Trace Design

Transport and Civil Engineering

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Report Reference 23020 – First Issue

2 Gloucester Road, Luton, LU1 3HX

Prepared by Jack Calland

September 2023

Trace Design

Ground Floor, 3 Silverdown Office Park

Fair Oak Close

Exeter, Devon, EX5 2UX

Email: info@trace-design.co.uk

This page is intentionally blank for double sided printing

DOCUMENT ISSUE RECORD

Project Summary - 23020				
REVISION	ISSUE/STATUS	REPORT ISSUED	PREPARED BY	CHECKED BY
-	First Issue	13.09.2023	J Calland	W Pahl

This document has been prepared by Trace Design in accordance with the client's instructions and requirements for their specific and sole use. Consequently, any third-party liability is expressly excluded.

Document ownership assignment and any third-party requirement to use, reproduce or reference upon this document or any part of, should seek the prior express written consent and agreement of Trace Design.

Any information provided by third parties and referred to herein is used in good faith and has not been checked or verified by Trace Design, unless otherwise expressly stated in the document.

This page is intentionally blank for double sided printing

Table of Contents

List of Figures

List of Tables

Appendices

1 Introduction

1.1 Trace Design was appointed to undertake a Flood Risk Assessment (FRA) and Drainage Strategy. This FRA has been undertaken to support a planning application for a mixed-use development on land at 2 Gloucester Road, Luton LU1 3HX. This site is located at Ordnance Survey grid reference TL 09670 21005 and an aerial view of the site can be seen below in Figure 1.

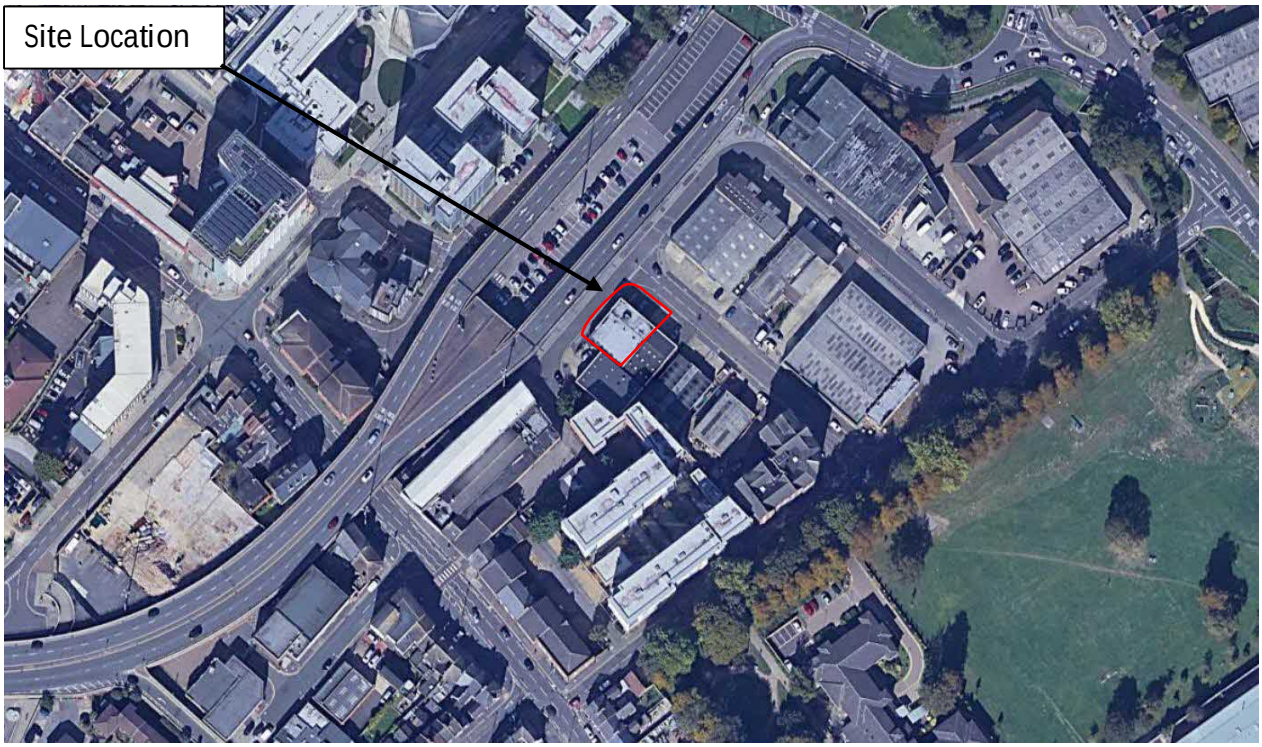


Figure 1: Google map view of the site location

1.2 This FRA is written per the requirements set out in the National Planning Policy Framework Document and Planning Practice Guidance which was last revised in August 2022. The Planning Practice Guidance was first published in 2014 and has since been continually updated.

1.3 A site-specific FRA is required for: -

Proposals of 1 Hectare or greater situated in Flood Zone 1,

New development (including minor development and change of use) located in areas of Flood Zone 1 that have critical drainage problems,

New development (including minor development and change of use) located in areas of Flood Zones 2 & 3.

1.4 The main objectives of this report (as recommended in the National Planning Policy Framework Document) are to:

Identify the probability of flooding at the proposed site under existing and proposed conditions,

Identify the proposed site use and the effects of flooding on its users,

Consider the site's future flood risk due to climate changes and extreme flooding events,

Produce a conceptual surface water drainage strategy using sustainable drainage design where suitable and appropriate,

Ensure flooding to third parties is not increased as a result of development,

If applicable, mitigate any residual risks to flooding, including flood resilience and resistance, safe access/escape routes, and emergency planning.

