

RIBA Stage 2

SuDS Strategy

Boyton Road



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Executive Summary

SuDS Strategy

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Overview

Eight Versa has been appointed to carry out a sustainable drainage systems (SuDS) strategy for the proposed development at Land adjacent Wat Tyler house - Boyton Road, Hornsey, London, N8 7AU in the London Borough of Haringey. The total site area is approximately 3,718m² or 0.37ha. Redevelopment of the car park adjacent Boyton Road to provide 15 new Council rent homes in a part-4, 5 and 7-storey building. Provision of associated amenity space, cycle and refuse/recycling stores, a wheelchair parking space on Boyton Road and enhancement of existing communal areas and play space to the rear on the Campsbourne Estate.

A SuDS strategy has been proposed for the development in accordance with all relevant best-practice guidance and the principles of the sustainable drainage hierarchy, along with local planning policy requirements. The suitability of specific SuDS components has been evaluated based on the site and development proposals. The SuDS strategy also aims to retain / recycle surface water for irrigation of the soft landscaped areas. The following SuDS components and features are proposed as part of a surface water drainage strategy for the site, specifically:

- Pervious paving with a surface area of approximately 173.9m², with attenuation storage in the sub-base.
- Extensive green roof with an area of approximately 160.5m².
- Existing Rain Gardens (404.8m²) located adjacent to the north of the site should be maintained and preserved for future use.
- Soft landscaping of about 1,256m².
- An attenuation storage tank with a volume of 15m³ for controlled discharge rate (to achieve greater than 50% betterment against the pre-development runoff rates).
- Flow control device to limit rate of discharge from site.

Preliminary hydraulic modelling of the proposed development site has been undertaken based on a notional surface water drainage network, using the hydraulic modelling software, Causeway Flow. The preliminary hydraulic modelling demonstrates that the proposed SuDS components would be viable for the surface water drainage strategy for the site, in order to achieve the targeted discharge rates, whilst mitigating flood risk to the site and surrounding area. Targeted discharge rates are subject to change, following the review and verification by a structural/drainage engineer during the detailed design stages.

The proposed SuDS components will allow the development to meet surface water management requirements for water quantity.

An outline management plan has been developed for the proposed SuDS components, providing indicative schedules of monitoring, management and maintenance activities to be implemented after handover of the development. Note that a detailed management plan will be developed during the detailed design stages and can be secured by planning conditions. Where applicable, guidance on management and maintenance from system manufacturer's must be adhered to.

Introduction

SuDS Strategy

Boyton Road

Introduction

Eight Versa has been appointed to develop a Sustainable Drainage Systems (SuDS) strategy for the proposed development at Boyton Road. The report will evaluate the suitability of the development site for incorporation of SuDS within the development proposal. Specific SuDS components will be recommended based on their suitability to manage surface water runoff within the constraints of the development.

About the Scheme

The development site at Boyton Road is located in the London Borough of Haringey (N8 7AU). The total site area is approximately 3,718m² or 0.37ha. Redevelopment of the car park adjacent Boyton Road to provide 15 new Council rent homes in a part-4, 5 and 7-storey building. Provision of associated amenity space, cycle and refuse/recycling stores, a wheelchair parking space on Boyton Road and enhancement of existing communal areas and play space to the rear on the Campsbourne Estate.

Planning Context

National Planning Policy Framework (Ministry of Housing, Communities & Local Government, 2021)

The National Planning Policy Framework (NPPF) requires that all local planning authorities ensure that proposed developments do not increase the potential for flood risk on a site. The NPPF not only requires that flood risk is minimised, but that the development is appropriately flood resilient, giving priority to the use of sustainable drainage systems (SuDS).

As a result of this, all new developments should utilise SuDS unless there are practical reasons for not doing so. The proposed site should ensure runoff rates are sufficiently managed and not increased as a result of the development, with the aim of achieving greenfield runoff rates where feasible.

The London Plan (Mayor of London, 2021)

The London Plan is the spatial development strategy, developed by the Mayor of London and the Greater London Authority (GLA), for the 32 London boroughs and the City of London. Policy SI 13 relates to SuDS, as referenced below:

- Development proposals should aim to achieve greenfield runoff rates and manage surface water runoff as close to its source as possible, in accordance with the sustainable drainage hierarchy (Figure 1).
- There should be a preference for 'green' over 'grey' features and the delivery of multi-benefits from SuDS features.
- Proposals for impermeable paving should be refused, unless they can be shown to be unavoidable (including on small areas such as front gardens and driveways).

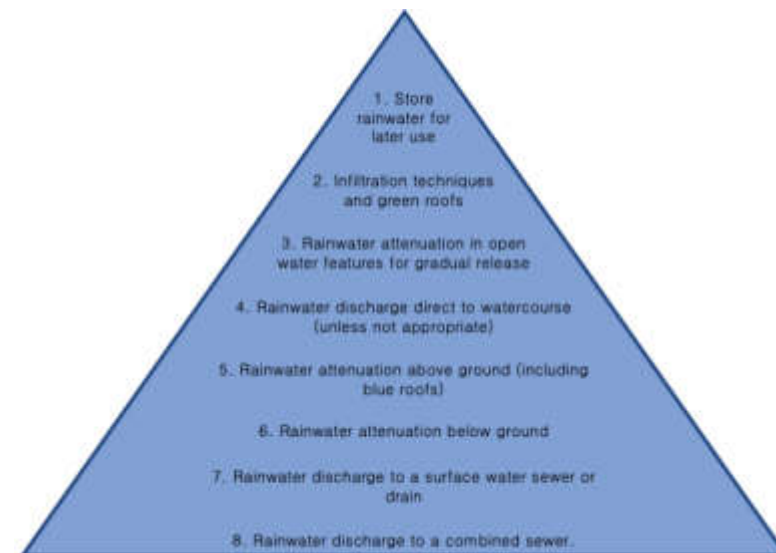


Figure 1: Sustainable drainage hierarchy.

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Sustainable Design and Construction: Supplementary Planning Guidance (Mayor of London, 2014)

This GLA document provides guidance to London boroughs and developers on design and construction measures that may be implemented to meet London Plan requirements, including guidance on the following:

- Specific conditions and consideration on flood risk to basements, along with recommended mitigation measures.
- Climate change resilience, including increased rainfall intensities and rising sea levels.
- Major developments for pre-developed sites must achieve at least 50% attenuation of pre-development surface water runoff at peak times.
- There may be situations where it is not appropriate to discharge at greenfield runoff rates (i.e. where the calculated greenfield runoff rate is extremely low and the final outfall of a piped system would be prone to blockage); in this instance an appropriate minimum discharge rate would be 5 l/s per outfall.
- Site conditions that should be considered when assessing the suitability of SuDS include potential contaminants, catchment area, local hydrology and development type.
- Infiltration SuDS proposals should consider soil permeability, ground stability, depth to water table, soil attenuation, potential contaminants and local hydrology.

Site Allocations DPD (London Borough of Haringey, 2017)

The Strategic Policies DPD (2013), as amended, sets out the long term vision of how Haringey, and the places within it, should develop by 2026 and sets out the Council's spatial strategy for achieving that vision. In particular, it identifies the broad locations for delivering housing and other strategic development needs such as employment, retail, infrastructure and other uses (see Table 3.1 and Appendix 2 and 4 of the Strategic Policies DPD). The Site Allocations development plan document (DPD) gives effect to the spatial strategy by allocating sufficient sites to accommodate the development needs of those parts of the borough outside the growth area of Tottenham, which is covered by the Tottenham Area Action Plan (AAP).

Tottenham Area Action Plan (London Borough of Haringey, 2017)

The Area Action Plan (AAP) has been prepared in order to ensure that the scale of development and change proposed for Tottenham through 2026 and beyond is positively managed and guided by a planning framework. It also ensures that investment decisions meet the aspirations of the local community and the Council for the area as a whole, as well as specific places and locations within it.

