



**SHELDON BAKERY,
OPENSHAW,
MANCHESTER,
M11 2FB**

DRAINAGE STRATEGY

8885-HBL-XX-XX-RP-D-001

Revision: P02



Document Control:

Document reference: 8885-HBL-00-00-RP-D-0001

Author	Paul Carter
Signature	<i>P.CARTER</i>
Date	11.11.2025
Approved	Ryan Jones Associate
Signature	<i>R.JONES</i>
Date	06.06.2025

Rev	Date	Details	Prepared By	Reviewed By
P01	06.06.2025	Preliminary	PC	RJ
P02	31.07.2025	REVISED STRATEGY TO NEW LAYOUT	RJ	RJ

Limitations;

This document has been prepared in accordance with the scope of HBL Associates Ltd appointment with its client and is subject to the terms of that appointment. It is addressed to and for the sole and confidential use and reliance of HBL Associates' Ltd client. HBL Associates Ltd accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of HBL Associates Ltd. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document. The contents of this document do not provide legal or tax advice or opinion.

All comments and proposals presented in this report, including any conclusions, are based on information available to HBL Associates Ltd at the time of the investigation.

The conclusions drawn by HBL Associates Ltd could therefore differ if the information available at that time is found to be inaccurate or misleading. HBL Associates Ltd accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this project.

Except as requested / instructed by Client, HBL Associates Ltd is not obliged to and disclaims any obligation to update the report for events taking place after the date on which this assessment was undertaken, and the date on which the report is delivered.

HBL Associates Ltd makes no representation concerning the legal significance of its findings or legal matters referred to in the following report. The information presented in this document and all conclusions drawn are based on statistical data and are for guidance purposes only. The report does not guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of the water levels, flow rates and associated probabilities.

CONTENTS

1.	INTRODUCTION.....	4
2.	SITE LOCATION AND TOPOGRAPHY	5
	Site Topography	6
	Geology Hydrogeology	7
	Groundwater	7
	Soil infiltration rates.....	7
	Hydrogeology/Hydrology	7
3.	EXISTING DRAINAGE CHARACTERISTICS	8
	Public sewers	8
	Site Drainage	9
	Foul Drainage	10
4.	PROPOSED DEVELOPMENT DETAILS.....	10
5.	CONSULTATION AND DATA REVIEW.....	12
	Water Authority	12
	Lead Local Flood Authority	12
	Internal Drainage Board District	12
6.	EXISTING RUNOFF RATE.....	13
	Existing Greenfield Runoff Rate	13
	Existing Greenfield Runoff Volume	13
	Existing Brownfield Runoff Rate.....	13
7.	PROPOSED DRAINAGE RUN-OFF.....	14
	Proposed Runoff Rate	14
	Proposed Runoff Volume	14
8.	PROPOSED SURFACE WATER RUNOFF DESTINATION	16
	Discharge into the ground - infiltration expectations	16
	Discharge to surface water body.	17
	Discharge to Surface Water Sewer	17
9.	SuDS COMPONENTS.....	17
10.	CLIMATE CHANGE ALLOWANCE	20
11.	SURFACE WATER DRAINAGE STRATEGY	21
	Surface Water Network	22
12.	FOUL WATER DRAINAGE STRATEGY	22
	Foul Water Network.....	22

13.	DESIGN FOR EXCEEDANCE	23
14.	WATER QUALITY	23
	The Proposed SuDS Components	24
15.	EXECUTIVE SUMMARY	25
	APPENDIX 1 – TOPOGRAPHICAL SURVEY	26
	APPENDIX 2 – PROPOSED SITE PLAN	27
	APPENDIX 3 – PROPOSED IMPERMEABLE AREAS PLAN	28
	APPENDIX 4 – UNITED UTILITIES PRE-DEVELOPMENT RESPONSE	29
	APPENDIX 5 – GREENFIELD RUN-OFF RATES	30
	APPENDIX 6 – PROPOSED DRAINAGE LAYOUT	31
	APPENDIX 7 – HYDRAULIC CALCULATIONS.....	32

1. INTRODUCTION

- 1.1 HBL Associates Ltd have been instructed to prepare a Drainage Strategy in support of a full planning application for a development proposed at land off Parkhouse Street in Openshaw, Manchester.
- 1.2 Table 1.1 below shows details of the proposed development.

Project Name	Sheldon Bakery, Openshaw
Project Description	The project includes commercial buildings, car parking with associated landscaping and infrastructure works
Location	land off Parkhouse Street, Openshaw, Manchester, Greater Manchester, England, M11 2FB.
NGR (Approximate)	387678E 397725N
Application Site Area (HA) – Red Boundary Line	21,666m ² = 2.17ha (Approximate area)
Development Type	“Greenfield” – the site is currently vacant and vegetated, with well-established dense vegetation present across part of the site. Historically the site was developed, including a dyeworks and terraced housing.
Local Planning Authority	Manchester City Council
Lead Local Flood Authority	Manchester City Council
Sewerage Undertaker	United Utilities

Table 1.1 Existing Site Details.

- 1.3 Sources of flooding will be assessed as part of the Drainage Strategy for the proposed development in its current context.
- 1.4 This document is to be read in conjunction with all associated drawings, supported reports and documentation.
- 1.5 The report follows advice contained in the Department for Communities and Local Government’s National Planning Policy Framework (NPPF) and Planning Practice Guidance, which provides advice to planning authorities, developers, the public and Environment Agency (EA) on development and flood risk.

2. SITE LOCATION AND TOPOGRAPHY

2.1 The application site is an area of land in the east of Manchester, as indicated in Figure 2.1 below.



Figure 2.1 Site Location Plan – (Source: Google maps)

2.2 Figure 2.2 shows the aerial image of the site and the immediate surrounding area.



Figure 2.2 Satellite imagery – (Source: Google maps)

- 2.3 The site is greenfield undeveloped land, with vegetation present.
- 2.4 The eastern site boundary is Kelbrook Road, the southern boundary is Parkhouse Street, and the southern part of the western boundary is Clayton Lane. The remainder of the western boundary and the northern boundary is formed by commercial developments.
- 2.5 The site is within the Manchester District of the Greater Manchester Combined Authority area.
- 2.6 The proposed development is a large commercial bakery and includes HGV loading docks, service yard, vehicle parking with associated landscaping and infrastructure works.

Site Topography

- 2.7 The site can be identified by approximate National Grid Reference 387688 , 397722.
- 2.8 A topographical survey has been undertaken by The CAD Room in March 2021, reference 01-S-1038 (**Appendix 1**).
- 2.9 The topographical survey shows that there is a general trend of levels falling down to the west across the site. however, large parts of the site were unable to be surveyed due to the dense vegetation, so existing levels are unconfirmed across much of the site.
- 2.10 Levels around 60.30m AOD are present in the southeast corner, falling to around 58m AOD in the southwest corner. The northwest corner is around 60.70m AOD, and the northwestern point is approximately 61m AOD.