1.5 This site is located within an area at low risk of surface water flooding therefore a Flood Risk Assessment will be required.

2 Existing Site and Conditions

Site Description

2.1 The site is rectangular in shape and is currently used as a church building consisting of two floors. The site area is 0.039ha.

2.2 The site is bounded by the following:

Bolton Road and car parking to the north-west,

Gloucester Road and industrial units to the north-east,

Neighbouring buildings to the south.

Hydrology

2.3 The river Lea is situated approximately 175m north-east of site and flows in a south-easterly direction.

2.4 The site is in a source protection zone identified as Zone 1 - Inner Protection Zone. This is described by the EA as *"*This zone is defined by a travel time of 50-days or less from any point within the zone at, or below the water table. Additionally, the zone has a minimum 50metre radius. It is based principally on biological decay criteria and is designated to protect against the transmission of toxic chemicals and water-borne disease.*"*

2.5 The underlying bedrock strata are classified as a Principal Aquifer and are described by the Environment Agency as *"*layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning that usually provide a high level of water storage. They may support water and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.*"*

2.6 The underlying superficial deposit strata are classified as a Secondary A Aquifer and are described by the Environment Agency as *"*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an

important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers."

Groundwater Vulnerability

2.7 The risk of groundwater being contaminated by an activity is the vulnerability of the aquifer. The site is located within an area where there is a medium-high groundwater vulnerability.

2.8 Medium groundwater vulnerability is defined by the EA (Report SC040016) as "soils of intermediate leaching potential that have a moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-adsorbed diffuse source pollutants and liquid discharges could penetrate the soil layer."

2.9 High groundwater vulnerability is defined by the EA (Report SC040016) as "soils of high leaching potential with little ability to attenuate diffuse source pollutants and in which non-adsorbed diffuse source pollutants and liquid discharge have the potential to move rapidly to underlying strata or groundwater".

Geology

2.10 The British Geological Survey (BGS) map of the area indicates the site to be underlain by Holywell Nodular Chalk Formation and New Pit Chalk Formation.

2.11 The BGS Mapping indicates the site to have superficial deposits in the form of Glaciofluvial deposits, sand and gravel.

2.12 No lithological description is provided by BGS for the bedrock or superficial deposits.

Existing Drainage Systems

2.13 According to the Thames Water (TW) record plan (refer to Appendix A) there are foul and surface water sewers located in Gloucester Road and Bolton Road which are serving existing buildings around the site.

3 Development Flood Risk

Flood Zones

3.1 The Environment Agency flood map shown in Figure 2 indicates that the site lies within Flood Zone 1 and therefore, has a low probability of flooding from either fluvial or tidal sources. This zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding in any year (<0.1%).

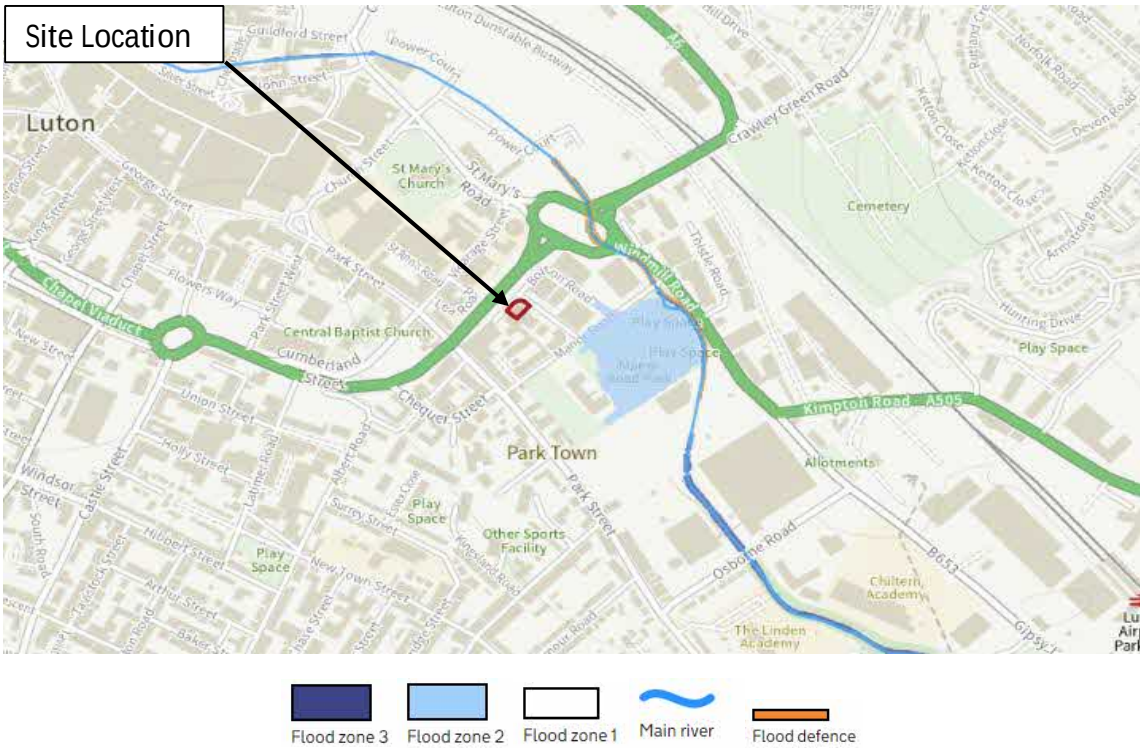


Figure 2: EA map showing the risk of fluvial and tidal flooding

Flooding from Land Runoff

3.2 Based on the information provided by the EA, Figure 3 shows the potential risk of flooding from overland flows. The figure shows that there is a low risk of surface water ponding on this site.

