



DRAINAGE STRATEGY

FOR

RESIDENTIAL DEVELOPMENT

AT

**Drake Street,
Rochdale OL16 1PJ**

HBL Ref: 11524-HBL-XX-XX-RP-C-5151

REV.P03

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1. INTRODUCTION

Scope of Appraisal

- 1.1 HBL Associates Ltd has been instructed by Great Places Housing Group to prepare a Drainage Strategy (DS) to accompany a planning application for a residential development at Land off Drake Street, Rochdale, OL16 1PJ.
- 1.2 The project comprises a residential development delivering 27 affordable dwellings on the Drake Street site, consisting of; an apartment building fronting Drake Street; a terrace of 4 large family houses; and associated external works, access, refuse store, and cycle store.

Table 1.1 Existing Site Details.

Project Name	Drake Street
Project Description	A residential development comprising 27 affordable dwellings, arranged as a three-storey apartment building fronting Drake Street and a terrace of four family houses fronting Broadfield Stile. The proposals also include associated access, parking, landscaping, cycle storage, refuse storage, boundary treatments and external works.
Location	Drake Street, Rochdale, OL16 1PJ.
NGR (Approximate)	SD 8912 4386
Application Site Area (ha) Red Boundary Line	0.335ha
Development Type	Brownfield
Type of Planning Application	Full Planning Application
Local Planning Authority	Rochdale Borough Council
Lead Local Flood Authority	Rochdale Borough Council
Sewerage Undertaker	United Utilities Plc.

- 1.3 The purpose of this Drainage Strategy Report is to assess the drainage implications arising from the proposed development and to establish an appropriate, sustainable and policy-compliant approach to the management of foul and surface water. This includes the identification of suitable mitigation measures and the consideration of opportunities for the integration of Sustainable Drainage Systems (SuDS) within the scheme.
- 1.4 This report sets out the design criteria, modelling parameters and key assumptions adopted in the drainage assessment and presents the proposed strategy for the management of foul and surface water runoff generated by the development, having regard to the surface water drainage hierarchy.
- 1.5 The findings, recommendations and conclusions presented in this report are based on information obtained during the course of the assessment, including third-party records and site-specific investigations. Whilst reasonable care has been taken in reviewing and interpreting this information, HBL cannot warrant the completeness or accuracy of data provided by others.
- 1.6 This report has been prepared in accordance with the National Planning Policy Framework (NPPF), associated Planning Practice Guidance (PPG), the Non-Statutory Technical Standards for Sustainable Drainage Systems (2015), the National Standards for Sustainable Drainage Systems (2025), relevant Local Plan policies, and guidance issued by the Environment Agency and other statutory consultees.

- 1.7 This document should be read in conjunction with all associated drawings, hydraulic calculations and supporting technical documentation.

Source of information

- 1.8 This report is informed by the following data:

- Topographical survey information:
 - Topographical Survey – Malcolm Hughes 62032/1 August 2024.
- Planning drawings:
 - Proposed Site Plan –19146-PJA-00-ZZ-DR-A-1200-K
 - Site Location Plan - 19146-PJA-00-ZZ-DR-A-1000
- Ground Investigation Reports:
 - Phase 1 - IGE Consulting Report ref: 3931-01 August 2024
 - Phase 2 - IGE Consulting Report ref: 3931-02D May 2026.
- Flood Risk Assessment Report
 - N/A
- Drainage Maintenance Report
 - Report ref: 11524-HBL-XX-XX-RP-C-5152 Rev.P02

National Planning Policy

National Planning Policy Framework (Updated: December 2024).

- 1.9 The National Planning Policy Framework (NPPF) promotes a risk-based, sustainable approach to managing surface water in new developments. Key principles include:
- Avoiding increased flood risk: Developments must be designed so they do not increase flood risk elsewhere, both during construction and over their lifetime.
 - Sustainable Drainage Systems (SuDS): The NPPF encourages the use of SuDS in all major developments, unless demonstrated to be inappropriate, to manage surface water runoff close to source and improve water quality, biodiversity, and amenity.
 - Climate change resilience: Drainage design must consider climate change allowances, ensuring that runoff from extreme rainfall events is effectively managed over the development's lifetime.
 - Early integration in design: Drainage strategies should be developed at an early stage to support site layout, landscape design, and flood risk mitigation in line with Planning Practice Guidance (PPG) and Lead Local Flood Authority (LLFA) requirements.

Local Planning Policy

Policy Ref: Rochdale Borough Local Plan S4: Managing Water Resources and Flood Risk.

- 1.10 Rochdale Core Strategy Policy G8 – Managing Water Resources and Flood Risk, which seeks to ensure that development:
- Does not increase flood risk on-site or elsewhere. Considers and addresses all sources of flood risk, including surface water, fluvial, groundwater and sewer flooding.
 - Incorporates appropriate Sustainable Drainage Systems (SuDS).

- Manages surface water in accordance with the drainage hierarchy, prioritising infiltration where feasible.
- Protects and enhances the water environment and water quality.
- Contributes to climate change resilience, including appropriate climate change allowances in drainage design.

Consideration of Climate Change

- 1.11 As explained in the Climate Change Adaptation Sub-Committee Progress Report 2014, increased flood risk is the greatest threat to the UK from climate change.
- 1.12 More frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall could be expected. Sea levels are also expected to continue to rise.
- 1.13 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.
- 1.14 The contingency allowances for climate change that are potentially applicable to this site are shown in Figures 1.1. and 1.2 below.

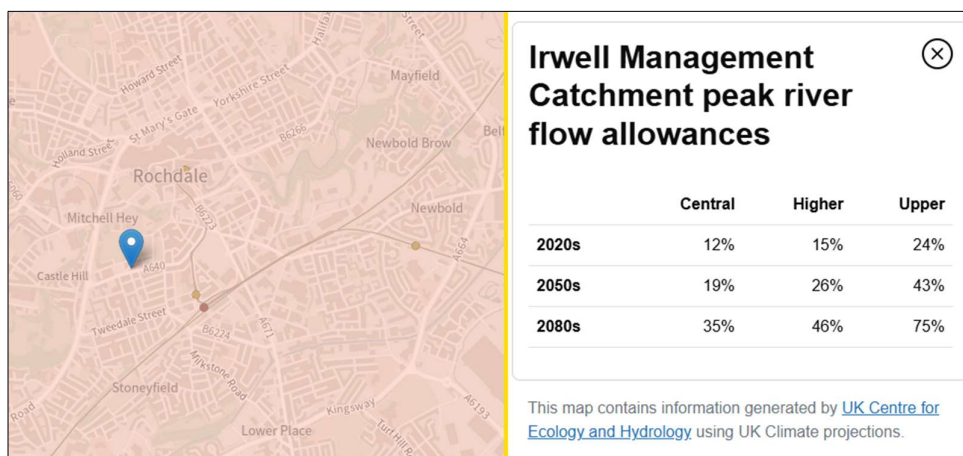


Figure 1.1 Peak River Flows –Catchment peak river flow allowances.

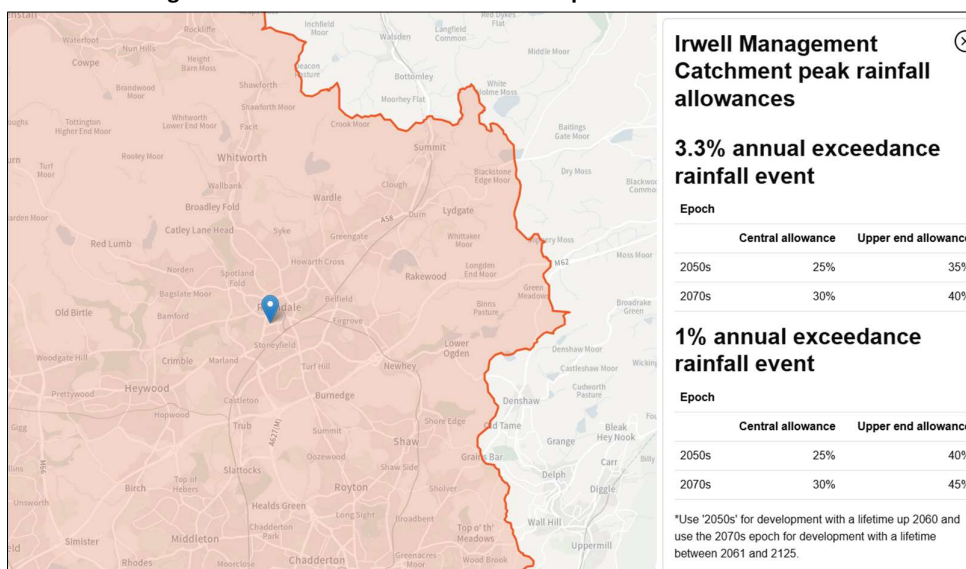


Figure 1.2 Peak Rainfall –Catchment peak rainfall allowances.

2. EXISTING SITE CONTEXT

Site Location

- 2.1 The application site comprises approximately 0.33 hectares of previously developed land located to the north of Drake Street, Rochdale, approximately 0.5 km south of Rochdale Town Centre (postcode OL16 1PJ).
- 2.2 The site is bounded by Drake Street to the south, Broadfield Stile to the east, residential properties and Broadfield Park to the north, and garages with further residential development beyond to the west.
- 2.3 The surrounding townscape is characterised by predominantly two- and three-storey brick buildings forming a traditional urban street frontage.
- 2.4 The site is currently vacant and overgrown, with evidence of former development including areas of hardstanding and demolition material.

