



## **Flood Risk Assessment and Drainage Strategy Report**

### **Barns Court and Friday Farm, Copthorne**

**Date:** Oct 2020  
**Reference:** 20-089\_R01

**Issue:** V3  
**Status:** Planning

**Prepared by:** PWE  
**Authorised by:** NRB  
**Issuing office:** BKM

**DOCUMENT CONTROL**

| Issue | Date       | Status   | BC Author      | BC Approval    | Notes |
|-------|------------|----------|----------------|----------------|-------|
| V1    | 23/09/2020 | DRAFT    | 23/09/2020_PWE | 23/09/2020_NRB |       |
| V2    | 02/10/2020 | Planning | 02/10/2020_PWE | 02/10/2020_NRB |       |
| V3    | 13/10/2020 | Planning | 13/10/2020_PWE | 13/10/2020_NRB |       |

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## 1.0 INTRODUCTION

- 1.1 HDR | Bradbrook was commissioned by The Turvey Corporation (the Client) to produce a Flood Risk Assessment (FRA) and drainage strategy for a proposed development at the existing business park at Barns Court and Friday Farm in Copthorne, West Sussex.
- 1.2 The relevant national planning guidance is set out by the National Planning Policy Framework (NPPF, updated in 2019). An FRA is required because the proposed development covers an area greater than 1 ha. The FRA must assess all sources of flood risk both to the development itself and the potential impact on people and property elsewhere within the catchment.
- 1.3 The overall objective of this study is to carry out an FRA that meets the requirements of the NPPF and West Sussex County Council flood risk policies. These consider surface water runoff management and the guidance published by the Environment Agency (EA), WSCC and Thames Water. The study is required to assess all aspects of flood risk to the proposed development, the potential impacts of the development on people and property elsewhere within the catchment and identify possible mitigation measures to ensure that the development is safe in the event of a flood. To achieve this aim, the following key actions were undertaken:
- Obtain publicly available flood data from the gov.uk website;
  - Review topographical and flood risk data to identify the existing flood risk posed to the site from all sources;
  - Assess the residual flood risk post-development;
  - Consider the vulnerability of the users and the development, taking account of the vulnerability classification;
  - Assess the safety of the route of access/egress from the site in a flood event;
  - Identify suitable mitigation measures to protect the development site against flooding; and
  - The production of a concept surface water drainage strategy for the proposed development.

## **2.0 PROJECT DETAILS AND ENVIRONMENTAL SETTING**

### **2.1 LOCATION**

2.1.1 The site is located west of Turners Hill Road and south of Copthorne Common Road (the A264) on the eastern edge of the village of Copthorne in West Sussex. Its post code is RH10 4HQ and it is approximately centred on Ordnance Survey National Grid Reference TQ 334 389.

2.1.2 A location plan is provided in Appendix A.

### **2.2 DESCRIPTION**

2.2.1 The site is irregular in plan shape and covers a total area of about 6.75 hectares. It consists of various land uses which are described in broad terms below.

2.2.2 The central part of the site is occupied by Barns Court business park, comprising several single-story commercial properties used by retail businesses which are accessed from Turners Hill Road. Areas external to the buildings are predominantly a mix of macadam, concrete and compacted gravel surfacing for car parking, with occasional soft landscaping. Some of these buildings are to be retained within the new development.

2.2.3 The northern sector of Barns Court comprises a mix of open grass-covered fields, assumed to be in agricultural/grazing use, as well as two warehouse-type units and an area of open storage. A security ditch extends along the eastern and southern boundaries of this area. The property further to the north of this land and bounded by Copthorne Common Road is known as Firs Farm and is outside the proposed development demise.

2.2.4 The western part of the site comprises a mix of dense vegetation including mature trees, and a series of open ponds / lagoons, some of which are understood to be used for amenity fishing purposes. The three western-most ponds retain water year-round, whilst the two eastern ponds are seasonally dry.

2.2.5 A detached residential property is located towards the southern end of the site, accessed via a driveway extending towards the north-west from Turners Hill Road. Land either side of the driveway comprises grass fields and mature boundary planting.

2.2.6 A June 2020 topographical survey produced by APR Services indicates ground levels fall from about 100.5 mAOD at the southern tip to about 92.5 mAOD on the western boundary. The central Barns Court area lies at between about 95.7 and 95.0 mAOD, falling from east to west, and levels in the northern agricultural fields range between about 94 and 91 mAOD, also falling towards the west. A copy of the survey is provided in Appendix B.

### **2.3 SURROUNDING LAND USE**

2.3.1 The site is situated in a generally rural environmental, with surrounding land use predominantly comprising agricultural land and sporadic residential properties.

## **2.4 PROPOSED DEVELOPMENT**

- 2.4.1 An architect's drawings of the proposed layout is provided in Appendix C. This indicates an extension to the existing business park (which is predominantly B1c light industrial) comprising new commercial properties (B1c use class) with associated access, parking and soft landscaping.

## **2.5 MAPPED GEOLOGY**

- 2.5.1 The site is mapped to be underlain by solid geology of the Upper Tunbridge Wells Sand. This lithology is described as thinly bedded silty mudstones, siltstones, silty sandstones and fine-grained sandstones.

## **2.6 HYDROGEOLOGY**

- 2.6.1 The Upper Tunbridge Wells Sand is a Secondary 'A' aquifer however the site is not located within a groundwater source protection zone.

## **2.7 HYDROLOGY**

- 2.7.1 The nearest surface water features are series of ponds are located in the site's western sector.
- 2.7.2 A south-north oriented drainage ditch is present to the west of these ponds and is assumed to receive outflows from them. Flows within this ditch are then directed westwards via the regional ditch network towards Copthorne, ultimately reaching Copthorne Brook about 1 km to the west.

### **3.0 POLICY AND GUIDANCE**

#### **3.1 NATIONAL PLANNING POLICY FRAMEWORK (JUNE 2019)**

3.1.1 In determining an approach for the assessment of flood risk for the development proposal there is a need to review the policy context. Government guidance requires that consideration be given to flood risk in the planning process. The National Planning Policy Framework (NPPF) was last updated in February 2019 and outlines the national policy position on development and flood risk assessment.

3.1.2 The Framework states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, it can be permitted provided it is made safe without increasing flood risk elsewhere.

3.1.3 The essence of NPPF is that:

- Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards.
- Policies in development plans should outline the consideration, which will be given to flooding issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change.
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Opportunities offered by new developments should be used to reduce the causes and impacts of flooding;
- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains; and
- The concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the “Exception Test”.

#### **3.2 FLOOD AND WATER MANAGEMENT ACT 2010**

3.2.1 Combined with the Flood Risk Regulations 2009 (‘the Regulations’), (which enact the EU Floods Directive in the England and Wales) the Flood and Water Management Act 2010 (‘the Act’) places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues.

- 3.2.2 The Act and the Regulations together raise the requirements and targets Local Authorities need to meet, including:
- Playing an active role leading Flood Risk Management;
  - Development of Local Flood Risk Management Strategies (LFRMS);
  - Implementing requirements of Flood and Water Management legislation;
  - Development and implementation of drainage and flooding management strategies;
  - Responsibility for first approval, then adopting, management and maintenance of Sustainable Drainage System (SuDS) where they service more than one property.

- 3.2.3 The Flood and Water Management Act also clarifies three key areas that influence development:
- Sustainable Drainage Systems (SuDS) - the Act makes provision for a national standard to be prepared on SuDS, and developers will be required to obtain local authority approval for SuDS in accordance with the standards, likely with conditions. Supporting this, the Act requires local authorities to adopt and maintain SuDS, removing any ongoing responsibility for developers to maintain SuDS if they are designed and constructed robustly.
  - Flood risk management structures - the Act enables the EA and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent from the relevant authority.
  - Permitted flooding of third party land - The EA and local authorities have the power to carry out work which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people's enjoyment of the environment or of cultural heritage.

### **3.3 PLANNING PRACTICE GUIDANCE FLOOD RISK AND COASTAL CHANGE**

- 3.3.1 The Planning Practise Guidance (PPG) for Flood Risk and Coastal Change (last updated September 2018) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. A key aspect of the guidance is that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.
- 3.3.2 The document provides guidance on how local planning authorities should:
- Assess flood risk;
  - Avoid flood risk; and

- Manage and Mitigate flood risk and coastal change.

3.3.3 There is also information on the requirements to consult the Environment Agency, on the role of lead local flood authorities and on flood risk in relation to minor developments.

