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DRAINAGE STRATEGY

Hertfordshire Constabulary, Headquarters Redevelopment

Project number: 60600329
HCHQ-ACM-XX-XX-RP-CE-000002

15 June 2021

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
P01	15.07.2021	For Planning			

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1. Introduction

Scope

Hertfordshire Police Constabulary have commissioned AECOM, as part of the wider design team working with V&G architects, to progress the design to RIBA Stage 2 Concept design. This report is a summary drainage infrastructure design work that has been undertaken in collaboration with the wider design team for the purposes of the planning application.

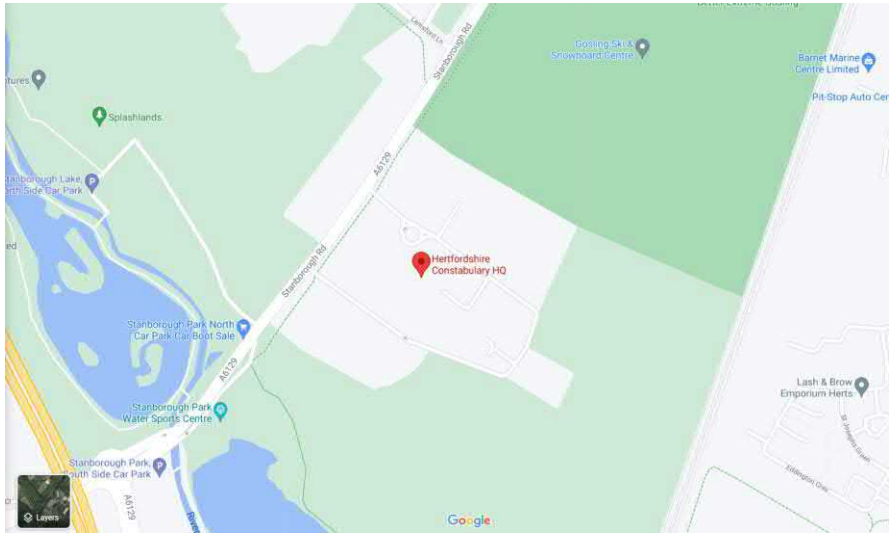
The scheme comprises a new main office building, a separate office facility, temporary catering for the build duration and ancillary buildings for various police departments.

Proposed site facilities include plant rooms, police and visitor parking.

Some parts of the site remain unchanged – this includes a large car park, firing range and open space, vehicle garages and some office space.

Location

The site is located on the existing Hertfordshire Constabulary HQ site on Stanborough Road, Welwyn Garden City, AL8 6XF



2. Design Requirements

Policy & Guidance

For guidance on surface water management in developments, the following documents provided by the Lead Local Flood Authority (LLFA); Hertfordshire County Council (HCC) have been referred to throughout:

- LLFA Summary Guidance for Developers
- Climate Change Allowance Note V3
- Hertfordshire County Council Local Flood Risk Management Strategy 2: 2019-2029 (Inclusive of SuDS policies).
- Roads in Hertfordshire: Highway Design Guide 3rd Edition; Section 4 – Design Standards and Advice

Herts' Local Policy is based on the NPPF and Defra Non-statutory Technical Standards and we have therefore not summarised all below to avoid repetition.

Any connections and discharges to sewers will be based on the information in Sewerage Sector Guidance Appendix C: Design and Construction Guidance, the replacement document for Sewers for Adoption. This came into use in April 2020 and the 6 month transition has now ended and the use of the document is mandatory.

General technical guidance from DCG, BS EN 752 Drainage systems outside buildings, BS EN 12056, Approved Document H of the Building Regulations and CIRIA C753 - The SuDS Manual will be considered throughout the design process.

The values and calculations included in this report are initial estimates only and will be subject to further review and development during the development of the design.
The purpose of this report is to demonstrate that the site is capable of discharging surface water without increasing flood risk to on-site and off-site parties. The drainage strategy considers the following:

- Existing site layout and discharge arrangements;
- Existing impermeable and permeable area arrangements;
- Proposed site layout and discharge arrangements;
- Proposed impermeable and permeable area arrangements;
- Climate change.

