FRA & SuDS Strategy Report

FRA20161.1A

The PES

Belmont Close Garages,

London,

EN4 9LT

27-11-2023

Prepared for:

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1. Executive Summary

The PES has been commissioned to produce a FRA & SuDS Strategy Report in support of a planning application for the proposed development at Belmont Close Garages, London, EN4 9LT. The proposal is for the retention of the existing garages and the creation of six new homes on the site. The existing roofs of the garages will be removed to accommodate the six new homes on a first floor podium level. Four car parking spaces are proposed in addition to a cycle store and refuse store, and the site will be comprehensively landscaped.

This FRA and SuDS report has been prepared as a desk top study based on the architectural drawings supplied and gathered data available within the public domain. It summarises the SuDS design process for the proposed development and demonstrates that the development complies with planning policy on flood risk – National Planning Policy Framework (NPPF) and supports Planning Practice Guidance (PPG) as well as the local London Borough of Enfield Policies and guidelines including associated SuDS requirements.

The design process began with a review and analysis of the proposed development and the existing site conditions with respect to surface water drainage and flood risk. This included a study of both the hydrology and hydrogeology of the site.

The proposed SuDS design strategy provides for the source control techniques of permeable paving as Formpave / Aquaflow attenuation / infiltration system or similar, green roofs and rain gardens and rainwater harvesting butt system for water reuse. Surface water will be discharged into the existing Thames Water surface water sewer network adjacent to the proposed development.

Associated hydraulic and attenuation calculations showing both pre and post development impermeable areas and a description of the proposed surface water management SuDS scheme for the site were prepared accordingly. Hydraulic design was an iterative process to provide for flow controls sized and used to allow a practicable maintenance regime to be incorporated within and to allow for attenuation drain down times. Flow controls have been sized and used to allow a practicable maintenance regime to be incorporated within permeable paving 250mm thick as Formpave / Aquaflow attenuation infiltration or similar system in conjunction with a 1200mm deep crated attenuation system. A controlled discharge rate of Qbar 0.5 l/s for the 1 in 100yr +40% cc runoff scenarios requires a total of 60.7m^3 attenuation. The required attenuation is provided within the permeable pavement, rain gardens, crated attenuation and the drainage network itself.

The SuDS provides a surface water management solution that reduces the surface water run off that leaves the site and shows that the proposed development does not result in an increase to the risk of flooding on or off site.

Permeable paving is provided on site for permeable conveyance and passive treatment techniques to collect, convey, attenuate and treat storm / surface water prior to discharge via a crated attenuation system into the existing adjacent offsite Thames Water surface water sewer network that serves the area. It will also take the first 5mm of rainfall.

Green roofs, rain garden and communal landscaping areas with Rainwater Harvesting water butts are provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration

Surface water from the site is to be connected to the Thames Water surface water sewer as existing.

A Thames Water capacity check & points of discharge application should be made.

This report provides a management and a maintenance regime statement for the SuDS surface water management of the new development.

2. Introduction

Brief

The PES has been commissioned to produce a FRA & SuDS Strategy Report in support of a planning application for the proposed development at Belmont Close Garages, London, EN4 9LT. The proposal is for the retention of the existing garages and the creation of six new homes on the site. The existing roofs of the garages will be removed to accommodate the six new homes on a first floor podium level. Four car parking spaces are proposed in addition to a cycle store and refuse store, and the site will be comprehensively landscaped.

This desk study report is produced to identify an appropriate SuDS for the new residential development that mirrors the natural drainage pattern of the development site and restricts flows to greenfield runoff conditions if possible for the site. The SuDS will provide a surface water management solution to reduce the surface water run off that leaves the site and show that the proposed development will not result in an increase to the risk of flooding on or off site. Where required, it recommends mitigation to any potential flooding issues associated with the proposed development. The SuDS solution follows the requirements of the Environment Agency (EA), The London Borough of Enfield and Thames Water.

The SuDS solution is developed using information supplied by others. The PES in good faith has used it as deemed accurate, without guarantee but as best information available at the time of completion of the SuDS design and associated report.

The purpose of this report is to summarise the SuDS strategy design process for the proposed development and demonstrate that the development complies with national planning policy on flood risk as well as the local London Borough of Enfield Policy, the London Plan and guidelines including associated SuDS requirements.

Report Structure

These works are discussed in the following sections. The structure of this report is summarised as follows:

- Section 3: Describes site conditions with respect to topography, hydrology, hydrogeology, drainage and potential design proposals as well as identifying National and local planning Policies and guidance;
- Section 4: Provides a commentary on how flood risk from a range of potential sources may or may not constrain development proposals and influence the SuDS solution;
- Section 5: Provides a surface water drainage statement;
- Section 6: Provides a management and a maintenance regime statement for the surface water drainage/ SuDS surface water management;
- Section 7: Presents a summary of the report and identifies the main conclusions that can be drawn.

3. Site Conditions and Planning Policy

Existing Conditions

The Belmont Close Garages site comprises a perimeter block of 28 private garages within a private residential estate in Cockfosters, whose main entrance is located on Mount Pleasant. The garages are accessed from two vehicular entrances at either end of the block, off Belmont Close and there is a dense row of unkempt shrubbery which borders the western edge. It sits within an existing urban mainly residential area.

There is no ordinary watercourse on or next to the site.

The existing site and neighbourhood is served by a separate Thames Water foul and surface water sewer network.

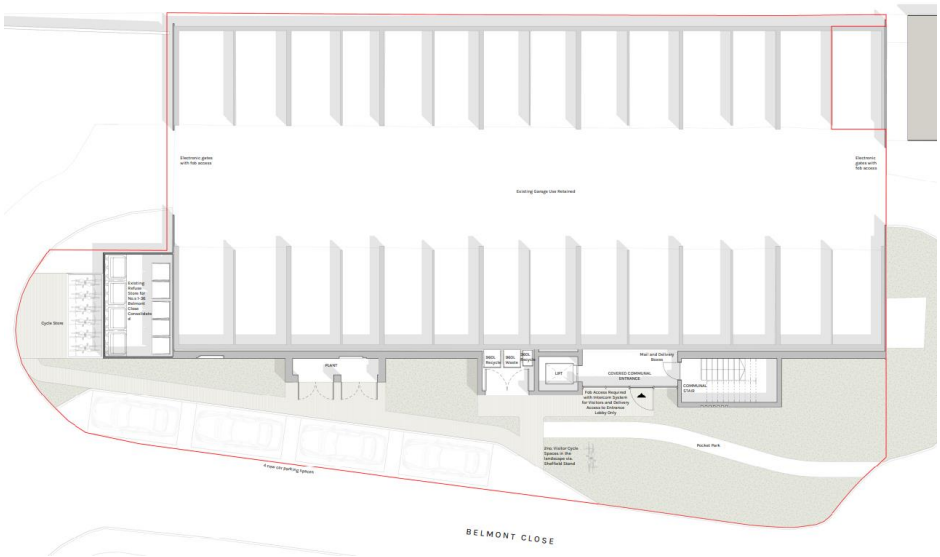
Proposed development

The development proposal is for the retention of the existing garages and the creation of six new homes on the site. The existing roofs of the garages will be removed to accommodate the six new homes on a first floor podium level. Four car parking spaces are proposed in addition to a cycle store and refuse store, and the site will be comprehensively landscaped.

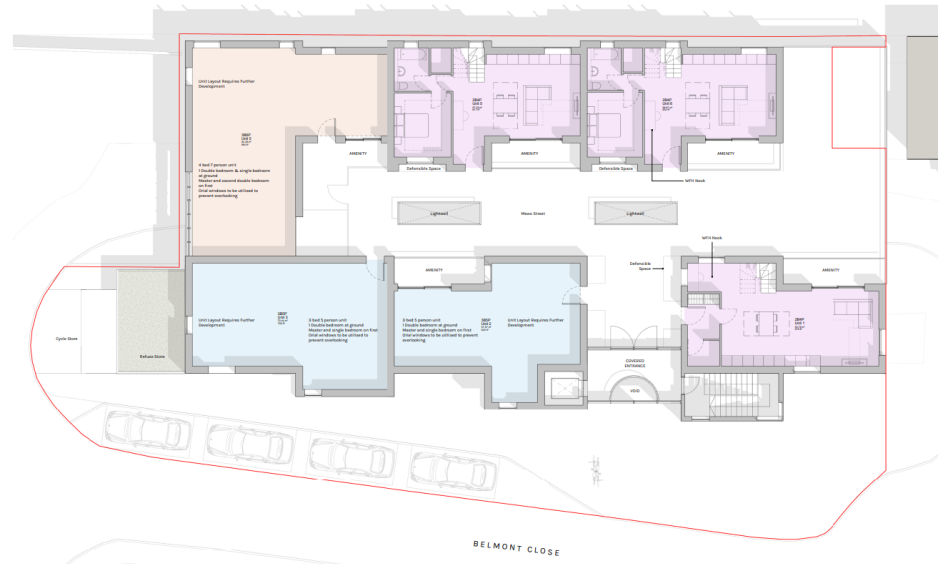
The site location can be seen in Figure 1 below.

Figure 1 - Site Location for Belmont Close Garages, London, EN4 9LT

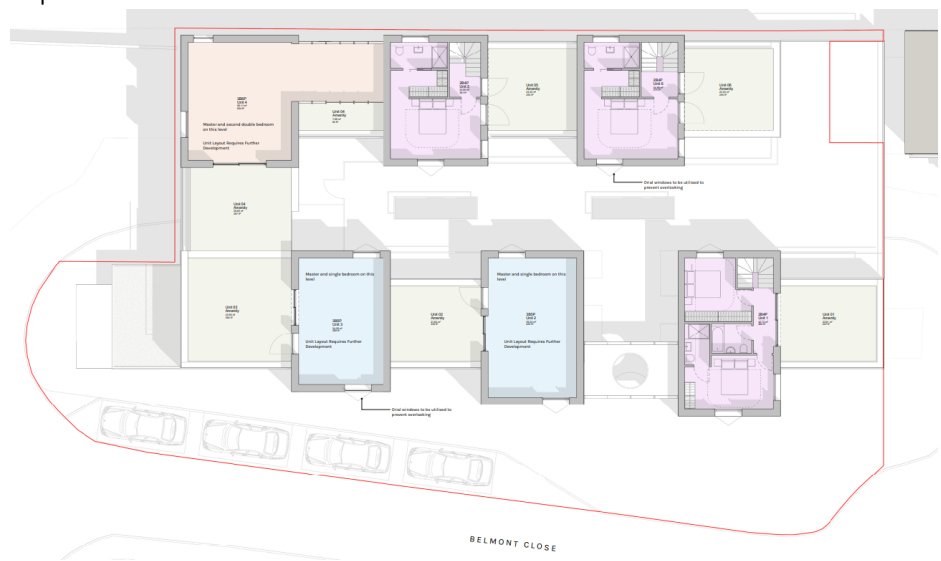
The ground, first & second floor plans and views looking east, south & north to the mews for the proposed development at Belmont Close garages, London, EN4 9LT are shown below in Figures 2 and 3 respectively.



Proposed Ground Floor GA Plan



Proposed First Floor GA Plan



Proposed Second Floor GA Plan

Figure 2 - Proposed Ground, First & Second Floor Plans for the development at Belmont Close Garages, London, EN4 9LT

Visual - View Looking East to Mews

Visual - View Looking South to Mews

Visual - View Looking North to Mews

Figure 3 – Views Looking East, South & North to Mews for the Proposed Development at Belmont Close Garages, London, EN4 9LT

Critical Drainage Area

The London Borough of Enfield 's Surface Water Management Plan has designated eighteen Critical Drainage Areas (CDAs) within the London Borough.

The Belmont Close Garages, London, EN4 9LT site is not located within a CDA as is shown on the London Borough of Enfield Critical Drainage Areas plan in Figure 4 below.

