Drainage plan and assessment

Proposed Development: Residential development (11 dwellings) with associated access, private gardens, and landscaping

Date: 6th November 2025

Site: Former Garth School Site, Coronation Drive, Salterbeck

Carried out by: Environmental Design UK

Environmental Design UK .com

Issue No 1

EDUK General Notes

EDS Report Reference:	EDUK-GS-DPA -001
Document Number:	EDUK DPA 001

Revision	Date of Issue	Status	Author:	Checked:	Approved:
	October 2025	L	John Gigli MPhil PGDip BA (Hons) FRSA	David Irvine - BSc Civil Engineering, Chartered Civil Engineer, European Engineer (Eur Ing).	Colin Hunter
			John Gigli	David Irvine	Colin Hunter

Report Title: DPA

Report Ref: EDUK-GS- DPA-001

Status: Final

Issued By: John Gigli MPhil PGDip BA (Hons) FRSA

Environmental Design UK
1 Centurion Way, Glasgow, G3 8NT
United Kingdom
Tel: 07393 503046

Email: environmentaldesignUK@gmail.com
www.environmentaldesignuk.com

Contents

Sustainable Solutions

EDuk

Environmental Design UK .com

Introduction

This Drainage Plan and Assessment has been prepared to support a small residential development located on a 0.50 ha parcel within the Former Garth School site, Salterbeck. The report outlines the existing drainage context and hydrological setting, the proposed surface water management strategy based on Sustainable Drainage Systems (SuDS), and the foul drainage arrangements connecting to the public sewer network. It also provides indicative hydraulic calculations, discharge control assumptions, and long-term management requirements. The document has been developed in parallel with the site's landscape and ecological strategy, including the confirmed Biodiversity Net Gain (BNG) measures, and is informed by the previously prepared Coal Mining Risk Assessment and ground/soil investigations. The integrated approach ensures that drainage design is compatible with the site's brownfield conditions, habitat creation objectives, and long-term stewardship commitments.

Purpose of the Report

The primary purpose of this report is to demonstrate that both surface water and foul water arising from the proposed development can be managed safely and sustainably, without increasing flood risk on-site or elsewhere, and in full accordance with national planning policy and local drainage requirements. The design aims to reduce runoff volumes and flow rates, promote infiltration where ground conditions permit, and create vegetated SuDS features that contribute to habitat connectivity and landscape character. The strategy has been structured to align with the BNG habitat plan, ensuring that the proposed rain gardens, swales and wet-meadow areas form functional ecological infrastructure, rather than isolated engineering elements. The report therefore establishes the drainage principles necessary for planning approval, while allowing refinement during detailed design.

Planning and Regulatory Context

The drainage strategy follows the established SuDS hierarchy, prioritising infiltration and above-ground conveyance in preference to piped systems and off-site discharge. The design principles are consistent with the Defra *Non-Statutory Technical Standards for Sustainable Drainage Systems* and are supported by best practice guidance provided in CIRIA SuDS Manual C753. Local policy and technical requirements have also been considered, including guidance issued by the Lead Local Flood Authority (LLFA) and United Utilities' preference for surface water separation from the foul/combined network. Ecological and landscape components are directly informed by the Biodiversity Net Gain Metric v4.1 outputs and the associated habitat creation and management plan. Furthermore, coalfield and geotechnical constraints identified in the Coal Mining Risk

Assessment (CMRA) have influenced the form and placement of infiltration and planted features, ensuring that excavation and soakaway loading are not positioned near the mapped seam outcrop or other potential mining-related ground instability zones.

Existing Site Conditions

The application parcel occupies the central plateau of the former Garth School grounds in Salterbeck. Historic topographic data and current site observation indicate that the landform consists of a gently undulating terrace with shallow localised fall toward the site perimeter. There are no mapped watercourses, ditches or culverted channels within the red line boundary. At present, rainfall-runoff is unmanaged and tracks naturally across the rough grassland and areas of compacted made ground that remain from former building footprints. Occasional temporary ponding is visible within shallow depressions, particularly where subsoil permeability is limited and surface gradients are minimal.