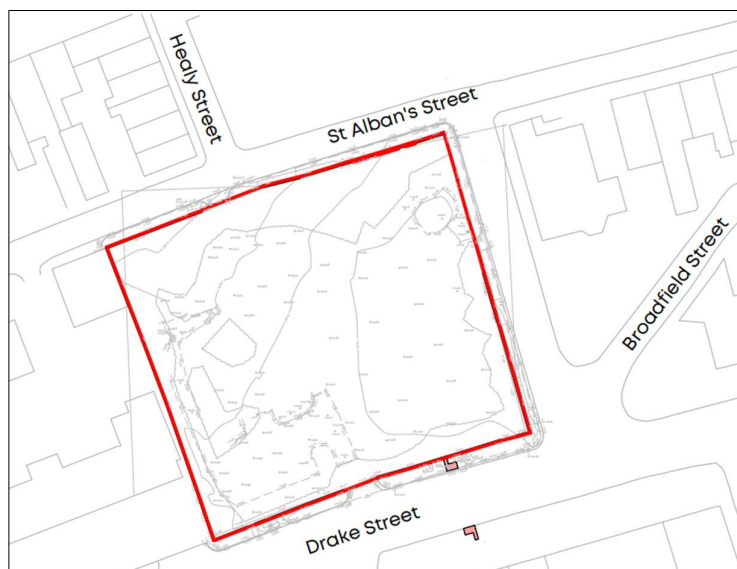


Figure 2.1 Site Location Plan – (Source:)



Figure 2.2 Recent Satellite imagery – (Source: Google Earth 2025)

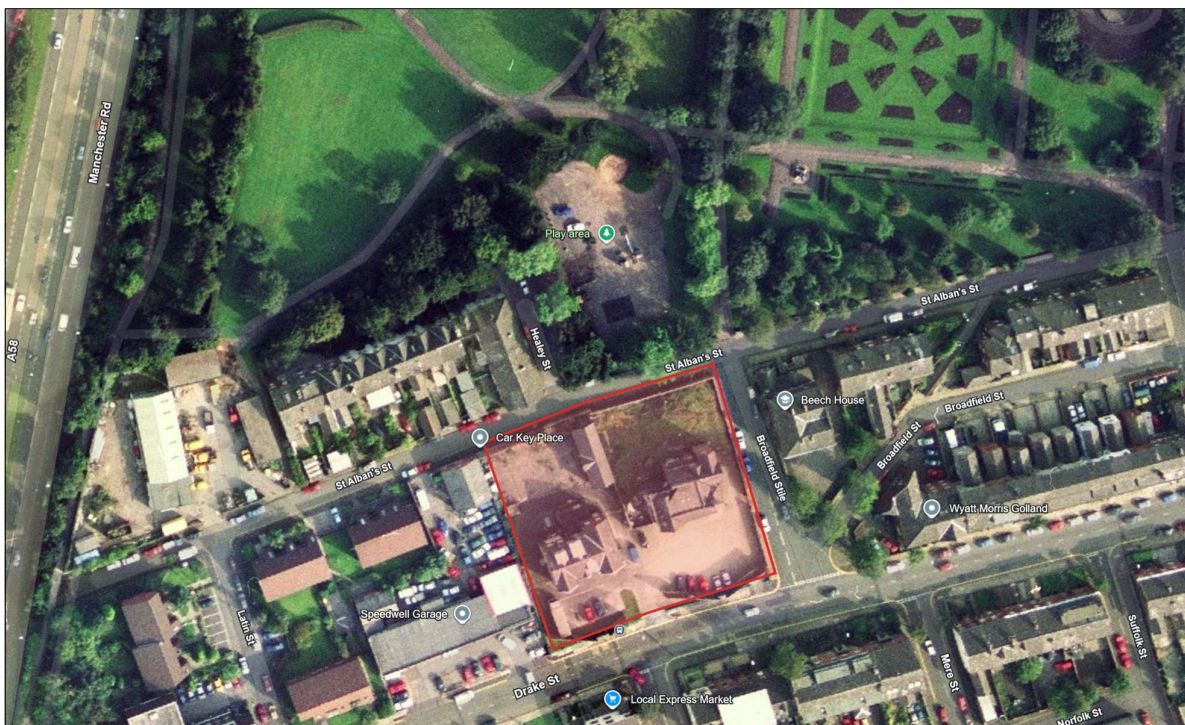


Figure 2.3 Historic Satellite imagery – (Source: Google Earth 2000-2005)

- 2.5 The site benefits from existing vehicular access points along Drake Street (A640) where a dropped kerb and widened hardstanding area are present along the southern boundary, indicating established vehicular use.
- 2.6 A further dropped kerb is identifiable along Broadfield Stile, suggesting secondary or historic access provision to the eastern boundary.
- 2.7 In addition, a localised dropped kerb is visible towards the north-east corner of the site along St Alban's Street, which may have previously facilitated limited vehicular access.

Site Topography

- 2.8 A topographical survey has been undertaken by Malcolm Hughes reference 62032/1_2 August 2024 included in Appendix A, which has been updated in March 2026.
- 2.9 The site generally slopes gently from east to north-west, with ground levels recorded at approximately 144.56m AOD in the southeastern corner of the site, falling to around 143.000 m AOD in the north-western corner.
- 2.10 Localised changes in levels are associated with areas of demolition rubble and made ground likely resulting from previous site clearance works.

Existing Impermeable Areas

- 2.11 The existing contributing areas plan is included as Figure 2.4 and provided within Appendix A, with the existing site areas summarised in Table 2.1 below.
- 2.12 The plan is based on the visible existing impermeable areas identified from the topographical survey and aerial imagery. It should be noted that further areas of hardstanding may be present beneath the existing overgrown

vegetation and made ground material; however, these cannot be accurately confirmed without further site clearance or intrusive investigation.

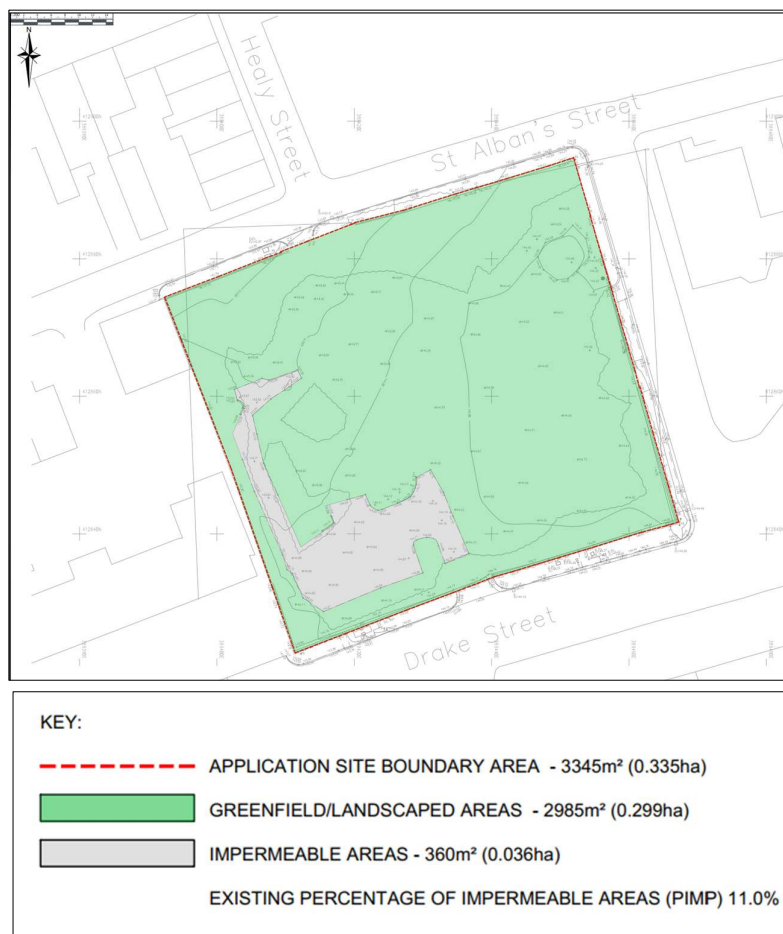


Figure 2.4 Application Site Area showing existing identified impermeable areas.

Table 2.1 Existing site areas.

Area	m ²	ha
Application Site Area Total	3345	0.335
Existing Impermeable Areas.	360	0.036
Percentage of Impermeable (PIMP) within application site	11%	
Remaining vegetated/landscaped areas	2985	0.299

3. EXISTING GROUND CONDITIONS

Geology

3.1 The British Geological Survey (BGS) online mapping (1:50,000 scale) shows that the site is underlain by:

- **Superficial Deposits** - Glaciofluvial deposits, Devensian-Sand and gravel. These sedimentary deposits are glaciofluvial in origin. They are detrital, generally coarse-grained, they form beds, channels, plains and fans associated with meltwater.
- **Bedrock Deposits** - Pennine Lower Coal Measures Formation-Mudstone, siltstone and sandstone. These sedimentary rocks are fluvial, palustrine and shallow-marine in origin. They are detrital, forming deposits reflecting the channels, floodplains and deltas of a river in a coastal setting (with periodic inundation from the sea).

