climate change. This includes the risk of flooding from watercourses, the sea, surface water, groundwater, reservoirs, sewers and artificial sources. The assessment of flood risk presented provides sufficient detail to enable the Sequential Test to be applied and, where applicable, the Exception Test. The reports provide detail of historic flooding records in the study area and mapping of differentiated Flood Zone 3a and 3b.
- The **Local Flood Risk Management Strategy** focuses on managing the risk of flooding to people and property due to surface runoff, ordinary watercourses and groundwater, in line with our responsibilities. The strategy provides detail of historic flooding records in the study area.
- The **Surface Water Management Plan** for Uckfield (Stage 1) is led by a partnership of flood risk management authorities who have responsibilities for aspects of local flooding, including the County Council, District Council, sewerage undertaker, Internal Drainage Boards, and other relevant authorities. The plan is a study to understand the flood risk that arises from surface runoff, groundwater and ordinary watercourses. Using a Source-Pathway-Receptor model hotspots were identified in the plan, where there were repeated incidents and/or multiple flood mechanisms along with areas of predicted flood risk.

- 1.3.2 The local planning authority will make decisions with regards to any planning application within any floodplain or flood risk area. The EA is a designated statutory consultee for areas within Flood Zones, areas with critical drainage problems, and plays a key role in providing advice on development and flood risk issues. The Lead Local Flood Authority (LLFA) is a statutory consultee for major developments which have surface water or other local flooding impacts.
- 1.3.3 This FRA should be read in conjunction with other planning application supporting documents.

1.4 Caveats and Exclusions

- 1.4.1 This FRA has been prepared in accordance with the NPPF and Local Planning Policy. The proposed flood management (including ground floor level recommendations) and surface water management strategies are based on the relevant British Standards (BS8533:2017), the standing advice provided by the EA or based on common practice.
- 1.4.2 The Construction (Design and Management) Regulations 2015 (CDM Regulations) will apply to any future development of this site which involves “construction” work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.
- 1.4.3 The approach for the FRA and proposals for the surface water management strategy are based on the requirements of the EA and East Sussex County Council in its role as LLFA.
- 1.4.4 The findings of this FRA are based on data available at the time of the study and on the subsequent assessment that has been undertaken in relation to the development proposals.
- 1.4.5 The EA Product 4 flood data on which the FRA is based is valid under a 12-month licence. As such, the FRA is accurate at time of issue, but we would recommend the end user reviews the validity of the flood data on an annual basis with the EA.
- 1.4.6 It should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development. Stantec does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

1.5 Flood Risk Assessment Credentials

- 1.5.1 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are all experienced engineers and members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

2 Proposed Development Site

2.1 Site Description

- 2.1.1 The approx. 41 hectare (ha) site is located at Land at Bird in Eye Farm, to east of Uckfield in East Sussex County (approximate Ordnance Survey (OS) grid reference 548301m E, 120692m N). The site is split into the two parcels, one being approximately 25ha of land which has been set aside as Strategic Suitable Alternative Natural Green Space (SANG), the second being approximately 16ha of proposed developable area. The latter being the area which has been assessed within this FRA.
- 2.1.2 The town of Uckfield lies within the administrative boundary of Wealden District Council (WDC).
- 2.1.3 The site consists of agricultural land surrounding the Bird in Eye Farm complex. The site is bound by the B2102 Bird in Eye Hill to the north, by Framfield Stream to the west, by Bird in Eye Shaw to the south, and by agricultural land to the east. Access to the site is via the B2102 Bird in Eye Hill.
- 2.1.4 A site location and key features plan is provided in **Appendix A**.

2.2 Existing Topography

- 2.2.1 A review of LiDAR data has been undertaken and shows the site falls on a generally western direction.
- 2.2.2 A topographic survey, undertaken in March 2020 by Encompass Surveys Ltd, of the site has been undertaken and confirms that the site falls west from a high point of approximate 53.0m AOD at the north east corner, towards a low point of 21.0m AOD on the western boundary, which equates to an average gradient across the site of 1:15. Steeper grades are noted along the western boundary which as steep as 1:6.
- 2.2.3 LiDAR heatmap and topographical survey information can be found in **Appendix A and B** respectively.

2.3 Hydrological Setting

- 2.3.1 The Framfield Stream, flows from south to north along the western boundary of the site towards its confluence with the River Uck approximately 375m north of the site boundary. Both watercourses are designated as Main Rivers by the EA.
- 2.3.2 The Chalybeate Arm, designated as an Ordinary Watercourse, runs in parallel to the Framfield Stream, at a distance of approximately 50m between the two watercourses. The Chalybeate Arm follows north and is a tributary of Framfield Stream before its discharges into the River Uck.
- 2.3.3 Approximately 25m south of the site, there is a minor watercourse (also an Ordinary Watercourse) which flows east to west and is a tributary of the Framfield Stream. OS mapping indicates that there are several springs along both of the watercourses.

Water Quality

- 2.3.4 The WFD establishes a framework for a European-wide approach to action in the field of water policy. The EA Catchment Data Explorer ^[1] website has water quality data relating to the WFD targets for 2027. Based on the most recent water quality data recorded in 2016,

^[1] <https://environment.data.gov.uk/catchment-planning/>

Framfield Stream was classified as having a 'Bad' rating for the quality of the overall water body. A chemical water quality of 'Good' was assigned to the river, however the ecological water quality was classified as 'Bad' and thus, the overall water body was classified to be of 'Bad' rating. The 'Reasons for Not Achieving Good' are flow (dissolved oxygen), invasive non-native (fish) and Macrophytes and Phytobenthos.

- 2.3.5 Downstream lies the Uck at Uckfield which was classified as having a 'Moderate', with 'Reasons for Not Achieving Good' relating to diffuse source and point source (phosphates) and the watercourse being in the protected area of the Nitrate Directive.
- 2.3.6 Any surface water runoff associated with the proposed development should therefore seek to maintain the chemical water quality of the watercourse but improve the ecological water quality through an integrated SuDS strategy.

2.4 Geology and Hydrogeology

- 2.4.1 The Geology of Britain viewer provided by the British Geological Survey (BGS) ^[1] indicates that the site is underlain by a bedrock of Lower Tunbridge Well Sand – Sandstone. The area surrounding the watercourse has superficial deposits of Alluvium – Clay, Silt, Sand and Gravel.
- 2.4.2 Mapping indicates the deposits to be a Secondary A aquifer and the groundwater vulnerability to be high. Also, the site does not lie within a Source Protection Zone. The SWMP drainage risk area mapping indicates the groundwater depths relating to the areas. The map shows the majority of the site is suggested to have a low groundwater depth (>5m), however the parts of the south and west of the site lie in an area of high groundwater depth (<3m).

2.5 Existing Drainage Arrangements

On-Site Drainage

- 2.5.1 The site consists primarily of open agricultural land, such that surface water would either drain via natural infiltration into the ground or would drain downslope towards the existing watercourse.
- 2.5.2 A ditch running from east to west on the western half of the site was noted through the centre of the field. This could be an informal channel for the discharge of runoff from the farm hardstanding to the Farmfield stream but would need to be investigated further to confirm functionality.

Public Sewers

- 2.5.3 Southern Water has provided copies of its sewerage infrastructure plans for the site and surrounding area. The mapping shows there to be no existing surface water sewers in or surrounding the site.
- 2.5.4 A copy of the sewer asset plan is provided in **Appendix C**.

^[1] <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

3 Assessment of Flood Risk

3.1 Environment Agency Flood Mapping

- 3.1.1 The first phase in identifying whether a site is potentially at risk of flooding is to consult the 'Flood Map for Planning' hosted on the GOV.UK website ^[1]. This website presents the Flood Zones, which are the starting point for assessing the probability of flooding from rivers and/or the sea. They are also used as the basis for determining which development types are appropriate within a given location and whether the Sequential Test or Exception Test need to be applied.

Flood Map for Planning

- 3.1.2 Flood Zone definitions are set out in Table 1 of the online PPG (Paragraph: 065 Reference ID: 7-065-20140306) as below:

- **Zone 1 – Low Probability:** Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
- **Zone 2 – Medium Probability:** Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
- **Zone 3a - High Probability:** Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
- **Zone 3b – The Functional Floodplain:** This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment ^[2] when considering location and potential future flood risks to developments and land uses."

- 3.1.3 The Flood Zones are predominantly based on hydraulic modelling work, although Flood Zone 2 can extend to include recorded flood outlines. Where detailed modelling has not been carried out, the Flood Zones are based on the 'National Generalised Flood Model'. This model does not explicitly represent channel geometry or structures such as culverts, bridges and weirs and hence may not provide an accurate estimation of the probability of flooding.
- 3.1.4 The Flood Zone map does not differentiate between Flood Zone 3a 'High Probability' and Flood Zone 3b 'Functional Floodplain' (the defined Flood Zone 3 is effectively a composite of Zone 3a and Zone 3b, and further review of the SFRA is required to define the extent of Zone 3b).
- 3.1.5 The majority of the site is shown by the EA's 'Flood Map for Planning' to lie within **Flood Zone 1 'Low probability'**. The areas adjacent to the existing watercourse flowing along the western

^[1] <https://flood-map-for-planning.service.gov.uk/>

^[2] <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Strategic-Flood-Risk-Assessment-section>

boundary are shown by the EA 'Flood Map for Planning' to lie within Flood Zone 2 and 3 'Medium and High probability' (see **Figure 3.1** or **Appendix D**).

3.1.6 The EA Product 4 confirm 'there are no formal EA defences protecting this site'.

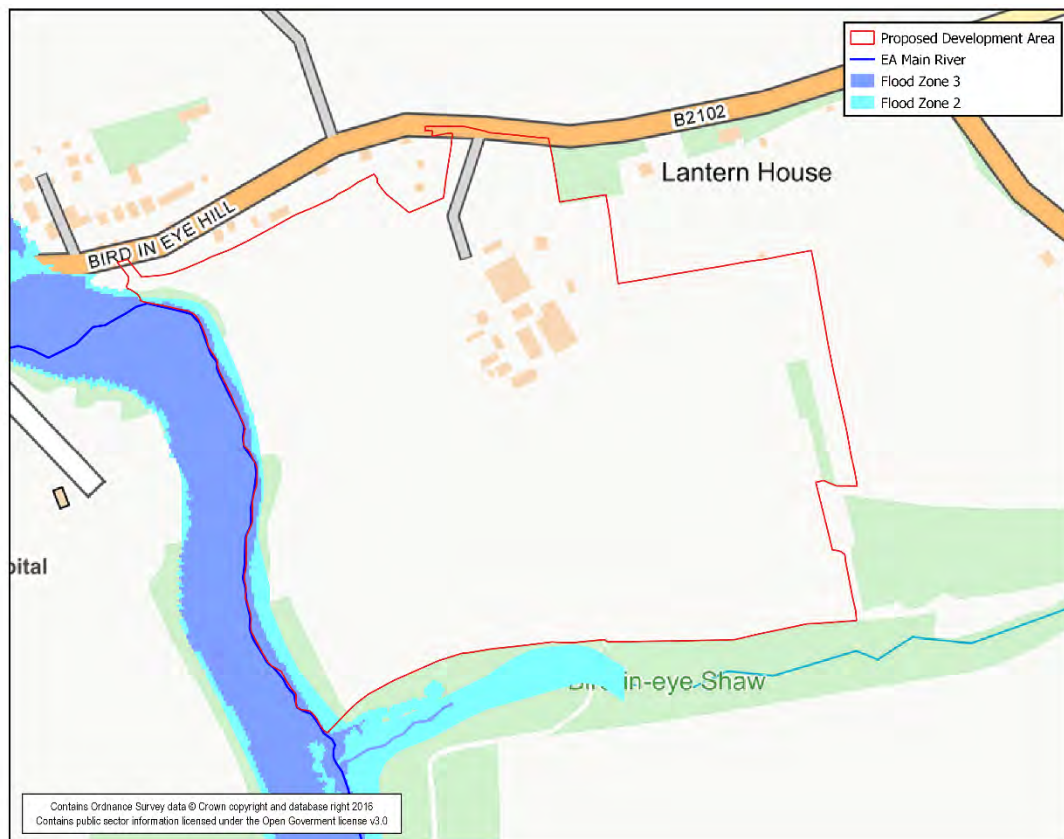


Figure 3.1 - EA Flood Map for Planning

Flood Risk from Surface Water Mapping

3.1.7 The 'Flood Risk from Surface Water' mapping, hosted on the flood warning information service website^[1], show areas which could be potentially susceptible to surface water flooding in extreme rainfall events.

3.1.8 The mapping has been derived by broadscale modelling using ground levels defined on a 2m square grid with building footprints raised by 0.3m, roads lowered by 0.125m and variable roughness values used to account for different land uses. Rainfall events of various likelihoods and durations were then simulated to determine likely flood depths and velocities for different risk categories.

- **High** - each year, the area has a chance of flooding of greater than 1 in 30 (3.3%)
- **Medium** - each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- **Low** - each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)

^[1] <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

- **Very low** - each year, the area has a chance of flooding of less than 1 in 1000 (0.1%)

- 3.1.9 It should be noted that the surface water maps are generated using a generic methodology on a national scale, whereby rainfall is routed over a ground surface model. The analysis does not take account of any specific local information on below-ground drainage infrastructure and infiltration, although an adjustment is included in urban areas to account for the impact of sewerage and a standard infiltration allowance based on soil type. Consequently, the mapping provides a guide to potentially vulnerable areas based on the general topography of an area.
- 3.1.10 The mapping indicates that the majority of the site lies in an area of *Very Low* risk of flooding from surface water. There are some areas of *Low* risk of flooding from surface water which lies adjacent to field boundaries within the site. The area surrounding the watercourse, along the western boundary, is shown to have *Low*, *Medium* and *High* risk of flooding from surface water (see **Figure 3.2** or **Appendix D**).
- 3.1.11 Further information on the Flood Risk Maps for Surface Water can be found in *Risk of flooding from surface water - Understanding and using the map* document hosted on the GOV.UK website^[2].

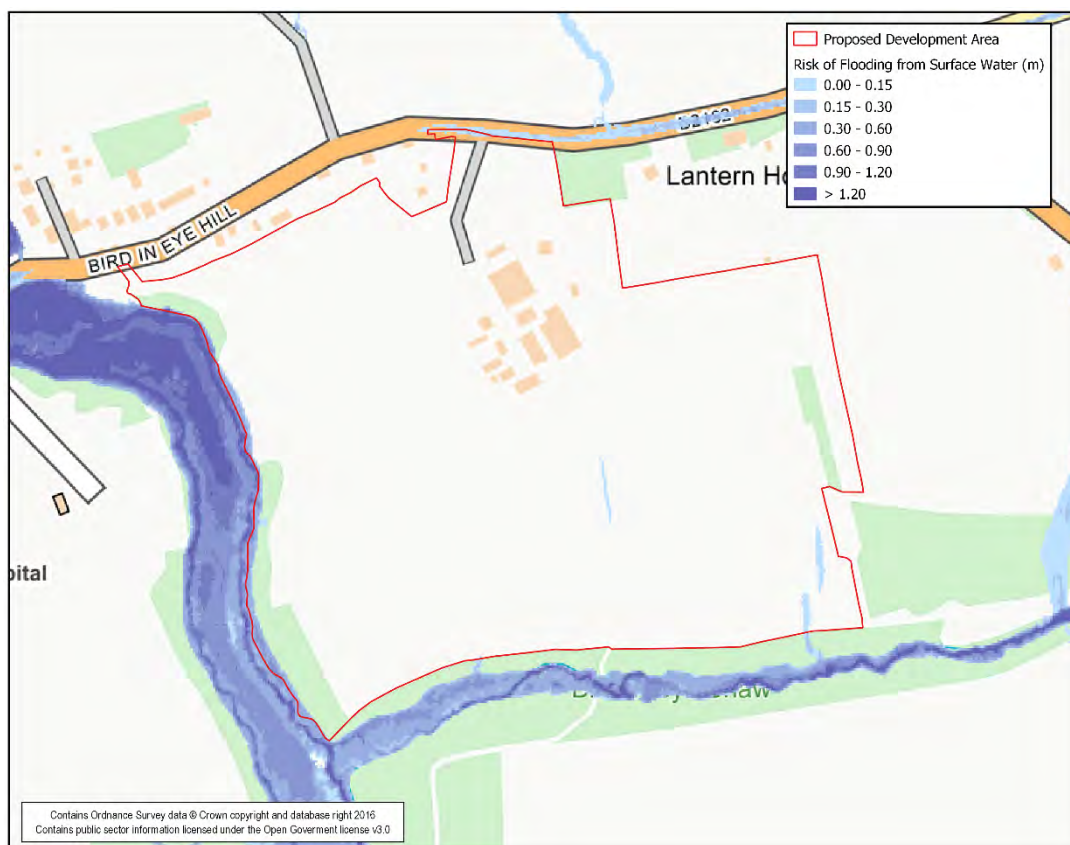


Figure 3.2 - EA Risk of Flooding from Surface Water (Depth (m), 1 in 1000 year)

^[2] <https://www.gov.uk/government/publications/flood-risk-maps-for-surface-water-how-to-use-the-map>

Flood Risk from Reservoirs Mapping

- 3.1.12 The '*Flood Risk from Reservoirs Mapping*' is hosted on the flood warning information service website ^[1] and present extents, depths and velocities of flooding for simulated, hypothetical '*credible worst case*' dam breaches for reservoirs with a capacity of 25,000m³ or greater. These reservoirs fall under the *Reservoir Act 1975*.
- 3.1.13 The mapping indicates that the site is not at risk of flooding from reservoirs.

3.2 Groundwater Flooding

- 3.2.1 No records of groundwater flooding have been identified within the site boundary, as part of the information gathering for this FRA.
- 3.2.2 The SFRA highlights there to be one historic record of groundwater flooding in the Uckfield area.
- 3.2.3 The PFRA, LFRMS and SWMP hotspot mapping shows the site lies in an areas of moderate/low groundwater flood risk.

3.3 Sewer Flooding

- 3.3.1 No records of sewer flooding have been identified within the site boundary, as part of the information gathering for this FRA.

3.4 Flooding from Artificial Sources

- 3.4.1 Artificial sources of flooding including canals, lakes and ponds. No such features have been identified that could present a flood risk to the site.

3.5 Historic Flooding

- 3.5.1 The EA 'Historic Flood Map' is a dataset showing the maximum extent of all individual recorded flood outlines from river, the sea and groundwater and shows areas of land that have previously been subject to flooding which shows records historic events have affected the western boundary of the site on the land adjacent to the watercourse. A copy of the datasets is shown in **Figure 3.3** or **Appendix D**.
- 3.5.2 The EA Product 4 and 'Recorded Flood Outlines' dataset shows records of flooding along the western boundary from 12th to 14th October 2000 result of channel capacity exceedance (no raised defences present).

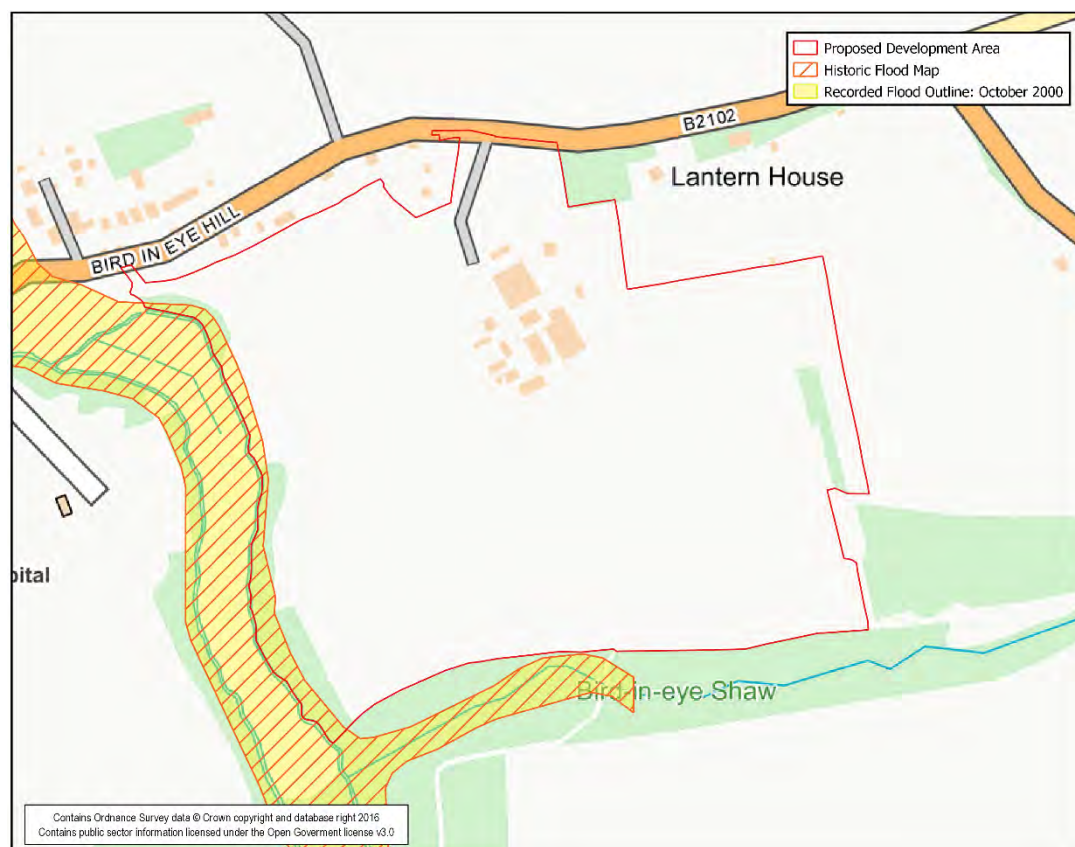


Figure 3.3 - EA Historic Flood Data

3.6 EA Modelled Flood Data – River Uck

- 3.6.1 The EA have also provided their detailed 'Product 4' flood risk information (EA ref: SSD168006). This includes modelled data taken from the River Uck Flood Risk Mapping Study, completed in Summer 2012 and is a 1D-2D ISIS TUFLOW model.
- 3.6.2 The data provided shows that there are 3 model nodes along the Framfield Stream adjacent to the western boundary of the site. The model was run for both defended and undefended scenarios. The EA Product 4 response summarises the modelled levels at nodes adjacent to the site.

Node	Undefended Water Levels (mAOD)		Defended Water Levels (mAOD)	
	1% AEP	0.1% AEP	1% AEP	0.1% AEP
1	21.55	22.17	21.55	22.15
2	21.49	22.13	21.49	22.13
3	21.48	22.12	21.48	22.13

Table 3.1 - EA Product 4 Undefended and Defended Water Levels

3.6.3 A review of the topographical survey shows that the majority of the proposed development is situated at higher elevation (approximately 26.00mAOD) than the flood levels modelled by the EA. Therefore, confirming the majority of the site has a low probability of fluvial flooding.

3.6.4 A copy of the model extents, node location map and data extracted in **Appendix D**.

3.7 Impact of Climate Change

3.7.1 In considering flood risk to the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures.

3.7.2 The EA model outputs include flood levels for a 1 in 100 annual probability plus 35%, 45% and 105% allowance for climate change event for the undefended scenario. It is not clear what allowance has been made for the defended scenario, but these levels are indicated to be lower than the undefended scenario as would be expected.

Node	Undefended Water Levels (mAOD)			Defended Water Levels (mAOD)
	1% AEP + 35% Climate Change	1% AEP + 45% Climate Change	1% AEP + 105% Climate Change	1% AEP + Climate Change
1	n/a	n/a	n/a	21.79
2	21.89	21.95	22.19	21.76
3	21.89	21.95	22.18	21.75

Table 3.2 - EA Product 4 Undefended and Defended Water Levels including Climate Change Allowances

3.7.3 Based on the proposed development being situated at an elevation of approximately 26.00mAOD or higher, it is demonstrated to be unaffected by the climate change increase for fluvial flooding.

3.7.4 Increased in rainfall intensities would require consideration in any surface water drainage strategy for new development are detailed in **Table 3.3** and is discussed in **Sections 6 and 7**.

Applies Across All of England	Total Potential Change Anticipated for the '2080s' (2010 to 2115)
<i>Upper end</i>	40%
<i>Central</i>	20%

Table 3.3 - Climate Change Allowances for Peak Rainfall Intensity

4 Proposed Development and Sequential Test

4.1 Development Proposals

4.1.1 The application submitted is for:

'Outline planning application for up to 290 dwellings, associated landscaping, informal open space and strategic SANG, with access from the B2102. Appearance, landscaping, layout and scale are reserved.'

4.1.2 The site concept plan is provided within **Appendix E**.

4.2 Development Vulnerability

4.2.1 PPG 'Flood Risk and Coastal Change' Table 2 (Paragraph 066 Reference ID: 7-067-20140306) confirms the 'Flood risk vulnerability classification' of a site, depending upon the proposed usage. This classification is subsequently applied to PPG Table 3 (Paragraph: 067 Reference ID: 7-067-20140306) to determine whether:

- The proposed development is suitable for the flood zone in which it is located, and;
- Whether an Exception Test is required for the proposed development.

4.2.2 The proposed development comprises the following uses and vulnerability classes:

- **More Vulnerable:** Residential dwellings.
- **Water Compatible:** Open space.

4.2.3 All built development lies entirely within Flood Zone 1 and therefore all forms of development are compatible, as indicated in Table 3 of the online PPG (Paragraph: 067 Reference ID: 7-067-20140306).

4.3 The Sequential and Exception Test

4.3.1 The NPPF requires local Planning Authorities to apply the Sequential Test to steer new development towards areas of lowest flood risk. As the site boundary contains areas of Flood Zones 2 and 3, a Sequential Test is required.

4.3.2 It is assumed that owing to the site's allocation in the emerging Local Plan, that the Sequential Test has been applied by Wealden District Council and determined as passed.

4.3.3 Table 3 of the PPG sets out flood risk vulnerability and Flood Zone compatibility, including thresholds invoking the Exception Test. Proposing land uses in locations whose corresponding flood risk vulnerability is permitted by Table 3, this is referred to as applying the Sequential Approach. All proposed More Vulnerable development will be located in Flood Zone 1, in accordance with the Sequential Approach, whilst only Water Compatible development is proposed in Flood Zones 2 and 3.