3.3 A low risk means that the area has a chance of flooding between 0.1% and 1% each year.

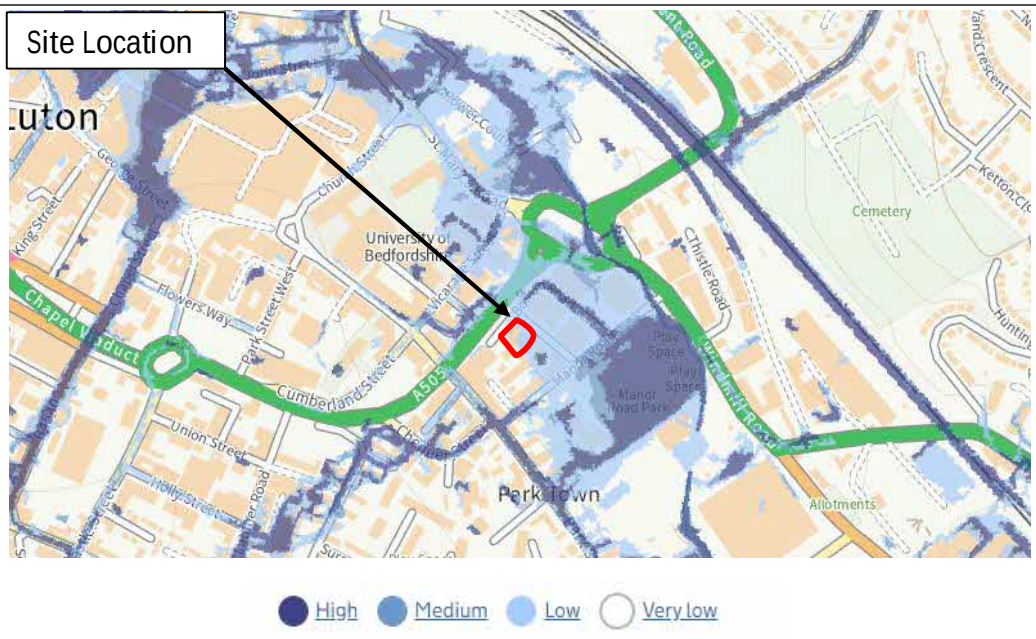


Figure 3: EA map showing risk of flooding from overland surface water

Flooding from Groundwater

3.4 At this design stage, the groundwater flooding potential can only be based on geological ground characteristics. This is merely based on the hydrogeological properties, and this is not currently based on any formal risk assessment.

3.5 The evaluation of groundwater regime and required mitigation proposals should be carried out during the detailed drainage design stage. This is likely to comprise of suitable land drainage proposals to alleviate waterlogging due to construction activities resulting in the change of the groundwater regime.

Flooding from Drainage Systems

3.6 As can be seen in Appendix A there are several drainage systems in Gloucester Road and Bolton Road. Despite Bolton Road being at a higher level in comparison to the proposed site according to the Luton Level 1 SFRA Update February 2013 there is no records of historic sewer flooding in this area.

Flooding from Reservoirs

3.7 As shown in Figure 4 by the EA map, the site is outside of the maximum extent of reservoir flooding.

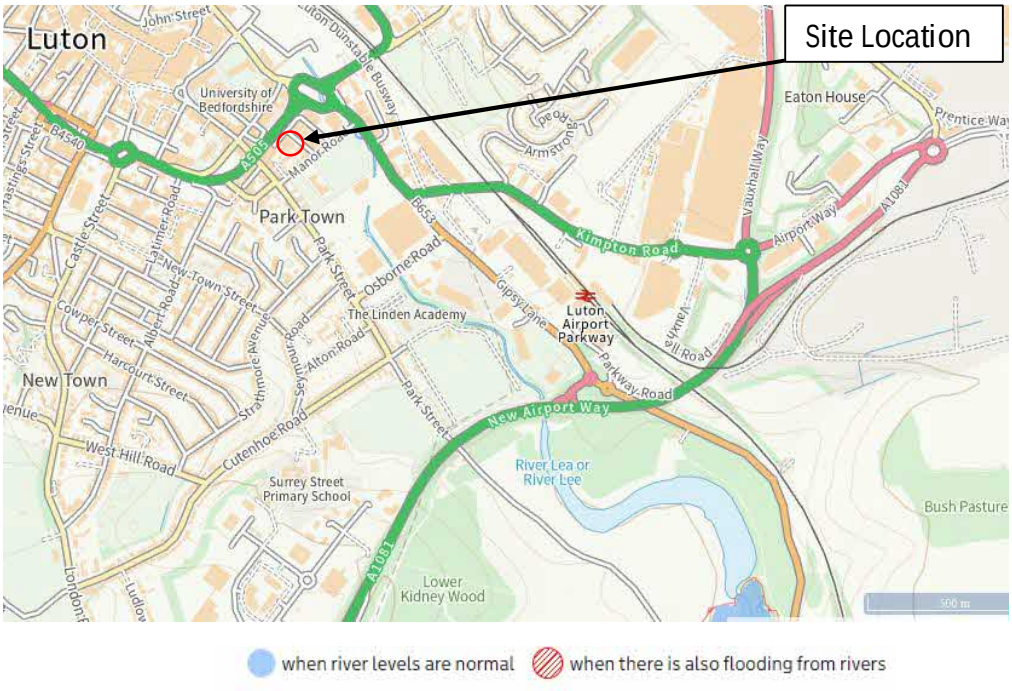


Figure 4: EA map showing maximum extent of flooding from reservoirs

Flooding from Other Sources

3.8 There are no other water features, that can be identified, that may pose a flood risk to the development.

4 Proposed Development

4.1 The proposal for this site is a mixed-use development consisting of 2 business units and 15 Flats over 8 floors with additional room for cycle storage on the ground floor.