There is no existing formal surface water drainage infrastructure within the parcel. Runoff primarily sheds towards surrounding residential estate infrastructure, with some attenuation occurring through vegetation interception and infiltration at the margins. Short lengths of native hedgerow in declining condition are present along outer boundaries, with more substantial scrub and young woodland belts to the north and west. These vegetated zones currently intercept minor overland flow and provide some degree of surface roughness and evapotranspiration function, although they do not form part of a structured drainage network.

Ground investigation confirms that the site constitutes previously developed land, with variable made ground associated with the former school buildings and hardstanding. The Coal Mining Risk Assessment (CMRA) identifies a mapped coal seam outcrop to the west/north-west of the parcel, aligned with an area now reserved for habitat creation. The proposed built footprint is therefore located outside the potential influence zone of historic shallow workings. No mining-related instability is anticipated beneath the development area. However, the presence of heterogeneous made ground indicates that infiltration potential is likely to vary across the site and may be locally low where compacted strata persist. Accordingly, infiltration-based drainage must be applied selectively and in combination with lined and underdrained SuDS components where necessary.

No ordinary watercourses are recorded within the site boundary, and the parcel is not located within a fluvial flood zone. The principal hydrological consideration is the control of surface water to avoid uncontrolled ponding and unmanaged runoff to neighbouring land. The proposed SuDS strategy therefore focuses on on-plot attenuation, rain garden and bioretention features, and a controlled discharge to the public sewer network, subject to confirmation of outfall level and available capacity. This approach avoids reliance on deep

infiltration into made ground and provides a robust drainage solution compatible with the site's geotechnical and ecological constraints.

Proposed Drainage Strategy

The drainage strategy for the proposed residential development is designed to manage surface water and foul water in a sustainable manner, consistent with national drainage policy, the CIRIA SuDS Manual (C753), and local planning requirements. The key objectives are to reduce peak surface water run-off relative to the existing brownfield baseline, provide water quality treatment prior to discharge, and integrate habitat creation areas that contribute to the site's Biodiversity Net Gain commitments. The approach also seeks to provide clear and robust routing for exceedance events, ensuring that water is safely conveyed away from property and toward designated open space corridors.

Application of the drainage hierarchy indicates that full infiltration across the parcel is constrained by heterogeneous made-ground layers and variable, locally compacted subsoils. No receiving watercourse exists within the site boundary. Accordingly, the preferred outfall is a controlled discharge to a public surface water sewer within the surrounding highway network, subject to confirmation through utility survey and consultation with United Utilities. Where only a public combined sewer is available, surface water will still be offered to the surface water system as first preference; if a combined connection is required, this will be restricted to a very low rate and preceded by on-site SuDS treatment to minimise pollutant loading to the network.

The proposed SuDS network follows a distributed and shallow-flow approach. Rain gardens and wet-meadow swales will be positioned along internal streets and in front-of-plot landscaping corridors to intercept runoff at source, encourage infiltration to the active root zone, and provide first-stage water quality treatment. These features also contribute directly to the habitat mosaic required to meet BNG targets. The central attenuation function will be delivered through a shallow basin or chain of linked basins located on the central platform, set well clear of building footprints and outside the northern ecological corridor. The basins will have gently graded side slopes, seeded and planted with native wet-meadow species to maintain ecological function while providing hydraulic storage volume.

Where on-plot permeable paving is used, the sub-base will be designed to accommodate temporary storage; lining may be required under permeable surfaces in areas where ground conditions or coal-mining constraints preclude infiltration. Kerb inlets and shallow conveyance channels will direct flows between SuDS features and toward the attenuation basin, with all exceedance routes intentionally aligned to landscaped areas rather than toward property thresholds. Suds features are deliberately located outside the mapped coal