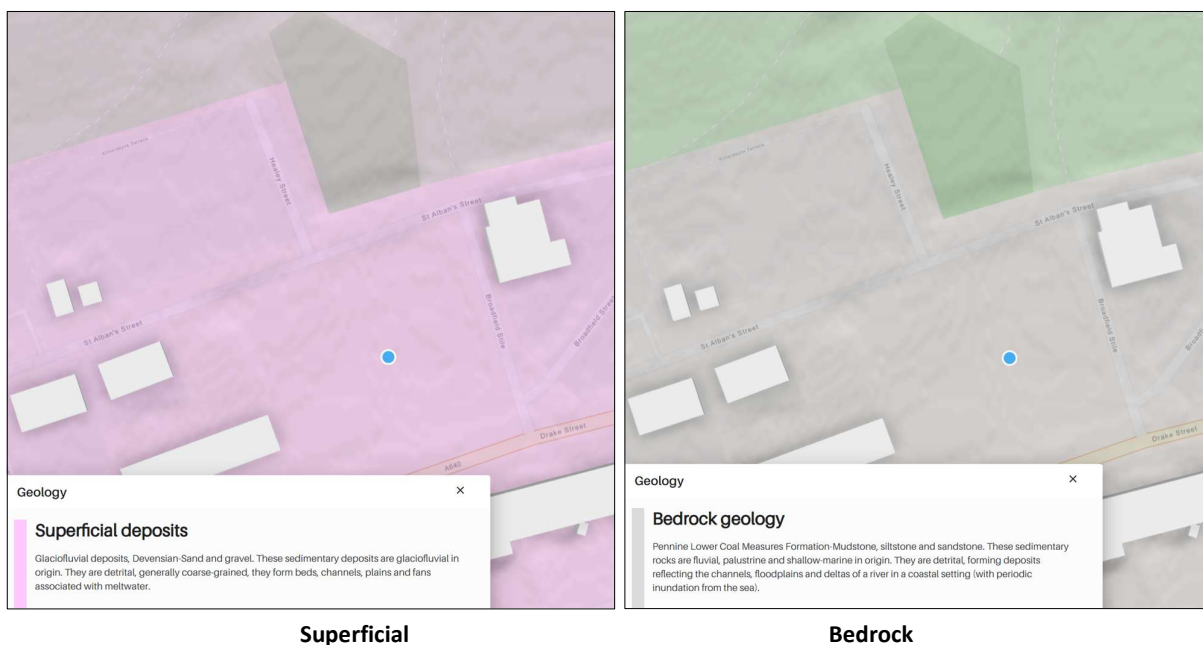


Figure 3.1: Extract from BGS Geology Viewer

- 3.2 A review of the Phase 2 Ground Investigation indicates that the site is generally underlain by Made Ground over Glaciofluvial Deposits.
- 3.3 Made Ground is typically encountered to depths of approximately 1.2 m to 2.7 m bgl, comprising predominantly gravelly sands with cobbles and occasional anthropogenic materials (brick, clinker and ash). The Made Ground thickness is locally greater toward the south-western part of the site.
- 3.4 Underlying the Made Ground are Glaciofluvial Deposits, consisting primarily of sands and gravels, locally medium dense to dense, with occasional silt and clay bands. These natural deposits extend to the maximum explored depth of approximately 5.45 m bgl.

Hydrogeology and Groundwater Vulnerability

- 3.5 A review of the Environment Agency Aquifer Designation Map (England) confirms that the site is not located within a designated Principal Aquifer. The Phase 2 Geo-Environmental Report identifies groundwater within the underlying superficial deposits as a potential controlled waters receptor and refers to underlying Secondary A Aquifers.

-
- 3.6 UK Government MAGIC mapping confirms that the site is located outside of any Source Protection Zone (SPZ), Drinking Water Safeguard Zone (Groundwater), Drinking Water Safeguard Zone (Surface Water), and Drinking Water Protected Area (Surface Water).
- 3.7 The Environment Agency Groundwater Vulnerability Map identifies the site as falling within a Medium–High groundwater vulnerability classification. This indicates that the superficial soils may permit vertical migration of pollutants to groundwater under certain conditions.
- 3.8 The Phase 2 Geo-Environmental Report identifies Made Ground across the site to depths of between 0.70m and 1.60m bgl, with elevated concentrations of metals, PAHs and TPH recorded within the Made Ground, together with a hydrocarbon odour in DS05. The Made Ground is therefore identified as a potential contaminative source, although the report concludes that the overall risk to controlled waters is low. Refer to Phase 2 Report, Sections 4.4 and 4.4.1.
- 3.9 The Phase 2 Report also notes that hydrocarbon impacts were recorded in the western part of the site, including DS01, DS05 and DS07, and that migration from the off-site historical/current garage cannot be discounted. However, no significant evidence of contamination migration, such as hydrocarbon free product, was recorded. Refer to Phase 2 Report, Section 4.2.
- 3.10 The Phase 2 Report identifies potential vertical migration pathways through coarse Made Ground and granular superficial deposits. However, the report states that the contaminants of concern are relatively low in solubility and mobility, and that testing of the underlying natural deposits did not record elevated determinands, indicating that significant migration is not occurring. Refer to Phase 2 Report, Section 4.4.
- 3.11 Groundwater was not widely encountered during the intrusive works, although local groundwater was recorded during monitoring at approximately 2.0m–2.4m bgl. The infiltration testing report also recorded slight water ingress at approximately 2.80m bgl in SA02.
- 3.12 The Remedial Strategy Report, Ref. 3931-03A, Sections 2.1 and 2.2, requires Made Ground and natural soils to be appropriately excavated, segregated and managed around drainage features, including excavation to 500mm below drainage bedding level where necessary. Service runs are to be backfilled with clean stone or chemically proven inert fill, and monitoring wells/boreholes are to be sealed to prevent contaminant transport.
- 3.13 The Remedial Strategy Report, Ref. 3931-03A, Section 3.1, Pages 15–17, requires clean cover systems within both private rear gardens and POS/soft landscaping areas. A 600mm cover system is required within private rear gardens, while a 300mm cover system is required within POS/soft landscaping areas.
- 3.14 On this basis, infiltration drainage is not proposed as the primary surface water disposal method. Surface water runoff will instead be collected within a positive drainage system, attenuated on site and discharged at a controlled rate in accordance with the drainage hierarchy. This approach avoids the deliberate concentration of surface water through Made Ground and reduces the potential for mobilisation of contaminants to groundwater.
- 3.15 Existing Surface Water Features
- 3.16 The site does not contain any open watercourses, ponds, drainage ditches or other surface water features within its boundary.
- 3.17 The nearest identified surface water receptor is the River Roch, designated as a Statutory Main River, located approximately 324m north of the site. The site is separated from the River Roch by established urban development and intervening road infrastructure, and there is no direct hydrological or topographical connectivity between the site and the Main River.

- 3.18 The Phase 2 Geo-Environmental Report, Section 4.4, states that lateral migration and overland flow to the surface water receptor is considered highly unlikely, given the distance to the receptor and the underlying ground conditions, which are considered more likely to facilitate vertical rather than lateral migration.

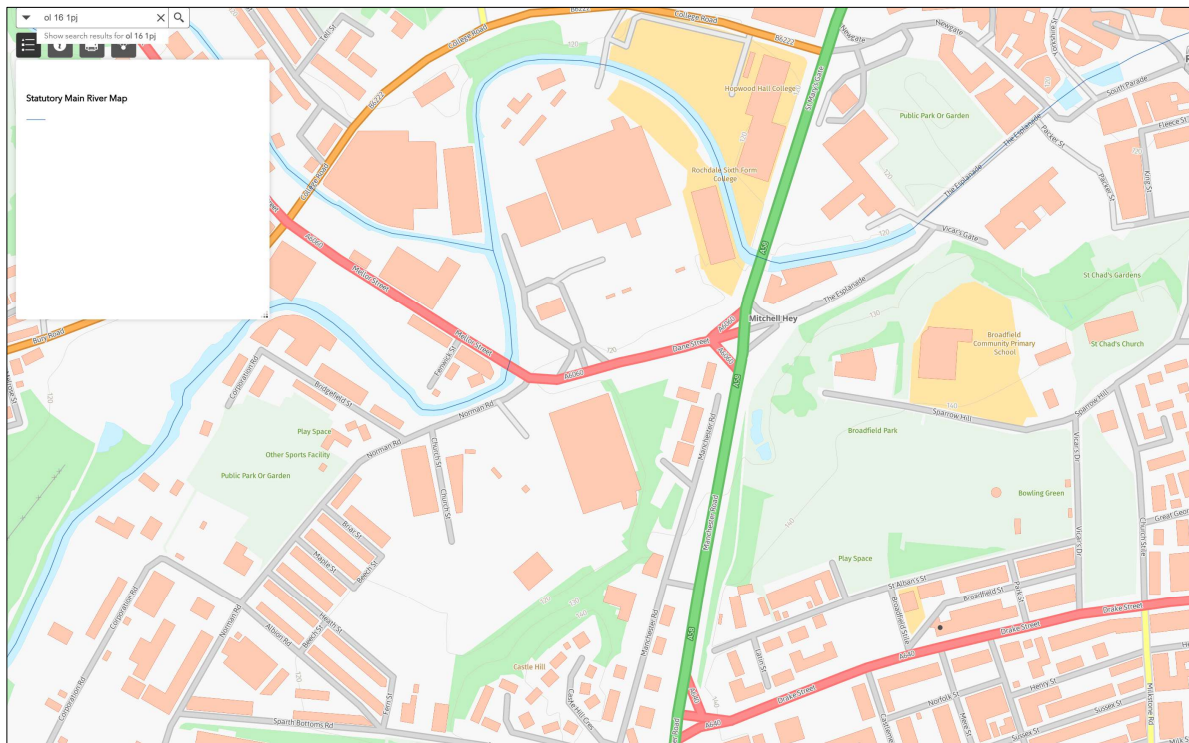


Figure 3.2 Statutory Main River Map (Source: Environment Agency).

- 3.19 A review of the site and surrounding area has not identified any open ordinary watercourses within or immediately adjacent to the site boundary.
- 3.20 Desk-based assessment of available mapping, including Environment Agency datasets and topographical survey information, does not indicate the presence of visible channels, ditches or culverted watercourses in the immediate vicinity.
- 3.21 Confirmation has been requested from Rochdale Borough Council, in its capacity as Lead Local Flood Authority, to establish whether any recorded ordinary watercourses (including culverted sections) are present within the surrounding area.
- 3.22 At the time of writing, no evidence of an ordinary watercourse influencing the site has been identified.
- 3.23 This position will be reviewed should further information be provided by the LLFA.

4. EXISTING DRAINAGE

Public sewers

- 4.1 The site is located within a well-established urban area served by a network of adopted public sewers maintained by United Utilities.
- 4.2 Public sewer records have been obtained from the Water Authority, and an excerpt is provided below in Figure 4.1 (Appendix D2). The following sewer infrastructure is identified in close proximity to the site boundaries:



Figure 4.1 Excerpt of Water Authority Sewer Records (Source: United Utilities)

Drake Street (southern boundary)

- 4.3 A 450 mm diameter public combined sewer (Ref. 4804 UU) is located within Drake Street immediately adjacent to the southern site boundary. This sewer has:
 - Cover Level (CL): 143.97 m
 - Invert Level (IL): 139.79 m
 - Recorded depth: approximately 4.18 m

St Alban's Street (northern boundary)

- 4.4 Combined sewer infrastructure is also present within St Alban's Street. The sewer map indicates continuation of the combined network north of the site boundary, with lamp holes (LH) access only within proximity to the site. Indicative invert levels in the vicinity suggest sewer depths circa 4.5m.