4.3.4 Therefore, by applying the Sequential Approach, this FRA passes the Exception Test.

5 Flood Mitigation Strategy

5.1 Sequential Approach

- 5.1.1 The NPPF encourages the application of the 'sequential approach' in the master-planning process for new development, i.e. locating the more sensitive/vulnerable elements of new development in the areas which lie at lowest probability of flooding and, conversely, reserve the areas of the site at greatest risk of flooding for the least vulnerable elements of the development (or, preferably, leave such areas undeveloped or as soft landscaping).
- 5.1.2 As all built development lies within Flood Zone 1, the sequential approach is inherent in the proposed masterplan's design.

5.2 Building Design

Ground Floor Levels

- 5.2.1 Standard requirements for ground floor levels of new development are set out in BS8533:2011 'Assessing and Managing Flood Risk in New Development – Code of Practice'. This recommends floor levels are set a minimum of 300mm above the modelled 1 in 100 annual probability plus allowance for climate change flood level.
- 5.2.2 In the context of this site, based on the 1 in 100 annual probability undefended flood event plus 105% allowance for climate change, ground floor levels should be at least 22.09mAOD. Based on the existing topography, the lowest elevation where residential units are proposed is approximately 26.00mAOD, therefore the requirements of BS8533:2011 are inherently met.
- 5.2.3 It is also recommended that for areas where levels would be naturally above the recommendation above, ground floor levels are set a suitable freeboard above surrounding ground (minimum 150mm) to mitigate the residual flood risk associated with excess surface water runoff in an exceedance rainfall event i.e. a storm in excess of the required design standard. Similarly, exterior ground levels across the site should also be appropriately contoured to direct surface water away from dwellings in such a scenario.
- 5.2.4 An overland flow assessment for an exceedance event will be undertaken as part of a future Reserved Matters Application for the development, whereby individual property ground floor levels and proposed highway levels will be available. The overland flow assessment will identify what freeboard is required for ground floor levels.

5.3 Safe Access

- 5.3.1 It is necessary to consider and incorporate safe access arrangements as part of the mitigation, to ensure the users/occupants of the development are safe in times of flooding.
- 5.3.2 The proposed access to the site is shown not to be at risk of flooding as lies within Flood Zone 1. Therefore, it is considered that safe access and egress will be available during extreme events.

5.4 Flood Risk Activity Permit Requirements

- 5.4.1 Proposed works in, over, under or within 8m a main river or a flood defence require a 'Flood Risk Activity Permit' (FRAP) application to be made to the EA (this replaced the previous 'Flood Defence Consent' (FDC) procedure). This is required to demonstrate any new development does not have a detrimental impact on flood risk, either through impacting the integrity of the existing defence or through preventing maintenance access to the defence.

- 5.4.2 The only works proposed that would require a FRAP is the construction of a surface water drainage outfall to the Framfield Stream, although it may be possible through further detailed design of the drainage proposals to meet the EA's exemption criteria, removing the need for a FRAP. This process would be undertaken as part of a future Reserved Matters Application.

6 Surface Water Drainage Parameters

6.1 Overview

6.1.1 A key requirement for the proposed development is to seek that flood risk downstream is not increased. The potential is associated with additional runoff generated by the introduction of roofs and hard-paved surfaces as part of the development. These surfaces replace natural ground where water can percolate into soil pores and to a greater or lesser extent infiltrate into the underlying rock. Additionally, natural ground is more uneven, promoting localised ponding while vegetation intercepts rainfall by collecting water. Lastly, natural ground is generally more resistant flow, reducing the velocity of overland flow and the time that it takes to leave the site.

6.1.2 The replacement of natural surfaces has two principal effects on the land's response to rainfall:

- An increase in the rate of runoff.
- An increase in the volume of runoff.

Both of these impacts have the potential to increase the flood risk downstream. The rate of runoff is normally of principal concern as it can impact on the peak flow rate in the receiving watercourse or drainage network. Increasing the volume of runoff can also increase flood risk in particular situations.

6.1.3 The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface water runoff from development sites and recommended that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development.

6.2 Outfall Destination

6.2.1 The key design criteria for the surface water drainage system are detailed in the following documents:

- NPPF 'Planning Practice Guidance';
- DEFRA 'Non-Statutory Technical Standards for Sustainable Drainage Systems';
- 'The SuDS Manual' CIRIA C753;
- 'East Sussex Local Flood Risk Management Strategy';
- 'Water. People. Places: A guide for master planning sustainable drainage into developments', prepared by the Lead Local Flood Authorities of the South East;
- East Sussex 'Guide to Sustainable Drainage Systems in East Sussex'.

6.2.2 Based on the guidance, consistent with the PPG and Building Regulations Part H, the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practical:

- i. *Into the ground (infiltration);*
- ii. *To a surface water body;*
- iii. *To a surface water sewer, highway drain or another drainage system;*

iv. To a combined sewer.

6.2.3 The hierarchy is considered in order below.

Discharge into the Ground (Infiltration)

6.2.4 Based on the hierarchy, the preferred method for disposal of surface water from the new development is via infiltration drainage.

6.2.5 Based on geological information available), infiltration is potentially feasible within areas of the site (explained in Herrington Technical Drainage Note, dated 2015). However, as a result of the geology having an easily erodible nature which could be prone to surface collapse infiltration has been discounted at this stage. The drainage strategy has therefore been based on the likelihood of no infiltration taking place.

6.2.6 It is recommended that the infiltration potential on site is confirmed by targeted in-situ soakage testing supported by an intrusive ground investigation to confirm the structural capacity of the underlying geology to support infiltration, in accordance with BRE Soakaway Design (DG 365) to support a future reserved matters planning application. This approach has been agreed with the LLFA (see **Appendix F**).

Discharge to a Surface Water Body

6.2.7 In areas where infiltration is not possible, the next preference in the hierarchy is to discharge to a surface water body (watercourse, lake, ditch etc.).

6.2.8 The strategy for managing surface water has been developed on the assumption that infiltration is not feasible and therefore a review of the site topography was undertaken to determine the proportion of the site that naturally drains to a nearby surface water body. It was determined that the whole site currently drains to the watercourse, Framfield Stream, identified along the western boundary. This drainage pathway will be maintained post-development.

6.2.9 Between the site and the Framfield Stream, there is an area of Ancient Woodland. In order to minimise any disturbance to vegetation, it is proposed that the surface water outfall route utilises an existing clearing through the woodland in the vicinity of existing overhead cables. During detailed design of the site, it is recommended that a detailed survey of this area of the site is undertaken so individual trees and other vegetation can be identified and avoided. Further information regarding this outfall route can be found in **Appendix G**.

Discharge to a Surface Water Sewer, Highway Drain or Another Drainage System

6.2.10 In the instance that discharge to the nearby surface water bodies is not permitted, the next preference would be to discharge to an existing surface water sewer, highway drain or another drainage system.

6.2.11 Asset mapping received from Southern Water (**Appendix C**) indicates there are no existing public surface water sewer in the vicinity of the site. Therefore, this would not be a viable discharge option for the proposed development.

Discharge to a Combined Sewer

6.2.12 Where discharge to a surface water sewer, highway drain, or another drainage system is not possible a discharge connection to a combined sewer may be acceptable.

6.2.13 Asset mapping received from Southern Water (**Appendix C**) indicates there are no combined sewers within or surrounding the site. Therefore, this would not be a viable discharge option for the proposed development.

6.3 Surface Water Outfall

Discharge Rate Control

- 6.3.1 The DEFRA “Non-statutory Technical Standards for Sustainable Drainage” standard for peak flow control on a greenfield site is as follows:

“S2 – For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must not exceed the peak greenfield runoff rate for the same event.”

- 6.3.2 The East Sussex guidance indicates that the local standard for peak flow control matches that given in the DEFRA standards.
- 6.3.3 These greenfield runoff rates have been calculated using the FEH post-2008 Statistical Method, and FEH13 rainfall data and point descriptors, extracted from the FEH online service. Calculations of the equivalent present-day greenfield runoff rates can be found in **Appendix F**.
- 6.3.4 In accordance with DEFRA standard S2, peak discharge rates from the proposed development will be limited to match the equivalent present-day greenfield runoff rates as given in **Table 6.1**.

Return Period	Pre-development Greenfield Runoff Rate (l/s/ha)	Post-development Greenfield Runoff Rate (l/s/ha)
1 in 1 year	4.4	4.4
QBAR (1 in 2.3 year)	5.2	5.2
1 in 30 year	12.4	12.4
1 in 100 year	16.5	16.5
1 in 100 year plus 40% climate change allowance	23.1 (estimated)	16.5

Table 6.1 - 'Pre' and 'Post' Development Greenfield Runoff Rates

- 6.3.5 In order to mitigate against the likely effects of climate change, the post-development discharge rate for the 1 in 100 year storm (plus 40% additional allowance) will be limited to match the pre-development greenfield runoff rate for the 1 in 100 year storm.
- 6.3.6 A hypothetical present day 1 in 100 year plus climate change allowance runoff rate has been estimated by increasing the 1 in 100 year rate by 40%. This has been estimated to demonstrate that the proposed peak discharge rate for the development represents a betterment compared with a “do nothing” scenario.

Discharge Volume Control

- 6.3.7 The DEFRA “Non-statutory Technical Standards for Sustainable Drainage” standard for volume control on a greenfield site is as follows:

“S4 – Where reasonably practicable, for greenfield developments, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must not exceed the greenfield runoff volume for the same event.”

S6 – Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.”

- 6.3.8 By limiting peak discharge rates from the proposed development to match the equivalent present-day greenfield runoff rates, an additional storage volume i.e. Long-Term Storage (LTS), will be required on site. This LTS is to manage the additional volume arising on site as a result of its increased impermeability following development when compared to its current greenfield state.
- 6.3.9 The required LTS volume has been calculated using the method stated in CIRIA document C753 “*The SuDS Manual*” Equation 24.10 and will be discharged at a peak rate of 2 l/s/ha, in compliance with DEFRA standard S4.
- 6.3.10 This indicates that 206.5m³ per impermeable hectare (m³/ha) LTS will be required.

Attenuation Volume

- 6.3.11 Based on the discharge rates and volume control principles set out above, to manage surface water on site for the design storm i.e. the 1 in 100 year storm event plus 40% increased rainfall intensity, the attenuation storage requirement has been calculated to be 636.0m³/ha. This volume includes allowance for LTS (see **Table 6.2** below).

LTS per Impermeable Hectare (m ³ /ha)	Attenuation Requirement per Impermeable Hectare including LTS (m ³ /ha)
206.5	636.0

Table 6.2 - Storage Requirements

- 6.3.12 Calculations for the attenuation volumes can be found in **Appendix F**.

7 Managing Surface Water

7.1 Overview

- 7.1.1 Based on the existing site information and the design parameters (outlined in **Section 6**, a concept surface water drainage strategy has been developed to demonstrate how surface water could be managed for the proposed development.
- 7.1.2 The surface water drainage strategy has been developed to a level suitable for an outline planning application, using best practice SuDS techniques in accordance with the NPPF. Guidance on suitable techniques and methods has been obtained from the LLFA and The SuDS Manual (CIRIA C753) amongst other sources.
- 7.1.3 Final volumes and SuDS techniques will be refined in future more detailed design stages.

7.2 Surface Water Drainage Concept

- 7.2.1 The overall philosophy of SuDS is to replicate, as closely as possible, the natural drainage process of a site prior to development to mitigate the adverse effects of urban storm water runoff on the environment. SuDS provide the ability to manage surface water discharge rates and volumes but also improve water quality, ecology and amenity within the development.
- 7.2.2 These aims are achieved by utilising a “management train”, which simply consists of three elements:
 - i. Source control.
 - ii. Conveyance.
 - iii. Site Control.
- 7.2.3 Each of these elements and how they can be implemented within the surface water drainage strategy concept are described in the following sections. A surface water drainage concept plan has been produced to illustrate how the various forms of SuDS discussed could be integrated within the development at a level of detail suitable for an Outline Application. This can be found in **Appendix G**.

Source Control

- 7.2.4 Source control is an overarching term for SuDS techniques that manage rainfall at source e.g. green roofs or permeable paving. It is the most effective method of improving surface water quality and intercepting rainfall within the development, which can help to reduce attenuation storage volumes (subject to more detailed design). Improving surface water quality within the drainage system can also help to provide better amenity value and biodiversity enhancement further downstream and help to realise the multiple benefits SuDS can provide.
- 7.2.5 At this outline stage, the following SuDS techniques could be implemented as source control measures within the development proposals:
 - Water Butt;
 - Pervious pavements;
 - Tree pits (Bioretention system);
 - Rain gardens (Bioretention system).

- 7.2.6 Pervious pavements can replace traditional hard surfaces, whilst allowing rainfall to infiltrate through its surface into the underlying structural layers. From this point, the water can either infiltrate to the ground (where suitable) or discharge at a controlled rate. By intercepting rainfall at source, they can help to reduce the volume and frequency of runoff whilst providing a highly effective means of water quality treatment. There are two types of pervious pavements; porous pavements (infiltrate water across their entire surface material) and permeable pavements (surface is formed of impermeable material but laid with void spaces through which the water and infiltrate to the underlying structural layers).
- 7.2.7 It is recommended that pervious pavements are utilised where possible, but specific locations will need to be agreed with the pavement's adopting authority e.g. the local highway authority or private management company, regarding suitable locations. However, as a starting point, all proposed hardstanding areas which will remain private i.e. not adopted, should be considered eligible to be pervious pavement.
- 7.2.8 Bioretention systems reduce runoff rates and volumes whilst treating runoff water quality through the use of engineered soils and vegetation. These are commonly referred to as rain gardens but can take a variety of forms, including tree pits. Their flexibility means they can be used in a variety of development landscapes, adapting to fit within the overall development form.
- 7.2.9 Bioretention systems are generally used to manage and treat runoff for frequent rainfall events close to source. Runoff collected by the system temporarily ponds on the surface before filtering through the vegetation and underlying soils, where the majority of treatment occurs. The filtered runoff is then collected by an underdrain system or infiltrates to the ground.
- 7.2.10 Differing forms of bioretention could be integrated throughout the development. For example, dwelling frontages or highway verges could be used as rain gardens or proposed tree lined streets could be linked together as tree pits within a SuDS network.
- 7.2.11 For the purpose of this flood risk assessment the surface water drainage system has been carried out as a high-level design. Detailed measure should be carried forward to consideration and design in further detail on the next design stage when more accurate information will be available.

Conveyance

- 7.2.12 Conveyance is the means which surface water is transported from source control features to site control features. Traditionally, this is done by pipes underneath highways, however SuDS measures offer alternative options which can contribute to managing runoff on site, providing water quality and treatment and contribute to the landscape and biodiversity objectives within the development. In addition, conveyance features are surface features and therefore are shallower than piped systems resulting in less earthworks required.
- 7.2.13 At this outline stage, the following SuDS techniques have been included as conveyance measures within the development proposals
- Swales;
 - Filter Strips.
- 7.2.14 Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and sometimes store surface water runoff. They can have a variety of profiles and can incorporate a range of different planting strategies, depending on the site characteristics and site aims and aspirations. Swales can also include check dams or berms across the channel to promote temporary ponding to increase pollutant removal and further reduce flow velocity.

- 7.2.15 Filter strips are uniformly graded and gently sloping strips of grass or other dense vegetation that are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration and infiltration (where acceptable).
- 7.2.16 The runoff is designed to flow as a sheet across the filter strip at sufficiently low velocities that treatment processes can take place effectively. They are often used as either a pre-treatment component before swales, bioretention system and trenches (to extend the life of these components and reduce maintenance frequencies by capturing sediment) or as a treatment component in themselves (where the flow path length across the strip is sufficient for treatment to occur).

Site Control

- 7.2.17 Site control provides the strategic means of managing the discharge rates and volumes within the development, although this function is augmented by the presence of upstream source control and conveyance SuDS features. By providing source control upstream, the water quality reaching a site control feature is far improved, with most pollutants removed. Clean water is an essential input to wet ecosystems, and this therefore facilitates utilising the site control for biodiversity enhancement on site. An attractive and function habitat can also provide amenity for future occupants of the site.
- 7.2.18 At this outline stage, the following SuDS techniques are proposed as site control measures within the development proposals:
- Detention basins;
 - Geocellular crates.
- 7.2.19 Detention basins are typically landscaped, vegetated depressions that are normally dry except during and immediately following storm events, where they attenuate surface water runoff up to the design standard. Where designed appropriately, some or all of the basin area can be used as a recreational facility or for other amenity uses.
- 7.2.20 Geocellular crates systems are cuboid plastic, concrete, plastic/steel or plastic/concrete structures underground that provide additional storage capacity.

7.3 Surface Water Drainage Strategy

- 7.3.1 Runoff generated by the development will be managed through intercepting flows via SuDS features such as permeable paving, as well as methods such as sumped road gullies and rainwater down pipes.
- 7.3.2 Flows will then be conveyed via a conveyance network (principally through pipes, but rain gardens and/or tree pits should be included where feasible) prior to discharging into two perimeter swales to the south and west of the site. The swales themselves will intercept highway run-off via filter strips and will then convey flows to the lowest part of the site and into a detention basin.
- 7.3.3 The detention basin will be a dry structure only filling during periods of prolonged rainfall and large storm events. Discharges from the detention basin to the Farmfield Stream will be via a flow restriction chamber to manage peak flows to match greenfield runoff rates.
- 7.3.4 An indicative surface water drainage strategy is included in **Appendix G**.

Permeable Paving Areas – PP-B1 to PP-P1

- 7.3.5 All permeable paving areas, modelled as part of this outline application, have a maximum sub-base storage depth of 300mm. Storage within this sub-base has been maximised by providing

a 20mm diameter orifice flow control downstream of the permeable paving area. These permeable paving areas will only intercept and manage rainfall which falls directly on to their surface, and as such storage depths within each of the permeable paving structures varies between 194-259mm within the 300mm sub-base for the 1 in 100 year storm event (plus 40% allowance for climate change).

- 7.3.6 A summary of the maximum storage depth and volume provided by each permeable paving area can be found in **Table 7.1** below:

Permeable Paving Structure	1 in 100 year Storm Event (plus 40% allowance for climate change)	
	Storage Depth (mm)	Storage Volume (m ³)
PP-B1	208	19.5
PP-C1	214	21.1
PP-C2	239	37.9
PP-D1	225	28.4
PP-E1	194	14.2
PP-F1	206	16.4
PP-G1	219	23.5
PP-H1	222	25.1
PP-J1	210	19.5
PP-L1	212	21.1
PP-M1	221	26.8
PP-P1	236	35.3
Total Volume:		288.8

Table 7.1 - Permeable Paving Storage Depths and Volumes

- 7.3.7 The design of permeable paving will be refined at the detailed design stage.

Detention Basin – DB-1

- 7.3.8 The detention basin, modelled as part of this outline application, has a maximum storage depth of 1.0m for a 1 in 100-year rainfall event plus the required 40% allowance for climate change. An additional 0.6m freeboard has been included (making the total depth 1.6m). In this instance, it is proposed that the maximum level of the 1.0m storage depth and 0.6m freeboard will match the existing ground level on the downstream slope i.e. none of the 0.6m freeboard will be provided above existing ground levels.
- 7.3.9 In a meeting with the LLFA on 5th May 2020, it was agreed that the peak discharge rate from the detention should be set based on the area upstream of the detention basin which could

contribute surface water runoff. This would include areas of green open space as well as the proposed development.

- 7.3.10 The required attenuation volume (including LTS) was then calculated based on the impermeable area that could drain to the detention basin. The green open space was included in this calculation by applying the SPR value used in the LTS calculation to determine how much runoff these areas would generate.
- 7.3.11 The attenuation requirement for the total site area is given in **Table 7.2** below based on the required peak discharge rate of 16.5 l/s/ha and attenuation per impermeable hectare of 636m³/ha.

Total Site Area (ha)	Area Upstream of DB-1 (ha)	Peak Discharge Rate (l/s)	Impermeable Area of Development (ha)	Required Attenuation Volume (including Long-Term Storage) (m ³)
16.000	12.090	199.5	5.192 ¹	3,300

Table 7.2 - Indicative Detention Basin Design Requirements for 1 in 100 year storm event (plus 40% allowance for climate change)

- 7.3.12 This required attenuation volume does not take account of the storage provided by the permeable paving areas, nor any inherent attenuation within the conveyance network (pipes and swales). Furthermore, this volume is based on scaling up a “per impermeable hectare” volume. A model was undertaken whereby the peak discharge rate and impermeable area given in **Table 7.2** were applied, and this indicated that the required volume for the detention basin would be approximately 2,760m³ (again not accounting for the permeable paving). Therefore, the volume given in **Table 7.2** should be considered as conservative and robust.
- 7.3.13 The design of detention basin will be refined at the detailed design stage, which will take account of the permeable paving areas and conveyance network to provide a more detailed site drainage model. It is recommended that, where possible, the detention basin has varying side slopes to allow the features to be multi-functional and integrate with the proposed landscape and ecology requirements for the site.

¹ Impermeable area based on Paul Brown Architects’ Illustrative Site Layout (ref: PRB/BIE/PA2) in Appendix D

8 Residual Risk

8.1 Exceedance and Overland Flows

- 8.1.1 The risk associated with a potential blockage for the main drainage system onsite is considered to be small. Routine inspection and maintenance procedures as described in **Section 9** of this report will minimise the risk of the accumulation of detritus and debris as well as ensuring that the drainage systems continue to operate efficiently. However, the residual risk of these events needs to be managed. The principles of dealing with these is set out below.
- 8.1.2 In the event of a rare storm (beyond the design condition), the capacity of the drainage network could be temporarily exceeded, and drainage inlets could be bypassed creating overland flow. To minimise and manage the impact of these events at source the SuDS features for the scheme will be designed with controlled overflows such as spillways and weirs.
- 8.1.3 The detailed masterplan will need to consider the overland flow paths required to manage these events and the flows from the overflow of SuDS features. Where possible, the masterplan should be designed to utilise natural and naturalised blue/green corridors to divert the flows from critical infrastructure and the development to further mitigate the impact.
- 8.1.4 In certain circumstances it may be necessary to utilise road corridors to deliver this function. This, however, should not be considered the preferred option and should still facilitate safe access and egress as well as taking reasonable steps to protect property.
- 8.1.5 All buildings should be provided with internal threshold levels raised above surrounding ground levels and designated flow paths created around the buildings to the lower lying levels. Localised grading may be required to achieve level access criteria. Exceedance flows would then naturally be directed around the buildings to lower ground.
- 8.1.6 An overland flow assessment should be carried out at detailed design stage once all construction information is available so that any hotspots can be identified and managed.

8.2 SuDS Health and Safety

- 8.2.1 Due to the inherent requirement of SuDS features to retain water, during normal operation open SuDS features pose a potential risk to the general public. As part of the detailed design process Health and Safety considerations need to inform the proposals and implement adequate protection for the public and enable safe means of egress from open features, while not compromising the proposed amenity uses.

8.3 Pollution Control

- 8.3.1 The drainage system will be designed to comply with the requirements of the SuDS Management Train as laid out in CIRIA C753 'The SuDS Manual'.
- 8.3.2 The proposed surface water sewer arrangement will incorporate suitable pollution control measures to help manage sediment and water quality upstream of SuDS features.
- 8.3.3 The final strategy for pollution control will be confirmed as part of the detailed design however, at this stage of the assessment, an appropriate SuDS treatment train has been incorporated into the design prior to discharge to the public surface water sewer. This consists of permeable paving, water butt, tree pits, rain garden, swales, filter strip, detention basin and crates which will contribute to the pollution control of the site.

- 8.3.4 In accordance with Table 26.2 of the SuDS Manual, the proposed development will have the pollution hazard indices as shown in **Table 8.1**.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roof	Very Low	0.2	0.2	0.05
Individual property highways, car parks, low traffic roads.	Low	0.5	0.4	0.4

Table 8.1 - Summary of Pollution Indices for Residential Development

- 8.3.5 **Table 8.2** presents the mitigation indices provided by each SuDS method proposed or recommended as part of the drainage strategy.

SuDS Measure	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Permeable Paving	0.7	0.6	0.7
Bioretention system	0.8	0.8	0.8
Swale	0.5	0.5	0.6
Detention basin	0.5	0.5	0.6

Table 8.2 - SuDS Mitigation Indices for Discharge to Surface Waters

- 8.3.6 Through applying the equation set out in section 26.7.1 of the SuDS Manual:

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

- 8.3.7 Each Land Use was evaluated against the SuDS measure proposed, as summarised in **Table 8.3**.

Land Use	SuDS Component	Resultant Indices		
		TSS	Metals	Hydro carbons
Residential Roof	Swales	0.5	0.6	0.6
	Detention basin	0.25	0.3	0.3
	Total	0.75 > 0.2 = Sufficient	0.9 > 0.2 = Sufficient	0.9 > 0.05 = Sufficient
Individual property highways, car parks, low traffic roads.	Swales	0.5	0.6	0.6
	Detention Basin	0.25	0.3	0.3
	Total	0.9 > 0.4 = Sufficient	0.9 > 0.4 = Sufficient	0.9 > 0.4 = Sufficient

Table 8.3 - Land Use Water Quality Evaluation

- 8.3.8 As shown in the above tables, the combined SuDS mitigation indices are higher than the pollution indices from a residential type development, therefore the water quality shall be adequately managed. In the case of this project, a number of the land uses could be subjected to a variety of additional SuDS measures at source, for example permeable paving in courtyard parking areas, filter strips serving some highways and bioretention where possible. Therefore, the quality of surface water runoff on site is more than adequately managed.

9 Operation and Maintenance

9.1 Operation and Maintenance

9.1.1 To ensure the ongoing performance of the SuDS scheme, the proposed drainage will require regular maintenance over its lifetime. Typically, the maintenance of a SuDS network involves removing litter/debris in the system and general landscaping/grass cutting.