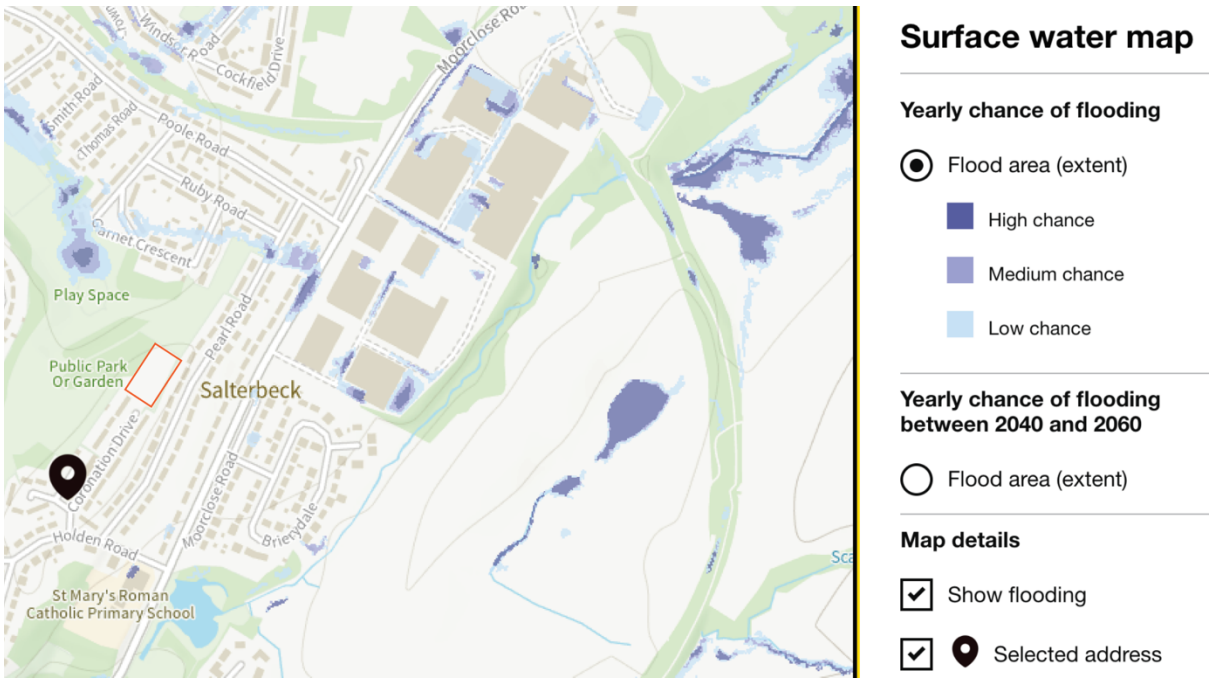
seam alignment and restricted to the stable central platform to avoid any potential future ground instability considerations.

Attenuation storage will be sized to manage the critical design rainfall events, with final discharge controlled via a flow-limiting device such as a vortex flow control or orifice plate. The discharge rate will be set at the greenfield runoff rate for the 0.50 ha catchment or a lower brownfield betterment standard, subject to agreement with United Utilities. Lining will be incorporated where necessary to avoid uncontrolled infiltration through made ground and to maintain predictable hydraulic performance over the long term.

During exceedance events, flows will be conveyed across intentionally graded surface routes toward the attenuation area and highway corridors, rather than ponding against buildings. Local bunding, grading and landscape profiles will reinforce these pathways. The resulting strategy provides a fully integrated water management system that supports biodiversity, maintains hydrological stability, reduces downstream drainage loading, and ensures resilience under a range of storm conditions.

surface water calculations

site red box



Surface Water Calculations

The red-box development parcel occupies approximately 0.50 ha on the central plateau of the former Garth School site. There are no mapped ordinary watercourses within the boundary, and surface water currently drains as uncontrolled overland flow across rough neutral grassland and compacted made ground. The proposed surface water strategy employs a SuDS treatment train comprising permeable/bioretention systems and a shallow attenuation basin, providing both water quality treatment and volume control prior to a restricted discharge to the public sewer network, subject to survey and agreement with United Utilities.