This report also includes an outline foul water drainage strategy.

LLFA SuDS Policy Requirements

Policy 13: Discharge hierarchy for SuDS
Proposals for SuDS must follow the discharge hierarchy as set out in the non-statutory technical standards for sustainable drainage systems.

The discharge hierarchy should be appropriately assessed and the selected discharge point for proposed SuDS must be justified in accordance with the SuDS standard requirement for runoff destination using a methodology acceptable to Hertfordshire County Council and the Local Planning Authority.

To support the drainage strategy, approval for discharge should be sought from the owner/operator of the receiving system. This should include permission to cross the land adjacent to the site and/or land in third-party ownership to secure access to the proposed connection point.

Policy 14: Runoff rates for greenfield sites
For greenfield sites, the peak runoff rate from the development for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event must not exceed the peak greenfield runoff rate from the whole site for the same event.

The runoff volume from the developed site in the 1 in 100-year, 6-hour rainfall event must not exceed the greenfield runoff volume for the same event.

Policy 15: Runoff rates for previously developed sites
Previously developed sites should aim to discharge at the original pre-development greenfield rate for the whole site area where possible. If not, a significant reduction in the current rate of discharge should be achieved and evidence provided as to why greenfield rates are not viable.

The volume of attenuation storage that would be required for the site should be based on the 1 in 100-year critical storm duration with an allowance for climate change and the allowable discharge rate.

Policy 16: Flooding on and from development sites
Flooding must not occur on any part of the site for a 1 in 30-year rainfall event except in areas that are designed to hold and convey water.

During a 1 in 100 year plus climate change rainfall event no flooding should occur in any part of a building (including a basement); utility plant susceptible to water (e.g. pumping station or electrical sub-station) or on neighbouring sites.

If there is flooding during 1 in 100 year plus climate change rainfall event, this should be indicated on plan showing extent and depth. Flows that exceed design criteria must be managed in exceedance routes) that minimise risks to people and property both on and off the site.

Policy 17: Development sites along natural flow routes and in existing flood risk areas
Where a development alters the natural flow route and/or is located in an area with existing flooding issues or a high risk of potential flooding; proposals must demonstrate the management of any existing and predicted overland flows entering the site from adjacent areas for all rainfall events up to and including 1 in 100 year plus climate change event.

Policy 18: SuDS to be designed at or near the surface
Proposals must demonstrate that the SuDS have been designed at or near the surface in line with the SuDS hierarchy. Underground attenuation features will only be acceptable where it is proven that alternate surface-based methods are not appropriate or feasible.

The design of the drainage system must account for the likely impacts of climate change and changes in impermeable area over the design life of the development. Appropriate allowances should be applied in each case.

Policy 19: During construction arrangements
There should be appropriate arrangements for surface water drainage during the construction phase of a development site. A construction management plan to address all surface water runoff and any flooding issues during the construction stage should be submitted at detailed design stage.

Policy 20: SuDS to have a design life compatible with the development and to include a management and maintenance plan
Drainage components should have a design life compatible with the development. Design should be based on actual site levels, ensuring that the construction of any other infrastructure and services does not compromise the final construction of the SuDS.

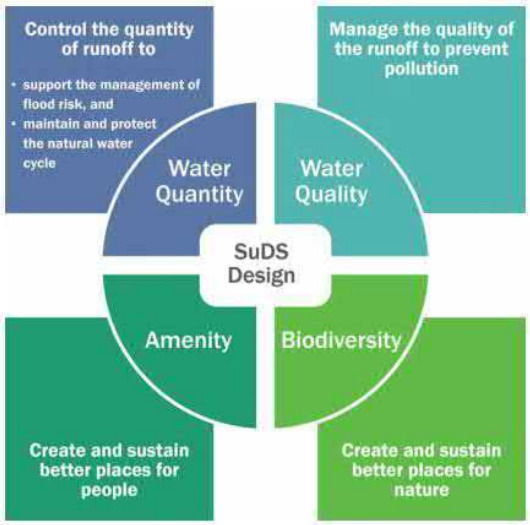
Proposals SuDS must include a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption and any other arrangements to secure the operation of the scheme throughout its lifetime.