3.3.4 The latest update provides additional guidance on SuDS, including:

- The importance of SuDS;
- When SuDS should be considered;
- The SuDS discharge hierarchy;
- Factors a local authority will address when considering SuDS as part of a planning application;
- When SuDS are inappropriate and relevant flood risk consultees;
- Applicability of Defra's Non-statutory Technical Standards for Sustainable Drainage Systems;
- Design and construction cost considerations;
- Operation and maintenance considerations; and
- Where to go for further SuDS advice.

### **3.4 SUDS MANUAL, CIRIA C753 (2015)**

3.4.1 The CIRIA SuDS Manual provides advice on the implementation of sustainable drainage techniques in the UK. It provides guidance on:

- Initial planning;
- Design through to construction;
- The management of SuDS in the context of the current regulatory framework; and
- Advice on landscaping, waste management, cost, and community engagement.

### **3.5 LOCAL FLOOD RISK MANAGEMENT STRATEGY (2013/14)**

3.5.1 The LFRMS sets out how WSCC carries out its responsibilities under the Flood and Water Management Act. WSCC is the Lead Local Flood Authority for the site area and is therefore required to produce such a strategy to define how flood risk will be properly managed within the county.

## **4.0 FLOOD PROBABILITY AND HAZARD**

### **4.1 POTENTIAL SOURCES**

4.1.1 The flood risk elements that need to be considered for any site are defined in BS 8533 as the “Forms of Flooding” and are listed as:

- flooding from Rivers (fluvial flood risk)
- flooding from the Sea (tidal flood risk)
- flooding from the Land
- flooding from Groundwater
- flooding from Sewers (sewer and drain exceedance, pumping station failure etc)
- flooding from Reservoirs, Canals and other Artificial Structures.

### **4.2 FLUVIAL FLOOD RISK AND EA FLOOD ZONE**

4.2.1 Fluvial flooding occurs when the amount of water exceeds the flow capacity of the channel. Most rivers have a natural floodplain into which the water spills in times of flood.

4.2.2 As noted in the introduction, the study site falls within Flood Zone 1 and has less than 1 in 1,000 annual probability of river flooding.

### **4.3 FLOODING FROM THE SEA**

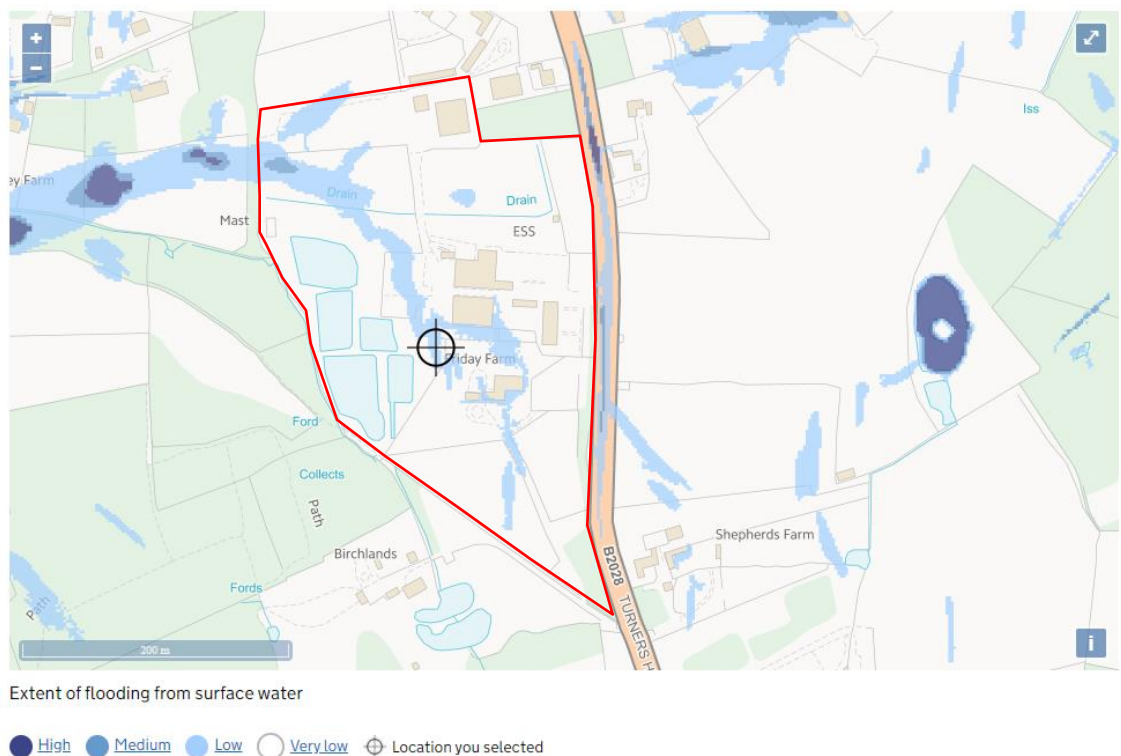
4.3.1 On the coast, storm surges and high tides can threaten low lying areas and can sometimes be large and rapid enough to overtop defences. However tidal flooding is not considered a risk to the site, due to its inland location.

### **4.4 PLUVIAL FLOOD RISK**

4.4.1 If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or another watercourse.

4.4.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur.

4.4.3 The Environment Agency’s surface water flood map, reproduced below, shows that most of the site is at ‘very low’ risk of flooding, with some localised areas categorised ‘low’ risk:



- 4.4.4 It is recognised that the impermeable surfacing associated with the proposed development will increase the volume of surface water runoff generated, and so lead to a greater volume of surface water flow. A drainage strategy has been developed to mitigate the associated flood risk, as described in Section 5 below.

## 4.5 GROUNDWATER

- 4.5.1 Groundwater flooding tends to occur after prolonged periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. In low-lying areas, the water table may be at shallow depth, and during very wet periods, with additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.
- 4.5.2 As noted above, the site is predominantly underlain by Upper Tunbridge Wells Sand which comprises mudstone and siltstones. These deposits are likely to be of relatively low porosity and permeability, such that groundwater is not expected to be present in significant volumes at shallow depth. The risk of flooding from this source is concluded to be relatively low.

## 4.6 FLOODING FROM SEWERS

- 4.6.1 Flooding from artificial drainage occurs when flow entering the system exceeds its conveyance capacity, the system becomes blocked, or it cannot discharge due to a high-water level in the receiving watercourse.
- 4.6.2 The proposed development will lead to an increase in impermeable area and therefore an associated increase in surface water runoff rates and volumes.

- 4.6.3 In this context, a surface water drainage scheme has been designed to accommodate the projected runoff, the details of which are set out in section 5 of this report.

#### **4.7 CLIMATE CHANGE**

- 4.7.1 Projections of the likely impact of climate change indicate that more frequent short-duration, high intensity rainfall events can be expected in the UK, as well as more frequent prolonged periods of rainfall.
- 4.7.2 For the surface water runoff assessment, an allowance of an increase in the rainfall intensity values by 20% has been included to account for the impact of climate change. This concurs with current EA / DEFRA guidance for the type of commercial properties proposed and the anticipated lifespan of the development (circa 40 years).

## **5.0 DRAINAGE STRATEGY AND SUDS**

### **5.1 EXISTING RUNOFF**

5.1.1 In accordance with DEFRA guidelines, it is proposed that surface water runoff from the development be restricted to the applicable greenfield runoff rates for the 1 in 1 year and 1 in 100 year rainfall events.

5.1.2 The theoretical greenfield run-off rates for the 1 in 1 year and 1 in 100 year return period storms have been calculated based on the FEH method, with a pro-rata value to account for the actual site area. These calculations can be found in Appendix D and are summarised as follows:

- 1 in 1 year: 4.7 l/s/ha
- 1 in 100 year: 17.6 l/s/ha

### **5.2 INFILTRATION DEVICES**

5.2.1 As previously stated, the site is mapped to be underlain by soils anticipated to be of relatively low permeability with an insufficient infiltration coefficient, into which it may not be feasible to install functioning soakaways for the new development.

### **5.3 GREEN ROOFS**

5.3.1 The site is proposed to be developed for new steel-framed industrial / commercial units. These buildings will be of lightweight and economic construction and the adoption of green roofs would require significant and costly modifications to the structural design, including significantly upgraded foundations and more extensive use of structural steelwork. It has been determined that such an option is not compatible within the proposed development.

### **5.4 PONDS / BASINS**

5.4.1 Inclusion of above-ground attenuation storage in the form of detention basins/ponds, where feasible within the development layout constraints, would be a suitable and beneficial SuDS option.

### **5.5 SURFACE WATER DRAINAGE STRATEGY**

5.5.1 The proposed surface water drainage strategy is provided on the drawings in Appendix E, with supporting calculations in Appendix D.