9.1.2 Final designs of the SuDS, outfalls, inlets and strategic drainage network must be designed with a regard for future maintenance. All areas should be easily accessible and safe for operatives without compromising the overall attenuation and landscape requirements.

9.1.3 The following tables outline key operation and maintenance requirements for permeable paving, filter strips, bioretention systems, swales and detention basins, as set out in CIRIA C753. Following further detailed design of the proposed surface water drainage system, these requirements should be refined for individual, named SuDS components, taking account of site-specific factors.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been required to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing materials	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)

Maintenance Schedule	Required Action	Typical Frequency
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 9.1 - Permeable Paving Recommended Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plant	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required

Maintenance Schedule	Required Action	Typical Frequency
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 9.2 - Filter Strip Recommended Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plant	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseed	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 9.3 - Bioretention Recommended Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and access standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 9.4 - Swale Recommended Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly

Maintenance Schedule	Required Action	Typical Frequency
	Inspect inlets and facility surface for silt accumulation. Established appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 9.5 - Detention Basin Recommended Operation and Maintenance Requirements

9.2 Design Standard

- 9.2.1 All proposed drains and sewers shall be designed in accordance with Building Regulations – Approved Document H, the Design Manual for Roads and Bridges and the Design and Construction Guidance (DCG), sometimes referred to as Sewers for Adoption 8 as appropriate.

9.3 Adoption and Management

- 9.3.1 Where possible, the surface water drainage strategy has been designed to maximise the number of features that are acceptable for adoption by Southern Water as the local sewerage company. Based on the criteria set out in the DCG, bioretention systems, swales and detention basins are all acceptable SuDS features.
- 9.3.2 However, filter strips and permeable paving are not as they do not have a clearly defined channel and form a fundamental part of the highway structure respectively. These features would need to be adopted/maintained separately.

10 Managing Foul Drainage

10.1 Proposed Foul Drainage Strategy

- 10.1.1 The site is within the area managed by Southern Water for foul drainage. Asset mapping received from Southern Water (see **Appendix C**) indicates that there is no recorded public infrastructure within the proposed development itself. It is not known whether Bird in Eye farm benefits from existing private foul drainage infrastructure, which could be located within the proposed site boundary.
- 10.1.2 As there is no public foul infrastructure within the proposed development site, no diversionary works are envisaged at this stage. However, consideration will need to be made should any private systems be encountered, including gaining agreement with the affected property owners on how their future foul drainage requirements are to be provided.
- 10.1.3 To manage and drain foul flows from the proposed development, a new foul sewer system will be constructed which will connect into the existing public foul sewer network. An indicative foul drainage network layout is provided in **Appendix G**.

10.2 Point of Connection

- 10.2.1 On review of the asset mapping provided by Southern Water, the nearest and preferred Point of Connection (POC) to the existing public network would be at a manhole in Bird in Eye Hill (ref: TQ48200803) less than 100m outside of the site boundary. Connection to this manhole could be made via a S98 requisition under the Water Industry Act 1991.
- 10.2.2 Southern Water were contacted to indicate whether this POC was acceptable and if not what their preferred POC would be. They indicated that there is currently inadequate capacity at the preferred location and that the nearest POC with adequate capacity would be approximately 1.1km west of the site at manhole ref: TQ47200601. However, due to the distance from the site this is not a practical or viable option, as this would involve a route through Uckfield town centre (causing potential disruption during construction). In addition, reaching this POC would require a Sewage Pumping Station (SPS), but proposed development site currently sits at an elevation higher than Bird in Eye Hill, therefore the SPS would need to be located off site on third party land, which is not deliverable.
- 10.2.3 Under S106 of the Water Industry Act, the development has a right to connect to a public sewer, provided that the connection is to a sewer with “reasonable” capacity. In this instance, “reasonable” is defined as a sewer diameter equal to or greater than that of the new sewer making a connection e.g. a new 150mm diameter sewer could connect to a 150mm or 225mm diameter sewer but not a 100mm diameter sewer irrespective of actual available capacity.
- 10.2.4 Stantec undertook an assessment to demonstrate that a “reasonable” connection can be made to the preferred POC and therefore this is viable and deliverable option, whereas Southern Water’s POC is neither.
- 10.2.5 It was calculated that peak foul flows from the proposed development would be 14.5 l/s, which based on existing levels on site can be accommodated within a 150mm diameter pipe whilst maintaining adequate self-cleansing velocity. The sewer downstream of the preferred POC is indicated within the supplied asset mapping as being 150mm diameter. Therefore, a “reasonable” connection can be made.
- 10.2.6 As the preferred POC and downstream existing public foul sewer network is outside of the site boundary and adopted by Southern Water, it is their responsibility to provide adequate capacity within the network. Any capacity improvement works would not require additional funding from a developer beyond the S98 requisition charges (outlined in Southern Water’s Site Specific Charges as given in their New Connections Services Charging Arrangements)

and New Infrastructure Charges (which are already payable as part of the proposed development irrespective of eventual POC).

10.2.7 Southern Water advised that they will be able to provide additional assessments regarding a foul POC following granting of Outline planning permission.

10.2.8 Details of correspondence with Southern Water on this matter can be found in **Appendix C**.

11 Conclusion

11.1 Planning Application

11.1.1 This FRA has been prepared to support an outline planning application for residential development at Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield.

11.2 Flood Risk

11.2.1 This FRA concludes that:

- The site is predominantly within Flood Zone 1, with areas immediately adjacent to the watercourse within Flood Zone 2 and 3.
- The proposed mitigation strategy demonstrates the development is safe through a number of measures as follows:
 - o The masterplan follows the sequential approach;
 - o Access and egress from the development is located within Flood Zone 1 and therefore will be available for emergency use during extreme river levels.

11.3 Surface Water Drainage

- 11.3.1 Infiltration drainage is likely to be viable on site based on geological information available. However, as a result of the geology having an easily erodible nature which could be prone to surface collapse infiltration has been discounted at this stage. It is recommended that the infiltration potential on site is confirmed by targeted in-situ soakage testing in accordance with BRE Soakaway Design (DG 365) to support a future reserved matters planning application.
- 11.3.2 The proposed development should manage surface water runoff utilising sustainable drainage methods and limit the discharge rate to match the existing greenfield runoff rates or less for the site. The outfall is be into the existing watercourse via source control (pervious pavements, water butts and bioretention), conveyance (filter strips and swales), and site control (detention basin).
- 11.3.3 The outline surface water drainage strategy has been developed based on peak post development runoff rates not exceeding the existing greenfield runoff for all return period up to and including 100-year rainfall events from the natural site catchment. On-site attenuation has been designed for 1 in 100 year (1% AEP) storm event plus a 40% increase in rainfall intensity allowance for climate change over the lifetime of development and includes Long Term Storage.

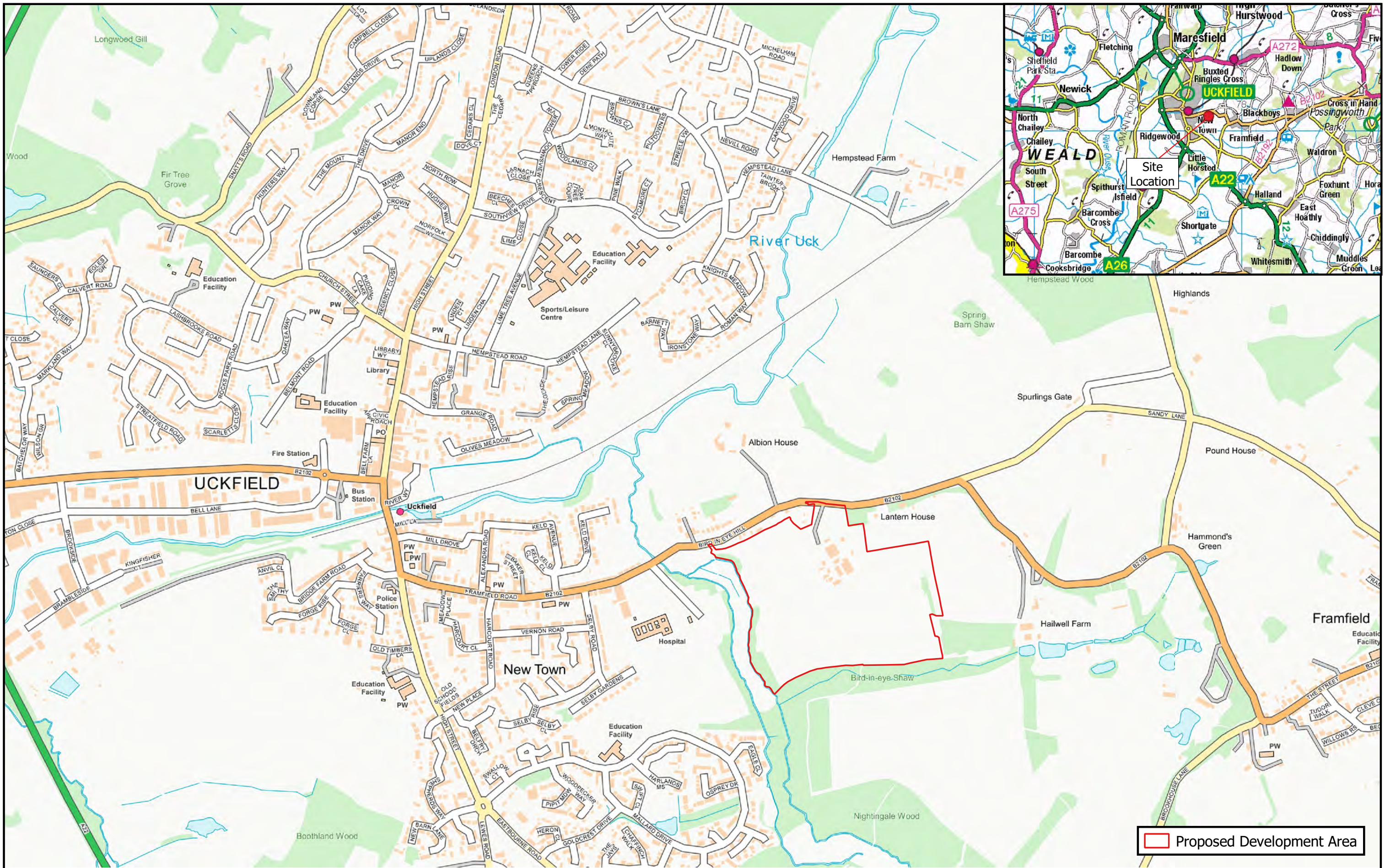
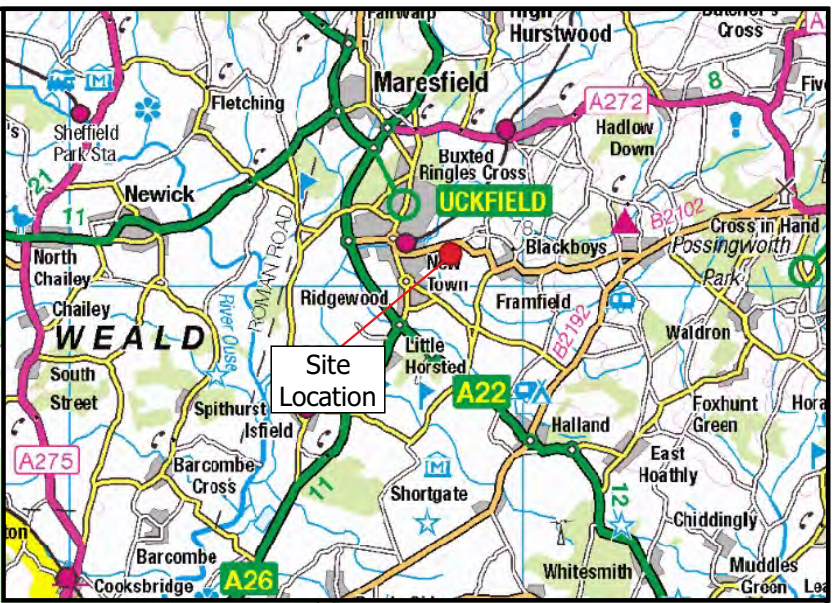
11.4 Policy

11.4.1 In conclusion, the future occupants and users of the proposed development will be safe from flooding and there will be no detrimental impact on third parties. The proposal complies with the National Planning Policy Framework (NPPF) and local planning policy with respect to flood risk and is an appropriate development at this location.

Appendix A Baseline Information

Figure 1 – Site Location Plan

Figure 2 – Key Features Plan



Proposed Development Area



Client:
Croudace Homes Limited
and Mr & Mrs Berry

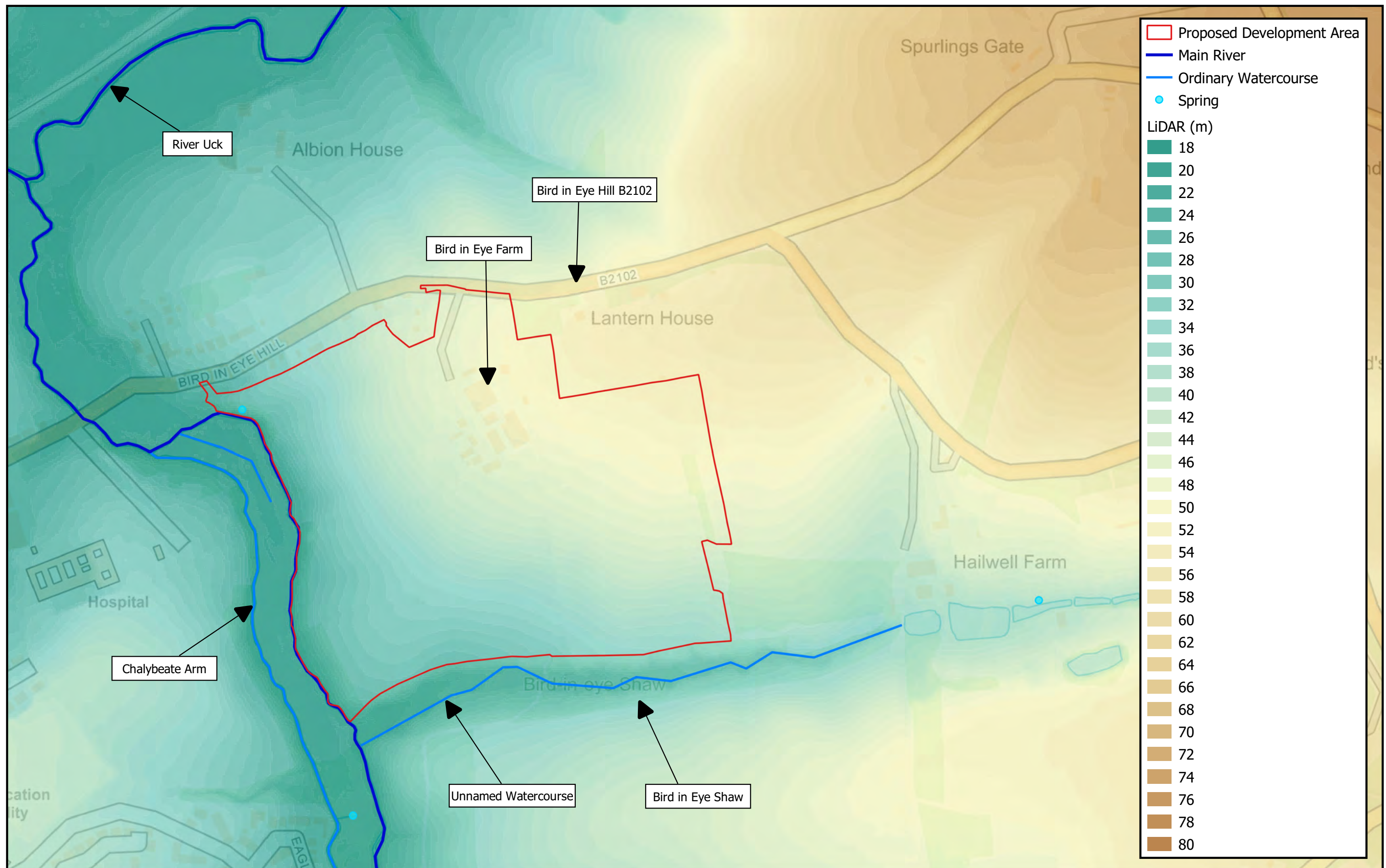
Contains Ordnance Survey data © Crown
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Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield

Site Location



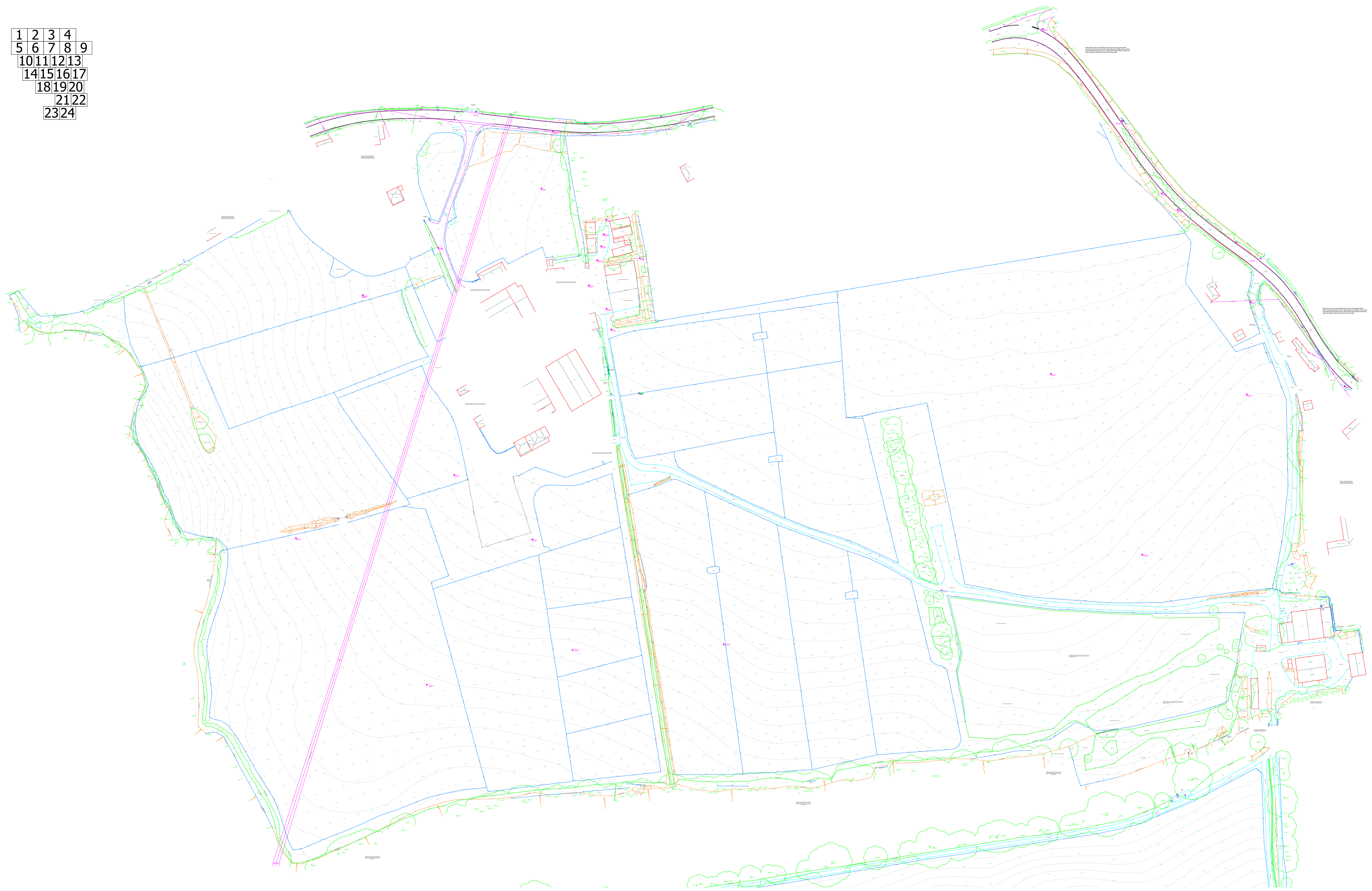
First Date of Issue: 29/03/2021
Scale: NTS
Drawn By: KT Checked By: LWD
Drawing Number:
Figure 1



Appendix B Topographical Survey

Topographic survey of the site (Drawing reference ENC/020320/6JJ2) undertaken by Encompass Surveys Ltd in March 2020

1	2	3	4	
5	6	7	8	9
10	11	12	13	
14	15	16	17	
18	19	20		
	21	22		
23	24			



Appendix C Southern Water Information

Initial Southern Water Foul Drainage Point of Connection Response

Asset Mapping – At Proposed Development Site

Asset Mapping – Southern Water Foul Drainage Point of Connection

Stantec Response to Southern Water Foul Drainage Point of Connection

Final Southern Water Foul Drainage Point of Connection Response



Stantec
33 Bowling Green Lane
Farringdon
London
EC1R 0BJ

Your ref

Our ref
DS_CC_PDE-116855

Date
07 May 2020

Contact
Tel 0330 303 0119

Dear

Site: Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

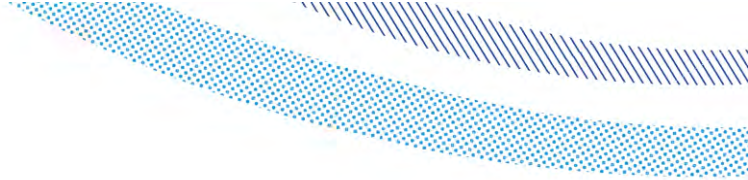
There is currently inadequate capacity within the foul sewerage network to accommodate a foul flow for the above development at manhole reference TQ4820**0803**. The proposed development would increase flows to the public sewerage system, and existing properties and land may be subject to a greater risk of flooding as a result. Additional off-site sewers, or improvements to existing sewers, will be required to provide sufficient capacity to service the development.

The nearest point where capacity is currently available is at manhole reference TQ4720**0601** which is located approximately **1.1 km** to the west of the proposed development site.

Please note, as on 1st April 2018 we have moved to the "New Connections Services Charging Arrangements". We understand that this may cause uncertainty for customers, particularly where they may have already committed to a development based on previous charging arrangements. We have worked with our stakeholders and Water UK to agree a set of principles by which we will base our charges. Please read through our new charging arrangement documents available at the following link:

southernwater.co.uk/infrastructure-charges

Alternatively, new appointees and variations (NAVs), also known as 'inset' companies, can provide new connection services or take ownership of the new water and wastewater connection infrastructure provided for a new development. NAVs are appointed by Ofwat and replace the regional water company. It is for the developer to choose whether to use a NAV or the regional water company to supply services for new sites, according to certain legal criteria.



It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal S106 connection application is required to be completed and approved by Southern Water Services. Please see the following link:

southernwater.co.uk/ConnectiontoPublicSewer/ApplicationForm

Should you require any further information, please contact us at the above mentioned phone number or address shown in the footer.

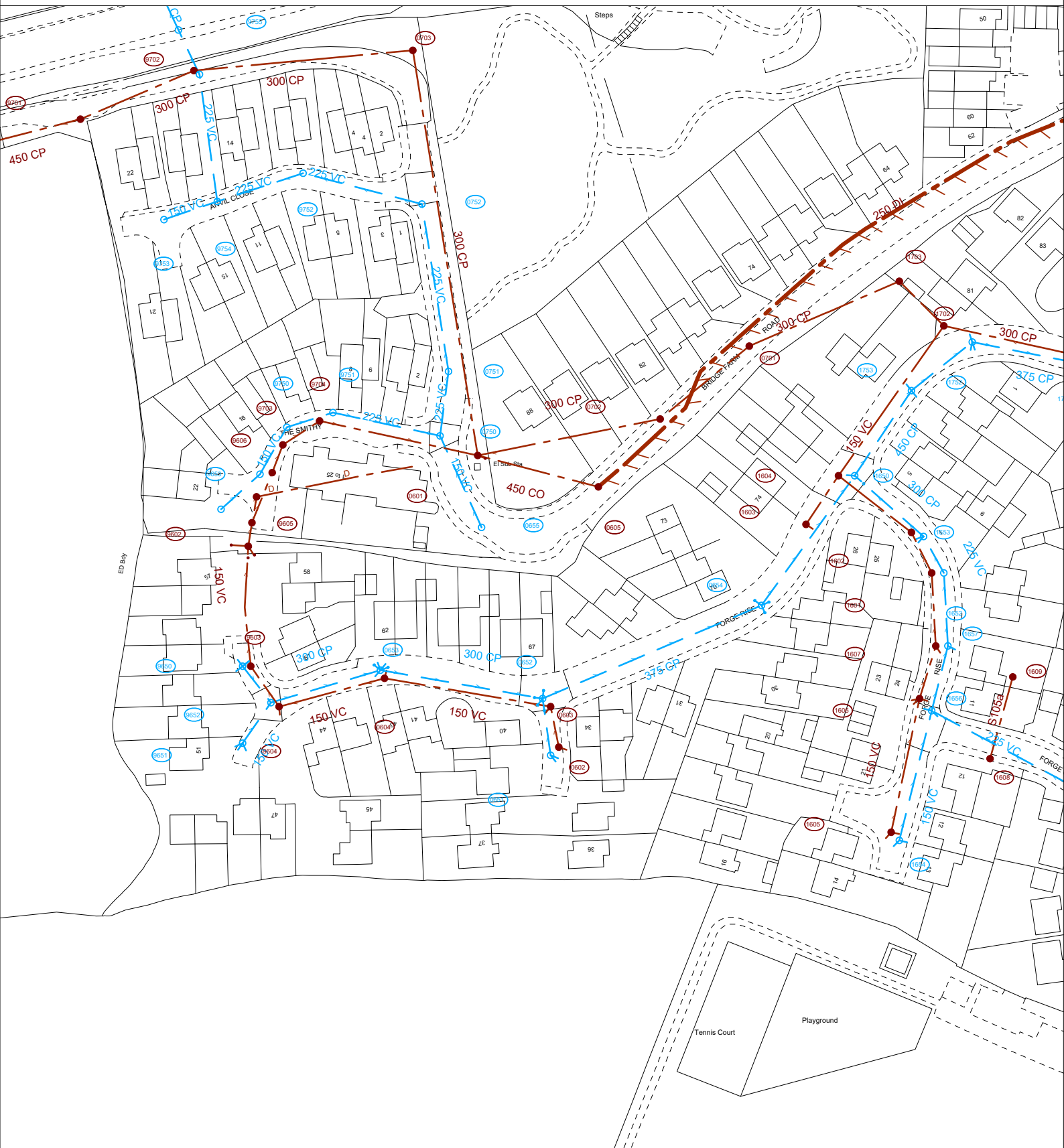
Yours sincerely,



Growth Planning Lead
Business Channels

Please note: - The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of
H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: TQ4720NW

Scale: 1:1250

Sewer Plot

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement



Printed By: Mercy

Date: 7-5-2020

MH0601

Requested By:



SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

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O.S. REF: TQ4820NW

Scale: 1:2500

Sewer Plot

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement



Printed By: Mercy

Site Plan

Requested By:

Date: 24-4-2020





Your Ref: DS_CC_PDE-116855

Our Ref: 48494/2003

04 June 2020

Southern Water
Southern House
Yeoman Road
Worthing
West Sussex
BN13 3NX

Email to: Developer.Services@southernwater.co.uk

For the Attention of [REDACTED]

Dear [REDACTED]

RE: Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA

Thank you for letter dated 07 May 2020 regarding existing foul sewerage capacity in the vicinity of the proposed development at Bird in Eye Farm, Uckfield.

