Cole Easdon

FLOOD RISK ASSESSMENT

Proposed Residential Development, Reading Road, Burghfield Common, Berkshire on Behalf of T A Fisher & Sons Limited

Date: January 2022
Issue No. 3

DOCUMENT ISSUE RECORD

Client: **T A Fisher & Sons Ltd**

Project: **Proposed Residential Development, Reading Road, Burghfield Common, Berkshire**

Job Number: **7740**

Document Title: **Flood Risk Assessment**

Issue No.	1	2	3	
Date	December 2021	January 2022	January 2022	
Description / Status	Draft for Client Comment	Draft for Client Comment	Formal Issue	
Prepared	N. Parajuli MEng	N. Parajuli MEng	N. Parajuli MEng	
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Document Check		C. Spanner BA (Hons)	C. Spanner BA (Hons)	

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1.0 INTRODUCTION

1.1 This *Flood Risk Assessment (FRA)* has been prepared by Cole Easdon Consultants Limited (CE) on behalf of T A Fisher & Sons Limited to accompany a full planning application for the proposed residential development of 32 dwellings on land at the rear of The Hollies, Reading Road, Burghfield Common, Berkshire. Refer to CE Figure 7740/500 Figure 1 [*Site Location Plan*] in Appendix 1.

1.2 The site is part of an allocated housing site as designated within the West Berkshire Local Plan (Policy HSA16) and is located immediately to the west of the recently constructed development of 28 dwellings by Crest Nicholson (planning application references 16/1685/OUTMAJ and 19/00772/RESMAJ) that formed part of the same allocation.

Development Proposals

1.3 The proposal comprises the development of the site for residential use. It comprises the erection of 32 new dwellings, with associated access, parking and landscaping. Access into the site will be provided by extending the existing access road into the site so that it serves both the application site and the adjacent development. Refer to Drawing No. 2021/P0162-02 [*Site Information Plan*] (by Twenty 20 Architecture) in Appendix 2.

Need for Study

1.4 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without placing itself at risk of flooding and without worsening flood risk to the area. The study has been undertaken as per guidance provided within national guidance documents, namely *National Planning Policy Framework (NPPF)* and its associated *Planning Practice Guidance (PPG)* and the requirements of the Environment Agency and Lead Local Flood Authority (West Berkshire Council).

1.5 In accordance with the national and local policies, the study will consider to minimise the risk and impact of flooding by:

- *directing development to areas with the lowest probability of flooding;*
- *ensuring the development addresses the effective management of all sources of flood risk;*
- *ensuring the development does not increase the risk of flooding elsewhere; and*
- *ensuring wider environmental benefits of development in relation to flood risk.*

Scope of Study

1.6 In Section 2.0, we describe the characteristics of the development site and surrounding area. In Section 3.0, we assess flood risk issues. In Section 4.0, we discuss foul and surface water

drainage proposals for the site, and conclusions are presented in Section 5.0.

1.7 The following publicly available documents have also been reviewed as part of this assessment:

- *CIRIA C753 The SuDS Manual (2015);*
- *DEFRA Non-statutory technical standards for sustainable drainage systems (2015);*
- *EA Flood risk assessments: climate change allowances (July 2021);*
- *National Planning Policy Framework (October 2021);*
- *Planning Practice Guidance (March 2014);*
- *Sewerage Sector Guidance Appendix C – Design and Construction Guidance V2;*
- *West Berkshire Core Strategy 2006-2026, adopted July 2012;*
- *West Berkshire Council Level 1 Strategic Flood Risk Assessment (June 2019); and*
- *West Berkshire Sustainable Drainage Systems Supplementary Planning Document (December 2018).*

1.8 The following abbreviations have been used in this Report:

- AEP Annual Exceedance Probability;
- AOD Above Ordnance Datum;
- BGS British Geological Survey;
- EA Environment Agency;
- FRA Flood Risk Assessment;
- LLFA Lead Local Flood Authority;
- LPA Local Planning Authority;
- NPPF National Planning Policy Framework;
- PPG Planning Practice Guidance;
- SFRA Strategic Flood Risk Assessment;
- SPD Supplementary Planning Document; and
- SuDS Sustainable Drainage Systems.

2.0 THE EXISTING SITE

Site Location and Topography

2.1 The application site is located within the north-eastern fringe of Burghfield Common in Berkshire, approx. 4.0km to the south west of Reading. The site is located off Reading Road, to the rear of properties fronting Reading Road and to the west of the recently completed residential estate known as Regis Manor Road. Refer to CE Figure 7740/500 Figure 1 [*Site Location Plan*] in Appendix 1.

2.2 The site, which is estimated to be approximately 1.80 hectares (ha) in size, is currently undeveloped and contains grassland, scrub, hedgerows and trees with woodland margins to the north.

2.3 The adjoining land use is residential and rural in character. The site is adjoined by the Hollies Care Home and residential properties to the east, by the residential properties to the south and west and by woodland and agricultural fields to the north.

2.4 The site occupies sloping ground with a northerly fall. Ground levels fall from 91.75m AOD within the southern extent to 72.00mAOD within the north eastern region. A topographical survey [*Plan No. L 10 15 – T*) dated 22.12.2015, referenced to the Ordnance Datum, undertaken by KND Surveys Ltd was provided for this study. This survey is included in CE Plan 7740/502 [*Proposed Drainage Strategy 1-500*] within Appendix 1.

Nearby Watercourses/Drainage Features

2.5 A small watercourse is located 40m to the north of the site boundary. The watercourse rises within the woodland area, c. 300m to the west of the site, and continues in a north easterly direction to join the Foundry Brook near Reading.

2.6 A number of ditches run through the site and along its boundary which drain to the above watercourse.

Existing Drainage/Sewers

2.7 Thames Water sewer records (in Appendix 3) show the presence of foul sewers to the north and south of the site. A foul sewer is also shown to run northerly through the eastern extent of the site from the manhole at the adjoining property, Haycroft, towards the set of foul sewers located to the north, however to date despite investigation works on site, this connection has not been proven. Another 150mm foul sewer runs from the same manhole at Haycroft along the rear of properties fronting Reading Road to discharge into a 225mm foul sewer at Lamden

Way to the west. This then flows northerly to discharge into a pair of sewers (150mm and 225mm) which then continues north easterly through the wooded area to the north of the site.

2.8 Public surface water sewers are located within the residential estates to the west which appear to discharge into the above watercourse running through the woodland. There are however no public surface water sewers in the immediate vicinity of the site. Refer to records in Appendix 3.

Existing Ground Conditions

2.9 British Geological Survey (BGS) mapping indicates the site is underlain by London Clay Formation with no superficial deposits. Refer to Appendix 3. Silchester Gravel Member superficial deposits are indicated along the Reading Road corridor to the south beyond the site extent.

2.10 London Clay beneath the area is an unproductive strata. The site is located within an outer groundwater source protection zone (Zone II) associated with a public water supply borehole.

3.0 FLOOD RISK ISSUES

3.1 This Section of the study reviews historical flooding events within the local catchment area and presents an assessment of flood risk to the proposed development from various external sources. Recommended flood risk mitigation measures appropriate to the level of perceived risk are included within this Assessment. Flood risk posed by additional surface water runoff generated by the new development and appropriate mitigation measures are addressed within Section 4.0.

Flood History

3.2 There have been no records of flooding at the site or its immediate vicinity.

Fluvial/Tidal Flood Risk

3.3 The EA's Flood Map indicates that the site lies within Flood Zone 1. The *NPPF* identifies Flood Zone 1 as low flood risk areas with an annual probability of flooding of less than a 1 in 1000 (0.1%) from rivers or sea. Refer to CE Figure 7740/500 Figure 2 [*Flood Map*] in Appendix 1.

