FLOOD RISK ASSESSMENT AND SURFACE WATER DRAINAGE STRATEGY

AT

BATFORD MILLS, HARPENDEN

JULY 2024

CONTENTS

Report prepared by:

Richard James
BEng (Hons) IEng MICE

1. INTRODUCTION

1.1. DEC Consulting Engineers Ltd. have been commissioned to produce a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development at Batford Mills Lower Luton Road Harpenden.

1.2. The proposed works comprise of demolition of the existing industrial buildings and the construction of 15 residential units, with ground floor retail space and a gym.

1.3. Based on the guidance in the National Planning Policy Framework (NPPF, February 2019) and associated Planning Practice Guidance (PPG, amended April 2015), developments should include an appropriate Flood Risk Assessment if any or all of the following criteria are met:

- Site is greater than 1 hectare
- Potentially located in Flood Zone 2 or 3
- Less than 1 hectare in Flood Zone 1, including a change of use in development type.
- Considered a major planning application (as defined by local planning authority)

1.4. In this case, the site is predominately located in Flood Zone 1 with a small section of the site is located in flood zone 2 and therefore this assessment has been prepared to accompany the planning application.

1.5. This report has been prepared in accordance with the NPPF and the accompanying Technical Guidance.

1.6. This report has been prepared by Richard James BEng (Hons) IEng MICE.

2. POLICY CONTEXT

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1 The latest NPPF was adopted in February 2019, one of the overarching objectives of the NPPF is the encouragement of growth and acknowledgement that decision-makers should adopt a presumption in favour of sustainable development. Paragraph 11 of the document states:

> _For decision-ta king this means:
>
> - approving development proposals that accord with an up-to-date development plan without delay; or
> - where there are no relevant development plan policies, or the policies which are most important for determining the application are out of date, granting permission unless:
>
> ⊡ the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development or
> ⊡ any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.:

2.2 Section 14 of the NPPF seeks to address the issues of climate change, flooding and coastal change. In paragraph 155 it states: _Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.:

PLANNING PRACTICE GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

2.3 The Planning Practice Guidance (PPG) was first published in March 2014 and at the same time the Technical Guidance to the NPPF was withdrawn. The key difference with the new PPG is that it is a web-based resource, and each section is updated as needed.

2.4 Section 7 covers _Flood Risk and Coastal Change: and was last updated in April 2015.

2.5 The assessment of flood risk is based on the definitions in Table 1 of the PPG. This information is replicated below for ease of reference.

TABLE 1: FLOOD ZONE DEFINITIONS

Flood Zone	Annual probability of river or sea flooding
Zone 1 Low Probability	ê Land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%)
Zone 2 Medium Probability	ê Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or ê Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	ê Land having a 1 in 100 or greater annual probability of river flooding; or ê Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	ê This zone comprises land where water has to flow or be stored in times of flood. ê Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

2.6 The NPPF classifies the Flood Risk Vulnerability of various land uses in Table 2 (reproduced below). The More Vulnerable Classification encompasses usages such as hospitals and buildings used for dwellings. Less Vulnerable applies to buildings used for general industry, storage and distribution.

TABLE 2: LAND USE CLASSIFICATION

Classification	Land Use
Essential Infrastructure	- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. - Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. - Wind turbines.
Highly Vulnerable	- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings.

Classification	Land Use
	- Caravans, mobile homes and park homes intended for permanent residential use. - Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as _essential infrastructure:).
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non´residential uses for health services, nurseries and educational establishments. - Landfill and sites used for waste management facilities for hazardous waste. - Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	- Buildings used for shops; financial, professional and other services, restaurants and cafes, hot - food takeaways, offices, general industry, storage and distribution and assembly and leisure. - Land and buildings used for agriculture and forestry. - Waste treatment (except landfill and hazardous waste facilities). - Minerals working and processing (except for sand and gravel working). - Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place).

2.8 The overall aim is to steer new development to Flood Zone 1. Where there are no reasonably available sites within Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. The table below, replicated from Table 3 of the PPG, indicates which Flood Zones are considered to be appropriate for different land uses based upon the Sequential Test.

TABLE 3: FLOOD RISK VULNERABILITY CLASSIFICATION

Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable (Residential)	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
Zone 3b Functional Floodplain	Exception Test Required	✓	×	×	×

✓ Development is appropriate

× Development should not be permitted

2.9 The sequential approach requires the application of the Sequential Test whereby, in addition to the requirements of Table 3, development should first be directed to Flood Zone 1, then Flood Zone 2 and lastly Flood Zone 3.

2.10 Where the Exception Test is required it is necessary to demonstrate, partly through a site-specific flood risk assessment, that:

* The development will provide extensive sustainability benefits to the community
* And that these benefits outweigh the flood risk
* When considering the vulnerability of its users, the development will be safe for its lifetime
* Flood risk is not increased elsewhere, and reduced overall where possible

2.11 Further detail on the lifetime of development is also given in the PPG, which advises for residential development that a period of 100 years should be considered whilst for non-residential this is dependent upon the development characteristics.

2.12 The use of sustainable drainage systems is considered by the PPG to offer the following benefits:

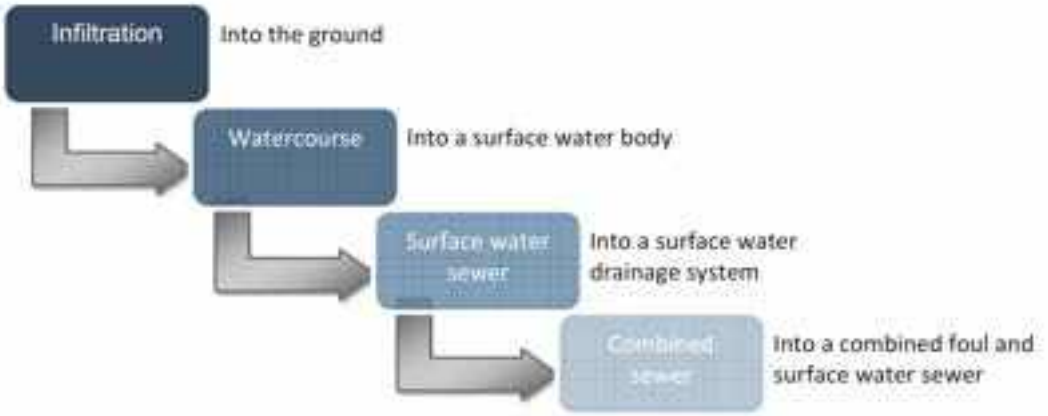
* Reduce the causes and impacts of flooding
* Remove pollutants from urban run-off at source
* Combine water management with green space with benefits for amenity, recreation and wildlife

2.13 In the consideration of major developments, sustainable drainage should be provided unless it can be demonstrated that this would be inappropriate. Major developments are defined in the Town and Country Planning Order 2015; some of these definitions encompass the following:

* Development site area of 1 hectare or more
* Provision of 10 or more residential dwellings
* Development of residential dwellings on a site having an area of 0.5 hectares or more and where the proposed no. of dwellings is not known to fall into the above criterion or not
* Provision of buildings where the floor space to be created by the development is 1, 000m/l or greater

2.14 The aim of sustainable drainage systems is to dispose of surface water using the following hierarchy were reasonably practicable.