- 2.11 Levels are in the region of 60 – 61m AOD in the centre of the site.

Geology Hydrogeology

- 2.12 LK Consult undertook a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy report, dated September 2021.
- 2.13 This report should be referred to for information relating to the existing ground conditions of the site.
- 2.14 The report advises that made ground is present across parts of the development site and a mixture of other strata was also recorded. Made Ground to 1.2mbgl to greater than 3mbgl and comprised gravelly sand or clay with ash, clinker, brick and other anthropogenic inclusions (slightly silty gravelly sand with ash, clinker, brick, occasional metal, cloth, ceramics).

Groundwater

- 2.15 The Phase 2 Ground Investigation Interpretative Report states groundwater and groundwater seepages were encountered within several of the exploratory holes at a number of locations across the site, at depths of between 1.8m and 9.0mbgl.
- 2.16 Excavation/drilling and the Made Ground and natural deposits included granular strata containing perched groundwater.
- 2.17 The report notes shallow groundwater identified on the site may present a constraint to the development and that suitable drainage should be considered in the proposed development layout. It is assumed that “shallow groundwater” is referring to the groundwater noted at a minimum of 1.8m depths at certain locations within the site.

Soil infiltration rates

- 2.18 The Phase 2 Geo-Environmental Investigation indicates that soil infiltration rates have not been determined by on site investigation. The report advises that it may be possible to implement soakaway drainage for disposing of surface water runoff in the north and south of the site and that soakaway tests, in accordance with BRE 365 should be undertaken to establish the viability of Sustainable Urban Drainage (SUDs).

Hydrogeology/Hydrology

- 2.19 The nearest watercourse is Clayton Brook, which is culverted through the site.
- 2.20 The culvert is recorded on the United Utilities sewer records as being 1200mm in diameter and shown to cross the site from the northeast to southwest. It is thought to run broadly east – west across the site, with a gentle curvature shown on the records.
- 2.21 The maintenance of ordinary watercourses is the responsibility of the landowner. This culverted watercourse is expected to be a Lead Local Flood Authority asset, who has a power to regulate i.e., powers associated with the prevention, mitigation and remedying of flood damage associated with ordinary watercourses.
- 2.22 The culvert is not shown on the online Flood Map for Planning, however, shows the Ashton Canal as the nearest canal to the site, as below within Figure 2.3.
- 2.23 There are no other known watercourses within the immediate vicinity of the Site.

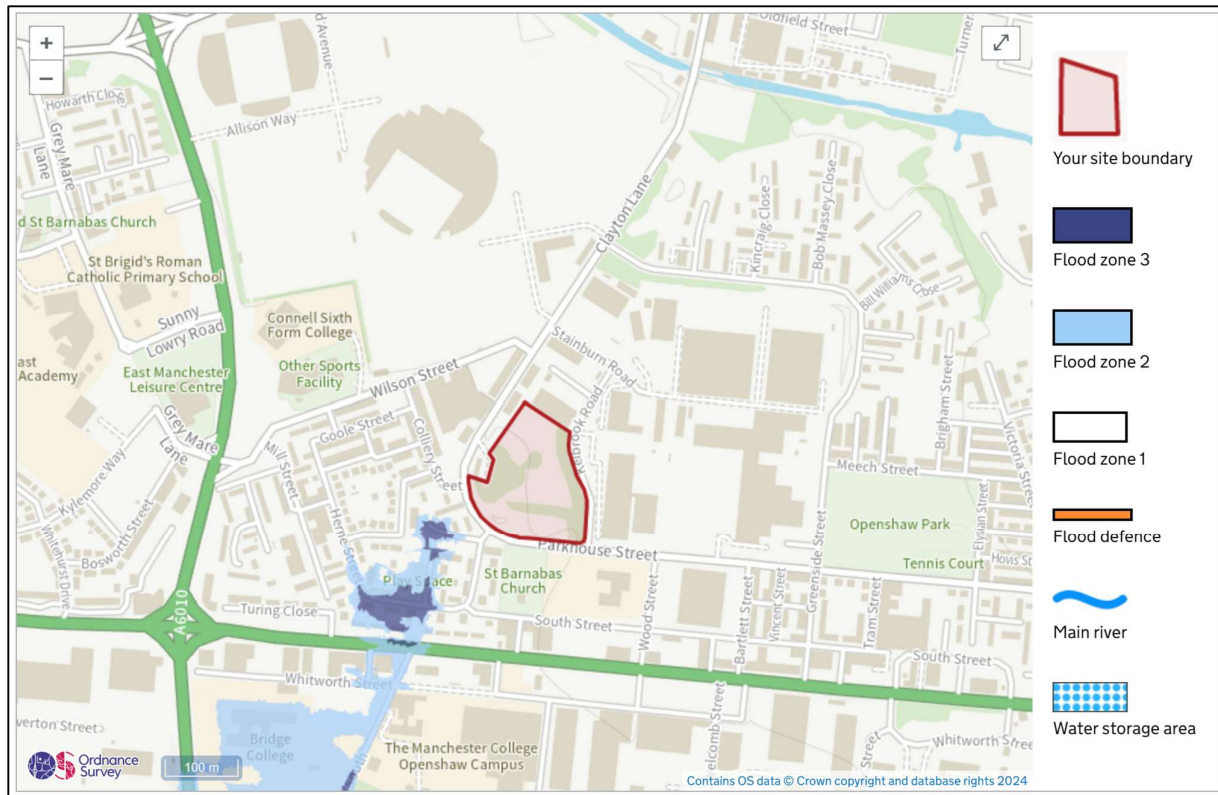


Figure 2.3 Extract from Flood Map for Planning. Source Environment Agency online mapping.

3. EXISTING DRAINAGE CHARACTERISTICS

Public sewers

3.1 Public sewer records have been obtained from United Utilities, who is the Water Authority for the area. A summary of the drainage is provided below and indicated in **Appendix 4** and Figure 3.1.

- The buildings close to the northwest corner of the site have a network of combined public sewers present, which include a 150mm sewer at the rear of the properties which runs close to the site boundary at this location.
- There are combined public sewers within the highways to the west and south of the site.
- A 750mm public surface water sewer is within Clayton Lane to the west of the site.
- A 300mm public surface water sewer is within Parkhouse Street to the southwest of the site.
- As noted above, a 1200mm diameter culvert is shown to cross the site from the northeast to southwest. It is expected this is a LLFA asset.