Policy 21: SuDS to have wider benefits
In accordance with relevant local plan policies and guidance, proposals for SuDS must maximise wider benefits as appropriate, which include consideration of:
• Safeguarding Water Quality
• Designing for Amenity and Multi-Functionality

SuDS Principles

In addition to the LLFA policy requirements SuDS principles should be developed based on the four pillars of SuDS.

Figure 1 - SuDs principles



3. Supporting Information

The following supporting information has been used to develop this stage of SuDS proposals. This includes a mix of publicly available data and site-specific investigation.

Topography – A topographic survey has been undertaken across the site and defines levels and salient features.

Originator: CSL Surveys Dwg 07908P (April 2018) with additional utilities information by Amethyst Surveys Dwg 12611 (Sept 2017). Further drainage information added September 2020 by CSL Surveys.

Existing Utilities - The Client has provided asset records and a CCTV Survey has been undertaken which show the location of existing surface & foul water drainage and utility services present within the site boundary.

Originator: Amethyst Surveys Dwg 12611 (Sept 2017) – Combined with topo survey

Geology – British Geological Survey mapping has been reviewed using the BGS Geology of Britain Viewer

Flood Risk Maps – Both of the online Flood Risk for Planning and Long-Term Flood Risk Map tools have been used.

Watercourse Maps – Herts' Watercourse Map has been used to check the presence of watercourses.

Greenfield Runoff – Soil and rainfall data within the UKSuDS Greenfield Runoff tool by HR Wallingford have been used to determine greenfield runoff rates. This provides a more accurate selection of SPR values than the maps within MicroDrainage.

Site Layout – HCHQ-VGA-XX-XX-DE-AR-00122 P01 by Vincent + Gorbing.

4. Site Review

Topography – Survey levels show the site to generally fall from northeast (81.5mAOD) to southwest (73.0mAOD) with car parking at the lowest part of the site. This area is considered suitable for storing short term flood volumes at-grade

Existing Utilities – Survey data shows a vast network of utilities serving the site buildings which remain operational. This includes separate foul and surface water drainage networks. Surface water is a gravity system, foul has several pumps and drains by gravity from the northern corner of the site across Stanborough Road. Other utilities include critical electricity supplies and a communiications mast which cannot be interrupted during the course of the works.

Geology - Based on BGS geology mapping, the site is considered to comprise superficial sands and gravels (Kesgrave Catchment Subgroup) as shown in Error! R eference source not found.. These superficial deposits are underlain by Lewes Nodular Chalk Formation as shown in Error! Reference source not found..