5 Proposed Drainage Strategy

5.1 At this stage of the development proposal, a detailed design for the proposed drainage system was not undertaken. However, this document outlines a drainage strategy for dealing with surface water disposal from the proposed development.

5.2 Best current practice should be used to determine suitable Sustainable Drainage Systems (SuDS) selection wherever possible. Surface water runoff generated from the proposed impermeable areas should seek to meet the following design objectives:

Infiltration into the ground should be as close as possible to the source to recharge the groundwater and watercourses base flows (depending on ground conditions and the existing site uses),

Attenuate and control surface water runoff from proposed impermeable areas to the equivalent of the Greenfield runoff rate,

Manage surface water runoff from the site so that it does not increase flood risk to third parties and where possible, reduce this flood risk,

Improve the quality of surface water discharge.

5.3 Several SuDS are ideally used throughout a site, linked together to form a SuDS train providing treatment, control and attenuation processes.

5.4 The proposed disposal of surface water runoff from the development will need to follow the hierarchal approach as outlined below:

Discharge into the ground via infiltration,

Discharge to surface waterbody,

Discharge to a surface water sewer, highways drain or another drainage system,

Discharge to a combined sewer (subject to Sewerage Undertaker carrying out capacity evaluation)

Infiltration

5.5 The use of infiltration structures presents the most desirable solution for the surface water disposal in terms of sustainability following the surface water management train. This is achieved by collecting surface water runoff from impermeable areas and redirecting it back into the ground.

5.6 Infiltration structures must be a minimum of 2.5m away from the site boundary and 5m away from highways and buildings. The distance between the building and boundary varies between 1.6m and 2.5m at different points. Therefore, when considering the offsets from the building, highways and boundary there is no room for infiltrations structures.

Discharge into Watercourses

5.7 Following the hierarchy, the next approach is to discharge the surface water into a watercourse. The nearest watercourse to the proposed site is the River Lea situated 175m north-east. This would require permission to cross third party land and permission from the riparian to install a headwall. It would not be guaranteed that permission would be given therefore this option has been discounted.

Discharge into Surface Water Sewer System

5.8 As shown on Thames Water Mapping (Appendix A) there are surface water sewers located along Bolton Road and Gloucester Road. The proposal is to connect into the sewer along Bolton Road as existing levels are known and can be achieved.

Greenfield Runoff Rate

5.9 Generally, the discharge from the proposed development is to be restricted to the greenfield runoff rates. The Greenfield runoff rate for the site is summarised in Table 1 and it was calculated using the online FEH Statistical method based on an area of 0.1ha and scaled to suit the proposed impermeable area. Refer to Appendix B for full calculations along with the associated BFI Host information from the FEH Web Service.

Table 1: Greenfield runoff rates for the existing site

Return Period	Greenfield Runoff Rate l/s (0.1ha)	Greenfield Runoff Rate l/s (0.038ha)
1 in 1	0.16	0.06
1 in 30	0.42	0.16
1 in 100	0.58	0.22
QBAR	0.18	0.07

5.10 As can be seen by the table, the greenfield runoff rates for the site are very slow and would require a flow control with a very small opening. The flow control would be highly susceptible to blocking and therefore, it is proposed to restrict discharge to 1 l/s.

5.11 To restrict the discharge to 1l/s a 27mm orifice is proposed. A emergency overflow pipe should also be installed above the height of the highest water level in case of a blockage.

5.12 Surface water runoff from the site will drain into 0.4m deep attenuation crates situated underneath business unit 1 and the refuse store. The combined volume of the attenuation crates is 29.8m^3. The final discharge will be into the existing TW surface water sewer located in Bolton Road to the north-west of site. Refer to Appendix C 230220-220-Drainage Strategy for the proposed layout.

5.13 A green roof is proposed on the 8th floor of the building. The area of this roof is approximately 105m^2 and for the attenuation calculations has been treated as impermeable.

5.14 The onsite attenuation has been designed to cater for a 1 in 100-year storm event with an allowance of 40% for climate change. An additional 10% for urban creep has also been considered within the calculations. A summary of the attenuation requirements for various critical storm events with the associated discharge rates is shown within Table 2. For full attenuation calculations, refer to Appendix D.

Table 2: Attenuation requirements

Critical Storm Event	Discharge Rates (l/s)	Attenuation Volume (m^3)
1 in 2-year +40%CC	0.5	9.5
1 in 30 + 40%CC	0.8	21.6
1 in 100 + 40%CC	0.9	27.3

5.15 Thames Water was consulted regarding the proposed discharge into the nearby sewer and they have confirmed that they would accept a connection into their surface water network at a maximum rate of 1.0l/s. Refer to the correspondence in Appendix E.

5.16 A summary of the SUDS that have been reviewed as part of the surface water drainage strategy and their suitability are listed in Table 3.