3.4 Based on the *NPPF/PPG*, the proposed residential use, classed as 'more vulnerable' use is considered acceptable in Flood Zone 1.

Fluvial/Tidal Flood Risk Mitigation Measures

3.5 No mitigation measures are required.

Existing Sewers/Drains Flood Risk

3.6 Sewers in the vicinity relate to foul only, which poses a low risk of property flooding.

Sewer Flood Risk Mitigation Measures

3.7 No mitigation measures are required.

Overland Flood Risk

3.8 There is a limited catchment (higher ground) to the south which rises above the site. However, these include rear gardens of properties and poses a low risk of generating overland runoff towards the site. The EA's surface water flood map confirms the above. The EA's mapping shows that flow routes in the extreme events (>1 in 1000yr) follow the onsite ditchlines. Refer to Appendix 5.

Overland Flood Risk Mitigation Measures

3.9 Flood risk from 'offsite' overland flow remains low. Suitably designed overland flow routes (via

roadways) and an adequately designed surface water drainage system and SuDS facilities will be incorporated within the new development to prevent surface water runoff generated by the new development from causing flooding at the site or increasing flood risk elsewhere. Further details are included in Section 4.0.

Groundwater Flood Risk

3.10 The underlying geology comprising London Clay acts as an impermeable barrier and prevents any groundwater to rise to the surface to cause flooding.

Groundwater Flood Risk Mitigation Measures

3.11 No mitigation measures are required.

4.0 DRAINAGE PROPOSALS

4.1 This Section details how surface water and foul flows arising from the development site will be managed in line with related national and local guidance, namely *NPPF, PPG, West Berkshire adopted Core Strategy (Policy CS16 – Flooding), West Berkshire SuDS SPD and SFRA* recommendations. The proposals will also consider the requirement of the Environment Agency, Thames Water and West Berkshire Council as a LLFA.

Existing Site Drainage

4.2 The application site is approximately 1.80 ha of greenfield land. The site generates 100 year greenfield runoff of 32.7 l/s with a Qbar of 10.3 l/s (refer to FEH greenfield runoff calculations in Appendix 6 calculated using HR Wallingford's online tool). The site currently drains towards the drainage ditches located within the site and around its boundaries.

Surface Water Drainage Proposal

4.3 The development site will add approx. 0.62ha (6,200m^2) of impermeable area to the existing greenfield site, which will increase surface water runoff without any mitigation measures. However, surface water runoff generated from the developed site will be reduced to minimal rates utilising sustainable drainage measures, as discussed below.

4.4 Drainage proposals for the site have been developed in line with national and local guidance, SuDS principles and Building Regulations guidelines. Opportunity for surface water runoff disposal via infiltration have been investigated before seeking to discharge into any alternative watercourses or sewers.

SuDS Feasibility Investigation

4.5 The underlying geology includes London Clay, known to be relatively impermeable. As such, infiltration is unlikely to work.

4.6 Accordingly, it is proposed that the development site drains into the existing ditchline located within the site. Discharge into the ditch will be limited to the greenfield rate (Qbar) of 10.3 l/s maximum, not exceeding the 1yr greenfield rate (8.7l/s) in the 1 in 1yr event.

4.7 West Berkshire's SuDS guidance states that '*the peak runoff rate from the development for the 1 in 1-year rainfall event and the 1 in 100-year event shall not exceed the peak greenfield runoff rate for the same event.'* The Reduction to Qbar offers a reduction of approximately 70% over what the site would currently generate in the 100yr event, thereby offering a significant betterment in such an extreme event.

Urban Creep Allowance

4.8 As per the SuDS guidance, a maximum urban creep allowance of 10% has been applied in the drainage design calculations to allow for an increase in impermeable areas over its lifetime. This increases the total hard area slightly to 0.655ha, by applying 10% to the hard area associated within private property curtilage only (0.365ha).

4.9 Surface water runoff will be managed within onsite SuDS comprising mainly a cellular storage tank located within the open space, with an outfall into the existing ditch. A bioretention area / ecological pond feature will be incorporated at the outfall of the storage system to attenuate and treat runoff prior to its discharge into the ditch. Refer to CE Plan 7740/502 [*Proposed Drainage Strategy 1-500*] in Appendix 1 for preliminary design.

4.10 Owing to the existing trees and steep topography along the proposed access road, above ground features such as swales cannot be utilised. However shallower ecological pond feature will be incorporated within the open space as discussed above. Permeable paving will be considered where feasible, such as where they are not adjacent to any retaining structures, at the detailed design stage.

4.11 Surface water runoff will be managed for up to the 1:100 year + 40% climate change event in line with the NPPF/EA requirements. Discharge will be restricted to 10.3 l/s maximum with the use of a Hydrobrake or similar flow control device. Accordingly, some 410m^3 of storage will be required within the site. Refer to preliminary calculations in Appendix 6.

4.12 Discharge into the ditch will be subject to a Land Drainage Consent from West Berkshire Council.

Residual Flood Risk

4.13 Should the drainage system block/fail or under extreme events of flooding exceeding the design standard, floodwater would direct via onsite highways towards the open space, as indicated within CE Plan 7740/502 [*Proposed Drainage Strategy 1-500*] in Appendix 1.

Water Quality

4.14 Runoff from hardstanding area across the site will pass through a series of pre-treatment devices, such as trapped gullies and silt chamber prior to its discharge into the cellular storage system. The bioretention area will further treat runoff prior to its disposal into the ditch.

Adoption/Maintenance

4.15 Long term ownership and maintenance responsibilities for all drainage devices will be secured

prior to occupation. It is the responsibility of the developer to put in place suitable management arrangements for the SuDS for the lifetime of the development.

4.16 The maintenance responsibility of onsite drainage infrastructure will be assigned as follows:

- The piped drainage networks will be designed to an adoptable standard and offered for adoption by Thames Water;
- Onsite SuDS (cellular tank, bioretention area) located within the open space will be maintained via the engagement of a private management company; and
- Property owners will be responsible for maintaining the drainage components, including permeable paving, located within their private curtilages.

4.17 Regular inspection and maintenance is important for the effective operation of SuDS components as designed. Maintenance should be carried out in line with the *CIRIA C753 The SuDS Manual* or as per manufacturer's specification, as outlined in tables below.

Table 4.1: Maintenance Schedule for Cellular Attenuation Storage

Schedule	Maintenance Requirement	Frequency
Regular	Inspect and identify any areas that are not operating correctly	Monthly for 3 months then annually
	Remove debris from the catchment surface	Monthly
	Remove sediment from pre-treatment structures and internal forebays	Annually or as required
Remedial	Repair and rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect inlets, outlets, overflows and vents to ensure they are operating as designed	Annually
	Survey inside of tank for sediment build-up and remove as necessary	Every 5 years or as required

Table 4.2: Bioretention Systems Operation and Maintenance Requirements

Schedule	Maintenance Requirement	Frequency
Regular Inspection	▪ Inspect infiltration surfaces for silting and ponding, record dewatering time of the facility and assess standing water levels in underdrain (if appropriate) to determine maintenance if necessary ▪ Assess plants for disease infection, poor growth, invasive species etc and replace if necessary ▪ 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

Schedule	Maintenance Requirement	Frequency
	▪ Repair minor accumulations of silt by raking away surface mulch, scarifying of medium and replacing mulch	
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 4.3: Maintenance Schedule for Pipeworks, Catchpits and Flow Control

Schedule	Maintenance Requirement	Frequency
Regular	▪ Inspect for accumulation of silt ▪ Inspect for debris and litter ▪ Inspect inlets and outlets for blockages	Every six months
Occasional	▪ Remove debris and litter ▪ Remove silt	As required
Remedial	Repair or replace	As required

Foul Drainage Proposal

4.18 The nearest potential connection relates to the 150mm public foul sewer to the south along the rear of properties fronting Reading Road. The 150mm sewer, shown within TW records, within the eastern extent of the site were not evident when investigated by trial pitting works. As such the connection into this sewer has been discounted at this stage, although investigation works continue onsite. Seeking the discharge to the sewers located to the north requires crossing the protected ancient woodland area, hence will not be achievable.