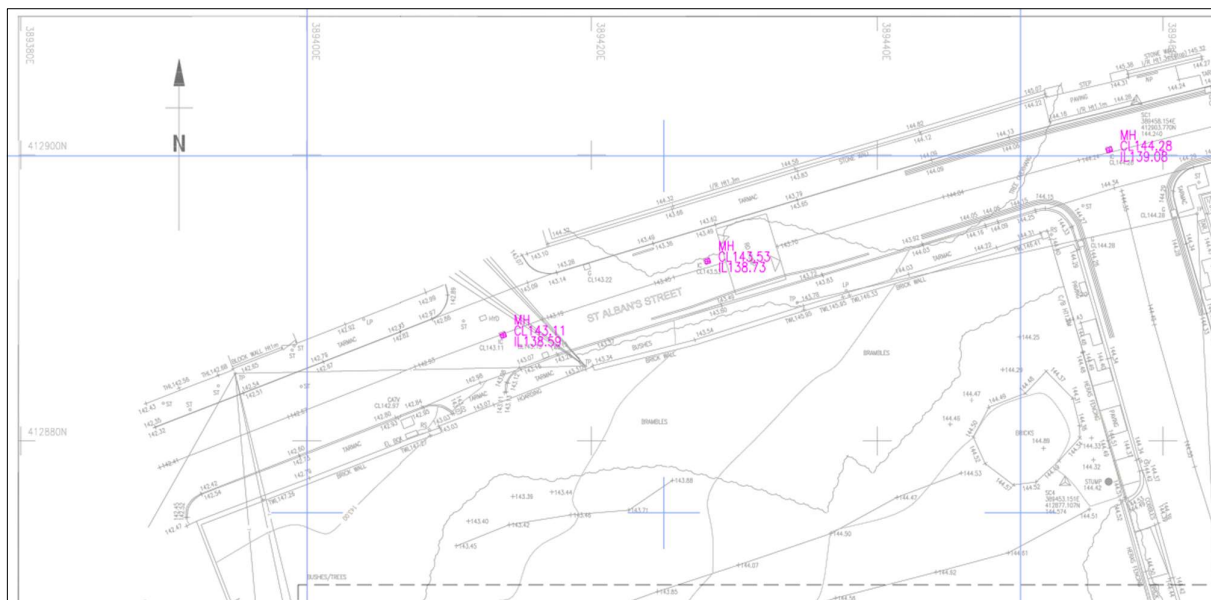


Figure 4.2 Excerpt of Topographical Survey with Lamp Hole/ Manhole Details in St. Alban's Street
(Source: Survey Eng Ltd.)

- 4.5 Given the site generally slopes gently from east to north-west discharge into sewers in St. Alban's Street present a hydraulically favourable discharge point post development.
- 4.6 The United Utilities sewer records and topographical survey do not indicate the presence of any public sewers crossing the application site boundary. The site therefore appears to be free from adopted public sewer constraints.
- 4.7 A partial CCTV survey of the existing 300mm diameter vitrified clay combined sewer was undertaken on 23 April 2026, from downstream manhole 3801 towards upstream node/lamphole 4802. The survey generally confirmed connectivity along the sewer serving the St Alban's Street / Drake Street frontage; however, the survey was abandoned close to the upstream end due to significant root mass. Refer to the CCTV Sewer Survey Report dated 23/04/2026 for full details.
- 4.8 The CCTV report records the inspected sewer as being in acceptable structural condition but identifies operational defects including root ingress/root mass, a defective/intruding connection, and poor visibility locally due to steam/hot water discharge. The sewer was given a Service/Operational Grade 5, with root mass causing up to 80% cross-sectional area loss near the upstream end.
- 4.9 United Utilities have provided agreement in principle for a connection to existing lamphole 4802, subject to reconstruction as a manhole chamber and detailed design/Section 106 approval.
- 4.10 Further coordination with United Utilities will be required to confirm final invert levels, chamber details, and any downstream cleansing, root removal or remedial works identified within the CCTV Sewer Survey Report dated 23/04/2026.

Private drainage / onsite infrastructure

- 4.11 The topographical survey does not identify any existing manholes within the site boundary. It is noted, however, that areas of made ground, demolition material and overgrown vegetation are present across parts of the site, and therefore the presence of buried chambers, redundant connections or historic private drainage infrastructure cannot be fully ruled out at this stage.

- 4.12 Following site clearance, an updated topographical survey will be undertaken. If any previously unidentified manholes or drainage chambers are found, a CCTV survey will be commissioned to establish their condition, connectivity and whether any existing sewer connection can be re-used, subject to United Utilities approval.

Existing Highway Drainage

- 4.13 The site is bounded by adopted highways on all sides, including Drake Street (A640), St Alban's Street, Broadfield Stile.
- 4.14 The surrounding carriageways are served by conventional kerb and gully highway drainage systems, with gullies located at regular intervals along each frontage, expected to be assets of the local Highway Authority.
- 4.15 Highway runoff is understood to discharge to the existing public combined sewer network within the surrounding streets.
- 4.16 There is no evidence that the site currently receives surface water runoff from the adjacent highways.

5. PROPOSED DEVELOPMENT DETAILS

- 5.1 The proposed development layout is illustrated in proposed plans in Appendix B, with an excerpt provided in Figure 5.1 below for reference.



Figure 5.1 Proposed Site Plan NTS (Source: Paddock Johnson 19146-PJA-00-ZZ-DR-A-1200-K)

- 5.2 The proposed development comprises a residential scheme arranged across the site with primary frontage to Drake Street and vehicular access taken from St Alban's Street. Pedestrian access is provided from the corner of Drake Street and Broadfield Street, in addition to St Alban's Street.
- 5.3 The residential development comprises 27 affordable dwellings, arranged as a three-storey apartment building fronting Drake Street and a terrace of four family houses fronting Broadfield Stile.
- 5.4 Associated external works include internal access roads, car parking areas, cycle storage, refuse storage, boundary treatments and external works including footways, private and communal amenity space, and landscaped areas around the site perimeter.
- 5.5 The total red line application site extends to approximately 0.335 ha and is bounded by adopted highways on all sides.
- 5.6 The proposed positively drained contributing areas within the application site have been calculated and are summarised in Table 5.1 and illustrated in Figure 5.2. These should be read in conjunction with the Proposed Contributing Areas Plan, included in Appendix B.

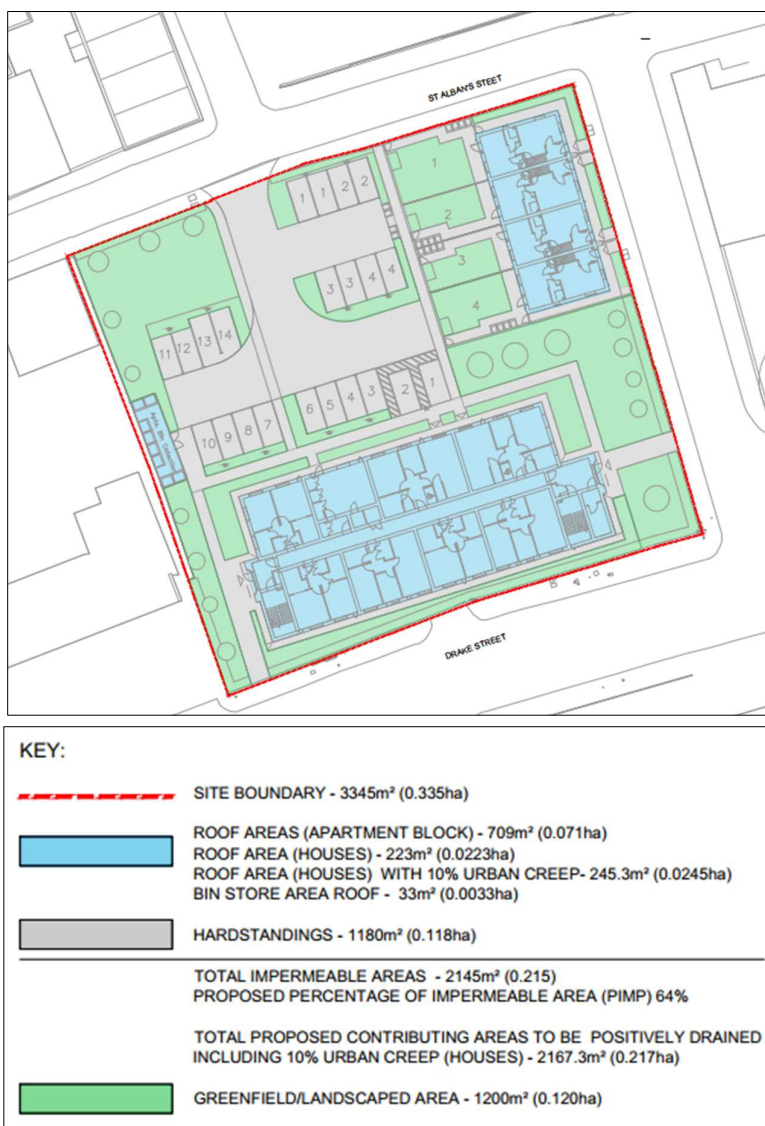


Figure 5.2 Proposed Contributing Areas Plan

- 5.7 The proposed development will result in an increase in impermeable surface area compared to the current site condition.

Table 5.1 Comparison of existing and proposed site areas.

Area	m ²	ha
Application Site Area Total	3345	0.345
Total Existing impermeable areas	360	0.360
Percentage of Impermeable (PIMP) within application site pre-development	11%	
Total proposed impermeable areas.	2145	0.215
Total proposed impermeable area including 10% urban creep (dwelling roofs only)	2167	0.217
Percentage of Impermeable (PIMP) within application site post-development	64%	
Increase in impermeable areas post development	1785	0.179

- 5.8 A sustainable positive drainage strategy is therefore required to manage surface water runoff from the proposed impermeable areas, limiting discharge rates, providing attenuation, and ensuring runoff is conveyed safely away from the development in accordance with the surface water drainage hierarchy.