Haringey's Local Plan Strategic Policies 2013-2026 (London Borough of Haringey, 2017)

The Local Plan outlines how the Council will address local and strategic development needs including housing, employment, leisure, and retail provision. It goes beyond traditional land use planning and considers other plans and strategies that influence the use of land and the way that places around us look and work. The Local Plan covers the physical aspects of location and land use but also addresses other factors that make places attractive, sustainable and successful, such as social and economic matters. Preparation of these policies has been subject to a sustainability appraisal. This promotes sustainable strategies and policies through an assessment of their social, environmental and economic impacts.

Policy SP5 – Water Management and Flooding

The Council will require all development in Haringey to be water efficient during construction and operation and to reduce all forms of flood risk. All development shall:

- Improve the water environment, water quality and drainage systems.
- Minimise water use and illustrate how development would contribute to general and flash flooding.
- Take account of flood risk vulnerability classification as set out in paragraph 100 of the NPPF and will apply the NPPF Sequential Test and Exception Test.
- Implement measures to prevent (or mitigate as last resort) local surface water and downstream flooding.
- Implement Sustainable Drainage Systems from strategic to individual site level to improve water attenuation, quality and amenity.

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Sustainable Design and Construction Supplementary Planning Document (London Borough of Haringey, 2013)

The Guidance will seek to contribute to achieving the vision in Haringey's Sustainable Community Strategy. The SPD will also play a key role in the implementation of the Council's Greenest Borough Strategy (2008-2018) and its priorities:

- Improving the urban environment.
- Protecting the natural environment.
- Managing environmental resources efficiently.
- Leading by example.
- Ensuring sustainable design and construction.
- Promoting sustainable travel.
- Raising awareness and involvement.

No flooding of property or off-site flows should occur as a result of a one in 100 year storm event (including an appropriate allowance for climate change). In principle, a well designed surface water drainage system should ensure that there is little or no residual risk of property flooding occurring during events well in excess of the return-period for which the sewer system itself is designed.

The design of drainage needs to be able to cope with the heaviest of storms expected over the buildings lifetime. Drainage techniques relying on water soaking into the soil underneath a site (known as infiltration systems) will NOT be effective in parts of the borough with clay soils as they become waterlogged easily. The use of soakaways or other infiltration methods on contaminated land carries groundwater pollution risks and may not work in areas with a high water table.

Site Overview

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Site Location

The development site is located at Land adjacent Wat Tyler house - Boyton Road, Hornsey, London, N8 7AU in the London Borough of Haringey. The OS grid reference for the site is X (Eastings) 530309, Y (Northings) 189603. It is bounded by Boyton Road to the west and residential buildings to the north, east and south. The total site area is approximately 3,718m² or 0.37ha (Figure 2). The development site is currently used as a car parking (Appendix A).

The underlying geological characteristics of the surrounding area have been determined using the British Geological Survey's 'Geology of Britain Viewer':

- Bedrock geology - London Clay Formation - Clay, silt and sand.
- Superficial geology - No superficial deposits recorded.



Figure 2: Map showing location of development site (Red boundary line showing the extend of the development, green boundary line showing the extend of the land within the ownership of the applicant).

Development Site

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Site Topography

An assessment of the topography at the site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localized depressions. The mapping shows a comparison between average ground levels on the site with ground levels in the surrounding area. The mapping in Figure 3 confirms the overall site is level.

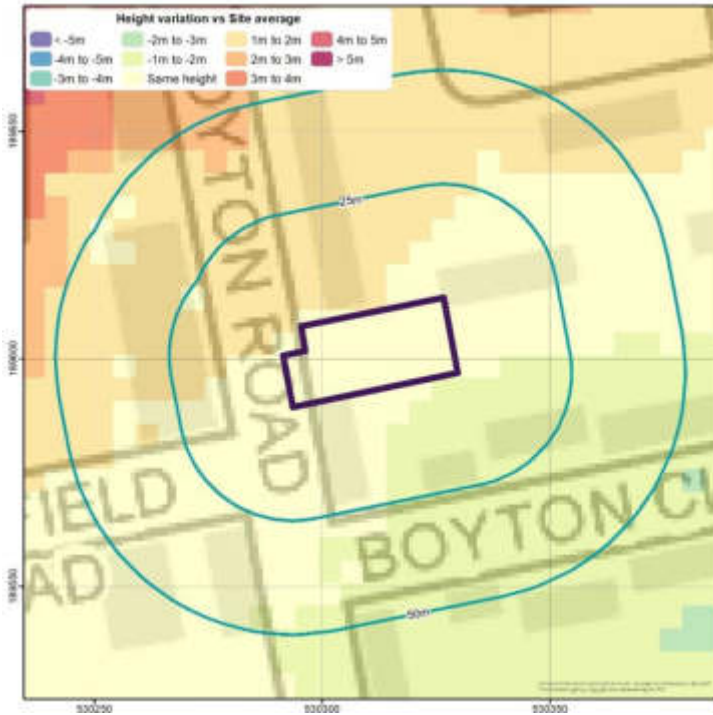


Figure 3: Topographical plan of the development site (GeoSmart Information).

Development Proposals

Redevelopment of the car park adjacent Boyton Road to provide 15 new Council rent homes in a part-4, 5 and 7-storey building. Provision of associated amenity space, cycle and refuse/recycling stores, a wheelchair parking space on Boyton Road and enhancement of existing communal areas and play space to the rear on the Campsbourne Estate. Figure 4, Figure 5 and Figure 6 illustrate the proposed ground floor plan, the proposed elevations and the proposed sections, respectively. Additional drawings are found in Appendix B.



Figure 4: Proposed ground floor plan.

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Figure 5: Proposed west elevation of the development.



Figure 6: Proposed section of the development.

Flood Risk

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Annual Probability of Flooding

The Environment Agency's (EA's) Flood Map for Planning confirms that the site is in Flood Zone 1; 'an area with a low probability of flooding' (Figure 7). Flood Zone 1 comprises areas assessed as having a 1% (1 in 100 years) Annual Exceedance Probability (AEP) or less annual probability of flooding from rivers and the sea. As the development site is less than 1 hectare and is located in Flood Zone 1, a site-specific flood risk assessment (FRA) is not required, provided the site is not affected by other sources of flooding. The full Environment Agency Flood Map for Planning report is given in Appendix C.

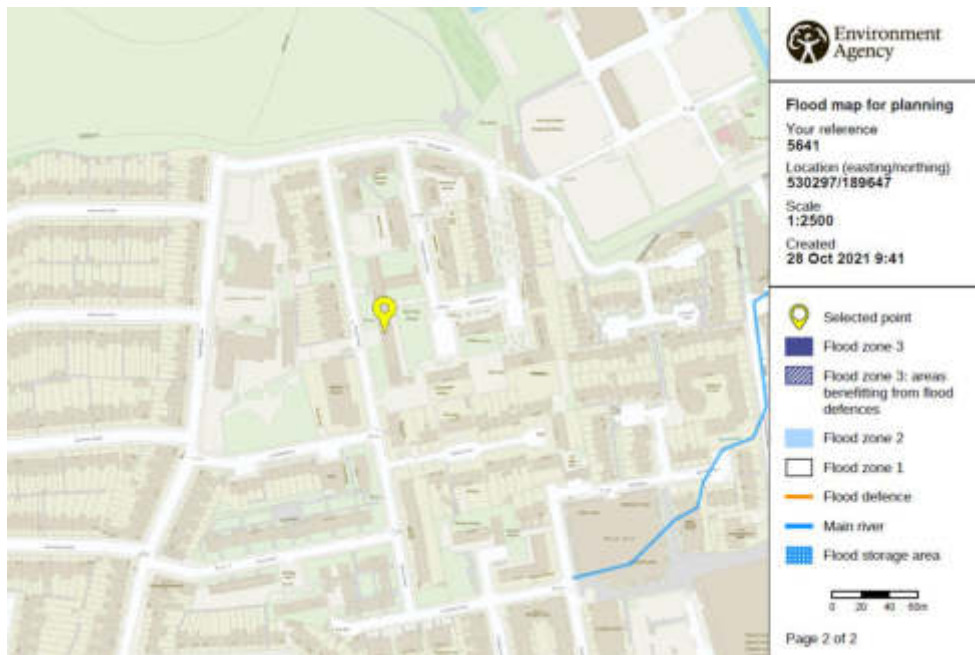


Figure 7: Approximate location of the development site in Flood Zone 1 as per the EA flood map.