TABLE 1: SURFACE WATER DISPOSAL HIERARCHY



2.15 The assessment of what is considered to be reasonably practicable in terms of sustainable drainage system provision should consider the costs associated with the design, construction, operation and maintenance of the system, and whether these are economically proportionate in relation to the consumer costs for an effective drainage system that instead connects directly to a public sewer.

SOUTH WEST HERTFORDSHIRE STRATEGIC FLOOD RISK ASSESSMENT (SFRA)

2.16 The main purpose of the SFRA is to provide sufficient flood risk information to enable an update of any flooding policies within the Borough. In achieving this, the SFRA will achieve the objectives of:

- Influencing Council policy regarding decisions that are made
- Aiding the Council's response to proposed developments
- Recognising means of reducing flood risk
- Inform the emergency flood plans

2.17 South West Hertfordshire Strategic Flood Risk Assessment was prepared by JBA Consulting Engineers in 2018.

ADDITIONAL POLICY / GUIDANCE

2.18 The following documents were consulted to inform the drainage strategy for the site:

- South West Hertfordshire Strategic Flood Risk Assessment 2018
- Hertfordshire Lead Local Flood Authority SuDS Policy Statement 2017

2.19 SuDS Policy 3: Previously developed sites should aim to discharge at the original pre-development greenfield rate for the whole site area where possible. If not a significant reduction in the current rate of discharge should be achieved and evidence provided as to why greenfield rates are not viable.

2.20 SuDS Policy 6: Proposals must demonstrate that the SuDS have been designed at or near the surface in line with the SuDS hierarchy. Underground attenuation features will only be acceptable where it can be proved that alternate surface-based methods are not appropriate or feasible.

2.21 Previously developed sites should aim to discharge at the original pre-development greenfield rate for the whole site area where possible. If not a significant reduction in the current rate of discharge should be achieved and evidence provided as to why greenfield rates are not viable.

2.22 The drainage assessment in this report will ensure that any proposals for additional drainage are assessed and mitigated, against flood risk, and incorporate good SuDS practices where possible.

DEVELOPMENT DESCRIPTION

3.1 The site is located at Batford Mill, Lower Luton Road, Harpenden, AL5 5ES. Please refer to images below for the site location and for an areial view of the site.

Site location Map

Site Ariel View

3.2 The site currently consists of an existing industrial unit and associated hardstanding with an approximate site area of 0.198 hectares.

3.3 The proposed works consist of the demolition of the existing industrial unit and the construction 15 residential units, with ground floor retail space and a gym, hard and soft landscaping and car parking

3.4 Refer to Appendix A for a copy of the existing site layout and Appendix B for a copy of the proposed site layout.

4 GEOLOGY & HYDROLOGY

4.1 The British Geological Survey (BGS) maps shows the following geology underlying the site:

Formation	Geology	Description
Bedrock	Lewes Nodular Chalk Formation	Lewes Nodular Chalk Formation and Seaford Chalk Formation. Sedimentary Bedrock formed approximately 84 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas.

4.2 The site is located within Zone II Outer Source Protection Zone.

4.3 The sites groundwater vulnerability zone designation is Major Aquifer High. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

4.4 A geotechnical site investigation / infiltration test undertaken at the site proved the above ground conditions and also due to the presence of shallow groundwater confirmed that infiltration is not viable on the site. A copy of the report is included in Appendix H

5 FLOOD RISK

5.1 The NPPF and the SFRA identifies several potential sources of flooding that must be considered when assessing flood risk, these are considered below in the following order:-

- Flooding from rivers (fluvial flooding)
- Flooding from the sea (tidal flooding)
- Flooding from land
- Flooding from sewers
- Flooding from groundwater
- Flooding from reservoirs, canals, and other artificial sources

FLODING FROM RIVERS (FLUVIAL FLOODING) & SEA (TIDAL FLOODING)

5.2 The indicative flood maps published by the Environment Agency (EA) identify that most of the site is located in flood zone 1 with a small section of the development located in flood zone 2 (existing car park/ hardstanding).

FLOODING FROM LAND & SEWERS

5.3 Maps published by the Environment Agency indicate that the site is at low risk of flooding from Surface Water.

5.4 Data obtained from Thames Water confirms that there have been no historic sewer flooding events within the site.

FLOODING FROM GROUNDWATER

5.5 Given the nature of the underlying ground it is not anticipated that shallow groundwater will be encountered at the site and therefore it is unlikely that the site is susceptible to groundwater flooding.

FLOODING FROM RESERVOIRS, CANALS & OTHER ARTIFICIAL SOURCES

5.6 The EA Risk of Flooding from Reservoirs Map is published on their website to identify areas potentially at risk of flooding form large reservoirs (>25,000m^3 of water), if they were to fail and release the water they hold.

5.7 The site is shown to be within the extent of flooding from reservoir failure, however the likelihood of a flood occurrence is considered low and in the unlikely event of a flood, there is likely to be prior warning of flood risk. Therefore, the flood risk is considered low.

6 SURFACE AND FOUL WATER DRAINAGE DESIGN

EXISTING

6.1 A Thames Water public sewer record of the site and the surrounding area has been obtained.

6.2 The records indicate a 225mm diameter foul sewer running in Lower Luton Road and Crabtree Lane terminating at the Batford Pumping Station.

6.3 A drainage tracing / CCTV survey undertaken at the site indicates that the foul water discharge from the site connects to the public foul water sewer in Crabtree Lane and Lower Luton Road. It also confirms that the existing site surface water discharge is positively drained to a private surface water sewer which runs along Crabtree lane.

EXISTING RUNOFF RATES

6.4 In Table 5 below, is a summary of the approximate greenfield run off rates for the entire developable site (0.198Ha). Refer to Appendix I for calculations.

TABLE 5: GREENFIELD RUN OFF RATES

Event	Greenfield Run Off Rate
QBar	0.1l/s
1i n 1 year	0.1l/s
1 in 30 year	0.2l/s
1 in 100 year	0.3l/s

6.5 As the site is already developed (brownfield) the greenfield runoff rates above do not give a true representation of the current surface water discharge rates from the site. The total site area of 0.198Ha discharges to the private sewer in Crabtree Lane.

6.6 The existing surface water discharge rates have been calculated on microdrainage as follows (Please refer to Appendix I for a copy of the calculations):

TABLE 6: EXISTING BROWNFIELD RUN OFF RATES

Event	Brownfield Discharge Rate
1 in 1 year	27.4l/s
1 in 30 year	71.1l/s
1 in 100 year	91.0l/s

PROPOSED

6.7 The following general principles shall be applied to the drainage design for the re-development.

- The run-off generated by the proposed development should be minimised by the use of Sustainable Drainage Systems (SuDS) techniques, prioritising infiltration where possible.
- The surface water drainage system should be designed to convey the design storm event of a 1 in 100yr storm plus a 40%climate change allowance.
- The discharge from the development to the local sewer network, if necessary, shall be controlled to avoid exceeding the capacity of the sewer system, without detriment to the site use and not increasing the flood risk to the surrounding area.

6.8 Given that infiltration testing undertaken at the site proved that the use of infiltration is not viable, it is proposed that the site surface water runoff will be discharged to the existing surface water sewer on site.

6.9 In light of the all the above information the proposal for the surface water discharge strategy is to provide significant betterment on the existing estimated free discharge rates. The greenfield runoff rate for the site of 0.3l/s is deemed a too small discharge rate. If a hydrobrake or orifice plate is used to this small rate, the orifice through which the water will passes will be susceptible to continual blocking, which is not a sustainable solution to discharge.