5.5.2 It is proposed that all runoff from new buildings and hard surfacing other than car parking be directed into the eastern-most of the existing basins. These ultimately outfall into the existing surface water ditch to the west. Permeable paving is proposed to be installed to new car park areas - this will likely be a 'Type B' system, where the proportion of rainfall that exceeds the infiltration capacity of the subsoil will flow into the drainage network.

5.5.3 Flow control devices (Hydrobrakes or similar) will be used to control outflow from the new basins into the existing east-west oriented ditch bisecting the northern part of the site. The basins have been sized to accommodate all runoff up to the 1 in 100 year return period storm plus 20% additional climate change allowance.

5.5.4 The gravity drainage system will be designed in accordance with the requirements of BS EN 752:2017 which stipulates that no surcharging should occur during a critical storm event of 1 in 2 years return period. It also requires that no exceedance flooding should occur during a critical storm event of 1 in 30 years return period. The drainage proposals are such that runoff from storm events up to 1 in 100 years return period plus a 20% allowance for climate change will be stored within the site.

## **5.6 FOUL DRAINAGE**

5.6.1 A Thames Water foul sewer currently passes below the site, approximately south-east to north-west. All foul effluent is proposed to be directed into this sewer, replicating present day arrangements, subject to a S106 public sewer connection agreement. Details are illustrated on the appended drainage drawing and the associated calculations are provided in Appendix E. Thames Water public sewer records are enclosed as Appendix F.

## **5.7 DRAINAGE MAINTENANCE**

5.7.1 In general, sewers, manholes and drainage channels are unlikely to require maintenance other than periodic inspections, unless a blockage occurs. Sewers, manholes, drainage channels and silt pits should be inspected at 6 monthly intervals and cleaned out at 12 monthly intervals. A full CCTV survey should also be carried out at 10 yearly intervals.

5.7.2 Reference should be made to all manufacturer's information and maintenance requirements for recommended intervals and safe methods of cleaning for the following proprietary systems:

- drainage channels
- oil separators
- flow controls

5.7.3 In all instances, inspection and cleaning is to be carried out only by a suitable Specialist Contractor, following the guidelines given in BE EN 752:2008 "Maintenance Considerations" and "Safe Working in Sewers and at Sewage Works", published by the National Joint Health and Safety Committee for the Water Services.

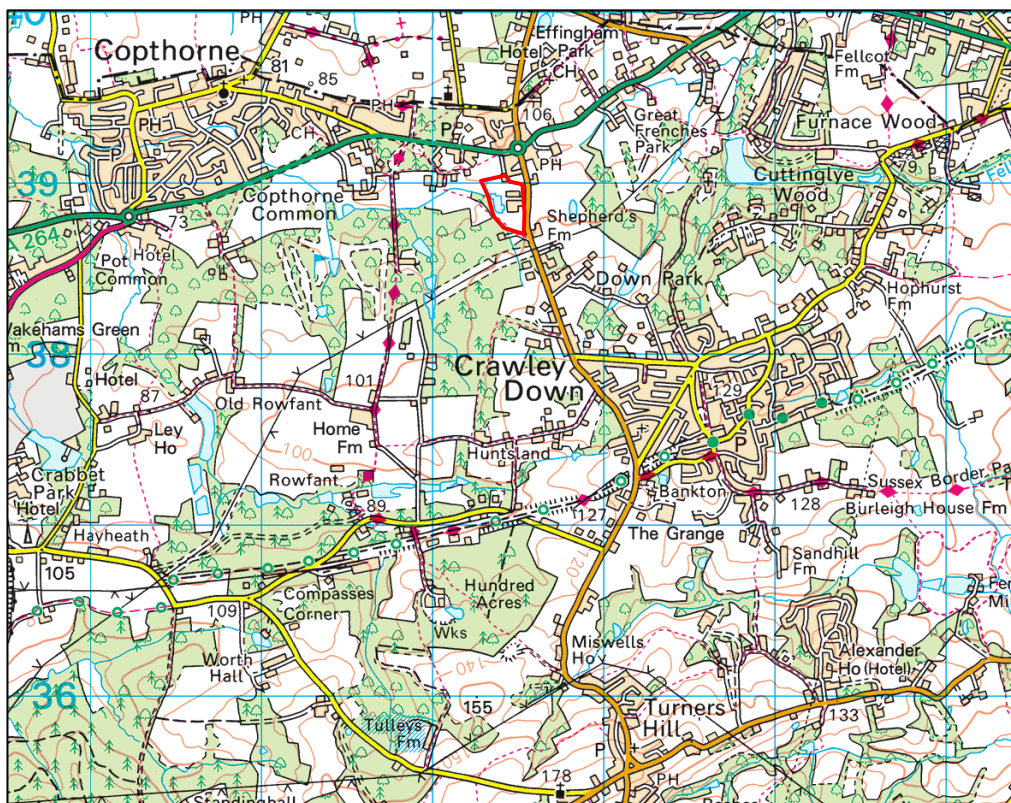
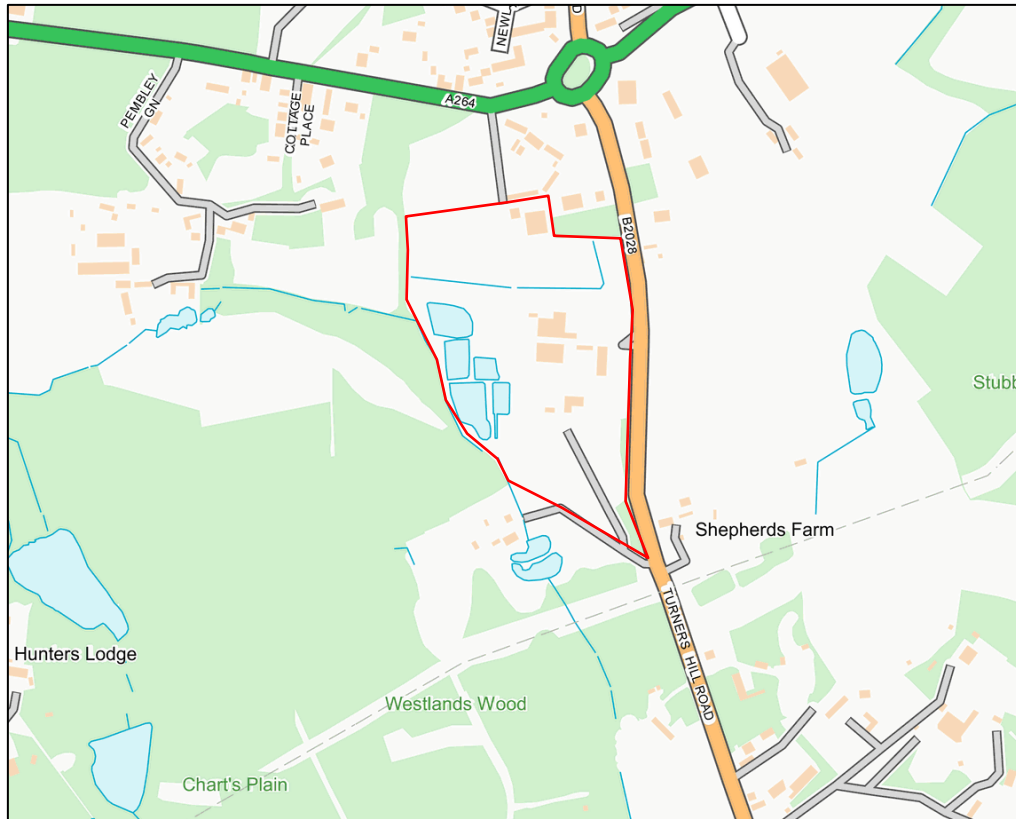
5.7.4 All underground and under-floor drains and manholes (including oil separators) represent confined spaces. Appropriate precautions should be taken before entering drains and manholes. Access should only be undertaken by appropriately trained personnel.

## 6.0 CONCLUSIONS

- 6.1 Bradbrook Consulting was appointed by The Turvey Corporation (the Client) to produce a Flood Risk Assessment and Drainage Strategy in connection with a proposed extension to Barns Court and Friday Farm near Copthorne, West Sussex.
- 6.2 The site is located in Flood Zone 1 and is at low probability of flooding from fluvial or tidal sources. Future flood risk, both on and off-site, from site-generated runoff has been addressed via a surface water drainage strategy.
- 6.3 The strategy described in this report comprises the use of above-ground ponds/basins and permeable pavements to attenuate run-off and is designed to accommodate up to a 1 in 100 year return period storm, plus 20% for climate change. Off-site discharge will then be directed westwards into the existing local surface water ditch network and will be restricted to greenfield run-off rates.
- 6.4 This FRA demonstrates that appropriate attenuation measures and SuDS techniques can be incorporated into the development. The illustrative surface water strategy shows how the scheme can accommodate the critical storm event whilst still preventing on- and off-site flooding. The development is therefore considered to be at low risk from flooding and is not considered to increase flood risk to others.