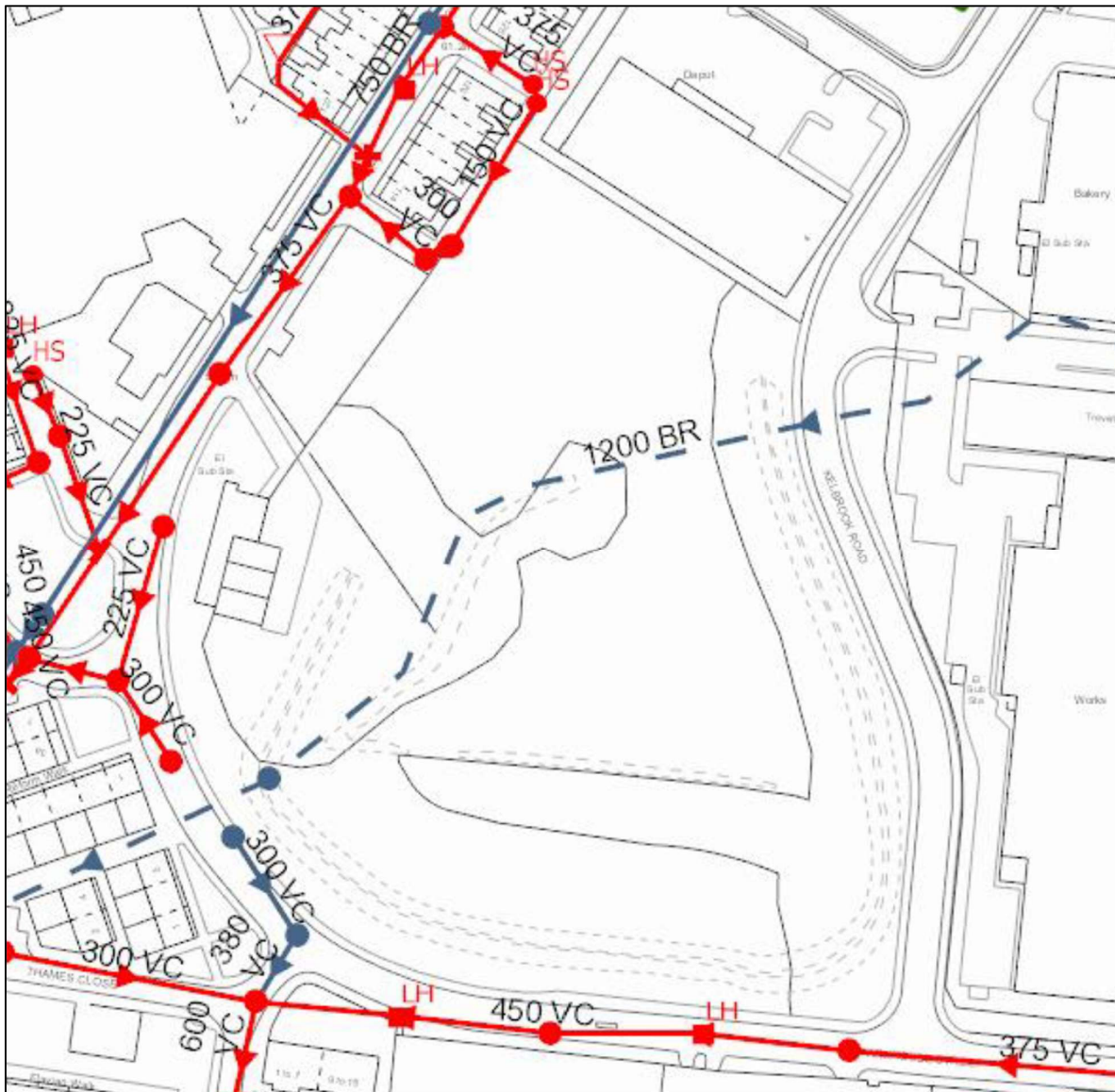


Figure 3.1 Extract from United Utilities sewer records. (Source: United Utilities).

Site Drainage

- 3.2 The site was historically developed and dye works and terraced housing were present. There would have been drainage systems present to accommodate the historic developments. However, the former developments have been demolished and removed, and the site is presently vacant and densely vegetated. The previous drainage systems would be expected to have been removed as part of the demolition, and any remnants would be unexpected to be functional. Therefore, the site is expected to be undrained in the present scenario.
- 3.3 The presence of existing field drains or other drainage infrastructure cannot be ruled out.
- 3.4 Highway drainage is present within the highway network adjacent to the site.
- 3.5 Further investigation would be required to determine the extent of any existing drainage within the site. However, the Phase 2 Geo-Environmental Investigation included intrusive investigation and does not suggest finding any functioning drainage system.

Foul Drainage

- 3.6 No existing foul drainage is expected on site, as previous drainage systems would be expected to have been removed as part of the demolition of the former developments.

4. PROPOSED DEVELOPMENT DETAILS

- 4.1 The proposed development is a large commercial bakery and includes HGV loading docks, service yard, vehicle parking with associated landscaping and infrastructure works.
- 4.2 A copy of the latest proposed site plan has been included within **Appendix 2** and an excerpt is below in Figure 4.1.