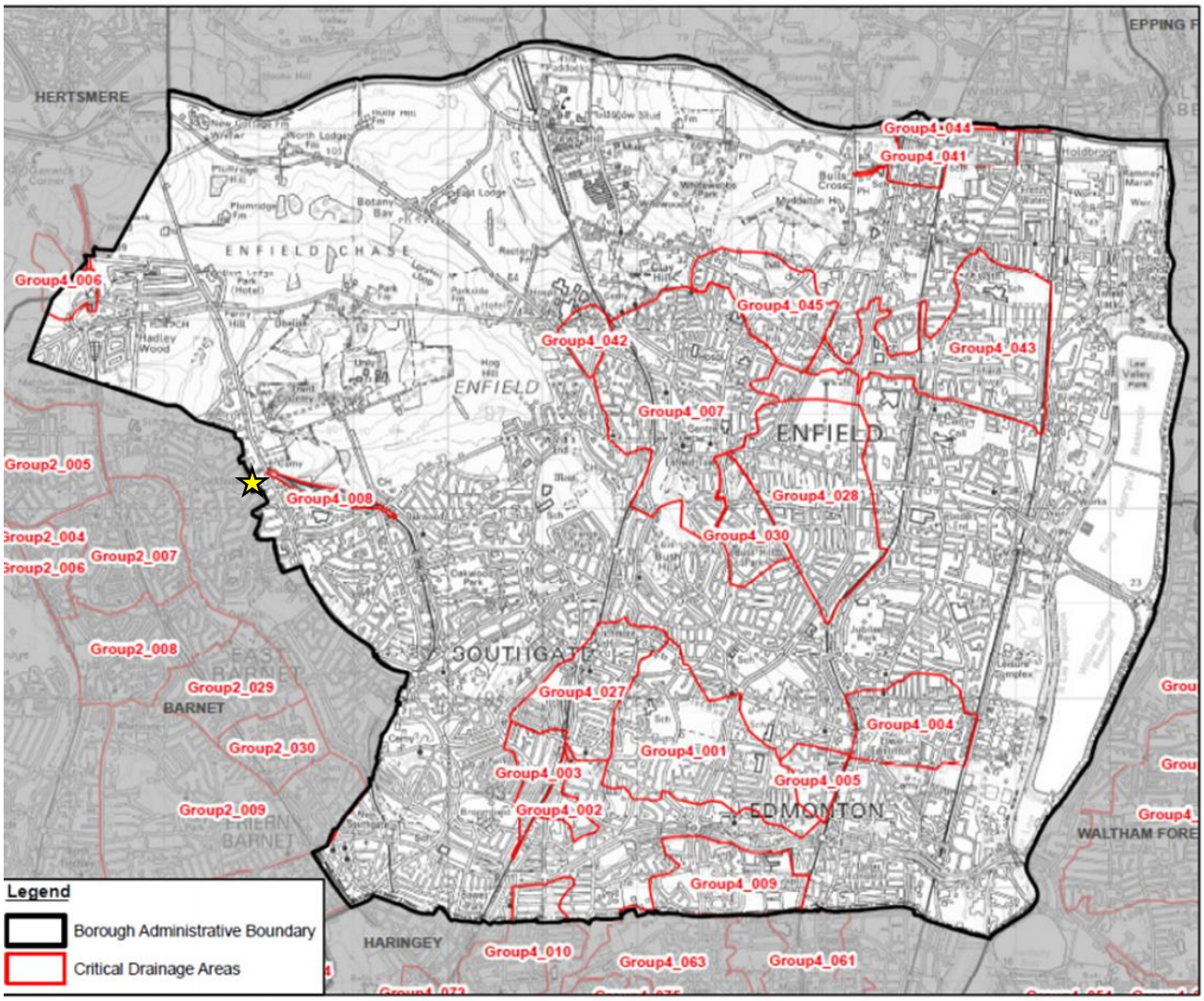


Figure i Critical Drainage Areas within the London Borough of Enfield

★ Site Location

Figure 4 - Figure i Critical Drainage Areas within the London Borough of Enfield (from the Enfield SWMP) Local Flood Risk Management Strategy 2012)

Existing Site Drainage / Thames Water

Thames Water Asset data shows that the site is serviced by a Thames Water separate surface and foul water sewer system network located immediately adjacent next to the existing east side of the buildings and to the south of the development site

Thames Water asset location data is provided within Appendix A. Please note that these are not a fully comprehensive record of their assets within the area and private drainage is not shown on their plans nor all level data for associated inspection chambers / manholes.

Topography

The Belmont Close Garages, London, EN4 9LT site falls from its northern end of approximately 98.2mAOD t97.6mAOD at its southern end. There is a slight fall from east to west of approximately 100mm.

Surface water runoff and exceedance flows generally flow towards the Belmont Close roadway.

Hydrology

The Belmont Close Garages, London, EN4 9LT site lies within the Environment Agency's (EA) Thames river basin district.

There is no ordinary watercourse on or adjacent to the site. There is no designated main river in close proximity to the development site. The nearest watercourse is a tributary of Merryhills Brook located approximately 250m to the east on the other side of the railway line adjacent to Cockfoster station. Pymme's Brook is a distance of nearly 1km to the west.

Surface water runoff and exceedance flows from the proposed development site fall off site to Belmont Close .

The existing development is serviced by a Thames Water surface water sewer network that runs within the site boundary at the rear of the property or into the surface water sewer within Sweet Briar Grove.

Hydrogeology

The British Geological Survey site describes the site bedrock geology as Claygate Member - Clay, Silt and Sand. A sedimentary bedrock formed in the Palaeogene Period. The Claygate Member comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. The bedrock at the Belmont Close garages site identified by the British Geological Survey site is shown in Figure 5 below.

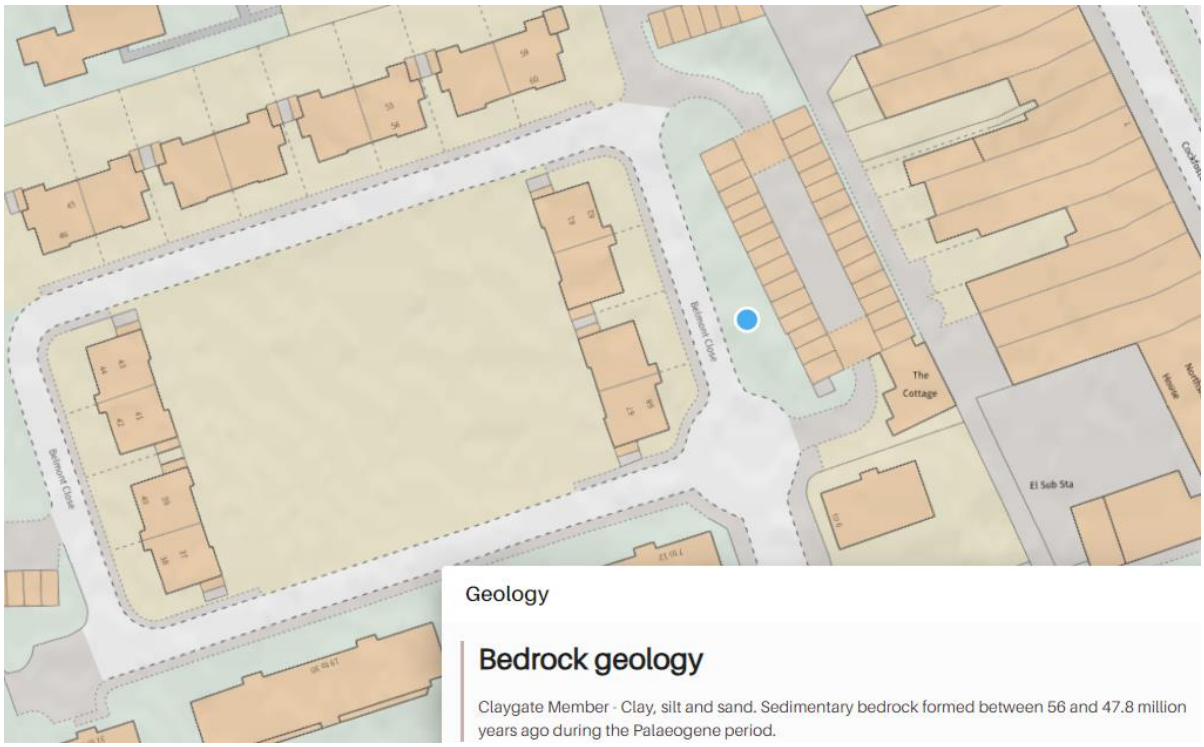


Figure 5 - BGS Bedrock Geology 1 in 50,000 (Source: British Geological Society Website (Contains British Geological Survey materials © URKI [2019]. Base mapping is provided by ESRI)).

The British Geological Survey site describes the superficial deposits geology on site as Dollis Hill Gravel Member - Sand and gravel. Sedimentary superficial deposit formed during the Quaternary period sits directly on the Claygate bedrock. The gravel, sandy and clayey in part, with laminated beds of silty clay, peat and organic material deposits are perched unconformably on the impermeable bedrock. The superficial deposits at the Belmont close garages site identified by the British Geological Survey site is shown in Figure 6 below. There is no current ground investigation information available for the site and there are no records of any historical boreholes on or near the site.

Further discussion relating to groundwater levels and groundwater flood risk for the proposed site is provided below within Section 4 Flooding. It identifies the development site as being within an area at risk of flooding from groundwater. It is concluded that high ground water levels would preclude the potential for a source control infiltration / soak away system at the site.

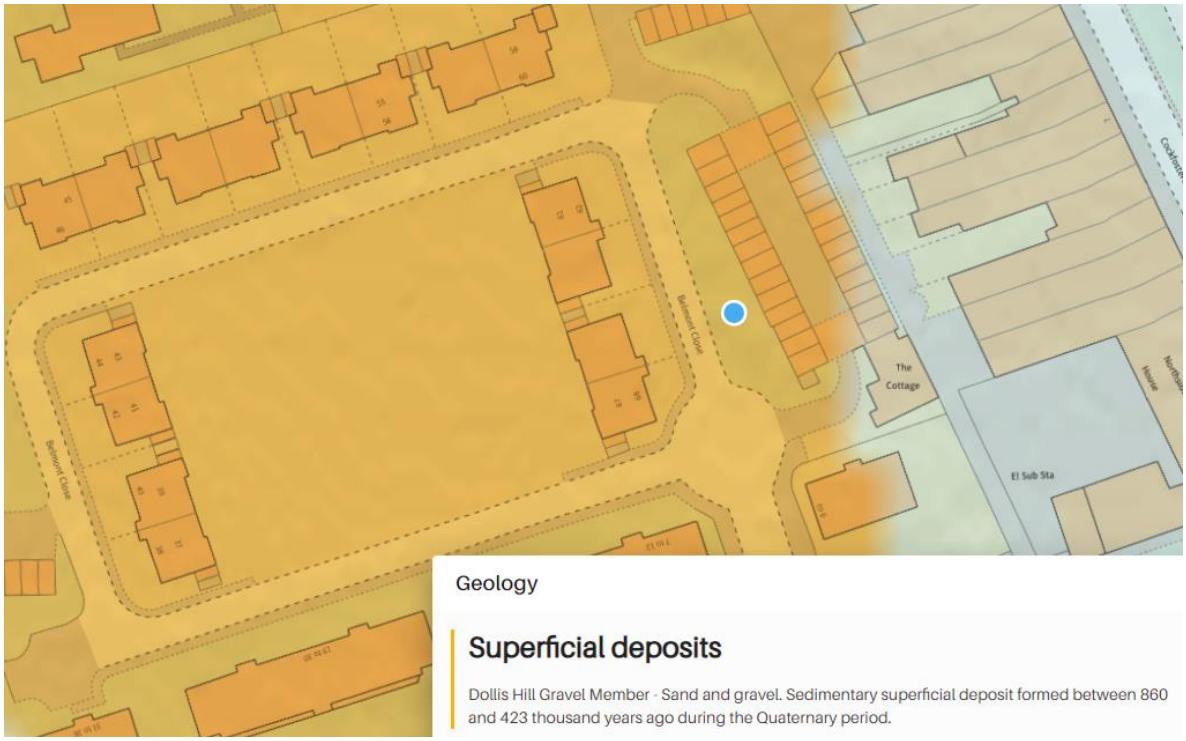
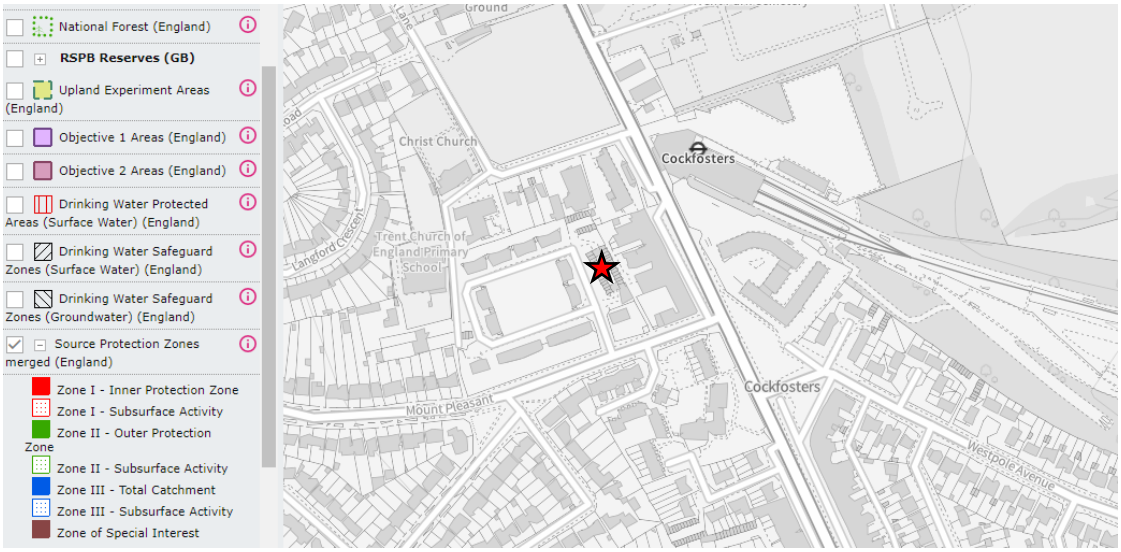


Figure 6 - BGS Superficial Geology 1 in 50,000 (Source: British Geological Society Website (Contains British Geological Survey materials © URKI [2019]. Base mapping is provided by ESRI)).

The presence of a Thames Water surface water sewers adjacent to the proposed development site that serves the area would seemingly confirm negative issues for infiltration within the area. A GI undertaken at detail design stage would prove infiltration rates and current water table levels but not potential future levels. The existing site is a mix of brown and greenfield that currently drains without flood occurrence. A SuDS strategy that mimics the existing drainage of the site should be proposed.

The SuDS strategy for the proposed development will be discussed further in sections below.