## APPENDIX A

### SITE LOCATION PLAN



## **APPENDIX B**

### TOPOGRAPHICAL SURVEY

[illegible]

ALL COORDINATES RELATE TO THE ORDNANCE SURVEY  
GRID AND DATUM VIA GPS OBSERVATIONS

THIS IS AN EXTENSION TO ORIGINAL SURVEY 914206  
FROM JULY 2014

All underground services information shown on this plan cannot be guaranteed and users should satisfy themselves of the type, size and route before commencing work on site.  
Tree types shown on this drawing cannot be guaranteed and if critical should be verified by an arboriculturist.  
Tree spreads and diameters are averages unless otherwise indicated.

This plan has been produced for the client detailed below or their appointed agent to an agreed specification and defines the limit of APSI Services liability

 **THE SURVEY**  
ASSOCIATION

|  |  |  |
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| Revisions |           | Date    |     |
| Date      | JUNE 2020 | Drawn   | DTT |
| Scale     | 1:200     | Checked | APR |

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| Dwg. No. 920205-1 | Job No. 920205 |
| Client            |                |
| THE TURVEY        |                |

|                 |             |
|-----------------|-------------|
| CORPORATION PLC |             |
| Dwg. Title      | LAND SURVEY |

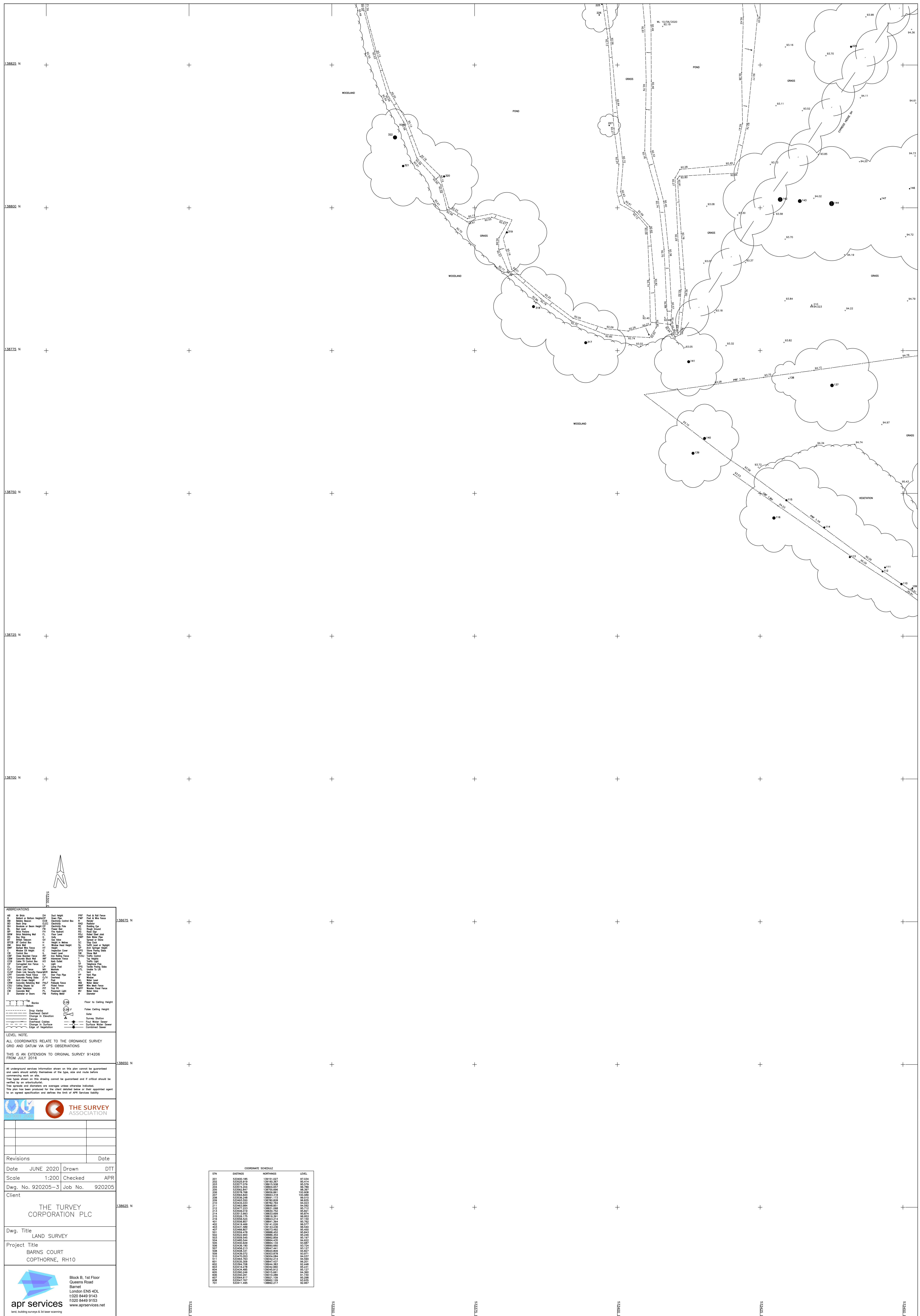
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|---------------|--------------------------------|
| Project Title | BARNS COURT<br>COPTHORNE, RH10 |
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## **APPENDIX C**

### **ARCHITECT'S PROPOSED DEVELOPMENT PLAN**

PROPOSED LAYOUT FOLLOWING PRE-APP MEETING  
SK 020 - REV.D - 02.09.20



**KEY**

- EXISTING BUILDING RETAINED
- PROPOSED BUILDING
- HARD LANDSCAPING
- SOFT LANDSCAPING

- PROPOSED LAYOUT INCLUDES:**
- REDUCED IMPACT ON NW CORNER,
  - REDUCED IMPACT ON B2028 BY STEPPING BACK TO DEVELOPMENT LINE OF EXISTING BLOCK (1 ON THIS PLAN),
  - INCREASED PERMEABILITY THROUGH SITE,
  - RETAIN EXISTING BUILDINGS TO ALLOW PHASING AND KEEP EMPLOYMENT ON SITE,
  - ABILITY TO CONNECT BETWEEN PATH, PONDS AND WIDER GREEN AREAS OF SITE, &
  - REDUCE BUILD FOOTPRINT IN LINE WITH OPENNESS OF GREEN SITE.