Your letter states that there is currently inadequate capacity within the existing foul sewerage network to accommodate the foul flows generated by the above development at manhole reference: TQ48200803), and that additional off-site sewers or improvements to existing sewers will be required to provide capacity. The letter follows this by recommending additional off-site sewers will be required to provide sufficient capacity. You have also advised that the nearest point where capacity is available is approximately 1.1km to the west of the development site at manhole reference: TQ47200601.. However, it is Stantec's view that this is not a practical or viable solution.

To reach the suggested Point of Connection (POC), foul flows discharged from the site would require pumping based on the existing topography. The site currently sits at a higher elevation than Bird in Eye Hill (B2102), therefore a sewage pumping station (SPS) would need to be located off site to facilitate the required pumping to the POC. For third party landownership reasons, this is not deliverable.

The existing sewers downstream of TQ48200803 currently discharge to an existing SPS, referenced as "080P" on the supplied plans. In addition, the supplied plans indicate another SPS west of 080P referenced as 972P. Therefore, there are currently 2no. existing foul rising mains under the B2102, presumably as well as additional services and sewers. Based on our understanding of the existing topography of Uckfield, it would appear that these two rising mains run westwards towards your proposed POC at TQ47200601 (or a sewer in this vicinity) before gravity discharge to the existing sewage treatment works (STW) adjacent to the A22. Presumably most foul flows in Uckfield drain to this STW. In our opinion, the proposal to construct a third foul rising main would likely be impractical from a spatial perspective (given the existing services underneath the B2102) as well as an inefficient use of existing infrastructure.

Furthermore, the construction of 1.1km of rising main underneath a key transport route into the centre of Uckfield would be at a considerable cost to my client and also cause significant disruption to the local community over a long period of time, either of which are not desirable.

Lakeside House
Blackbrook Business Park
Blackbrook Park Avenue
Taunton TA1 2PX

Telephone: +44 (0)1823 218940
email: PBA.Taunton@stantec.com

Registered Office:
Stantec UK Ltd
Buckingham Court
Kingsmead Business Park
Frederick Place, London Road
High Wycombe HP11 1JU
Registered in England No. 1188070

For the reasons given above, Stantec maintains that TQ48200803 should be the foul POC for the proposed development, which will require improvements to existing sewers.

It is understood that developers have a right to connect to a public sewer provided that they propose to connect to a sewer with “reasonable” capacity, with “reasonable” defined as a sewer diameter equal to or greater than that of the new sewer making a connection. For example, a new 150mm diameter sewer could connect into an existing 150mm or 225mm diameter sewer but not a 100mm diameter sewer. Therefore, Stantec have undertaken an assessment to determine whether a reasonable connection can be made to TQ48200803.

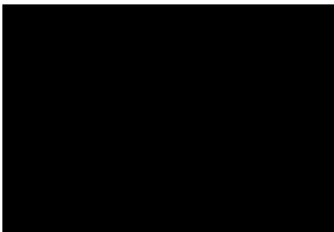
The supplied mapping indicates that the sewer downstream of TQ48200803 is a 150mm diameter vitrified clay sewer, therefore it has reasonable capacity to accept foul flows from a 150mm diameter sewer but no larger. Based on peak flows of 4,000 l/dwelling/day (0.005 l/s/day) from no more than 290 units, peak foul flows from the proposed development will be 14.5 l/s. A 150mm diameter sewer can accommodate these flows and maintain self-cleansing velocity at a gradient no flatter than 1:111 based on the pipe tables produced by HR Wallingford. The average gradient from the far north-western corner of the site (whereby all dwellings should be connected to the new foul network) to the B2102 (before connecting into TQ48200803) is 1:20.

Therefore, a 150mm diameter sewer will have adequate capacity (with self-cleansing velocities) to serve the proposed development and can make connection at TQ48200803 as the existing network has reasonable capacity to accept these flows. If the existing network downstream of TQ48200803 does not have available capacity to accept the flows from the proposed development, then it is the responsibility of Southern Water to undertake necessary improvements.

For the avoidance of doubt, Stantec propose that a new sewer connection is made from the proposed development's foul drainage network to manhole TQ48200803, as either a S98 requisition (funded under Southern Water's Site Specific Charges as given in their New Connections Services Charging Arrangements 2020/21) or S104 self-lay. If the foul network downstream of TQ48200803 requires reinforcements works, to either the existing sewers, SPS and online or offline tank, this will be funded by Southern Water through the New Infrastructure Charges already payable as part of the proposed development i.e. no additional funding required by our client.

We trust that the information above is clear and that Southern Water are in agreement with this assessment.

Yours sincerely,



on behalf of Stantec UK Ltd

[REDACTED]

From: southernwaterplanning <SouthernWaterPlanning@southernwater.co.uk>
Sent: 12 June 2020 17:00
To: [REDACTED]
Subject: FW: SWS-SUSXE-CC-004953 - DS_CC_PDE-116855 - Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA
Attachments: 200604_Southern Water Foul POC Response.pdf

Hi [REDACTED]

Thank you for your email.

At this stage we would advise you to apply for outline planning permission with the local authority. If your planning application is granted it will act as a trigger for us to look into this further and provide the infrastructure at the practical point of connection.

Southern Water aim to provide this within 24 months following the date that planning has been granted for developments not identified as strategic sites in our current business plan. Strategic sites are larger developments and will often take longer than 24 months for a full solution to be provided.

If you need any further assistance please let me know.

Kind regards

[REDACTED]

**Growth Planning Coordinator for Sussex
Developer Services**

T. 03303030119
M.
southernwater.co.uk



From: [REDACTED]
Sent: 04 June 2020 15:47
To: Developer Services <Developer.Services@southernwater.co.uk>

[REDACTED]

Subject: FW: SWS-SUSXE-CC-004953 - DS_CC_PDE-116855 - Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA

Dear [REDACTED]

Thank you for your recent foul capacity check response, which was sent to my colleague Simone.

Having now reviewed the information originally sent by yourself, please find attached Stantec's response. Should you have any questions, please feel free to get in touch.

Kind regards,

[Taunton](#)

COVID-19: Please note that I am now working reduced hours of 30 hours per week, which may be subject to change. I will respond to your email as soon as I can.

Better Together, Even If We're Apart. Read [more](#) about Stantec's COVID-19 response, including remote working and business continuity measures.



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Please consider the environment before printing this email.

From: [Redacted]

Sent: 11 May 2020 12:21



Subject: FW: SWS-SUSXE-CC-004953 - DS_CC_PDE-116855 - Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA

Hi [Redacted]

We have received the foul capacity check for Bird in Eye project last week.

See below and attached documents from Southern Water.

Thanks.



Kind regards,



88 Gray's Inn Road
London
WC1X 8AA



The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

Please consider the environment before printing this email.

From: Developer Services <Developer.Services@southernwater.co.uk>

Sent: 07 May 2020 15:35

To: [Redacted]

Subject: SWS-SUSXE-CC-004953 - DS_CC_PDE-116855 - Bird in Eye Farm, Uckfield, East Sussex, TN22 5HA

Dear [Redacted]

Please find the Southern Water's response to your recent enquiry.

Yours sincerely,

Growth Planning Lead, Business Channels

T. 0330 303 0119
southernwater.co.uk



from
Southern Water 

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Appendix D Flood Risk

Figure 3 – EA Flood Map for Planning

Figure 4 – EA Risk of Flooding from Surface Water

Figure 5 – EA Historic Flood Data

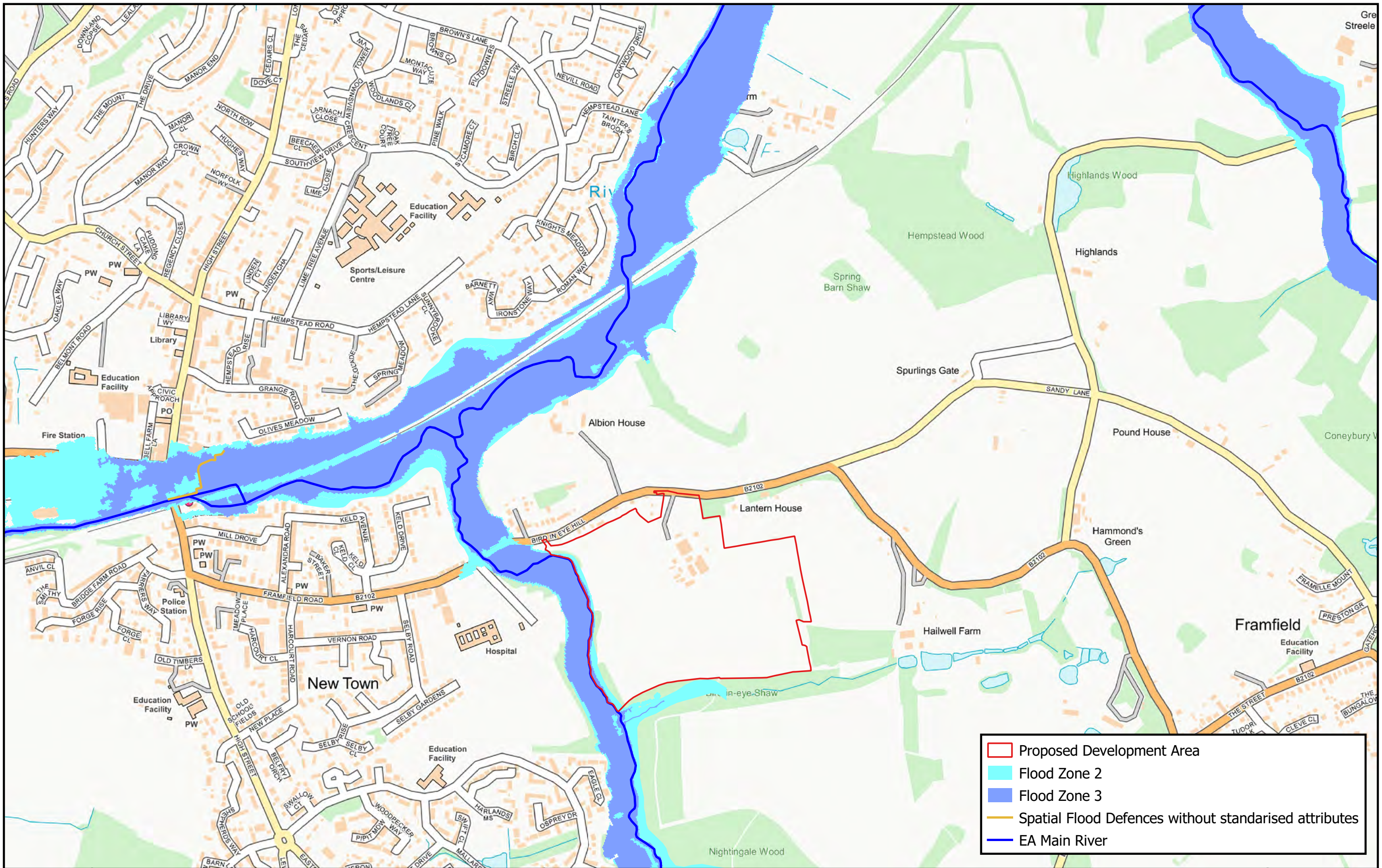
EA Product 4 Letter

EA Node Location Map

EA Node Levels and Depths Data

EA Modelled Flood Outlines – Defended Fluvial

EA Modelled Flood Outlines – undefended Fluvial



- Proposed Development Area
- Flood Zone 2
- Flood Zone 3
- Spatial Flood Defences without standardised attributes
- EA Main River



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Tel: 01823 218940

Client:
Croudace Homes Limited
and Mr & Mrs Berry

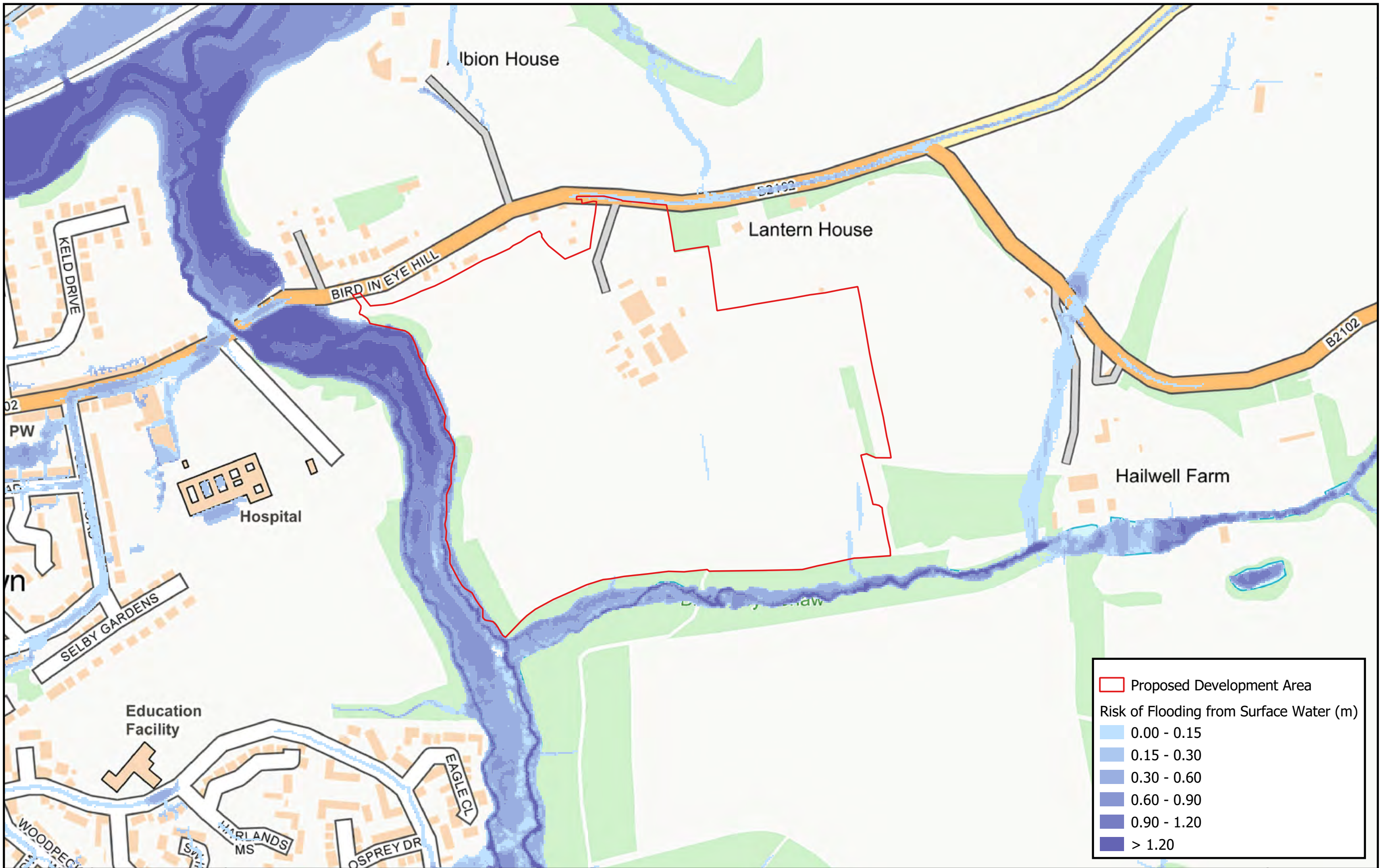
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Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield

EA Flood Map for Planning

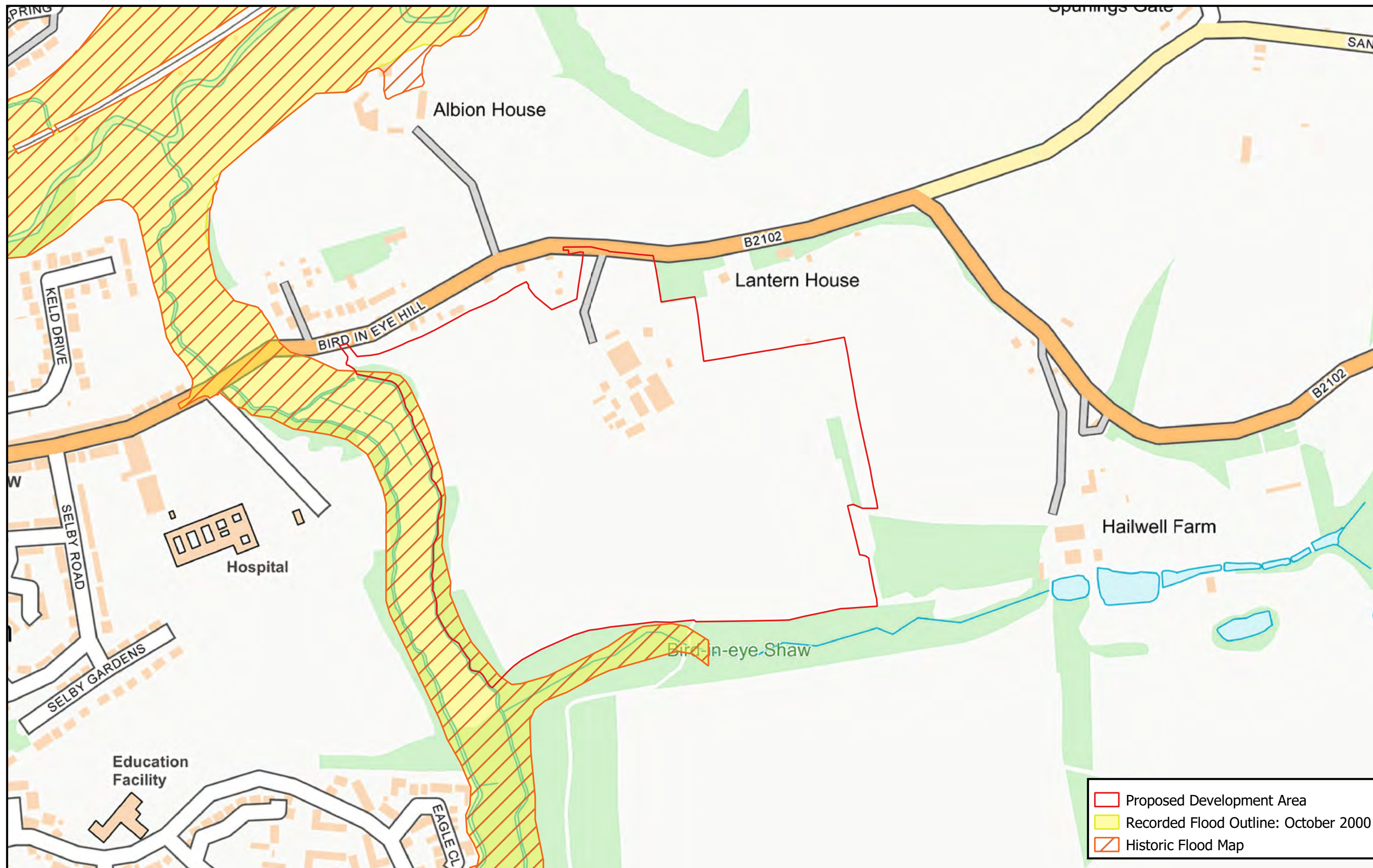


First Date of Issue: 29/03/2021	
Scale: NTS	
Drawn By: KT	Checked By: LWD
Drawing Number: Figure 3	



Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield
EA Risk of Flooding from Surface Water
Depth (m) 1 in 1000 year





- Proposed Development Area
- Recorded Flood Outline: October 2000
- Historic Flood Map



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Client:

Croudace Homes Limited
and Mr & Mrs Berry

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Land at Bird in Eye Farm, South of Bird in Eye Hill, Uckfield EA Historic Flood Data



First Date of Issue: 29/03/2021

Scale: NTS

Drawn By: KT Checked By: LWD

Drawing Number:

Figure 5



[REDACTED]
Stantec,
33 Bowling Green Ln,
Farringdon,
London,
EC1 0BJ

Our ref: SSD168006
Date: 16/04/2020

Dear [REDACTED]

Enquiry Regarding Product 4 for Flood Risk Assessment for Bird in Eye Farm, Uckfield, TN22 5HA

Thank you for your enquiry which was received on 7 April 2020.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is within an area located in Flood Zone 1 as shown on our Flood Map for Planning (Rivers and Sea). Please find attached a copy of the Flood Map for Planning (Rivers and Sea) for the area relating to your address.

The likelihood of flooding from surface water in this area:

This address is in an area at **very low risk** of surface water flooding, areas within 10m of the site are in an area at high risk of surface water flooding. For more information about how surface water flooding is managed in your local area please contact **Lead Local Flood Authority, East Sussex County Council**.

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences – There are no formal EA defences protecting this site.

Model Information - All modelled data taken from the River Uck Flood Risk Mapping Study, completed Summer 2012 by JBA Consulting. The model is a 1D-2D ISIS TUFLOW model.

Flood History – We have the following records of flooding to the west of the site.

Oct 2000 Fluvial Flood	
Event Code	3196
Event Name	07421J601FEO_OCT2000_Ouse_BarcombeMills
Start Date	12/10/2000
End Date	14/10/2000
Source of Flooding	Main River
Cause of Flooding	channel capacity exceeded (no raised defences)

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **East Sussex County Council** or the Local Authority, **Wealden District Council** for a more comprehensive flood history check.

Flood Warning – This site does not fall within a flood warning area. More information is available at: <http://www.environment-agency.gov.uk/homeandleisure/floods/38289.aspx> alternatively call Floodline on: 0345 988 1188

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

This information is supplied subject to the notice which can be viewed via the following link <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact PSOEastSussex@environment-agency.gov.uk.

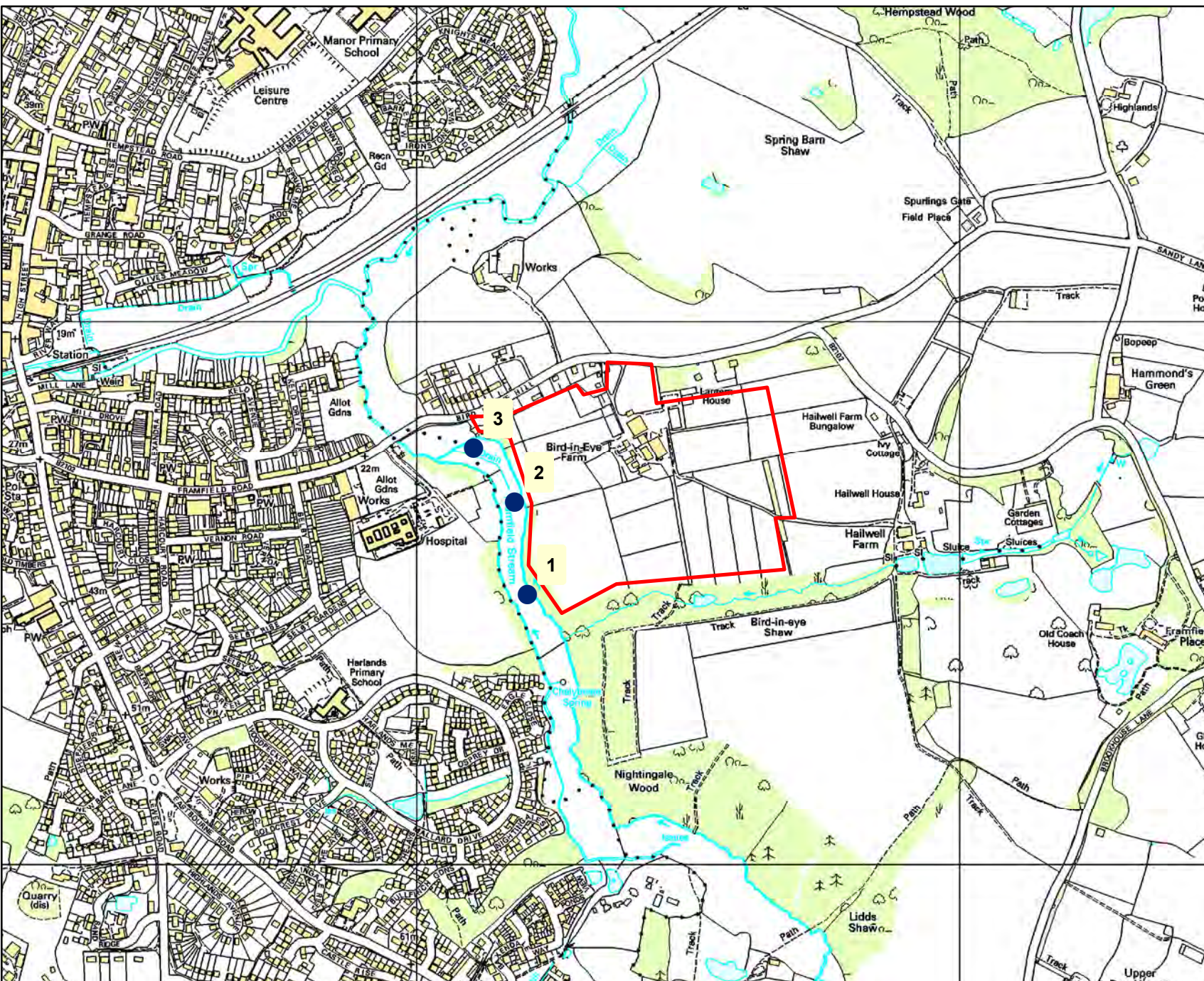
I hope that we have correctly interpreted your request.