6.10 Given that the site is a brownfield development, it is proposed that on-site storage be provided to limit surface water discharge to 2l/s, which is the lowest practical level that the discharge can be restricted to whilst still maintaining self-cleaning velocity.

6.11 Based on a total site area of 0.198 hectares and a proposed area of hardstanding for the development of 0.174 hectares and a restricted surface water discharge of 2l/s there is a requirement for 96m^3 of attenuation on site.

6.12 Restricting the proposed surface water discharge to 2l/s provides a significant reduction in runoff to the private sewer when compared to the existing situation.

6.13 The development utilise its existing right to connect to the private surface water sewer that currently serves the development and runs down Crabtree Lane.

6.14 It is therefore proposed that the surface water runoff from the site will be dealt with by a combination of a modular below ground attenuation tank to cater for runoff from the proposed new buildings and lined permeable paving with 300mm of sub base storage to collect the run off from the car parking areas.

6.15 The drainage has been designed to accommodate the 1 in 100-year storm event including a 40%allowance for climate change.

6.16 A copy of the proposed surface water drainage strategy for the site is included in Appendix F and a copy of the Microdrainage calculations are included in appendix C.

6.17 It can be seen that the size of attenuation can easily be accommodated within the development.

6.18 Due to the levels of the existing surface water outfall a pumped drainage solution will be required for the development

6.19 Part of the site South East corner of the is located in Flood Zone 2, the extent of this flooding will fall within the proposed new car park area with the proposed new building remaining protected. The FFL`s of the properties in this area will be a minimum of 84.900 (150mm above the existing car park level of 84.75).

6.20 While the proposed building extends into the flood zone by 7.9m^2, there is greater offset provided by the removal of the existing building (please refer to the sketch in appendix J) there is therefore no requirement to undertake compensatory flood storage or fluvial modelling as there is no risk to surrounding properties off site.

6.21 The levels of the proposed new car parking area will be set to match the existing levels in order to maintain the current flood storage levels.

6.22 In the event of a flood, while the vehicular access to the site is potentially restricted, all the properties have pedestrian access that is located outside of the flood zone and therefore safe access is available to Lower Luton Road to the north which is not located in the flood zone.

6.23 The proposed foul water from the development will discharge to the Thames Water public foul sewer in Crabtree Lane via a new connection, subject to agreement with Thames Water.

7 SUDS

7.1 A geotechnical study undertaken at the site confirmed that the site is underlain by alluvium over chalk. Infiltration testing confirmed that the underlying ground is not suitable for infiltration.

7.2 Reviewing the use of SuDS on the site against the SuDS hierarchy and corresponding proposed drainage strategy for the subject site is as follows:

SUDS HIERACHY	PROPOSED DRAINAGE STRATEGY
Store rainwater for later use	It is not proposed that rainwater harvesting will be used on the site.
Use infiltration techniques, such as porous surfaces in non-clay areas	Due to the fact that infiltration is not viable, site will utilise a lined porous surface for the new car parking areas with discharge to the onsite surface water system.
Attenuate rainwater in ponds or open water features for gradual release	Ponds or open water features not practical due to site constraints.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Below ground surface water attenuation and restricted discharge to surface water sewer proposed.
Discharge rainwater direct to a watercourse	Surface water discharge to existing surface water drain which in turn connects to the River Lea.
Discharge rainwater to a surface water sewer/drain	Proposed site to discharge to existing private surface water drain.
Discharge rainwater to the combined sewer	Not applicable as no combined sewers in proximity of site.

8 SURFACE WATER DRAINAGE/ SUDS MAINTENANCE

8.1 A private management company will be responsible for the maintenance of the below ground drainage and SuDS across the site.

DRAINAGE CHANNELS

8.2 Inspections should be frequent and regular, depending on local conditions, but at least annually. Inspections should include gratings; covers including their locking bolts; sumps and sump buckets; exposed concrete surround and adjacent paving.

GULLIES

8.3 Inspections should be frequent and regular depending on local conditions. At this time inspect all gullies for damage and clean out sumps. Any petrol/oil spillages should be cleaned up as soon as possible

8.4 After removal of gratings and/or inspection covers, channels should be flushed with water or high-pressure jetting (Do not use boiling water or cleaning agents). All surfaces and joints should be checked and repaired as necessary. Empty all silt buckets and clean out sump/gully and connections. Replace bucket and gratings ensuring they are correctly fitted.

BELOW GROUND MANHOLES AND DRAINAGE ´GENERAL

8.5 Manhole and Catchpit Inspections should be frequent and regular, depending on local conditions, but at least annually. The drainage system should be cleaned/ jetted as necessary.

MODULAR ATTENUATION

8.6 These plastic geocellular systems wrapped in an impermeable membrane have a high void ratio, which is used to provide storm water storage.

8.7 The operation and maintenance requirements are given in the table below:

MODULAR ATTENUATION MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Remove sediment and debris from catchpits and geocellular crates.	Annually.
Remedial actions	Repair/ rehabilitation of inlets, outlets, vents.	As required.
Monitoring	Inspect catchpits and note rate of sediment accumulation.	Monthly in the first year and then annually.

PERMEABLE PAVING

8.8 Permeable block paving allows water to infiltrate through gaps between the blocks into a layer of gravel.

8.9 The operation and maintenance requirements are given the table below:

PERMEABLE PAVING MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Sweeping. Note: Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement.	Three times a year at the end of winter, mid-summer and after autumn lead fall. Also as required based on site-specific observations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washing into the paving. Removal of weed.	As required
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users. Rehabilitation of surface and underlying sand and geotextile.	As required

Monitoring	Inspect for evidence of poor operation and/ or weed growth. If required take remedial action.	Monthly for three months after installation, then during regular maintenance visits.

8.10 Over time the ability of the permeable paving to infiltrate and convey surface water run-off may degrade due to clogging of the joints by silt and other sediments.

8.11 All areas of permeable pavement should be regularly inspected by those responsible, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

9 RECOMMENDATIONS AND CONCLUSIONS

9.1 The development site is located mainly within Zone 1 on the Environment Agency's Indicative Flood Map with little or no risk of flooding from fluvial sources. A smaller portion of the south east corner of the site is located in flood zone 2, however this area will be located in the new car park for the development and safe pedestrian access and egress is provides form the front of each property to Lower Luton Road which is not located in a flood zone.

9.2 The site is classed as a _more vulnerable: development. In accordance with the NPPF, the proposed development is suitable in this location.

9.3 The drainage layout and associated calculations demonstrate that the proposed design can manage surface water run-off for all storms, including 1 in 1-year storms up to and including a 1 in 100-year storm with a 40%provision for climate change.

9.4 The FFL's of the properties in the south east corner of the site will be a minimum of 84.900 (150mm above the existing car park level of 84.75). This will ensure that these buildings remain protected in a flood event.

9.5 Details of the maintenance of the proposed surface water drainage system have been provided in section 8.0 and the maintenance requirements for SuDS systems on the site will be undertaken in line with the recommendations in the CIRIA SuDS Manual.

9.6 The development will utilise the existing surface water drainage connection to the private surface water sewer in Crabtree lane with the proposed drainage strategy providing a significant reduction in runoff when compared to the existing site and therefore the surface water drainage design principles set out in this document will ensure that the development does not increase the risk of flooding to the surrounding area and will mimic the pre-development site.