| Building                                                                                                                                                                       | Potential Use Class | Area                    | Building Heights |             | Vehicle Spaces                                                    |       |     |      |        |                    |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|------------------|-------------|-------------------------------------------------------------------|-------|-----|------|--------|--------------------|--|
|                                                                                                                                                                                |                     | Footprint GIFA<br>(sqm) | Eaves            | Ridge       | Car                                                               | Lorry | Van | Bike | M'bike | Disabled<br>5% inc |  |
|                                                                                                                                                                                |                     |                         |                  |             | In-line with Mid-Suzsex Development Infrastructure Draft SPD 2018 |       |     |      |        |                    |  |
| <b>Existing Buildings Retained</b> <small>Note: Total area of existing buildings is 3243sqm. Note some buildings are to be demolished as they are not fit for purpose.</small> |                     |                         |                  |             |                                                                   |       |     |      |        |                    |  |
| 1                                                                                                                                                                              | B2                  | 400                     | approx. 3m       | As existing | 16                                                                | 1     | 3   | 2    | 1      | 1                  |  |
| 2                                                                                                                                                                              | B8                  | 680                     | approx. 5m       | As existing | 21                                                                | 1     | 1   | 2    | 1      | 1                  |  |
| 3                                                                                                                                                                              | B8                  | 680                     | approx. 5m       | As existing | 21                                                                | 1     | 1   | 2    | 1      | 1                  |  |
| 4                                                                                                                                                                              | B2                  | 770                     | up to approx. 6m | As existing | 19                                                                | 2     | 2   | 3    | 1      | 1                  |  |
| Total                                                                                                                                                                          |                     | 2530                    |                  |             | 77                                                                | 5     | 7   | 9    | 4      | 4                  |  |
| <b>Proposed Buildings</b> <small>Note: all divisible into smaller units - see plan</small>                                                                                     |                     |                         |                  |             |                                                                   |       |     |      |        |                    |  |
| A                                                                                                                                                                              | B2                  | 620                     | approx. 4.5m     | approx. 6m  | 16                                                                | 2     | 2   | 2    | 1      | 1                  |  |
| B                                                                                                                                                                              | B2                  | 840                     | approx. 4.5m     | approx. 6m  | 19                                                                | 1     | 4   | 3    | 1      | 1                  |  |
| C                                                                                                                                                                              | B2                  | 600                     | approx. 4.5m     | approx. 6m  | 20                                                                | 1     | 2   | 2    | 1      | 1                  |  |
| D                                                                                                                                                                              | B2                  | 800                     | approx. 4.5m     | approx. 6m  | 12                                                                | 1     | 6   | 3    | 1      | 1                  |  |
| E                                                                                                                                                                              | B2                  | 600                     | approx. 8.5m     | approx. 11m | 13                                                                | 1     | 3   | 2    | 1      | 1                  |  |
| F                                                                                                                                                                              | B2                  | 400                     | approx. 4.5m     | approx. 6m  | 15                                                                | 1     | 1   | 2    | 1      | 1                  |  |
| G                                                                                                                                                                              | B2                  | 400                     | approx. 4.5m     | approx. 6m  | 15                                                                | 1     | 1   | 1    | 0      | 1                  |  |
| H                                                                                                                                                                              | B2                  | 500                     | approx. 4.5m     | approx. 6m  | 23                                                                | 1     | 1   | 2    | 1      | 1                  |  |
| I                                                                                                                                                                              | B2                  | 600                     | approx. 4.5m     | approx. 6m  | 21                                                                | 1     | 1   | 1    | 0      | 1                  |  |
| J                                                                                                                                                                              | B8                  | 750                     | approx. 4.5m     | approx. 6m  | 26                                                                | 1     | 2   | 2    | 1      | 1                  |  |
| K                                                                                                                                                                              | B8                  | 600                     | approx. 4.5m     | approx. 6m  | 12                                                                | 1     | 2   | 2    | 1      | 1                  |  |
| L                                                                                                                                                                              | B2                  | 600                     | approx. 8.5m     | approx. 11m | 12                                                                | 1     | 2   | 2    | 1      | 1                  |  |
| Total                                                                                                                                                                          |                     | 7310                    |                  |             | 204                                                               | 13    | 27  | 24   | 10     | 12                 |  |
| Grand Total                                                                                                                                                                    |                     | 9840                    |                  |             |                                                                   |       |     |      |        |                    |  |

## APPENDIX D

### DRAINAGE CALCULATIONS

|                                                               |                                            |                                                                                     |
|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|
| Bradbrook Consulting                                          |                                            | Page 1                                                                              |
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| Date 22/09/2020 10:46<br>File 20-089C - Source Control...     | Designed by NDH<br>Checked by PWE          |                                                                                     |
| Innovyze Source Control 2020.1                                |                                            |                                                                                     |

ICP SUDS Mean Annual Flood

Input

|                       |       |           |       |               |          |
|-----------------------|-------|-----------|-------|---------------|----------|
| Return Period (years) | 1     | SAAR (mm) | 852   | Urban         | 0.000    |
| Area (ha)             | 1.000 | Soil      | 0.450 | Region Number | Region 6 |

**Results    1/s**

|            |      |
|------------|------|
| QBAR Rural | 5.5  |
| QBAR Urban | 5.5  |
| Q1 year    | 4.7  |
| Q1 year    | 4.7  |
| Q30 years  | 12.5 |
| Q100 years | 17.6 |

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|                                                               |                                           |                                                                                     |
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| Date 01/10/2020 16:42                                         | Designed by NDH                           |                                                                                     |
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| Innovyze                                                      | Source Control 2020.1                     |                                                                                     |

#### Rainfall Details

|                       |                   |                       |       |
|-----------------------|-------------------|-----------------------|-------|
| Rainfall Model        | FSR               | Winter Storms         | Yes   |
| Return Period (years) | 100               | Cv (Summer)           | 0.750 |
| Region                | England and Wales | Cv (Winter)           | 0.840 |
| M5-60 (mm)            | 20.000            | Shortest Storm (mins) | 15    |
| Ratio R               | 0.343             | Longest Storm (mins)  | 10080 |
| Summer Storms         | Yes               | Climate Change %      | +20   |

#### Time Area Diagram

Total Area (ha) 2.110

| Time (mins) | Area | Time (mins) | Area  | Time (mins) | Area  | Time (mins) | Area  |
|-------------|------|-------------|-------|-------------|-------|-------------|-------|
| From:       | To:  | (ha)        | From: | To:         | (ha)  | From:       | To:   |
| 0           | 4    | 0.527       | 4     | 8           | 0.527 | 8           | 12    |
|             |      |             |       |             |       | 0.528       | 12    |
|             |      |             |       |             |       |             | 16    |
|             |      |             |       |             |       |             | 0.528 |

|                                                               |                                            |                                                                                     |
|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|
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| Innovyze                                                      | Source Control 2020.1                      |                                                                                     |

### Model Details

Storage is Online Cover Level (m) 92.600

### Tank or Pond Structure

Invert Level (m) 91.650

| Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------|------------------------|-----------|------------------------|
| 0.000     | 1016.0                 | 1.250     | 1583.0                 | 1.251     | 0.0                    |

### Complex Outflow Control

### Hydro-Brake® Optimum

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SHE-0149-9900-0705-9900 |
| Design Head (m)                   | 0.705                      |
| Design Flow (l/s)                 | 9.9                        |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Minimise upstream storage  |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 149                        |
| Invert Level (m)                  | 91.600                     |
| Minimum Outlet Pipe Diameter (mm) | 225                        |
| Suggested Manhole Diameter (mm)   | 1200                       |

| Control Points            | Head (m) | Flow (l/s) | Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|---------------------------|----------|------------|
| Design Point (Calculated) | 0.705    | 9.9        | Kick-Flo®                 | 0.516    | 8.6        |
| Flush-Flo™                | 0.248    | 9.9        | Mean Flow over Head Range | -        | 8.2        |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 5.4        | 1.200     | 12.7       | 3.000     | 19.7       | 7.000     | 29.6       |
| 0.200     | 9.8        | 1.400     | 13.7       | 3.500     | 21.2       | 7.500     | 30.5       |
| 0.300     | 9.8        | 1.600     | 14.6       | 4.000     | 22.6       | 8.000     | 31.5       |
| 0.400     | 9.5        | 1.800     | 15.4       | 4.500     | 23.9       | 8.500     | 32.5       |
| 0.500     | 8.8        | 2.000     | 16.2       | 5.000     | 25.1       | 9.000     | 33.4       |
| 0.600     | 9.2        | 2.200     | 17.0       | 5.500     | 26.3       | 9.500     | 34.3       |
| 0.800     | 10.5       | 2.400     | 17.7       | 6.000     | 27.5       |           |            |
| 1.000     | 11.7       | 2.600     | 18.4       | 6.500     | 28.5       |           |            |

### Orifice

Diameter (m) 0.192 Discharge Coefficient 0.600 Invert Level (m) 92.305

|                                                               |                                            |                                                                                     |
|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|
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| Innovyze                                                      | Source Control 2020.1                      |                                                                                     |