Table 3: SuDS Feature with general description from CIRIA C753 SUDS Manual

SUDS Feature	Description	Potential for Application
Rainwater Harvesting	Rainwater Harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used for domestic, commercial, industrial, or institutional properties.	Rainwater harvesting could be explored during detailed design.
Green Roofs	Green roofs are areas of vegetation installed on the top of buildings, for reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff.	A green roof is proposed on the 8th floor.

SUDS Feature	Description	Potential for Application
Infiltration Systems	There are various types of infiltration structures which can include: soakaways, infiltration trenches, infiltration blankets, infiltration basins and permeable subbases. Infiltration can contribute to reducing runoff rates and volumes while supporting baseflow and groundwater recharge processes.	There is no available space to utilise infiltration.
Proprietary Treatment Systems	Proprietary treatment systems are manufactured products that remove specified pollutants from surface water runoff.	The additional treatment of surface water is not required for this site.
Filter Strips	Filter strips are uniformly graded and gently sloping strips of grass or other dense vegetation that are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration, and infiltration (where acceptable).	There is limited space onsite therefore, filter strips cannot be used.
Filter Drains	These are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance, and filtration of surface water runoff.	There is limited space onsite therefore, filter drains cannot be used.
Swales	Swales are shallow, flat bottomed, vegetated open channels designed	There is no available space on site to use swales.

SUDS Feature	Description	Potential for Application
	to convey, treat, and often attenuate surface water runoff.	
Bio Retention Systems (including tree pits)	Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution using engineered soils and vegetation.	There is no proposed landscaping on this site therefore bioretention systems cannot be used.
Pervious Pavements	Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers.	There is no proposed driveways or pavements on site to use pervious paving.
Attenuation Storage (belowground)	Belowground storage is typically a void space for the temporary storage of surface water before infiltration, controlled release, or use. There are various forms which are, but not limited to; geocellular storage systems, oversized pipes, concrete boxes etc.	Belowground storage is used as part of attenuation.
Attenuation Basins	These are landscaped depressions that are normally dry except during and immediately following storm events.	There is no available space on site to use a attenuation basin.
Ponds and Wetlands	Ponds and wetlands are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff.	There is no available space on site to use ponds or wetlands.

SUDS Feature	Description	Potential for Application
Trees	Trees can provide various benefits for the water quality, amenity, and biodiversity for a site,	No trees are proposed on this site.

Surface Water Treatment

5.17 Minor amounts of silt will be produced from the roof area of the building. This will be collected in the sumps located before and after the attenuation crates.

Foul Drainage Strategy

5.18 There is existing drainage on site as shown on the topographical survey which could be used for the proposed development. This option can be explored during detailed design once the conditions of the existing connections is assessed.

5.19 However, if existing connections cannot be used the proposal for this site is to have a foul connection going into the existing foul sewer located along Bolton Road from a chamber next to the unit 1 entrance.

5.20 Thames Water have confirmed that there will be sufficient sewer capacity in the adjacent foul water sewer network to serve the development. Refer to the correspondence within Appendix E.

6 Operation and Maintenance

6.1 To ensure that the drainage systems can operate throughout the lifetime of the development, there must be regular maintenance of the system. This prevents issues such as blockages and means that the system can continue to operate as designed.

6.2 For the SuDS structures, ongoing regular maintenance will be required to ensure continuous operation to design performance standards. The SuDS Manual C753 gives generic guidance for a maintenance schedule. The schedule provides a list of required

maintenance procedures along with the frequency at which it needs to occur. It should be noted that the manual states that the tables 'provide guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.'

6.3 Some of the regular maintenance actions that are required for the attenuation crates are listed below:

Check to see if the system is operating properly and that all the components are in good working condition, if not then remedial action needs to be undertaken.

Inspect for debris/sediment build-up and remove any debris/sediment that may have accumulated within the tank and manhole which would otherwise reduce the maximum storage capacity.

6.4 Some of the regular maintenance actions that are required for green roofs are:

Inspecting all components of the green roof for structural integrity, waterproofing and any evidence of leaking,

Inspecting the drains for potential blockages,

Removal of nuisance planting, dead plants and debris and litter,

If on inspection there are issues with the green roof, the appropriate measures to rectify the problem will be undertaken.

6.5 For further information on maintenance of the proposed SuDS refer to Appendix F.

6.6 If on inspection there are issues with the features, then remedial action will be required. Where damage to any component has been found, these will either need to be replaced or rehabilitated.

7 Summary

7.1 This FRA has been undertaken to support a planning application for a mixed-use development on land at 2 Gloucester Road, Luton LU1 3HX.

7.2 The site lies within Flood Zone 1 and therefore, has a low probability of flooding from fluvial and tidal sources. However, is situated in an area at low risk to surface water flooding.

7.3 Infiltration structures require a 2.5m offset from the site boundary and a 5m offset from buildings and highways. At most there is 2.5m from the building to boundary therefore, infiltration structures requirements are not met.

7.4 To discharge into the nearest watercourse permission to cross third party land and permission from the riparian to install a head wall would be required. This permission would not be guaranteed therefore the option has been discounted.

7.5 There are surface water sewers located along Bolton Road and Gloucester Road. The sewer along Bolton Road provides the most suitable connection for discharge in terms of levels.

7.6 Greenfield runoff rates for the site are very slow therefore, it is proposed to discharge at 1l/s.

7.7 It is proposed surface water will be conveyed into 0.4m deep attenuation crates with a total volume of 29.8m^3 underneath the refuse store and business unit 1 with a final discharge into the existing surface water sewer along Bolton Road. The attenuation has been designed for a 1 in 100-year storm event including 40% allowance for climate change and 10% for urban creep.