FIGURES

FIGURE 1

Risk of Flooding from Rivers or Sea

Environment Agency Website

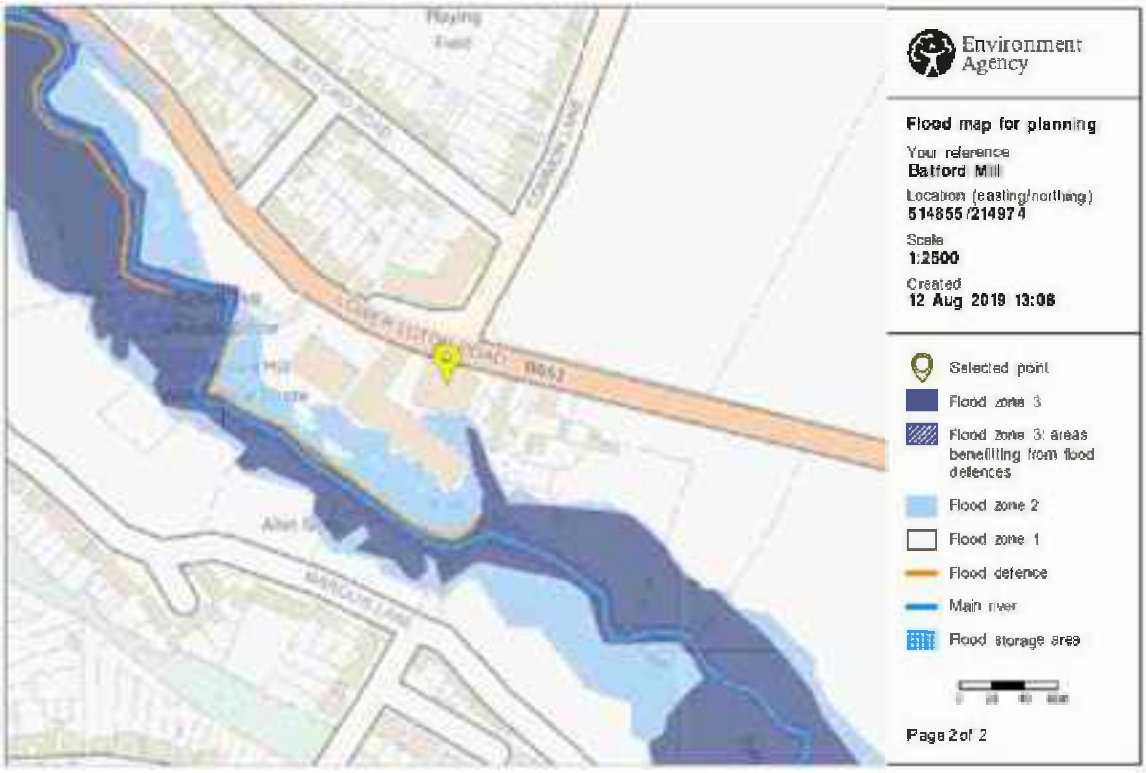


FIGURE 2

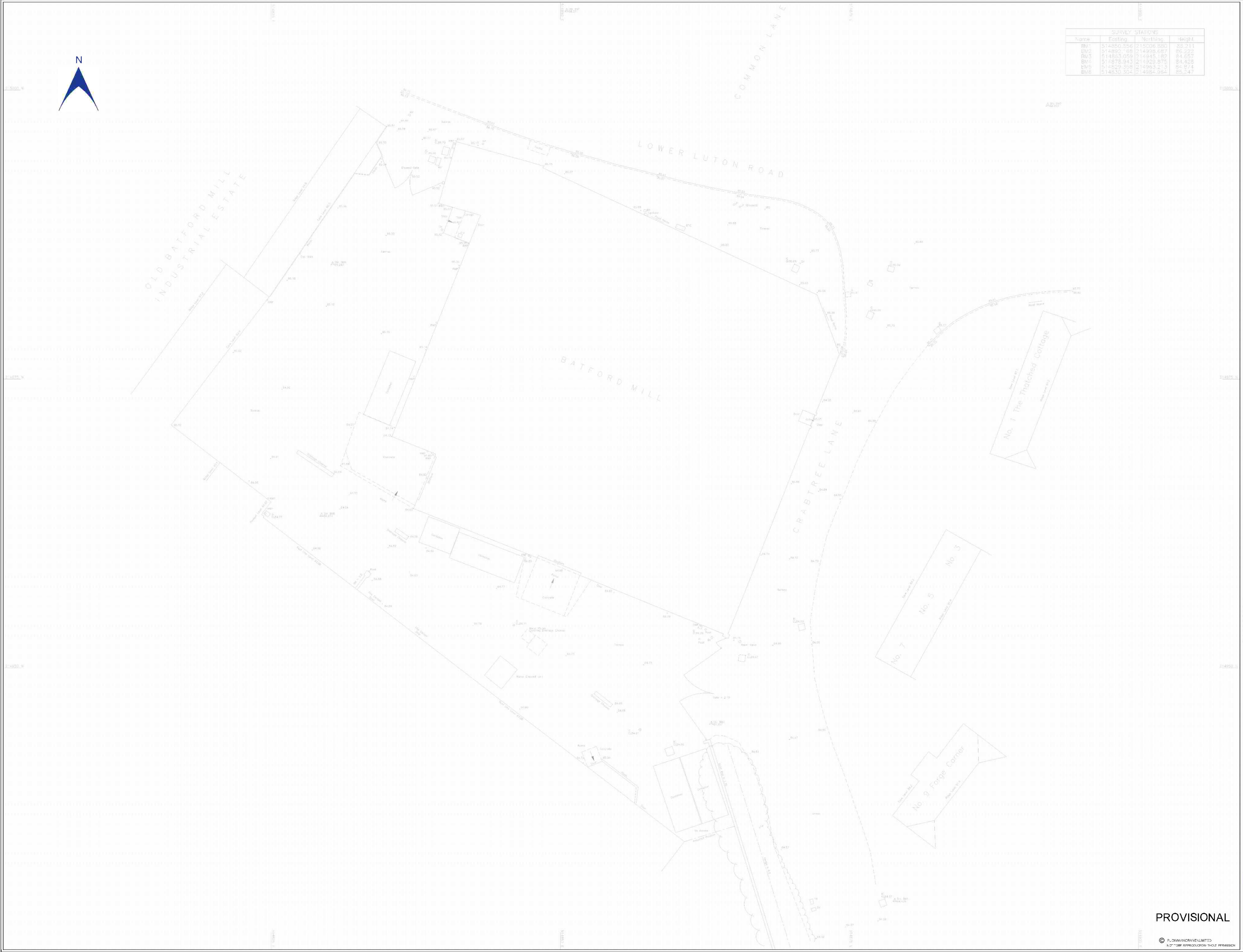
Surface Water Flood Risk

Environment Agency Website

APPENDICES

APPENDIX A

Existing Site Layout



SURVEY STATIONS			
Name	Easting	Northing	Height
BM1	514850.556	215006.880	88.211
BM2	514892.168	214998.687	86.222
BM3	514863.059	214945.182	84.657
BM4	514878.943	214929.875	84.428
BM5	514829.358	214963.213	84.874
BM6	514830.304	214984.964	85.247