Yours sincerely,

[Redacted Signature]

FCRM Officer - PSO East Sussex

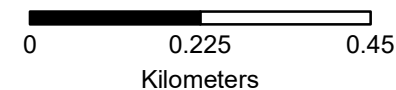
SSD186006 - Site Node and Boundary Points - Centred TN22 5HA



Legend

-  Node_Points
 Site Boundary

Scale: 1:10,000



Product 4 Flood Risk Data Requested by: Simone Pinna-Nossai, Stantec, 33 Bowling Green Ln, Farringdon, London, EC1 0BJ

Site: Bird in Eye Farm, Uckfield, TN22 5HA

Table 1: Water Levels: Fluvial Undefended

# Node	NGR		Modelled Flood Levels in Metres Undefended Annual Exceedance Probability										
	E	N	20%	10%	5%	2%	1.3%	1%	0.4%	0.1%	1% +CC 35%	1% + CC 45%	1% + CC 105%
1	548203.4	120497.4	21.30	21.31	21.31	21.39	21.48	21.55	21.87	22.17	N/A	N/A	N/A
2	548180.1	120667.7	20.75	20.88	21.04	21.27	21.39	21.49	21.84	22.13	21.89	21.95	22.19
3	548105	120767.2	20.73	20.86	21.02	21.26	21.38	21.48	21.84	22.12	21.89	21.95	22.18

Table 2: Water Levels: Fluvial Defended

	NGR		Modelled Flood Levels in Metres Defended Annual Exceedance Probability								
Node Ref	Eastings	Northings	20%	10%	5%	2%	1.3%	1%	1% +CC	0.4%	0.1%
1	548203.4	120497.4	21.30	21.31	21.31	21.39	21.48	21.55	21.79	21.87	22.15
2	548180.1	120667.7	20.75	20.88	21.04	21.27	21.39	21.49	21.76	21.84	22.13
3	548105	120767.2	20.73	20.86	21.02	21.26	21.38	21.48	21.75	21.84	22.13

Table 3: Water Depth: Fluvial Undefended

# Node	NGR		Modelled Flood Levels in Metres Undefended Annual Exceedance Probability										
	E	N	20%	10%	5%	2%	1.3%	1%	0.4%	0.1%	1% +CC 35%	1% +CC 45%	1% +CC 105%
1	548203.4	120497.4	0.82	0.83	0.83	0.91	1.00	1.07	1.31	1.39	1.69	N/A	N/A
2	548180.1	120667.7	0.31	0.43	0.59	0.82	0.94	1.04	1.33	1.39	1.68	1.33	1.39
3	548105	120767.2	0.54	0.66	0.83	1.06	1.19	1.28	1.59	1.64	1.93	1.71	1.77

Table 4: Water Depth: Fluvial Defended

	NGR		Modelled Flood Levels in Metres Defended Annual Exceedance Probability								
Node Ref	Eastings	Northings	20%	10%	5%	2%	1.3%	1%	1% +CC	0.4%	0.1%
1	548203.4	120497.4	0.82	N/A	0.83	0.91	1.00	1.07	1.31	1.39	1.67
2	548180.1	120667.7	0.31	0.33	0.59	0.82	0.94	1.04	1.31	1.39	1.68
3	548105	120767.2	0.54	0.68	0.83	1.06	1.19	1.28	1.56	1.64	1.93

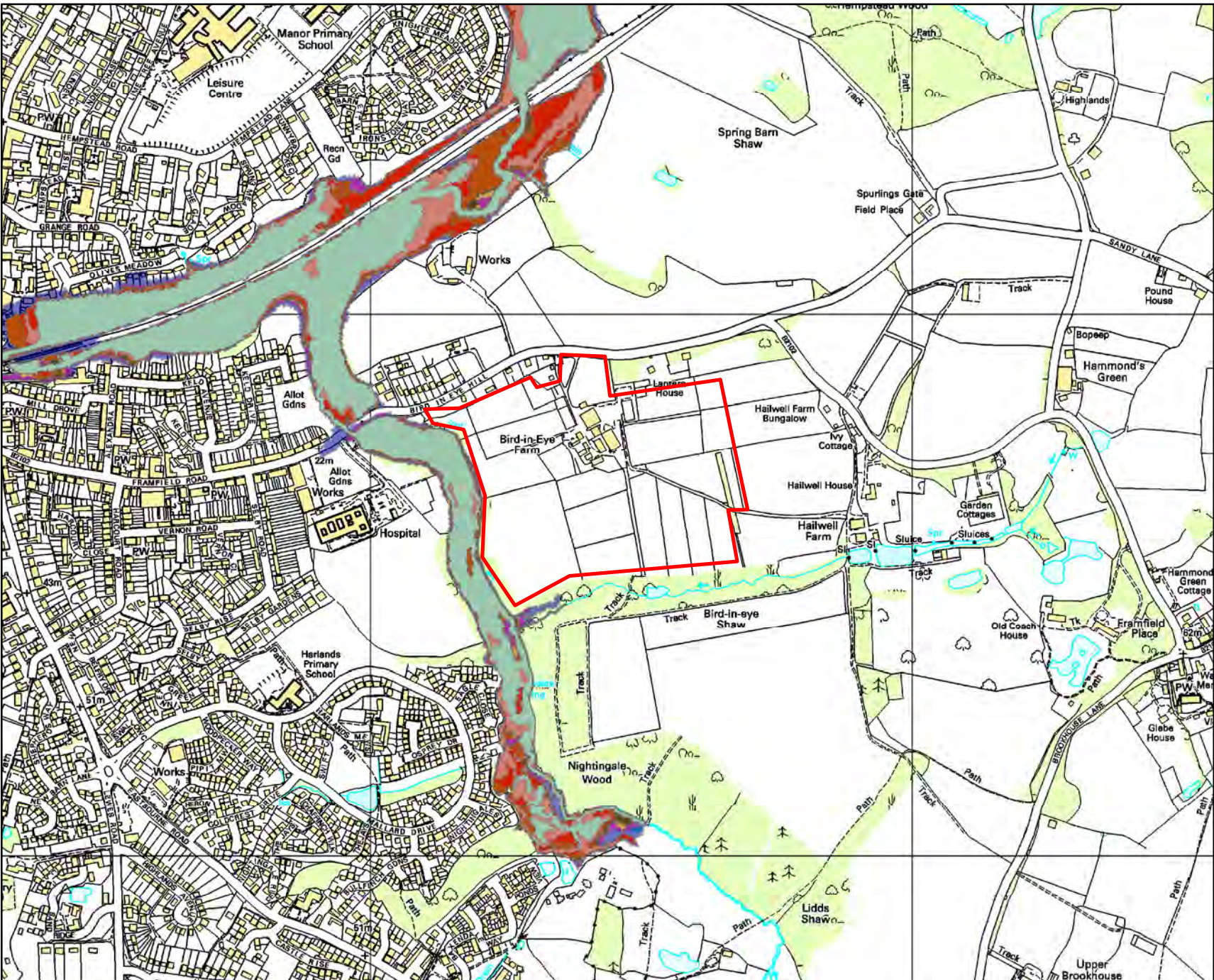
All Tidal model data taken from River Uck Flood Risk Mapping Study completed in 2012 by JBA Consultancy.

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

Produced on 16/04/2020

Environment Agency Solent & South Downs
Office Address: Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD
Email: enquiries@environment-agency.gov.uk
customer service line 03708 506 506
gov.uk/environment-agency

SSD168006 - Modelled Flood Outlines (defended fluvial) - Centred TN22 5HA



Legend

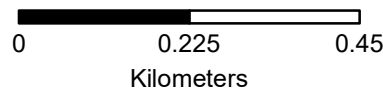
- Site Boundary
- 20% AEP (Defended Fluvial)
- 10% AEP (Defended Fluvial)
- 5% AEP (Defended Fluvial)
- 2% AEP (Defended Fluvial)
- 1.3% AEP (Defended Fluvial)
- 1% AEP (Defended Fluvial)
- 0.4% AEP (Defended Fluvial)
- 0.1% AEP (Defended Fluvial)
- 1% AEP + CC20 (Defended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Climate Change (CC) for fluvial models is based on an increase in river flows of 35, 45 & 105% for undefended scenarios.

Defended scenarios only show the superseded 20% increase in flows

Scale: 1:10,000



SSD168006 - Modelled Flood Outlines (undefended fluvial) - Centred TN22 5HA



Environment
Agency



Legend

- Site Boundary
- 20% AEP (Undefended Fluvial)
- 10% AEP (Undefended Fluvial)
- 5% AEP (Undefended Fluvial)
- 2% AEP (Undefended Fluvial)
- 1.3% AEP (Undefended Fluvial)
- 1% AEP (Undefended Fluvial)
- 0.4% AEP (Undefended Fluvial)
- 0.1% AEP (Undefended Fluvial)
- 1% AEP + CC35 (Undefended Fluvial)
- 1% AEP + CC45 (Undefended Fluvial)
- 1% AEP + CC105 (Undefended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Climate Change (CC) for fluvial models is based on an increase in river flows of 35, 45 & 105% for undefended scenarios.

Defended scenarios only show the superseded 20% increase in flows

Scale: 1:10,000

00.2250.45

Kilometers

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Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Appendix E Development Proposal

Illustrative Site Layout PRB-BIE-PA2N by Paul Brown Architects



Applicants:
Croudace Homes Ltd and Mr. & Mrs. Berry

Croudace
HOMES.CO.UK

R Paul Brown RIBA Chartered Architect
14 Weymede, Green Lane, Byfleet, Surrey, KT14 7DG
T: 01932 349946 M: 07443 417 952

Land at Bird in Eye Farm, South of Bird in Eye Hill,

UCKFIELD

Illustrative Site Layout

Ref: PRB/BIE/PA2N

Apr 2020

Appendix F Surface Water Parameters

LLFA Meeting Minutes

LLFA Correspondence

FEH Greenfield Runoff per 1ha

Additional Storage Requirement per 1ha

1 in 100 year (plus 40% Climate Change) Attenuation Volume Requirement per 1ha

Permeable Paving PP-B1 1 in 100 year (plus 40% Climate Change) Model.

Permeable Paving PP-C1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-C2 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-D1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-E1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-F1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-G1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-H1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-J1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-L1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-M1 1 in 100 year (plus 40% Climate Change) Model

Permeable Paving PP-P1 1 in 100 year (plus 40% Climate Change) Model

Detention Basin DB-1 1 in 100 year (plus 40% Climate Change) Model

MINUTES

Meeting Title: Bird in Eye, Uckfield – Pre-advisory meeting with East Sussex LLFA

Attendees: Victoria Lander (VL), Charlie Cooper (CC) (East Sussex Lead Local Flood Authority (LLFA)), Elisabetta Torricelli (ET), Mike Niisato (MN), Simone Pinna-Nossai (SPN) (Stantec)

Apologies: Steven Brown (SB) (Wolf Bond Planning)

cc: Emma Challenger (EC) (Croudace Homes), Paul Brown (PB) (Architect)

Date of Meeting: 05/05/2020

Job Number: 48494

These minutes should be read in conjunction with Stantec Sketch '48494-MU240420-drainage strategy_RevB'.

Item	Subject	Actions
1.	<u>Introduction</u> ET outlined the purpose and aims of the meeting - To provide the officers with an introduction to the overall scheme and discuss/agree design principles that will help define the development of the surface water drainage strategy.	
2.	<u>Overview of Development proposals</u> ET provided a background summary of the site, focusing on the area's existing use, existing buildings/farm and existing drainage infrastructure. ET explained that Stantec's design team is currently appraising the use of a multitude of SuDS features such as, water butt, permeable paving, raingardens, conveyance channels, swales, filter strips, detention basin and geo-cellular crates.	
3.	<u>Overview of Flood Risk and existing drainage</u> ET presented the current masterplan option, the topography on the hydrological context of the site identifying the keys aspects in terms of flow route within the site e discharge point location. ET identified that the site is mainly located in Flood Zone 1, with smaller area with higher risk of flooding not included within the development area. This includes the impact of climate change, as assessed using the Product 4 data received from the Environment Agency. ET described the site's existing surface water drainage regime. The Framfield Stream and EA Main River flows from south to north along the western boundary of the site towards its confluence with the River Uck. The Chalybeate Arm runs in parallel to the Framfield Stream, between the two watercourses. The Chalybeate Arm follows north	

MINUTES

Item	Subject	Actions
	and is a tributary of Framfield Stream before its discharges into the River Uck. The site naturally drains towards the Framfield Stream.	
4.	<p><u>Proposed Surface Water Drainage Strategy</u></p> <p>MN presented the key drainage principles proposed for the development which are based on the site's specific constraints and existing conditions. These being:</p> <ol style="list-style-type: none"> 1. Uncontrolled surface water from each plot will be collected and conveyed into a surface water drainage pipe located within the highways (likely to adopted). 2. Uncontrolled surface water from the greenfield part of the site to be collected with the use of filter strips and swales, located downslope of the site. 3. Surface water from both development area and greenfield area within the site to be collected into a detention basin and attenuated through a geo-cellular crate located underneath the basin. 4. Attenuated surface water to be discharged to the greenfield runoff rates into the nearest Framfield Stream watercourse on the south west of the site (subject to EA permit). <p>VL noted that infiltration drainage solution can be used within the site rather than geo-cellular attenuation crate. MN highlighted the fact that erosion from infiltration features could be an issue in the Tunbridge Sand stratum, as per recommendations set out in the Kent County Council (KCC) SuDS guidance. CC added that the LLFA are not aware of any specific issues in the area, but they would welcome more info in the FRA.</p> <p>VL added that infiltration t would indeally need to be carried out ahead of the planning application. MN confirmed that should infiltration be feasible; the crates system could be replaced by deep borehole soakaways and permeable paving would not be lined. The current strategy caters for a worst-case scenario, where a higher amount of attenuation needs to be provided on site, but it is flexible enough to include infiltration measures should they be found effective</p> <p>ET highlighted that because of the Covid-19 situation, it is unlikely that a site survey and infiltration tests could be undertaken before planning application submission which is anticipated in early July. VL confirmed that considering the circumstances, the outline nature of the planning application and the conservative approach so far applied to the surface water strategy, it would be acceptable for infiltration tests to be dealt with by way of planning condition.</p> <p>MN asked for any comments on SuDS. VL replied that in principle the proposed strategy looks acceptable, but that ESCC are not in favour of crates underneath the detention basin due to maintenance and siltation issues. MN noted that crates could potentially be moved north, and this option will be tested. Options to use additional open features have also been tested but found unfeasibly due to space and topographical constraints. VL confirmed that the LLFA preference is to use basins only but, if it can be demonstrated that other options have been exhausted, then geo-cellular crates attenuation solutions would be acceptable if part of a wider SuDS strategy. MN also pointed</p>	

MINUTES

Item	Subject	Actions
	<p>that the current attenuation basin volume does not consider the amount of storage that can be provided in permeable paving and that this will be tested too.</p> <p>MN added that detention basin with crates underneath has been designed in accordance with Sewers of Adoption (SfA) 8th and that in the future, it could be offered for adoption to Southern Water (SW). CC noted that LLFA do not know if SW will adopt it and it is unlikely that ESC will accept it anyway if crates are proposed under the basin. ET added that the upstream network is likely to be adopted by SW, in accordance with SfA 7th and that Stantec will engage with them to get the dialogue started in advance of planning being submitted.</p> <p>CC noted that the FRA should show that the connection into the watercourse falls within the control of the site's owner. ET confirmed that site ownership's boundary would be provided to demonstrate connection is feasible.</p> <p>MN explained that the drainage strategy presented so far is just a schematic and will be refined when submitting the FRA. VL noted that that the LLFA would want to see the basin levels, size, volume, invert and cover levels and generally that the drainage system works by gravity. VL added that is acceptable to assume lined permeable paving for now.</p> <p>ET asked if a source control design with MicroDrainage would be sufficient without modelling the entire network. VL accepted it and confirmed it would be acceptable.</p> <p>VL asked about discharge rate on site. MN noted that that discharge rate is equivalent to greenfield (GF) runoff rate (at flow match) for all rainfall event up to 1:100. In order to mitigate against the likely effects of climate change, the post-development discharge rate for the 1 in 100-year storm + 40% Climate change will be limited to match the pre-development greenfield runoff rate for the 1 in 100-year storm. CC confirmed the discharge approach would be acceptable and asked which impermeable area has been used to calculate greenfield runoff rate on site. MN confirmed that the entire redline has been used (16ha). CC pointed out that the impermeable area can be reduced as per development area only. ET suggested that the area upstream of the swales is considered in the GF runoff calculations, with any downstream areas not included in the catchment. CC confirmed this approach is acceptable.</p> <p>ET asked if groundwater monitoring is likely to be requested as a planning condition by ESC LLFA. VL confirmed that this will be the case, the LLFA will request groundwater monitoring during winter from October to December.</p>	
5.	<p><u>AOB</u></p> <p>It was agreed that following on from this Skype meeting between members of the design team and drainage officers, further communication over the coming months could be dealt with via emails/telephone where clarifications or refinement is required.</p> <p>SPN would follow up this meeting with minutes to confirm discussions</p>	

MINUTES



[REDACTED]

From: Su DS Consultations - Flood <Su.DS@eastsussex.gov.uk>
Sent: 21 August 2020 12:49
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Bird in Eye LLFA meeting minutes

Hi Lewis,

Apologies for the late response. Yes we agree that the meeting minutes should reflect what was discussed and as such we just wanted to point out that our general stance to development in the county is that infiltration should be investigated as a first option, which was highlighted in the meeting. In this particular site and given that it would appear that greenfield runoff from the site does currently fall towards the existing watercourse, we accept what you are proposing as a conservative approach to calculating attenuation volumes and agree that infiltration testing can be set as a condition to the outline planning permission in this case. I can therefore confirm agreement to the approach described in the meeting minutes in this respect, but please just note that we wouldn't accept the covid crisis as the sole reason for not undertaking testing as we are aware that site investigations have continued to take place in the past couple of months as usual. The reason for pointing this out is that other developers have not been exempt from undertaking site investigations as a result of Covid-19 and there should be a uniform approach to this issue.

Kind regards,

[REDACTED]
Sustainable Drainage Advisor
Flood Risk Management - CET

[REDACTED]
SuDS@eastsussex.gov.uk



From: [REDACTED]
Sent: 01 July 2020 15:46

[REDACTED]

Subject: RE: Bird in Eye LLFA meeting minutes

Hi [REDACTED]

Thank you for your response regarding the minutes for the meeting about the site at Bird in Eye, Uckfield

We understand the LLFA's position that infiltration should be explored as the first option, however we need to be mindful of the purpose of the minutes in that they should reflect the discussions held in the meeting. It would be inappropriate to change these minutes to reflect updates to the Governments COVID-19 policy which occurred after the meeting's date. Therefore, we are not in favour of this amendment. For the avoidance of doubt, during the meeting it was acknowledged and agreed by all present that, given the outline nature of the application and conservative approach adopted, infiltration testing could be dealt with by way of planning condition.

Stantec have maintained their conservative approach to the surface water drainage strategy design, but we have also developed the surface water drainage strategy so that it can readily be amended should infiltration be proven viable at a later date. We are also currently in the process of coordinating infiltration testing and groundwater monitoring on site, but cannot guarantee that this will be available prior to submission of an outline planning application. The FRA will explicitly acknowledge that infiltration testing is outstanding / in progress so that this point is not lost in later stages and reinforces the planning condition suggested in the original meeting. This, therefore, seeks to establish the principles of the surface water drainage strategy for the site whilst demonstrating that there is a viable "back-up" outfall i.e. discharge to the watercourse, if infiltration is proven unviable.

It is our viewpoint that this is an appropriate compromise given the recent circumstances and trust that this is acceptable to the LLFA.

Kind regards,

[Redacted]

[Taunton](#)

Better Together, Even If We're Apart. Read [more](#) about Stantec's COVID-19 response, including remote working and business continuity measures.

Please note that I am now working unconventional hours during the week. I will respond to your email as soon as I can.

[Redacted]



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From: [Redacted]
Sent: 17 June 2020 09:36
To: [Redacted]
Cc: Su DS Consultations - Flood <Su.DS@eastsussex.gov.uk>
Subject: RE: Bird in Eye LLFA meeting minutes

Good morning [Redacted]

The meeting minutes are generally acceptable to us, but I would like to make a couple of remarks:

- The LLFA's view on infiltration testing was conveyed during the meeting: wherever ground conditions are considered suitable we would always require that discharge via infiltration is explored as a first option, and we require infiltration testing to be carried out as part of an outline submission. The Pre-App meeting was held at a time of uncertainty in relation to Covid-19, but matters have progressed since and most contractors are back to business as usual. If there is a specific reason why it is not possible to undertake testing, this should be conveyed to us. Otherwise our preference would be that infiltration testing is undertaken at early stages to inform the drainage strategy.
- Just a minor clarification on the wording of our request for groundwater monitoring: groundwater monitoring should be undertaken for three months between autumn and spring; October to December is one of the options but we would accept other timeframes between October to March.

Kind regards,

[Redacted]

Sustainable Drainage Advisor

SuDS@eastsussex.gov.uk



From: [REDACTED]
Sent: 09 June 2020 13:01
To: [REDACTED]
Subject: RE: Bird in Eye LLFA meeting minutes

Good afternoon,

I hope you are well and keeping safe.

In regards of the minutes notes for Bird in Eye pre-advisory meeting attended on 05/05/2020.
Could you please confirm if you have any comments and if you are happy with it?

Many thanks and I look forward to hearing from you.

Kind regards,

[REDACTED]
88 Gray's Inn Road
London
WC1X 8AA



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From: [REDACTED]
Sent: 15 May 2020 15:49
[REDACTED]
Subject: Bird in Eye LLFA meeting minutes

Good afternoon,

Please see attached meeting minutes as discussed during the pre-advisory meeting attended on 05/05/2020 for Bird in Eye project.

Please do not hesitate to get in touch if you have any comments.

Thank you and I look forward to hearing from you.