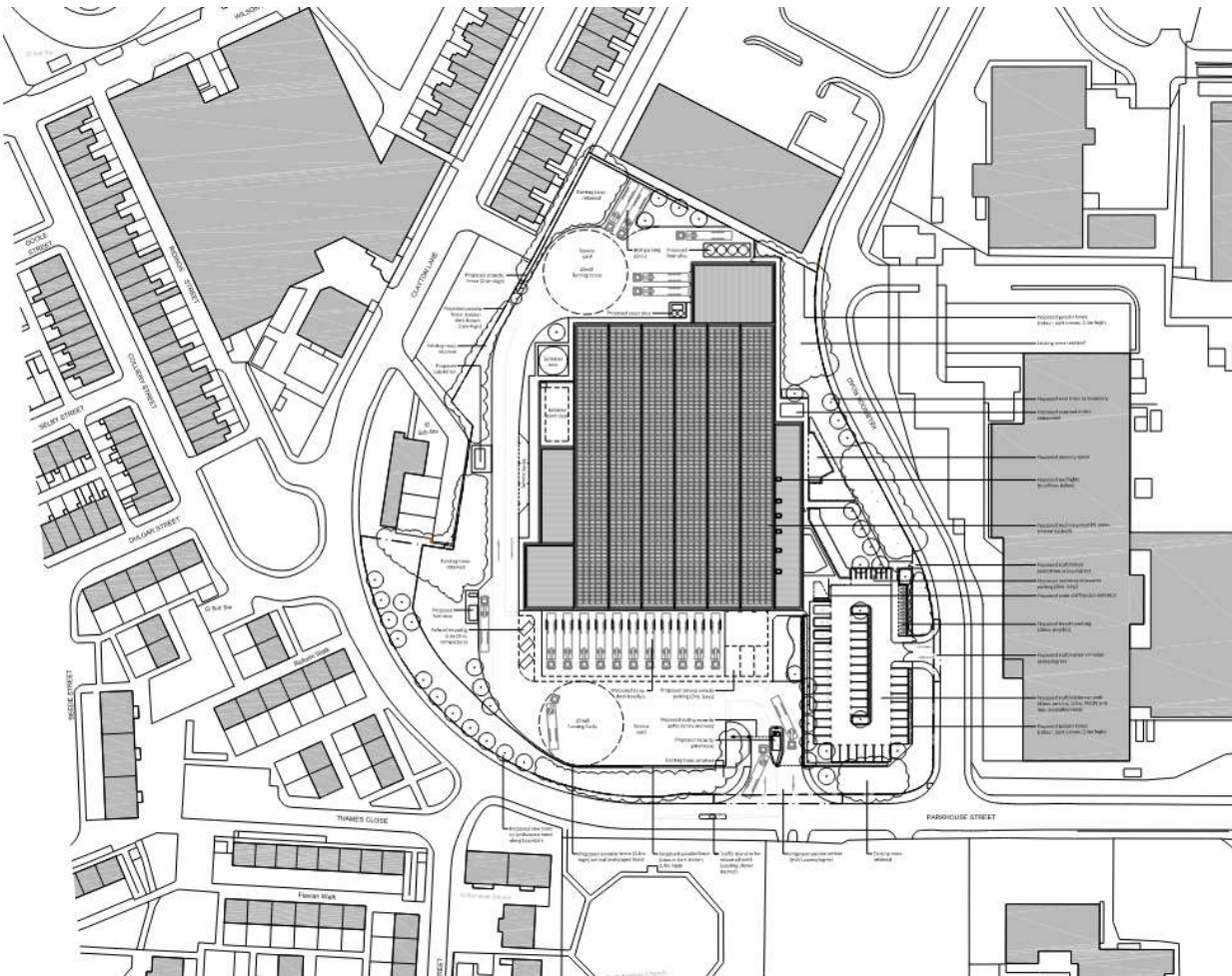


Figure 4.1 Proposed Preliminary Site Layout

- 4.3 An assessment of existing permeable/ impermeable areas is included in Figures 4.2 below and shown in **Appendix 3**. Existing/proposed site areas are summarised in Table 4.1 below.

Area	m ²	ha
Application Site Area Total	21,666	2.17
Existing Drained Impermeable areas	0	0.0
Proposed Impermeable Areas.	15,821	1.58
Percentage of (additional) Proposed Impermeable (PIMP) within application site	100%	

Table 4.1 Existing / proposed site areas.

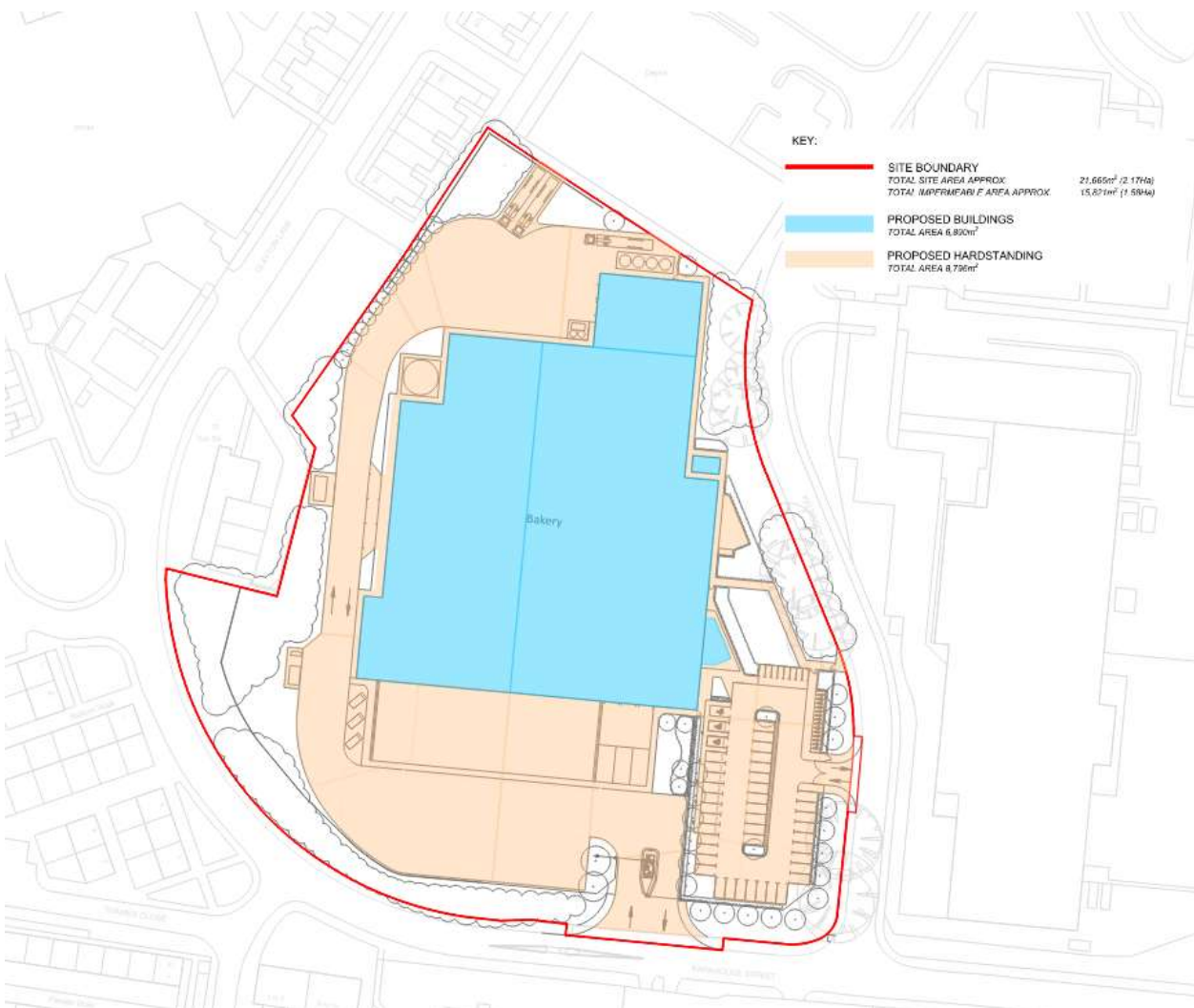


Figure 4.2 Proposed Impermeable Areas (to be drained).

- 4.4 Comparison of existing and proposed site areas presented in Table 4.2 and Figure 4.2 indicates an increase in impermeable areas post development.

Area	m ²	ha
Application Site Area Total	21,666	2.17
Existing Drained Impermeable areas	0	0.0
Percentage of Impermeable (PIMP) within application site	0%	
Total proposed impermeable areas.	15,821	1.58
Percentage of Impermeable (PIMP) within application site post-development	100%	
Increase in impermeable areas post development	15,821	1.58

Table 4.2 Proposed site areas.