Figure 2 - BGS map showing superficial deposits at the site

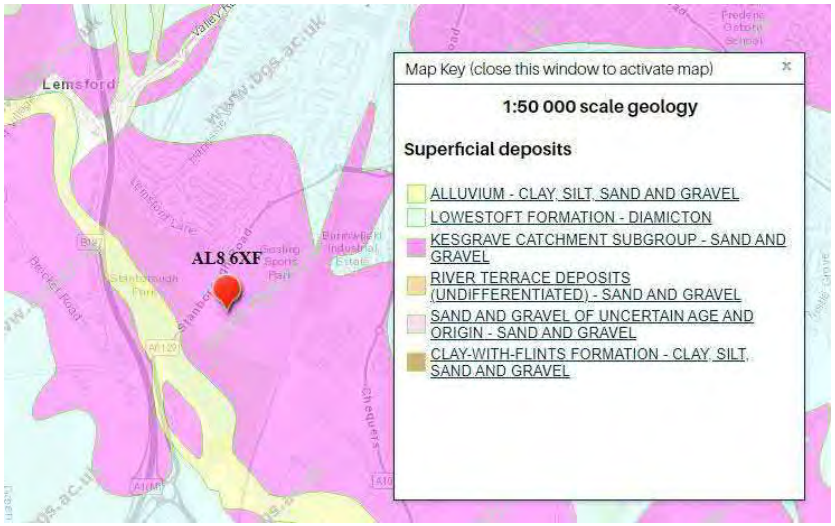
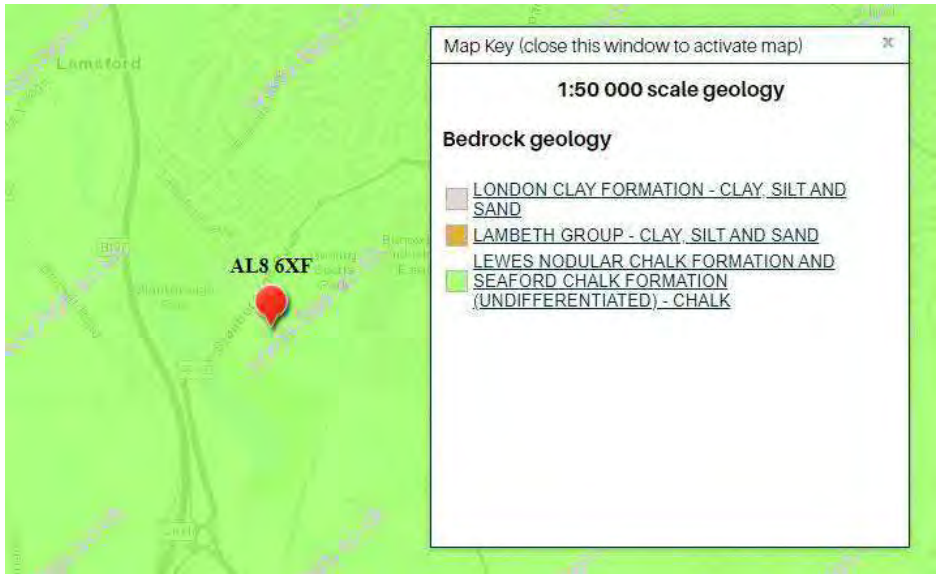


Figure 3 - BGS map showing bedrock geology at the site



Suitability for Infiltration – As part of the SuDS design a drainage hierarchy needs to be considered with more natural methods preferred for disposal of runoff, including infiltration. The soils shown on the BGS maps indicate infiltration is likely to work, however geotechnical input should be sought for infiltration into chalk and testing will be required at later stages to validate assumed infiltration rates. Chalk can be very dense with poor infiltration or pose a risk to foundations. In the interim conservative rates shall be used.

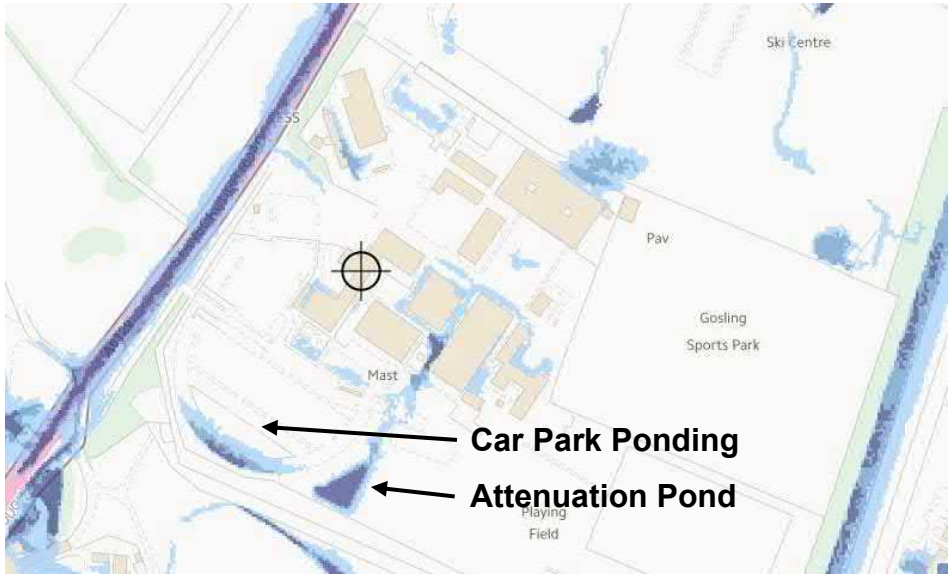
Flood Risk - In accordance with the Online Flood Maps for Planning the site sits within Flood Zone 1 and therefore has a less than 1 in 1,000 annual probability of river or sea flooding. Figure 44 shows the site to be generally at low risk from surface water flooding.