4.19 Accordingly, it is proposed that the new properties discharge foul water into the public foul sewer located to the south. Based on levels, an onsite pump station will be required. The proposed rising main from the pump station will run beneath the site access road and through vacant strip of land (located outside the application boundary) to discharge into the existing public sewer. It is understood that this strip of land is within the ownership of the same landowner, hence it will be possible to achieve permission to carry out the proposed sewer connection work. Refer to CE Plan 7740/502 [*Proposed Drainage Strategy 1-500*] in Appendix 1.

4.20 The proposed foul networks serving the site will be offered for adoption by Thames Water. The pump station and the rising main will remain private.

4.21 The proposal is subject to an appropriate agreement with Thames Water.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 This Report discusses flood risk and drainage issues associated with the proposed residential development on land to the rear of The Hollies, Reading Road, Burghfield Common, Berkshire. The study considers the requirements of the Environment Agency and Lead Local Flood Authority and guidance contained within the *NPPF* and *PPG*.

5.2 The new development is located within Flood Zone 1 with low flood risk from river/sea, and also at low risk from surface water, groundwater and sewer flooding. The *NPPF/PPG* guidance considers all types of development suitable in Flood Zone 1.

5.3 The development is on greenfield land. The proposal will incorporate SuDS (storage tank, bioretention area and permeable paving), designed to accommodate the 1:100 year + 40% event which will ensure that runoff and flood risk is not increase post development. Residual flood risk will be managed by diverting flood flows towards the open space via onsite roadways, and away from the new properties. Use of trapped gullies, silt chamber and bioretention area will ensure that runoff entering the receiving surface water body is of acceptable quality.

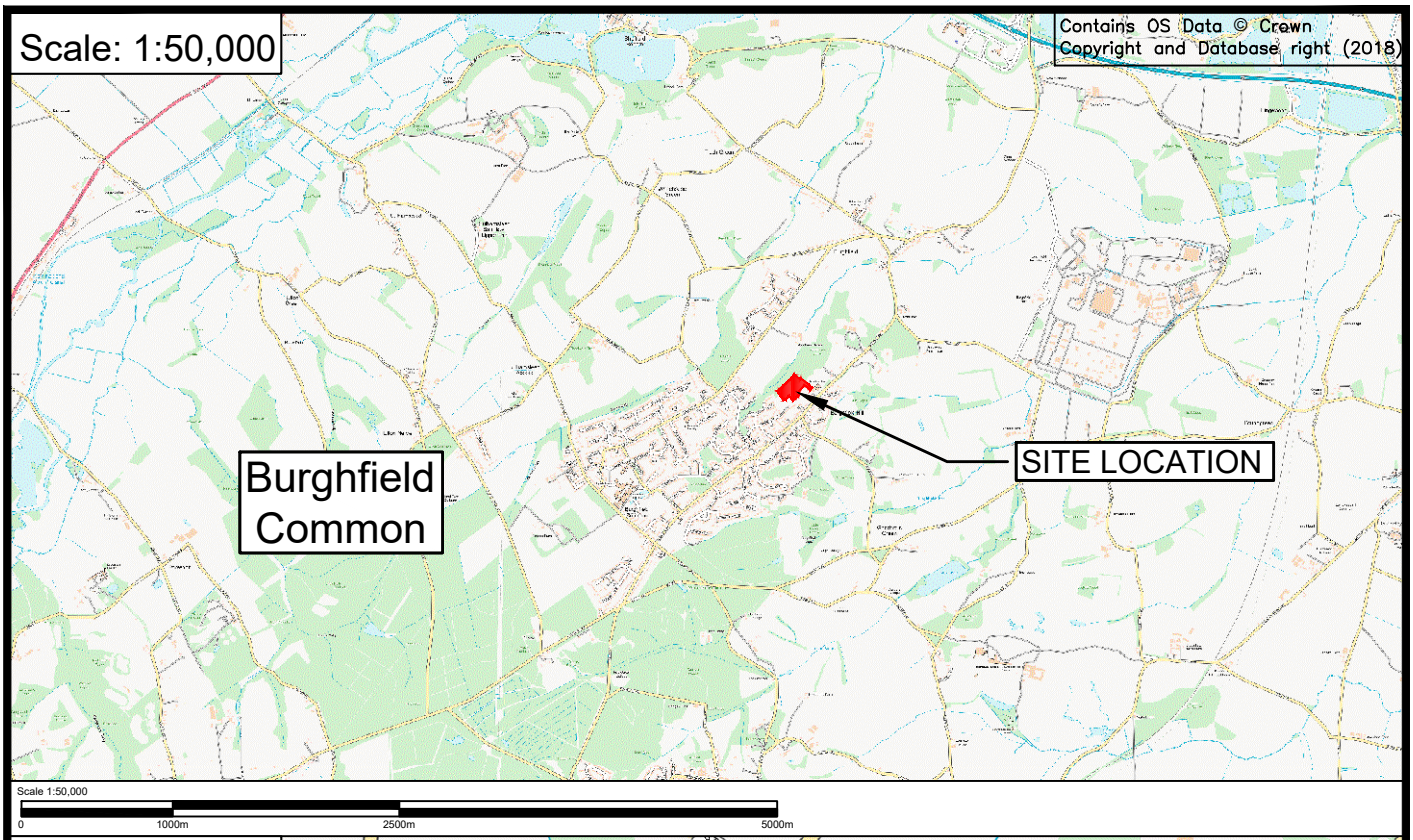
5.4 The site will discharge into the existing ditch at the greenfield rate (Qbar) maximum for up the 1:100 year + 40% event, ensuring no increase in runoff in the 1:1 year event. This offers a reduction of approximately 70% over the current 100 year greenfield rate, thereby offering a significant betterment in terms of flood risk.