6. CONSULTATIONS

Lead Local Flood Authority

- 6.1 The Lead Local Flood Authority (LLFA) for the site is Rochdale Borough Council.
- 6.2 An initial pre-application consultation response was received from Rochdale Borough Council LLFA on 30 March 2026 under reference PRE/2026/0164 and is included within Appendix D3 – LLFA Consultations. The LLFA noted that no drainage plan or drainage information had been provided at that stage and advised that any subsequent application must be supported by a detailed drainage plan and Sustainable Drainage Assessment.
- 6.3 The LLFA advised that surface water runoff should be discharged as high up the drainage hierarchy as reasonably practicable, including consideration of infiltration/recycling, on-site SuDS features, discharge to watercourse, surface water sewer and, only where necessary, combined sewer. The response also requested site-specific BRE365 infiltration testing, consideration of rainwater harvesting/recycling, and hydraulic calculations for the 1 in 100-year storm event plus 45% climate change allowance for the Irwell Management Catchment area.
- 6.4 A further, more detailed enquiry has subsequently been submitted to the LLFA on 22 May 2026 to seek clarification on the proposed drainage approach and site-specific requirements following site layout sign off. At the time of writing, a response to this further enquiry has not yet been received.
- 6.5 The drainage strategy will be reviewed and updated as necessary following receipt of any further LLFA comments.

Water Authority

- 6.6 Statutory sewer records and a Pre-Development Enquiry response have been obtained from United Utilities and are included within Appendix D2
- 6.7 United Utilities confirmed that there does not appear to be any charted public sewers located within the boundary of the proposed development.

- 6.8 United Utilities confirmed that foul flows from the site will be allowed to drain to the public combined sewer system, with their preferred point of discharge being the 300mm diameter public combined sewer within St Alban's Street, located north of the proposed development.
- 6.9 The response confirms no objection in principle to a new manhole onto the existing 300mm combined sewer, with the final location to be agreed subject to other services and site constraints.
- 6.10 For surface water, United Utilities advised that the drainage hierarchy should be followed and evidence provided to discount higher priority options before public sewer discharge is considered.
- 6.11 United Utilities confirmed that a connection to the public combined sewer may be considered, with the pass-forward flow to be agreed with the LLFA and not exceeding 5 l/s.

7. EXISTING RUNOFF RATE

Greenfield Runoff Rate

- 7.1 An assessment of the greenfield runoff rates has been undertaken to provide comparison with calculated further in the report brownfield and proposed runoff rates. The results are summarised in table below. Calculations are included within Appendix F.

Table 7.1. Greenfield run off rate for range of return periods

Return Period (Yr.)	FEH22 (UK SuDS) (0.335ha)	FEH22 (Causeway Flow) (0.335ha)
QBAR (rural)	0.7	0.9
Q1 Y (100%)	0.6	0.8
Q2 Y (50%)	0.6	0.8
Q30 Y (3.33%)	1.1	1.6
Q100 Y (1%)	1.6	1.9

Greenfield Runoff Volume

- 7.2 An assessment of the greenfield runoff volume has been undertaken using Causeway Flow, the results are summarised below. Calculations are included within Appendix F.

Table 7.2. Greenfield volume for 100yr return period 360min storm duration.

	YR 100 (1% AEP) 6-hour rainfall event
Percentage Runoff (%)	57.5%
Greenfield Runoff Volume (m ³)	127

Brownfield Runoff Rate and Volume.

- 7.3 The application site comprises previously developed land; however, the former buildings have been demolished, and the site is currently cleared.
- 7.4 There is no evidence of an active positive drainage system currently in operation within the site boundary.

- 7.5 A simplified brownfield runoff appraisal based on Modified Rational Method indicates that the identified impermeable surfacing 0.036ha (possibly more buried) could generate broadly comparable to approximately 10 l/s during higher intensity rainfall events.
- 7.6 The proposed drainage strategy would restrict runoff from the entire developed site to a maximum discharge rate of 5.0 l/s, as agreed in principle through the ongoing United Utilities Pre-Development Enquiry discussions.

8. PROPOSED RUNOFF RATE AND VOLUMES

Proposed Runoff Rate

- 8.1 Following consultation with United Utilities, a restricted surface water discharge rate of 5 l/s has been accepted in principle.
- 8.2 A comparison of the estimated brownfield runoff rates and proposed restricted discharge rate is presented in Table 8.1 below.

Table: 8.1. Greenfield, Brownfield and Proposed Restricted Discharge Rate Comparison

	YR 1 (100% AEP)	YR 30 (3.33% AEP)	YR 100 (1% AEP)
Greenfield Runoff Rate FEH22 Q (litres/sec)	0.9	1.5	1.8
Brownfield Runoff Rate (MRM) Q (litres/sec)	2.1	8.3	10.5
Proposed Discharge Rate Q (litres/sec)	5		

Proposed Runoff Volume

- 8.3 'Where reasonably practicable, 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 should not exceed the greenfield runoff volume for the same event.' (Standard S4, Non-Statutory Technical Standards for Sustainable Drainage Systems, 2015)
- 8.4 Should full greenfield volume compliance be demonstrated to be impracticable due to site-specific constraints, attenuation storage will be maximised within the available site envelope and peak flows will remain restricted to the agreed discharge rate.
- 8.5 A comparison of estimated pre and post-development runoff volumes—both with and without climate change allowances—is provided in the table below.

**Table 8.2 Greenfield, Pre-Development "Brownfield", and Post -development run-off volume
YR 100 (1% AEP) 6-hour rainfall event.**

	Runoff Volume YR 100 (1% AEP) 6-hour rainfall event
Greenfield Runoff volume - V (m ³)	127
Brownfield Runoff volume - V (m ³)	152
Proposed Runoff Volume V (m ³) including 45% Climate Change factor	149.5
Difference in Runoff Volume pre and post development V (m ³) including 45% Climate Change Factor	-2.5

- 8.6 Where it is not reasonably practicable to limit the volume of runoff to match the greenfield runoff volume, the Non-Statutory Technical Standards for Sustainable Drainage Systems (NSTSuDS,) states that the runoff must be discharged at a rate that does not increase flood risk.
- 8.7 The proposed discharge rate of 5.0 l/s for all rainfall events up to and including the critical 1 in 100-year event plus 45% climate change allowance is considered to be in accordance with this standard, as it will not adversely affect flood risk downstream.

9. SURFACE WATER MANAGEMENT

- 9.1 This is reflected in national guidance, including the National Planning Policy Framework, the Non-Statutory Technical Standards for Sustainable Drainage Systems, the National Standards for Sustainable Drainage Systems, and Rochdale Core Strategy Policy G8 / Local Plan Policy S4: Managing Water Resources and Flood Risk.
- 9.2 In accordance with Part II, Section A of the National Standards for Sustainable Drainage Systems, the following hierarchy of discharge preferences must be applied when determining the destination of surface water runoff:
- Rainwater harvesting and reuse
 - Discharge to ground (infiltration)
 - Discharge to a surface water body
 - Discharge to a surface water sewer or drain
 - Discharge to a combined sewer
- 9.3 To comply with these standards, different runoff destinations may be appropriate for different parts of a site, depending on local conditions and site constraints.
- 9.4 The final drainage strategy must demonstrate compliance with the National SuDS Standards, Building Regulations, and local planning policies and guidance, ensuring the most suitable and sustainable discharge method is selected for each drainage sub-catchment within the site.

Rainwater harvesting and reuse.

- 9.5 In accordance with the revised 2025 National Standards for Sustainable Drainage Systems (SuDS), rainwater harvesting should be prioritised as the primary destination for managing surface water runoff generated by the proposed redevelopment.
- 9.6 As part of the Sustainable Drainage Systems (SuDS) strategy, proportionate rainwater harvesting measures are proposed to manage surface water at source and provide water reuse benefits.
- 9.7 Individual residential dwellings will be provided with water butts to collect roof runoff for garden irrigation.
- 9.8 Rainwater harvesting and reuse has been considered in accordance with the surface water drainage hierarchy.
- 9.9 It is proposed that individual water butts will be provided to residential dwellings within rear private garden space, as a simple and proportionate means of reusing roof runoff for garden irrigation.
- 9.10 Non-potable reuse system for the apartment block has also been reviewed; however, given the affordable residential nature of the scheme, likely management arrangements, tenant turnover, plant space requirements, maintenance burden and long-term operational responsibility, a pumped communal reuse system is not currently considered to represent a reasonably practicable or proportionate solution.

Discharge into the ground - infiltration expectations

- 9.11 The feasibility of discharging surface water to ground is dependent on the underlying ground conditions, groundwater levels and the potential risk of contaminant mobilisation.
- 9.12 The site is underlain by variable Made Ground over glaciofluvial sands and gravels, with intermittent bands of silt and clay. Made Ground has been recorded across the site to depths of approximately 0.70 m to 1.60 m bgl, with elevated concentrations of metals, PAHs and TPH, together with local hydrocarbon odour.
- 9.13 Groundwater has also been recorded locally, with monitoring identifying groundwater at approximately 1.99 m to 2.33 m bgl. Slight water ingress was also recorded during infiltration testing at approximately 2.80 m bgl.
- 9.14 Although the site is not located within a Source Protection Zone or Drinking Water Safeguard Zone, the Environment Agency Groundwater Vulnerability Mapping identifies the site as having a Medium–High groundwater vulnerability classification. The Phase 2 Geo-Environmental Report also identifies groundwater within the underlying superficial deposits as a potential controlled waters receptor.
- 9.15 The presence of Made Ground, variable superficial deposits, local groundwater and potential vertical migration pathways creates uncertainty regarding both the long-term performance of infiltration systems and the potential for concentrated surface water infiltration to mobilise contaminants to groundwater.
- 9.16 On this basis, infiltration drainage is not proposed as the primary surface water disposal method for the development.

Discharge to surface water body.

- 9.17 There are no ordinary watercourses within or immediately adjacent to the site boundary, and the nearest Main River (River Roch) is located approximately 340 m to the north, separated from the site by established urban development and highway infrastructure.
- 9.18 As there is no direct hydrological connection to a watercourse and no practical route for gravity discharge, disposal of surface water via a watercourse is not considered feasible.

Discharge to surface water sewer

- 9.19 A review of the statutory sewer records indicates that there are no public surface water sewers within the immediate vicinity of the site to provide a viable outfall. As such, discharge of surface water to a dedicated surface water sewer is not considered feasible.