5. CONSULTATION AND DATA REVIEW

Water Authority

- 5.1 A pre-planning consultation has been undertaken with the Water Authority, United Utilities. A response was received by email on 29/10/2024, reference **UU REF 06538060**, and is included in **Appendix 4** for reference.
- 5.2 The Water Authority advised foul flow from this site will be allowed to drain into the public 375dia or 450dia combined sewers running adjacent to the site.
- 5.3 They advised all surface water flow from the proposed development should drain in-line with the drainage hierarchy. They noted they would support the proposed surface water drainage strategy to drain to the culvert, and confirmed the requirement to discuss the diversion, connection points and flow rates with the riparian owner and local authority.
- 5.4 Further consultation will be acquired at planning, and the general principles will be followed from their standard guidance and consultation responses in due course.

Lead Local Flood Authority

- 5.5 A formal consultation has not been formally undertaken with the Lead Local Flood Authority for the area, Manchester City Council, at the time of writing this report.
- 5.6 Further consultation will be acquired at planning, and the general principles will be followed from their standard guidance and consultation responses in due course.
- 5.7 It is expected that a sustainable drainage system will need to be undertaken as part of a detailed drainage strategy.

Internal Drainage Board District

- 5.8 The Site is not located within an Internal Drainage Board (IDB) District.

6. EXISTING RUNOFF RATE

Existing Greenfield Runoff Rate

- 6.1 The existing site is considered fully developable, with an existing greenfield area assessed as 2.17ha, as shown in Table 5.2 above.
- 6.2 An assessment of the existing greenfield runoff rates has been undertaken using online HR Wallingford IH124 Methodology and the results are summarised in Table 7.1 below and the calculations are included within **Appendix 5**.
- 6.3 The assessment below includes rates for the full area of the existing site.

Return Period	Run-off Rates		
	Greenfield per 50 hectare (l/s/ha)	Greenfield per hectare (l/s/ha)	For total Developable area of Site (2.17ha)
1 in 1	281.80	5.64	12.2
Qbar	323.91	6.48	14.0
1 in 30	550.65	11.01	23.9
1 in 100	673.73	13.47	29.2

Table 6.1. Greenfield run off rate for a range of areas and return periods

Existing Greenfield Runoff Volume

- 6.4 An assessment of the existing greenfield runoff volume has been undertaken using Causeway Flow, and the results are summarised below in Figure 6.1.

Pre-development discharge

Site Makeup
Greenfield
Greenfield Method
FSR/FEH
Positively Drained Area (ha)
2.160
Soil Index
4
SPR
0.47
Catchment Wetness Index
105.037
Return Period (years)
100
Climate Change (%)
0
Storm Duration (mins)
360
Betterment (%)
0
PR
0.449
Runoff Volume (m³)
528

OK

Cancel

Calc

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

Figure 6.1 Pre-Development "Greenfield" run-off volume

Existing Brownfield Runoff Rate

- 6.5 The site is considered to be greenfield in terms of existing drainage systems and land use, therefore, no Pre-development (Brownfield) Runoff Volume has been calculated.

7. PROPOSED DRAINAGE RUN-OFF

Proposed Runoff Rate

- 7.1 As the site is considered to be fully greenfield and permeable, the proposed development will introduce additional impermeable/contributing areas.
- 7.2 It may therefore be necessary for surface water discharge from the site to be limited to the equivalent greenfield runoff rate.
- 7.3 The Regulatory Authorities will need to confirm the allowable discharge rates.
- 7.4 The National Standards for Sustainable Drainage systems (NSSDS 2011) and Non-Statutory Technical Standards for Sustainable Drainage (NSTSSD 2015) require that:
 - *For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield runoff rate for the same event. (S2 NSTSSD 2015).*
 - *‘For developments which were previously developed, the peak runoff rate from the development to any drain, sewer, or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event’. (S3 NSTSSD 2015).*
- 7.5 For this development, therefore, it is proposed that the drainage system should be designed with a proposed discharge rate as close as reasonably practicable to the existing Qbar greenfield runoff rate.
- 7.6 The existing greenfield rates are shown above within Table 6.1. On the assumption that the entire development is to be considered greenfield, this range of rates can be set as proposed discharge rates for the same rainfall events and are summarised below in Table 8.1.

Return Period	Run-off Rates
	For total Developable area of Site (2.16ha)
1 in 1	12.2
Qbar	14.0
1 in 30	23.9
1 in 100	29.2

Table 8.1. Greenfield run off rate for range of return periods

- 7.7 On the above basis, it is proposed that the proposed maximum discharge rate for the development be set at the existing QBar greenfield rate of **14l/s**.
- 7.8 The proposed development will introduce an additional 15,821m² of impermeable/contributing areas positively drained. This is based on Table 4.2 above, which, as stated, assumes all proposed buildings and all surfacing are impermeable. This is to ensure a robust analysis is undertaken, and is considered “worst case scenario”.

Proposed Runoff Volume

- 7.9 ‘Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same

event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.' (**S5 NSTSSD 2015**)

- 7.10 An assessment of the proposed storage volume required has been undertaken using Causeway Flow as a surface water storage estimate, both with and without an allowance for climate change, and the results are summarised below in Figure 7.1 and 7.2.

Storage Estimate	
Return Period (years)	100
Climate Change (%)	0
Impermeable Area (ha)	1.600
Peak Discharge (l/s)	14.000
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m³)	Calc
from	475
to	669

Figure 7.1. Surface Water Storage Volume Estimate (no climate change)

Storage Estimate	
Return Period (years)	100
Climate Change (%)	45
Impermeable Area (ha)	1.600
Peak Discharge (l/s)	14.000
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m³)	Calc
from	771
to	1064

Figure 7.2. Surface Water Storage Volume Estimate (including 45% climate change)

- 7.11 The assessment above suggests the proposed storage volume without an allowance for climate change would be between 475 m³ and 669 m³, giving an average value of 572m³.
- 7.12 The assessment above suggests the proposed storage volume would be between 771 m³ and 1064 m³, including an allowance of 45% for climate change, giving an average value of 918m³.
- 7.13 The comparison of greenfield, brownfield and proposed runoff volumes has been included within the table below.

	Application Site 21,589m ²
Proposed impermeable/contributing areas (m ²)	15,821
Existing Greenfield Runoff Volume (m ³)	528
Existing Brownfield Runoff Volume (m ³)	0
Total Existing Runoff Volume (m ³)	528
Proposed Runoff Volume from proposed impermeable areas (m ³) – not including Climate Change factor	572
Difference in Runoff volume post development (m ³)	Increase by 44
Proposed Runoff Volume including 45% Climate Change factor	918
Difference in Runoff Volume post development (m ³) including 45% Climate Change Factor	Increase by 390

TABLE 8.2. Greenfield, Brownfield and Proposed run-off volume - YR 100 (1% AEP) 6-hour rainfall event.

- 7.14 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body to brownfield runoff volume, S6 NSTSSD 2015 states that the runoff volume must be discharged at a rate that does not adversely affect flood risk.
- 7.15 The proposed discharge rate 14.0l/s. is considered meeting the above standard.