Figure 4 - Surface water flood risk map

Further detail on the Long-Term Flood Risk Mapping site has been analysed and shows some onsite areas of surface water risk. These are shown on **Error! R eference source not found.** and typically highlight a low edge of the car park away from vulnerable buildings. The triangular area adjacent the car park is the existing attenuation pond.

A separate FRA is being prepared for submission with the application.

Figure 5 - Long term flood risk map



Watercourses - The River Lea is the nearest main river and runs in a south-easterly direction approximately 200m from the southernmost point of the site. There are no ordinary watercourses that run through or immediately adjacent the site.

Existing Drainage

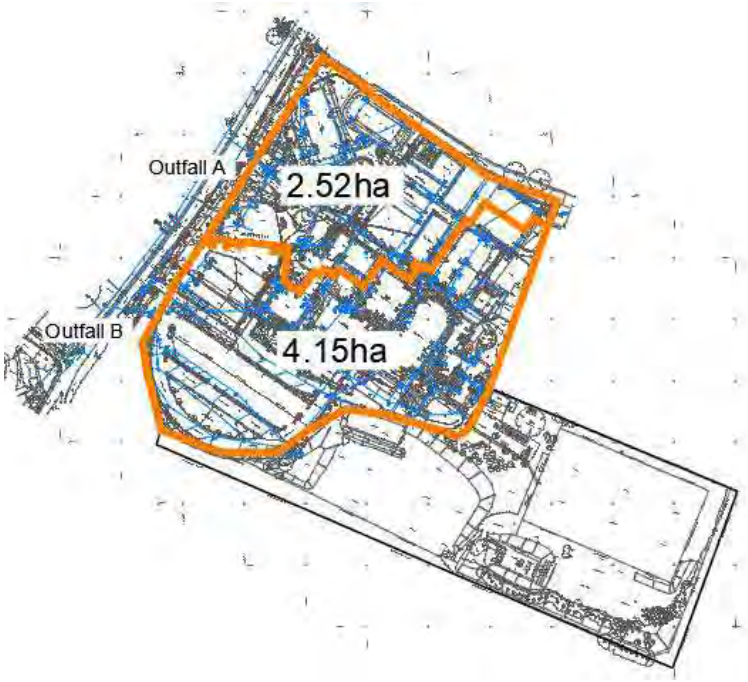
Development Site Status - The site is currently an operational police HQ with a positive drainage system and is considered a brownfield site for drainage purposes.

Outfalls - The site currently has 2 x 225mm diameter surface water outfalls to the Thames Water sewer in Stanborough Road. These are shown on the existing catchment plan HCHQ-ACM-XX-ZZ-DR-CE-01002, Outfall A and B have a capacity of 127 l/s and 198 l/s respectively. Additionally, there is an existing 150mm diameter foul lateral from the north of the site draining to the existing Thames Water sewer on the opposite of Stanborough Road.

Existing Contributing Area - The site currently has 3 existing catchments, totalling 11.5ha, shown on drawing HCHQ-ACM-XX-ZZ-DR-CE-01002. Catchment 1 drains to Outfall A unrestricted. Catchment 2 drains to Outfall B via an attenuation pond but there appears to be no flow control device. The contribution of Catchment 3 is limited due to the pipe leaving the existing attenuation pond throttling flows. The pipe is 225 diameter and approximately 1/280 giving a capacity of just over 30 l/s using the Colebrook-White equation.

Brownfield Runoff Rates – Using the area of the main site, exclusive of large open space and the shooting range, the Modified rational method has been used to calculate the existing brownfield runoff rates for each outfall. **Error! Reference s ource not found.** shows these runoff areas for reference and although they have not been used to determine discharge rates they do offer insight into the betterment the proposed scheme provides.