Groundwater



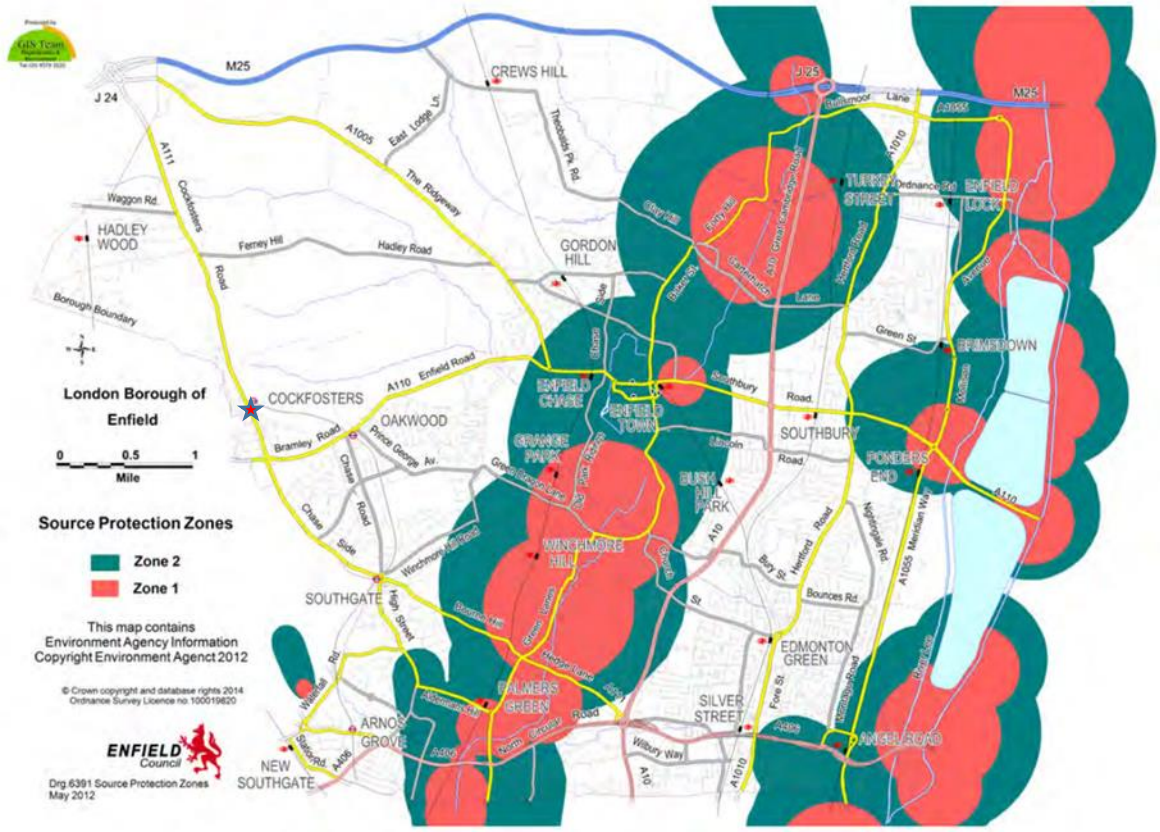
★ Location of the development.

Figure 7 - magic.defra.gov.uk - Source Protection Zones merged (England)

The application site is not located within a groundwater source protection zone as is shown above within the magic.defra.gov.uk in Figure 7 and below in Figure 8 - Map 15.3 Source Protection Zones: London Borough of Enfield document Development Management Document (DMD) November 2014.

15.3 Source Protection Zones

Map 15.4 Source Protection Zones



★ Site Location

Figure 8 - Map 15.3 Source Protection Zones: LB of Enfield DMD November 2014.

Flood Zone

The application site is within a Flood Zone 1 area as shown in Figure 9 below.

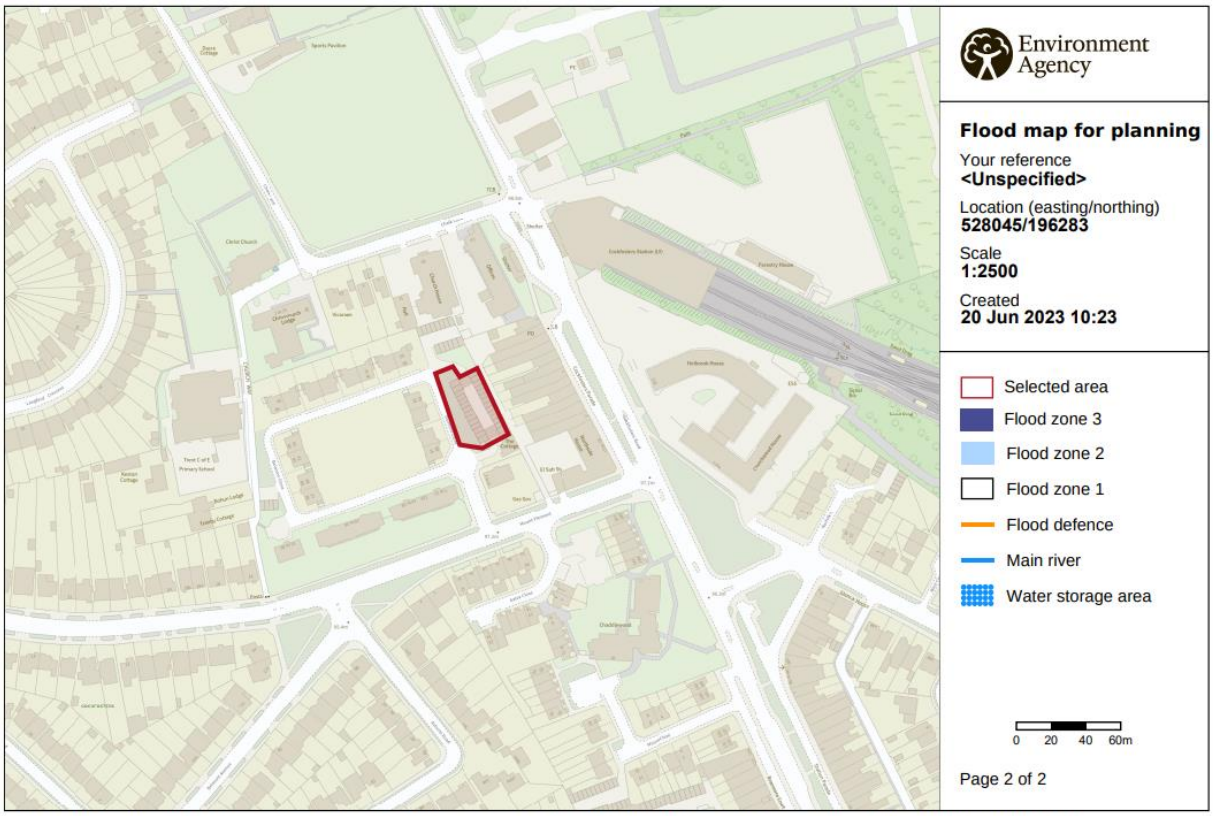


Figure 9 – EA Flood Map for Planning

Planning Policy

The National Planning Policy Framework (NPPF) currently sets out the Government's planning policies for England and defines Flood Zones, Flood Risk vulnerability classification and their compatibility in the tables below.

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)

Flood Zone	Definition
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Table 1 – Table 1 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

Table 2: Flood risk vulnerability classification

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More vulnerable • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.

• Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 1 – Table 2 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

The proposed development classification at the application site is more vulnerable.

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

Table 2 – Table 3 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

More vulnerable developments are acceptable within a Flood Zone 1.

References

This FRA & SuDS Strategy takes into account and makes reference to the NPPF and the National Planning Practice Guidance (NPPG) as well as the local polices and guidance provided within the

London Plan policy 5.13 & draft New London Plan policySI13; London Borough of Enfield 's SuDS webpage; Strategic Flood Risk Assessment February 2008: Level 2 Strategic Flood Risk Assessment July 2013; Development Management Document (DMD) November 2014; New draft local Plan policy SUS5; Flood Risk Management Strategy 2016; Preliminary Flood Risk Assessment; Surface Water Management Plan 2012; Sustainable Drainage design & Evaluation Guide as well as direct consultation through flooding@enfield.gov.uk / suds@enfield.gov.uk .

It also makes reference to consultations with the Environment Agency and Thames Water as well as CIRIA753 The SuDS Manual.

4. Flooding

Introduction

There are a wide range of potential mechanisms which can cause flooding. Each potential source of flooding is discussed individually below. This section refers to the LB of Enfield Local and Strategic Flood Risk / Management Strategies.

Tidal or River Flooding

The EA plan shows that the application site is within an area where the flood risk from rivers or the sea at this location is less than very low as shown in the Environment Agency flood risk map showing "Extent of flooding from rivers or the sea" provided below in Figure 10 – Flood Risk from Rivers or the sea.

Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.

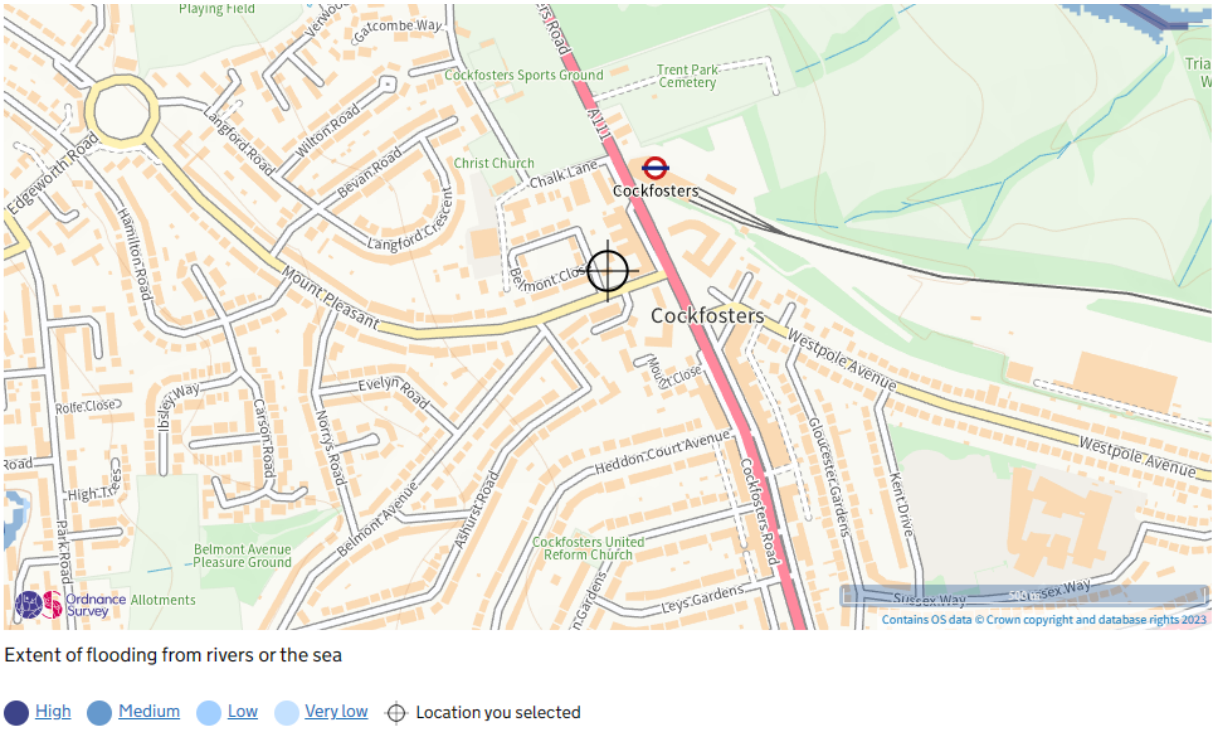


Figure 10 - Flood Risk from Rivers or the sea

There is no historical record of fluvial flooding at the site.

Surface Water Flooding

Surface water flooding can occur during high intensity rainfall events as sheet run off from fields or hard paved areas.

The Belmont Close Garages site sits within an area that has a very low of flooding from surface water as shown in the Environment Agency flood risk map "Extent of flooding from surface water" provided below in Figure 11 - Flood Risk from Surface Water.

Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Extent of flooding from surface water

High Medium Low Very low Location you selected

Figure 11 - Flood Risk from Surface Water

There is no historical record of surface water flooding at the site.