8. PROPOSED SURFACE WATER RUNOFF DESTINATION

- 8.1 According to National Standards for sustainable drainage systems Part II Section A – the following order of preference must be considered in respect of the Surface Water Runoff destination:

- Discharge into the ground,
- Discharge to surface water body,
- Discharge to a surface water sewer, drain,
- Discharge to a combined sewer,

- 8.2 Subject to complying with these National standards, different destinations may apply for different parts of the site.

Discharge into the ground - infiltration expectations

- 8.3 The proposed means of managing surface water runoff from the proposed development has been considered with respect to the hierarchy set out in Building Regulations Part H (2010) as follows.
- 8.4 Consideration of the proposed means of surface water drainage should firstly be given to infiltration techniques (to ground).
- 8.5 Infiltration rates are unconfirmed therefore the viability of proposing surface water disposal via infiltration is not known at this time. This will be investigated further to determine the suitability of infiltration systems.
- 8.6 On this basis, discharge into the ground is not yet confirmed as viable for the development, and alternative methods are considered below.

Discharge to surface water body.

- 8.7 The nearest watercourse is Clayton Brook, which is culverted through the site.
- 8.8 The culvert is recorded on the United Utilities sewer records as being 1200mm in diameter and shown to cross the site from the northeast to southwest. It is thought to run east – west across the site.
- 8.9 There are no other watercourses within the immediate vicinity of the Site.
- 8.10 On the above basis, discharge to the culverted surface water body crossing the site is recommended for the proposed development.
- 8.11 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out.

Discharge to Surface Water Sewer

- 8.12 As above, a proposed connection to the existing surface water culvert within the site is considered feasible, therefore, at this stage, a proposed connection to public sewer is not considered further at this time.

9. SuDS COMPONENTS

- 9.1 It is policy for all surface water systems for development sites to be designed using SuDS wherever possible.
- 9.2 Initial assessment of the SuDS techniques is summarised in Table 10.1 below.

TABLE: 10.1. Types of SuDS Components – Ciria SuDS Manual 2015.

Component Type	Description and Proposed Development Suitability	
Rainwater harvesting systems	Description	Rainwater is collected from the roof of a building or from other paved surfaces in an over ground or underground tank for use on site. Depending on its intended use, the system may include treatment elements. The system should include specific storage provision if it is to be used to manage runoff to a design standard.
	Suitability	Rainwater butts should be considered.
Green Roofs/ Blue Roofs	Description	A planted soil layer constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by the vegetation. Blue roofs store water at roof level, without the use of vegetation.
	Suitability	Not suitable due to the development layout.
Infiltration systems	Description	These systems collect and store runoff allowing it to infiltrate into the ground. Overlaying vegetation and underlaying unsaturated solid can offer protection to ground water from pollution risks.
	Suitability	Infiltration rates are unconfirmed therefore the viability of proposing surface water disposal via infiltration is not known at this time. This will be investigated further to determine the suitability of infiltration systems.

Filter Strips	Description	Runoff from impermeable area is allowed to flow across a grassed or otherwise planted area to promote sedimentation and filtration.
	Suitability	Shedding water to landscaped areas will be encouraged where site layout and external levels permit.
Filter drains	Description	Runoff is temporarily stored below the surface in a shallow trench filled with stone/gravel, providing attenuation, conveyance and treatment (via filtration).
	Suitability	Not suitable due to the development layout and soil infiltration properties.
Swales	Description	A vegetation channel is used to convey and treat runoff via shallow naturally landscaped channels that convey and/or infiltrate the runoff (via infiltration). These can be 'wet', where water is designed to remain permanently at the base of the swale, or 'dry' where water is only present in the channel after rainfall events. It can be lines, or unlined to allow infiltration.
	Suitability	Not suitable due to the development layout.
Bioretention systems	Description	A shallow landscaped depression allows runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils prior to collection or infiltration. In its simplest form it is often referred to as a rain garden. Engineered soils (gravel and sand layers) and enhanced vegetation can be used to improve treatment performance.
	Suitability	Small rain gardens could be incorporated within landscaping. Proprietary systems suggested below.
Trees	Description	Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone features within soil-filled tree pits, tree planters or structural soils, collection and storing runoff and providing treatment (via infiltration and phytoremediation).
	Suitability	Existing trees will be retained where possible. See ecologist report for details.
Pervious Pavements	Description	Runoff is allowed to soak through structural paving. This can be paving blocks with gaps between solid blocks, or porous paving where water filters through the block itself. Water can be stored in the sub-base and potentially allowed to infiltrate into the ground.
	Suitability	The vehicle parking areas have potential for pervious/porous pavement systems, as shown on the attached Proposed Drainage Plan.
Attenuation storage tanks	Description	Below ground voided spaces can be used to temporarily store runoff before infiltration, controlled release or use. The storage structure is often constructed using geocellular or other modular storage systems, concrete tanks or oversized pipes.
	Suitability	Attenuation storage tanks could be utilised as part of the drainage proposal via Proprietary systems suggested below. See attached Proposed Drainage Plan.
Detention Basin	Description	During a rainfall event, runoff drains to a landscaped depression with an outlet that restricts flows, so that the basin fills and provides attenuation. Generally, basins are dry, except during and immediately following the rainfall events. If vegetated, runoff will be treated as it is conveyed and filtered across the base of the basin. Naturally, vegetated depressions designed to store runoff temporarily.
	Suitability	Not suitable for the Proposed Development Layout.

Ponds and wetlands	Description	Features with a permanent pool of water can be used to provide attenuation and treatment of runoff, where outflows are controlled, and water levels are allowed to increase following rainfall. They can support emergent and submerged vegetation along their shoreline and in shallow. Marshy zones, which enhance treatment processes and biodiversity.
	Suitability	Small ponds are not proposed on this development.

9.3 It is proposed to adopt appropriate SuDS throughout the new development wherever possible, with specific target areas being:

- Source Control SuDS techniques, such as rain gardens with broad leaves high water interception species. Permeable surfaces with overflow to next stage of drainage system will be encouraged where possible.
- Site - control - reduction in peak flows to outfall, thereby not increasing flood risk downstream of connection.
- Improvement of water quality arriving at outfall (passive removal of pollutants), thereby reducing potential for pollution downstream of the connection point.