### Summary of Results for 30 year Return Period

| Storm Event      | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m <sup>3</sup> ) | Status |
|------------------|---------------|---------------|-------------------|------------------------------|--------|
| 15 min Summer    | 91.905        | 0.255         | 9.9               | 272.8                        | O K    |
| 30 min Summer    | 91.984        | 0.334         | 9.9               | 362.4                        | O K    |
| 60 min Summer    | 92.064        | 0.414         | 9.9               | 455.9                        | O K    |
| 120 min Summer   | 92.139        | 0.489         | 9.9               | 547.2                        | O K    |
| 180 min Summer   | 92.176        | 0.526         | 9.9               | 592.7                        | O K    |
| 240 min Summer   | 92.197        | 0.547         | 9.9               | 618.5                        | O K    |
| 360 min Summer   | 92.219        | 0.569         | 9.9               | 645.6                        | O K    |
| 480 min Summer   | 92.225        | 0.575         | 9.9               | 653.4                        | O K    |
| 600 min Summer   | 92.224        | 0.574         | 9.9               | 651.9                        | O K    |
| 720 min Summer   | 92.221        | 0.571         | 9.9               | 648.5                        | O K    |
| 960 min Summer   | 92.213        | 0.563         | 9.9               | 637.9                        | O K    |
| 1440 min Summer  | 92.190        | 0.540         | 9.9               | 609.5                        | O K    |
| 2160 min Summer  | 92.150        | 0.500         | 9.9               | 559.7                        | O K    |
| 2880 min Summer  | 92.104        | 0.454         | 9.9               | 503.9                        | O K    |
| 4320 min Summer  | 92.012        | 0.362         | 9.9               | 395.1                        | O K    |
| 5760 min Summer  | 91.933        | 0.283         | 9.9               | 304.5                        | O K    |
| 7200 min Summer  | 91.870        | 0.220         | 9.9               | 233.8                        | O K    |
| 8640 min Summer  | 91.823        | 0.173         | 9.9               | 181.5                        | O K    |
| 10080 min Summer | 91.788        | 0.138         | 9.7               | 144.0                        | O K    |
| 15 min Winter    | 91.936        | 0.286         | 9.9               | 306.9                        | O K    |
| 30 min Winter    | 92.023        | 0.373         | 9.9               | 408.1                        | O K    |
| 60 min Winter    | 92.113        | 0.463         | 9.9               | 514.8                        | O K    |
| 120 min Winter   | 92.198        | 0.548         | 9.9               | 619.1                        | O K    |
| 180 min Winter   | 92.240        | 0.590         | 9.9               | 672.5                        | O K    |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m <sup>3</sup> ) | Discharge Volume (m <sup>3</sup> ) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------------------------|------------------|
| 15 min Summer    | 72.187       | 0.0                              | 285.1                              | 30               |
| 30 min Summer    | 48.193       | 0.0                              | 380.8                              | 44               |
| 60 min Summer    | 30.811       | 0.0                              | 487.1                              | 72               |
| 120 min Summer   | 19.101       | 0.0                              | 604.1                              | 130              |
| 180 min Summer   | 14.264       | 0.0                              | 676.6                              | 190              |
| 240 min Summer   | 11.542       | 0.0                              | 730.0                              | 248              |
| 360 min Summer   | 8.565        | 0.0                              | 812.8                              | 364              |
| 480 min Summer   | 6.921        | 0.0                              | 875.7                              | 480              |
| 600 min Summer   | 5.863        | 0.0                              | 927.3                              | 558              |
| 720 min Summer   | 5.117        | 0.0                              | 971.2                              | 614              |
| 960 min Summer   | 4.126        | 0.0                              | 1044.2                             | 740              |
| 1440 min Summer  | 3.042        | 0.0                              | 1154.8                             | 1008             |
| 2160 min Summer  | 2.239        | 0.0                              | 1275.2                             | 1428             |
| 2880 min Summer  | 1.800        | 0.0                              | 1367.0                             | 1832             |
| 4320 min Summer  | 1.322        | 0.0                              | 1505.7                             | 2600             |
| 5760 min Summer  | 1.061        | 0.0                              | 1611.3                             | 3304             |
| 7200 min Summer  | 0.895        | 0.0                              | 1699.8                             | 3976             |
| 8640 min Summer  | 0.779        | 0.0                              | 1775.7                             | 4672             |
| 10080 min Summer | 0.693        | 0.0                              | 1842.5                             | 5344             |
| 15 min Winter    | 72.187       | 0.0                              | 319.4                              | 30               |
| 30 min Winter    | 48.193       | 0.0                              | 426.6                              | 44               |
| 60 min Winter    | 30.811       | 0.0                              | 545.6                              | 72               |
| 120 min Winter   | 19.101       | 0.0                              | 676.6                              | 128              |
| 180 min Winter   | 14.264       | 0.0                              | 758.0                              | 186              |

|                                                               |                                            |                                                                                     |
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| Innovyze                                                      | Source Control 2020.1                      |                                                                                     |

#### Summary of Results for 30 year Return Period

| Storm Event      | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status     |
|------------------|---------------|---------------|-------------------|-----------------|------------|
| 240 min Winter   | 92.265        | 0.615         | 9.9               | 704.1           | O K        |
| 360 min Winter   | 92.292        | 0.642         | 9.9               | 739.5           | O K        |
| 480 min Winter   | 92.303        | 0.653         | 9.9               | 753.5           | Flood Risk |
| 600 min Winter   | 92.305        | 0.655         | 9.9               | 755.8           | Flood Risk |
| 720 min Winter   | 92.301        | 0.651         | 9.9               | 751.1           | Flood Risk |
| 960 min Winter   | 92.289        | 0.639         | 9.9               | 734.5           | O K        |
| 1440 min Winter  | 92.258        | 0.608         | 9.9               | 695.5           | O K        |
| 2160 min Winter  | 92.200        | 0.550         | 9.9               | 621.5           | O K        |
| 2880 min Winter  | 92.134        | 0.484         | 9.9               | 540.4           | O K        |
| 4320 min Winter  | 91.987        | 0.337         | 9.9               | 365.5           | O K        |
| 5760 min Winter  | 91.870        | 0.220         | 9.9               | 233.9           | O K        |
| 7200 min Winter  | 91.793        | 0.143         | 9.8               | 149.3           | O K        |
| 8640 min Winter  | 91.755        | 0.105         | 9.4               | 108.7           | O K        |
| 10080 min Winter | 91.740        | 0.090         | 8.4               | 92.7            | O K        |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 240 min Winter   | 11.542       | 0.0                 | 817.8                 | 242              |
| 360 min Winter   | 8.565        | 0.0                 | 910.4                 | 356              |
| 480 min Winter   | 6.921        | 0.0                 | 981.0                 | 470              |
| 600 min Winter   | 5.863        | 0.0                 | 1038.6                | 578              |
| 720 min Winter   | 5.117        | 0.0                 | 1087.9                | 680              |
| 960 min Winter   | 4.126        | 0.0                 | 1169.5                | 774              |
| 1440 min Winter  | 3.042        | 0.0                 | 1293.5                | 1084             |
| 2160 min Winter  | 2.239        | 0.0                 | 1428.2                | 1544             |
| 2880 min Winter  | 1.800        | 0.0                 | 1530.9                | 1996             |
| 4320 min Winter  | 1.322        | 0.0                 | 1686.8                | 2768             |
| 5760 min Winter  | 1.061        | 0.0                 | 1805.0                | 3416             |
| 7200 min Winter  | 0.895        | 0.0                 | 1903.9                | 4040             |
| 8640 min Winter  | 0.779        | 0.0                 | 1988.8                | 4584             |
| 10080 min Winter | 0.693        | 0.0                 | 2063.7                | 5248             |

|                                                               |                                           |                                                                                     |
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| Innovyze                                                      | Source Control 2020.1                     |                                                                                     |

Summary of Results for 100 year Return Period (+20%)