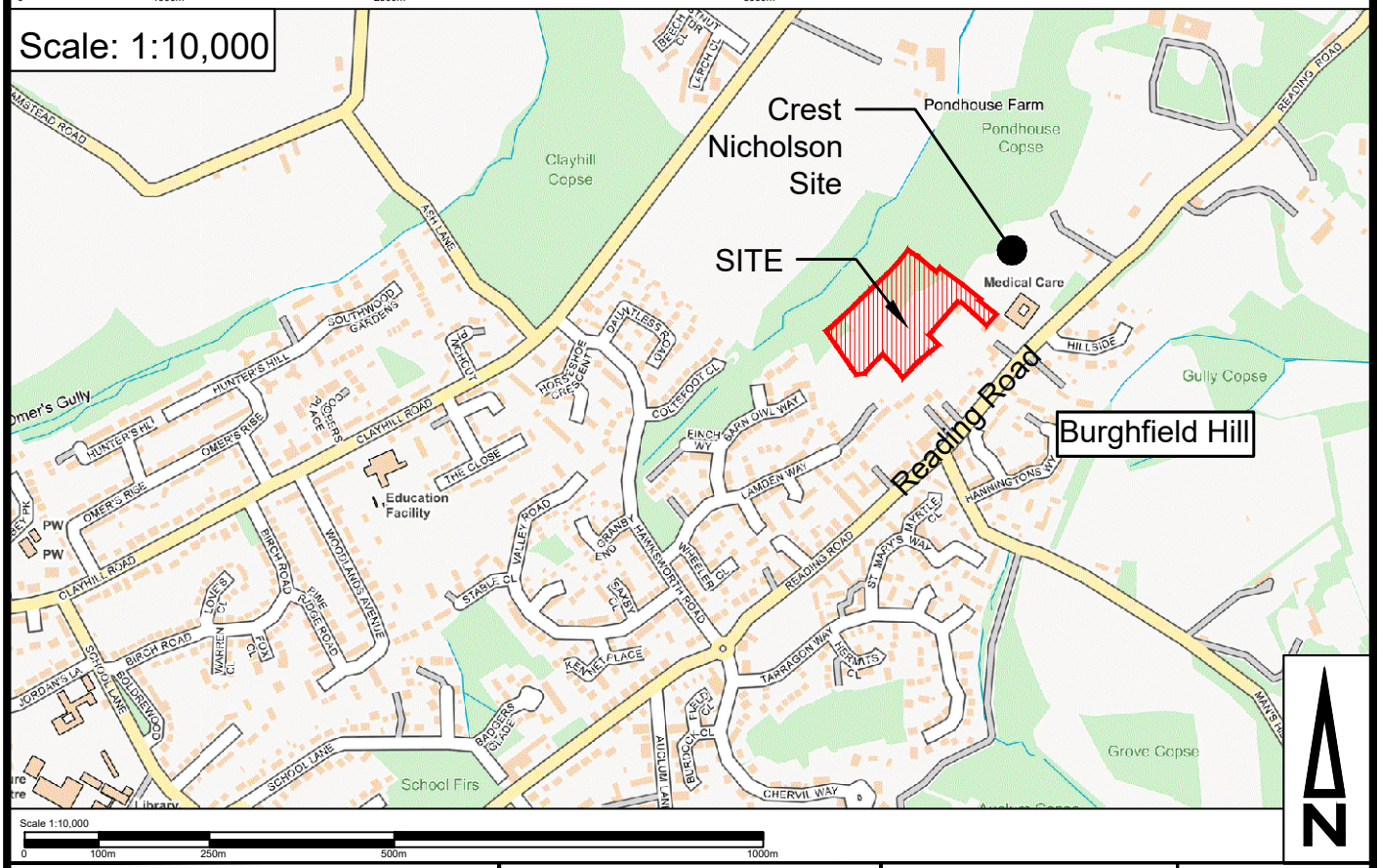
5.5 The development will discharge foul flows into the 150mm public foul sewer located to the south via an onsite private pump station and rising main. Works to lay the rising main within the area beyond the site boundary will be carried out with a permission from the landowner. It is understood that this strip of land remains within the ownership of the same landowner, hence it will be possible to achieve permission to carry out such works.

5.6 This study has been undertaken in accordance with the principles of the *NPPF* document. We conclude that providing the development adheres to the conditions advised within this Report, the proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the LPA/LLFA.

Cole Easdon Consultants Limited
January 2022

Appendix 1





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Job Title:
Land off Reading Road
Burghfield Common
Reading
Berkshire

Client:
T A Fisher & Sons Ltd

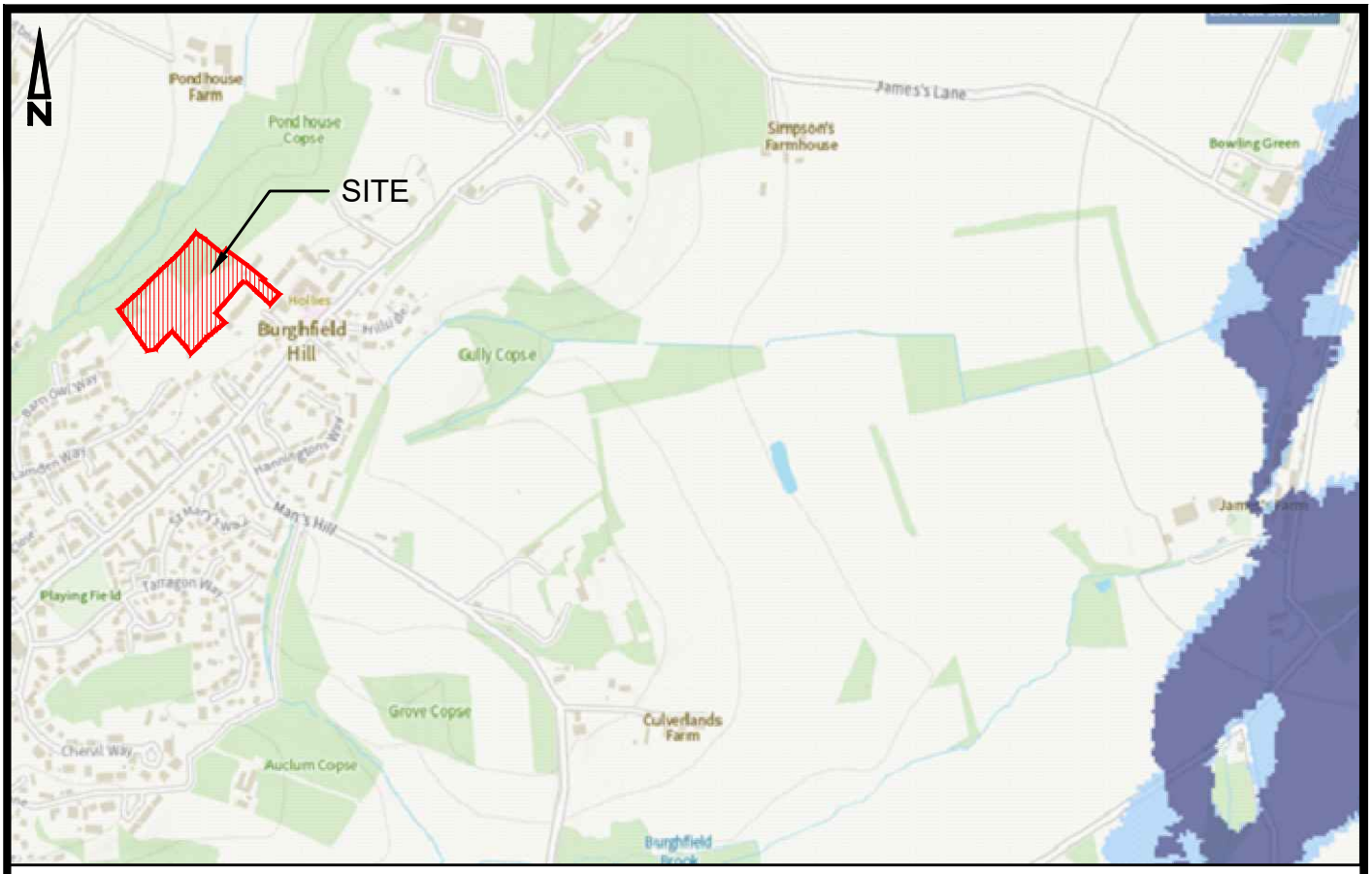
Drawing Status:

CONSTRUCTION AT CLIENT AND/OR CONTRACTOR RISK		
	FOR COMMENT	
	FOR PLANNING	X
	FOR TENDER	
	FOR APPROVAL	
	FOR CONSTRUCTION	
	AS BUILT	

Drawing Title:
Site Location Plan

Drawn By	Date Drawn	Scale
NP	Dec 2021	As Shown (A4)

Checked By	Drawing No.	Revision
RB	7740/500/Figure 1	-



Flood Zone 1 – Low Risk

Flood Zone 2 – Medium Risk

Flood Zone 3 – High Risk

Main Rivers

Cole Easdon

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CONSTRUCTION AT CLIENT AND/OR CONTRACTOR RISK		
	FOR COMMENT	
	FOR PLANNING	X
	FOR TENDER	
	FOR APPROVAL	
	FOR CONSTRUCTION	
	AS BUILT	

Drawing Title:
Flood Map
(produced by EA)

Drawn By	Date Drawn	Scale
NP	Dec 2021	Not to Scale (A4)

Checked By	Drawing No.	Revision
RB	7740/500/Figure 2	-

DRAINAGE NOTES:

1. Surface water runoff to be discharge into the existing ditch at restricted greenfield rate (Q_{bar} of 10.3l/s).
2. Runoff to be managed within below ground tank and bioretention area designed for up to the 1:100 year + 40% event.
3. Foul water to discharge into the public foul sewer located at rear of properties fronting Reading Road via an onsite private pump station and rising main in agreement with Thames Water.
4. Existing sewer information based on Thames Water sewer records. Exact route and invert levels to be confirmed on site.
5. Drainage shown subject to detailed design.