Discharge to combined water sewer

- 9.20 Where infiltration, discharge to a watercourse and connection to a surface water sewer are not feasible, the remaining option within the drainage hierarchy is restricted discharge to the public combined sewer network, subject to agreement with United Utilities.
- 9.21 A review of the statutory sewer records identifies a 300 mm diameter public combined sewer within St Alban's Street, located adjacent to the northern site boundary, as the most practical point of connection. The sewer is in close proximity to the proposed site access and provides the opportunity for a direct gravity connection.
- 9.22 United Utilities have provided agreement in principle for connection to the existing lamphole 4802, subject to it being reconstructed as a manhole chamber and subject to detailed design and formal Section 106 approval
- 9.23 On this basis, connection to the combined sewer within St Alban's Street is considered to represent the most practical and proportionate outfall solution.
- 9.24 Surface water discharge will be restricted to 5.0 l/s, as accepted in principle by United Utilities, with attenuation provided on site to manage flows up to and including the design storm event.

10. SUDS COMPONENTS

10.1 It is policy for all surface water systems for development sites to be designed using SuDS wherever possible.

10.2 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 overground 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	Water butts are proposed to residential dwellings within rear private garden space, as a simple and proportionate means of reusing roof runoff for garden irrigation. This provides a simple, proportionate and low-maintenance form of rainwater reuse suitable for the residential nature of the scheme. A wider non-potable reuse system or communal rainwater harvesting tank serving the apartment block is not currently proposed, as this would introduce additional infrastructure, plant space, maintenance, management and long-term operational responsibilities which are not considered proportionate for this affordable residential development.
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 considered suitable for the proposed development. The apartment building is predominantly formed with pitched roof areas, with PV panels, which limits the opportunity for green or blue roof provision. No green or blue roof areas are therefore proposed as part of the current drainage strategy.
Infiltration systems	Description	These systems collect and store runoff, allowing it to infiltrate into the ground. Overlaying vegetation and underlying unsaturated soils can offer protection to ground water from pollution risks.
	Suitability	Not suitable. The Phase 2 Site Investigation and Remediation Strategy confirm variable Made Ground, recorded contamination, hydrocarbon impacts/odour, localised groundwater and the requirement for clean cover systems and controlled soil management. On this basis, infiltration is not considered appropriate, as it could concentrate surface water through impacted Made Ground and increase the risk of contaminant mobilisation. The drainage strategy therefore assumes no discharge via infiltration, with runoff instead collected within a positive drainage system, attenuated on site and discharged at a controlled rate.
Filter Strips	Description	Runoff from impermeable area is allowed to flow across a grassed or otherwise planted area to promote sedimentation and filtration.
	Suitability	Limited suitability. The proposed drainage strategy does not rely on runoff from paths or hardstanding areas discharging directly across filter strips. Due to the constrained urban layout, limited verge widths and the need to positively collect and convey runoff, filter strips are not proposed as a principal SuDS component. Treatment and interception will instead be provided through lined bioretention/rain garden features, permeable surfacing and the wider positive drainage network.
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	Limited suitability. Due to the confirmed Made Ground, contamination constraints, localised groundwater and BRE365 infiltration test results, filter drains are not suitable as infiltration features. They are therefore not proposed as a primary SuDS component
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. They can be lined, or unlined to allow infiltration.
	Suitability	Not considered suitable for this residential apartment-led development. The constrained site layout, parking provision, pedestrian access routes and limited areas of open space restrict opportunities to incorporate open vegetated swales or drainage corridors. Swales are therefore not proposed as part of the drainage strategy.

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	Considered suitable and proposed where practicable. Bioretention areas / rain gardens will be incorporated within landscaped margins and adjacent to parking areas to provide treatment, interception and localised surface-level attenuation for residual runoff from the permeable car parking bays and impermeable access road. Where feasible, selected rainwater pipes from the apartment block will also be directed into the bioretention areas to provide additional source control and SuDS treatment. Due to the confirmed Made Ground, contamination constraints, localised groundwater conditions and BRE365 infiltration test results, these features will operate as lined systems with underdrains and overflow connections to the positive drainage network. They are not proposed to infiltrate to ground.
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	Suitable as part of the wider landscape strategy. Tree planting is proposed where shown on the Landscape Architect's plans and will provide amenity, biodiversity and minor surface water benefits through interception and evapotranspiration. However, trees are not relied upon for primary attenuation, infiltration or discharge control within the drainage strategy.
Pervious Pavements	Description	Permeable paving allows surface water runoff to pass through the surface into a stone sub-base, where it can be temporarily stored and treated before being discharged to the downstream drainage network. Where infiltration is suitable, water may discharge to ground; however, where infiltration is not appropriate, the system can be lined and positively drained.
	Suitability	Suitable within parking bays only. Permeable paving is proposed to provide local surface water treatment and sub-base storage within the parking areas. Due to the confirmed Made Ground, contamination constraints, localised groundwater and BRE365 infiltration test results, infiltration to ground is not proposed. The permeable paving will therefore operate as a lined system, with runoff collected through a diffuser / underdrain outlet and discharged to the downstream positive drainage network prior to attenuation and restricted discharge.
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	Given the site constraints, confirmed lack of infiltration opportunities and limited feasibility of open SuDS features, below-ground attenuation storage is required to provide the primary attenuation volume. The attenuation storage will receive runoff from the positively drained impermeable areas, including the lined permeable paving and lined bioretention/rain garden features, prior to controlled discharge to the downstream combined sewer network at the agreed restricted rate
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 are designed to store runoff temporarily.
	Suitability	Not considered suitable due to limited open space and the need to maximise developable area. The site layout does not provide sufficient space for open detention basins.
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	Not suitable. The constrained urban nature of the site and limited available open space preclude the inclusion of permanent water features.

10.3 Appropriate SuDS measures will be incorporated throughout the proposed development where practicable, having regard to the site constraints, ground conditions, proposed layout and drainage hierarchy.

10.4 The strategy will prioritise source control, water quality treatment and attenuation through the use of water butts to individual dwellings, lined permeable paving within parking bays, lined bioretention / rain garden features, and below-ground attenuation storage.

- 10.5 These measures will intercept, treat and temporarily store runoff prior to discharge to the downstream drainage network.
- 10.6 Below-ground attenuation will provide the primary site control, with flows restricted to the agreed discharge rate of 5 l/s before discharge to the public combined sewer.
- 10.7 The following SuDS components are therefore considered most suitable for the proposed development and will be developed further at detailed design stage:
- **Rainwater harvesting** - hybrid water butts/hydro planters to individual dwellings rear garden where practicable and secure.
 - **Lined permeable paving** - proposed within the parking bays, with a diffuser / underdrain outlet connecting to the downstream surface water drainage network. The permeable paving will receive runoff from the parking bay surface, together with runoff from the adjacent impermeable access road.
Where practicable, overflow will be directed via dropped kerb / missed feature kerb to adjacent bioretention areas / hydro-planters, providing additional SuDS treatment and conveyance before discharge to the downstream network.
 - **Lined bioretention / rain garden features/Hydroplanters** are proposed with underdrains and overflow connections to the positive surface water drainage network. These features will receive residual runoff from the permeable surfaces and access road.
The bioretention areas / hydro-planters to the north of the apartment block will also receive inflow from selected rainwater pipes, where feasible, to provide additional source control and SuDS treatment before discharge to the downstream network.

11. CLIMATE CHANGE ALLOWANCE

- 11.1 Climate change is expected to result in an increase in rainfall intensity, and as such, allowances for climate change must be incorporated into the drainage design to minimise vulnerability and enhance resilience to future flood risk. Both the 'Central' and 'Upper End' climate change allowances should be assessed to understand the range of potential impacts.
- 11.2 The 'Central' allowance should be used to assess the performance of the proposed surface water drainage system under critical design events, while the 'Upper End' allowance should be applied to assess residual flood risks and ensure that any exceedance flooding can be safely managed within the site boundary.
- 11.3 Based on the new Environment Agency guidance "Flood risk assessments: climate change allowances" information on expected changes in rainfall, river flows and sea level rise shown in Section 1 of this report, the anticipated increase in extreme rainfall intensity for the site area is expected to be between 30-45%.
- 11.4 The selection of the appropriate allowance should consider several factors:
- Development Vulnerability and Classification,
 - Flood Zone location,
 - Lifespan of development,
 - Site specific flood risk assessment,
 - Built in resilience and resistance measures and opportunities to include additional resilience measured in the future.
- 11.5 Given the nature of the proposed residential development, it is considered appropriate to apply the upper-end climate change allowance.
- 11.6 It is recommended that the site drainage is designed to contain a 1 in 100-year, critical storm event with a 45% climate change allowance, ensuring no uncontrolled surface flooding occurs under these conditions.