7.8 Thames Water have confirmed there is sufficient capacity to accommodate a maximum discharge of 1.0l/s into their surface water network for the surface water runoff from the site.

7.9 There are two options for foul water drainage. The first is to utilise exiting connections on site. For this option to be used conditions of these existing connections would need to be assessed.

7.10 Alternatively, foul water can drain into the existing TW foul sewer located along Bolton Road to the north-west of the site.

7.11 Thames Water have confirmed there is sufficient capacity within their foul water network to accommodate the development.

7.12 Drainage strategy is subject to the detailed design.

7.13 The FRA demonstrates the proposed development would not increase flood risk to the site or the surrounding area.

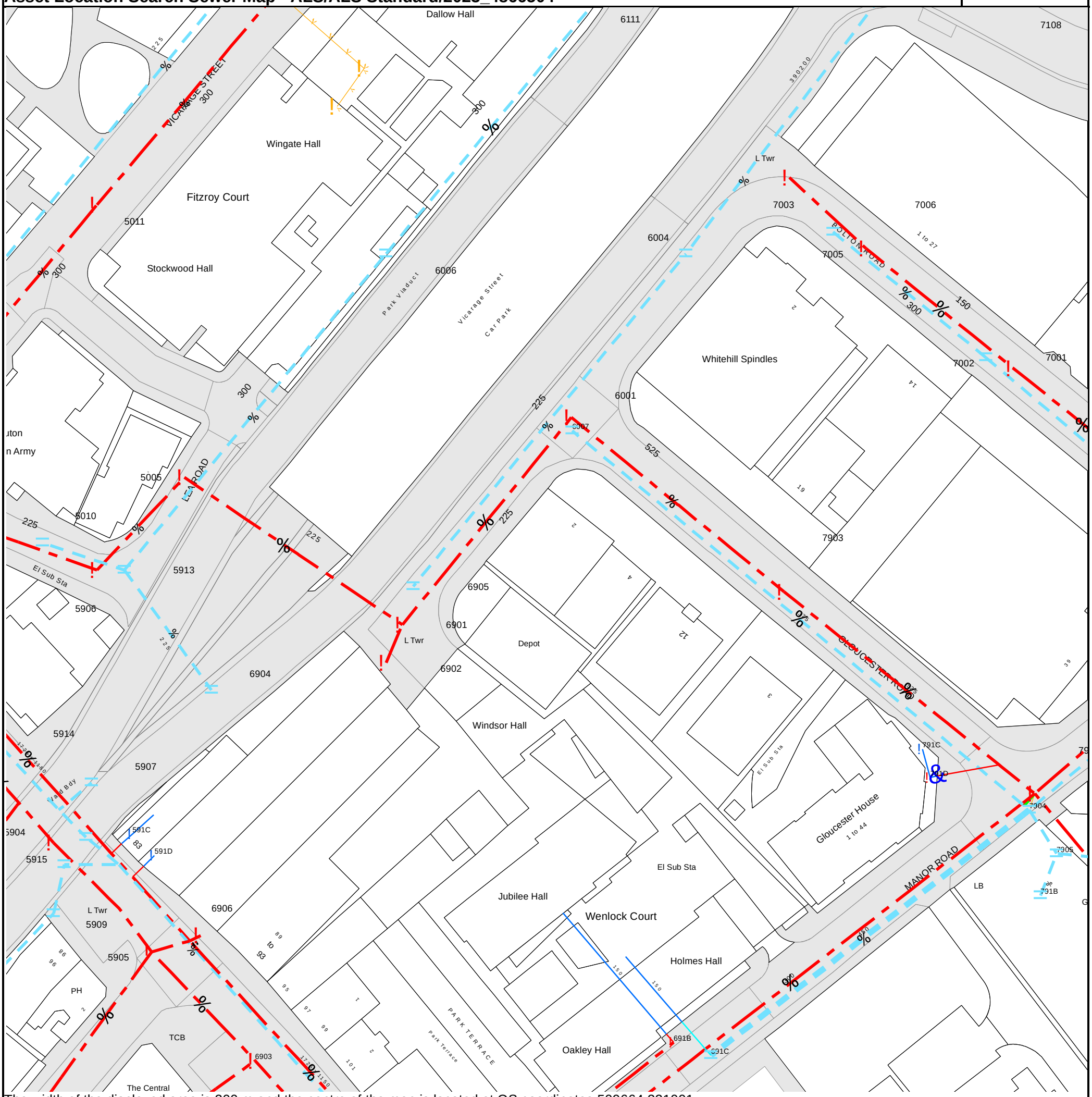
8 Reservations

8.1 This Flood Risk Assessment is generally based on information and statistics supplied by the Environment Agency for historic and predicted events. As a result, this report does not in any way constitute or can be construed as constituting a representation or warranty actual or implied, regarding the possibility of future flooding to the site. Ultimately, we cannot accurately forecast natural events but 'best guess' these events based on historical statistics. As such, we have considered the likelihood of flooding, the possible implications, and the mitigation measures that may be employed to minimise the impact.