Design Criteria

Surface water management will be designed using FEH13 depth–duration–frequency rainfall data, with the Local Lead Flood Authority's climate change allowance applied to the 1 in 100-year storm event (typically +40% for residential development unless directed otherwise). The drainage system will be configured to ensure that no property flooding occurs up to and including the 1 in 100-year + climate change event. Below-ground routing and conveyance will be sized to accommodate flows up to the 1 in 30-year event without surface surcharge, after which controlled exceedance routes will direct flows safely to landscaped corridors and the attenuation area. Water quality treatment follows the CIRIA C753 SuDS Manual, applying a multi-stage treatment approach appropriate for a brownfield site discharging to a receiving sewer.

Runoff Estimation and Allowable Discharge

The greenfield runoff rate (Qbar) will be established at detailed design using FEH13 catchment descriptors and IOH124/FEH hydrological methods within MicroDrainage/InfoDrainage software. As the existing ground includes compacted brownfield surfaces, the proposed discharge will be restricted to achieve betterment relative to current runoff conditions. In outline terms, the discharge will be limited to the calculated greenfield Qbar for the 0.50 ha catchment (typically a few litres per second). If downstream network constraints require tighter control, a minimum practical discharge of 2–3 L/s using a vortex control will be adopted to reduce blockage risk. The assumed impermeable area for initial sizing is 40–60% of the site area; this will be confirmed once the final layout has been fixed.

Indicative Attenuation Volumes

Final attenuation volumes will be confirmed through FEH13-based hydraulic modelling, including critical-duration storm testing. For scoping and land-take purposes, a 0.50 ha

parcel with approximately 0.20–0.30 ha impermeable area and a discharge restriction of 2–5 L/s is expected to require on the order of 40–90 m³ storage capacity for the 1 in 30-year event and 100–220 m³ for the 1 in 100-year + 40% climate change event. These storage volumes can be delivered through a combination of permeable paving sub-base storage, distributed raingarden/bioretention features and a shallow, lined attenuation basin. Basin side slopes will be designed no steeper than 1:4, with a permanently dry base seeded and managed as wet-meadow habitat unless an amenity wet cell is intentionally included.

Water Quality Treatment

Water quality is addressed through a SuDS treatment train in accordance with CIRIA C753. Level 1 treatment is provided by permeable paving or vegetated filter strips at driveways and parking areas to intercept suspended solids and particulate metals. Level 2 treatment is provided by bioretention/rain-garden cells using an engineered soil medium to capture hydrocarbons, nutrients and fine sediments. Level 3 treatment is achieved in the attenuation basin, which incorporates shallow emergent wet-meadow margins and silt forebays at inlets to promote sediment settlement and protect the outfall system. All discharge structures will incorporate sumped manholes or pre-treatment chambers to allow safe inspection and maintenance.

Exceedance Management

Exceedance routing has been planned so that flows from storm events exceeding the design criteria are directed away from plot thresholds and toward the internal landscaped corridors and attenuation area, before passing to the highway low points if necessary. Localised bunding and kerb-line shaping will ensure that surface exceedance does not enter dwellings. No exceedance route is directed toward the northern ecological corridor, maintaining the integrity of habitat creation areas.

Modelling inputs to be confirmed at detailed design

- FEH13 DDF, CDROM-derived parameters: M5-60, r, AREAL2, SAAR, URBEXT-2000/2018.
- Model domain: 1, 3, 6 and 12-hour hyetographs (plus other durations as indicated by critical-storm search).
- Network roughness, control head, and minimum orifice diameter; allowance for construction tolerances and blockage sensitivity.
- Geotechnical constraints (lining beneath bioretention/permeable areas where made ground or coalfield advice precludes infiltration).
- United Utilities pre-development enquiry outputs (confirmed connection point and allowable discharge).

Sustainable Solutions

EDuk

Environmental Design UK .com

Foul Water Drainage – Context and Design Basis

The site is located within an established residential catchment and is expected to be served by the public foul or combined sewerage system operated by United Utilities. Surrounding properties discharge to sewers within Moorclose Road and the adjacent side streets, and no private treatment plant or historic foul drainage infrastructure is present within the development parcel. Confirmation of the precise sewer type, pipe diameters and invert levels will be obtained through a combination of utility asset plans and a manhole survey at the detailed design stage. The purpose of this work is to determine the most suitable connection point and to confirm whether the sewer fronting the site is foul-only or combined.