Kind regards,

[REDACTED]

88 Gray's Inn Road
London
WC1X 8AA

[REDACTED]



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FEH Greenfield Runoff

Using the 2008 Statistical Method QMED Equation



Project Title	Bird in Eye, Uckfield
Project No	48494

Methodology as set out in SuDS Manual 24.3.2

[SUDS Manual Chapter 24](#)

1 Retrieve FEH Catchment Information

Define BFIHOST definition source	FEH	see note 1
Catchment Descriptors	BFIHOST	0.441
	SAAR	778.0 see note 1
	FARL	1.0 see note 2

2 Derive QBAR (mean annual flood)

Define area	Site Area	1.0 ha
	Applied Area	50.0 ha see note 3
FEH Index Flood (SuDS Manual Equation 24.2)	QMED (Q ₂)	4.6 l/s see note 4
Calculate QBAR by dividing QMED by 2yr growth factor	QBAR	5.2 l/s see note 5

3 Select appropriate growth factors

FSR Hydrological Region		7
100yr Growth Curve Factor	GQ ₁₀₀	3.19
30yr Growth Curve Factor	GQ ₃₀	2.40
10yr Growth Curve Factor	GQ ₁₀	1.62
2yr Growth Curve Factor	GQ ₂	0.88
1yr Growth Curve Factor	GQ ₁	0.85

(refer to FSR Hydrological Region tab)



Figure 24.1 Hydrological areas

4 Derive Flood Frequency

Greenfield Runoff per 1ha

100yr Peak Runoff Rate	Q ₁₀₀	16.5 l/s	Q ₁₀₀	16.5 l/s/ha
30yr Peak Runoff Rate	Q ₃₀	12.4 l/s	Q ₃₀	12.4 l/s/ha
10yr Growth Curve Rate	Q ₁₀	8.4 l/s	Q ₁₀	8.4 l/s/ha
QBAR Peak Runoff Rate	QBAR	5.2 l/s	Q _{BAR}	5.2 l/s/ha
2yr Peak Runoff Rate	Q ₂	4.6 l/s	Q ₂	4.6 l/s/ha
1yr Peak Runoff Rate	Q ₁	4.4 l/s	Q ₁	4.4 l/s/ha

Location of FEH Point Data (as Hyperlink)

[Saved here](#)

DOCUMENT ISSUE RECORD

Rev	Comments	Prepared	Date	Checked	Date
-	Original calculation	KT	03/04/2020		

Additional Runoff Estimation

Long Term Storage - Greenfield



Project Title	Bird in Eye, Uckfield	
Project No	48494	4001

1 in 100 year 6 hour storm rainfall depth	RD	69.76	mm	(from FEH)
Area	A	1.00	ha	(1 ha)
SPR Index (undeveloped)	SPR	0.404		(from FEH)
Percentage Impermeable	PIMP	100.0		
Runoff percentage (developed area)	%	70		(80 recommended)
Proportion of Paved Area Runoff Received	α	1		(between 0 and 1)
Proportion of Pervious Area Runoff Received	β	1		(between 0 and 1)
Additional Runoff Volume	Vol _{xs}	206.5	m ³ /ha	

EQ. 24.10 Estimating the extra runoff volume from a development site compared to the greenfield equivalent

$$Vol_{xs} = RD \times A \times 10 \left[\frac{PIMP}{100} (\alpha \cdot 0.8) + \left(1 - \frac{PIMP}{100} \right) (\beta \cdot SPR) - SPR \right]$$

where:

- Vol_{xs} = extra runoff volume of development runoff over greenfield runoff (m³)
- RD = rainfall depth for the 1:100 year, 6 hour event (mm)
- PIMP = impermeable area as a percentage of the total area
- A = area of the site, in hectares (ha)
- SPR = SPR index for the SOIL or HOST class (specified as a decimal proportion; this specifies the proportion of runoff from pervious surfaces (if SPRHOST values are used, then the minimum value should be set to 0.1)
- α = proportion of paved area draining to the network (values 0–1) with 80% assumed runoff
- β = proportion of the pervious area draining to the network or directly to the river (values from 0 to 1)

If the paved area is assumed to drain to the network, and all the permeable areas are landscaped so that they do not enter the drainage system or river, Equation 1 simplifies to:

$$Vol_{xs} = RD \times A \times 10 \left(0.8 \frac{PIMP}{100} - SPR \right)$$

However, where all the permeable areas are assumed to continue to drain to the river or network as well as all paved areas, Equation 2 becomes:

$$Vol_{xs} = RD \times A \times 10 \left(0.8 - SPR \right) \frac{PIMP}{100}$$

(CIRIA SuDS Manual 2015 (C753), 2015)

Location of FEH Data (as Hyperlink)

[Saved here](#)

DOCUMENT ISSUE RECORD

Rev	Comments	Prepared	Date	Checked	Date
-	Original calculation	KT	03/04/2020		

Peter Brett Associates		Page 1
Blackbrook Business Park	BIRD IN EYE	
Blackbrook Avenue	UCKFIELD	
Taunton TA1 2PX	HYDROBRAKE AND ORIFICE	
Date 07/04/2020 16:22	Designed by EAD	
File BIRD IN EYE WITH ORIFICE.SRCX	Checked by	
Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.510	0.510	6.6	279.6	O K
30 min Summer	0.646	0.646	10.7	369.1	O K
60 min Summer	0.776	0.776	13.2	461.3	O K
120 min Summer	0.852	0.852	14.4	518.5	O K
180 min Summer	0.885	0.885	14.9	543.7	O K
240 min Summer	0.898	0.898	15.1	554.3	O K
360 min Summer	0.910	0.910	15.3	563.2	O K
480 min Summer	0.914	0.914	15.3	566.9	O K
600 min Summer	0.915	0.915	15.4	567.6	O K
720 min Summer	0.913	0.913	15.3	566.0	O K
960 min Summer	0.905	0.905	15.2	559.3	O K
1440 min Summer	0.876	0.876	14.8	537.2	O K
2160 min Summer	0.833	0.833	14.1	504.4	O K
2880 min Summer	0.794	0.794	13.5	475.0	O K
4320 min Summer	0.728	0.728	12.3	426.9	O K
5760 min Summer	0.679	0.679	11.3	392.0	O K
7200 min Summer	0.000	0.000	0.0	0.0	O K
8640 min Summer	0.000	0.000	0.0	0.0	O K
10080 min Summer	0.000	0.000	0.0	0.0	O K
15 min Winter	0.561	0.561	8.6	312.5	O K
30 min Winter	0.710	0.710	12.0	413.7	O K
60 min Winter	0.851	0.851	14.4	518.1	O K
120 min Winter	0.936	0.936	15.7	583.8	O K
180 min Winter	0.974	0.974	16.2	614.3	O K
240 min Winter	0.991	0.991	16.4	628.7	O K
360 min Winter	0.999	0.999	16.5	634.8	O K
480 min Winter	1.000	1.000	16.5	635.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	193.1	19
30 min Summer	101.080	0.0	268.2	33
60 min Summer	64.792	0.0	475.8	62
120 min Summer	38.150	0.0	560.1	122
180 min Summer	27.925	0.0	614.4	180
240 min Summer	22.344	0.0	654.6	240
360 min Summer	16.277	0.0	712.5	292
480 min Summer	12.968	0.0	752.8	352
600 min Summer	10.865	0.0	782.7	420
720 min Summer	9.403	0.0	805.4	488
960 min Summer	7.495	0.0	838.7	624
1440 min Summer	5.444	0.0	880.8	894
2160 min Summer	3.997	0.0	1075.2	1296
2880 min Summer	3.231	0.0	1157.2	1672
4320 min Summer	2.409	0.0	1252.8	2420
5760 min Summer	1.967	0.0	1414.4	3120
7200 min Summer	-0.012	0.0	-10.5	0
8640 min Summer	-0.010	0.0	-10.5	0
10080 min Summer	-0.008	0.0	-10.5	0
15 min Winter	150.752	0.0	218.7	19
30 min Winter	101.080	0.0	306.2	33
60 min Winter	64.792	0.0	533.1	62
120 min Winter	38.150	0.0	627.4	120
180 min Winter	27.925	0.0	687.9	176
240 min Winter	22.344	0.0	732.6	232
360 min Winter	16.277	0.0	796.6	330
480 min Winter	12.968	0.0	840.6	372

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
600 min Winter	0.996	0.996	16.5	632.6	O K
720 min Winter	0.988	0.988	16.4	626.3	O K
960 min Winter	0.968	0.968	16.1	609.4	O K
1440 min Winter	0.916	0.916	15.4	567.8	O K
2160 min Winter	0.845	0.845	14.3	513.0	O K
2880 min Winter	0.784	0.784	13.3	467.8	O K
4320 min Winter	0.692	0.692	11.6	401.0	O K
5760 min Winter	0.628	0.628	10.3	357.4	O K
7200 min Winter	0.000	0.000	0.0	0.0	O K
8640 min Winter	0.000	0.000	0.0	0.0	O K
10080 min Winter	0.000	0.000	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.865	0.0	873.0	448
720 min Winter	9.403	0.0	898.0	526
960 min Winter	7.495	0.0	937.5	674
1440 min Winter	5.444	0.0	990.0	954
2160 min Winter	3.997	0.0	1204.6	1364
2880 min Winter	3.231	0.0	1296.7	1756
4320 min Winter	2.409	0.0	1408.8	2504
5760 min Winter	1.967	0.0	1584.3	3224
7200 min Winter	-0.012	0.0	-11.8	0
8640 min Winter	-0.010	0.0	-11.8	0
10080 min Winter	-0.008	0.0	-11.8	0

Peter Brett Associates		Page 3
Blackbrook Business Park	BIRD IN EYE	
Blackbrook Avenue	UCKFIELD	
Taunton TA1 2PX	HYDROBRAKE AND ORIFICE	
Date 07/04/2020 16:22	Designed by EAD	
File BIRD IN EYE WITH ORIFICE.SRCX	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.000

Time (mins)		Area
From:	To:	(ha)
0	4	1.000

Peter Brett Associates		Page 4
Blackbrook Business Park	BIRD IN EYE	
Blackbrook Avenue	UCKFIELD	
Taunton TA1 2PX	HYDROBRAKE AND ORIFICE	
Date 07/04/2020 16:22	Designed by EAD	
File BIRD IN EYE WITH ORIFICE.SRCX	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 1.600

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	466.0	0.395	594.8	1.000	822.4	1.600	1084.4

Complex Outflow Control

Hydro-Brake® Optimum

Unit Reference MD-SHE-0076-2000-0395-2000
Design Head (m) 0.395
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 76
Invert Level (m) 0.000
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.395	2.0	Kick-Flo®	0.284	1.7
Flush-Flo™	0.124	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	0.800	2.8	2.000	4.2	4.000	5.8	7.000	7.7
0.200	1.9	1.000	3.1	2.200	4.4	4.500	6.2	7.500	8.0
0.300	1.8	1.200	3.3	2.400	4.6	5.000	6.5	8.000	8.2
0.400	2.0	1.400	3.6	2.600	4.8	5.500	6.8	8.500	8.5
0.500	2.2	1.600	3.8	3.000	5.1	6.000	7.1	9.000	8.7
0.600	2.4	1.800	4.0	3.500	5.5	6.500	7.4	9.500	9.0

Orifice

Diameter (m) 0.093 Discharge Coefficient 0.600 Invert Level (m) 0.395

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 532 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.075	0.075	0.0	0.2	0.2	7.1	O K
30 min Summer	0.106	0.106	0.0	0.3	0.3	9.9	O K
60 min Summer	0.137	0.137	0.0	0.3	0.3	12.9	Flood Risk
120 min Summer	0.159	0.159	0.0	0.3	0.3	14.9	Flood Risk
180 min Summer	0.170	0.170	0.0	0.3	0.3	16.0	Flood Risk
240 min Summer	0.176	0.176	0.0	0.3	0.3	16.5	Flood Risk
360 min Summer	0.180	0.180	0.0	0.3	0.3	17.0	Flood Risk
480 min Summer	0.181	0.181	0.0	0.3	0.3	17.1	Flood Risk
600 min Summer	0.182	0.182	0.0	0.3	0.3	17.1	Flood Risk
720 min Summer	0.182	0.182	0.0	0.3	0.3	17.1	Flood Risk
960 min Summer	0.181	0.181	0.0	0.3	0.3	17.0	Flood Risk
1440 min Summer	0.175	0.175	0.0	0.3	0.3	16.4	Flood Risk
2160 min Summer	0.165	0.165	0.0	0.3	0.3	15.5	Flood Risk
2880 min Summer	0.156	0.156	0.0	0.3	0.3	14.6	Flood Risk
4320 min Summer	0.138	0.138	0.0	0.3	0.3	13.0	Flood Risk
5760 min Summer	0.123	0.123	0.0	0.3	0.3	11.6	O K
15 min Winter	0.086	0.086	0.0	0.2	0.2	8.1	O K
30 min Winter	0.120	0.120	0.0	0.3	0.3	11.3	O K
60 min Winter	0.156	0.156	0.0	0.3	0.3	14.7	Flood Risk
120 min Winter	0.180	0.180	0.0	0.3	0.3	17.0	Flood Risk
180 min Winter	0.193	0.193	0.0	0.4	0.4	18.2	Flood Risk
240 min Winter	0.200	0.200	0.0	0.4	0.4	18.8	Flood Risk
360 min Winter	0.207	0.207	0.0	0.4	0.4	19.4	Flood Risk
480 min Winter	0.208	0.208	0.0	0.4	0.4	19.5	Flood Risk
600 min Winter	0.206	0.206	0.0	0.4	0.4	19.4	Flood Risk
720 min Winter	0.206	0.206	0.0	0.4	0.4	19.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	6.6	19
30 min Summer	101.080	0.0	9.4	34
60 min Summer	64.792	0.0	13.2	64
120 min Summer	38.150	0.0	15.8	122
180 min Summer	27.925	0.0	17.5	182
240 min Summer	22.344	0.0	18.8	242
360 min Summer	16.277	0.0	20.7	358
480 min Summer	12.968	0.0	22.1	406
600 min Summer	10.865	0.0	23.2	466
720 min Summer	9.403	0.0	24.2	528
960 min Summer	7.495	0.0	25.7	662
1440 min Summer	5.444	0.0	28.0	938
2160 min Summer	3.997	0.0	31.7	1344
2880 min Summer	3.231	0.0	34.2	1732
4320 min Summer	2.409	0.0	38.4	2512
5760 min Summer	1.967	0.0	42.2	3288
15 min Winter	150.752	0.0	7.6	19
30 min Winter	101.080	0.0	10.8	33
60 min Winter	64.792	0.0	15.0	62
120 min Winter	38.150	0.0	17.9	120
180 min Winter	27.925	0.0	19.9	178
240 min Winter	22.344	0.0	21.3	236
360 min Winter	16.277	0.0	23.4	346
480 min Winter	12.968	0.0	25.0	450
600 min Winter	10.865	0.0	26.2	486
720 min Winter	9.403	0.0	27.3	558

Stantec UK Ltd		Page 2
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:45	Designed by LWD	
File 210429_PP-B1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.203	0.203	0.0	0.4	0.4	19.0	Flood Risk
1440 min Winter	0.192	0.192	0.0	0.4	0.4	18.0	Flood Risk
2160 min Winter	0.176	0.176	0.0	0.3	0.3	16.5	Flood Risk
2880 min Winter	0.160	0.160	0.0	0.3	0.3	15.1	Flood Risk
4320 min Winter	0.134	0.134	0.0	0.3	0.3	12.6	Flood Risk
5760 min Winter	0.114	0.114	0.0	0.3	0.3	10.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	29.0	712
1440 min Winter	5.444	0.0	31.5	1010
2160 min Winter	3.997	0.0	35.7	1448
2880 min Winter	3.231	0.0	38.6	1872
4320 min Winter	2.409	0.0	43.2	2640
5760 min Winter	1.967	0.0	47.5	3408

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.031

Time (mins)	Area
From:	To: (ha)
0	4 0.031

Stantec UK Ltd		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:45	Designed by LWD	
File 210429_PP-B1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.7
Membrane Percolation (mm/hr)	1000	Length (m)	17.7
Max Percolation (l/s)	87.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Stantec UK Ltd		Page 1
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN		
Date 29/04/2021 13:52	Designed by LWD	
File 200528_PP-C1_Permearable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 553 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	7.6	O K
30 min Summer	0.108	0.108	0.0	0.3	0.3	10.6	O K
60 min Summer	0.140	0.140	0.0	0.3	0.3	13.8	Flood Risk
120 min Summer	0.163	0.163	0.0	0.3	0.3	16.0	Flood Risk
180 min Summer	0.174	0.174	0.0	0.3	0.3	17.1	Flood Risk
240 min Summer	0.181	0.181	0.0	0.3	0.3	17.7	Flood Risk
360 min Summer	0.186	0.186	0.0	0.4	0.4	18.3	Flood Risk
480 min Summer	0.187	0.187	0.0	0.4	0.4	18.4	Flood Risk
600 min Summer	0.188	0.188	0.0	0.4	0.4	18.4	Flood Risk
720 min Summer	0.188	0.188	0.0	0.4	0.4	18.4	Flood Risk
960 min Summer	0.187	0.187	0.0	0.4	0.4	18.3	Flood Risk
1440 min Summer	0.181	0.181	0.0	0.3	0.3	17.8	Flood Risk
2160 min Summer	0.172	0.172	0.0	0.3	0.3	16.9	Flood Risk
2880 min Summer	0.163	0.163	0.0	0.3	0.3	16.0	Flood Risk
4320 min Summer	0.146	0.146	0.0	0.3	0.3	14.3	Flood Risk
5760 min Summer	0.131	0.131	0.0	0.3	0.3	12.9	Flood Risk
15 min Winter	0.088	0.088	0.0	0.2	0.2	8.7	O K
30 min Winter	0.123	0.123	0.0	0.3	0.3	12.1	O K
60 min Winter	0.160	0.160	0.0	0.3	0.3	15.7	Flood Risk
120 min Winter	0.185	0.185	0.0	0.3	0.3	18.2	Flood Risk
180 min Winter	0.198	0.198	0.0	0.4	0.4	19.5	Flood Risk
240 min Winter	0.206	0.206	0.0	0.4	0.4	20.2	Flood Risk
360 min Winter	0.213	0.213	0.0	0.4	0.4	20.9	Flood Risk
480 min Winter	0.214	0.214	0.0	0.4	0.4	21.1	Flood Risk
600 min Winter	0.213	0.213	0.0	0.4	0.4	20.9	Flood Risk
720 min Winter	0.213	0.213	0.0	0.4	0.4	20.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	7.0	19
30 min Summer	101.080	0.0	10.0	34
60 min Summer	64.792	0.0	14.0	64
120 min Summer	38.150	0.0	16.9	122
180 min Summer	27.925	0.0	18.7	182
240 min Summer	22.344	0.0	20.0	242
360 min Summer	16.277	0.0	22.1	360
480 min Summer	12.968	0.0	23.5	416
600 min Summer	10.865	0.0	24.7	476
720 min Summer	9.403	0.0	25.7	536
960 min Summer	7.495	0.0	27.3	668
1440 min Summer	5.444	0.0	29.7	940
2160 min Summer	3.997	0.0	33.7	1360
2880 min Summer	3.231	0.0	36.5	1756
4320 min Summer	2.409	0.0	40.8	2548
5760 min Summer	1.967	0.0	45.0	3288
15 min Winter	150.752	0.0	8.1	19
30 min Winter	101.080	0.0	11.4	33
60 min Winter	64.792	0.0	15.9	62
120 min Winter	38.150	0.0	19.1	120
180 min Winter	27.925	0.0	21.1	178
240 min Winter	22.344	0.0	22.7	236
360 min Winter	16.277	0.0	24.9	348
480 min Winter	12.968	0.0	26.6	454
600 min Winter	10.865	0.0	27.9	500
720 min Winter	9.403	0.0	29.0	564

Stantec UK Ltd		Page 2
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:52	Designed by LWD	
File 200528_PP-C1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.210	0.210	0.0	0.4	0.4	20.6	Flood Risk
1440 min Winter	0.200	0.200	0.0	0.4	0.4	19.7	Flood Risk
2160 min Winter	0.184	0.184	0.0	0.3	0.3	18.1	Flood Risk
2880 min Winter	0.169	0.169	0.0	0.3	0.3	16.6	Flood Risk
4320 min Winter	0.143	0.143	0.0	0.3	0.3	14.1	Flood Risk
5760 min Winter	0.122	0.122	0.0	0.3	0.3	12.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	30.8	720
1440 min Winter	5.444	0.0	33.4	1024
2160 min Winter	3.997	0.0	38.0	1452
2880 min Winter	3.231	0.0	41.1	1872
4320 min Winter	2.409	0.0	46.0	2680
5760 min Winter	1.967	0.0	50.6	3456

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.033

Time (mins)	Area
From:	To: (ha)
0	4 0.033

Stantec UK Ltd		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:52	Designed by LWD	
File 200528_PP-C1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.1
Membrane Percolation (mm/hr)	1000	Length (m)	18.1
Max Percolation (l/s)	91.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Stantec UK Ltd		Page 1
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN		
Date 29/04/2021 13:57	Designed by LWD	
File 200528_PP-C2_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 952 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	12.2	O K
30 min Summer	0.108	0.108	0.0	0.3	0.3	17.2	O K
60 min Summer	0.142	0.142	0.0	0.3	0.3	22.5	Flood Risk
120 min Summer	0.166	0.166	0.0	0.3	0.3	26.4	Flood Risk
180 min Summer	0.180	0.180	0.0	0.3	0.3	28.6	Flood Risk
240 min Summer	0.190	0.190	0.0	0.4	0.4	30.1	Flood Risk
360 min Summer	0.200	0.200	0.0	0.4	0.4	31.8	Flood Risk
480 min Summer	0.206	0.206	0.0	0.4	0.4	32.6	Flood Risk
600 min Summer	0.208	0.208	0.0	0.4	0.4	33.0	Flood Risk
720 min Summer	0.208	0.208	0.0	0.4	0.4	33.0	Flood Risk
960 min Summer	0.209	0.209	0.0	0.4	0.4	33.2	Flood Risk
1440 min Summer	0.209	0.209	0.0	0.4	0.4	33.2	Flood Risk
2160 min Summer	0.207	0.207	0.0	0.4	0.4	32.8	Flood Risk
2880 min Summer	0.203	0.203	0.0	0.4	0.4	32.3	Flood Risk
4320 min Summer	0.193	0.193	0.0	0.4	0.4	30.7	Flood Risk
5760 min Summer	0.182	0.182	0.0	0.3	0.3	29.0	Flood Risk
15 min Winter	0.088	0.088	0.0	0.2	0.2	14.0	O K
30 min Winter	0.123	0.123	0.0	0.3	0.3	19.6	O K
60 min Winter	0.161	0.161	0.0	0.3	0.3	25.6	Flood Risk
120 min Winter	0.189	0.189	0.0	0.4	0.4	29.9	Flood Risk
180 min Winter	0.205	0.205	0.0	0.4	0.4	32.5	Flood Risk
240 min Winter	0.215	0.215	0.0	0.4	0.4	34.2	Flood Risk
360 min Winter	0.228	0.228	0.0	0.4	0.4	36.2	Flood Risk
480 min Winter	0.234	0.234	0.0	0.4	0.4	37.2	Flood Risk
600 min Winter	0.238	0.238	0.0	0.4	0.4	37.7	Flood Risk
720 min Winter	0.239	0.239	0.0	0.4	0.4	37.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	10.3	19
30 min Summer	101.080	0.0	14.4	34
60 min Summer	64.792	0.0	21.9	64
120 min Summer	38.150	0.0	26.3	124
180 min Summer	27.925	0.0	29.1	182
240 min Summer	22.344	0.0	31.1	242
360 min Summer	16.277	0.0	34.1	362
480 min Summer	12.968	0.0	36.1	480
600 min Summer	10.865	0.0	37.6	600
720 min Summer	9.403	0.0	38.8	670
960 min Summer	7.495	0.0	40.4	772
1440 min Summer	5.444	0.0	41.4	1026
2160 min Summer	3.997	0.0	53.7	1444
2880 min Summer	3.231	0.0	57.9	1848
4320 min Summer	2.409	0.0	63.9	2676
5760 min Summer	1.967	0.0	72.1	3464
15 min Winter	150.752	0.0	11.8	19
30 min Winter	101.080	0.0	16.1	33
60 min Winter	64.792	0.0	24.9	62
120 min Winter	38.150	0.0	29.7	122
180 min Winter	27.925	0.0	32.8	180
240 min Winter	22.344	0.0	35.1	238
360 min Winter	16.277	0.0	38.2	354
480 min Winter	12.968	0.0	40.4	468
600 min Winter	10.865	0.0	42.0	578
720 min Winter	9.403	0.0	43.1	686

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.238	0.238	0.0	0.4	0.4	37.8	Flood Risk
1440 min Winter	0.236	0.236	0.0	0.4	0.4	37.4	Flood Risk
2160 min Winter	0.230	0.230	0.0	0.4	0.4	36.5	Flood Risk
2880 min Winter	0.222	0.222	0.0	0.4	0.4	35.2	Flood Risk
4320 min Winter	0.204	0.204	0.0	0.4	0.4	32.3	Flood Risk
5760 min Winter	0.186	0.186	0.0	0.4	0.4	29.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	44.6	878
1440 min Winter	5.444	0.0	45.5	1096
2160 min Winter	3.997	0.0	60.5	1556
2880 min Winter	3.231	0.0	65.1	1992
4320 min Winter	2.409	0.0	71.5	2856
5760 min Winter	1.967	0.0	81.1	3688

Stantec UK Ltd		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:57	Designed by LWD	
File 200528_PP-C2_Permearable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.053

Time (mins)		Area
From:	To:	(ha)
0	4	0.053

Stantec UK Ltd		Page 4
Caversham Bridge House Waterman Place Reading, RG1 8DN	BIRD IN EYE UCKFIELD HYDROBRAKE AND ORIFICE	
Date 29/04/2021 13:57	Designed by LWD	
File 200528_PP-C2_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	146.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 731 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	9.7	O K
30 min Summer	0.108	0.108	0.0	0.3	0.3	13.6	O K
60 min Summer	0.141	0.141	0.0	0.3	0.3	17.7	Flood Risk
120 min Summer	0.164	0.164	0.0	0.3	0.3	20.7	Flood Risk
180 min Summer	0.177	0.177	0.0	0.3	0.3	22.3	Flood Risk
240 min Summer	0.185	0.185	0.0	0.3	0.3	23.3	Flood Risk
360 min Summer	0.193	0.193	0.0	0.4	0.4	24.4	Flood Risk
480 min Summer	0.196	0.196	0.0	0.4	0.4	24.7	Flood Risk
600 min Summer	0.197	0.197	0.0	0.4	0.4	24.8	Flood Risk
720 min Summer	0.197	0.197	0.0	0.4	0.4	24.9	Flood Risk
960 min Summer	0.197	0.197	0.0	0.4	0.4	24.9	Flood Risk
1440 min Summer	0.195	0.195	0.0	0.4	0.4	24.6	Flood Risk
2160 min Summer	0.190	0.190	0.0	0.4	0.4	23.9	Flood Risk
2880 min Summer	0.183	0.183	0.0	0.3	0.3	23.1	Flood Risk
4320 min Summer	0.169	0.169	0.0	0.3	0.3	21.4	Flood Risk
5760 min Summer	0.156	0.156	0.0	0.3	0.3	19.7	Flood Risk
15 min Winter	0.088	0.088	0.0	0.2	0.2	11.1	O K
30 min Winter	0.123	0.123	0.0	0.3	0.3	15.4	O K
60 min Winter	0.160	0.160	0.0	0.3	0.3	20.1	Flood Risk
120 min Winter	0.186	0.186	0.0	0.4	0.4	23.4	Flood Risk
180 min Winter	0.201	0.201	0.0	0.4	0.4	25.3	Flood Risk
240 min Winter	0.210	0.210	0.0	0.4	0.4	26.5	Flood Risk
360 min Winter	0.220	0.220	0.0	0.4	0.4	27.8	Flood Risk
480 min Winter	0.224	0.224	0.0	0.4	0.4	28.3	Flood Risk
600 min Winter	0.225	0.225	0.0	0.4	0.4	28.4	Flood Risk
720 min Winter	0.225	0.225	0.0	0.4	0.4	28.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	8.6	19
30 min Summer	101.080	0.0	12.2	34
60 min Summer	64.792	0.0	17.7	64
120 min Summer	38.150	0.0	21.2	122
180 min Summer	27.925	0.0	23.5	182
240 min Summer	22.344	0.0	25.2	242
360 min Summer	16.277	0.0	27.7	360
480 min Summer	12.968	0.0	29.5	480
600 min Summer	10.865	0.0	30.9	534
720 min Summer	9.403	0.0	32.1	590
960 min Summer	7.495	0.0	34.0	712
1440 min Summer	5.444	0.0	36.2	980
2160 min Summer	3.997	0.0	42.8	1388
2880 min Summer	3.231	0.0	46.2	1812
4320 min Summer	2.409	0.0	51.6	2596
5760 min Summer	1.967	0.0	57.2	3400
15 min Winter	150.752	0.0	9.9	19
30 min Winter	101.080	0.0	13.8	33
60 min Winter	64.792	0.0	20.1	62
120 min Winter	38.150	0.0	24.0	120
180 min Winter	27.925	0.0	26.6	180
240 min Winter	22.344	0.0	28.5	238
360 min Winter	16.277	0.0	31.3	352
480 min Winter	12.968	0.0	33.3	462
600 min Winter	10.865	0.0	34.8	568
720 min Winter	9.403	0.0	36.1	664