Flood Risk from Rivers and Sea

According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) map, the site has a very low risk of flooding from fluvial or coastal flooding, with less than 0.1% annual probability of flooding (Figure 8). Therefore, the SuDS design is unlikely to be affected.



Figure 8: EA's map illustrating risk of flooding from rivers and the sea (GeoSmart Information).

Flood Risk

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Surface Water (Pluvial)

In accordance with the EA's Risk of Flooding from Surface Water mapping tool, the development site is considered to be at very low to low risk of surface water flooding. The map in Figure 9 illustrates the extent and depth of flooding during the 1 in 100 year event.

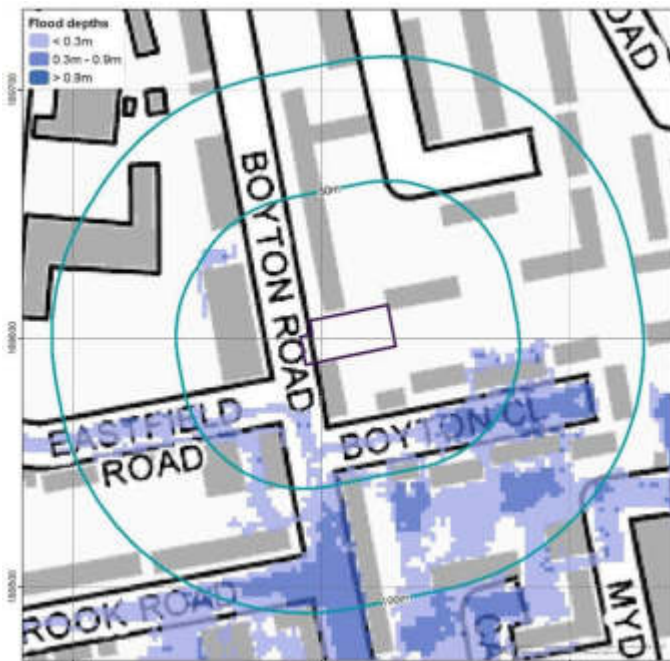


Figure 9: EA's map illustrating risk of flooding from surface water (GeoSmart Information).

Groundwater

GeoSmart's Groundwater Flood Risk (GW5) map (Figure 10) confirms that the site has a negligible risk of groundwater flooding during a 1% annual probability (1 in 100 year) event. Further investigation may be required, including surveying of ground conditions at the site, to confirm the site-specific geological and groundwater conditions with respect to groundwater flood risk.



Figure 10: GeoSmart's Groundwater Flood Risk (GW5) map.

Flood Risk

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Artificial Water Sources

Reservoirs and canals

In accordance with the EA's Risk of Flooding from Reservoirs mapping tool, the site is at very low risk of flooding from any reservoirs (Figure 11). Moreover, the EA's Risk of Flooding from Reservoirs mapping tool mentions that flooding from reservoirs is highly unlikely and, as noted on the EA's Historic Flood Map, there are no records of flood at the site (Figure 12).

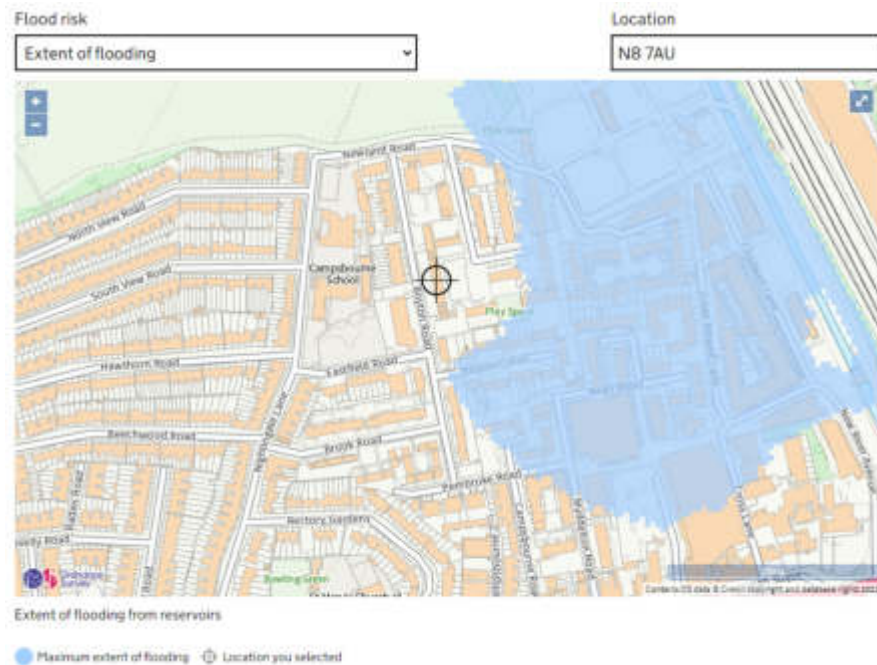


Figure 11: EA's map illustrating flood risk from reservoir.



Figure 12: EA's Historic Flood Map.

Flood Risk

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Sewers

Thames Water provided information on the number of properties that have experienced flooding based on postcode to inform the Strategic Flood Risk Assessment (2011). As illustrated in Figure 13, a total of one flooding incidents has been reported at the postcode of the development site and most of them were internal. Moreover, as noted on the EA Historic Flood Map, there are no records of flood at the site (Figure 12) and it can be considered to include floods from sewers. Therefore, the flood risk from sewers can be considered to be very low.

GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the site. There is a public surface water sewer, located adjacent to the west of the site. Therefore, discharge to sewer is likely to be appropriate (Figure 14).

It should be noted that the development proposals will introduce new drainage systems to the site. These will be designed so that flooding does not occur on any part of the site for a 1 in 30 year rainfall event and flooding does not occur in any part of a building for a 1 in 100 year event, in accordance with planning policy and all relevant best-practice guidance. The site will reduce the surface water run-off rate and volume by over 50%, which will further reduce the likelihood of flooding from sewers.

Post Code Sector	2 in 10 external	2 in 10 internal	1 in 10 external	1 in 10 internal	1 in 20 external	1 in 20 internal	Severe	Total Properties
N22 7	0	0	0	0	1	0	0	1
N22 8	0	0	1	0	0	7	0	8
N4 1	0	0	0	0	0	5	0	5
N4 4	0	0	2	1	0	4	0	7
N6 4	0	0	0	0	1	1	0	2
N6 5	0	0	1	2	1	4	0	8
N8 0	0	0	0	0	1	0	0	1
N8 7	0	0	0	0	0	1	0	1
N8 8	0	3	1	1	0	17	0	22
N8 9	0	0	1	3	0	0	0	4
Total	14	3	51	7	81	98	6	251

Figure 13: Properties flooded from sewers.



Figure 14: GeoSmart's map of sewer features in relation to the development.

Flood Risk

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Flood Risk Conclusions

The risk of flooding to the development site, from specific common sources of flooding, has been assessed. The risk from the respective sources of flooding is as follows:

- Rivers and the sea – very low risk.
- Pluvial (surface water) – very low to low risk.
- Groundwater – negligible.
- Artificial water sources (reservoirs and canals) – very low risk.
- Artificial water sources (sewers) – very low risk.

Vulnerability Policy

National and local planning policy requires that all developments should consider the vulnerability of building users when carrying out flood risk assessments, in accordance with current Environment Agency guidance and the National Planning Policy Framework (NPPF) 2021. The development proposals are for dwellings, which fall into the vulnerability classifications of 'more vulnerable'.

The Sequential Test

Planning policy and the NPPF typically requires that new developments must undertake a sequential test, if they are located in Flood Zone 2 or 3, CDA or if a sequential test has not already been carried out for a development of the same type at the development site. However, a development is not required to undertake a sequential test if one has already been carried out for the same type of development at the site; the development is a minor development; the development involves the change of use; or is located in Flood Zone 1 (provided there are no other flooding issues in the area).

The development is a major development and located in Flood Zone 1, therefore a sequential test is not required for this development.