Groundwater Flooding

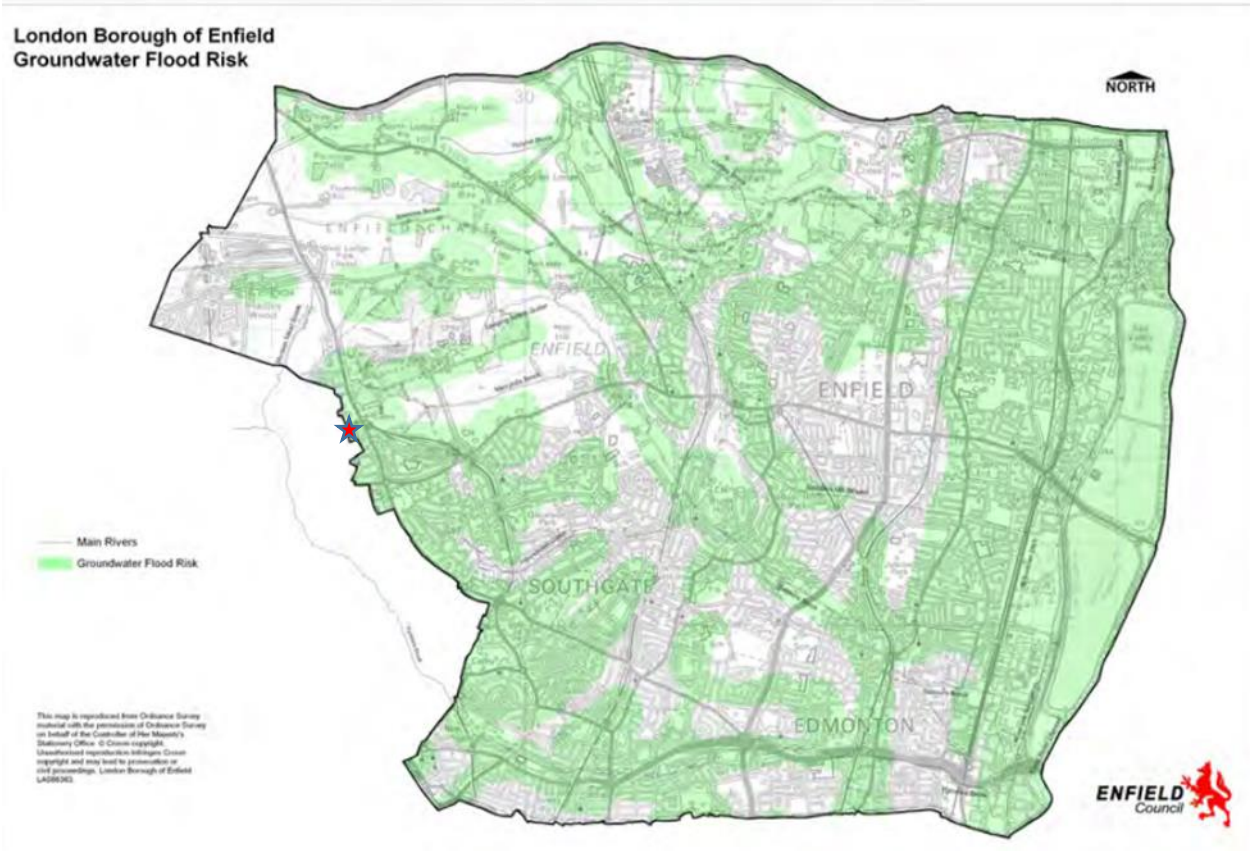
The London Borough of Enfield's Surface Water Management Plan (SWMP) states that "Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata." And, that "A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land." The London Borough of Enfield has no historical records of Groundwater flooding at the proposed development site.

The London Borough of Enfield Map 15.2 Groundwater Flood Risk indicates that the proposed Belmont Close Garages site is within an area at risk of groundwater flooding. Figure 12 - Flood Risk from groundwater flooding below, shows the London Borough of Enfield Map 15.2 Groundwater Flood Risk.

Given that the proposed SuDS solution should apply for the life time of the development a full ground water source control infiltration soakaway system may not be appropriate for this site. However, a partial infiltration may be appropriate. It is noted that the site is currently served by surface water sewers located adjacent to the site itself.

The London Borough of Enfield has no historical records of groundwater flooding at the proposed development site.

Map 15.2 Groundwater Flood Risk



Location of the development.

Figure 12 - Flood Risk from groundwater flooding

Flood Risk From Sewers

Thames Water has sewerage networks within the vicinity that services the development site for both foul sewage and surface water drainage. The Thames Water asset plans are shown in Appendix A.

Thames Water have confirmed that their flooding records indicate that there have been no incidents of flooding as a result of surcharging / overloaded public sewers at the application site. Please see the Thames Water correspondence in Appendix A.

Thames Water referencing for properties at risk of flooding from sewers include the following:

• A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

• "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

• "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.

• Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.

• Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.

• Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.

It is expected that the sewers and water distribution networks in the vicinity of this site are well maintained as Thames Water is a highly professional company having planned operations and maintenance regimes for their sewerage, drainage and potable water main network systems.

It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Thames Water. Their report excludes flooding from private sewers and drains and Thames Water makes no comment upon this matter.

Flood Risk from other Sources

In rare occasions, a development may be subject to flood risk from upstream features such as reservoirs, where there is a theoretical risk of failure. An area is considered at risk if peoples' lives could be threatened by an uncontrolled release of water from a reservoir.

The application site is not at risk of flooding from the failure of a reservoir as is shown in the EA flood risk map below in Figure 13 - Flood Risk from Reservoirs.

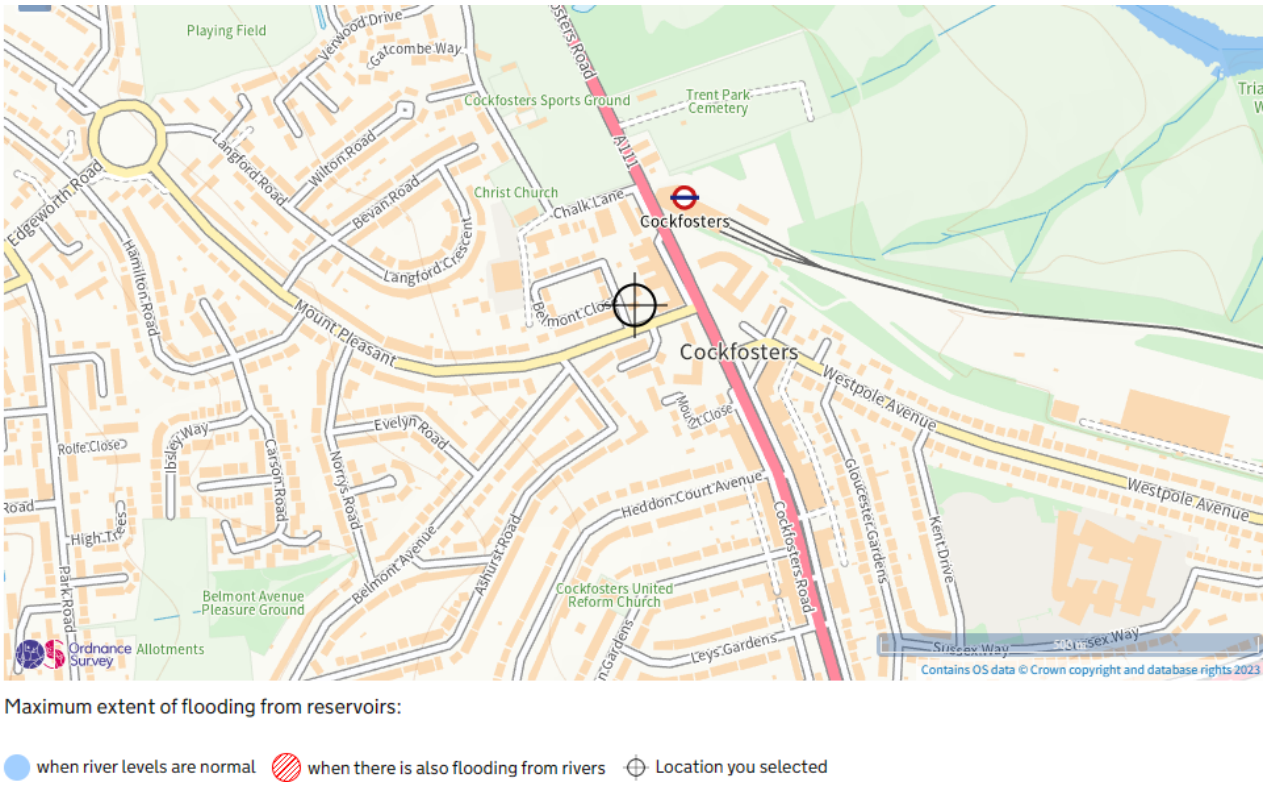


Figure 13 – Flood Risk from Reservoirs

Flood Risk Summary

Data from the Environment Agency's flood maps and information provided by Thames Water along with the LB of Enfield state that the site is generally at a low risk of flooding.

There are no historical records of flooding at the site.

5. Sustainable Drainage Systems Strategy

Philosophy

Sustainable drainage has moved away from the traditional thinking of designing to manage flood risk and where runoff is regarded as a nuisance to a philosophy of surface water being a valuable resource that should be managed for maximum benefit.

Sustainable Drainage systems (SuDS) can contribute to sustainable development overall by improving the places and spaces where we live, work and play as well as balancing the different opportunities and challenges that influence urban design and the development of communities.

The SuDS philosophy is to replicate, as closely as possible the natural drainage from a site before development. SuDS mimic nature and manage rainfall close to where it falls. They can be designed to convey surface water, slow / attenuate runoff before it enters watercourses, provide areas to store water in natural contours and can be used to allow water to infiltrate into the ground or evaporate from the surface and transpired from vegetation.

The "four pillars" of SuDS design philosophy is to meet design objective where surface water runoff is managed for water quantity, water quality, amenity and biodiversity benefits.

Management Train

Adopting a holistic approach towards surface water drainage provides the benefits of combined water quality and quantity control, biodiversity as well as increased amenity value. This is accomplished by managing the increased flows and pollution from surface water runoff that can arise from development

A fundamental concept used in the management / development of SuDS is the management train or treatment train, illustrated in Figure 14 below

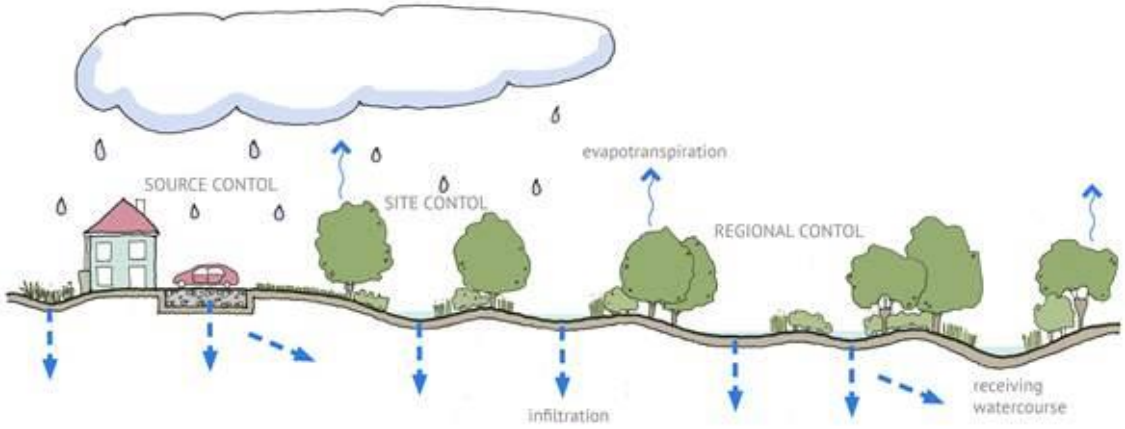


Figure 14 - SuDS Management Train (susdrain)

Just as in a natural catchment, drainage techniques can be used in series to change the flow and quality characteristics of the runoff in stages. The management train starts with prevention (prevent runoff by reducing impermeable areas), or good housekeeping measures for reducing pollution; and progresses through local source controls to larger downstream site and regional controls

They are regarded as a sequence of management practices, control structures and strategies designed to efficiently and sustainably drain surface water, while minimising pollution and managing the impact on water quality of local water bodies. Within the philosophy of the surface water management train each component adds to the performance of the whole drainage system.

Design Requirements

SuDS design proposals should consider the location of discharge as a hierarchy, Planning Practice Guidance states:

"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer."

The current London Plan Policy SI 13 Sustainable drainage states:

"Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

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

SuDS design:

- Manage runoff volumes and flow rates from hard surfaces, reducing the impact of urbanisation on flooding
- Provide opportunities for using runoff where it falls
- Protect or enhance water quality (reducing pollution from runoff)
- Protect natural flow regimes in watercourses
- Are sympathetic to the environment and the needs of the local community
- Provide an attractive habitat for wildlife in urban watercourses
- Provide opportunities for evapotranspiration from vegetation and surface water
- Encourage natural groundwater/aquifer recharge (where appropriate)
- Create better places to live, work and play.

Summary of typical SuDS Components:

Source Control

- Good house keeping
- Green Roofs
- Infiltration Basins
- Infiltration trenches
- Permeable pavements / Grasscrete
- Rainwater Harvesting
- Soakaways

Permeable Conveyance Systems

- Filter (or French) Drains
- Swales

Passive Treatment

- Bioretention / Vegetated areas
- Filter Strips
- Detention Basins
- Retention ponds
- Wetlands

Pipes and accessories. A series of conduits and their accessories normally laid underground that convey surface water to a suitable location for treatment and/or disposal. (Although sustainable, these techniques should be considered where other SUDS techniques are not practicable).

Site Considerations

As well as to ensure that the users of the site are not at risk, another key objective is to ensure that the development does not increase the potential of flooding elsewhere. This objective can be achieved by designing a drainage / SuDS strategy for the development that will set the strict framework to be followed during the detailed drainage design.

Physical site conditions as described in Section 3 above are taken into account in order to develop a suitable SuDS Strategy for the proposed development. The SuDS strategy will be delivered in accordance with prevailing national and local planning policies and guidance provided within the London Plan policy 5.13 & New London Plan policy SI13 and the LB of Enfield Policies design standards including CIRIA Reports etc.

Currently, the most significant directives influencing the design of the SuDS strategy are the Flood and Water Management Act 2010, London Borough of Enfield 's SuDS webpage; Strategic Flood Risk Assessment February 2008: Level 2 Strategic Flood Risk Assessment July 2013; Development Management Document (DMD) November 2014; New draft local Plan policy SUS5; Flood Risk Management Strategy 2016; Preliminary Flood Risk Assessment; Surface Water Management Plan 2012; Sustainable Drainage design & Evaluation Guide as well as direct consultation through flooding@enfield.gov.

It also makes reference to consultations with the Environment Agency and Thames Water as well as CIRIA753 The SuDS Manual.