| Storm Event      | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m <sup>3</sup> ) | Status     |
|------------------|---------------|---------------|-------------------|------------------------------|------------|
| 15 min Summer    | 92.042        | 0.392         | 9.9               | 430.6                        | O K        |
| 30 min Summer    | 92.166        | 0.516         | 9.9               | 579.2                        | O K        |
| 60 min Summer    | 92.289        | 0.639         | 9.9               | 735.3                        | O K        |
| 120 min Summer   | 92.398        | 0.748         | 16.0              | 879.0                        | Flood Risk |
| 180 min Summer   | 92.439        | 0.789         | 21.6              | 933.6                        | Flood Risk |
| 240 min Summer   | 92.454        | 0.804         | 23.4              | 954.5                        | Flood Risk |
| 360 min Summer   | 92.464        | 0.814         | 24.8              | 967.7                        | Flood Risk |
| 480 min Summer   | 92.469        | 0.819         | 25.6              | 974.2                        | Flood Risk |
| 600 min Summer   | 92.470        | 0.820         | 25.9              | 976.8                        | Flood Risk |
| 720 min Summer   | 92.470        | 0.820         | 25.8              | 975.9                        | Flood Risk |
| 960 min Summer   | 92.464        | 0.814         | 24.9              | 968.3                        | Flood Risk |
| 1440 min Summer  | 92.446        | 0.796         | 22.5              | 943.5                        | Flood Risk |
| 2160 min Summer  | 92.418        | 0.768         | 19.1              | 905.5                        | Flood Risk |
| 2880 min Summer  | 92.394        | 0.744         | 15.4              | 873.6                        | Flood Risk |
| 4320 min Summer  | 92.340        | 0.690         | 11.0              | 801.9                        | Flood Risk |
| 5760 min Summer  | 92.265        | 0.615         | 9.9               | 703.7                        | O K        |
| 7200 min Summer  | 92.189        | 0.539         | 9.9               | 608.1                        | O K        |
| 8640 min Summer  | 92.106        | 0.456         | 9.9               | 506.4                        | O K        |
| 10080 min Summer | 92.021        | 0.371         | 9.9               | 405.5                        | O K        |
| 15 min Winter    | 92.087        | 0.437         | 9.9               | 483.9                        | O K        |
| 30 min Winter    | 92.223        | 0.573         | 9.9               | 650.7                        | O K        |
| 60 min Winter    | 92.358        | 0.708         | 12.1              | 825.8                        | Flood Risk |
| 120 min Winter   | 92.469        | 0.819         | 25.6              | 974.5                        | Flood Risk |
| 180 min Winter   | 92.508        | 0.858         | 32.1              | 1028.7                       | Flood Risk |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m <sup>3</sup> ) | Discharge Volume (m <sup>3</sup> ) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------------------------|------------------|
| 15 min Summer    | 112.219      | 0.0                              | 443.5                              | 30               |
| 30 min Summer    | 75.639       | 0.0                              | 598.0                              | 45               |
| 60 min Summer    | 48.611       | 0.0                              | 768.9                              | 74               |
| 120 min Summer   | 30.102       | 0.0                              | 952.3                              | 130              |
| 180 min Summer   | 22.369       | 0.0                              | 1061.6                             | 186              |
| 240 min Summer   | 18.005       | 0.0                              | 1139.0                             | 242              |
| 360 min Summer   | 13.274       | 0.0                              | 1259.9                             | 306              |
| 480 min Summer   | 10.674       | 0.0                              | 1350.7                             | 364              |
| 600 min Summer   | 9.005        | 0.0                              | 1424.5                             | 430              |
| 720 min Summer   | 7.833        | 0.0                              | 1486.8                             | 498              |
| 960 min Summer   | 6.279        | 0.0                              | 1589.5                             | 638              |
| 1440 min Summer  | 4.589        | 0.0                              | 1719.1                             | 922              |
| 2160 min Summer  | 3.346        | 0.0                              | 1905.9                             | 1348             |
| 2880 min Summer  | 2.671        | 0.0                              | 2028.5                             | 1792             |
| 4320 min Summer  | 1.940        | 0.0                              | 2210.0                             | 2688             |
| 5760 min Summer  | 1.545        | 0.0                              | 2346.0                             | 3520             |
| 7200 min Summer  | 1.296        | 0.0                              | 2460.7                             | 4328             |
| 8640 min Summer  | 1.123        | 0.0                              | 2558.2                             | 5104             |
| 10080 min Summer | 0.995        | 0.0                              | 2644.2                             | 5752             |
| 15 min Winter    | 112.219      | 0.0                              | 496.8                              | 30               |
| 30 min Winter    | 75.639       | 0.0                              | 669.8                              | 44               |
| 60 min Winter    | 48.611       | 0.0                              | 861.1                              | 72               |
| 120 min Winter   | 30.102       | 0.0                              | 1066.6                             | 126              |
| 180 min Winter   | 22.369       | 0.0                              | 1188.8                             | 180              |

|                                                               |                                            |                                                                                     |
|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|
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| File 20-089C - Source Control Ca...                           | Checked by PWE                             |                                                                                     |
| Innovyze                                                      | Source Control 2020.1                      |                                                                                     |

Summary of Results for 100 year Return Period (+20%)

| Storm Event      | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status     |
|------------------|---------------|---------------|-------------------|-----------------|------------|
| 240 min Winter   | 92.521        | 0.871         | 34.2              | 1046.3          | Flood Risk |
| 360 min Winter   | 92.532        | 0.882         | 36.1              | 1062.8          | Flood Risk |
| 480 min Winter   | 92.537        | 0.887         | 37.0              | 1069.8          | Flood Risk |
| 600 min Winter   | 92.536        | 0.886         | 36.8              | 1068.1          | Flood Risk |
| 720 min Winter   | 92.532        | 0.882         | 36.0              | 1062.1          | Flood Risk |
| 960 min Winter   | 92.519        | 0.869         | 33.9              | 1044.3          | Flood Risk |
| 1440 min Winter  | 92.491        | 0.841         | 29.2              | 1005.0          | Flood Risk |
| 2160 min Winter  | 92.453        | 0.803         | 23.3              | 952.9           | Flood Risk |
| 2880 min Winter  | 92.421        | 0.771         | 19.4              | 908.8           | Flood Risk |
| 4320 min Winter  | 92.365        | 0.715         | 12.6              | 835.0           | Flood Risk |
| 5760 min Winter  | 92.269        | 0.619         | 9.9               | 709.6           | O K        |
| 7200 min Winter  | 92.150        | 0.500         | 9.9               | 560.3           | O K        |
| 8640 min Winter  | 92.005        | 0.355         | 9.9               | 386.3           | O K        |
| 10080 min Winter | 91.896        | 0.246         | 9.9               | 261.9           | O K        |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 240 min Winter   | 18.005       | 0.0                 | 1276.0                | 232              |
| 360 min Winter   | 13.274       | 0.0                 | 1411.1                | 286              |
| 480 min Winter   | 10.674       | 0.0                 | 1513.0                | 360              |
| 600 min Winter   | 9.005        | 0.0                 | 1595.6                | 436              |
| 720 min Winter   | 7.833        | 0.0                 | 1665.4                | 510              |
| 960 min Winter   | 6.279        | 0.0                 | 1780.3                | 658              |
| 1440 min Winter  | 4.589        | 0.0                 | 1921.7                | 952              |
| 2160 min Winter  | 3.346        | 0.0                 | 2134.9                | 1392             |
| 2880 min Winter  | 2.671        | 0.0                 | 2271.9                | 1844             |
| 4320 min Winter  | 1.940        | 0.0                 | 2475.2                | 2820             |
| 5760 min Winter  | 1.545        | 0.0                 | 2627.7                | 3808             |
| 7200 min Winter  | 1.296        | 0.0                 | 2756.1                | 4680             |
| 8640 min Winter  | 1.123        | 0.0                 | 2865.7                | 5280             |
| 10080 min Winter | 0.995        | 0.0                 | 2961.6                | 5856             |

## 20-089 – Barns Court and Friday Farm, Cophthorne

### Preliminary assessment of foul flows (by NDH)

#### Areas taken from Cowan Architect drawing Masterplan

#### Estimate of peak foul flow

Total floor area of proposed buildings = **7,310m<sup>2</sup>**

Total floor area of warehouse (assume 90% of total) = **6,580m<sup>2</sup>**

Total area of offices (assume 10% of total) = **730m<sup>2</sup>**

From Employment Densities Guide 3<sup>rd</sup> Edition – November 2015;

Warehouse = 1 person per 47m<sup>2</sup> (B1c)

6,580m<sup>2</sup> / 47 = 140 persons

Offices = 1 person per 12m<sup>2</sup> (General office)

730m<sup>2</sup> / 12 = 60 persons

Total number of persons on site = 140 + 60 = **200 persons**

From British Water – Flows and Loads 2;

flow loading per person per day = 100 litres (office/factory with canteen as worst-case scenario)

200 x 100 l/p/day = 20,000 litres

DWF (based on 12 hour working day) = 20,000 / 12 x 60 x 60 = **0.46 l/sec**

Peak flow = 4 x DWF = 4 x 0.46 = **1.8 l/sec**

## **APPENDIX E**

### **DRAINAGE STRATEGY DRAWINGS**



## **APPENDIX F**

### **THAMES WATER PUBLIC SEWER RECORDS**

# Asset location search



## Property Searches

HDR  
Bourne House  
Prince Edward Street  
BERKHAMSTED  
HP4 3EZ

**Search address supplied**      Barns Court  
Turners Hill Road  
Crawley Down  
Crawley  
RH10 4HQ

**Your reference**                      20-089

**Our reference**                      ALS/ALS Standard/2020\_4264691

**Search date**                          28 September 2020

### Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd  
Property Searches, PO Box 3189, Slough SL1 4WW  
DX 151280 Slough 13



[searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
[www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)



0845 070 9148

**Search address supplied:** Barns Court, Turners Hill Road, Crawley Down, Crawley, RH10 4HQ

Dear Sir / Madam

**An Asset Location Search is recommended when undertaking a site development.** It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

### Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd  
Property Searches  
PO Box 3189  
Slough  
SL1 4WW

Email: [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)

Web: [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)

## Waste Water Services

**Please provide a copy extract from the public sewer map.**

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

## Clean Water Services

**Please provide a copy extract from the public water main map.**

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

South East Water  
Rocfort Road  
Snodland



Kent  
ME6 5AH

Tel: 0845 301 0845

[www.southeastwater.co.uk](http://www.southeastwater.co.uk).

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

## **Payment for this Search**

A charge will be added to your suppliers account.