The Exception Test

Planning policy requires that new developments must undertake an exception test, if they meet the specific flood risk vulnerability and Flood Zone classifications, as outlined in Table 1. It helps to confirm that the site and its users are safe if the site is at risk of flooding.

According to Table 1, an exception test is not required as the development is classified as 'more vulnerable' and is in Flood Zone 1. Moreover, the site is not within a CDA, therefore an exception test is not required for this development.

Table 1: Flood risk vulnerability and Flood Zone 'compatibility' for the exception test.

Flood Zones	Flood risk vulnerability classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	Exception test required	✓	✓	✓
Flood Zone 3a	Exception test required	X	Exception test required	✓	✓
Flood Zone 3b	Exception test required	X	X	X	✓

✓ Development permitted

X Development not permitted

SuDS Overview

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Introduction to SuDS

Sustainable drainage systems (SuDS) are drainage systems designed to maximise the opportunities and benefits that can be secured from surface water management. SuDS are considered to be environmentally beneficial due to their ability to manage water and flood risk within the urban and built up environment and take account of water quality by minimising water pollution, whilst also providing the opportunities for improvements in biodiversity and amenity space for the local community.

SuDS are able to replicate the natural environment, capturing rainfall and slowing down water at its source, whilst having the ability to allow water to infiltrate and provide water storage, to slow down runoff into streams and rivers.

The SuDS Manual highlights the importance of SuDS design providing a number of benefits to the sustainability of the site (Figure 15). In addition to slowing down water runoff and reducing flood risk, SuDS can also protect the ecology and natural hydrological systems on and surrounding the site; prevent water pollution to allow the system to be resilient for future change; create biodiverse green spaces to contribute to habitat connectivity and supporting local biodiversity; and provide a social place for the local community that can enhance the visual character of a space in a safe environment.

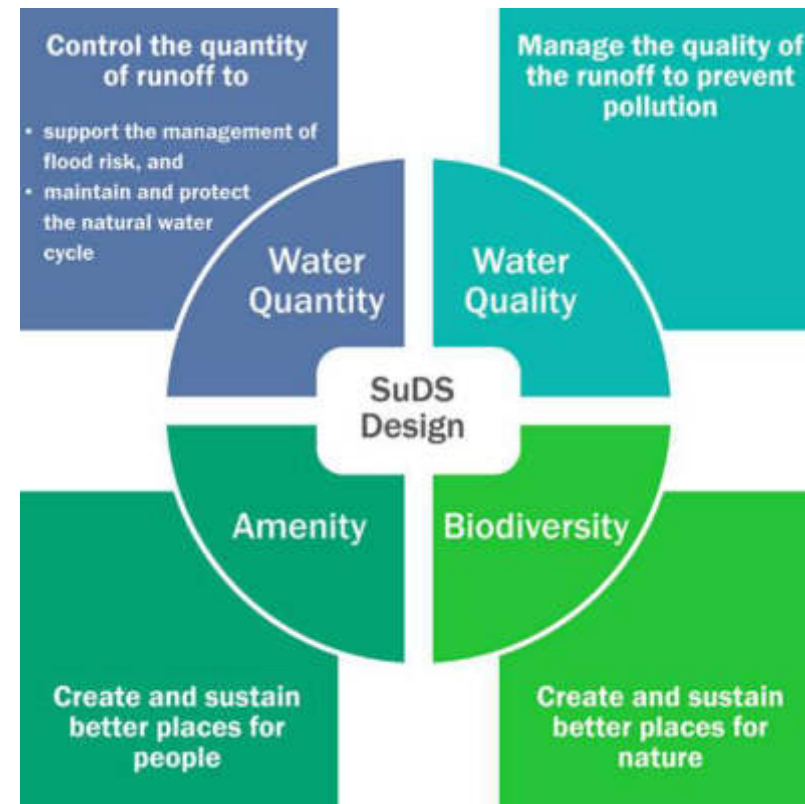


Figure 15: Multi-beneficial SuDS design principles (The SuDS Manual).

SuDS Overview

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SuDS Guidance and Principles

The SuDS Manual is published guidance by CIRIA, written by a series of experts, and based on existing guidance and research in the UK and internationally. The CIRIA guidelines within the SuDS Manual, and UKSuDS tools have been used to as a guideline for the evaluation of SuDS suitability and to develop a SuDS strategy for the development.

To comply with current best practice, the drainage system should:

1. Manage runoff at or close to its source;
2. Manage runoff at the surface;
3. Be integrated with public open space areas and contribute towards meeting the objectives of the urban plan;
4. Be cost-effective to operate and maintain.

The drainage system should endeavour to ensure that, for any particular site:

1. Natural hydrological processes are protected through maintaining interception of an initial depth of rainfall and prioritising infiltration, where appropriate;
2. Flood risk is managed through the control of runoff peak flow rates and volumes discharged from the site;
3. Stormwater runoff is treated to prevent detrimental impacts to the receiving water body as a result of urban contaminants.

In addition, it is desirable to maximise the amenity and ecological benefits associated with the drainage system where there are appropriate opportunities. Many SuDS components are green infrastructure features and can provide health benefits and reduce the vulnerability of developments to the impacts of climate change.

SuDS: Site Evaluation

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SuDS Guidance and Principles

The Infiltration Suitability map screens the potential for infiltration drainage at the site. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual site drainage design and the planning of further site investigation. Figure 16 indicates that there is low potential for infiltration SuDS across the site. It is likely that the underlying geology at the site has low permeability and an infiltration SuDS scheme would not be possible. However, a land contamination report should be considered

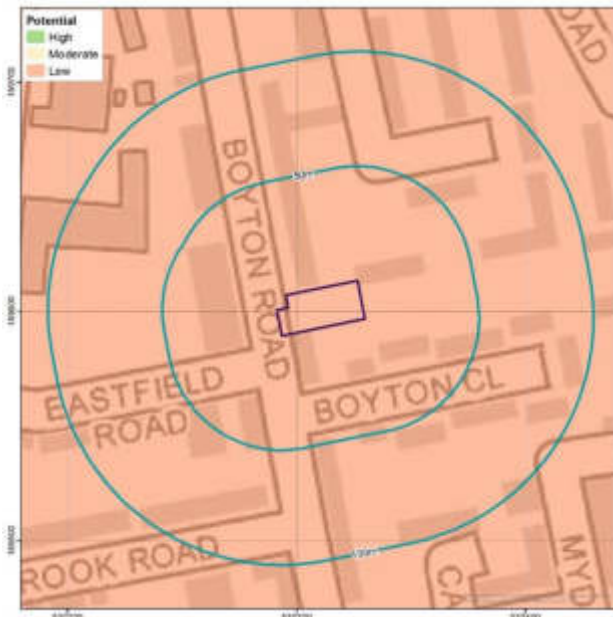


Figure 16: GeoSmart SuDS Infiltration Suitability (SD50) map.

Source Protection Zones

An assessment of the EA's groundwater Source Protection Zones (SPZs) within the vicinity of the development site has been undertaken (Figure 17) and confirms the site lies within an inner groundwater Source Protection Zone (SPZ I). Infiltration, if possible, is likely to be acceptable providing risk screening identifies suitable mitigation measures, if required, to prevent an impact on water quality from the proposed or historical land use and contaminated land. If further analysis is required, this would involve a review of site-specific contaminated land data.



Figure 17: EA's Source Protection Zones map (GeoSmart Information).

SuDS: Site Evaluation

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Surface Water Features

The map in Figure 18 shows that there is no surface water feature within 100m of the site. Therefore, discharge to surface water is unlikely to be appropriate.