STANDARD ABBREVIATIONS

LEGEND

Stairs arrows point up

The identification of service covers has been made by a surface inspection only - critical identifications should be verified by the lifting of covers or a full utilities survey

Due to the inherent instability of paper materials, drawings plotted paper may be stretched distorted - dimensions scaled from paper plots should therefore be treated with caution

This drawing has been produced for the purpose of the original commission agreement. Plowman Craven Limited will accept no responsibility for details that are subsequently found to be the consequence of undisclosed facts or that were obscured from view at the time of survey or that have been altered since the survey

See www.plowmancraven.co.uk for full terms and conditions of contract

SHEET LAYOUT

ISSUES & REVISIONS

Issue	Details	By	Date
Aprov1	Provisional Issue	CW	07/02/2019

This survey is commensurate with band E accuracy, as outlined in the RICS survey detail accuracy banding table

All levels are in metres and are above Ordnance Survey Newlyn datum derived by multiple network RTKGPS observations

The survey grid shown on this drawing is positioned on Ordnance Survey (OS) National Grid, obtained by multiple network RTKGPS observations

Unless otherwise stated, levels have been taken to finished floor surface

All quoted dimensions are in metres

Drawing units are metres

CLIENT

Catton Homes

Unit 1 Stanta Business Centre
3 Soothouse Spring
St Albans
AL3 6PF

PROJECT TITLE

Batford Mill

Lower Luton Road

Topographical Survey

PRESENTATION SCALE: 1:100 @A0

DATE OF ORIGINAL SURVEY: 29th Jan 2019

PC PROJECT No.: 41928 CHECKED: JL

DRAWING No.: 41928T-01 ISSUE: Aprov1

Plowman Craven

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SE1 0AX
Tel: +44 (0)207 490 7700

APPENDIX B

Proposed Site Layout

0 1m 2 3 4 5 6 7 8 9 10m

SCALE BAR 1:200

unlimited assets

IMPORTANT NOTE:
ALL GUTTERS, FOUNDATIONS AND DOWN PIPES TO REMAIN WITHIN THE BOUNDARY LINES OF THE SUBJECT PROPERTY. ALL PLANS ARE SUBJECT TO FULL PLANS APPROVAL BY BUILDING CONTROL, NOT BUILDING NOTICE.

All Measurements to be checked prior to construction any change to be reported back to This Office.
Contractor Responsible to call out Building Control Officer as required at stages as requested by council

RIBA Chartered Practice

REVISION	DRAWN BY	DATE

DISCLAIMER:
THESE ARE THE PLANNING DRAWINGS AND SHOULD NOT BE USED FOR STRUCTURAL CALCULATIONS OR ANY ENGINEERING PURPOSE.

ISSUE: PLANNING ISSUE

PROJECT:
Batford Mill
Lower Luton Road
Harpenden AL5 5BZ

TITLE: PROPOSED PLANS PLANS - GF UNITS AREAS

SCALE: 1:200 @A1

DATE: NOV 2023

DWG NO: VC/JS.0154/15.r0

APPENDIX C

Micro Drainage Calculations

Date 07/06/2020 14:20	Designed by
File Attenuation Calculations.SRCX	Checked by
Innovyze	Source Control 2020.1

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

Half Drain Time : 388 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	83.365	0.565	0.0	2.0	2.0	43.0	O K
30 min Summer	83.532	0.732	0.0	2.0	2.0	55.6	O K
60 min Summer	83.686	0.886	0.0	2.0	2.0	67.3	O K
120 min Summer	83.804	1.004	0.0	2.0	2.0	76.3	O K
180 min Summer	83.841	1.041	0.0	2.0	2.0	79.1	O K
240 min Summer	83.843	1.043	0.0	2.0	2.0	79.2	O K
360 min Summer	83.810	1.010	0.0	2.0	2.0	76.8	O K
480 min Summer	83.775	0.975	0.0	2.0	2.0	74.1	O K
600 min Summer	83.740	0.940	0.0	2.0	2.0	71.5	O K
720 min Summer	83.707	0.907	0.0	2.0	2.0	68.9	O K
960 min Summer	83.642	0.842	0.0	2.0	2.0	64.0	O K
1440 min Summer	83.520	0.720	0.0	2.0	2.0	54.7	O K
2160 min Summer	83.355	0.555	0.0	2.0	2.0	42.2	O K
2880 min Summer	83.216	0.416	0.0	2.0	2.0	31.6	O K
4320 min Summer	83.017	0.217	0.0	2.0	2.0	16.5	O K
5760 min Summer	82.915	0.115	0.0	2.0	2.0	8.8	O K
7200 min Summer	82.891	0.091	0.0	1.8	1.8	6.9	O K
8640 min Summer	82.878	0.078	0.0	1.6	1.6	6.0	O K
10080 min Summer	82.869	0.069	0.0	1.4	1.4	5.3	O K
15 min Winter	83.437	0.637	0.0	2.0	2.0	48.4	O K
30 min Winter	83.626	0.826	0.0	2.0	2.0	62.7	O K
60 min Winter	83.803	1.003	0.0	2.0	2.0	76.2	O K
120 min Winter	83.946	1.146	0.0	2.0	2.0	87.1	O K
180 min Winter	83.998	1.198	0.0	2.0	2.0	91.0	O K
240 min Winter	84.726	1.926	0.0	2.0	2.0	91.9	Flood Risk
360 min Winter	83.988	1.188	0.0	2.0	2.0	90.3	O K
480 min Winter	83.941	1.141	0.0	2.0	2.0	86.8	O K
600 min Winter	83.896	1.096	0.0	2.0	2.0	83.3	O K
720 min Winter	83.851	1.051	0.0	2.0	2.0	79.9	O K
960 min Winter	83.757	0.957	0.0	2.0	2.0	72.8	O K
1440 min Winter	83.573	0.773	0.0	2.0	2.0	58.7	O K
2160 min Winter	83.323	0.523	0.0	2.0	2.0	39.7	O K
2880 min Winter	83.120	0.320	0.0	2.0	2.0	24.3	O K
4320 min Winter	82.900	0.100	0.0	2.0	2.0	7.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.874	0.0	45.3	26
30 min Summer	90.946	0.0	59.3	40
60 min Summer	56.713	0.0	74.0	68
120 min Summer	34.162	0.0	89.1	126
180 min Summer	25.057	0.0	98.1	184
240 min Summer	19.992	0.0	104.3	242
360 min Summer	14.500	0.0	113.5	322
480 min Summer	11.545	0.0	120.5	382
600 min Summer	9.667	0.0	126.1	444
720 min Summer	8.358	0.0	130.8	510
960 min Summer	6.638	0.0	138.6	646
1440 min Summer	4.791	0.0	150.0	914
2160 min Summer	3.452	0.0	162.1	1304
2880 min Summer	2.733	0.0	171.2	1676
4320 min Summer	1.964	0.0	184.5	2340
5760 min Summer	1.552	0.0	194.4	2992
7200 min Summer	1.292	0.0	202.4	3672
8640 min Summer	1.112	0.0	209.0	4408
10080 min Summer	0.980	0.0	214.8	5136
15 min Winter	138.874	0.0	50.7	26
30 min Winter	90.946	0.0	66.4	40
60 min Winter	56.713	0.0	82.9	68
120 min Winter	34.162	0.0	99.9	124
180 min Winter	25.057	0.0	109.9	182
240 min Winter	19.992	0.0	116.9	238
360 min Winter	14.500	0.0	127.1	348
480 min Winter	11.545	0.0	134.9	446
600 min Winter	9.667	0.0	141.3	478
720 min Winter	8.358	0.0	146.6	552
960 min Winter	6.638	0.0	155.2	704
1440 min Winter	4.791	0.0	168.0	994
2160 min Winter	3.452	0.0	181.6	1388
2880 min Winter	2.733	0.0	191.7	1736
4320 min Winter	1.964	0.0	206.7	2212