Appendix A

Existing Thames Water Sewer Mapping

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4866504



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 509664,221001

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
791B	n/a	n/a
7905	103.13	101.26
7904	103.29	101.33
7901	103.26	101.9
791D	n/a	n/a
791C	n/a	n/a
7001	103.27	102.39
7002	103.24	101.99
7006	103.33	102.6
6903	105.51	102.74
691B	n/a	n/a
691C	n/a	n/a
6904	104.72	103.52
6902	104.82	103.75
6901	104.73	102.55
7903	103.65	102.17
6905	104.59	102.83
5913	104.68	103.23
5906	104.69	102.91
5010	104.75	103.38
5005	104.45	102.79
6007	n/a	n/a
6001	103.74	102.31
6006	104.19	102.95
6004	103.43	102.28
7005	n/a	n/a
5011	104.95	103.49
7003	n/a	n/a
5904	105.59	n/a
5909	105.92	105.16
5915	105.52	103.77
5907	105.61	n/a
5914	105.46	104.94
5905	105.6	103.06
591D	n/a	n/a
6906	105.65	n/a
591C	n/a	n/a

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

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
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- 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.

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

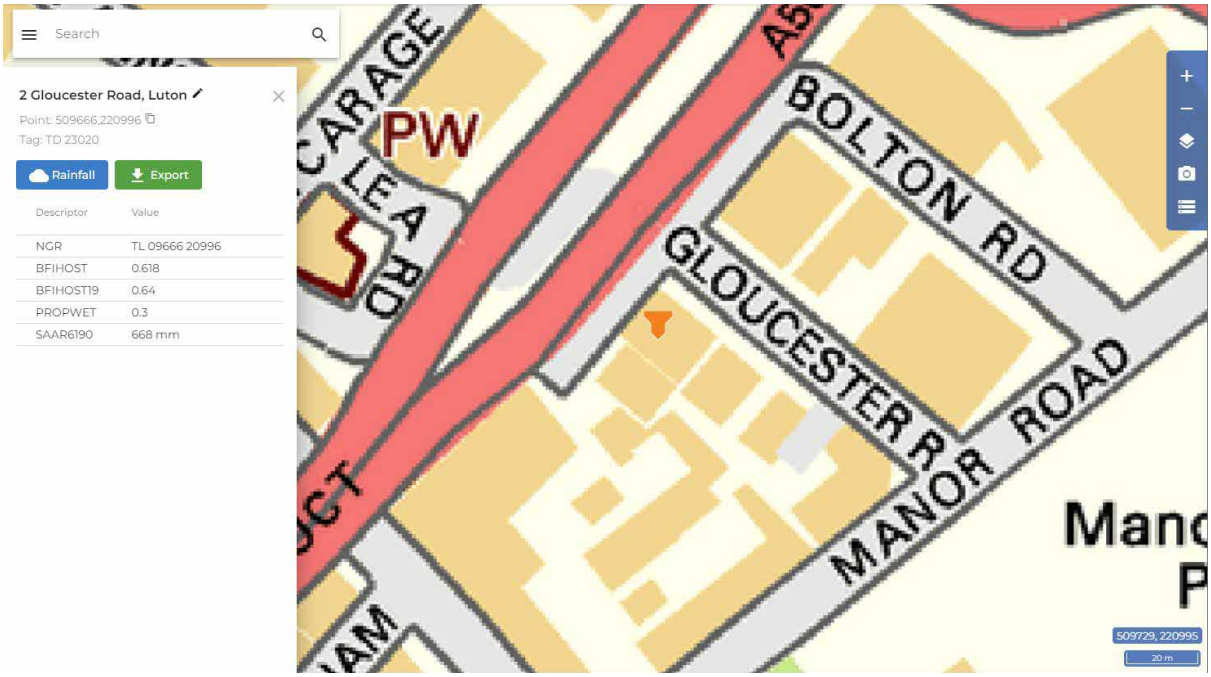
Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the 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 indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. 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, please contact Property Searches on 0800 009 4540.

Appendix B

Greenfield Runoff Rates



Greenfield runoff ra estimation for sit

www.uksuds.com | Greenfield runoff

Calculated by:	jack calland
Site name:	2 Gloucester Road
Site location:	Luton

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:	51.87688° N
Longitude:	0.40831° W
Reference:	3873174816
Date:	Aug 03 2023 11:21

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): .1

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.640
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm):	672	672
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.