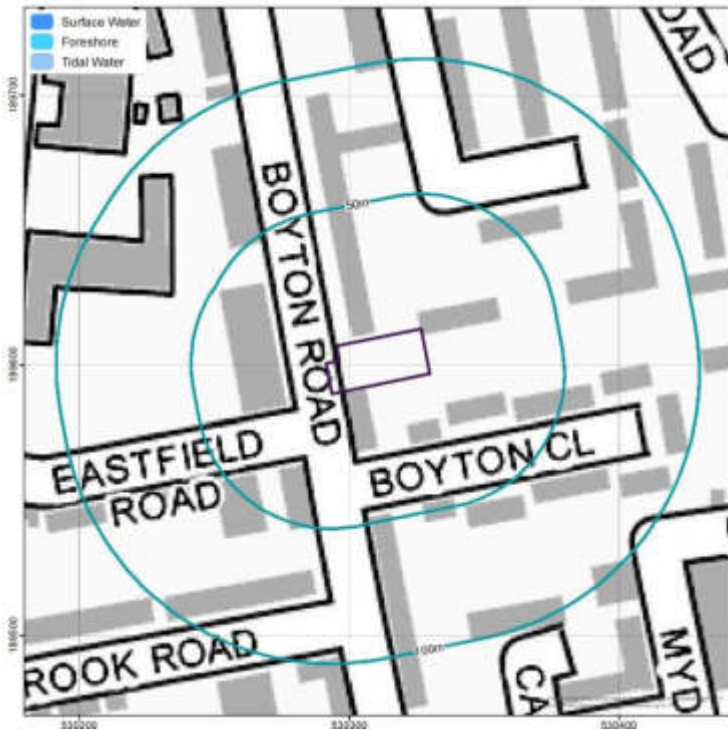


Figure 18: Surface water features map (GeoSmart Information).

Sewer Features

As shown in Figure 14, a public surface water sewer, located adjacent to the west of the site. Therefore, discharge to surface water sewer is likely to be appropriate.

Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider would also be required to determine that sufficient capacity is available to accept the proposed discharge, and to gain permission to connect if required.

SuDS: Site Evaluation

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SuDS Component Feasibility

The site conditions and development proposals have been assessed for their suitability for different SuDS components. The following SuDS components are considered for the proposed development and are recommended based on their feasibility for the site.

Each SuDS component has been assessed under three broader categories. There are key criteria for each category on which the SuDS component is evaluated. The key criteria have been given a weighting based on a tick-system, an example representation of this is shown below:

✓✓✓✓✓ = 3 scored out of a possible 5

The weighting of each of the criteria within the categories is shown below:

- Local area and site impact (maximum score of 10):
 - Local planning policy priority = ✓✓
 - Space required for component = ✓✓✓
 - Applicability with development design = ✓✓
 - Compatibility with geological conditions and flood risk = ✓✓✓
- Multi-beneficial design principles (maximum score of 10):
 - Water quantity = ✓✓✓✓
 - Water quality = ✓✓
 - Amenity = ✓✓
 - Biodiversity = ✓✓

- Capital cost, operation and maintenance (maximum score of 5):
 - Capital cost of component = ✓✓
 - Regular maintenance requirements = ✓✓
 - Impact of remedial actions = ✓

Key comments on each of the criteria and the corresponding score will be provided in a table (example below) for each of the SuDS components. The score for each of the criteria will be summed and each of the technologies will then be ranked. The assessment of each technology is undertaken on the following pages.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Example component	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓

Component Evaluation

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Rainwater Harvesting System

A rainwater harvesting system collects and stores rainwater for use in a development. Systems range from small-scale rainwater storage butts for irrigation, to large-scale systems to serve non-potable (and in some cases, potable) uses within a building. Rainwater harvesting systems intercept surface water from roofs and can be designed to reduce the runoff volume of a development, via recycling and reuse to meet water demand on-site.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Rainwater harvesting system 	✓✓✓✓✓ ✓✓✓✓ Policy priority. Space required for storage tank(s). Residential use likely to meet demand. Ground/flood compatible.	✓✓✓✓✓ ✓✓✓✓✓ Control runoff volumes from roofs. Treatment for internal non-potable use. No direct amenity or biodiversity benefits.	✓✓✓✓✓ Relatively high capital cost. Regular maintenance and inspection required.

Green Roof

A green roof is a roof of a building that is covered with a growing medium and vegetation, planted over a waterproofing membrane. Green roofs intercept rainfall and may facilitate flow control, attenuation and treatment of surface water. Green roofs may be particularly beneficial in high-density, urbanised areas, where there are otherwise limited opportunities for incorporating SuDS in landscaping. Green roofs provide additional benefits for biodiversity and reducing the urban heat island effect.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Green roof 	✓✓✓✓✓ ✓✓✓✓✓ Policy priority. Some roof areas may be feasible. Pitched roofs and solar PV panels proposed so traditional system types not viable. Ground/flood compatible.	✓✓✓✓✓ ✓✓✓✓✓ Runoff rate/volume control only for small rainfall events. Limited treatment functions provided. Amenity benefits provided if visible. Significant biodiversity benefits provided.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required.

Component Evaluation

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Infiltration System

Infiltration system types include:

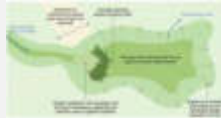
- Soakaway - sub-surface storage structure (typically rubble-filled voids beneath lawns) that stores runoff from a single house or development and allows for efficient infiltration into adjacent soil.
- infiltration trench - trench filled with permeable granular material, designed to promote infiltration of water to the ground.

Infiltration systems should be located at least 5m from all buildings and roads and at least 3m from the site boundary. The viability of infiltration should be validated with site investigations confirming groundwater levels (which should remain a minimum of 1m below the base of any infiltration systems) and infiltration rates (in accordance with BRE Digest 365).

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Infiltration system	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓
	Policy priority. Must be 5m from buildings/roads. Infiltration capacity and ground water levels must be verified.	Excellent runoff rate/volume control. Limited treatment functions provided. No direct amenity or biodiversity benefits.	Relatively low capital cost. Regular maintenance and inspection required. Pre-treatment sediment removal required.

Infiltration Basin

An infiltration basin is a vegetated basin or depression, which is designed to promote infiltration and is typically dry, except in periods of heavy rainfall.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Infiltration basin	✓✓✓✓✓ ✓✓✓✓✓  Policy priority. Significant space requirement. Infiltration capacity and ground water levels must be verified.	✓✓✓✓✓ ✓✓✓✓✓ Excellent runoff rate/volume control. Limited treatment functions provided. Good amenity benefits. Good biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required.

Component Evaluation

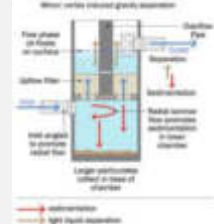
SuDS Strategy

Boyton Road

Proprietary Treatment System

A proprietary treatment system is a manufactured product that removes specified pollutants from surface water runoff. They are often useful where site constraints preclude the use of other methods. System types include:

- Treatment channels.
- Hydrodynamic or vortex separators.
- Proprietary filtration systems.
- Oil separators.
- Multi-process systems.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Proprietary treatment system 	✓✓✓✓✓ ✓✓✓✓✓ Small space requirement. Ground/flood compatible.	✓✓✓✓✓ ✓✓✓✓✓ Treatment functions provided. May be combined with flow rate control. No direct amenity or biodiversity benefits.	✓✓✓✓✓ Moderate capital cost. Regular maintenance and inspection required. Pre-treatment may be required.

Filter strip

Filter strips are gently sloping, vegetated strips of land that treat runoff by filtering and promoting the settlement of pollutants, commonly installed in proximity to impermeable surfaces (for instance roads and car parks). They may be used as a pre-treatment component before swales, bioretention systems and trenches or a treatment component (where the flow path length across the strip is sufficient).

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Filter strip 	✓✓✓✓✓ ✓✓✓✓✓ Significant space requirement. Best-suited for use adjacent to large impermeable surfaces.	✓✓✓✓✓ ✓✓✓✓✓ Limited runoff rate/volume control. Moderate treatment functions provided. Moderate amenity benefits. Moderate biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Infrequent maintenance and inspection required. May provide pre-treatment function.

Component Evaluation

SuDS Strategy

Boyton Road

Filter Drain

Filter drains are shallow trenches, filled with stone or gravel, and constructed slightly below the adjacent ground surface. Filter drains are typically most effective when installed alongside impermeable areas such as roads and car parks, to attenuate water runoff in a storm event, whilst also providing a treatment function.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Filter drain	✓✓✓✓✓ ✓✓✓✓✓ Best-suited for use adjacent to large impermeable surfaces. Compatible with contaminated land/ high groundwater levels.	✓✓✓✓✓ ✓✓✓✓✓ Limited runoff rate/volume control. Good treatment functions provided. No direct amenity or biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required. Risk of blockages/ pollutant build up.