This strategy sets the guidelines for future detailed design, but more importantly, it demonstrates that a sustainable drainage solution is deliverable at this site, complying with all relevant planning and legislative criteria.

Outline SuDS Strategy Design

The aim of the outline drainage / SuDS strategy is to mimic the existing drainage system for the site and to restrict discharge rates from the site to as close to greenfield rates as is practicable.

The existing Belmont Close garages site is partially green and brownfield. It consists of the existing hard surfaced residential garages with a rough green area on its western end.

The site sits on superficial deposits of Dollis Hill Member sitting directly on Claygate bedrock. The superficial deposit of gravel, sandy and clayey in part, with laminated beds of silty clay, peat and organic material deposits are perched on the impermeable bedrock. The development site is identified as being within an area at risk of flooding from groundwater. It is concluded that the high ground water levels would preclude the use of a source control infiltration / soak away system at the

site. GI / infiltration testing at detail design would confirm the potential for the use of a source control infiltration / soak away system at the site.

There are no drainage ditches or watercourses on or near the site to drain into. There is no designated main river in the close proximity of the development site.

Thames Water asset drawings provided in Appendix A confirm the location of foul and surface water sewer networks within and adjacent the application site. Please note that these are not a fully comprehensive record of their assets within the area and private drainage is not shown on their plans. The presence of a Thames Water surface water sewers would seemingly confirm the ground being unsuitable for an infiltration / soakaway system at the site. Surface water drainage from the existing development discharges into the Thames Water surface water sewer network.

There are no historical records of flooding at the application site. A review of the EA flood maps, British Geological Society, Thames Water and LB of Merton documents have identified that the site is not suitable for an infiltration solution and has a generally low risk of flooding from on or offsite sources other than groundwater. There is potentially a high risk from groundwater flooding.

Mitigation for the risk of flooding from groundwater should incorporate flood resilient and waterproof measures into the design of the proposed development structure. Structural waterproofing measures are to be integrated into the detail design to prevent any increase in on or off-site groundwater flood risk. The structural design and construction techniques should include for high groundwater.

Surface water runoff exceedance flows from the existing application site falls and flows away from the site.

The main flood risk to the development is therefore from surface water runoff from the development itself. The proposed SuDS strategy will provide for the surface water runoff on the site itself.

In addition to ensuring flood risk on site is not increased the SuDS design for the proposed development considers mitigation in order not to add to offsite flood risk. Surface water drainage flows from the application site will be to a flow based on greenfield runoff / a practicably controlled rate that allows for the associated attenuation half drain down rates.

Thames Water have confirmed that their flooding records indicate that there have been no incidents of flooding as a result of surcharging / overloaded public sewers adjacent to the application site at the Cottage Belmont Close immediately adjacent the garages. It is therefore concluded that the Thames Water surface water sewer has capacity for the existing surface water flow from the existing brownfield site. Drainage flows to the Thames Water surface water sewer will be reduced from the existing unrestricted flow to a flow based on greenfield runoff / a practicably maintained controlled rate that allows for the associated attenuation half drain down rates.

The flow route for exceedance surface water flows off site should be maintained as existing.

The total area of the proposed development site is 1110m^2 and has an impervious area of 710m^2. Brownfield run off calculations for the site were completed and establish brownfield runoff flows for 1 in 2yr of 14.7 l/s, Q30 of 23.6 l/s and Q100 of 29.6 l/s. These calculations are provided in Appendix B.

It is the aim of this study to provide a SuDS strategy solution that is pragmatic in both its specification and maintenance in accordance with site constraints. A practicably maintainable flow control is used to determine a suitable surface water discharge from the proposed development layout. The hydraulic calculation process was an iterative one to assess discharge with appropriate sized flow controls and attenuation drain down times based on as close to greenfield runoff rates as possible.

Runoff calculations for the proposed development site of total impermeable area 950m^2 were calculated to establish greenfield runoff flows for 1 in 2yr and Qbar of 0.5 l/s, 1 in 30yr of 1 l/s and 1 in 100yr of 1.3 l/s. These calculations are provided in Appendix B.

The proposed development has an impervious area of 950m^2.

Runoff calculations for the proposed development site were calculated using the impermeable area of 950m^2. The optimised design provides for a 15mm diameter orifice flow control as the smallest recommended as appropriate for practicable maintenance within a SuDS System..

It provides a flow for 1 in 2yr discharge of 0.3 l/s and 0.5 l/s for the 1 in 100yr+40% cc. The proposed 1 in 100yr+40% cc discharge of 0.5 l/s is equal to the greenfield Qbar discharge and is a saving of 98% of the 1 in 100yr brownfield runoff discharge form the site. Thames Water have confirmed that there is no record of flooding at the site. The proposed runoff for 1 in 100yr + 40% cc calculates that attenuation of 60.7m^3 is required. The required attenuation is provided within the rain gardens, drainage mat, permeable pavement, attenuation crates and the drainage network itself. These calculations are also provided in Appendix B.

Surface water runoff from the first and second floor levels green roofs and the first floor Mews street 40mm thick drainage mat will be collected and drain via ducting and rainwater pipes to rainwater harvesting water butt systems, rain gardens and 250mm thick Formpave / Aquaflow SuDS attenuation system or similar at ground level. Surface water runoff from the roofs and permeable paved off road carparking area at the development frontage drains to a 36m^2 x 1.2m deep crated attenuation prior to discharge via a 15mm diameter orifice flow control to the Thames Water surface water sewer within Belmont Close. Landscaped areas drain to ground.

The proposed SuDS design strategy will provide a mix of source control, permeable conveyance and treatment techniques to collect, convey, attenuate and treat storm / surface water prior to discharge into the existing Thames Water surface water sewer network that serves the existing site.

Green roofs, rain gardens and rainwater harvesting water butt systems and communal landscaping are provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as provide opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration.

The permeable paving will provide for both source control and the 5mm first flush and will provide for an element of passive treatment prior discharge to the ground and overflow to the Thames Water Surface Water sewer.

Rain gardens and rainwater harvesting water butt systems are to be included at rainwater down pipes in accordance with landscaping requirements to accommodate an element of water reuse for the landscaped areas.

Ground levels should allow for exceedance flows from roofs and ground level to be directed away from the development to mirror the existing flow routes.

Rainwater runoff flows from the development will drain as it currently does.

A plan of the drainage strategy is provided in drawing FRA 20161-DS-001A in Appendix C and should be read in conjunction with the landscaping strategy.

This strategy has been developed from a desk top study. Site surveys / investigations of the site drainage connections, network lines and levels should be undertaken to confirm the SuDS Strategy for detailed design.

A Thames Water capacity check & points of discharge application should be made.

6. Management and Maintenance

The onsite surface water management system is not eligible for adoption and will remain in the private ownership of the developer / HA / freeholder. The developer / HA / freeholder will be responsible for the long-term maintenance of the onsite drainage system.

All drainage works are to be completed prior to occupation.

On Site SuDS

Surface water runoff from the first and second floor levels green roofs and the first floor Mews street drainage 40mm thick drainage mat will be collected and drain via ducting and rainwater pipes to rainwater harvesting water butt systems, rain gardens and 250mm thick Formpave / Aquaflow SuDS attenuation system or similar at ground level. Surface water runoff from the roofs and permeable paved off road carparking area at the development frontage drains to a $36m^2$ x 1.2m deep crated attenuation prior to discharge via a 15mm diameter orifice flow control to the Thames Water surface water sewer within Belmont Close. Landscaped areas drain to ground.

Rainwater harvesting water butts will be provided at rainwater down pipes adjacent landscaped garden areas to accommodate an element of water reuse and stimulate biodiversity and amenity value for the communal areas.

Ground levels should allow for exceedance flows from roofs and ground level to be directed away from the development to Belmont Close to mirror the existing flow routes.

A plan of the drainage strategy is provided in drawing FRA 20163-DS-001A in Appendix C.

Maintenance

The maintenance strategy and regime are to be in line with the CIRIA SuDS Design Guide and specific manufacturers recommendations. They should include

- inspections required to identify performance issues and plan appropriate maintenance needs
- operation and maintenance of the overall drainage system
- landscape management
- waste management associated with contaminated silt and other waste materials resulting from maintenance.

An Operations & Management Manual for the SuDS should be prepared and supplied to the site operator. It should provide the surface water management strategy and SuDS overall philosophy as well as the function and operation of each component. Manufacturers technical details and maintenance procedures and requirements should be included within the Manual.

General

Regular monthly good housekeeping management with inspections and cleansing should be employed at the whole of the site.

Regular inspection and cleansing of catchment, guttering, pipe inlets, channels, filters and inspection chambers to reduce the likelihood of contamination is required to suit the prevailing operations, usage and circumstances of the development site.

Inspections after extreme rainstorms are essential to ensure that there are no blockages.

Regular inspections & removal of litter, debris and sediment intrusion or other items that represent blockage risks.

Contaminated silts / sediments etc to be disposed of at appropriately licenced tip.

Regular weeding and maintenance should be carried out and more intently during months of growth.

Green Roof Maintenance

Inspection routines are essential to maintain efficient drainage performance of a green / blue roof and they should be carried out at regular intervals. Inspections and frequency of maintenance needed will be based on the green roof design and purpose of the installation. Checking of condition of filter medium and deeper drainage layers will be required occasionally. All green roofs require an annual maintenance programme.

Regular:	Seasonal weed and invasive plant control. Feed green roof planting. Keep edges tidy.
	Each outlet, should be inspected and cleared of any build up or debris. Ensure roof drainage is clear and functioning, remove sediment, litter and other deposits from inspection chambers and check pipe inlets. Do not flush debris down rainwater pipes.
	The catch pit chamber and orifice plate for the attenuation should be checked and emptied regularly to ensure there is no silting up of the system
	Visually inspect the waterproofing system at all upstands, to ensure it is firmly adhered to the detail that it is waterproofing.
Occasional:	Following any significant storm event, the outlets & flow controls should be visually inspected to ensure no blockage has occurred.
	Following any significant traffic or remedial works that take place on or around the roof, each of the outlets should be visually inspected to ensure all drainage holes are clear and free draining.
	All leaf litter mainly autumnal visit, should be removed from the roof surface.
	Vegetation replacement.
Remedial:	Rehabilitate planting. With the exception of saplings, which should always be removed, weeds in a biodiverse green roof should be considered as a problem only of aesthetics, unless they are particularly invasive. If considered undesirable, they should be removed.
	Any vegetation which has encroached into drainage outlets, Inspection chambers, walkways and the vegetation barriers (pebbles) should be removed. If movement/settlement of the pebble vegetation barrier has occurred, additional washed stone pebbles similar to the existing are to be added.
	Structure rehabilitation / repair. Patching with new sedum mat / seed and replace the die back as required. Remediate drainage system and structure as required.

Permeable paving & Drainage Mat

Inspection routines are essential to maintain efficient performance of permeable paving and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken within 3 months of installation. Occasional but regular inspections to be undertaken over the lifetime as required.

Regular:	The catch pit chamber and flow control for the permeable sub-base storage should be checked and emptied regularly to ensure there is no silting up of the system
	Vacuum and sweep permeable paving surface to remove litter, debris and contamination as circumstances require. Minimum: seasonally during Spring and at leaf fall in Autumn.
Occasional:	Management / removal and disposal of sediment intrusion.
	Removal of weeds and invasive plants as circumstance require.
	Washdown paving as required.
Remedial:	Infiltration surface reconditioning / rehabilitate surface. Sweep in and reapplication of 2-4mm clean gritstone. As Required
	Remediate areas of rutting and depressions - structure rehabilitation /repair.
As required	Replace broken / damaged blocks.

Rainwater Harvesting

An Operations & Management Manual for the Rainwater Harvesting Butt technology to be specified at detail design should be prepared accordingly and supplied to the site operator.

Water Butts

Inspection routines are essential to maintain efficient performance of a rainwater harvesting / Water Butt system and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken following a significant storm and / or within 1 month of installation. Regular (quarterly) inspections to be undertaken over the lifetime as required.

Regular:	Inlet and outlet, should be inspected and cleared of any build up or debris.
	Keeping the water within a water butt clean should be a priority. Empty water butt completely to allow cleansing of the interior and remove the sludge, algae and grime that builds up on the sides and bottom of the container. There are various ecologically-sound products available to buy which are specifically made for cleaning the interior of water butts and enhancing the quality of the water. They contain non-toxic chemicals, so they are safe for children, wildlife and pets. These products liquids are usually very good at getting rid of smells in water butts and generally raising the quality of the water. Water purification tablets are an option.
	The exterior of a butt or rain barrel should receive a wipe over with an appropriate cleaning liquid on a regular basis to stop grime building.
Occasional:	Cleansing and reducing volumes of water for winter to prevent the risk of ice forming, expanding, and then cracking or splitting of the container.
Remedial:	Any vegetation which has encroached into drainage outlets should be removed immediately.
	Structure rehabilitation / repair. Remediate drainage system and structure as required.

Crated attenuation system

Inspection routines are essential to maintain efficient performance of crated attenuation systems and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken following a significant storm and / or within 3 months of installation. Regular (quarterly) inspections to be undertaken over the lifetime as required.

Inspection / control chambers are required to monitor and control the water level within the system. The control chamber provide access for inspection and maintenance for cleansing operations as required etc.