Figure 4 - Runoff areas to outfalls A and B



A summary of the rates, calculated using Causeway Flow, are provided in **Table 1.** In this table PIMP stands for the percentage impermeable area and runoffs are calculated in l/s.

Table 1 – Brownfield (BF) runoff rates

	Total Area (ha)	PIMP (%)	Pre-Dev. BF runoff (Q1)	Pre-Dev. BF runoff (Q30)	Pre-Dev. BF runoff (Q100)
Outfall A (Catchment 1)	2.52	80	73.6	180.3	236.0
Outfall B (Catchment 2 and 3)	4.15	80	121.3	297.0	388.7

Rainfall Data - At this stage FEH data has not been acquired and FSR data was used. As detailed within the DEFRA EA Coastal Erosion R&D Preliminary rainfall runoff management for developments report, FEH rainfall data yields a higher rainfall depth than that of FSR for this area. It is therefore the intention to use FEH data at detailed design stage to ensure appropriate sizing of proposals.

Greenfield Runoff Rates – Greenfield runoff rates have been calculated in accordance with Policy 15 using the ICP SuDS method. These have been divided pro-rata to each of the development areas and are shown in **Table 2**.

Table 2 – Greenfield (GF) runoff (ICP SuDs Method)

	Total Area (ha)	Pre-Dev. GF runoff (QBar)	Pre-Dev. GF runoff (Q1)	Pre-Dev. GF runoff (Q30)	Pre-Dev. GF runoff (Q100)
Whole site (l/s)	11.5	19.49	16.57	44.84	62.19
(l/s/ha)	1.0	1.70	1.45	3.90	5.4

5. Proposed Drainage

Surface Water Drainage

5.1 The proposed development comprises multiple buildings within the planning application boundary. These comprise the Atrium (main office building), Decant (providing continuity of office space during construction of the Atrium),relocated dog kennels and the Estates & Facilities building.

5.2 Drainage should follow the hierarchy set out in the Building Regulations and PPG. Based on the data review in section 4 the site conditions are summarised against the hierarchy below:

- **Design for re-use:** As the site comprises mostly office space water demand is relatively low. The cost of distributing recycles water over a number of floors is prohibitive and this has not been incorporated. The frequent use of SuDS in the landscaping design also reduces the reliance on watering so this has limited benefit externally.
- **Disposal using infiltration:** Infiltration has been utilised in ~1.4ha of external paved areas representing nearly half of all runoff.
- **Drain to a watercouse:** No watercourses are present on site
- **Drain to a sewer:** Roof drainage and areas not utilising infiltration, e.g. due to proximity to buildings, is drained to the sewer at an attenuated rate

5.3 Values for QBar have been applied to the developed areas to assess peak storage volumes requested runoff rates in Policy 15. **Table 3** shows the anticipated runoff values post development whereby a 0 l/s discharge reflects a proposed infiltration solution.

5.4 Storage estimates are shown on drawing HCHQ-00-00-DR-CE-01003.

Table 3 – Preliminary proposed runoff values

Area	Catchment Area (ha)	Pre-Dev. GF runoff (QBar)	Post-Dev. discharge	Post-Dev. Contributing Area (ha)	Post-Dev. PIMP (%)
Atrium	1.14	1.94	3.41	0.64	56
Main Car Park Incl. E&F Building	0.87	1.47	0	0.72	83
Decant / Support Building	0.82	1.39	1.39	0.24	26
Rear Car Park	0.54	0.90	0	0.49	82
Kennels	0.16	0.3	1.2	0.08	
Total	**3.53**	**6.00**	**6.00**	**2.17**	**61**

5.5 Where attenuation volumes cannot be met due to topography, obstructions or other constraints the rate would be increased to meet the volume of attenuation that can be provided without unnecessary flooding on or off site subject to the agreement of the LLFA.

5.6 **Climate Change** - A 40% climate change allowance for an increase in peak rainfall intensity is to be used for post-development calculations as detailed within the HCC Climate Change Allowance Note to support the NPPF.