12. SURFACE WATER DRAINAGE STRATEGY

- 12.1 The purpose of this Drainage Strategy Report is to assess the drainage implications arising from the proposed residential development and to outline appropriate mitigation measures, including opportunities for the integration of Sustainable Drainage Systems (SuDS) into the scheme.
- 12.2 The strategy aims to ensure that the development will not increase flood risk elsewhere and that all surface water is managed in accordance with SuDS principles, in line with the National Planning Policy Framework (NPPF) Local Policy G8 and recognised best practice guidance.
- 12.3 The development site (0.335 ha) is located within Flood Zone 1, which corresponds to a less than 1 in 1,000 annual probability (0.1%) of river or sea flooding, plus allowance for climate change.
- 12.4 As the site is not at significant flood risk, there is no requirement for minimum threshold levels above external ground under national flood risk guidance.
- 12.5 External paving should fall away from the buildings with a minimum gradient of 1 in 60 to direct surface water safely away from walls and entrances. Where level access thresholds are required, a 500 mm wide reverse fall strip shall be incorporated to prevent water ponding against the building. Threshold drainage channels to be installed at all entrances to intercept runoff and protect internal areas.
- 12.6 The proposed residential development (27 dwellings) on the Drake Street site, consisting of; an apartment building fronting Drake Street; a terrace of 4 family houses; and associated external works, access, refuse store, and cycle store on previously developed ("Brownfield") site as outlined in 'Proposed Site Plan' in Appendix B.
- 12.7 The application site comprises previously developed land and includes identified areas of existing impermeable surfacing, together with Made Ground, demolition material and remnants of former development. Although no operational positive drainage network has been confirmed, the existing impermeable areas are likely to generate uncontrolled or only partially managed runoff during rainfall events.
- 12.8 For the purposes of this drainage strategy, a conservative brownfield runoff appraisal has therefore been undertaken using the Modified Rational Method, based only on the identified existing impermeable area. This provides a reasonable baseline comparison against the proposed restricted discharge rate, while recognising the uncertainty associated with the former drainage arrangements.
- 12.9 The proposed restricted discharge rate of 5 l/s, accepted in principle by United Utilities, represents an approximate 50% reduction against the conservatively estimated brownfield runoff rate and provides betterment when compared with the existing unmanaged site condition.
- 12.10 The total proposed contributing areas to be positively drained on site amount to 0.217ha and can be identified accordingly:
- Roof areas (including 10% urban creep for dwelling roofs) = 0.099ha
 - Hardstandings = 0.118ha
- 12.11 All contributing areas will be drained to meet the Statutory Requirements as follows:
- Drainage system will be designed for the critical 100-year (1%) rainfall event with climate change allowance, therefore there will be no risk of uncontrolled flooding off site for all rainfall events up 100-year return +45% CC,
 - Exceedance flows above the design capacity of the drainage system will be routed safely through the site towards landscaped / less vulnerable areas and onward through the site, where appropriate. Exceedance routes will be designed to avoid flooding of vulnerable or critical areas and to ensure flows do not increase flood risk to neighbouring land or properties.

- 12.12 Infiltration has been ruled out as a suitable means of surface water disposal due to the confirmed ground conditions, contamination constraints, localised groundwater and BRE365 infiltration test results, as identified within the Phase 2 SI, Remediation Strategy and infiltration testing reports. Surface water will therefore be collected within a positive drainage system, attenuated on site and discharged at a controlled rate.
- 12.13 There are no suitable water bodies or surface water sewers in proximity to accept surface water discharge from the proposed development, therefore controlled discharge to the public combined sewer is proposed.
- 12.14 A review of the statutory sewer records identifies the 300 mm diameter public combined sewer within St Alban's Street, located adjacent to the northern site boundary, as the most practical and proportionate point of connection, providing the opportunity for a direct gravity connection via existing lamphole 4802, which United Utilities has accepted in principle subject to reconstruction as a manhole chamber, detailed design, formal Section 106 approval, and restriction of surface water discharge to 5.0 l/s with on-site attenuation.
- 12.15 The application of SuDS based drainage systems have been considered as the primary measures for surface water management for the proposed development.
- 12.16 Based on the assessment of the hierarchy of discharge, the proposed site layout and topography, the following SuDS elements have been considered:

- **Rainwater reuse:**

Water butts are proposed for individual dwellings where private rear garden space and suitable rainwater downpipe arrangements are available. These will capture roof runoff for reuse in garden irrigation, providing a simple and proportionate form of rainwater harvesting. This supports water conservation objectives, helps reduce reliance on mains water for external use, and provides minor interception of roof runoff at source. Where practical, water butts with integrated hydro-planter features should be encouraged, as these would provide additional SuDS treatment, amenity value and source control benefits.



Figure 12.1 Water butt examples.

- **Bioretention/raingardens**

Selected landscaped areas will be provided as lined bioretention / rain garden features where site levels allow runoff to be directed into these areas.

These features (RG1, RG2, RG3) will receive residual runoff from the permeable car parking bays (drop kerb/ feature missed kerb inlets) and access road, and will provide interception, temporary retention and filtration of surface water runoff. Underdrains / overflow connections will be provided to the downstream positive drainage network.

Bioretention areas RG2, RG3 and RG4 will also receive discharge from selected rainwater pipes from the apartment block, where feasible.

Where integrated with landscape design, these features will also provide biodiversity and amenity benefits.



Figure 12.2 Bioretention / Rain Gardens / Hydroplanters

- **Permeable/porous surfaces**

Permeable paving is proposed within the car parking bays, comprising a lined gravel sub-base storage layer with diffuser / underdrain outlet to the downstream positive drainage network. These areas will provide local treatment and storage of surface water runoff prior to conveyance to the attenuation system.

The permeable paving areas will receive runoff from the parking bay surfaces, together with runoff from the adjoining impermeable access roads, where levels allow. During higher-intensity rainfall events, residual runoff will be directed towards adjacent bioretention / rain garden features.

Details are shown on the Proposed Drainage Strategy Plan in Appendix E, with supporting hydraulic calculations included in Appendix F.

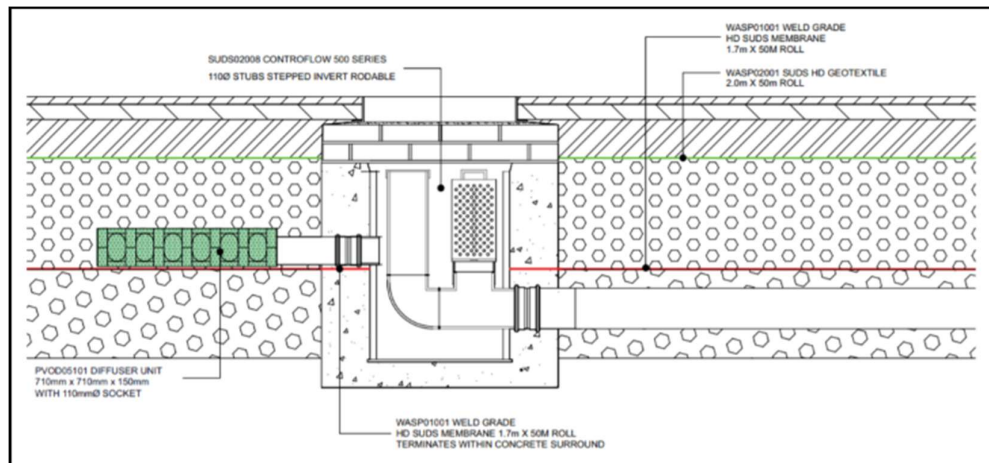


Figure 12.3 Typical Permeable surface sub-base storage layer with diffuser outlet and flow control.

- **Cellular attenuation**

Cellular attenuation storage will be utilised to provide the remaining attenuation volumes required.

Based on hydraulic modelling (Appendix F), an attenuation volume of 125.4m³ is required within the geocellular tank (95% void ratio) to manage surface water runoff from the 0.217 ha contributing area, with discharge restricted to 5.0l/s for all rainfall events up to and including the 100-year + 45% climate change allowance.

12.17 Proposed Drainage strategy Plan is included within the Appendix E with associated hydraulic calculation in Appendix F.

12.18 All recommendations will be investigated/developed further during the detailed design stage following consultation with Lead Local Flood Risk Authority, United Utilities and further site investigations and surveys.

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 1:100-year rainfall event plus 45% climate change.
- 13.2 Surface water exceedance and overland flows occur when intense rainfall is unable to either soak into the ground or enter a drainage system; due to blockages or the capacity of the system being exceeded.
- 13.3 Designing for exceedance aims to divert and control flood flows along routes where the risk of property flooding and the risk to health and safety is minimised and can be managed.

Proposed Exceedance and Overland Flow Routes and Mitigation Measures

- 13.4 The proposed drainage system has been designed so that there is no flooding within the site for up to and including the 1 in 100-year rainfall event, which is in line with current Design and Construction Guidance (DCG) for sewers offered for adoption and local LLFA guidance.
- 13.5 During extreme storm periods exceeding the critical 1 in 100-year + 45% climate change rainfall event, surface water sewers may surcharge and cause localised flooding at low points within the site. These areas are shown in Figure 13.1 for the development site.



Figure 13.1: Proposed exceedance/overland flow routes

- 13.6 The development proposals demonstrate that surface water exceedance events will be managed safely on site. The layout incorporates overland flow routing and temporary surface storage areas, where feasible, to convey exceedance flows away from buildings and other vulnerable or critical infrastructure. This approach ensures that any flows in excess of the design standard can pass safely through the site without increasing flood risk elsewhere.

14. WATER QUALITY

- 14.1 The surface water drainage strategy has been developed to manage runoff quality in accordance with the CIRIA C753 SuDS Manual and the Simple Index Approach.
- 14.2 The site is not located within a Principal Aquifer; however, the superficial deposits and underlying bedrock are classified as Secondary A Aquifers. No Source Protection Zones are recorded on site or within 500 m of the site. The Phase 1 Geo-Environmental Report identifies groundwater within the Secondary A Aquifers and the River Roch, located off site to the north, as controlled waters receptors.
- 14.3 The Phase 2 Ground Investigation and Remediation Strategy have identified Made Ground, recorded contamination, hydrocarbon impacts / odour, localised groundwater and the requirement for controlled soil management and clean cover systems. On this basis, infiltration drainage is not proposed, as deliberate infiltration could concentrate surface water through impacted Made Ground and increase the risk of contaminant mobilisation.
- 14.4 Surface water runoff will instead be collected within a positive drainage system and treated through a SuDS treatment train prior to attenuation and restricted discharge. The proposed water quality strategy includes water butts to individual dwellings, lined permeable paving within parking bays, lined bioretention / rain garden features, below-ground attenuation storage and controlled discharge to the public combined sewer.
- 14.5 Residential roof areas are considered to have a very low pollution hazard level. Roof runoff from the individual dwellings will be captured by water butts where private garden space and suitable downpipe arrangements allow, providing a simple and proportionate form of rainwater reuse. Remaining roof runoff will be conveyed via the positive drainage network to the attenuation system.
- 14.6 Parking areas and low-traffic access areas are considered to have a low pollution hazard level. Runoff from parking bays will be managed through lined permeable paving with a gravel sub-base storage layer and diffuser / underdrain outlet to the downstream drainage network. This will provide localised filtration, treatment and storage while preventing infiltration to ground.
- 14.7 Lined bioretention / rain garden features will also be incorporated where site levels allow runoff to be directed into these areas. These features will provide interception, temporary retention and filtration through planted media, with underdrains and overflow connections to the positive drainage network. They will not discharge by infiltration.
- 14.8 The Simple Index Approach has been applied to assess the pollution hazard indices against the proposed SuDS mitigation indices, where:

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard index}$$

(For each contaminant type) (for each contaminant type)

- 14.9 Where the mitigation index of an individual SuDS components is insufficient, two components or more in series will be required, where:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5 (\text{mitigation index}_2)$$

Where: $\text{Mitigation Index}_n = \text{mitigation index for component } n$

- 14.10 The proposed treatment train is considered appropriate for the residential nature of the development and the associated low pollution hazard. The use of lined SuDS features also ensures that water quality treatment is provided while avoiding uncontrolled infiltration through Made Ground.
- 14.11 Surface water runoff will ultimately be attenuated on site and discharged to the existing public combined sewer within St Alban's Street at the agreed restricted rate of 5.0 l/s.