### Further contacts:

#### Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

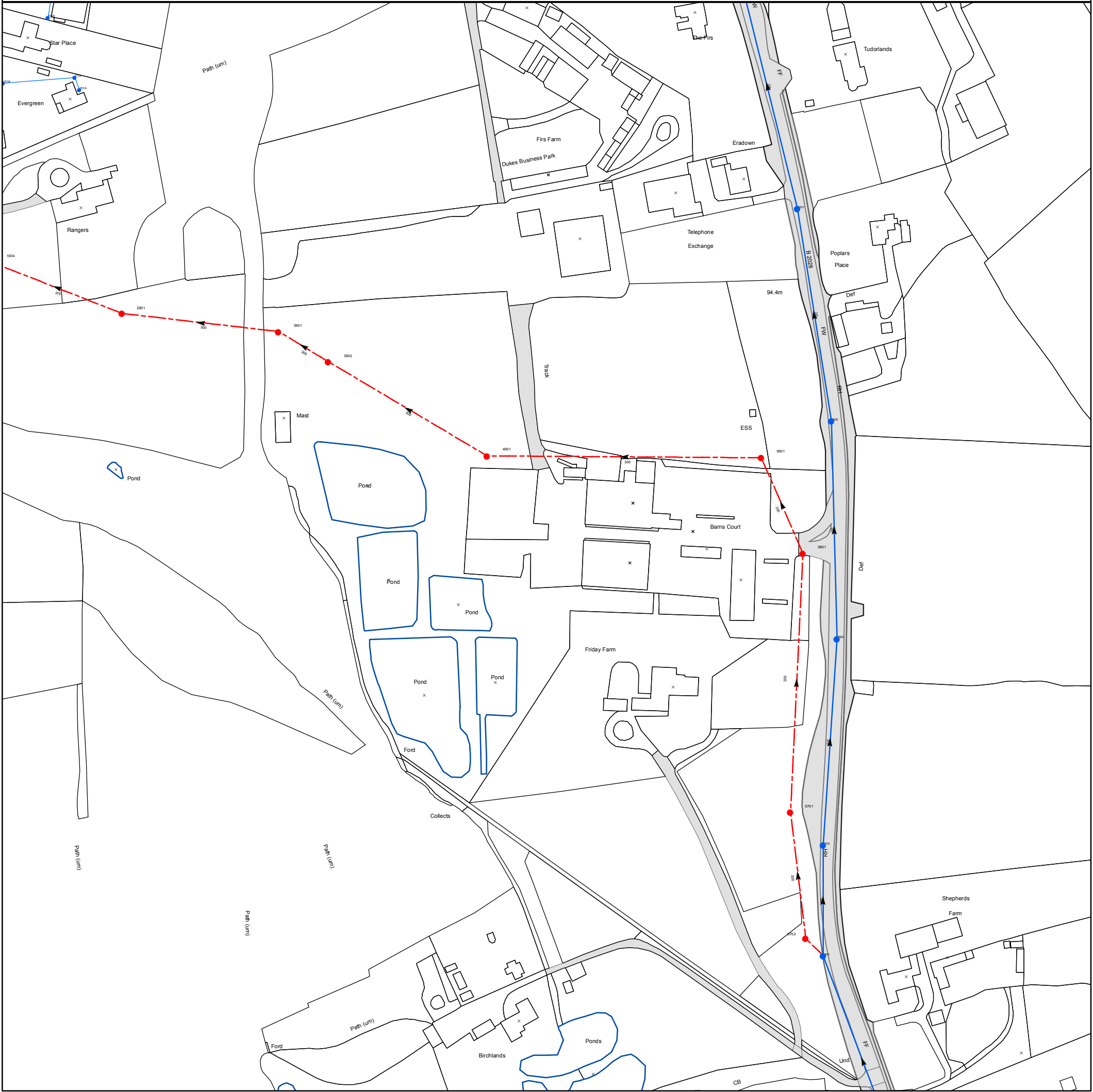
Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

#### Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)  
Thames Water  
Clearwater Court  
Vastern Road  
Reading  
RG1 8DB

Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)



The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

**Scale:** 1:1792  
**Width:** 500m  
**Printed By:** G1KANAGA  
**Print Date:** 29/09/2020  
**Map Centre:** 533438,138886  
**Grid Reference:** TQ3338NW

**Comments:**

# ALS/ALS Standard/2020\_4264691

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

| REFERENCE | COVER LEVEL | INVERT LEVEL |
|-----------|-------------|--------------|
| 5701      | 98.79       | 96.82        |
| 5702      | 100.16      | 98.01        |
| 2901      | 89.42       | 87.69        |
| 3902      | 91.28       | 89.44        |
| 101A      |             |              |
| 5001      | 94.59       | 91.69        |
| 5902      | 95.11       | 92.29        |
| 5601      | 100.21      | 98.12        |
| 211B      |             |              |

| REFERENCE | COVER LEVEL | INVERT LEVEL |
|-----------|-------------|--------------|
| 5801      | 95.92       | 94.62        |
| 5901      | 94.71       | 93.05        |
| 3901      | 90.94       | 88.95        |
| 4901      | 92.81       | 91.52        |
| 211A      |             |              |
| 5703      | 98.18       | 96.2         |
| 5802      | 96.3        | 94.45        |
| 201A      |             |              |



# ALS Sewer Map Key

## Public Sewer Types (Operated & Maintained by Thames Water)

|  |                                                                                                                                             |
|--|---------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Foul:</b> A sewer designed to convey waste water from domestic and industrial sources to a treatment works.                              |
|  | <b>Surface Water:</b> A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses. |
|  | <b>Combined:</b> A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.   |
|  | Trunk Surface Water                                                                                                                         |
|  | Trunk Foul                                                                                                                                  |
|  | Storm Relief                                                                                                                                |
|  | Trunk Combined                                                                                                                              |
|  | Vent Pipe                                                                                                                                   |
|  | Bio-solids (Sludge)                                                                                                                         |
|  | Proposed Thames Surface Water Sewer                                                                                                         |
|  | Proposed Thames Water Foul Sewer                                                                                                            |
|  | Gallery                                                                                                                                     |
|  | Foul Rising Main                                                                                                                            |
|  | Surface Water Rising Main                                                                                                                   |
|  | Combined Rising Main                                                                                                                        |
|  | Sludge Rising Main                                                                                                                          |
|  | Proposed Thames Water Rising Main                                                                                                           |
|  | Vacuum                                                                                                                                      |

### Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

## Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

|  |             |
|--|-------------|
|  | Air Valve   |
|  | Dam Chase   |
|  | Fitting     |
|  | Meter       |
|  | Vent Column |

## Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

|  |               |
|--|---------------|
|  | Control Valve |
|  | Drop Pipe     |
|  | Ancillary     |
|  | Weir          |

## End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

|  |               |
|--|---------------|
|  | Outfall       |
|  | Undefined End |
|  | Inlet         |

## Other Symbols

Symbols used on maps which do not fall under other general categories

|  |                                               |
|--|-----------------------------------------------|
|  | Public/Private Pumping Station                |
|  | Change of characteristic indicator (C.O.C.I.) |
|  | Invert Level                                  |
|  | Summit                                        |

### Areas

Lines denoting areas of underground surveys, etc.

|  |                  |
|--|------------------|
|  | Agreement        |
|  | Operational Site |
|  | Chamber          |
|  | Tunnel           |
|  | Conduit Bridge   |

## Other Sewer Types (Not Operated or Maintained by Thames Water)

|  |                       |
|--|-----------------------|
|  | Foul Sewer            |
|  | Surface Water Sewer   |
|  | Combined Sewer        |
|  | Gully                 |
|  | Culverted Watercourse |
|  | Proposed              |
|  | Abandoned Sewer       |

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

## Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

## Ways to pay your bill

| Credit Card                                                                     | BACS Payment                                                                                                                                                                                                                                                       | Telephone Banking                                                                                                        | Cheque                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Call <b>0845 070 9148</b> quoting your invoice number starting CBA or ADS / OSS | Account number <b>90478703</b><br>Sort code <b>60-00-01</b><br>A remittance advice must be sent to:<br><b>Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.</b><br>or email <a href="mailto:ps.billing@thameswater.co.uk">ps.billing@thameswater.co.uk</a> | By calling your bank and quoting:<br>Account number <b>90478703</b><br>Sort code <b>60-00-01</b> and your invoice number | Made payable to ' <b>Thames Water Utilities Ltd</b> '<br>Write your Thames Water account number on the back.<br>Send to:<br><b>Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW</b><br>or by DX to <b>151280 Slough 13</b> |

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