5.7 **Run-off Coefficient** - A Volumetric Runoff Coefficient (Cv) of 1.0 will to be used for the purposes of determining runoff from paved areas and zero for green areas (SSG Appendix C – Design & Construction Guidance C6.1.3)

5.8 **Attenuation Volumes** – Using Microdrainage's quick storage estimate tool we have calculated a range of storage volumes for on-site attenuation that would be required if a QBar discharge rate is implemented. The summary volume range for the 1:30 year event is 964 – 1334m^3 which must be stored below ground. For the 100 year event plus 40% climate change allowance the summary volume is 2007 – 2661m^3 – this can be stored underground or managed at grade, e.g. stored in open areas, car parks and away from buildings. An approximation of the distribution of this is shown below.

Table 4 – Preliminary Attenuation Volumes

Area	Volume (30 year)	Volume (100 year + 40%)
Atrium	289-400m^3	601-797m^3
Main Car Park Incl. E&F Building	324-449m^3	675-895m^3
Decant / Support Building	107-148 m^3	222-294m^3
Rear Car Park	209-289 m^3	435-576m^3
Kennels	36-49 m^3	74-98m^3
Total	**964-1334m^3**	**2007-2661m^3**

5.9 **Attenuation Methods –** Attenuation provision will be met in a number of ways. Car parks will attenuate residual volumes within open graded subbase until it has dissipated into the ground. This must also meet 24 hour half-drain down criteria and is therefore subject to suitable infiltration rates.

Where runoff is captured on surfaces it will be directed where possible to rain gardens. This will percolate through landscaping features minimum 400mm deep and into an underlying layer of open graded aggregate. Where necessary to increase attenuation volumes a layer of cellular storage will be included.

Once collected the Atrium and kennel area drains into an existing attenuation pond which will be increased to contain any increase in storage required as a result of reducing discharge to greenfield rates.

5.10 Consideration will be given to rainwater harvesting despite not relying on it as a method of storage, potential uses including washdown areas and watering plants as part of the landscape maintenance however these are not guaranteed and will be utilised if the development during detail design highlights a need or opportunity.

Figure 5 - Typical underdrained rain garden

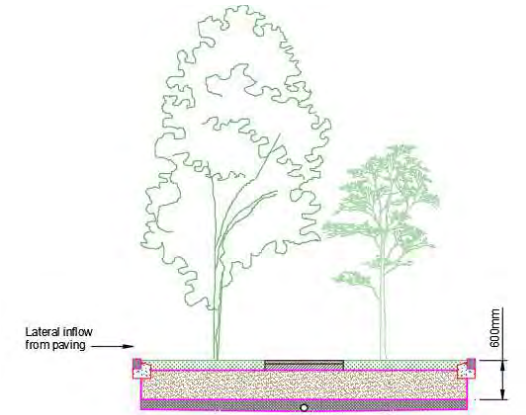


Figure 6 - Typical underdrained rain garden with storage

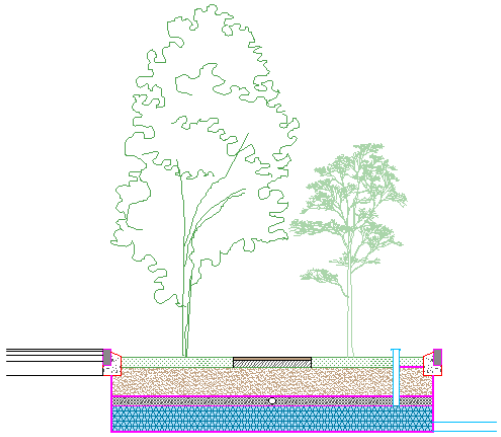
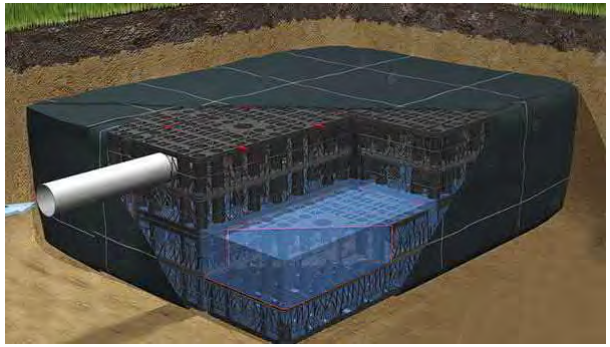