Site Area ≈ 1.80ha

Impermeable Area 0.62ha
655ha with 10% urban creep applied to private curtilage only)

Greenfield Runoff

Q_{bar}	10.3l/s
Q_{1yr}	8.7l/s
Q_{100yr}	32.7l/s

1:100yr +40%CC Storage Requirement 410m³

REFERENCE DRAWINGS:				
Drawing No.	Drawing Title	Revision	Date	Company
2021-P0162-02	Site Information Plan	–	17/11/21	Twenty-20 Architecture
L 10 15 T	Topographical Survey	–	22.12.15	KND Surveys Ltd

KEY:

- APPLICATION BOUNDARY
- 90.00 EXISTING LEVEL
- PROPOSED FOUL WATER SEWER, MANHOLE (ADOPTABLE)
- STORM WATER SEWER, MANHOLE (ADOPTABLE)
- EXISTING FOUL WATER SEWER AND MANHOLE
- ABANDONED SEWER
- CELLULAR STORAGE TANK
- BIORETENTION AREA
- FLOOD FLOW ROUTE
- SEWER EASEMENT
- FFL 87.35 FINISHED FLOOR LEVEL (TO BE CONFIRMED)
- +87.55 PROPOSED LEVELS
- 1/20 PROPOSED FALL

FOUL CONNECTION UNDETERMINED

Proposed surface water discharge into the ditch subject to land drainage consent

PROPOSED PRIVATE FOUL WATER PUMP STATION

Bioretention area/Ecological Pond

Flow Control Discharge 10.3l/s max

Cellular Storage Tank (410m³) 53x10x1.2m

PROPOSED FOUL CONNECTION

PLOTS 1 - 5

Glebe Gardens

Kelynack

Haycroft

Stable Cottage

Hazeldene

Bleak Cottage

Hollies (Nursing Home)

Poplar Close

READING ROAD

90.8m

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Client: T A FISHER & SONS LTD

Job Title: Land off Reading Road, Burghfield Common, Reading

Drawing Title: Proposed Drainage Strategy 1-500

Drawing Status:

FOR COMMENT	FOR PLANNING	FOR TENDER	FOR APPROVAL	FOR CONSTRUCTION	AS BUILT
	X				

"CONSTRUCTION AT CLIENT / CONTRACTOR RISK"

Designed by:	Drawn by:	Checked by:
NP	NP	RB

Date: Jan 2022 | Scale: 1:500 @ A1

Drg. No.: 7740/502 | Rev.: -

Appendix 2

REFER TO COLE EASDON DRAWINGS
FOR LEVELS AND DRAINAGE INFORMATION

LINE OF 15m ANCIENT WOODLAND BUFFER

PLOT 29 PLOT 28 PLOT 27 PLOT 26 PLOT 25 PLOT 24

ATTENUATION POND

OPEN SPACE

PUMPING STATION (BY OTHERS)

ANTENNATE PARKING BAY

19/20 BCP PLOT 20 PLOT 19 PLOT 18 PLOT 17 PLOT 16 PLOT 15

PLOT 30 PLOT 31 PLOT 32

PLOT 23 PLOT 22 PLOT 21 21/22

PLOT 14 PLOT 13 PLOT 12 12/13

PLOT 11 PLOT 10 PLOT 9 PLOT 8 PLOT 7 PLOT 6

6-11

BINS/ CYCLES

PLOTS 1 - 5

46 1 2

Glebe Gardens Kelynack Haycroft

N

LEGEND:-

- TREES TO BE RETAINED
- INDICATIVE PROPOSED PLANTING
- TREES TO BE REMOVED
- EXISTING BUILDING(S) TO BE DEMOLISHED
- +00.00 EXISTING LEVELS
- +00.00 PROPOSED LEVELS
- APPROX. F.F.L +00.000 APPROXIMATE FINISHED FLOOR LEVEL
- TREE ROOT PROTECTION AREA
- LOCKABLE CYCLE SHED

0 5 10 15 20m 30 40 50m

SCALE 1:500

REV.	DATE	REVISIONS:	REV.	DATE	REVISIONS:

CLIENT: TA FISHER & SONS LTD		PROJECT: LAND REAR OF THE HOLLIES, READING ROAD, BURGHFIELD COMMON	
SCALE: 1:500 (A2 ORIGINAL)		DRAWING: SITE INFORMATION PLAN	
DRAWN:	JOB NO: 2021 / P0162	DRAWING NO: 02	REVISION:
DATE: JAN 22			

TWENTY-20 :Architecture :Technical :Vision
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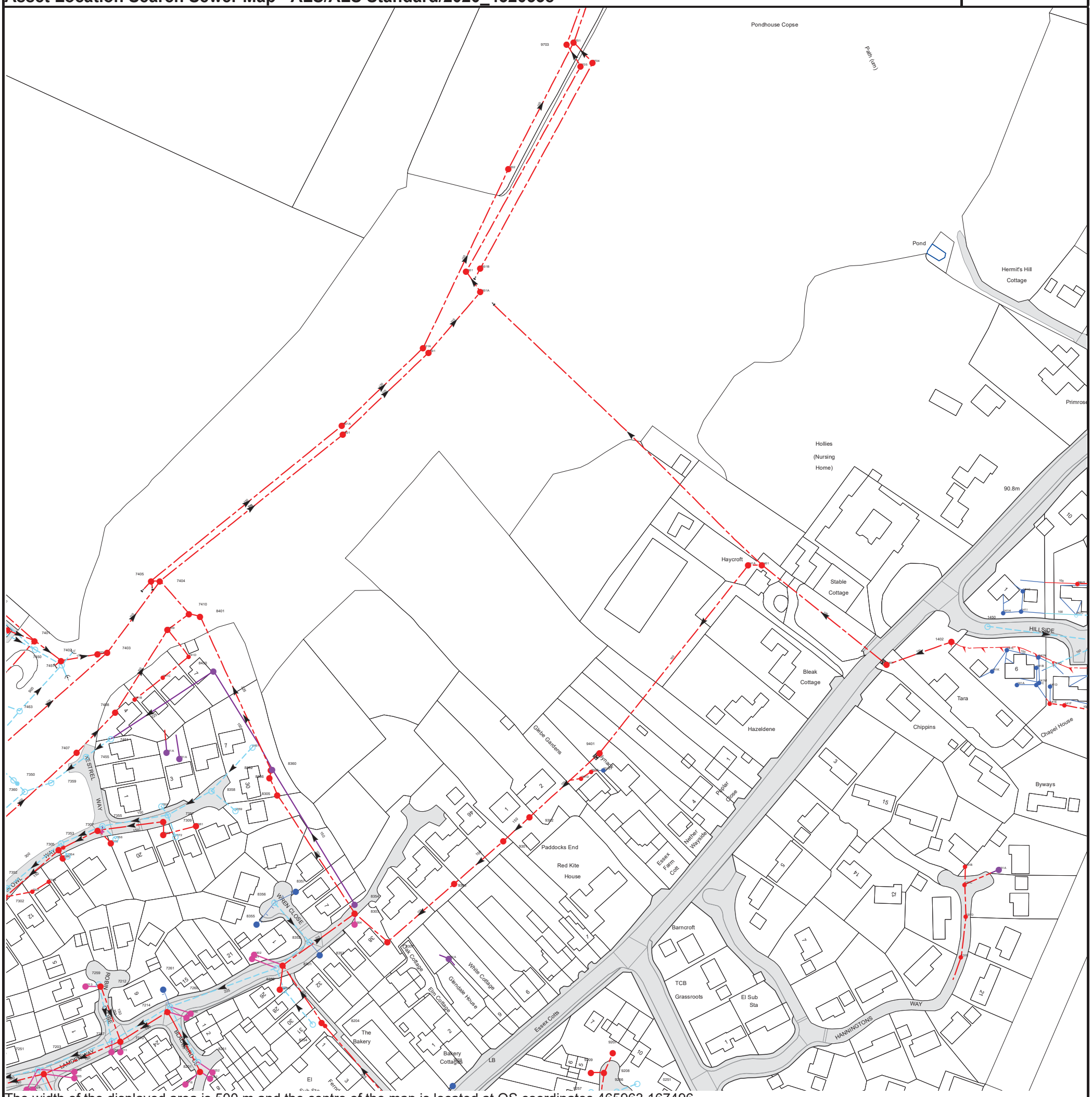
Old Boundary House, London Road, Sunningdale, Berkshire, SL5 0DJ