14.12 The Proposed Drainage Strategy Plan confirms the use of water butts, nil infiltration, bioretention / rain garden features, permeable surfaces, attenuation storage and restricted discharge to the combined sewer at 5 l/s.

14.13 The Simple Index Approach has been applied to assess pollution hazard and mitigation indices.

TABLE 14.1 Simple Index Approach Assessment.

Area	Pollution hazard level	Pre-Treatment Pollution Index	Attenuation Feature	Mitigation Indices	Sufficient Treatment Provided
Residential Roofs	Very Low	Total Suspended Solids = 0.1-0.3 Metals = 0.2 Hydrocarbons = 0.05	Water butts where practicable, followed by positive drainage network with silt traps and attenuation storage	Total Suspended Solids = 0.85 Metals = 0.7 Hydrocarbons = 0.7	yes
Permeable hardstandings	Low	Total Suspended Solids = 0.5 Metals = 0.4 Hydrocarbons = 0.4	Lined permeable paving with gravel sub-base storage layer and diffuser / underdrain outlet to downstream network	Total Suspended Solids = 0.7 Metals = 0.6 Hydrocarbons = 0.6	yes
Impermeable Hardstandings / Access to site	Low	Total Suspended Solids = 0.5 Metals = 0.4 Hydrocarbons = 0.4	Positive drainage network, with bioretention / rain garden treatment where levels allow, followed by attenuation storage	Total Suspended Solids = 0.6 Metals = 0.4 Hydrocarbons = 0.5	yes

14.14 The proposed drainage strategy provides appropriate water quality mitigation for the development through source control, lined permeable paving, lined bioretention / rain garden features and attenuation storage. The strategy avoids infiltration through impacted Made Ground and provides controlled discharge to the public combined sewer at the agreed restricted rate of 5.0 l/s.

15. FOUL WATER DRAINAGE STRATEGY

15.1 The proposed foul drainage arrangement is shown on the Proposed Drainage Strategy Plan included within Appendix E.

15.2 Foul water from the proposed development will be collected via a separate on-site gravity foul drainage network.

15.3 United Utilities have confirmed that foul flows from the site will be allowed to discharge unrestricted to the public combined sewer system. Their preferred point of discharge is the existing 300 mm diameter public combined sewer within St Alban's Street, located to the north of the proposed development.

15.4 The restricted surface water flow and unrestricted foul water flows will combine within the proposed demarcation manhole CW01 prior to discharge to the public combined sewer.

15.5 The final connection is proposed via existing lamphole 4802 on the existing 300 mm diameter combined sewer within St Alban's Street, which is to be reconstructed as manhole chamber CW02, subject to detailed design, confirmation of existing services and site constraints, formal Section 106 approval, and United Utilities' technical requirements.

15.6 Details of the United Utilities Pre-Development Enquiry response are included within Appendix D2.

15.7 Proposed drainage should be designed in accordance with Building Regulations Document H1, relevant British Standards and full consideration to long term maintenance

16. SUMMARY AND CONCLUSIONS

- 16.1 This Drainage Strategy has been prepared to support the full planning application for the proposed residential development at Drake Street. The report demonstrates that surface water and foul water from the proposed development can be managed in a safe, sustainable and technically appropriate manner, subject to detailed design and the necessary statutory approvals.
- 16.2 The application site is located within Flood Zone 1 and is therefore considered to be at low risk of fluvial and tidal flooding. The proposed drainage strategy has been developed to ensure that the development does not increase flood risk on site, to neighbouring land, or elsewhere within the downstream catchment.
- 16.3 The proposed development will positively drain a contributing impermeable area of approximately 0.217 ha, comprising roof areas, parking areas, access routes and associated hardstanding. The drainage system will be designed to accommodate rainfall events up to and including the 1 in 100-year return period plus 45% climate change allowance, with no uncontrolled flooding from the drainage system within the design event.
- 16.4 Surface water runoff from the site will be managed through a SuDS-based treatment train, including water butts where practicable, lined permeable paving, lined bioretention / rain garden features, below-ground attenuation storage and controlled discharge to the public combined sewer.
- 16.5 Infiltration has been discounted as a suitable method of surface water disposal due to the confirmed ground conditions, Made Ground, contamination constraints, localised groundwater and the findings of the infiltration testing and site investigation reports. The proposed SuDS features will therefore be lined, with underdrains and overflow connections to the positive drainage network, to prevent uncontrolled infiltration through potentially impacted ground.
- 16.6 There are no suitable watercourses or public surface water sewers in close proximity to the site that provide a practical point of discharge. Surface water runoff will therefore be attenuated on site and discharged at a controlled rate to the existing 300 mm diameter public combined sewer within St Alban's Street.
- 16.7 United Utilities have accepted, in principle, the proposed surface water discharge to the public combined sewer, subject to the discharge being restricted to 5.0 l/s, the provision of on-site attenuation, detailed design and formal Section 106 approval. The proposed point of connection is via existing lamphole 4802, which is to be reconstructed as a manhole chamber.
- 16.8 Hydraulic calculations confirm that an attenuation volume of approximately 125.4 m³ is required within the proposed geocellular attenuation tank, based on a 95% void ratio, to manage runoff from the proposed contributing area while restricting discharge to 5.0 l/s for events up to and including the 1 in 100-year plus 45% climate change event with additional storage provided within subbase of permeable surfaces and bioretention systems.
- 16.9 Exceedance flows above the design capacity of the drainage system will be routed safely through the site, away from buildings, entrances and other vulnerable areas wherever practicable. External levels, falls, threshold drainage and overland flow routes will be developed further at detailed design stage to ensure that residual flood risk is appropriately managed.
- 16.10 The proposed water quality strategy has been assessed in accordance with the CIRIA C753 SuDS Manual and the Simple Index Approach. Residential roofs are considered to present a very low pollution hazard, while parking and low-traffic access areas are considered to present a low pollution hazard. The proposed SuDS treatment train provides appropriate mitigation for the anticipated pollution hazard levels.
- 16.11 The use of lined permeable paving, lined bioretention / rain garden features, silt management measures and attenuation storage will provide source control, filtration and treatment of surface water runoff prior to controlled discharge to the public combined sewer. The strategy also avoids infiltration through Made Ground and therefore reduces the risk of contaminant mobilisation.

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- 16.12 Foul water from the proposed development will be collected within a separate on-site gravity foul drainage network.
- 16.13 The restricted surface water flow and unrestricted foul water flows will combine within the proposed demarcation manhole CW01 prior to discharge to the public combined sewer. The final connection is proposed via existing lamphole 4802 on the existing 300 mm diameter combined sewer within St Alban's Street, which is to be reconstructed as a manhole chamber CW02, subject to detailed design, confirmation of existing services and site constraints, formal Section 106 approval, and United Utilities' technical requirements.
- 16.14 All drainage infrastructure will be designed and constructed in accordance with the Building Regulations, relevant British Standards, the Design and Construction Guidance, CIRIA C753 SuDS Manual, United Utilities requirements and recognised industry best practice.
- 16.15 The proposed drainage strategy remains subject to statutory approvals and agreement with the relevant regulatory authorities, including the Local Planning Authority, Local Lead Flood Authority and United Utilities.
- 16.16 The drainage network, including all SuDS components, attenuation storage, flow control devices, inspection chambers, channel drains and gullies, will be designed with consideration for long-term maintenance, access, inspection and operational performance.
- 16.17 Silt trap units or silt filters will be specified for surface water inspection chambers where appropriate to minimise silt accumulation within the proposed drainage network. Channel drains and road gullies will also be specified with suitable silt sump units to assist with sediment capture and routine maintenance.
- 16.18 During construction and for an agreed period post-completion, the developer will be responsible for maintaining the drainage infrastructure. Ongoing maintenance responsibilities will then transfer to the site owner, management company or operator, ensuring the drainage system continues to operate effectively over the lifetime of the development.
- 16.19 The Maintenance Schedule, document reference 11524-HBL-XX-XX-RP-C-5152 (P01), will be updated at detailed design / construction stage to include as-built drainage plans, post-construction CCTV survey information, manufacturer details for proprietary drainage components, SuDS maintenance requirements and any relevant operational guidance. This information will be incorporated within the site Operation and Maintenance Manual.
- 16.20 Subject to detailed design, statutory approvals and implementation of the proposed mitigation measures, the drainage strategy demonstrates that the proposed development can be drained in a safe, sustainable and maintainable manner without increasing flood risk elsewhere.
- 16.21 Based on the assessment findings, HBL Associates Ltd recommends that the Local Planning Authority accepts this Drainage Strategy in support of the full planning application for the proposed development.

17. APPENDICES

APPENDIX A – EXISTING SITE DETAILS

APPENDIX B – PROPOSED DEVELOPMENT DETAILS

APPENDIX C – SITE INVESTIGATION AND CONSTRAINTS

APPENDIX D – CONSULTATIONS

D.1 Environment Agency Consultation – Flood Risk

D.2 Water Company Consultation

D.3 Lead Local Flood Authority Consultation

APPENDIX E – PROPOSED DRAINAGE STRATEGY DRAWINGS

APPENDIX F – HYDRAULIC CALCULATIONS

F.1 Pre-development – Brownfield and Greenfield Calculations

F.2 Proposed Surface Water System (SWS) Hydraulic Calculations

F.3 Proposed Foul Water System (FWS) Hydraulic Calculations