Figure 9 - Typical underground storage



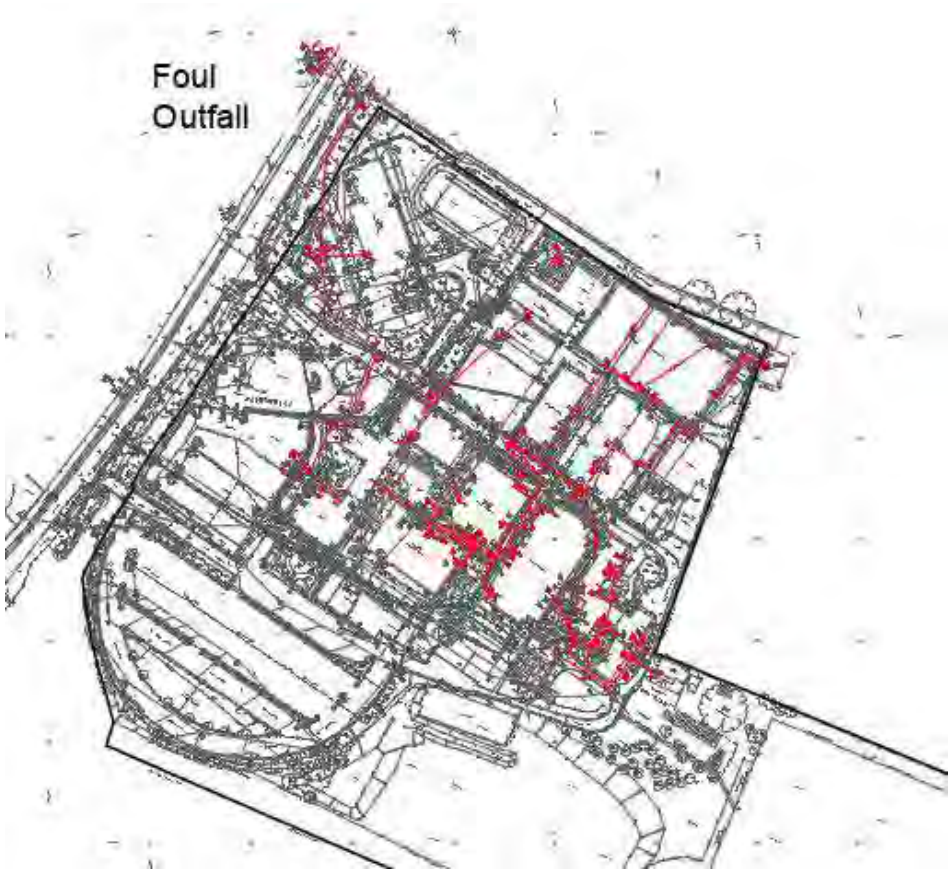
Foul Drainage

5.11 Foul drainage will make use of the existing site drainage network, some of which is pumped. Foul flows are not expected to change significantly and will be conveyed to the existing outfall within the site boundary.

5.12 Foul pumps should have a backup pump and be sized to ensure 24 hours storage is provided to comply with Building Regulations. This ensures the system capacity is not exceeded in the event that the pump fails.

5.13 **Foul Outfall –** The foul outfalls to the existing Thames Water sewer on the opposite side of Stanborough Road. Capacity is unlikely to be an issue as there is no expected increase in water use with the redevelopment.

Figure 7 - Foul water sewage network within the site



Compliance, Engagement and Approvals

5.14 A number of stakeholders are involved in the drainage aspects of the scheme. It's likely that permission or consultation will be needed with both the Lead Local Flood Authority (Herts County Council) and Thames Water to agree a strategy at this stage.

5.15 These are expected to be:

- Thames Water pre-development discussions regarding foul and surface water capacity
- LLFA pre-planning discussions to develop the proposed strategy
- Thames Water approval of the connections prior to construction
- Clearance of and drainage related planning conditions prior to construction
- Highway authority approval for any adjustments to gullies at the site entrance (if required)

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