Appendix 3

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4320538



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 465963,167496

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 and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Trunk Surface Water
- Storm Relief
- Vent Pipe
- Proposed Thames Surface Water Sewer
- Gallery
- Surface Water Rising Main
- Sludge Rising Main
- Vacuum
- Trunk Foul
- Trunk Combined
- Bio-solids (Sludge)
- Proposed Thames Water Foul Sewer
- Foul Rising Main
- Combined Rising Main
- Proposed Thames Water Rising Main

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)

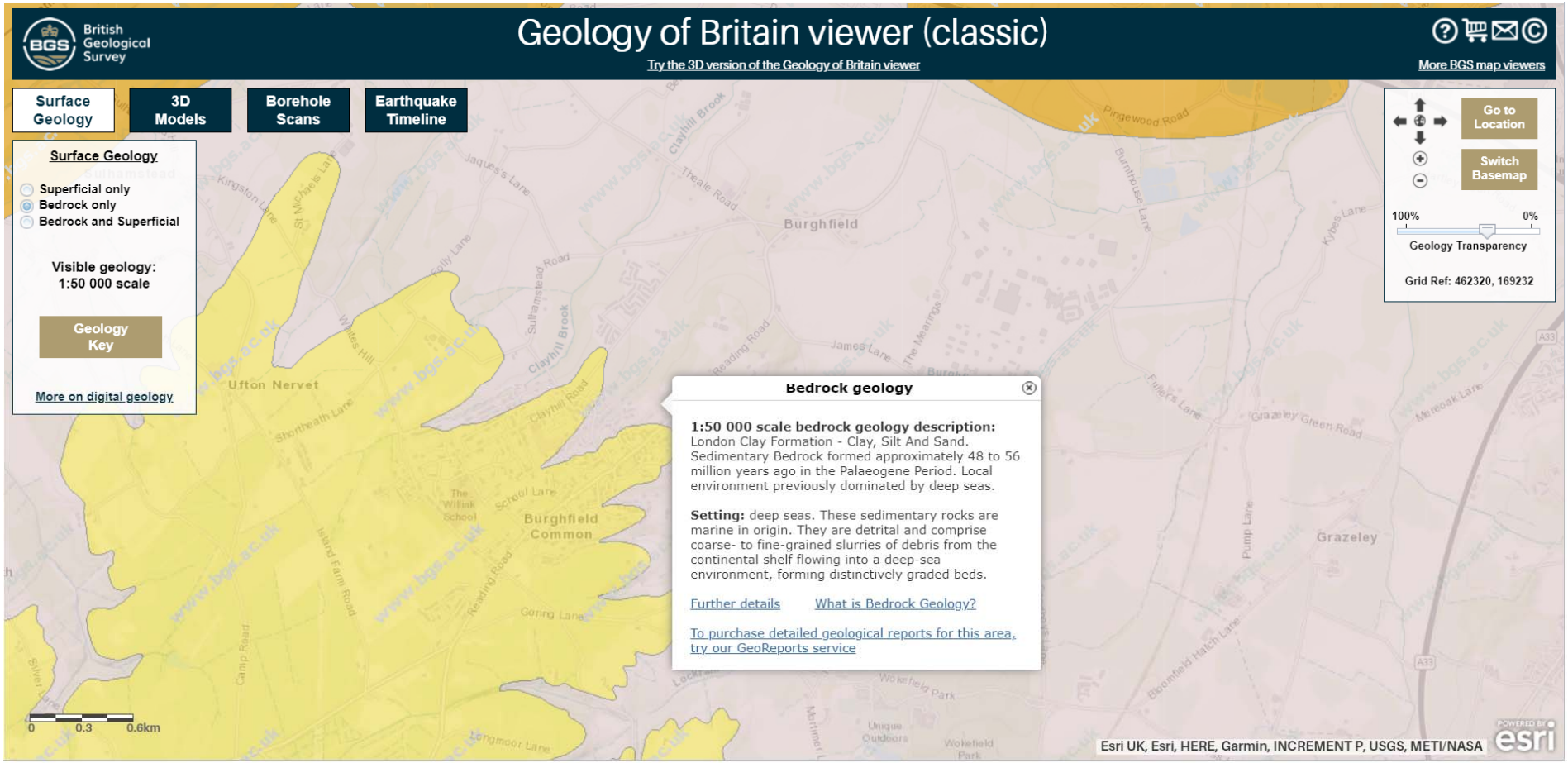
- Foul Sewer
- Combined Sewer
- Culverted Watercourse
- Surface Water Sewer
- Gulley
- Proposed
- Abandoned Sewer

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.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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.