9.4 Based on the assessment of the hierarchy of discharge, the proposed site layout and topography, the following SuDS elements have been included within the proposed surface water management on site:

- **Surface Water Storage and Attenuation: Geocellular Attenuation System**
- **Proprietary Treatment System: GreenBlue HydroPlanter System**

9.5 Indicative information of the HydroPlanter system is shown below:



Figure 10.1 Proposed GreenBlue HydroPlanter System (Source: GreenBlue)



Figure 10.2 Proposed GreenBlue HydroPlanter System (Source: GreenBlue)

10. CLIMATE CHANGE ALLOWANCE

- 10.1 It is anticipated that climate change will bring an increase in rainfall intensity in the future and therefore an allowance for climate change should be included to help minimise vulnerability and provide resilience to flooding and coastal change in the future. Both the 'central' and 'upper end' allowance should be assessed to understand the range of impact.
- 10.2 The 'Central' allowance should be applied to the surface water drainage network/design to assess its performance and ability to contain critical events. The 'Upper End' allowance should be applied to assess the potential flood risk implications to the site and to ensure that flooding is wholly contained onsite.
- 10.3 New Environment Agency guidance "Flood risk assessments: climate change allowances" issued in August 2022 provides up to date information on expected changes in rainfall, river flows and sea level rise as a consequence of climate change based on a 1981-2000 baseline.
- 10.4 The Environment Agency Guidance in Figure 11.1 and Table 11.1 show a summary of the anticipated changes in extreme rainfall intensity within in the Irwell Management Catchment.

Table 11.1 Peak rainfall intensity allowance in small and urban catchments.

Applies across all of England	Total potential change anticipated for the 2050s (2040-2069)	Potential Change anticipated for the 2080s (2070 – 2115)
Upper End	+40%	+45%
Central	+25%	+30%

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

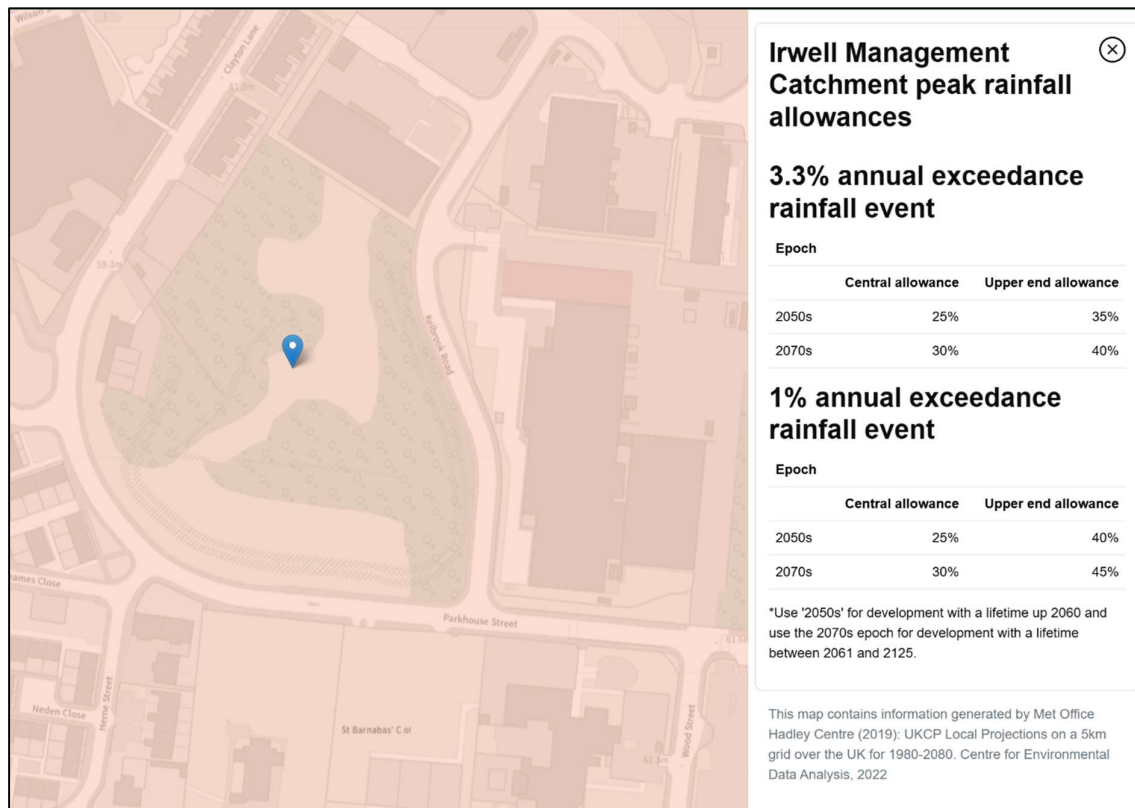


Figure 11. 1 Peak rainfall intensity allowance in small and urban catchments

- 10.5 The National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (NPPG) states that the residential development should be considered for a minimum of 100 years, but that the lifetime for a nonresidential development depends on the characteristics of the development.
- 10.6 Drainage design methods limiting surface water disposal flows should incorporate rainfall intensities that have been increased by 45% to take account of the effects of climate change until the year 2115.
- 10.7 It is recommended that for the proposed development the drainage is designed to make sure there is no increase in the rate of runoff discharge from the site for the upper end allowance of 45% CC (Climate Change).

11. SURFACE WATER DRAINAGE STRATEGY

- 11.1 A preliminary drainage strategy has been undertaken to establish principles of the design for foul and surface water drainage for the proposed development.
- 11.2 All drained areas will be designed to meet the Statutory Requirements as follows:
 - Source Control SuDS techniques such as rain gardens planted with broad-leaved shrubs/plants with high rainfall interception and water demand allowing interception of surface water runoff from adjoining surfaces.
 - Site control - All SuDS features will be designed for the critical 100-year (1%) rainfall event with an allowance for climate change and therefore there will be no risk of uncontrolled flooding on site for all rainfall events up to 100-year return with 45% climate change.

- All exceedance flows beyond those for which the drainage system is designed will be directed thought the site, as such that there will be no risk of flooding of vulnerable or critical areas.
- 11.3 Via proprietary systems, permeable surfaced SuDS features will be encouraged throughout the development to provide interception and pollution removal, storage and disposal via partial infiltration at source with overflow from the sub-base storage layer to next element of drainage system i.e. attenuation structures.
- 11.4 All recommendations will be investigated/developed further during the detailed design stage.
- 11.5 The Phase 2 Geo-Environmental Investigation advises that the presence of substantial depths of Made Ground across the site may result in settlement and recommends that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement. This will need to be considered further at detailed design stage.
- 11.6 Current drainage strategy includes:
 - GreenBlue HydroPlanter system, a modular bioretential rain garden system.
 - Geocellular Attenuation Tank
- 11.7 All recommendations will be investigated/developed further during the detailed design stage and are subject to amendment.

Surface Water Network

- 11.8 All surface water runoff arising from the proposed building, parking, service yard, access road, ponds and any other impermeable areas (approximate contributing area of 15,821sqm) will be directed by underground gravity pipes to attenuation storage structures. Proprietary treatment systems are proposed to satisfy the SuDS requirements of the system.
- 11.9 Discharge from attenuation structures will be via flow control devices set to the agreed discharge rate to the proposed discharge location.
- 11.10 See attached Outline Drainage Strategy plan in **Appendix 6**.
- 11.11 See attached hydraulic surface water calculations in **Appendix 7**.
- 11.12 Proposed systems to be installed in strict accordance with manufacturers' design and instructions. Systems to include maintenance access features / ventilation pipes as required.
- 11.13 In order to accommodate the 1 in 100 year plus 45% climate change event, based on the proposed discharge rate, approximately 918m³ of storage would be required.
- 11.14 It is proposed that the majority of the attenuation will be provided within a geocellular attenuation tank system with isolator row.
- 11.15 The configuration, depths and layout of the attenuation features will need to be calculated in more detail when the existing and proposed details are clarified further.