Swale

Swales are linear vegetated drainage features that convey and attenuation surface water, along with in some instances facilitating infiltration and providing pollutant control by allowing settlement. Swales intercept rainfall and may facilitate flow control and volume reduction (via infiltration, where viable), along with conveying water to the on-site drainage network. Check dams and berms can also be installed along a swale to incorporate attenuation storage and promote settling and infiltration.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Swale	✓✓✓✓✓ ✓✓✓✓✓ Moderate space requirement. Compatible with contaminated land/ high groundwater levels (if lined). 	✓✓✓✓✓ ✓✓✓✓✓ Good runoff rate/volume control. Moderate treatment functions provided. Good amenity benefits. Good biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required. Inlets, culverts and outlets need to be cleared.

Component Evaluation

SuDS Strategy

Boyton Road

Bioretention System

Bioretention systems are shallow vegetated landscaped depressions, which are typically under drained and constructed with engineered soils. Bioretention systems are typically referred to as rain gardens, when constructed on a small scale, without engineered soils. Bioretention systems intercept rainwater (typically at least the first 5mm) and facilitate flow control and volume reduction (via infiltration, where viable) from frequent and smaller rainfall events, along with filtering sediment and pollutants from surface water. Plant species that are tolerant to inundations should be selected to optimise performance of the system.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Bioretention system	 ✓✓✓✓✓ ✓✓✓✓✓ Small space requirement. Compatible with contaminated land/ high groundwater levels (if lined).	✓✓✓✓✓ ✓✓✓✓✓ Moderate runoff rate/volume control. Good treatment functions provided. Good amenity benefits. Moderate biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required.

Pervious Paving

Pervious paving may be used for the construction of otherwise impermeable surfaces (i.e. roads (typically with speeds less than 30 mph), car parks, patios and pedestrian pathways), with materials that allow infiltration to a subsurface medium, from where water may be infiltrated to the ground or piped to the surface water drainage network. Pervious paving includes:

- Porous paving – paving that infiltrates water across the entire surface.
- Permeable paving – paving that infiltrates water through the gaps between solid blocks.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Pervious paving	 ✓✓✓✓✓ ✓✓✓✓✓ Compatible with hard landscaping proposals. Compatible with contaminated land/ high groundwater levels (if lined).	✓✓✓✓✓ ✓✓✓✓✓ Good runoff rate/volume control. Good treatment functions provided. Low direct amenity or biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Regular maintenance and inspection required. Risk of clogging with poor maintenance.

Component Evaluation

SuDS Strategy

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Attenuation Storage

Attenuation storage may be provided to temporarily store runoff volumes prior to discharge from the site. An attenuation storage structure may be located under external landscaping areas, or within a proposed building. Runoff from the roof and any other impermeable surfaces may be collected and stored in the structure. Types of storage structure include:

- Geocellular storage structure (typically modular plastic units).
- Oversized concrete, plastic or corrugated steel pipes.
- Precast or in situ concrete panel structures and tanks.
- Glass-reinforced plastic (GRP) tanks.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Attenuation storage 	✓✓✓✓✓ ✓✓✓✓✓ Large sub-surface space required (compatible beneath landscaping). May be compatible with high groundwater levels.	✓✓✓✓✓ ✓✓✓✓✓ Excellent runoff rate/volume control. No direct treatment functions provided. No direct amenity or biodiversity benefits.	✓✓✓✓✓ Relatively high capital cost. Regular maintenance and inspection required. Accessibility and maintainability key.

Detention Basin

A detention basin is a surface storage basin or depression, that provides flow control through attenuation of surface water runoff. Detention basins are normally dry and in certain situations the land may also function as a recreational facility. However, basins can also be mixed, including both a permanently wet area for wildlife or treatment of the runoff and an area that is usually dry to cater for flood attenuation. They also facilitate some settling of particulate pollutants.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Detention basin 	✓✓✓✓✓ ✓✓✓✓✓ Large space required. May be compatible with high and vulnerable groundwater (if lined).	✓✓✓✓✓ ✓✓✓✓✓ Moderate runoff rate/volume control. Moderate treatment functions provided. Good amenity benefits. Moderate biodiversity benefits.	✓✓✓✓✓ Relatively low capital cost. Limited maintenance and inspection required.

Component Evaluation

SuDS Strategy

Boyton Road

Pond / Wetland

Ponds and wetlands can provide attenuation storage and treatment functions for surface water, at varying scales, along with promoting the ecological benefits of SuDS. A pond can perform the role of a retention pond or a detention pond. Wetlands comprise shallow ponds and marshy areas, covered almost entirely in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle, and to remove contaminants by facilitating adhesion to vegetation and aerobic decomposition. They also provide significant ecological benefits.

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance
Pond/wetland 	✓✓✓✓✓ ✓✓✓✓✓ Policy priority when aligned with biodiversity objectives. Large space required. May be compatible with high and vulnerable groundwater (if lined).	✓✓✓✓✓ ✓✓✓✓✓ Good runoff rate/volume control. Good treatment functions provided. Excellent amenity benefits. Excellent biodiversity benefits.	✓✓✓✓✓ Relatively high capital cost due to large size. Moderate maintenance and inspection required. Vegetation management required.

Component Evaluation

SuDS Strategy

Boyton Road

SuDS Component Evaluation

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance	Total score	Proposed	Rationale
Rainwater harvesting system	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	12 out of 25	No	Insufficient space for the demand.
Green roof	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	17 out of 25	Yes	Suitable space available.
Infiltration system	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	13 out of 25	No	Low infiltration potential and development covers most of the footprint of site.
Infiltration basin	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	17 out of 25	No	Low infiltration potential and development covers most of the footprint of site.
Proprietary treatment system	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	13 out of 25	No	Low pollution hazard.
Filter strip	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	12 out of 25	No	Insufficient space.
Filter drain	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	12 out of 25	No	Insufficient space.
Swale	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	17 out of 25	No	Insufficient space.

Component Evaluation

SuDS Strategy

Boyton Road

SuDS Component Evaluation

SuDS component	Local area and site impact	Multi-beneficial design principles	Capital cost, operation and maintenance	Total score	Proposed	Rationale
Bioretention system	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	17 out of 25	Yes	Suitable space.
Pervious paving	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	16 out of 25	Yes	Suitable space.
Attenuation storage	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	12 out of 25	Yes	Suitable space.
Detention basin	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	14 out of 25	No	Insufficient space.
Pond/wetland	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓ ✓✓✓✓✓	✓✓✓✓✓	15 out of 25	No	Insufficient space.

SuDS Proposals

SuDS Strategy

Boyton Road

SuDS Proposals

The suitability of specific SuDS components for the site has been evaluated. Based on this evaluation, and the sustainable drainage hierarchy (Figure 19). A number of SuDS components have been recommended to be integrated in the site-wide SuDS design:

1. [Store rainwater for later use](#) – Not proposed: rainwater harvesting systems for the development is not proposed. There is insufficient space on site to meet the demands of the development.
2. [Infiltration techniques and green roofs](#) – Proposed: there is low infiltration potential and development covers most of the footprint of site. Green roofs are proposed.
3. [Rainwater attenuation in open water features for gradual release](#) – Not proposed: there are no suitable space on the site for the implementation of a retention pond.
4. [Discharge rainwater direct to a watercourse](#) – Not proposed: there are no water features within 100m of the site.
5. [Rainwater attenuation above ground \(including blue roofs\)](#) – Not proposed: There are no suitable space.
6. [Rainwater attenuation below ground \(tanks or sealed water features for gradual release\)](#) – Proposed: there is sufficient space.
7. [Rainwater discharge to a surface water sewer or drain](#) – Proposed: there is a public surface water sewer, located adjacent to the west of the site.
8. [Rainwater discharge to the combined sewer](#) – Not proposed: discharge to the combined sewer is not proposed.