Appendix 4

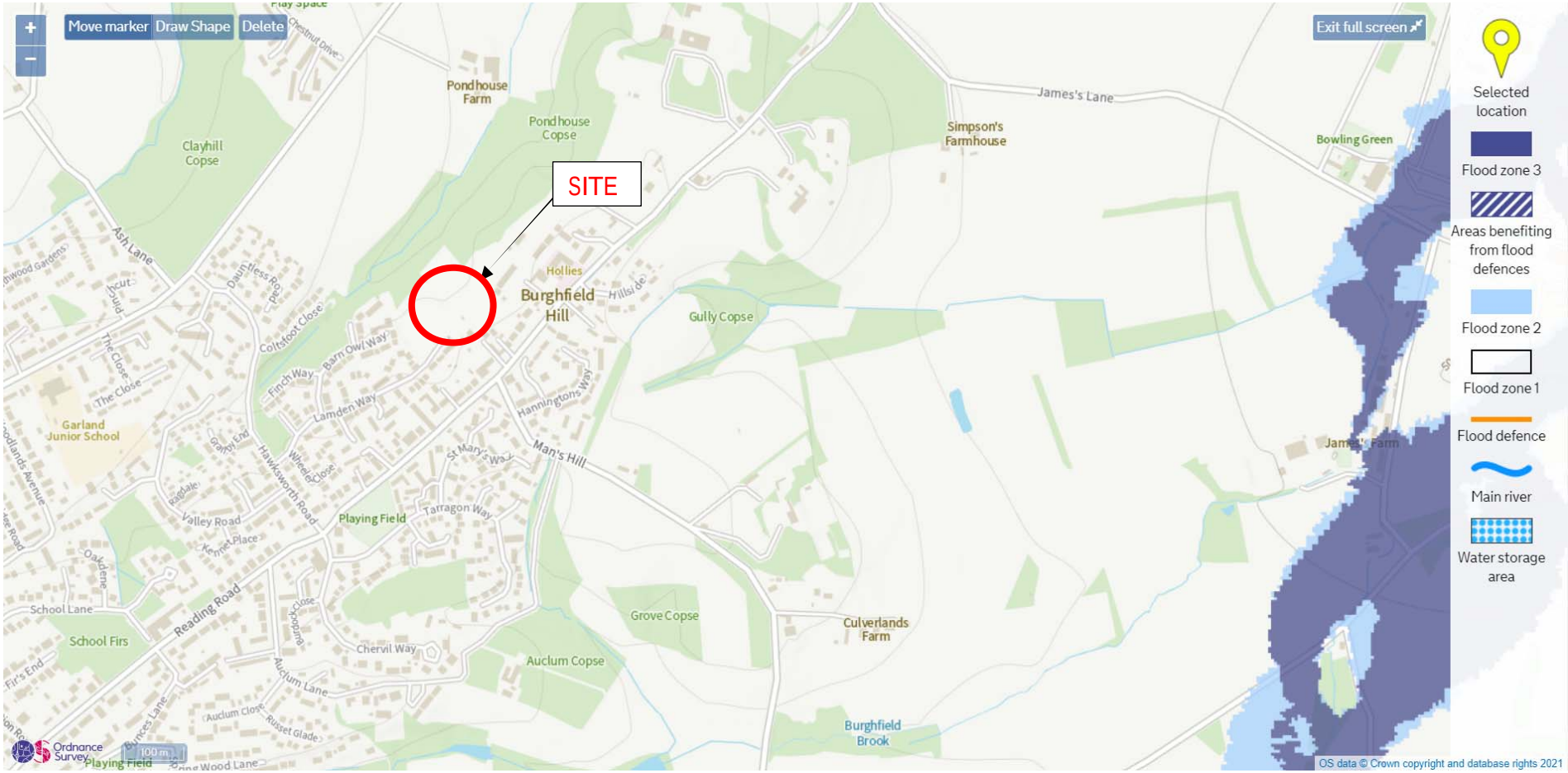
British Geological Survey – Bedrock Geology



Contains British Geological Survey materials ©NERC [2021]

Appendix 5

Environment Agency's Flood Map



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Environment Agency Surface Water Flood Map

Extent of flooding from surface water

High Medium Low Very low

Appendix 6

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Nisha Parajuli
Site name:	Land off Reading Road
Site location:	Burghfield Common

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

Site Details

Latitude:	51.40214° N
Longitude:	1.05361° W
Reference:	652269658
Date:	Dec 08 2021 10:28

Runoff estimation approach FEH Statistical

Site characteristics

Total site area (ha): 1.8

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Calculate from dominant
HOST class:	HOST 25
BFI / BFIHOST:	0.209
Q_{MED} (l/s):	9.03
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics	Default	Edited
SAAR (mm):	675	675
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	10.26	10.26
1 in 1 year (l/s):	8.72	8.72
1 in 30 years (l/s):	23.6	23.6
1 in 100 year (l/s):	32.73	32.73
1 in 200 years (l/s):	38.37	38.37

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

Half Drain Time : 384 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	75.858	0.858	0.0	8.8	8.8	293.6	O K
30 min Summer	75.934	0.934	0.0	9.2	9.2	319.4	O K
60 min Summer	75.999	0.999	0.0	9.4	9.4	341.8	O K
120 min Summer	76.037	1.037	0.0	9.6	9.6	354.8	O K
180 min Summer	76.034	1.034	0.0	9.6	9.6	353.7	O K
240 min Summer	76.014	1.014	0.0	9.5	9.5	347.0	O K
360 min Summer	75.963	0.963	0.0	9.3	9.3	329.3	O K
480 min Summer	75.918	0.918	0.0	9.1	9.1	314.0	O K
600 min Summer	75.877	0.877	0.0	8.9	8.9	300.0	O K
720 min Summer	75.839	0.839	0.0	8.7	8.7	286.9	O K
960 min Summer	75.771	0.771	0.0	8.7	8.7	263.7	O K
1440 min Summer	75.650	0.650	0.0	8.7	8.7	222.2	O K
2160 min Summer	75.469	0.469	0.0	8.7	8.7	160.5	O K
2880 min Summer	75.338	0.338	0.0	8.7	8.7	115.5	O K
4320 min Summer	75.200	0.200	0.0	8.6	8.6	68.5	O K
5760 min Summer	75.147	0.147	0.0	8.0	8.0	50.3	O K
7200 min Summer	75.127	0.127	0.0	6.9	6.9	43.6	O K
8640 min Summer	75.114	0.114	0.0	6.1	6.1	39.1	O K
10080 min Summer	75.105	0.105	0.0	5.4	5.4	36.0	O K
15 min Winter	75.964	0.964	0.0	9.3	9.3	329.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	246.896	0.0	300.1	26
30 min Summer	136.216	0.0	331.3	40
60 min Summer	75.152	0.0	367.9	68
120 min Summer	41.463	0.0	406.1	126
180 min Summer	29.280	0.0	430.2	184
240 min Summer	22.876	0.0	448.1	240
360 min Summer	16.154	0.0	474.7	306
480 min Summer	12.621	0.0	494.5	368
600 min Summer	10.422	0.0	510.4	432
720 min Summer	8.913	0.0	523.8	500
960 min Summer	6.981	0.0	547.0	638
1440 min Summer	4.948	0.0	581.3	916
2160 min Summer	3.507	0.0	619.4	1284
2880 min Summer	2.747	0.0	646.8	1624
4320 min Summer	1.994	0.0	703.6	2296
5760 min Summer	1.589	0.0	748.8	2944
7200 min Summer	1.332	0.0	784.6	3680
8640 min Summer	1.153	0.0	814.9	4408
10080 min Summer	1.021	0.0	841.0	5136
15 min Winter	246.896	0.0	336.3	26

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
30 min Winter	76.050	1.050	0.0	9.7	9.7	359.0	O K
60 min Winter	76.126	1.126	0.0	10.0	10.0	385.2	O K
120 min Winter	76.176	1.176	0.0	10.2	10.2	402.2	O K
180 min Winter	76.180	1.180	0.0	10.2	10.2	403.4	O K
240 min Winter	76.164	1.164	0.0	10.2	10.2	398.1	O K
360 min Winter	76.108	1.108	0.0	9.9	9.9	379.0	O K
480 min Winter	76.052	1.052	0.0	9.7	9.7	359.6	O K
600 min Winter	76.001	1.001	0.0	9.5	9.5	342.3	O K
720 min Winter	75.951	0.951	0.0	9.2	9.2	325.1	O K
960 min Winter	75.857	0.857	0.0	8.8	8.8	293.2	O K
1440 min Winter	75.683	0.683	0.0	8.7	8.7	233.7	O K
2160 min Winter	75.416	0.416	0.0	8.7	8.7	142.2	O K
2880 min Winter	75.243	0.243	0.0	8.7	8.7	83.2	O K
4320 min Winter	75.138	0.138	0.0	7.5	7.5	47.4	O K
5760 min Winter	75.115	0.115	0.0	6.1	6.1	39.2	O K
7200 min Winter	75.101	0.101	0.0	5.1	5.1	34.7	O K
8640 min Winter	75.092	0.092	0.0	4.4	4.4	31.6	O K
10080 min Winter	75.086	0.086	0.0	3.9	3.9	29.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	136.216	0.0	371.1	40
60 min Winter	75.152	0.0	412.2	68
120 min Winter	41.463	0.0	454.9	124
180 min Winter	29.280	0.0	481.9	180
240 min Winter	22.876	0.0	502.0	236
360 min Winter	16.154	0.0	531.8	340
480 min Winter	12.621	0.0	554.0	384
600 min Winter	10.422	0.0	571.8	460
720 min Winter	8.913	0.0	586.7	538
960 min Winter	6.981	0.0	612.7	692
1440 min Winter	4.948	0.0	651.2	990
2160 min Winter	3.507	0.0	693.9	1360
2880 min Winter	2.747	0.0	724.5	1656
4320 min Winter	1.994	0.0	788.3	2252
5760 min Winter	1.589	0.0	838.7	2944
7200 min Winter	1.332	0.0	878.8	3680
8640 min Winter	1.153	0.0	912.8	4408
10080 min Winter	1.021	0.0	942.3	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 465900 167600 SU 65900 67600
C (1km)	-0.030
D1 (1km)	0.280
D2 (1km)	0.289
D3 (1km)	0.348
E (1km)	0.310
F (1km)	2.557
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.655