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.224	0.224	0.0	0.4	0.4	28.2	Flood Risk
1440 min Winter	0.218	0.218	0.0	0.4	0.4	27.5	Flood Risk
2160 min Winter	0.208	0.208	0.0	0.4	0.4	26.2	Flood Risk
2880 min Winter	0.196	0.196	0.0	0.4	0.4	24.7	Flood Risk
4320 min Winter	0.173	0.173	0.0	0.3	0.3	21.8	Flood Risk
5760 min Winter	0.154	0.154	0.0	0.3	0.3	19.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	38.1	750
1440 min Winter	5.444	0.0	40.2	1054
2160 min Winter	3.997	0.0	48.2	1512
2880 min Winter	3.231	0.0	52.0	1932
4320 min Winter	2.409	0.0	58.0	2768
5760 min Winter	1.967	0.0	64.3	3576

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:34	Designed by EAD	
File 200528_PP-D1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.042

Time (mins)		Area
From:	To:	(ha)
0	4	0.042

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:34	Designed by EAD	
File 200528_PP-D1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.5
Membrane Percolation (mm/hr)	1000	Length (m)	20.5
Max Percolation (l/s)	116.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 391 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.075	0.075	0.0	0.2	0.2	5.5	O K
30 min Summer	0.104	0.104	0.0	0.3	0.3	7.6	O K
60 min Summer	0.135	0.135	0.0	0.3	0.3	9.9	Flood Risk
120 min Summer	0.155	0.155	0.0	0.3	0.3	11.3	Flood Risk
180 min Summer	0.163	0.163	0.0	0.3	0.3	11.9	Flood Risk
240 min Summer	0.168	0.168	0.0	0.3	0.3	12.2	Flood Risk
360 min Summer	0.170	0.170	0.0	0.3	0.3	12.4	Flood Risk
480 min Summer	0.171	0.171	0.0	0.3	0.3	12.5	Flood Risk
600 min Summer	0.170	0.170	0.0	0.3	0.3	12.4	Flood Risk
720 min Summer	0.169	0.169	0.0	0.3	0.3	12.4	Flood Risk
960 min Summer	0.166	0.166	0.0	0.3	0.3	12.1	Flood Risk
1440 min Summer	0.157	0.157	0.0	0.3	0.3	11.5	Flood Risk
2160 min Summer	0.144	0.144	0.0	0.3	0.3	10.5	Flood Risk
2880 min Summer	0.133	0.133	0.0	0.3	0.3	9.7	Flood Risk
4320 min Summer	0.113	0.113	0.0	0.3	0.3	8.3	O K
5760 min Summer	0.099	0.099	0.0	0.2	0.2	7.2	O K
15 min Winter	0.086	0.086	0.0	0.2	0.2	6.3	O K
30 min Winter	0.119	0.119	0.0	0.3	0.3	8.7	O K
60 min Winter	0.154	0.154	0.0	0.3	0.3	11.2	Flood Risk
120 min Winter	0.176	0.176	0.0	0.3	0.3	12.8	Flood Risk
180 min Winter	0.186	0.186	0.0	0.4	0.4	13.6	Flood Risk
240 min Winter	0.192	0.192	0.0	0.4	0.4	14.0	Flood Risk
360 min Winter	0.194	0.194	0.0	0.4	0.4	14.2	Flood Risk
480 min Winter	0.194	0.194	0.0	0.4	0.4	14.1	Flood Risk
600 min Winter	0.192	0.192	0.0	0.4	0.4	14.0	Flood Risk
720 min Winter	0.190	0.190	0.0	0.4	0.4	13.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	5.2	19
30 min Summer	101.080	0.0	7.5	33
60 min Summer	64.792	0.0	10.3	62
120 min Summer	38.150	0.0	12.3	122
180 min Summer	27.925	0.0	13.7	182
240 min Summer	22.344	0.0	14.7	240
360 min Summer	16.277	0.0	16.1	306
480 min Summer	12.968	0.0	17.2	366
600 min Summer	10.865	0.0	18.1	430
720 min Summer	9.403	0.0	18.8	498
960 min Summer	7.495	0.0	20.1	636
1440 min Summer	5.444	0.0	21.9	908
2160 min Summer	3.997	0.0	24.6	1300
2880 min Summer	3.231	0.0	26.6	1700
4320 min Summer	2.409	0.0	29.8	2464
5760 min Summer	1.967	0.0	32.7	3176
15 min Winter	150.752	0.0	6.0	19
30 min Winter	101.080	0.0	8.5	33
60 min Winter	64.792	0.0	11.7	62
120 min Winter	38.150	0.0	14.0	120
180 min Winter	27.925	0.0	15.5	176
240 min Winter	22.344	0.0	16.6	232
360 min Winter	16.277	0.0	18.2	338
480 min Winter	12.968	0.0	19.5	382
600 min Winter	10.865	0.0	20.4	458
720 min Winter	9.403	0.0	21.3	534

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.184	0.184	0.0	0.3	0.3	13.4	Flood Risk
1440 min Winter	0.169	0.169	0.0	0.3	0.3	12.3	Flood Risk
2160 min Winter	0.148	0.148	0.0	0.3	0.3	10.8	Flood Risk
2880 min Winter	0.131	0.131	0.0	0.3	0.3	9.6	Flood Risk
4320 min Winter	0.104	0.104	0.0	0.3	0.3	7.6	O K
5760 min Winter	0.086	0.086	0.0	0.2	0.2	6.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	22.7	684
1440 min Winter	5.444	0.0	24.7	980
2160 min Winter	3.997	0.0	27.7	1388
2880 min Winter	3.231	0.0	29.9	1788
4320 min Winter	2.409	0.0	33.5	2552
5760 min Winter	1.967	0.0	36.8	3296

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:37	Designed by EAD	
File 200528_PP-E1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins)		Area
From:	To:	(ha)
0	4	0.024

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:37	Designed by EAD	
File 200528_PP-E1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.6
Membrane Percolation (mm/hr)	1000	Length (m)	15.6
Max Percolation (l/s)	67.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 446 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.078	0.078	0.0	0.2	0.2	6.2	O K
30 min Summer	0.108	0.108	0.0	0.3	0.3	8.6	O K
60 min Summer	0.140	0.140	0.0	0.3	0.3	11.2	Flood Risk
120 min Summer	0.161	0.161	0.0	0.3	0.3	12.9	Flood Risk
180 min Summer	0.171	0.171	0.0	0.3	0.3	13.7	Flood Risk
240 min Summer	0.176	0.176	0.0	0.3	0.3	14.1	Flood Risk
360 min Summer	0.179	0.179	0.0	0.3	0.3	14.3	Flood Risk
480 min Summer	0.180	0.180	0.0	0.3	0.3	14.4	Flood Risk
600 min Summer	0.180	0.180	0.0	0.3	0.3	14.4	Flood Risk
720 min Summer	0.180	0.180	0.0	0.3	0.3	14.3	Flood Risk
960 min Summer	0.177	0.177	0.0	0.3	0.3	14.1	Flood Risk
1440 min Summer	0.169	0.169	0.0	0.3	0.3	13.5	Flood Risk
2160 min Summer	0.157	0.157	0.0	0.3	0.3	12.5	Flood Risk
2880 min Summer	0.146	0.146	0.0	0.3	0.3	11.6	Flood Risk
4320 min Summer	0.126	0.126	0.0	0.3	0.3	10.1	O K
5760 min Summer	0.111	0.111	0.0	0.3	0.3	8.9	O K
15 min Winter	0.089	0.089	0.0	0.2	0.2	7.1	O K
30 min Winter	0.124	0.124	0.0	0.3	0.3	9.9	O K
60 min Winter	0.160	0.160	0.0	0.3	0.3	12.7	Flood Risk
120 min Winter	0.183	0.183	0.0	0.3	0.3	14.6	Flood Risk
180 min Winter	0.195	0.195	0.0	0.4	0.4	15.6	Flood Risk
240 min Winter	0.201	0.201	0.0	0.4	0.4	16.1	Flood Risk
360 min Winter	0.206	0.206	0.0	0.4	0.4	16.4	Flood Risk
480 min Winter	0.205	0.205	0.0	0.4	0.4	16.3	Flood Risk
600 min Winter	0.204	0.204	0.0	0.4	0.4	16.3	Flood Risk
720 min Winter	0.202	0.202	0.0	0.4	0.4	16.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	5.9	19
30 min Summer	101.080	0.0	8.4	33
60 min Summer	64.792	0.0	11.6	62
120 min Summer	38.150	0.0	13.9	122
180 min Summer	27.925	0.0	15.4	182
240 min Summer	22.344	0.0	16.5	240
360 min Summer	16.277	0.0	18.2	322
480 min Summer	12.968	0.0	19.4	380
600 min Summer	10.865	0.0	20.4	442
720 min Summer	9.403	0.0	21.2	506
960 min Summer	7.495	0.0	22.6	646
1440 min Summer	5.444	0.0	24.6	922
2160 min Summer	3.997	0.0	27.7	1320
2880 min Summer	3.231	0.0	29.9	1728
4320 min Summer	2.409	0.0	33.5	2468
5760 min Summer	1.967	0.0	36.8	3232
15 min Winter	150.752	0.0	6.8	19
30 min Winter	101.080	0.0	9.6	33
60 min Winter	64.792	0.0	13.1	62
120 min Winter	38.150	0.0	15.7	120
180 min Winter	27.925	0.0	17.4	178
240 min Winter	22.344	0.0	18.7	234
360 min Winter	16.277	0.0	20.5	342
480 min Winter	12.968	0.0	21.9	398
600 min Winter	10.865	0.0	23.0	466
720 min Winter	9.403	0.0	23.9	542

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.197	0.197	0.0	0.4	0.4	15.7	Flood Risk
1440 min Winter	0.183	0.183	0.0	0.3	0.3	14.6	Flood Risk
2160 min Winter	0.164	0.164	0.0	0.3	0.3	13.1	Flood Risk
2880 min Winter	0.147	0.147	0.0	0.3	0.3	11.7	Flood Risk
4320 min Winter	0.119	0.119	0.0	0.3	0.3	9.5	O K
5760 min Winter	0.099	0.099	0.0	0.2	0.2	7.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	25.5	694
1440 min Winter	5.444	0.0	27.8	994
2160 min Winter	3.997	0.0	31.2	1408
2880 min Winter	3.231	0.0	33.7	1816
4320 min Winter	2.409	0.0	37.7	2596
5760 min Winter	1.967	0.0	41.4	3344

Stantec UK Ltd		Page 3
Caversham Bridge House Waterman Place Reading, RG1 8DN	BIRD IN EYE UCKFIELD HYDROBRAKE AND ORIFICE	
Date 29/04/2021 14:02	Designed by LWD	
File 200528_PP-F1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.027

Time (mins)		Area
From:	To:	(ha)
0	4	0.027

Stantec UK Ltd		Page 4
Caversham Bridge House Waterman Place Reading, RG1 8DN	BIRD IN EYE UCKFIELD HYDROBRAKE AND ORIFICE	
Date 29/04/2021 14:02	Designed by LWD	
File 200528_PP-F1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	16.3
Membrane Percolation (mm/hr)	1000	Length (m)	16.3
Max Percolation (l/s)	73.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Peter Brett Associates		Page 1
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN		
Date 19/08/2020 10:45	Designed by EAD	
File 200528_PP-G1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 618 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	8.3	O K
30 min Summer	0.108	0.108	0.0	0.3	0.3	11.6	O K
60 min Summer	0.141	0.141	0.0	0.3	0.3	15.1	Flood Risk
120 min Summer	0.164	0.164	0.0	0.3	0.3	17.5	Flood Risk
180 min Summer	0.176	0.176	0.0	0.3	0.3	18.8	Flood Risk
240 min Summer	0.183	0.183	0.0	0.3	0.3	19.6	Flood Risk
360 min Summer	0.189	0.189	0.0	0.4	0.4	20.3	Flood Risk
480 min Summer	0.191	0.191	0.0	0.4	0.4	20.5	Flood Risk
600 min Summer	0.191	0.191	0.0	0.4	0.4	20.5	Flood Risk
720 min Summer	0.192	0.192	0.0	0.4	0.4	20.5	Flood Risk
960 min Summer	0.191	0.191	0.0	0.4	0.4	20.5	Flood Risk
1440 min Summer	0.187	0.187	0.0	0.4	0.4	20.0	Flood Risk
2160 min Summer	0.179	0.179	0.0	0.3	0.3	19.2	Flood Risk
2880 min Summer	0.171	0.171	0.0	0.3	0.3	18.3	Flood Risk
4320 min Summer	0.155	0.155	0.0	0.3	0.3	16.6	Flood Risk
5760 min Summer	0.140	0.140	0.0	0.3	0.3	15.0	Flood Risk
15 min Winter	0.088	0.088	0.0	0.2	0.2	9.5	O K
30 min Winter	0.123	0.123	0.0	0.3	0.3	13.2	O K
60 min Winter	0.160	0.160	0.0	0.3	0.3	17.2	Flood Risk
120 min Winter	0.186	0.186	0.0	0.4	0.4	19.9	Flood Risk
180 min Winter	0.200	0.200	0.0	0.4	0.4	21.4	Flood Risk
240 min Winter	0.208	0.208	0.0	0.4	0.4	22.3	Flood Risk
360 min Winter	0.217	0.217	0.0	0.4	0.4	23.2	Flood Risk
480 min Winter	0.219	0.219	0.0	0.4	0.4	23.5	Flood Risk
600 min Winter	0.218	0.218	0.0	0.4	0.4	23.4	Flood Risk
720 min Winter	0.218	0.218	0.0	0.4	0.4	23.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	7.6	19
30 min Summer	101.080	0.0	10.8	34
60 min Summer	64.792	0.0	15.3	64
120 min Summer	38.150	0.0	18.3	122
180 min Summer	27.925	0.0	20.3	182
240 min Summer	22.344	0.0	21.8	242
360 min Summer	16.277	0.0	24.0	360
480 min Summer	12.968	0.0	25.6	438
600 min Summer	10.865	0.0	26.8	494
720 min Summer	9.403	0.0	27.9	556
960 min Summer	7.495	0.0	29.7	682
1440 min Summer	5.444	0.0	32.1	954
2160 min Summer	3.997	0.0	36.8	1364
2880 min Summer	3.231	0.0	39.7	1760
4320 min Summer	2.409	0.0	44.5	2552
5760 min Summer	1.967	0.0	49.1	3336
15 min Winter	150.752	0.0	8.7	19
30 min Winter	101.080	0.0	12.3	33
60 min Winter	64.792	0.0	17.3	62
120 min Winter	38.150	0.0	20.8	120
180 min Winter	27.925	0.0	23.0	178
240 min Winter	22.344	0.0	24.6	236
360 min Winter	16.277	0.0	27.1	348
480 min Winter	12.968	0.0	28.9	458
600 min Winter	10.865	0.0	30.3	556
720 min Winter	9.403	0.0	31.5	578

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.216	0.216	0.0	0.4	0.4	23.1	Flood Risk
1440 min Winter	0.207	0.207	0.0	0.4	0.4	22.2	Flood Risk
2160 min Winter	0.193	0.193	0.0	0.4	0.4	20.7	Flood Risk
2880 min Winter	0.179	0.179	0.0	0.3	0.3	19.2	Flood Risk
4320 min Winter	0.154	0.154	0.0	0.3	0.3	16.5	Flood Risk
5760 min Winter	0.134	0.134	0.0	0.3	0.3	14.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	33.4	730
1440 min Winter	5.444	0.0	36.0	1036
2160 min Winter	3.997	0.0	41.4	1472
2880 min Winter	3.231	0.0	44.7	1900
4320 min Winter	2.409	0.0	50.0	2720
5760 min Winter	1.967	0.0	55.2	3512

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:45	Designed by EAD	
File 200528_PP-G1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.036

Time (mins)		Area
From:	To:	(ha)
0	4	0.036

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:45	Designed by EAD	
File 200528_PP-G1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.9
Membrane Percolation (mm/hr)	1000	Length (m)	18.9
Max Percolation (l/s)	99.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 662 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	8.7	O K
30 min Summer	0.109	0.109	0.0	0.3	0.3	12.3	O K
60 min Summer	0.142	0.142	0.0	0.3	0.3	16.0	Flood Risk
120 min Summer	0.165	0.165	0.0	0.3	0.3	18.6	Flood Risk
180 min Summer	0.177	0.177	0.0	0.3	0.3	20.0	Flood Risk
240 min Summer	0.185	0.185	0.0	0.3	0.3	20.8	Flood Risk
360 min Summer	0.192	0.192	0.0	0.4	0.4	21.7	Flood Risk
480 min Summer	0.193	0.193	0.0	0.4	0.4	21.8	Flood Risk
600 min Summer	0.194	0.194	0.0	0.4	0.4	21.9	Flood Risk
720 min Summer	0.194	0.194	0.0	0.4	0.4	22.0	Flood Risk
960 min Summer	0.194	0.194	0.0	0.4	0.4	21.9	Flood Risk
1440 min Summer	0.191	0.191	0.0	0.4	0.4	21.5	Flood Risk
2160 min Summer	0.184	0.184	0.0	0.3	0.3	20.8	Flood Risk
2880 min Summer	0.176	0.176	0.0	0.3	0.3	19.9	Flood Risk
4320 min Summer	0.160	0.160	0.0	0.3	0.3	18.1	Flood Risk
5760 min Summer	0.146	0.146	0.0	0.3	0.3	16.5	Flood Risk
15 min Winter	0.089	0.089	0.0	0.2	0.2	10.0	O K
30 min Winter	0.124	0.124	0.0	0.3	0.3	14.0	O K
60 min Winter	0.161	0.161	0.0	0.3	0.3	18.2	Flood Risk
120 min Winter	0.187	0.187	0.0	0.4	0.4	21.1	Flood Risk
180 min Winter	0.201	0.201	0.0	0.4	0.4	22.7	Flood Risk
240 min Winter	0.210	0.210	0.0	0.4	0.4	23.7	Flood Risk
360 min Winter	0.219	0.219	0.0	0.4	0.4	24.7	Flood Risk
480 min Winter	0.222	0.222	0.0	0.4	0.4	25.1	Flood Risk
600 min Winter	0.222	0.222	0.0	0.4	0.4	25.1	Flood Risk
720 min Winter	0.221	0.221	0.0	0.4	0.4	24.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	7.9	19
30 min Summer	101.080	0.0	11.3	34
60 min Summer	64.792	0.0	16.1	64
120 min Summer	38.150	0.0	19.3	122
180 min Summer	27.925	0.0	21.4	182
240 min Summer	22.344	0.0	23.0	242
360 min Summer	16.277	0.0	25.2	360
480 min Summer	12.968	0.0	26.9	456
600 min Summer	10.865	0.0	28.2	506
720 min Summer	9.403	0.0	29.4	566
960 min Summer	7.495	0.0	31.2	692
1440 min Summer	5.444	0.0	33.6	966
2160 min Summer	3.997	0.0	38.8	1380
2880 min Summer	3.231	0.0	41.9	1784
4320 min Summer	2.409	0.0	46.9	2592
5760 min Summer	1.967	0.0	51.8	3344
15 min Winter	150.752	0.0	9.1	19
30 min Winter	101.080	0.0	12.9	33
60 min Winter	64.792	0.0	18.3	62
120 min Winter	38.150	0.0	21.9	120
180 min Winter	27.925	0.0	24.2	178
240 min Winter	22.344	0.0	26.0	236
360 min Winter	16.277	0.0	28.5	350
480 min Winter	12.968	0.0	30.4	458
600 min Winter	10.865	0.0	31.8	560
720 min Winter	9.403	0.0	33.1	590

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.220	0.220	0.0	0.4	0.4	24.8	Flood Risk
1440 min Winter	0.212	0.212	0.0	0.4	0.4	23.9	Flood Risk
2160 min Winter	0.199	0.199	0.0	0.4	0.4	22.5	Flood Risk
2880 min Winter	0.186	0.186	0.0	0.4	0.4	21.0	Flood Risk
4320 min Winter	0.161	0.161	0.0	0.3	0.3	18.2	Flood Risk
5760 min Winter	0.141	0.141	0.0	0.3	0.3	15.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	35.1	732
1440 min Winter	5.444	0.0	37.6	1040
2160 min Winter	3.997	0.0	43.7	1488
2880 min Winter	3.231	0.0	47.2	1904
4320 min Winter	2.409	0.0	52.7	2724
5760 min Winter	1.967	0.0	58.2	3520

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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File 200528_PP-H1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.038

Time (mins)		Area
From:	To:	(ha)
0	4	0.038

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.4
Membrane Percolation (mm/hr)	1000	Length (m)	19.4
Max Percolation (l/s)	104.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN		
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Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 528 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.076	0.076	0.0	0.2	0.2	7.1	O K
30 min Summer	0.107	0.107	0.0	0.3	0.3	9.9	O K
60 min Summer	0.139	0.139	0.0	0.3	0.3	12.9	Flood Risk
120 min Summer	0.161	0.161	0.0	0.3	0.3	14.9	Flood Risk
180 min Summer	0.172	0.172	0.0	0.3	0.3	16.0	Flood Risk
240 min Summer	0.178	0.178	0.0	0.3	0.3	16.5	Flood Risk
360 min Summer	0.182	0.182	0.0	0.3	0.3	16.9	Flood Risk
480 min Summer	0.183	0.183	0.0	0.3	0.3	17.0	Flood Risk
600 min Summer	0.184	0.184	0.0	0.3	0.3	17.1	Flood Risk
720 min Summer	0.184	0.184	0.0	0.3	0.3	17.1	Flood Risk
960 min Summer	0.182	0.182	0.0	0.3	0.3	16.9	Flood Risk
1440 min Summer	0.176	0.176	0.0	0.3	0.3	16.4	Flood Risk
2160 min Summer	0.167	0.167	0.0	0.3	0.3	15.5	Flood Risk
2880 min Summer	0.157	0.157	0.0	0.3	0.3	14.6	Flood Risk
4320 min Summer	0.139	0.139	0.0	0.3	0.3	12.9	Flood Risk
5760 min Summer	0.124	0.124	0.0	0.3	0.3	11.5	O K
15 min Winter	0.088	0.088	0.0	0.2	0.2	8.1	O K
30 min Winter	0.122	0.122	0.0	0.3	0.3	11.3	O K
60 min Winter	0.158	0.158	0.0	0.3	0.3	14.7	Flood Risk
120 min Winter	0.183	0.183	0.0	0.3	0.3	17.0	Flood Risk
180 min Winter	0.195	0.195	0.0	0.4	0.4	18.2	Flood Risk
240 min Winter	0.203	0.203	0.0	0.4	0.4	18.8	Flood Risk
360 min Winter	0.209	0.209	0.0	0.4	0.4	19.4	Flood Risk
480 min Winter	0.210	0.210	0.0	0.4	0.4	19.5	Flood Risk
600 min Winter	0.209	0.209	0.0	0.4	0.4	19.4	Flood Risk
720 min Winter	0.208	0.208	0.0	0.4	0.4	19.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	6.6	19
30 min Summer	101.080	0.0	9.5	34
60 min Summer	64.792	0.0	13.2	64
120 min Summer	38.150	0.0	15.9	122
180 min Summer	27.925	0.0	17.6	182
240 min Summer	22.344	0.0	18.9	242
360 min Summer	16.277	0.0	20.7	356
480 min Summer	12.968	0.0	22.1	406
600 min Summer	10.865	0.0	23.2	464
720 min Summer	9.403	0.0	24.2	526
960 min Summer	7.495	0.0	25.8	662
1440 min Summer	5.444	0.0	28.0	938
2160 min Summer	3.997	0.0	31.7	1344
2880 min Summer	3.231	0.0	34.3	1732
4320 min Summer	2.409	0.0	38.4	2508
5760 min Summer	1.967	0.0	42.2	3280
15 min Winter	150.752	0.0	7.6	19
30 min Winter	101.080	0.0	10.8	33
60 min Winter	64.792	0.0	15.0	62
120 min Winter	38.150	0.0	18.0	120
180 min Winter	27.925	0.0	19.9	178
240 min Winter	22.344	0.0	21.3	236
360 min Winter	16.277	0.0	23.4	346
480 min Winter	12.968	0.0	25.0	450
600 min Winter	10.865	0.0	26.2	484
720 min Winter	9.403	0.0	27.3	558

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
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File 200528_PP-J1_Permeable Paving_1...	Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.205	0.205	0.0	0.4	0.4	19.0	Flood Risk
1440 min Winter	0.194	0.194	0.0	0.4	0.4	18.0	Flood Risk
2160 min Winter	0.177	0.177	0.0	0.3	0.3	16.4	Flood Risk
2880 min Winter	0.161	0.161	0.0	0.3	0.3	15.0	Flood Risk
4320 min Winter	0.135	0.135	0.0	0.3	0.3	12.5	Flood Risk
5760 min Winter	0.114	0.114	0.0	0.3	0.3	10.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	29.0	712
1440 min Winter	5.444	0.0	31.6	1010
2160 min Winter	3.997	0.0	35.7	1448
2880 min Winter	3.231	0.0	38.6	1848
4320 min Winter	2.409	0.0	43.2	2640
5760 min Winter	1.967	0.0	47.5	3408

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Caversham Bridge House Waterman Place Reading, RG1 8DN	BIRD IN EYE UCKFIELD HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2020.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.031