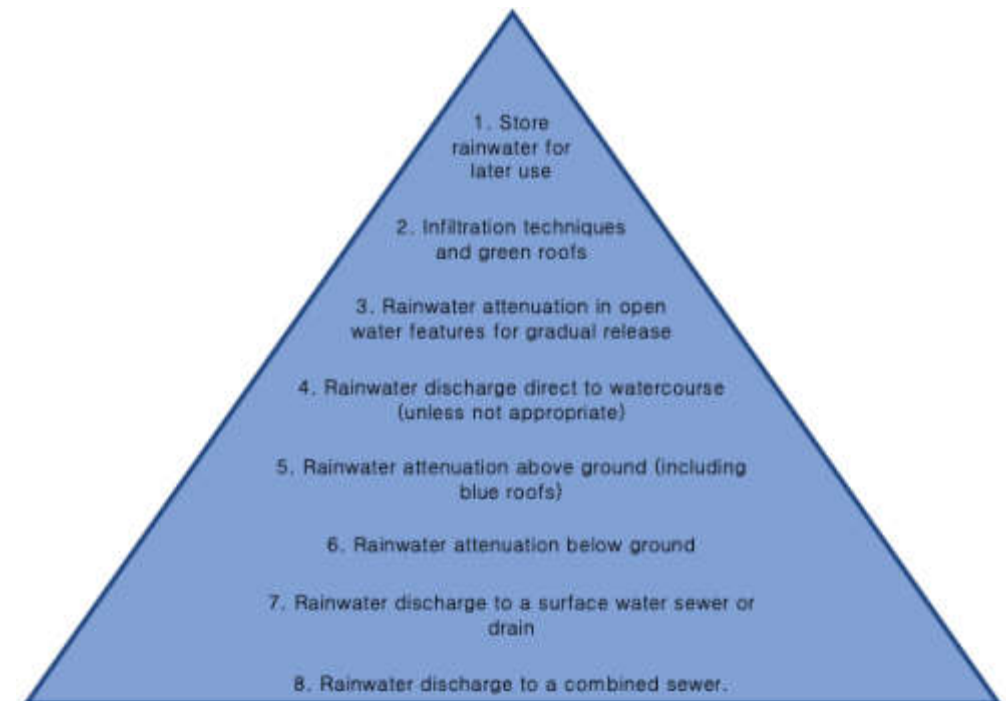


Figure 19: Sustainable drainage hierarchy.

SuDS Proposals

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Hydraulic Design Criteria

In accordance with local planning policy, the hydraulic design of the scheme will meet the following design principles:

Flood risk

The surface water drainage network will be designed so that flooding does not occur on any part of the site for a 1 in 30 year rainfall event (aside from areas specifically design to hold or convey water) and flooding does not occur in any part of a building for a 1 in 100 year event (with 40% climate change allowance).

Peak runoff flow control

The peak runoff rate for the 1 in 1 year, 1 in 30 year and 1 in 100 year rainfall events for the post-developed site will not exceed the pre-developed runoff rates from the site for the same rainfall events. A 50% betterment of the pre-developed runoff rates and rates as close as practicably possible to the greenfield runoff rates will be targeted.

Runoff volume control

The runoff volume for the 1 in 100 year (6 hour duration) rainfall event for the post-developed site will not exceed the pre-developed site runoff volume for the same event.

Water quality

All appropriate best-practice guidance for runoff pollution control will be following, to ensure that the water quality of any receiving water body will not be adversely affected by the development. are car parking areas proposed for the development, there is a potential pollution hazard.

Highway drainage

There will be no SuDS features proposed within existing highways or new proposed highways for adoption.

Climate change

The effects of climate change will be accounted for in calculations, with an allowance of 40% made for increased rainfall intensities for the 1 in 100 year rainfall event, in accordance with the latest guidance provided by the Environment Agency.

Urban creep

The potential future expansion within the development will be accounted for by making an allowance for urban creep of 10% within calculations.

Hydraulic Modelling

Causeway Flow is a hydraulic modelling software for the design and analysis of surface water and foul water drainage networks. Flow has been used to calculate peak runoff rates and runoff volumes for the site and model a notional surface water drainage network and SuDS components. See Appendix D for the set of results reports from Causeway Flow.

Flow uses the EPA Storm Water Management Model (SWMM), which is a dynamic rainfall runoff simulation model used for single event or continuous simulation of runoff quantity and quality. SWMM conceptualises a drainage system as a series of water and material flows between major environmental compartments and a network of conveyance and storage elements. The functionality of the atmosphere, land surface and groundwater compartments is not directly accounted for in SWMM.

SuDS Proposals

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Runoff Rates

Greenfield and pre-development peak runoff rates have been calculated using Causeway Flow, in accordance with the best-practice estimation methods outlined in the SuDS Manual:

- Greenfield runoff rates using the Institute of Hydrology 124 (IH124) method.
- Pre-development runoff rates using the Modified Rational Method (MRM).

In accordance with local planning policy, for previously developed sites, the peak runoff rate for the 1 in 1 year, 1 in 30 year and 1 in 100 year rainfall events for the post-developed site must not exceed the pre-development runoff rates from the site for the same rainfall events and should be as close as reasonably practicable to greenfield runoff rates. It can be noted below that the post-development discharge rates have achieved more than 50% betterment from the pre-development (Table 2).

Note that the discharge rates targeted in this report are derived from preliminary hydraulic modelling, based on a notional surface water drainage network. Targeted discharge rates are subject to change, following the review and verification by a structural/drainage engineer during the detailed design stages.

Table 2: Greenfield, pre-development and post-development peak runoff rates.

Return period	Greenfield peak runoff rates (l/s)	Pre-development peak runoff rates (l/s)	Post-development proposed discharge rates (l/s)	Betterment from pre-development peak runoff rates (l/s)
Q _{BAR}	0.2	-	-	-
Q1 (1 in 1 year)	0.1	4.4	0.2	98.0%
Q30 (1 in 30 year)	0.3	10.5	0.3	98.3%
Q100 (1 in 100 year)	0.4	13.3	0.3	98.2%
Q100 (1 in 100 +40)	-	-	0.6	-

Runoff Volumes

Greenfield and pre-development runoff volumes have been calculated using Flow, in accordance with the best-practice estimation methods outlined in the SuDS Manual:

- Greenfield runoff volumes using the Flood Studies Report (FSR) rainfall and Fixed Percentage Runoff Model (FSSR 16) method.
- Pre-development runoff volumes using the Modified Rational Method (MRM) and FSSR 16 method.

In accordance with local planning policy, for previously developed sites, the runoff volume for the 1 in 100 year (6 hour duration) rainfall event should be as close as reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the previously developed site. The proposed discharge volume is 17.0m³, compared to the pre-development runoff volume of 20.0m³ and 10.0m³ for greenfield volume (Table 3).

Opportunities to reduce the runoff volume, via interception and evapotranspiration from new vegetated areas, have been optimised through the inclusion of green roofs and soft landscaping within the development.

Table 3: Greenfield, pre-development and post-development runoff volumes.

Return period	Greenfield runoff volume (m ³)	Pre-development runoff volume (m ³)	Post-development proposed discharge volume (m ³)
Q100 (1 in 100 year +40, 6 hour duration)	10.0	20.0	17.0

SuDS Proposals

SuDS Strategy

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Surface Water Drainage Model

Positively drained area

The total impermeable area of the proposed development is approximately 0.166ha, which covers the approximately 30% footprint of the site. The total impermeable area is taken as the positively drained area for the surface water drainage model (Appendix E).

Drains, manholes and pipes

All drains, manholes and pipes will be designed in accordance with Building Regulations Part H and Sewers for Adoption 7th Edition. A notional series of drains, manholes and pipes has been developed to evaluate the surface water drainage potential for the proposed site.

Attenuation storage in the sub-base of the pervious paving

Pervious paving with storage in the sub base allows for temporary storage of surface water runoff, prior to discharge from the site at the allowable discharge rates. A surface area of approximately 173.9m² is proposed with a sub-base thickness of 210mm for attenuation storage based on 1 in 100 year event plus 40% climate change, subject to verification of ground suitability and system specification by a structural or drainage engineer. The attenuation storage is modelled as a Structure Type of Depth / Area / Inf Area with a porosity of 0.30.