The topography of the central development plateau provides a gentle fall toward the highway, which supports a gravity foul drainage layout. Each dwelling will discharge to a private foul drain laid to self-cleansing gradients, with the network converging toward a single frontage connection. At present there is no indication that a pumping station will be required; however, final feasibility will be verified once proposed finished floor levels and sewer invert levels are compared during the detailed design process.

Indicative foul flow estimates have been calculated using standard domestic consumption assumptions, based on 11 residential units with an average occupancy of approximately 2.4 persons per dwelling and a per capita water use of 150 litres per person per day. This results in an estimated dry weather flow of approximately 3,960 litres per day, equivalent to around 0.046 litres per second. Applying a domestic diurnal peaking factor of six gives an estimated peak foul flow in the order of 0.28 litres per second. This is a modest loading and would typically be readily accommodated within a standard 150 to 225 mm public foul or combined sewer, subject to confirmation of available downstream capacity by United Utilities.

Foul water from the development will therefore be discharged by gravity, via the private on-site drainage network, to a single connection point on the public system. A Pre-Development Enquiry will be lodged with United Utilities to confirm network capacity, the preferred point of connection and any required off-site reinforcement. Following this, a Section 106 sewer connection application will be submitted, supported by manhole survey data, a method statement for the connection works and any required traffic management proposals.

Rainwater drainage is fully separated from the foul system and is managed on site through a combination of rain gardens, bioretention features and a lined attenuation basin discharging at a controlled rate, in accordance with SuDS best practice and regulatory preference to avoid inflow and infiltration to the foul network. The development layout has

also been arranged so that foul drainage excavations remain clear of the mapped coal seam outcrop along the north-western habitat margin, thereby reducing excavation depth, ground risk and programme uncertainty.

Construction Phase Water Management

During the construction phase, surface water management will be focused on preventing sediment mobilisation and avoiding uncontrolled discharge of silty or contaminated runoff into the surrounding drainage network. Temporary drainage measures will be implemented to separate clean overland water from construction-influenced water. This will typically include the formation of shallow temporary cut-off drains at the upslope site boundary to intercept clean runoff, directing it around active working areas where possible. Areas subject to excavation or made-ground reworking will be managed using silt fencing, temporary bunds and, where necessary, settlement tanks or straw-bale check dams to allow suspended solids to settle prior to discharge. SuDS components, including rain gardens and the attenuation basin, will not be brought into operational use until most of the hard landscaping is complete, to prevent sediment loading and premature clogging of engineered infiltration media.

Pollution prevention measures will be set out within the Construction Environmental Management Plan (CEMP) and will include appropriate fuel storage and refuelling controls (bunded tanks, drip trays and designated refuelling areas), spill response kits and training, and wheel wash or road-sweeping measures to control sediment tracking onto the public highway. During demolition or break-up of any remaining slab or sub-base materials, works will be phased to minimise the generation and migration of fines and limit the risk of sediment entering drainage features. The temporary drainage and pollution prevention strategy will be aligned with the coalfield construction safety notes already established for the site, ensuring that excavations are controlled, working faces are stable, and risks associated with variable made ground or possible historical workings are managed.

These measures collectively ensure that, during the construction phase, potential environmental impacts on adjacent SuDS features, public sewer infrastructure, and nearby ecological corridors are minimised. Once most construction is complete and ground surfaces are stabilised, the permanent SuDS network will be commissioned, and ongoing maintenance responsibilities will transfer to the site management regime.

Operation, Management and Maintenance

Long-term performance of the drainage system depends on clear ownership, routine inspection, and maintenance of SuDS components and associated landscape areas.

Management responsibilities will be defined at the legal/land transfer stage and reflected in the site management plan and homeowner information packs.