Regular:	Each outlet, should be inspected and cleared of any build up or debris. Ensure connection drainage is clear and functioning, remove sediment, litter and other deposits from inspection chambers and check pipe inlets..
Occasional:	Following any significant storm event, the outlets & flow controls should be visually inspected to ensure no blockage has occurred. Following any significant traffic or remedial works that take place on or around the tank, each of the outlets should be visually inspected to ensure all drainage holes are clear and free draining.
Remedial:	Any vegetation which has encroached into drainage outlets, Inspection chambers and crates should be removed. Structure rehabilitation / repair. Remediate drainage system and structure as required.

Rain Garden Maintenance

Inspection routines are essential to maintain efficient drainage performance of a rain garden and they should be carried out at regular intervals. Inspections and frequency of maintenance needed will be based on the rain garden design and purpose of the installation. Checking of condition of drainage layers will be required occasionally. Provide specific garden vegetation management and manage surrounding landscape to ensure it does not interfere with clogging of the rain garden. identify and remediate erosion and ponding. All rain gardens require an annual maintenance programme.

Regular:	Seasonal weed and invasive plant control. Feed green roof planting. Keep edges tidy. Each inlet / outlet, should be inspected and cleared of any build up or debris. Ensure drainage is clear and functioning, remove sediment, litter and other deposits from inspection chambers and check pipe inlets. Do not flush debris down rainwater pipes. The catch pit chamber and orifice plate for the attenuation should be checked and emptied regularly to ensure there is no silting up of the system
Occasional:	Following any significant storm event, the outlets & flow controls should be visually inspected to ensure no blockage has occurred and to ensure all drainage holes are clear and free draining. All leaf litter mainly autumnal visit, should be removed from the rain garden. Vegetation replacement.
Remedial:	Rehabilitate planting. With the exception of saplings, which should always be removed, weeds in a biodiverse garden should be considered as a problem

only of aesthetics, unless they are particularly invasive. If considered undesirable, they should be removed. Remediation of erosion and ponding / poor hydraulic performance.

Any vegetation which has encroached into drainage outlets.

Accidental spillages, oils, poor water quality, odours or nuisance insects to be removed.

Rehabilitation of deteriorated surfaces and permeability.

Structure rehabilitation / repair. Remediate drainage system and structure as required.

7. Conclusions

The PES has been commissioned to produce a FRA & SuDS Strategy Report in support of a planning application for the proposed development at Belmont Close Garages, London, EN4 9LT. The proposal is for the retention of the existing garages and the creation of six new homes on the site. The existing roofs of the garages will be removed to accommodate the six new homes on a first floor podium level. Four car parking spaces are proposed in addition to a cycle store and refuse store, and the site will be comprehensively landscaped.

This FRA and SuDS report has been prepared as a desk top study based on the architectural drawings supplied and gathered data available within the public domain. It summarises the SuDS design process for the proposed development and demonstrates that the development complies with planning policy on flood risk – National Planning Policy Framework (NPPF) and supports Planning Practice Guidance (PPG) as well as the local London Borough of Enfield Policies and guidelines including associated SuDS requirements.

The design process began with a review and analysis of the proposed development and the existing site conditions with respect to surface water drainage and flood risk. This included a study of both the hydrology and hydrogeology of the site.

The proposed SuDS design strategy provides for the source control techniques of permeable paving as Formpave / Aquaflow attenuation / infiltration system or similar, green roofs and rain gardens and rainwater harvesting butt system for water reuse. Surface water will be discharged into the existing Thames Water surface water sewer network adjacent to the proposed development.

Associated hydraulic and attenuation calculations showing both pre and post development impermeable areas and a description of the proposed surface water management SuDS scheme for the site were prepared accordingly. Hydraulic design was an iterative process to provide for flow controls sized and used to allow a practicable maintenance regime to be incorporated within and to allow for attenuation drain down times. Flow controls have been sized and used to allow a practicable maintenance regime to be incorporated within permeable paving as Formpave / Aquaflow attenuation infiltration or similar system in conjunction with a crated attenuation system. A controlled discharge rate of Qbar 0.5 l/s for the 1 in 100yr +40% cc runoff scenarios requires a total of 60.7m^3 attenuation. The required attenuation is provided within the permeable pavement, crated attenuation and the drainage network itself.

The SuDS provides a surface water management solution that reduces the surface water run off that leaves the site and shows that the proposed development does not result in an increase to the risk of flooding on or off site.

Permeable paving is provided on site for permeable conveyance and passive treatment techniques to collect, convey, attenuate and treat storm / surface water prior to discharge via a crated attenuation system into the existing adjacent offsite Thames Water surface water sewer network that serves the area. It will also take the first 5mm of rainfall.

Green roofs, rain garden and communal landscaping areas with Rainwater Harvesting water butts are provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration

Surface water from the site is to be connected to the Thames Water surface water sewer as existing.

A Thames Water capacity check & points of discharge application should be made.

This report provides a management and a maintenance regime statement for the SuDS surface water management of the new development.

Appendix A

Thames Water Correspondence

Asset location search

Thames Water Property Searches

eb Sustainability
Mira Sol Llanfrechfa,Mira Sol

CWMBRAN
NP44 8UF

Search address supplied

The Cottage
Belmont Close
Mount Pleasant
Cockfosters
Barnet
EN4 9LT

Your reference Belmont Close Garages

Our reference ALS/ALS Standard/2023_4846957

Search date 22 June 2023

Notification of Price Changes

From 1st April 2023 Thames water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches. Historically costs would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%.

Customers will be emailed with the new prices by January 1st 2023.

Any orders received with a higher payment prior to the 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset location search

Property Searches

Search address supplied: The Cottage, Belmont Close, Mount Pleasant, Cockfosters, Barnet, EN4 9LT

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield

AL10 9EZ
Tel: 0345 3572401

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

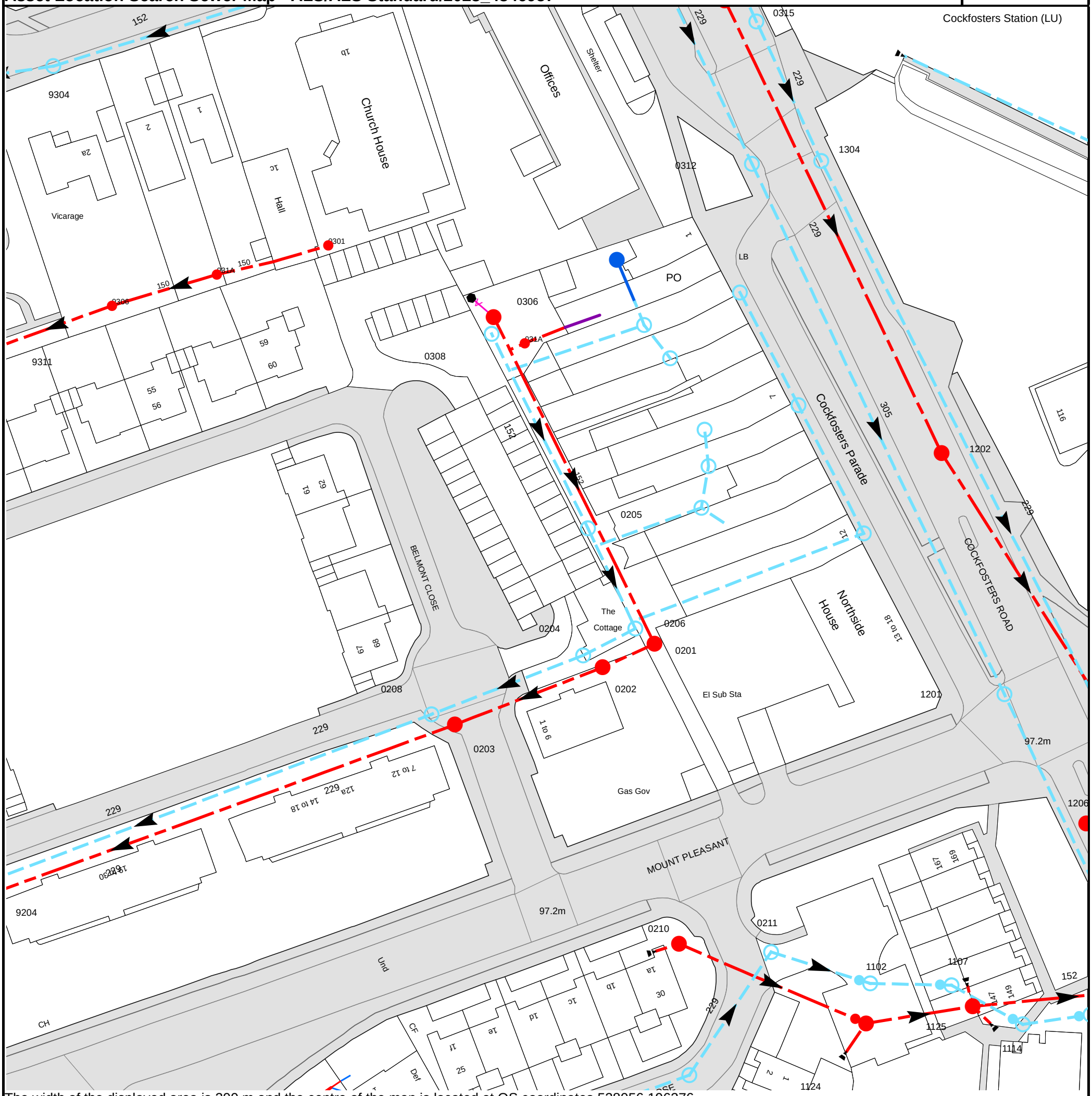
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4846957



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 528056,196276

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1115	96.47	93.78
1206	96.75	94.31
931A	n/a	n/a
0301	98.61	96.93
0308	98.24	96.32
0306	98.33	97.07
031A	n/a	n/a
0204	97.6	94.7
0205	97.9	95.7
0202	97.62	95.62
03CG	n/a	n/a
0206	97.71	95.35
03CI	n/a	n/a
0201	97.69	95.79
03CJ	n/a	n/a
02CB	n/a	n/a
02BJ	n/a	n/a
02CA	n/a	n/a
03DB	n/a	n/a
0312	98.28	97.32
0315	98.44	97.5
13AI	n/a	n/a
1304	98.33	97.01
12AI	n/a	n/a
1202	97.54	91.87
0104	96.63	95.11
1114	96.3	93.82
1124	96.61	94.69
1125	96.55	94.33
1107	96.6	93.95
1102	96.56	94.32
0211	97	94.6
0210	97.2	95.28
0203	97.49	95.33
0208	97.53	94.43
1201	97.33	96.5
9304	98.56	97.61
9306	97.91	96.08

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Sewer Flooding
History Enquiry

Thames Water Property Searches

eb Sustainability

Search address supplied	The Cottage Belmont Close Mount Pleasant Cockfosters Barnet EN4 9LT
Your reference	Belmont Close Garages
Our reference	SFH/SFH Standard/2023_4846958
Received date	**22 June 2023**
Search date	**22 June 2023**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: The Cottage,Belmont Close,Mount Pleasant,Cockfosters,Barnet,EN4 9LT

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Appendix B

Surface Water Drainage System Associated Hydraulic Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Site	0.071	5.00	97.600	1200	-18.438	-7.397	1.350
EX-0208			97.530	1200	21.719	-39.355	1.622

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Site	EX-0208	51.322	0.600	96.250	95.908	0.342	150.0	150	6.05	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.818	14.5	9.6	1.200	1.472	0.071	0.0	89	0.874

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	51.322	150.0	150	Circular	97.600	96.250	1.200	97.530	95.908	1.472

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Site	1200	Manhole	Adoptable	EX-0208	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Site	-18.438	-7.397	97.600	1.350	1200	 0	1.000	96.250	150
EX-0208	21.719	-39.355	97.530	1.622	1200	 1	1.000	95.908	150

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	2880
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	2 year (l/s)	13.5
Summer CV	0.750	30 year (l/s)	24.9
Winter CV	1.000	100 year (l/s)	31.6
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Time of Concentration (mins)	5.00
Brownfield Method	MRM	Betterment (%)	0
Contributing Area (ha)	0.111	Q 2 year (l/s)	13.5
PIMP (%)	64	Q 30 year (l/s)	24.9
CV	0.750	Q 100 year (l/s)	31.6

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Site	11	96.384	0.134	15.4	0.2918	0.0000	OK
15 minute winter	EX-0208	11	96.021	0.113	14.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Site	1.000	EX-0208	14.7	0.955	1.017	0.7893	7.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Site	12	96.983	0.733	29.2	1.6006	0.0000	SURCHARGED
15 minute winter	EX-0208	12	96.045	0.137	23.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Site	1.000	EX-0208	23.6	1.343	1.634	0.8840	13.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Site	12	97.570	1.320	38.0	2.8824	0.0000	FLOOD RISK
15 minute winter	EX-0208	11	96.050	0.142	29.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Site	1.000	EX-0208	29.6	1.683	2.049	0.8944	17.5

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
MAT	0.052	5.00	100.600		1.320	-15.553	0.150
PERM-P	0.015	5.00	97.600		1.320	-19.004	0.950
ATT-IN-3	0.000		97.600		1.320	-20.821	1.592
ATT-OUT	0.000	5.00	97.600		9.640	-24.421	1.600
FCC	0.000		97.600	1200	9.640	-25.421	1.607
EX-0208	0.000		97.530	1200	21.719	-39.355	1.660
RWG-2	0.003	5.00	98.500		-25.727	-17.580	0.900
S05	0.000		97.600	450	-25.720	-18.872	1.050
RWG-3	0.009	5.00	98.500		-19.507	-17.580	0.900
S06	0.008	5.00	97.600	450	-19.495	-19.707	1.092
ATT-IN-2	0.000		97.600		1.320	-22.499	1.592
RWG-1	0.008	5.00	98.500		13.900	-17.632	0.900
S03			97.600	450	15.552	-17.625	1.050
S04			97.600	450	15.570	-20.821	1.071
ATT-IN-1			97.600		13.320	-20.821	1.592