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.220	4	8	0.220	8	12	0.215

Model Details

Storage is Online Cover Level (m) 77.000

Cellular Storage Structure

Invert Level (m) 75.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	360.0	360.0	1.200	360.0	451.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SFF-0139-1030-1200-8700
Design Head (m)	1.200
Design Flow (l/s)	10.3
Flush-Flo™	User Defined
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	139
Invert Level (m)	75.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	10.3
Flush-Flo™	0.264	8.7
Kick-Flo®	0.585	7.4
Mean Flow over Head Range	-	8.1

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	3.4	1.200	10.3	3.000	15.9	7.000	24.0
0.200	4.5	1.400	11.1	3.500	17.2	7.500	24.8
0.300	5.4	1.600	11.8	4.000	18.3	8.000	25.5
0.400	6.2	1.800	12.5	4.500	19.4	8.500	26.3
0.500	6.8	2.000	13.1	5.000	20.4	9.000	27.0
0.600	7.4	2.200	13.7	5.500	21.3	9.500	27.8
0.800	8.5	2.400	14.3	6.000	22.2		
1.000	9.4	2.600	14.9	6.500	23.1		

Summary of Results for 1 year Return Period

Half Drain Time : 86 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	75.115	0.115	0.0	6.1	6.1	39.2	O K
30 min Summer	75.132	0.132	0.0	7.2	7.2	45.1	O K
60 min Summer	75.145	0.145	0.0	7.9	7.9	49.6	O K
120 min Summer	75.154	0.154	0.0	8.3	8.3	52.7	O K
180 min Summer	75.157	0.157	0.0	8.3	8.3	53.6	O K
240 min Summer	75.156	0.156	0.0	8.3	8.3	53.3	O K
360 min Summer	75.150	0.150	0.0	8.2	8.2	51.4	O K
480 min Summer	75.144	0.144	0.0	7.8	7.8	49.1	O K
600 min Summer	75.137	0.137	0.0	7.5	7.5	46.9	O K
720 min Summer	75.131	0.131	0.0	7.1	7.1	44.8	O K
960 min Summer	75.121	0.121	0.0	6.5	6.5	41.4	O K
1440 min Summer	75.107	0.107	0.0	5.5	5.5	36.5	O K
2160 min Summer	75.093	0.093	0.0	4.5	4.5	31.9	O K
2880 min Summer	75.084	0.084	0.0	3.8	3.8	28.8	O K
4320 min Summer	75.074	0.074	0.0	3.1	3.1	25.3	O K
5760 min Summer	75.067	0.067	0.0	2.6	2.6	23.0	O K
7200 min Summer	75.063	0.063	0.0	2.3	2.3	21.4	O K
8640 min Summer	75.059	0.059	0.0	2.1	2.1	20.1	O K
10080 min Summer	75.056	0.056	0.0	1.9	1.9	19.1	O K
15 min Winter	75.128	0.128	0.0	6.9	6.9	43.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	34.992	0.0	41.0	23
30 min Summer	21.244	0.0	50.2	35
60 min Summer	12.897	0.0	62.4	56
120 min Summer	7.830	0.0	75.9	88
180 min Summer	5.847	0.0	85.1	122
240 min Summer	4.753	0.0	92.4	156
360 min Summer	3.550	0.0	103.5	220
480 min Summer	2.886	0.0	112.3	284
600 min Summer	2.457	0.0	119.5	346
720 min Summer	2.155	0.0	125.8	408
960 min Summer	1.757	0.0	136.7	530
1440 min Summer	1.317	0.0	153.5	772
2160 min Summer	0.987	0.0	173.8	1132
2880 min Summer	0.804	0.0	188.8	1500
4320 min Summer	0.617	0.0	216.8	2212
5760 min Summer	0.512	0.0	240.9	2944
7200 min Summer	0.443	0.0	260.3	3672
8640 min Summer	0.393	0.0	277.1	4408
10080 min Summer	0.355	0.0	291.8	5144
15 min Winter	34.992	0.0	46.1	23

Summary of Results for 1 year Return Period

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
30 min Winter	75.148	0.148	0.0	8.0	8.0	50.5	O K
60 min Winter	75.163	0.163	0.0	8.4	8.4	55.8	O K
120 min Winter	75.171	0.171	0.0	8.4	8.4	58.4	O K
180 min Winter	75.170	0.170	0.0	8.4	8.4	58.0	O K
240 min Winter	75.165	0.165	0.0	8.4	8.4	56.4	O K
360 min Winter	75.152	0.152	0.0	8.3	8.3	52.1	O K
480 min Winter	75.142	0.142	0.0	7.7	7.7	48.4	O K
600 min Winter	75.132	0.132	0.0	7.2	7.2	45.1	O K
720 min Winter	75.124	0.124	0.0	6.7	6.7	42.3	O K
960 min Winter	75.111	0.111	0.0	5.9	5.9	38.1	O K
1440 min Winter	75.096	0.096	0.0	4.7	4.7	32.7	O K
2160 min Winter	75.082	0.082	0.0	3.6	3.6	27.9	O K
2880 min Winter	75.073	0.073	0.0	3.0	3.0	25.0	O K
4320 min Winter	75.063	0.063	0.0	2.3	2.3	21.6	O K
5760 min Winter	75.057	0.057	0.0	2.0	2.0	19.5	O K
7200 min Winter	75.053	0.053	0.0	1.7	1.7	18.1	O K
8640 min Winter	75.050	0.050	0.0	1.5	1.5	17.0	O K
10080 min Winter	75.047	0.047	0.0	1.4	1.4	16.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	21.244	0.0	56.4	35
60 min Winter	12.897	0.0	70.0	58
120 min Winter	7.830	0.0	85.1	94
180 min Winter	5.847	0.0	95.5	132
240 min Winter	4.753	0.0	103.6	166
360 min Winter	3.550	0.0	116.1	234
480 min Winter	2.886	0.0	125.9	298
600 min Winter	2.457	0.0	134.0	362
720 min Winter	2.155	0.0	141.1	422
960 min Winter	1.757	0.0	153.3	546
1440 min Winter	1.317	0.0	172.2	786
2160 min Winter	0.987	0.0	194.8	1152
2880 min Winter	0.804	0.0	211.5	1504
4320 min Winter	0.617	0.0	243.1	2248
5760 min Winter	0.512	0.0	269.9	2952
7200 min Winter	0.443	0.0	291.6	3744
8640 min Winter	0.393	0.0	310.5	4408
10080 min Winter	0.355	0.0	327.1	5112