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
5760 min Winter	82.879	0.079	0.0	1.6	1.6	6.0	O K
7200 min Winter	82.866	0.066	0.0	1.3	1.3	5.0	O K
8640 min Winter	82.857	0.057	0.0	1.1	1.1	4.3	O K
10080 min Winter	82.850	0.050	0.0	1.0	1.0	3.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Winter	1.552	0.0	217.8	2944
7200 min Winter	1.292	0.0	226.6	3672
8640 min Winter	1.112	0.0	234.1	4368
10080 min Winter	0.980	0.0	240.5	5136

Date 07/06/2020 14:20
File Attenuation Calculations.SRCX
Designed by
Checked by
Innovyze
Source Control 2020.1

Rainfall Details

Rainfall Model	FSR	Ratio R	0.406	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.174

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.058	4	8	0.058	8	12	0.058

Date 07/06/2020 14:20	Designed by
File Attenuation Calculations.SRCX	Checked by
Innovyze	Source Control 2020.1

Model Details

Storage is Online Cover Level (m) 84.800

Cellular Storage Structure

Invert Level (m) 82.800 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)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	80.0	80.0	1.200	80.0	130.4	1.201	0.0	130.4

Pump Outflow Control

Invert Level (m) 82.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.700	2.0000	1.300	2.0000	1.900	2.0000	2.500	2.0000
0.200	2.0000	0.800	2.0000	1.400	2.0000	2.000	2.0000	2.600	2.0000
0.300	2.0000	0.900	2.0000	1.500	2.0000	2.100	2.0000	2.700	2.0000
0.400	2.0000	1.000	2.0000	1.600	2.0000	2.200	2.0000	2.800	2.0000
0.500	2.0000	1.100	2.0000	1.700	2.0000	2.300	2.0000	2.900	2.0000
0.600	2.0000	1.200	2.0000	1.800	2.0000	2.400	2.0000	3.000	2.0000

APPENDIX D

Thames Water Sewer Flooding History

Sewer Flooding
History Enquiry

Property Searches

Search address supplied

Lower Luton Road
Batford Mill
Harpenden
AL5 5BZ

Your reference	Batford Mill
Our reference	SFH/SFH Standard/2019_4056368
Received date	**9 August 2019**
Search date	**12 August 2019**

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

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Sewer Flooding

History Enquiry

Property Searches

Search address supplied: Ian Farmer Associates,Unit 1a,Lower Luton Road,Batford Mill,Harpenden,AL5 5BZ

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd
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DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Sewer Flooding

History Enquiry

Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

APPENDIX E

Thames Water Public Sewer Records

Asset location search

Property Searches

Search address supplied

Lower Luton Road
Batford Mill
Harpenden
AL5 5BZ

Your reference	Batford Mill
Our reference	ALS/ALS Standard/2019_4056366
Search date	9 August 2019

Keeping you up-to-date

Notification of Price Changes

From 1 September 2018 Thames Water Property Searches will be increasing the price of its Asset Location Search in line with RPI at 3.23%.

For further details on the price increase please visit our website: www.thameswater-propertysearches.co.uk
Please note that any orders received with a higher payment prior to the 1 September 2018 will be non-refundable.

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

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

Asset location search

Property Searches

Search address supplied: Ian Farmer Associates, Unit 1a, Lower Luton Road, Batford Mill, Harpenden, AL5 5BZ

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 searchprovides 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
Web: www.thameswater-propertysearches.co.uk

Asset location search

Property Searches

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:

Affinity Water Ltd
Tamblin Way
Hatfield

Asset location search

Property Searches

AL10 9EZ
Tel: 0845 7823333

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
RG18DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

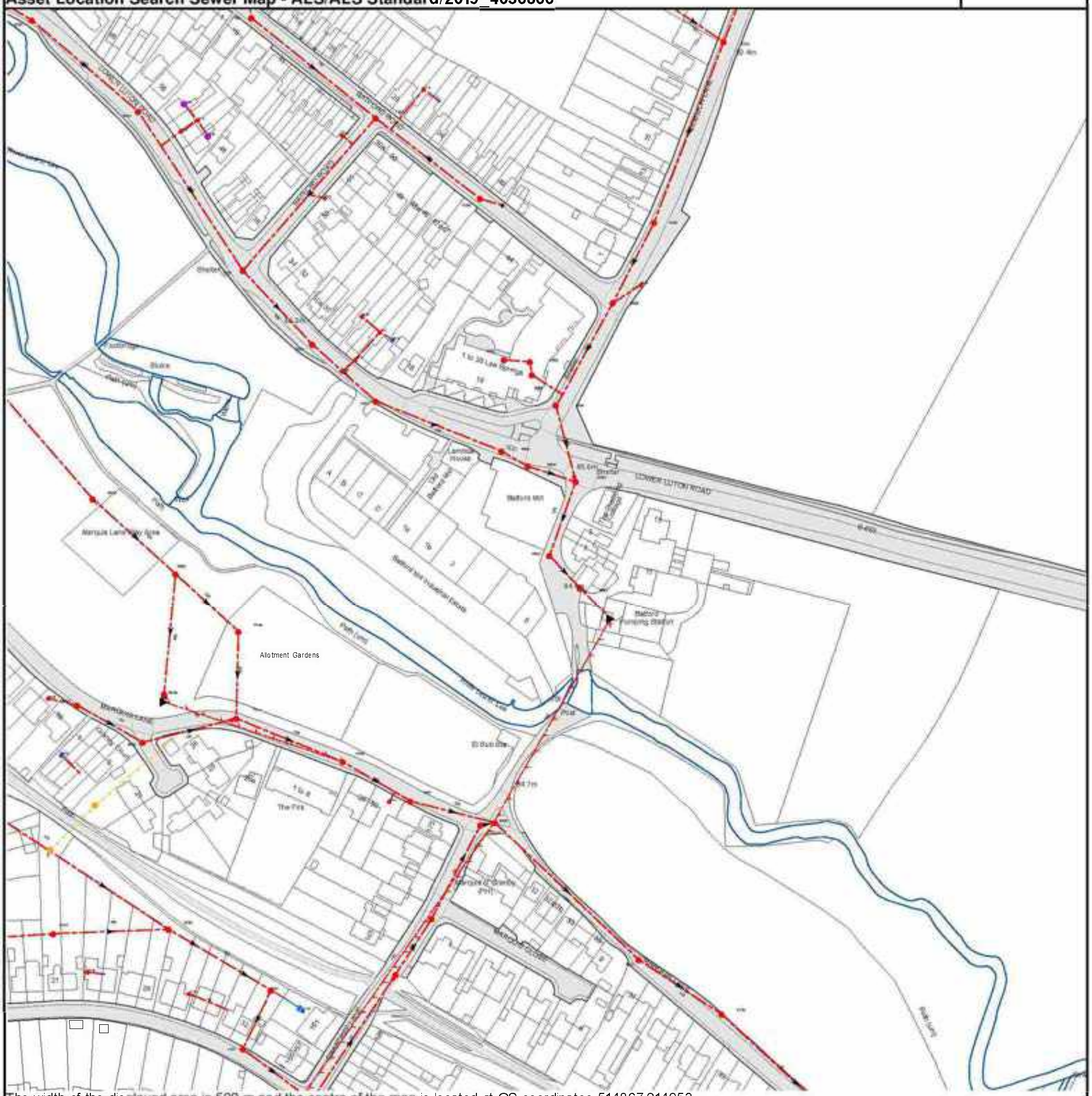
Clean Water queries

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
RG18DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4056366