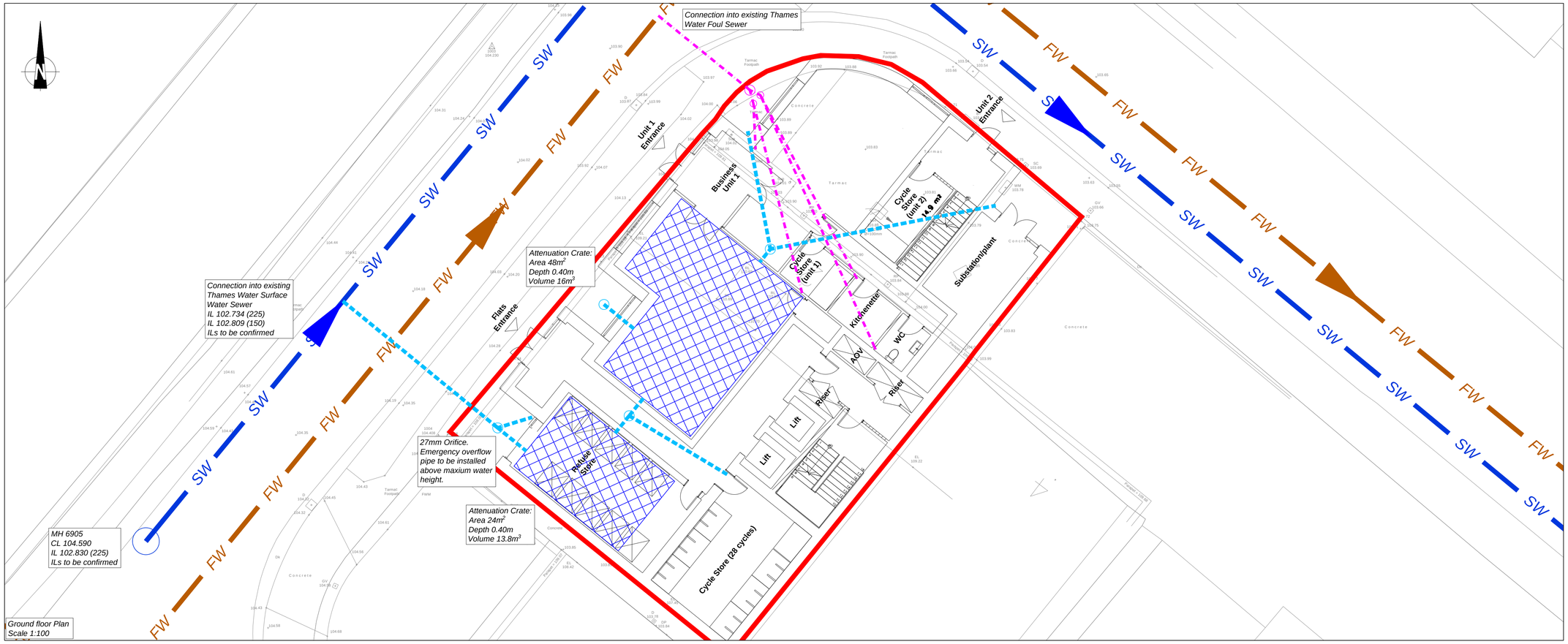
Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):		0.18
1 in 1 year (l/s):		0.16
1 in 30 years (l/s):		0.42
1 in 100 year (l/s):		0.58
1 in 200 years (l/s):		0.68

Appendix C

Drainage Strategy



Ground floor Plan
Scale 1:100

Roof Plan
Scale 1:100

0m 1m 2m 3m 4m 5m 10m

GENERAL NOTES

- This drawing is to be read in conjunction with all other relevant Architect's, Engineers & Specialist drawings, details and the relevant Health and Safety Plan (as appropriate).
- Do not scale from this drawing. Use figured dimensions only.
- Existing statutory undertakers plant has not been provided. Locations to be determined prior to any excavations.
- S106 connection to be undertaken by the contractor.

Key

- Site boundary
- Proposed foul drainage
- Proposed surface water drainage
- Proposed attenuation crates
- Proposed impermeable area (276m²)
- Proposed green roof area (105m²)
- FW — Existing Thames Water foul sewer
- SW — Existing Thames Water surface water drainage

Return period including 40% climate change	Greenfield run-off rate (l/s)	Maximum discharge rate (l/s)	Maximum water depth (m)	Maximum attenuation volume (m³)
1 in 1 year	0.06	N/a	N/a	N/a
1 in 2 year	N/a	0.50	0.137	9.456
1 in 30 year	0.16	0.80	0.314	21.627
1 in 100 year	0.22	0.90	0.396	27.282
QBAR	0.07	N/a	N/a	N/a

Rev	Date	Description	Drawn	Check
-	16.08.2023	First issue	JWC	WP

Trace Design
Transport and Civil Engineering

Ground Floor
3 Silverdown Office Park
Fair Oak Close
Clyst Honiton
Exeter, Devon
EX5 2UX

Drawing Status: FOR PLANNING

Scale @ A1: 1:100

Project: 2 Gloucester Road, Luton

Project No.: 23020

Drawing: Drainage Strategy

Drawing No.: 220

Revision: -

Appendix D

Attenuation Calculations

Appendix E

Thames Water Capacity Correspondence

Mr Jack Calland

3 Silverdown Office Park
Fair Oak Close
Exeter
EX5 2UX

Wastewater pre-planning
Our ref DS6107573

31 August 2023

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 2, GLOUCESTER ROAD, LUTON, LU1 3HX

Dear Mr Calland,

Thank you for providing information on your development.

Proposed site: Demolishment of existing 245m2 commercial premises to provide 244m2 of commercial business units and 15 flats.

Proposed foul water: To discharge by gravity to 225mm foul sewer between manholes 6901 and 6001.

Proposed surface water: To discharge by gravity to 225mm surface sewer between manholes 6905 and 6004 and restricted to a total of 1 l/s.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.
This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.
When developing a site, policy SI 13 of the London Plan states "Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:"

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 1.0 l/s, for all storms up to and including 1:100+40%CC; then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

Source Protection Zone

The development site boundary falls within two Source Protection Zones for groundwater abstraction. These zones may be at particular risk from polluting activities on or below the land surface. To prevent pollution, the Environment Agency and Thames Water (or other local water undertaker) will use a tiered, risk-based approach to regulate activities that may impact groundwater resources, this may potentially affect your drainage or surface water strategies where deep or infiltration systems are proposed. The applicant is encouraged to read the Environment Agency's approach to groundwater protection (available at *https://www.gov.uk/government/publications/groundwater-protection-position-statements* and may wish to discuss the full implications for their development with a suitably qualified environmental consultant.

Diversion

Where there are any existing public sewers crossing the site, new buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. If you wish us to review a diversion proposal, please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers. Please contact us for further information on this process.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0800 009 3921.

Yours sincerely

[redacted]

James Kitching
Development Engineer
Developer Services – Sewer Adoptions Team

Appendix F

Excerpt from CIRIA SuDS Manual C753 – Attenuation Storage (crates)

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Excerpt from CIRIA SuDS Manual C753 - Green Roofs

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required