12. FOUL WATER DRAINAGE STRATEGY

Foul Water Network

- 12.1 The foul water records noted above indicate that there are combined public sewers within the highways to the west and south of the site. United Utilities has advised that foul flow from this site will be allowed to drain into the public 375dia or 450dia combined sewers running adjacent to the site.

- 12.2 Foul Water flows associated with the proposed development will therefore be directed into the existing public combined drainage network. See attached Outline Drainage Strategy plan in **Appendix 6**.
- 12.3 Therefore, a connection into the existing public drainage system is recommended as the point of discharge for Foul Water from the site.
- 12.4 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out.
- 12.5 Any proposed private foul drainage will be designed in accordance with Building Regulations Document H1.
- 12.6 Any connections are to be approved by United Utilities prior to any works being undertaken on the existing network.

13. DESIGN FOR EXCEEDANCE

- 13.1 The drainage system will be designed so that, unless an area is designed to hold/or convey water as part of the design, flooding does not occur on any part of the site for 1 in 100-year rainfall event plus 45% climate change.
- 13.2 The design has considered flows resulting from rainfall in excess of the 1 in 100-year rainfall event plus 45% climate change and site surfaces will be modelled so that flood flows generated on site from events beyond the stipulated drainage design criteria will be directed away from vulnerable areas and contained on site where possible.
- 13.3 Following measures have been considered:
- Slope of footpaths/driveways to direct surface water away from buildings where possible,
 - Raised and dropped kerb details to direct flow,
 - Raised door threshold, dpc height 150mm around the proposed buildings

14. WATER QUALITY

- 14.1 Runoff quality from various land use is classed as Very Low, Low, Medium, and High Hazard depending on its source.
- 14.2 Pollution hazard from non-residential car parking is classed as **low**. Removal of gross solids and sediments is required. Silt chambers to be installed upstream of attenuation tanks.
- 14.3 Pollution hazard from commercial yard and delivery yards, low traffic roads, (e.g. general access road) is classed as **medium** and simple index approach will be used to deliver adequate treatment.

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, roofs (excluding residential) , residential car parks, low traffic roads, (e.g. cul de sacs, home zones, general access road), non-residential	Low	0.5	0.4	0.4

Commercial yard and delivery yard, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
--	--------	-----	-----	-----

Table 15.1. Minimum water quality management requirements for discharge to receiving surface waters and groundwater – Extract from Ciria SuDS Manual 2015 Table 26.2

- 14.4 Bespoke products are proposed to be incorporated as part of the drainage network, to provide a suitable system configuration to accommodate the required on-site storage to attenuate the calculated runoff and manage the treatment train to provide appropriate pollution mitigation.
- 14.5 Where run off cannot be intercepted by treatment SuDS, other forms of treatment such as petrol interceptors will be used to ensure water quality is managed appropriately.

The Proposed SuDS Components -

- 14.6 Pollution Mitigation Indices for Proprietary Treatment System: GreenBlue HydroPlanter System / TreePits
- Pollution Mitigation Index - Suspended Solids TSS = 0.8
 - Pollution Mitigation Index - Metals = 0.8
 - Pollution Mitigation Index - Hydrocarbons = 0.8
- 14.7 Following assessment of the pollution indices for the development (**Low** and **Medium**) Hazard and the pollution mitigation indices for the proposed SuDS Components, it is considered that the total mitigation level of proposed SuDS components exceeds the development pollution risk and therefore comply with the Water Framework Directives.
- 14.8 Additional Silt trap units or silt filters can be specified for surface water inspection chambers throughout the system to minimize silt accumulation in the proposed drainage network.
- 14.9 Manufacturer of Proprietary Treatment Systems noted above to confirm whether additional oil interceptors need to be incorporated into the proposed system to assist intercepting suspended solids, metals and hydrocarbons.
- 14.10 Channel drains and road gullies can also be specified with silt sump units.

15. EXECUTIVE SUMMARY

- 15.1 The site development lies within Flood Zone 1, there is no requirement to satisfy either the Sequential Test or the Exception Test.
- 15.2 A surface water drainage strategy has been prepared for the site providing interception, attenuation, and controlled disposal for all rainfall events up to and including the 100-year critical rainfall event with an increase of 45% to allow for increases in rainfall intensities due to climate change.
- 15.3 Infiltration testing needs to be carried out to confirm the viability of discharging to the ground via soakaways.
- 15.4 It is proposed in accordance with the drainage hierarchy that surface water runoff will be directed into the existing culverted watercourse that passes through the site as the point of discharge for Surface Water from the site.
- 15.5 The existing culverted watercourse currently sits within the proposed building footprint. Therefore the watercourse will need to be diverted to mitigate the potential for it to be damaged during construction works and to allow for easier maintenance access.
- 15.6 All surface water runoff arising from the existing building extension, parking, service yard and access road (approximate contributing area of 15,821 m sq.) will be directed by underground gravity pipes to attenuation storage structures.
- 15.7 Discharge from attenuation structures will be via flow control devices set to the agreed discharge rate to the proposed discharge location.
- 15.8 Drainage design considers flows resulting from rainfall in excess of the 1 in 100-year rainfall event plus 45% climate change. Site surfaces should be modelled so that flood flows generated on site from events beyond the stipulated drainage design criteria will flow away from buildings and other sensitive areas and will be contained on site as reasonably practicable.
- 15.9 Connection into the existing combined sewers neighboring the site is recommended as the point of discharge for Foul Water from the site.
- 15.10 At this stage, the existing invert levels are unconfirmed, and therefore the requirement of a pumped solution cannot be ruled out for both foul and surface water.
- 15.11 All SuDS on site will be installed with full consideration for long term maintenance.
- 15.12 Any proposed on-site drainage will be designed and constructed in accordance with current best practice, Lead Local Flood Authority and Regulatory Authority requirements and Building Regulations as appropriate.

APPENDIX 1 – TOPOGRAPHICAL SURVEY

APPENDIX 2 – PROPOSED SITE PLAN

APPENDIX 3 – PROPOSED IMPERMEABLE AREAS PLAN

APPENDIX 4 – UNITED UTILITIES PRE-DEVELOPMENT RESPONSE

APPENDIX 5 – GREENFIELD RUN-OFF RATES

APPENDIX 6 – PROPOSED DRAINAGE LAYOUT

APPENDIX 7 – HYDRAULIC CALCULATIONS