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.000	MAT	PERM-P	3.451	0.600	100.450	96.700	3.750	0.9	100	5.01	50.0
5.001	PERM-P	ATT-IN-3	1.817	0.600	96.650	96.619	0.031	58.6	150	5.03	50.0
1.000	RWG-2	S05	1.292	0.600	97.600	96.550	1.050	1.2	150	5.00	50.0
1.001	S05	S06	6.281	0.600	96.550	96.508	0.042	150.0	150	5.13	50.0
2.000	RWG-3	S06	2.127	0.600	97.600	96.508	1.092	1.9	150	5.00	50.0
1.002	S06	ATT-IN-2	21.001	0.600	96.508	96.368	0.140	150.0	150	5.56	50.0
4.000	RWG-1	S03	1.652	0.600	97.600	96.550	1.050	1.6	150	5.00	50.0
4.001	S03	S04	3.196	0.600	96.550	96.529	0.021	150.0	150	5.07	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
5.000	8.133	63.9	7.0	0.050	0.800	0.052	0.0	22	5.334
5.001	1.316	23.3	9.1	0.800	0.831	0.067	0.0	65	1.238
1.000	9.159	161.9	0.4	0.750	0.900	0.003	0.0	6	1.871
1.001	0.818	14.5	0.4	0.900	0.942	0.003	0.0	17	0.355
2.000	7.277	128.6	1.2	0.750	0.942	0.009	0.0	10	2.271
1.002	0.818	14.5	2.7	0.942	1.082	0.020	0.0	44	0.630
4.000	8.099	143.1	1.1	0.750	0.900	0.008	0.0	9	2.328
4.001	0.818	14.5	1.1	0.900	0.921	0.008	0.0	28	0.480

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.002	S04	ATT-IN-1	2.250	0.600	96.529	96.514	0.015	150.0	150	5.11	50.0
3.000	ATT-OUT	FCC	1.000	0.600	96.000	95.993	0.007	150.0	150	5.02	50.0
3.001	FCC	EX-0208	18.441	0.600	95.993	95.870	0.123	150.0	150	5.40	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.002	0.818	14.5	1.1	0.921	0.936	0.008	0.0	28	0.480
3.000	0.818	14.5	0.0	1.450	1.457	0.000	0.0	0	0.000
3.001	0.818	14.5	0.0	1.457	1.510	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	3.451	0.9	100	Circular	100.600	100.450	0.050	97.600	96.700	0.800
5.001	1.817	58.6	150	Circular	97.600	96.650	0.800	97.600	96.619	0.831
1.000	1.292	1.2	150	Circular	98.500	97.600	0.750	97.600	96.550	0.900
1.001	6.281	150.0	150	Circular	97.600	96.550	0.900	97.600	96.508	0.942
2.000	2.127	1.9	150	Circular	98.500	97.600	0.750	97.600	96.508	0.942
1.002	21.001	150.0	150	Circular	97.600	96.508	0.942	97.600	96.368	1.082
4.000	1.652	1.6	150	Circular	98.500	97.600	0.750	97.600	96.550	0.900
4.001	3.196	150.0	150	Circular	97.600	96.550	0.900	97.600	96.529	0.921
4.002	2.250	150.0	150	Circular	97.600	96.529	0.921	97.600	96.514	0.936
3.000	1.000	150.0	150	Circular	97.600	96.000	1.450	97.600	95.993	1.457
3.001	18.441	150.0	150	Circular	97.600	95.993	1.457	97.530	95.870	1.510

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	MAT		Junction		PERM-P		Junction	
5.001	PERM-P		Junction		ATT-IN-3		Junction	
1.000	RWG-2		Junction		S05	450	Manhole	Adoptable
1.001	S05	450	Manhole	Adoptable	S06	450	Manhole	Adoptable
2.000	RWG-3		Junction		S06	450	Manhole	Adoptable
1.002	S06	450	Manhole	Adoptable	ATT-IN-2		Junction	
4.000	RWG-1		Junction		S03	450	Manhole	Adoptable
4.001	S03	450	Manhole	Adoptable	S04	450	Manhole	Adoptable
4.002	S04	450	Manhole	Adoptable	ATT-IN-1		Junction	
3.000	ATT-OUT		Junction		FCC	1200	Manhole	Adoptable
3.001	FCC	1200	Manhole	Adoptable	EX-0208	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
MAT	1.320	-15.553	100.600	0.150			0	5.000	100.450	100
PERM-P	1.320	-19.004	97.600	0.950			1 0	5.000 5.001	96.700 96.650	100 150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
ATT-IN-3	1.320	-20.821	97.600	1.592		1	5.001	96.619	150
ATT-OUT	9.640	-24.421	97.600	1.600		0	3.000	96.000	150
FCC	9.640	-25.421	97.600	1.607	1200	1	3.000	95.993	150
						0	3.001	95.993	150
EX-0208	21.719	-39.355	97.530	1.660	1200	1	3.001	95.870	150
RWG-2	-25.727	-17.580	98.500	0.900		0	1.000	97.600	150
S05	-25.720	-18.872	97.600	1.050	450	1	1.000	96.550	150
						0	1.001	96.550	150
RWG-3	-19.507	-17.580	98.500	0.900		0	2.000	97.600	150
S06	-19.495	-19.707	97.600	1.092	450	1	2.000	96.508	150
						2	1.001	96.508	150
						0	1.002	96.508	150
ATT-IN-2	1.320	-22.499	97.600	1.592		1	1.002	96.368	150
RWG-1	13.900	-17.632	98.500	0.900		0	4.000	97.600	150
S03	15.552	-17.625	97.600	1.050	450	1	4.000	96.550	150
						0	4.001	96.550	150
S04	15.570	-20.821	97.600	1.071	450	1	4.001	96.529	150
						0	4.002	96.529	150
ATT-IN-1	13.320	-20.821	97.600	1.592		1	4.002	96.514	150

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	2880
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	2 year (l/s)	0.5
Summer CV	0.750	30 year (l/s)	1.0
Winter CV	1.000	100 year (l/s)	1.3
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	40	0	0
1000	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.111	Betterment (%)	0
SAAR (mm)	672	QBar	0.5
Soil Index	4	Q 2 year (l/s)	0.5
SPR	0.47	Q 30 year (l/s)	1.0
Region	1	Q 100 year (l/s)	1.3
Growth Factor 2 year	0.90		

Node FCC Online Orifice Control

Flap Valve	x	Design Depth (m)	1.400	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	0.5		
Invert Level (m)	95.993	Diameter (m)	0.015		

Node RWG-2 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.900	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.032		

Node RWG-2 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.600	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.009		

Node RWG-2 Online Weir Control

Flap Valve	x	Invert Level (m)	98.480	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node RWG-3 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.900	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.032		

Node RWG-3 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.600	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.009		

Node RWG-3 Online Weir Control

Flap Valve	x	Invert Level (m)	98.480	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node RWG-1 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.900	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.032		

Node RWG-1 Online Orifice Control

Flap Valve	x	Invert Level (m)	97.600	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.009		

Node RWG-1 Online Weir Control

Flap Valve	x	Invert Level (m)	98.480	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node ATT-IN-1 Online Orifice Control

Flap Valve	x	Invert Level (m)	96.008	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.150		

Node ATT-IN-2 Online Orifice Control

Flap Valve	x	Invert Level (m)	96.008	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.150		

Node ATT-IN-3 Online Orifice Control

Flap Valve	x	Invert Level (m)	96.008	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.150		

Node MAT Online Orifice Control

Flap Valve	x	Invert Level (m)	100.450	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.015		

Node MAT Online Weir Control

Flap Valve	x	Invert Level (m)	100.495	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node ATT-OUT Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Main Channel Length (m)	8.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	96.000	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	1680	Main Channel n	0.001

Inlets

ATT-IN-3 | ATT-IN-2 | ATT-IN-1

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	38.0	0.0	1.200	38.0	0.0	1.201	0.0	0.0

Node RWG-2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.150	0.6	0.0	0.151	0.0	0.0

Node RWG-2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	9

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.450	0.6	0.0	0.451	0.0	0.0

Node RWG-2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	Time to half empty (mins)	56

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.300	0.6	0.0	0.301	0.0	0.0

Node RWG-3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.150	0.6	0.0	0.151	0.0	0.0

Node RWG-3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	15

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.450	0.6	0.0	0.451	0.0	0.0

Node RWG-3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	Time to half empty (mins)	55

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.300	0.6	0.0	0.301	0.0	0.0

Node RWG-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.150	0.6	0.0	0.151	0.0	0.0

Node RWG-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	14

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.450	0.6	0.0	0.451	0.0	0.0

Node RWG-1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	Time to half empty (mins)	55

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.6	0.0	0.300	0.6	0.0	0.301	0.0	0.0

Node PERM-P Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	97.100	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	320	Depth (m)	0.250
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	31.600		

Node MAT Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	100.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.85	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	105.0	0.0	0.040	105.0	0.0	0.041	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 74.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MAT	12	100.523	0.073	11.3	3.6146	0.0000	OK
15 minute winter	PERM-P	12	96.725	0.075	11.4	0.0000	0.0000	OK
1440 minute winter	ATT-IN-3	1050	96.432	0.424	0.8	0.0000	0.0000	OK
1440 minute winter	ATT-OUT	1050	96.432	0.432	0.6	0.0000	0.0000	SURCHARGED
1440 minute winter	FCC	1050	96.432	0.439	0.3	0.4959	0.0000	SURCHARGED
15 minute summer	EX-0208	1	95.870	0.000	0.1	0.0000	0.0000	OK
60 minute winter	RWG-2	44	97.906	0.306	0.3	0.1742	0.0000	SURCHARGED
60 minute winter	S05	45	96.559	0.009	0.1	0.0015	0.0000	OK
30 minute winter	RWG-3	21	98.117	0.517	1.5	0.2123	0.0000	SURCHARGED
15 minute winter	S06	12	96.551	0.043	2.6	0.0068	0.0000	OK
1440 minute winter	ATT-IN-2	1050	96.432	0.424	0.2	0.0000	0.0000	OK
30 minute winter	RWG-1	21	98.074	0.474	1.3	0.2045	0.0000	SURCHARGED
30 minute winter	S03	21	96.578	0.028	1.0	0.0044	0.0000	OK
30 minute winter	S04	22	96.556	0.027	1.0	0.0043	0.0000	OK
1440 minute winter	ATT-IN-1	1050	96.432	0.424	0.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MAT	Orifice	PERM-P	0.1				
15 minute winter	MAT	Weir	PERM-P	8.7				
15 minute winter	PERM-P	5.001	ATT-IN-3	12.0	1.344	0.515	0.0162	
1440 minute winter	ATT-IN-3	Flow through pond	ATT-OUT	0.6	0.003	0.000	15.4368	
1440 minute winter	ATT-OUT	3.000	FCC	0.3	0.077	0.022	0.0176	
1440 minute winter	FCC	Orifice	EX-0208	0.3				32.2
60 minute winter	RWG-2	Orifice	S05	0.0				
60 minute winter	RWG-2	Orifice	S05	0.1				
60 minute winter	RWG-2	Weir	S05	0.0				
60 minute winter	S05	1.001	S06	0.1	0.171	0.008	0.0113	
30 minute winter	RWG-3	Orifice	S06	1.0				
30 minute winter	RWG-3	Orifice	S06	0.1				
30 minute winter	RWG-3	Weir	S06	0.0				
15 minute winter	S06	1.002	ATT-IN-2	2.5	0.617	0.175	0.0860	
1440 minute winter	ATT-IN-2	Flow through pond	ATT-OUT	0.6	0.003	0.000	15.4368	
30 minute winter	RWG-1	Orifice	S03	0.8				
30 minute winter	RWG-1	Orifice	S03	0.1				
30 minute winter	RWG-1	Weir	S03	0.0				
30 minute winter	S03	4.001	S04	1.0	0.438	0.067	0.0070	
30 minute winter	S04	4.002	ATT-IN-1	1.0	0.457	0.067	0.0047	
1440 minute winter	ATT-IN-1	Flow through pond	ATT-OUT	0.6	0.003	0.000	15.4368	