Ownership and Adoption

Rain gardens and swale features located within shared spaces, public realm, or private estate roads will be managed either by the adopting authority (if offered under a Section 104/38 arrangement) or by a site management company acting on behalf of residents. Where rain gardens or permeable paving are located within individual plot curtilage, ongoing maintenance responsibility will rest with the homeowner and will be secured through a deed of covenant to ensure consistency over the site's lifetime.

The attenuation basin, including its inlet structures, flow control chamber and any embankment or safety features, will have a single accountable owner to ensure continuity of long-term management. This is typically the site management company or a designated landholding trust associated with the development. The ownership model will ensure that inspection, vegetation management, sediment removal, and safety compliance are undertaken on a planned basis and not left to individual dwelling owners.

Routine Maintenance Tasks

Rain Gardens and Swales

These features will be inspected at least twice annually and following significant rainfall events. Maintenance activities include removal of litter, debris and accumulated silt around inlets/outlets, selective vegetation cutting to maintain a diverse wet-meadow structure, and management of invasive species. Fertilisers and pesticides are not to be used, as nutrient enrichment would compromise the biodiversity and water-treatment function.

Permeable Paving

Permeable block surfaces will be vacuum swept annually to prevent clogging of voids within the bedding and sub-base layers. Jointing material will be reinstated as required to maintain structural performance and infiltration characteristics. Homeowners will be advised not to seal or resurface permeable paving with impermeable coatings.

Attenuation Basin

The basin will be inspected quarterly to check slope stability, vegetation cover, inlet/outlet condition and the performance of the control chamber. Silt forebays will be emptied when approximately 75% full to maintain hydraulic capacity and prevent sediment mobilisation. Vegetation will be managed to maintain a species-rich wet-meadow condition, avoiding woody scrub encroachment unless intentionally designed. Safe access and edge gradients will be maintained to comply with CIRIA C753 guidance.

Flow Controls and Isolation Valves
The flow control (orifice or vortex) and any associated penstocks or isolation valves will be inspected and tested at routine intervals to confirm free operation. Screens will be cleared of debris to prevent upstream flooding or bypassing of treatment stages.

Long-Term Interface with Biodiversity Net Gain (BNG)

The drainage landscape is integrated with the Biodiversity Net Gain habitat creation strategy. Meadow areas in and around SuDS features will be subject to a low-input, cut-and-collect regime, generally involving a single main cut in late summer and optional light cuts as needed to prevent dominance by coarse grasses. Selective scrub management will ensure that structure and ecological value develop without the system becoming overgrown or shaded. No nutrient inputs will be applied to meadow or SuDS planting zones, maintaining the low-fertility conditions required for species-rich composition. External lighting remains excluded from the northern ecological corridor to maintain a functional dark route for bats and other nocturnal wildlife.

Coal Seam Alignment and Drainage Implications

Coal Authority geological mapping identifies a shallow coal seam outcrop trending along the western to north-western edge of the site. This alignment coincides with land designated for habitat creation and falls outside the proposed development platform, building footprints and internal access routes. No mine entries are recorded within, or immediately adjacent to, the development parcel, and the Coal Mining Risk Assessment concluded that the likelihood of instability within the construction area is low, provided foundations and drainage works avoid unnecessary deep infiltration or disturbance in proximity to the mapped seam.

Existing residential neighbourhoods in Salterbeck have been constructed along the same mapped seam corridor with no recorded pattern of surface-level subsidence, demonstrating that development in this geological setting is established and feasible when standard precautions are applied. The design approach for this site therefore maintains a precautionary stance by locating key infrastructure on the central plateau, away from the outcrop margin.

In terms of drainage, the seam alignment influences the selection of SuDS techniques. Deep infiltration systems are not proposed directly over or adjacent to the mapped seam boundary to avoid unnecessary interaction with potential historical workings or variable made-ground conditions. Instead, the drainage strategy employs shallow, lined SuDS features such as rain gardens, bioretention cells and a controlled attenuation basin situated wholly on the stable central platform. These features provide water-quality treatment and

peak flow attenuation while minimising vertical infiltration pathways through uncertain strata.