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 514867,214953

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.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8005	86.43	85.02
8004	87.87	86.55
8003	87.89	86.76
8002	88.43	87.39
8006	88.04	86.56
9100	90.19	88.34
8100	92.56	91.01
9101	92.59	91.11
611B	n/a	n/a
711A	n/a	n/a
711B	n/a	n/a
7000	86.67	83.58
7100	93.88	91.72
7001	86.85	83.39
711C	n/a	n/a
711D	n/a	n/a
701E	n/a	n/a
701D	n/a	n/a
701B	n/a	n/a
7002	86.89	83.22
7102	93.64	90.55
701F	n/a	n/a
701A	n/a	n/a
7701	98.82	95.25
771D	n/a	n/a
771C	n/a	n/a
7702	97.24	95.34
771A	93.389	91.139
671B	n/a	n/a
6701	98.14	95.94
6700	97.34	95.4
781A	n/a	n/a
8801	85.73	82.99
681B	n/a	n/a
681C	n/a	n/a
6801	89.68	87.74
6800	88.15	86.15
6806	n/a	82.1
6902	84.6	82.48
7801	87.48	83.23
7900	84.75	83.34
7800	86.54	83.14
6100	86.34	84.18
6900	85.49	84.56
6101	86.22	83.88
611A	n/a	n/a
871A	90.55	89.085
881A	86.42	84.22
8800	86.02	83.87
8905	86.04	83.01
8904	85.88	83.01
8902	84.7	82.76
8903	85.61	82.91
8901	84.63	82.66
9701	84.79	82.58
9700	84.4	82.5

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

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

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 (COCI)

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

Gulley

Culverted Watercourse

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 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 **0845 070 9148** quoting your invoice number starting CBA or ADS/OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

APPENDIX F

Proposed Drainage Strategy

Proposed Public foul water sewer

Proposed Surface Water Drainage

Lined Permeable paving with 300mm low fines sub base material.

Approximate extent of flood Zone 2

Exceedance Flood Flow Route

225mm

225mm

Modular Attenuation Tank 5mx16mx1.2m deep

Outlet from lined permeable paving

Surface Water Pump Chamber, Duty/ Standby Pump Arrangement 2l/s Discharge Rate

Existing Surface Water Manhole
CL: 84.56
IL: 83.76

BATFORD MILL SURFACE WATER DRAINAGE STRATEGY

APPENDIX G

Existing Drainage Survey

N

JOINS MAIN

F6

WATER METER

RWP 1

RWP OG

RWP OG

RWP OG

RWP OG

RWP OG

RWP OG

RWP OG

DC1

RWP Gully

PERMEABLE BLOCK PAVING

UNDER PAVEMENTS

RWP Gully

LATH

S1

TO S2 OFFSITE

LOWER LUTON ROAD

WATER METER

UTL

UTL

F5

F4

F3

F2

F1

S3

RWP Gully

OLD WATFORD ROAD INDUSTRIAL ESTATE

WATFORD MILL

The Watching Centre

RWP OG

ONGROUND

LEGEND

SHEET LAYOUT

ISSUES & REVISIONS

Issue	Details	By	Date
Option 1	Provisional Issue	CW	07/02/2019
A	First Issue	A	

CLIENT

Catton Homes

Unit 1 Stanta Business Centre
3 Southmoor Spring
St Albans
AL3 6PF

PROJECT TITLE

Batford Mill

Lower Luton Road

Topographical Survey

PRESENTATION SCALE	1:100 @ A0
DATE OF ORIGINAL SURVEY	29th Jan 2019
PC PROJECT No.	41928
CHECKED	DGR
DRAWING No.	ISSUE
41928T-01	A

Plowman Craven

APPENDIX H

Infiltration Testing Results

25 March 2020

GEA

Widbury Barn
Widbury Hill
Ware SG12 7QE

01727 824666
mail@gea-ltd.co.uk
www.gea-ltd.co.uk

Our ref: J20054/JW/01

Paul Ulmer
Catton Homes
Bray Stables
Kennel Lane
Harpenden
AL5 3PZ

Dear Paul

Re: INFILTRATION TESTING AT BATFORD MILLS, LOWER LUTON ROAD, HARPENDEDN AL5 5ES

Further to your instruction dated 2 March 2020, we attended site on 19 March 2020 to carry out soakage testing for the proposed soakaway at the above site.

The aim of this investigation was to establish soakage design parameters for the proposed soakaway beneath the site. The advice and recommendations made in this letter are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where exploratory holes were excavated and the number of tests undertaken; no liability can be accepted for information in other data sources or conditions not revealed by the testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

A single trial pit was mechanically excavated using a JCB 3CX. The investigation encountered the expected ground conditions in that, beneath 30 mm of tarmac and 80 mm of concrete, a generally limited thickness of made ground was encountered, below which alluvium was encountered overlying the Lewes Nodular and Seaford Chalk Formations (Undifferentiated) to the maximum depth investigated of 1.50 m.

The made ground comprised dark reddish-brown gravelly sand with whole brick and brick fragments, concrete, metal, plastic and tarmac fragments and was encountered to a depth of 0.80 m in the north of the pit and 0.60 m in the south of the pit. Below this, alluvium was encountered, comprising dark brown clayey gravelly sand to a depth of 1.10 m. The gravel was composed of flint and chalk. Below this, the chalk formations were encountered comprising very wet slightly gravelly clay, probably due to the presence of groundwater at this depth and was encountered to the maximum depth investigated of 1.50m.

Groundwater was encountered at a depth of 1.20 m and rose to 1.10 m almost instantly. The pit was bailed and subsequently excavated deeper to 1.50 m, but the groundwater continued to flow into the pit, rising to a depth of 1.10 m on each occasion. BRE 365 Digest guidelines suggest that soakaways

should not be installed within 1.0 m of the groundwater table; therefore, given the presence of shallow groundwater encountered during the investigation, it is apparent that soakaways will not be an appropriate means of surface water disposal at this site.

We trust that we have provided sufficient information for your present requirements; however, if we can be of any further assistance please do not hesitate to contact us.