Results for 30 year Critical Storm Duration. Lowest mass balance: 74.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MAT	10	100.546	0.096	21.4	3.6146	0.0000	OK
720 minute winter	PERM-P	675	96.861	0.211	2.4	0.0000	0.0000	SURCHARGED
720 minute winter	ATT-IN-3	675	96.861	0.853	2.2	0.0000	0.0000	OK
720 minute winter	ATT-OUT	690	96.860	0.860	1.6	0.0000	0.0000	SURCHARGED
720 minute winter	FCC	675	96.860	0.867	0.4	0.9810	0.0000	SURCHARGED
15 minute summer	EX-0208	1	95.870	0.000	0.2	0.0000	0.0000	OK
30 minute winter	RWG-2	21	97.985	0.385	0.9	0.1885	0.0000	SURCHARGED
720 minute winter	S05	675	96.860	0.310	0.1	0.0493	0.0000	SURCHARGED
15 minute winter	RWG-3	12	98.487	0.887	3.7	0.3365	0.0000	FLOOD RISK
720 minute winter	S06	690	96.861	0.353	0.7	0.0561	0.0000	SURCHARGED
720 minute winter	ATT-IN-2	675	96.860	0.852	0.7	0.0000	0.0000	OK
15 minute winter	RWG-1	13	98.433	0.833	3.3	0.3045	0.0000	FLOOD RISK
720 minute winter	S03	675	96.861	0.311	0.3	0.0494	0.0000	SURCHARGED
720 minute winter	S04	675	96.861	0.332	0.3	0.0527	0.0000	SURCHARGED
720 minute winter	ATT-IN-1	690	96.860	0.852	0.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MAT	Orifice	PERM-P	0.1				
15 minute winter	MAT	Weir	PERM-P	21.2				
720 minute winter	PERM-P	5.001	ATT-IN-3	2.2	0.833	0.095	0.0320	
720 minute winter	ATT-IN-3	Flow through pond	ATT-OUT	1.6	0.004	0.000	30.9243	
720 minute winter	ATT-OUT	3.000	FCC	0.4	0.121	0.031	0.0176	
720 minute winter	FCC	Orifice	EX-0208	0.4				52.9
30 minute winter	RWG-2	Orifice	S05	0.6				
30 minute winter	RWG-2	Orifice	S05	0.1				
30 minute winter	RWG-2	Weir	S05	0.0				
720 minute winter	S05	1.001	S06	0.1	0.097	0.006	0.1106	
15 minute winter	RWG-3	Orifice	S06	1.6				
15 minute winter	RWG-3	Orifice	S06	0.2				
15 minute winter	RWG-3	Weir	S06	1.0				
720 minute winter	S06	1.002	ATT-IN-2	0.7	0.420	0.047	0.3697	
720 minute winter	ATT-IN-2	Flow through pond	ATT-OUT	1.6	0.004	0.000	30.9243	
15 minute winter	RWG-1	Orifice	S03	1.5				
15 minute winter	RWG-1	Orifice	S03	0.2				
15 minute winter	RWG-1	Weir	S03	0.0				
720 minute winter	S03	4.001	S04	0.3	0.318	0.021	0.0563	
720 minute winter	S04	4.002	ATT-IN-1	0.3	0.325	0.021	0.0396	
720 minute winter	ATT-IN-1	Flow through pond	ATT-OUT	1.6	0.004	0.000	30.9243	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 74.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MAT	10	100.571	0.121	38.9	3.6146	0.0000	FLOOD RISK
960 minute winter	PERM-P	675	97.341	0.691	3.1	9.9119	0.0000	FLOOD RISK
960 minute winter	ATT-IN-3	675	97.341	1.333	3.0	0.0000	0.0000	OK
960 minute winter	ATT-OUT	675	97.297	1.297	2.2	0.0000	0.0000	SURCHARGED
960 minute winter	FCC	675	97.306	1.313	0.6	1.4851	0.0000	FLOOD RISK
15 minute summer	EX-0208	1	95.870	0.000	0.3	0.0000	0.0000	OK
15 minute winter	RWG-2	13	98.186	0.586	2.2	0.2247	0.0000	SURCHARGED
960 minute winter	S05	675	97.337	0.787	0.1	0.1251	0.0000	FLOOD RISK
15 minute winter	RWG-3	10	98.499	0.899	6.7	0.3441	0.0000	FLOOD RISK
960 minute winter	S06	675	97.337	0.829	0.8	0.1317	0.0000	FLOOD RISK
960 minute winter	ATT-IN-2	675	97.336	1.328	0.7	0.0000	0.0000	OK
15 minute winter	RWG-1	10	98.497	0.897	6.0	0.3429	0.0000	FLOOD RISK
960 minute winter	S03	660	97.321	0.771	0.4	0.1226	0.0000	FLOOD RISK
960 minute winter	S04	660	97.321	0.792	0.3	0.1259	0.0000	FLOOD RISK
960 minute winter	ATT-IN-1	660	97.320	1.312	0.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MAT	Orifice	PERM-P	0.2				
15 minute winter	MAT	Weir	PERM-P	38.7				
960 minute winter	PERM-P	5.001	ATT-IN-3	3.0	0.874	0.130	0.0320	
960 minute winter	ATT-IN-3	Flow through pond	ATT-OUT	2.2	0.008	0.000	43.6319	
960 minute winter	ATT-OUT	3.000	FCC	0.6	0.124	0.044	0.0176	
960 minute winter	FCC	Orifice	EX-0208	0.5				82.1
15 minute winter	RWG-2	Orifice	S05	1.1				
15 minute winter	RWG-2	Orifice	S05	0.1				
15 minute winter	RWG-2	Weir	S05	0.0				
960 minute winter	S05	1.001	S06	0.1	0.092	0.007	0.1106	
15 minute winter	RWG-3	Orifice	S06	1.6				
15 minute winter	RWG-3	Orifice	S06	0.2				
15 minute winter	RWG-3	Weir	S06	4.9				
960 minute winter	S06	1.002	ATT-IN-2	0.7	0.396	0.052	0.3697	
960 minute winter	ATT-IN-2	Flow through pond	ATT-OUT	2.2	0.008	0.000	43.6319	
15 minute winter	RWG-1	Orifice	S03	1.6				
15 minute winter	RWG-1	Orifice	S03	0.2				
15 minute winter	RWG-1	Weir	S03	4.2				
960 minute winter	S03	4.001	S04	0.3	0.321	0.022	0.0563	
960 minute winter	S04	4.002	ATT-IN-1	0.3	0.319	0.021	0.0396	
960 minute winter	ATT-IN-1	Flow through pond	ATT-OUT	2.2	0.008	0.000	43.6319	

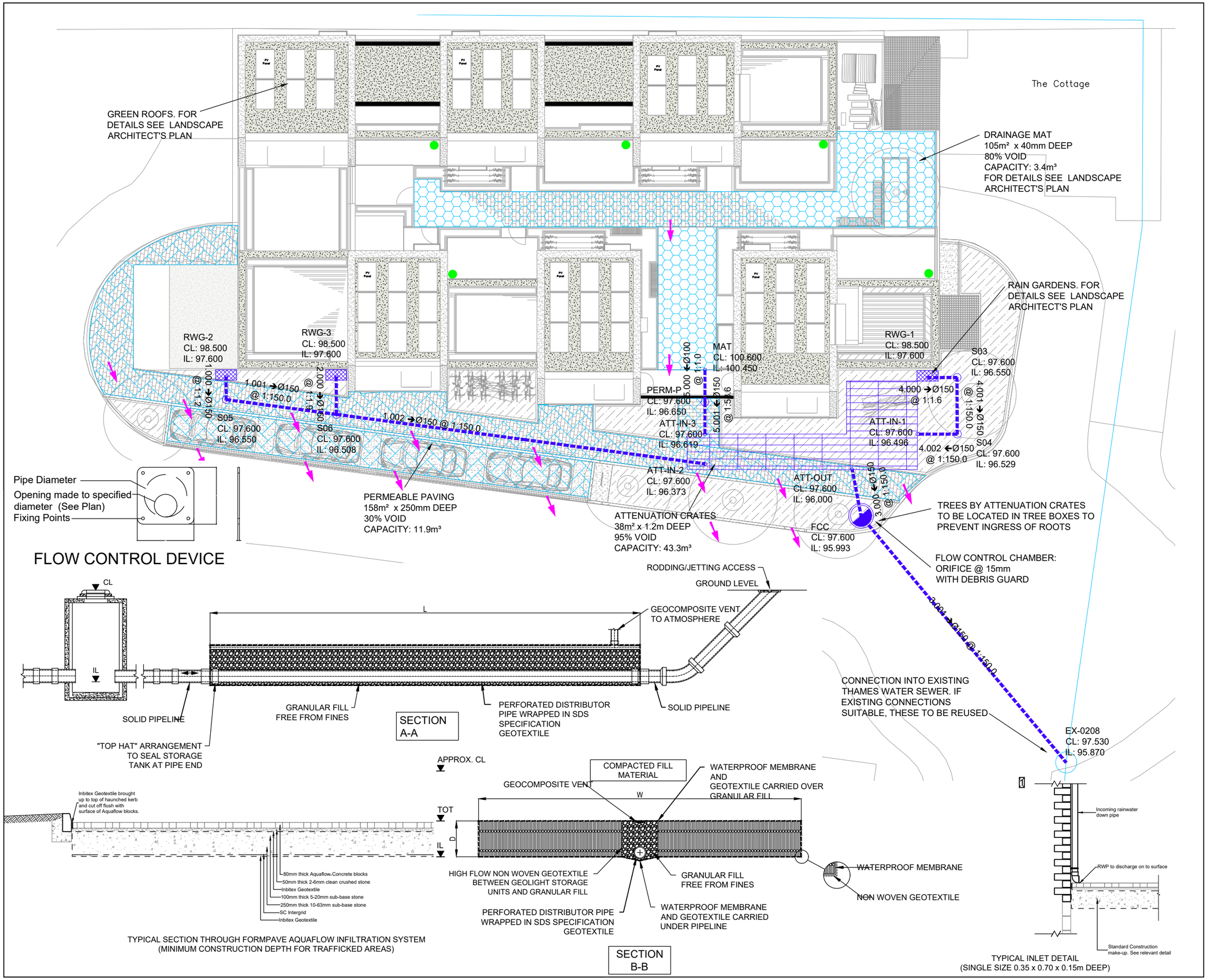
Results for 1000 year Critical Storm Duration. Lowest mass balance: 74.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MAT	10	100.580	0.130	45.8	3.6146	0.0000	FLOOD RISK
360 minute winter	PERM-P	256	97.596	0.946	8.0	10.3651	0.0000	FLOOD RISK
360 minute winter	ATT-IN-3	256	97.596	1.588	7.8	0.0000	0.0000	OK
480 minute winter	ATT-OUT	320	97.424	1.424	4.1	0.0000	0.0000	FLOOD RISK
360 minute winter	FCC	256	97.479	1.486	0.7	1.6812	0.0000	FLOOD RISK
15 minute summer	EX-0208	1	95.870	0.000	0.4	0.0000	0.0000	OK
30 minute winter	RWG-2	21	98.284	0.684	2.1	0.2423	0.0000	FLOOD RISK
360 minute winter	S05	256	97.570	1.020	0.4	0.1622	0.0000	FLOOD RISK
15 minute winter	RWG-3	9	98.500	0.900	7.9	0.3446	0.1096	FLOOD
360 minute winter	S06	256	97.570	1.062	2.2	0.1689	0.0000	FLOOD RISK
360 minute winter	ATT-IN-2	256	97.568	1.560	2.0	0.0000	0.0000	OK
15 minute winter	RWG-1	10	98.500	0.900	7.0	0.3445	0.0000	FLOOD RISK
360 minute winter	S03	256	97.518	0.968	0.9	0.1538	0.0000	FLOOD RISK
360 minute winter	S04	256	97.519	0.990	0.8	0.1574	0.0000	FLOOD RISK
360 minute winter	ATT-IN-1	256	97.518	1.510	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MAT	Orifice	PERM-P	0.2				
15 minute winter	MAT	Weir	PERM-P	45.6				
360 minute winter	PERM-P	5.001	ATT-IN-3	7.8	1.148	0.334	0.0320	
360 minute winter	ATT-IN-3	Flow through pond	ATT-OUT	5.1	0.021	0.000	43.6319	
480 minute winter	ATT-OUT	3.000	FCC	0.7	0.228	0.047	0.0176	
360 minute winter	FCC	Orifice	EX-0208	0.6				70.9
30 minute winter	RWG-2	Orifice	S05	1.3				
30 minute winter	RWG-2	Orifice	S05	0.1				
30 minute winter	RWG-2	Weir	S05	0.0				
360 minute winter	S05	1.001	S06	0.3	0.146	0.019	0.1106	
15 minute winter	RWG-3	Orifice	S06	1.6				
15 minute winter	RWG-3	Orifice	S06	0.2				
15 minute winter	RWG-3	Weir	S06	5.2				
360 minute winter	S06	1.002	ATT-IN-2	2.0	0.519	0.139	0.3697	
360 minute winter	ATT-IN-2	Flow through pond	ATT-OUT	5.1	0.021	0.000	43.6319	
15 minute winter	RWG-1	Orifice	S03	1.6				
15 minute winter	RWG-1	Orifice	S03	0.2				
15 minute winter	RWG-1	Weir	S03	5.2				
360 minute winter	S03	4.001	S04	0.8	0.401	0.053	0.0563	
360 minute winter	S04	4.002	ATT-IN-1	0.8	0.410	0.055	0.0396	
360 minute winter	ATT-IN-1	Flow through pond	ATT-OUT	5.1	0.021	0.000	43.6319	

Appendix C

SuDS Strategy Drawing No FRA20161-DS-001A



Sources of Information

KEY

- SURFACE WATER SEWER
- SURFACE WATER CHAMBER
- FLOW CONTROL CHAMBER
- RAIN GARDEN
- ATTENUATION CRATE
- PERMEABLE PAVING
- DRAINAGE MAT
- WATER BUTTS (TBC)
- EXISTING SW SEWER
- EXCEEDANCE FLOW PATH

NOTES

DRAWING TO BE READ IN CONJUNCTION WITH LANDSCAPE ARCHITECT'S DRAWINGS IN SKETCHBOOK JKD044R01

REV	DETAILS	DRW	CHKD	DATE
A	Updated for new layout	CDA	DF	24.11.2023

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Project: BELMONT CLOSE

Drawing: SUDS STRATEGY

Date	28.06.2023	Scale	1:200
Drawn By	cda	Checked By	DF
Drawing No.	FRA20163-DS-001	Rev.	A