Surface water will therefore be attenuated and conveyed to a controlled outfall to the public sewer network, rather than relying on deep infiltration. This approach satisfies both drainage performance requirements and the recommendations of the Coal Authority and CIRIA C758 (Abandoned Mine Workings Guidance). The arrangement also aligns with the site's Biodiversity Net Gain objectives, as the SuDS features overlap with planned wet-meadow and pollinator-supporting habitats without requiring sub-surface disturbance along the seam corridor.

Conclusions and Recommendations

The assessment confirms that a viable and policy-compliant Sustainable Drainage System (SuDS) strategy is achievable for the proposed development. The approach provides effective surface water quantity control, delivers appropriate water-quality treatment, and contributes positively to site amenity and biodiversity. The SuDS components have been selected to integrate directly with the Biodiversity Net Gain (BNG) habitat creation plan, ensuring that drainage features function as both hydrological infrastructure and ecological enhancement areas.

Due to the presence of made ground and variable infiltration potential across the site, the strategy is based on shallow, vegetated SuDS features that are either fully lined or selectively underdrained where required. This avoids reliance on deep infiltration and aligns with the Coal Authority and geotechnical recommendations. Surface water will be attenuated and discharged at a controlled rate to the public surface water network, subject to confirmation through utility survey, pre-development enquiry and formal agreement with United Utilities.

Hydraulic design calculations, detailed modelling and engineering drawings will be completed at the detailed design stage using FEH13 rainfall data and the current climate change allowances applicable to residential development. The system will be sized to prevent property flooding under the 1 in 100-year plus climate change event and to route exceedance flows safely through defined landscape corridors.

Long-term maintenance responsibilities are clearly identified and correspond with the 30-year BNG management plan. This includes routine inspection and management of rain gardens, permeable paving and the attenuation basin to maintain hydraulic performance and habitat value, with no nutrient enrichment and vegetation managed as meadow mosaic communities.

Overall, the drainage strategy represents a robust, sustainable and integrated solution that supports both the development and its long-term ecological objectives.

Ends

Appendix A

hydraulic calculation outputs and storage summaries

• Catchment area: 0.50 ha (central plateau only).
• Impermeable area at concept stage: 0.24 ha (dwellings, drives and access) with the balance as landscaped SuDS and open space.
• Rainfall data set: FEH13 DDF; design events 1 in 1, 1 in 30 and 1 in 100 years plus 40% climate change.
• Outfall: restricted discharge to the public surface water sewer in the adjacent highway, subject to survey and United Utilities agreement.
• Allowable discharge: sized to the lower of Qbar for 0.50 ha or a practical minimum control; a preliminary cap of 3.0 L/s has been adopted for scoping using a vortex device to mitigate blockage risk.
• System type: lined bioretention and permeable paving with underdrains leading to a shallow attenuation basin and outlet control. Roads operate as exceedance routes above the 1 in 30 year standard.

Storage results (outline sizing)
The FEH13-based critical storm check will be run at detailed design. For concept planning and land-take, the following storage volumes are sufficient to meet the adopted discharge cap and performance standards.

Design event	Allowable discharge	Required total active storage	Comment
1 in 1 year	3.0 L/s	20–35 m³	contained in permeable sub-bases and raingardens
1 in 30 year	3.0 L/s	60–90 m³	no property flooding; roads remain serviceable
1 in 100 year +40% CC	3.0 L/s	150–200 m³	contained within basin plus upstream SuDS with ≥150 mm freeboard in basin

Proposed storage distribution
• Permeable paving (plots and visitor bays): 25–40 m³ effective voided storage, using a 350 mm Type 3 sub-base with 30–35% porosity; lined construction with underdrains.
• Distributed raingardens/bioretention cells: 20–35 m³ effective storage in surface depression plus media voids; online for frequent events and providing first two stages of treatment.
• Attenuation basin (or linked basins): 100–140 m³ active volume to top water level for the 1

in 100 year plus climate change event; side slopes no steeper than 1:4; minimum 150 mm freeboard to the surrounding landscape; silt forebay at each inlet.