Time (mins)		Area
From:	To:	(ha)
	0	4 0.031

Stantec UK Ltd		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading, RG1 8DN	HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.6
Membrane Percolation (mm/hr)	1000	Length (m)	17.6
Max Percolation (l/s)	86.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN		
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Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 557 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.076	0.076	0.0	0.2	0.2	7.6	O K
30 min Summer	0.107	0.107	0.0	0.3	0.3	10.6	O K
60 min Summer	0.139	0.139	0.0	0.3	0.3	13.8	Flood Risk
120 min Summer	0.161	0.161	0.0	0.3	0.3	16.0	Flood Risk
180 min Summer	0.172	0.172	0.0	0.3	0.3	17.1	Flood Risk
240 min Summer	0.179	0.179	0.0	0.3	0.3	17.7	Flood Risk
360 min Summer	0.184	0.184	0.0	0.3	0.3	18.3	Flood Risk
480 min Summer	0.185	0.185	0.0	0.3	0.3	18.4	Flood Risk
600 min Summer	0.186	0.186	0.0	0.4	0.4	18.5	Flood Risk
720 min Summer	0.186	0.186	0.0	0.4	0.4	18.5	Flood Risk
960 min Summer	0.185	0.185	0.0	0.3	0.3	18.4	Flood Risk
1440 min Summer	0.180	0.180	0.0	0.3	0.3	17.9	Flood Risk
2160 min Summer	0.171	0.171	0.0	0.3	0.3	17.0	Flood Risk
2880 min Summer	0.162	0.162	0.0	0.3	0.3	16.1	Flood Risk
4320 min Summer	0.145	0.145	0.0	0.3	0.3	14.4	Flood Risk
5760 min Summer	0.130	0.130	0.0	0.3	0.3	12.9	Flood Risk
15 min Winter	0.087	0.087	0.0	0.2	0.2	8.7	O K
30 min Winter	0.121	0.121	0.0	0.3	0.3	12.1	O K
60 min Winter	0.158	0.158	0.0	0.3	0.3	15.7	Flood Risk
120 min Winter	0.183	0.183	0.0	0.3	0.3	18.1	Flood Risk
180 min Winter	0.196	0.196	0.0	0.4	0.4	19.5	Flood Risk
240 min Winter	0.203	0.203	0.0	0.4	0.4	20.2	Flood Risk
360 min Winter	0.211	0.211	0.0	0.4	0.4	20.9	Flood Risk
480 min Winter	0.212	0.212	0.0	0.4	0.4	21.1	Flood Risk
600 min Winter	0.211	0.211	0.0	0.4	0.4	21.0	Flood Risk
720 min Winter	0.210	0.210	0.0	0.4	0.4	20.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	7.0	19
30 min Summer	101.080	0.0	10.0	34
60 min Summer	64.792	0.0	14.0	64
120 min Summer	38.150	0.0	16.8	122
180 min Summer	27.925	0.0	18.7	182
240 min Summer	22.344	0.0	20.0	242
360 min Summer	16.277	0.0	22.0	360
480 min Summer	12.968	0.0	23.5	416
600 min Summer	10.865	0.0	24.7	476
720 min Summer	9.403	0.0	25.7	538
960 min Summer	7.495	0.0	27.3	672
1440 min Summer	5.444	0.0	29.7	940
2160 min Summer	3.997	0.0	33.7	1360
2880 min Summer	3.231	0.0	36.4	1756
4320 min Summer	2.409	0.0	40.8	2548
5760 min Summer	1.967	0.0	45.0	3288
15 min Winter	150.752	0.0	8.1	19
30 min Winter	101.080	0.0	11.4	33
60 min Winter	64.792	0.0	15.9	62
120 min Winter	38.150	0.0	19.1	120
180 min Winter	27.925	0.0	21.1	178
240 min Winter	22.344	0.0	22.6	236
360 min Winter	16.277	0.0	24.9	348
480 min Winter	12.968	0.0	26.5	454
600 min Winter	10.865	0.0	27.8	502
720 min Winter	9.403	0.0	28.9	564

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.208	0.208	0.0	0.4	0.4	20.7	Flood Risk
1440 min Winter	0.198	0.198	0.0	0.4	0.4	19.7	Flood Risk
2160 min Winter	0.183	0.183	0.0	0.3	0.3	18.2	Flood Risk
2880 min Winter	0.168	0.168	0.0	0.3	0.3	16.7	Flood Risk
4320 min Winter	0.142	0.142	0.0	0.3	0.3	14.1	Flood Risk
5760 min Winter	0.122	0.122	0.0	0.3	0.3	12.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	30.8	720
1440 min Winter	5.444	0.0	33.4	1024
2160 min Winter	3.997	0.0	38.0	1452
2880 min Winter	3.231	0.0	41.0	1876
4320 min Winter	2.409	0.0	45.9	2680
5760 min Winter	1.967	0.0	50.6	3456

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.033

Time (mins)		Area
From:	To:	(ha)
0	4	0.033

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:50	Designed by EAD	
File 200528_PP-L1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.2
Membrane Percolation (mm/hr)	1000	Length (m)	18.2
Max Percolation (l/s)	92.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 690 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.076	0.076	0.0	0.2	0.2	9.2	O K
30 min Summer	0.106	0.106	0.0	0.3	0.3	12.9	O K
60 min Summer	0.139	0.139	0.0	0.3	0.3	16.8	Flood Risk
120 min Summer	0.162	0.162	0.0	0.3	0.3	19.6	Flood Risk
180 min Summer	0.174	0.174	0.0	0.3	0.3	21.1	Flood Risk
240 min Summer	0.182	0.182	0.0	0.3	0.3	22.1	Flood Risk
360 min Summer	0.190	0.190	0.0	0.4	0.4	23.0	Flood Risk
480 min Summer	0.192	0.192	0.0	0.4	0.4	23.3	Flood Risk
600 min Summer	0.193	0.193	0.0	0.4	0.4	23.4	Flood Risk
720 min Summer	0.193	0.193	0.0	0.4	0.4	23.4	Flood Risk
960 min Summer	0.193	0.193	0.0	0.4	0.4	23.4	Flood Risk
1440 min Summer	0.191	0.191	0.0	0.4	0.4	23.1	Flood Risk
2160 min Summer	0.185	0.185	0.0	0.3	0.3	22.4	Flood Risk
2880 min Summer	0.178	0.178	0.0	0.3	0.3	21.6	Flood Risk
4320 min Summer	0.164	0.164	0.0	0.3	0.3	19.8	Flood Risk
5760 min Summer	0.150	0.150	0.0	0.3	0.3	18.2	Flood Risk
15 min Winter	0.087	0.087	0.0	0.2	0.2	10.5	O K
30 min Winter	0.121	0.121	0.0	0.3	0.3	14.7	O K
60 min Winter	0.158	0.158	0.0	0.3	0.3	19.1	Flood Risk
120 min Winter	0.184	0.184	0.0	0.3	0.3	22.3	Flood Risk
180 min Winter	0.198	0.198	0.0	0.4	0.4	24.0	Flood Risk
240 min Winter	0.207	0.207	0.0	0.4	0.4	25.1	Flood Risk
360 min Winter	0.217	0.217	0.0	0.4	0.4	26.3	Flood Risk
480 min Winter	0.220	0.220	0.0	0.4	0.4	26.7	Flood Risk
600 min Winter	0.221	0.221	0.0	0.4	0.4	26.8	Flood Risk
720 min Winter	0.220	0.220	0.0	0.4	0.4	26.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	8.2	19
30 min Summer	101.080	0.0	11.7	34
60 min Summer	64.792	0.0	16.8	64
120 min Summer	38.150	0.0	20.2	122
180 min Summer	27.925	0.0	22.4	182
240 min Summer	22.344	0.0	24.0	242
360 min Summer	16.277	0.0	26.4	360
480 min Summer	12.968	0.0	28.2	474
600 min Summer	10.865	0.0	29.5	518
720 min Summer	9.403	0.0	30.7	578
960 min Summer	7.495	0.0	32.5	702
1440 min Summer	5.444	0.0	34.9	970
2160 min Summer	3.997	0.0	40.7	1384
2880 min Summer	3.231	0.0	44.0	1788
4320 min Summer	2.409	0.0	49.2	2592
5760 min Summer	1.967	0.0	54.4	3352
15 min Winter	150.752	0.0	9.5	19
30 min Winter	101.080	0.0	13.3	33
60 min Winter	64.792	0.0	19.1	62
120 min Winter	38.150	0.0	22.9	120
180 min Winter	27.925	0.0	25.4	180
240 min Winter	22.344	0.0	27.2	236
360 min Winter	16.277	0.0	29.8	350
480 min Winter	12.968	0.0	31.8	460
600 min Winter	10.865	0.0	33.3	566
720 min Winter	9.403	0.0	34.6	656

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.219	0.219	0.0	0.4	0.4	26.5	Flood Risk
1440 min Winter	0.213	0.213	0.0	0.4	0.4	25.8	Flood Risk
2160 min Winter	0.201	0.201	0.0	0.4	0.4	24.4	Flood Risk
2880 min Winter	0.189	0.189	0.0	0.4	0.4	22.9	Flood Risk
4320 min Winter	0.166	0.166	0.0	0.3	0.3	20.1	Flood Risk
5760 min Winter	0.146	0.146	0.0	0.3	0.3	17.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	36.6	742
1440 min Winter	5.444	0.0	38.9	1052
2160 min Winter	3.997	0.0	45.9	1492
2880 min Winter	3.231	0.0	49.6	1932
4320 min Winter	2.409	0.0	55.3	2764
5760 min Winter	1.967	0.0	61.2	3568

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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File 200528_PP-M1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.040

Time (mins)		Area
From:	To:	(ha)
0	4	0.040

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:51	Designed by EAD	
File 200528_PP-M1_PERMEABLE PAVING_1...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.1
Membrane Percolation (mm/hr)	1000	Length (m)	20.1
Max Percolation (l/s)	112.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

Peter Brett Associates		Page 1
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN		
Date 19/08/2020 10:51	Designed by EAD	
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Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 882 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.077	0.077	0.0	0.2	0.2	11.5	O K
30 min Summer	0.109	0.109	0.0	0.3	0.3	16.2	O K
60 min Summer	0.142	0.142	0.0	0.3	0.3	21.2	Flood Risk
120 min Summer	0.166	0.166	0.0	0.3	0.3	24.8	Flood Risk
180 min Summer	0.180	0.180	0.0	0.3	0.3	26.9	Flood Risk
240 min Summer	0.189	0.189	0.0	0.4	0.4	28.2	Flood Risk
360 min Summer	0.200	0.200	0.0	0.4	0.4	29.8	Flood Risk
480 min Summer	0.204	0.204	0.0	0.4	0.4	30.5	Flood Risk
600 min Summer	0.206	0.206	0.0	0.4	0.4	30.7	Flood Risk
720 min Summer	0.206	0.206	0.0	0.4	0.4	30.8	Flood Risk
960 min Summer	0.207	0.207	0.0	0.4	0.4	30.9	Flood Risk
1440 min Summer	0.206	0.206	0.0	0.4	0.4	30.8	Flood Risk
2160 min Summer	0.203	0.203	0.0	0.4	0.4	30.4	Flood Risk
2880 min Summer	0.199	0.199	0.0	0.4	0.4	29.7	Flood Risk
4320 min Summer	0.188	0.188	0.0	0.4	0.4	28.0	Flood Risk
5760 min Summer	0.176	0.176	0.0	0.3	0.3	26.3	Flood Risk
15 min Winter	0.089	0.089	0.0	0.2	0.2	13.2	O K
30 min Winter	0.124	0.124	0.0	0.3	0.3	18.5	O K
60 min Winter	0.161	0.161	0.0	0.3	0.3	24.1	Flood Risk
120 min Winter	0.189	0.189	0.0	0.4	0.4	28.2	Flood Risk
180 min Winter	0.205	0.205	0.0	0.4	0.4	30.5	Flood Risk
240 min Winter	0.215	0.215	0.0	0.4	0.4	32.1	Flood Risk
360 min Winter	0.227	0.227	0.0	0.4	0.4	33.9	Flood Risk
480 min Winter	0.233	0.233	0.0	0.4	0.4	34.8	Flood Risk
600 min Winter	0.236	0.236	0.0	0.4	0.4	35.2	Flood Risk
720 min Winter	0.236	0.236	0.0	0.4	0.4	35.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	9.9	19
30 min Summer	101.080	0.0	13.9	34
60 min Summer	64.792	0.0	20.8	64
120 min Summer	38.150	0.0	25.0	122
180 min Summer	27.925	0.0	27.6	182
240 min Summer	22.344	0.0	29.6	242
360 min Summer	16.277	0.0	32.4	362
480 min Summer	12.968	0.0	34.4	480
600 min Summer	10.865	0.0	36.0	596
720 min Summer	9.403	0.0	37.2	642
960 min Summer	7.495	0.0	39.0	760
1440 min Summer	5.444	0.0	40.3	1010
2160 min Summer	3.997	0.0	50.7	1428
2880 min Summer	3.231	0.0	54.7	1844
4320 min Summer	2.409	0.0	60.7	2640
5760 min Summer	1.967	0.0	68.0	3456
15 min Winter	150.752	0.0	11.3	19
30 min Winter	101.080	0.0	15.6	33
60 min Winter	64.792	0.0	23.6	62
120 min Winter	38.150	0.0	28.3	122
180 min Winter	27.925	0.0	31.2	180
240 min Winter	22.344	0.0	33.4	238
360 min Winter	16.277	0.0	36.5	354
480 min Winter	12.968	0.0	38.7	466
600 min Winter	10.865	0.0	40.3	576
720 min Winter	9.403	0.0	41.5	684

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	0.235	0.235	0.0	0.4	0.4	35.1	Flood Risk
1440 min Winter	0.232	0.232	0.0	0.4	0.4	34.7	Flood Risk
2160 min Winter	0.225	0.225	0.0	0.4	0.4	33.6	Flood Risk
2880 min Winter	0.216	0.216	0.0	0.4	0.4	32.3	Flood Risk
4320 min Winter	0.197	0.197	0.0	0.4	0.4	29.3	Flood Risk
5760 min Winter	0.178	0.178	0.0	0.3	0.3	26.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	7.495	0.0	43.2	790
1440 min Winter	5.444	0.0	44.3	1082
2160 min Winter	3.997	0.0	57.2	1536
2880 min Winter	3.231	0.0	61.6	1988
4320 min Winter	2.409	0.0	68.1	2848
5760 min Winter	1.967	0.0	76.5	3640

Peter Brett Associates		Page 3
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.050

Time (mins)		Area
From:	To:	(ha)
0	4	0.050

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 0.430

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.3
Membrane Percolation (mm/hr)	1000	Length (m)	22.3
Max Percolation (l/s)	138.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	0.000	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.000

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Caversham Bridge House Waterman Place Reading RG1 8DN	BIRD IN EYE UCKFIELD	
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Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.556	0.556	42.7	1444.8	O K
30 min Summer	0.712	0.712	92.6	1890.4	O K
60 min Summer	0.845	0.845	147.5	2284.7	O K
120 min Summer	0.888	0.888	165.7	2416.5	O K
180 min Summer	0.906	0.906	173.5	2472.7	O K
240 min Summer	0.916	0.916	177.7	2503.0	O K
360 min Summer	0.919	0.919	179.0	2512.4	O K
480 min Summer	0.911	0.911	175.4	2487.1	O K
600 min Summer	0.899	0.899	170.3	2449.7	O K
720 min Summer	0.885	0.885	164.6	2408.1	O K
960 min Summer	0.858	0.858	153.2	2325.7	O K
1440 min Summer	0.810	0.810	133.1	2181.0	O K
2160 min Summer	0.760	0.760	112.0	2031.3	O K
2880 min Summer	0.724	0.724	97.5	1925.1	O K
4320 min Summer	0.670	0.670	79.3	1769.7	O K
5760 min Summer	0.635	0.635	68.6	1667.5	O K
15 min Winter	0.616	0.616	61.6	1614.1	O K
30 min Winter	0.786	0.786	122.8	2108.4	O K
60 min Winter	0.930	0.930	182.8	2545.4	O K
120 min Winter	0.979	0.979	194.2	2697.6	O K
180 min Winter	0.996	0.996	198.1	2750.0	O K
240 min Winter	0.999	0.999	198.8	2761.8	O K
360 min Winter	0.985	0.985	195.7	2718.5	O K
480 min Winter	0.960	0.960	190.0	2640.1	O K
600 min Winter	0.934	0.934	183.7	2557.7	O K
720 min Winter	0.910	0.910	175.0	2484.1	O K
960 min Winter	0.868	0.868	157.5	2356.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.752	0.0	1345.2	19
30 min Summer	101.080	0.0	1826.7	33
60 min Summer	64.792	0.0	2470.0	62
120 min Summer	38.150	0.0	2916.3	104
180 min Summer	27.925	0.0	3205.9	134
240 min Summer	22.344	0.0	3422.6	166
360 min Summer	16.277	0.0	3742.4	234
480 min Summer	12.968	0.0	3976.0	302
600 min Summer	10.865	0.0	4163.9	368
720 min Summer	9.403	0.0	4323.1	434
960 min Summer	7.495	0.0	4589.5	562
1440 min Summer	5.444	0.0	4977.4	820
2160 min Summer	3.997	0.0	5569.2	1192
2880 min Summer	3.231	0.0	5997.9	1560
4320 min Summer	2.409	0.0	6686.8	2296
5760 min Summer	1.967	0.0	7333.9	3048
15 min Winter	150.752	0.0	1513.9	18
30 min Winter	101.080	0.0	2057.1	32
60 min Winter	64.792	0.0	2772.2	60
120 min Winter	38.150	0.0	3272.2	112
180 min Winter	27.925	0.0	3596.7	138
240 min Winter	22.344	0.0	3839.5	176
360 min Winter	16.277	0.0	4198.1	250
480 min Winter	12.968	0.0	4460.0	320
600 min Winter	10.865	0.0	4670.9	388
720 min Winter	9.403	0.0	4849.6	456
960 min Winter	7.495	0.0	5149.0	588

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
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File 200528_DB-1_DETENTION BASIN_100...	Checked by	
Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
1440 min Winter	0.803	0.803	129.9	2159.7	O K
2160 min Winter	0.740	0.740	104.0	1972.3	O K
2880 min Winter	0.696	0.696	87.0	1844.1	O K
4320 min Winter	0.635	0.635	68.7	1669.4	O K
5760 min Winter	0.604	0.604	56.7	1579.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440 min Winter	5.444	0.0	5585.9	848
2160 min Winter	3.997	0.0	6241.2	1232
2880 min Winter	3.231	0.0	6721.4	1612
4320 min Winter	2.409	0.0	7492.9	2336
5760 min Winter	1.967	0.0	8216.2	3112

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Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:30	Designed by EAD	
File 200528_DB-1_DETENTION BASIN_100...	Checked by	
Innovyze	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 548274 120643 TQ 48274 20643	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	5760
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.192

Time (mins)		Area
From:	To:	(ha)
0	4	5.192

Peter Brett Associates		Page 4
Caversham Bridge House	BIRD IN EYE	
Waterman Place	UCKFIELD	
Reading RG1 8DN	HYDROBRAKE AND ORIFICE	
Date 19/08/2020 10:30	Designed by EAD	
File 200528_DB-1_DETENTION BASIN_100...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 1.600

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2400.0	0.425	2704.3	1.000	3144.9	1.600	3640.1

Complex Outflow Control

Hydro-Brake® Optimum

Unit Reference MD-SHE-0223-2420-0425-2420
Design Head (m) 0.425
Design Flow (l/s) 24.2
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 223
Invert Level (m) 0.000
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.425	24.2	Kick-Flo®	0.392	23.3
Flush-Flo™	0.293	24.2	Mean Flow over Head Range	-	16.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.800	32.7	2.000	50.9	4.000	71.3	7.000	93.6
0.200	22.2	1.000	36.5	2.200	53.4	4.500	74.7	7.500	96.9
0.300	24.2	1.200	39.8	2.400	55.7	5.000	78.8	8.000	100.1
0.400	23.5	1.400	42.9	2.600	57.9	5.500	82.8	8.500	103.3
0.500	26.2	1.600	45.7	3.000	62.0	6.000	86.5	9.000	106.3
0.600	28.5	1.800	48.4	3.500	66.8	6.500	90.1	9.500	109.2

Orifice

Diameter (m) 0.351 Discharge Coefficient 0.600 Invert Level (m) 0.425

Appendix G Surface Water & Foul Drainage Plans

48494/2002/500/A – Indicative Surface Water & Foul Drainage

48494/2002/SK01 – Surface Water Drainage Outfall Concept Design



- | | |
|---|---|
|  | Application Boundary |
|  | Ancient Woodland 15m Buffer Zone |
|  | Tree Root Protection Area |
|  | Proposed Surface Water Drainage Sewer (indicative only) |
|  | Proposed Foul Drainage Sewer (indicative only) |
|  | Proposed Surface Water Drainage Headwall |
|  | Proposed Permeable Paving |
|  | Proposed Swale |
|  | Proposed Detention Basin |
|  | MicroDrainage Model Reference Code |

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.

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 sewers, services, plant or apparatus may affect their operations.

Land at Bird in Eye Farm
South of Bird in Eye Hill, Uckfield

Client <div style="font-size: 24px; font-weight: bold; text-align: center;">Croudace Homes Limited and Mr & Mrs Berry</div>			
Date of 1st Issue	Designed	Drawn	
11.11.2020	LWD	LWD	
AT Scale	Checked	Approved	
1:1000	ET	ET	
Drawing Number		Revision	
48494/2002/500		A	



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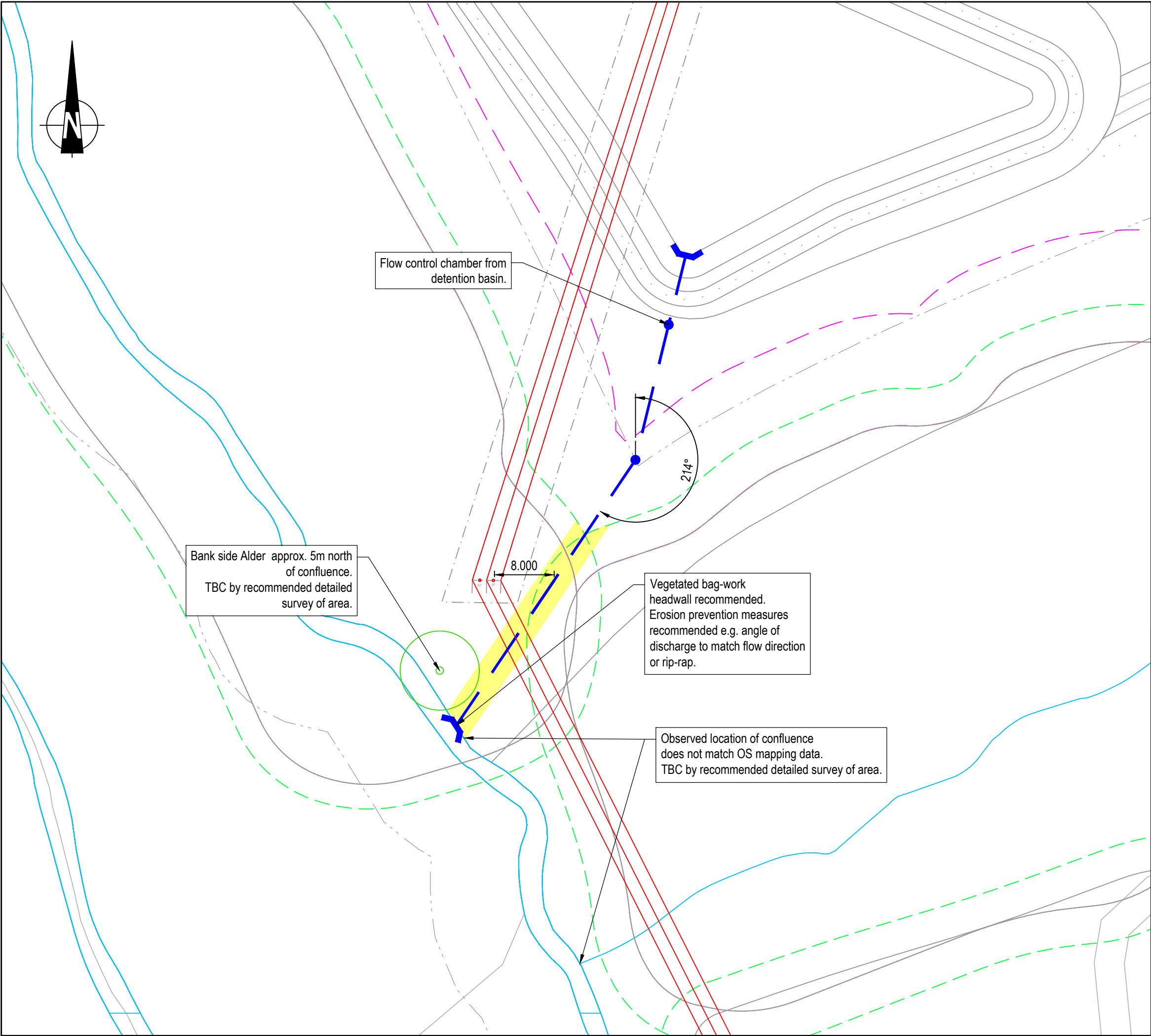
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TAUNTON

Tel: 01823 218 940





Notes:

1. This drawing is to be read in conjunction with all other Engineer's drawings.
2. Do not scale from this drawing.
3. All dimensions are in metres unless noted otherwise.
4. All levels are in metres above Ordnance Datum (AOD).
5. Proposed installation corridor is based on site observations, minimising the impact of the surface water drainage outfall on the existing vegetation.
6. It is recommended that final surface water drainage outfall arrangements should be informed by a detailed survey of the area, to accurately locate trees and other vegetation which are to be protected and confirm the depth of the watercourse. This should be undertaken prior to submission of any relevant Reserved Matters Applications.

Key:

- Ancient Woodland 15m Buffer Zone
- Tree Root Protection Area
- === Overhead Power Lines
- Proposed Surface Water Drainage Outfall Pipe
- Proposed Surface Water Drainage Chamber
- ⌋ Proposed Surface Water Drainage Headwall
- 4m Installation Corridor

Mark	Revision	Date	Drawn	Chkd	Appd
------	----------	------	-------	------	------

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.
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 sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status
For Information

Land at Bird in Eye Farm
South of Bird in Eye Hill, Uckfield
Surface Water Drainage
Outfall Concept Design

Client <div></div>			<div> Stantec</div>		
Date of 1st Issue 18.08.2020	Designed LWD	Drawn LWD	<div>stantec.com/uk</div> <div>Copyright reserved The copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorised by Stantec is forbidden.</div> <div>TAUNTON Tel: 01823 218 940</div>		
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Drawing Number 48494/2002/SK01		Revision -			