Yours sincerely
GEOTECHNICAL & ENVIRONMENTAL ASSOCIATES

Jordan Wood

Encs

GEA

Geotechnical & Environmental Associates

Project				TRIAL PIT No
Batford Mills, Lower Luton Road, Harpenden AL5 5E5				**TP1**
Job No	Date	Ground Level (m OD)	Co-Ordinates()	
J20054	19-03-20			
Client		Engineer		Sheet
Catton Homes		Mason Navarro Pledge		1 of 1

SAMPLES & TESTS				Water	STRATA			
Depth	No	Type	Results		DESCRIPTION	Reduced Level (m)	Depth (thick-ness)	Legend
					Tarmac.		0.03	
					Concrete.		0.08	
					MADE GROUND (dark reddish-brown gravelly sand with whole brick and brick fragments, concrete, metal, plastic and tarmac fragments).		(0.72)	
							0.80	
					Dark brown clayey gravelly SAND. Gravel is fine to medium, sub angular of chalk and flint.		(0.30)	
				▽			1.10	
				▼	Structureless CHALK recovered as very wet slightly gravelly CLAY. Gravel fine, low density and very weak.		(0.40)	
							1.50	

GENERAL REMARKS

Pit mechanically excavated using a JCB 3CX.
All sides of the pit remained stable throughout the investigation.
Groundwater was encountered at a depth of 1.20 m, rising to 1.10 m immediately.

All dimensions in metres Scale1:25	Method/ Plant Used JCB 3CX	Logged By JW

Report ID: TRIAL PIT | | Project: J20054 - BATFD RD MILLS.GPJ | | Library: GEA LIBRARY GLB | | Date: 24 March 2020

APPENDIX I

Greenfield Runoff rate and Existing SW Discharge Rates

Date 07/06/2020 08:45	Designed by	
File	Checked by	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	700	Urban	0.000
Area (ha)	0.198	Soil	0.150	Region Number	Region 6

Results l/s

QBAR Rural	0.1
QBAR Urban	0.1
Q100 years	0.3
Q1 year	0.1
Q30 years	0.2
Q100 years	0.3

Date 07/06/2020 10:42	Designed by
File Batfrod Existing.MDX	Checked by
Innovyze	Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.900	Add Flow / Climate Change (%)	0
Ratio R	0.438	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.170	4-8	0.028

Total Area Contributing (ha) = 0.198

Total Pipe Volume (m^3) = 0.795

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000	0.100	100.0	0.099	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	10.000	0.100	100.0	0.099	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.13	84.050	0.099	0.0	0.0	0.0	1.31	52.0	13.4
1.001	50.00	5.25	83.950	0.198	0.0	0.0	0.0	1.31	52.0	26.8

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.099	0.099	0.099
1.001	-	-	100	0.099	0.099	0.099
				Total	Total	Total
				0.198	0.198	0.198

Date 07/06/2020 10:42 | Designed by
File Batfrod Existing.MDX | Checked by
Innovyze | Network 2020.1

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.900	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.438	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 Winter	1	+0%	30/15 Summer				84.141	-0.134	0.000	0.34
1.001	2	15 Winter	1	+0%	30/15 Summer				84.081	-0.094	0.000	0.63

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			14.8	OK	
1.001	2			27.4	OK	

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Innovyze | Network 2020.1

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.900	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.438	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 Winter	30	+0%	30/15 Summer				84.411	0.136	0.000	0.83
1.001	2	15 Winter	30	+0%	30/15 Summer				84.345	0.170	0.000	1.64

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			36.0	SURCHARGED	
1.001	2			71.1	SURCHARGED	

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Innovyze | Network 2020.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.900	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.438	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

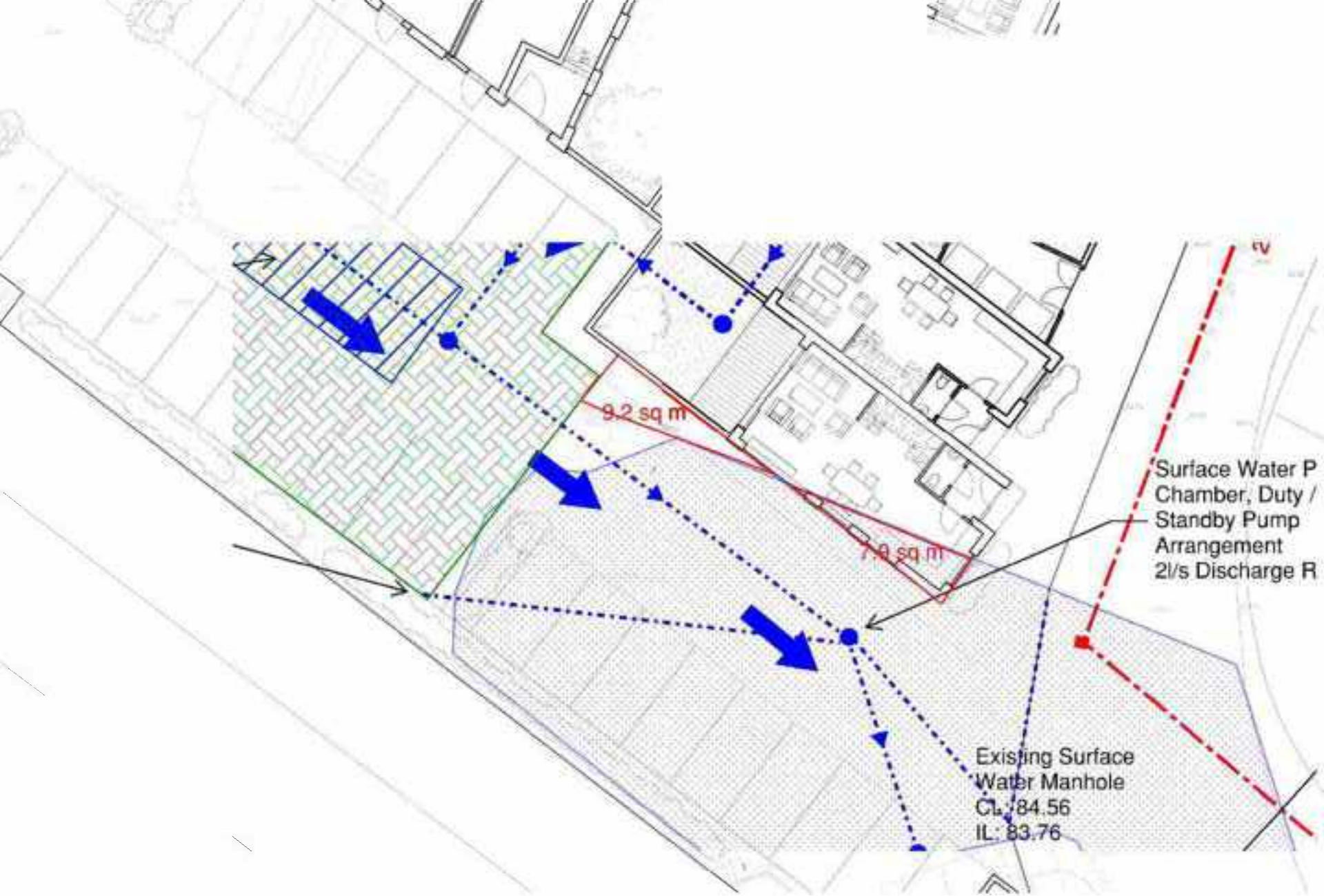
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 Winter	100	+0%	30/15 Summer				84.624	0.349	0.000	1.06
1.001	2	15 Winter	100	+0%	30/15 Summer				84.518	0.343	0.000	2.10

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1			46.0	SURCHARGED	
1.001	2			91.0	FLOOD RISK	

APPENDIX J

Flood Offset Areas


9.2 sq m
7.0 sq m
Surface Water P
Chamber, Duty /
Standby Pump
Arrangement
2l/s Discharge R
Existing Surface
Water Manhole
CL: 84.56
IL: 83.76