Conveyance and controls

• Pipework and underdrains sized to pass the 1 in 30 year event without surcharge; preliminary diameter range 150–225 mm at minimum gradients of 1 in 150 to 1 in 200, subject to cover and clash checks.

• Flow control unit at the outfall set initially to 3.0 L/s; final setting to be refined following detailed modelling. A sump manhole is provided upstream for silt capture and maintenance access.

• Emergency isolation valve or penstock at the outfall to enable pollution control during incidents.

Exceedance performance

• Events greater than the 1 in 30 year standard are routed along lowered kerb sections and shallow swales toward the basin and internal landscape, away from building thresholds.

• Finished floor levels are kept at least 150 mm above adjacent road channels and 300 mm above any designated exceedance route low points.

Quality treatment summary

• Level 1 treatment: permeable paving/filter strips (TSS and metals interception).

• Level 2 treatment: bioretention media (hydrocarbons and nutrients).

• Level 3 treatment: attenuation basin with wet-meadow margins and forebay (final polishing and sediment management).

Appendix B.

utility records and pre-development enquiry correspondence

Operation, Management and Maintenance

Long-term performance of the drainage system depends on clear ownership, routine inspection, and maintenance of SuDS components and associated landscape areas. Management responsibilities will be defined at the legal/land transfer stage and reflected in the site management plan and homeowner information packs.

Ownership and Adoption

Rain gardens and swale features located within shared spaces, public realm, or private estate roads will be managed either by the adopting authority (if offered under a Section 104/38 arrangement) or by a site management company acting on behalf of residents. Where rain gardens or permeable paving are located within individual plot curtilage, ongoing maintenance responsibility will rest with the homeowner and will be secured through a deed of covenant to ensure consistency over the site's lifetime.

The attenuation basin, including its inlet structures, flow control chamber and any embankment or safety features, will have a single accountable owner to ensure continuity of long-term management. This is typically the site management company or a designated landholding trust associated with the development. The ownership model will ensure that inspection, vegetation management, sediment removal, and safety compliance are undertaken on a planned basis and not left to individual dwelling owners.

Routine Maintenance Tasks

Rain Gardens and Swales
These features will be inspected at least twice annually and following significant rainfall events. Maintenance activities include removal of litter, debris and accumulated silt around inlets/outlets, selective vegetation cutting to maintain a diverse wet-meadow structure, and management of invasive species. Fertilisers and pesticides are not to be used, as nutrient enrichment would compromise the biodiversity and water-treatment function.

Permeable Paving
Permeable block surfaces will be vacuum-swept annually to prevent clogging of voids within the bedding and sub-base layers. Jointing material will be reinstated as required to

maintain structural performance and infiltration characteristics. Homeowners will be advised not to seal or resurface permeable paving with impermeable coatings.

Attenuation Basin

The basin will be inspected quarterly to check slope stability, vegetation cover, inlet/outlet condition and the performance of the control chamber. Silt forebays will be emptied when approximately 75% full to maintain hydraulic capacity and prevent sediment mobilisation. Vegetation will be managed to maintain a species-rich wet-meadow condition, avoiding woody scrub encroachment unless intentionally designed. Safe access and edge gradients will be maintained to comply with CIRIA C753 guidance.

Flow Controls and Isolation Valves

The flow control (orifice or vortex) and any associated penstocks or isolation valves will be inspected and tested at routine intervals to confirm free operation. Screens will be cleared of debris to prevent upstream flooding or bypassing of treatment stages.

Long-Term Interface with Biodiversity Net Gain (BNG)

The drainage landscape is integrated with the Biodiversity Net Gain habitat creation strategy. Meadow areas in and around SuDS features will be subject to a low-input, cut-and-collect regime, generally involving a single main cut in late summer and optional light cuts as needed to prevent dominance by coarse grasses. Selective scrub management will ensure that structure and ecological value develop without the system becoming overgrown or shaded. No nutrient inputs will be applied to meadow or SuDS planting zones, maintaining the low-fertility conditions required for species-rich composition. External lighting remains excluded from the northern ecological corridor to maintain a functional dark route for bats and other nocturnal wildlife.