The system, would additionally, consist of an impermeable geo-membrane to prevent possible contamination of the drained water from the surrounding soils, this would involve a review of site-specific contaminated land data. Regular inspection for surface ponding, sediment build up, pollution and vegetation health with remediation taken as required.

The pervious pavements should be designed and constructed in accordance with the SuDS Manual (Chapter 20 'Pervious pavements').

Green roof

A total surface area of green roofs of approximately 160.5m² is proposed for the development. In order to provide significant benefits for the development in terms of managing surface water runoff, biodiversity and amenity value, the green roofs should meet the following minimum criteria:

- Extensive sedum green roof-type system.
- Substrate depth should be maximised, within the limitations of the extensive green roof system. It is recommended that a minimum depth of substrate of 125mm should be used for the green roof areas. The system must be verified by a structural engineer with regards to the structural capacity of the building to withstand the imposed loads, including the saturated weight of the system.
- Substrate comprising commercial brick-base aggregate (or equivalent).
- Long-term plant coverage should be maximised through either of the seeded or 'biodiverse' roof types, to maximise the evapotranspiration performance of the green roof. It is acknowledged that the 'biodiverse' roof type would result in an initial lack of plant coverage but would be achieved once the indigenous plant species become established.

SuDS Proposals

SuDS Strategy

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Attenuation storage

It is estimated that a minimum storage volume of approximately 15m³ would be required to temporarily store surface water runoff, prior to discharge from site at the allowable discharge rates. The storage structure may be a plastic tank. This attenuation storage structure should be installed after the entry point for runoff from all positively drained areas, but prior to the flow control device, limiting the final discharge rates from the site.

The design of attenuation storage structures and associated infrastructure should seek to prevent a build-up of silt and other debris contained in surface water runoff (e.g. by use of benching and low-flow channels) and should be designed to allow access for regular maintenance. Attenuation storage should be designed and constructed in accordance with the SuDS Manual (Chapter 21 'Attenuation Storage Tanks').

Flow control

In order to target discharge rates (Table 2) from the site that are in accordance with local planning policy, a flow control device should be installed prior to the point of connection with the local surface water sewer. The actual flow rate(s) and variability of flow rates between each simulated rainfall event will be confirmed at the detailed design stages with the specification of a suitable flow control product. Key considerations include:

- Flow control devices may be static (such as fixed orifice plates or vortex flow controls) or variable (such as pistons or slide valves).
- Static controls should have a minimum opening size of 100 mm chamber, or equivalent.
- Variable controls may have a smaller opening provided they have a self-cleansing mechanism.
- Static controls typically have less onerous maintenance requirements than variable controls, but variable controls typically can achieve greater variability of flow rates than static controls.
- A bypass should be included with a surface operated penstock or valve; and access should be provided to the upstream and downstream sections of a flow control device to allow maintenance.

Note that the flow control function may be performed by the pumping system, installed further upstream (provided no additional runoff enters the drainage network after the flow control provided by the pumping system).

Flow controls devices should be designed and constructed in accordance with the SuDS Manual (Chapter 28 'Inlets, Outlets and Flow Control Systems').

Exceedance and overland flows

The surface water drainage network has been designed to safely contain volumes of surface water up to the 1 in 100 year (with 40% climate change) event. The preliminary hydraulic modelling estimates that the 1 in 100 year event will be contained within the surface water drainage network. However, it is proposed that any exceedance flow is channelled to the communal playspace in the centre of the site for temporary storage and gradual release.

Management Plan

SuDS Strategy

Boyton Road



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Outline SuDS Management Plan

To ensure that SuDS features and components work effectively, it is essential that they are adequately maintained and working to their expected capacity. A detailed site-specific SuDS management plan will be produced for the development, including responsibilities and a programme of maintenance works and inspections. An outline management plan for the proposed SuDS components is provided below. A template SuDS inspection and maintenance checklist form, which may be used to record the site inspections and management and maintenance actions undertaken, is provided in Appendix F to this report.

Management and maintenance of all surface water drainage and SuDS components within the curtilages of the properties will be the responsibility of the respective property owners, for the lifetime of the development. All surface water drainage and SuDS components outside of the property curtilages, but within the curtilages of the overall development site, will be the shared responsibility of the respective property owners and will be managed and maintained via a management agreement or similar contractual arrangement, for the lifetime of the development.

To ensure that the maintenance requirements and responsibilities for the proposed SuDS components are met, information will be made available to the first owners of each property in a clear and concise format to clarify their requirements. The developer shall be responsible for providing a framework management agreement for SuDS outside of the property curtilages, for the future property owners.

Management and maintenance requirements should be determined in accordance with all best-practice guidance and the SuDS Manual (Chapter 32: Operation and Maintenance), including:

- Regular maintenance activities.
- Occasional maintenance activities.
- Remedial maintenance requirements.
- Ongoing monitoring requirements.

All management, monitoring and maintenance activities should follow guidance from the SuDS system manufacturer, where applicable.

Drains, Manholes and Pipes

All drains, manholes and pipes should be constructed, operated and maintained in accordance with Building Regulations Part H, Sewers for Adoption 7th Edition and BS EN 752:2017 'Drain and sewer systems outside buildings'.

Pumping System and Rising Mains

The surface water pumping station system be constructed, operated and maintained in accordance with Building Regulations Part H, Sewers for Adoption 7th Edition and BS EN 16932-1:2018 'Drain and sewer systems outside buildings - Pumping systems'.

Flow Control Devices

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the device and filter for debris and sediment build-up.	Annually (and following poor performance).
	Cleaning of device inlet/outlet, chamber and sump.	Annually (and following poor performance).
Occasional maintenance	Cleaning and/or replacement of any filters.	Three monthly (or as required).
Remedial actions	Repair of flow control device.	As required.
Monitoring	Visual inspection within chamber to ensure that the device is in good condition and operating as designed.	Annually.
	Survey from inside of chamber for sediment build-up and remove if necessary.	Every 5 years, or as required.

Management Plan

SuDS Strategy

Boyton Road

Pervious Paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall (or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations).
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).

Pervious Paving (continued)

Maintenance schedule	Required action	Typical frequency
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Regular inspection for surface ponding and pollution.	As required.
	Monitor inspection chambers.	Annually.

Green Roofs

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspections and remedial works to control weeds and invasive plants	Monthly
Occasional maintenance	Replacement of vegetation may be required, depending on the type of green roof	Quarterly
Remedial actions	Structural rehabilitation or repair may be required if inspections reveal damage to the underlying structure	Annually (or as required)

Management Plan

SuDS Strategy

Boyton Road

Attenuation Storage

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually.
	Remove sediment from pre-treatment structures and/ or internal forebays.	Annually, or as required.
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years, or as required.

Conclusions

SuDS Strategy

Boyton Road

Flood Risk

The site is located in Flood Zone 1 and the overall risk of flooding to the site is considered to be very low. The risk from the assessed sources of flooding is as follows:

- Rivers and the sea – very low risk.
- Pluvial (surface water) – very low to low risk.
- Groundwater – negligible.
- Artificial water sources (reservoirs and canals) – very low risk.
- Artificial water sources (sewers) – very low risk.

Sustainable Drainage Systems

A SuDS strategy has been proposed for the development in accordance with all relevant best practice guidance and the principles of the sustainable drainage hierarchy, along with local planning policy requirements. The suitability of specific SuDS components has been evaluated based on the site and development proposals. The SuDS strategy also aims to retain / recycle surface water for irrigation of the soft landscaped areas. A number of SuDS components and features are proposed as part of a surface water drainage strategy for the site, specifically:

- Pervious paving with a surface area of approximately 173.9m², with attenuation storage in the sub-base.
- Extensive green roof with an area of approximately 160.5m².
- Existing Rain Gardens (404.8m²) located adjacent to the north of the site should be maintained and preserved for future use.
- Soft landscaping of about 1,256m².
- An attenuation storage tank with a volume of 15m³ for controlled discharge rate (to achieve greater than 50% betterment against the pre-development runoff rates).
- Flow control device to limit rate of discharge from site.

Preliminary hydraulic modelling of the proposed development site has been undertaken based on a notional surface water drainage network, using the hydraulic modelling software, Causeway Flow. The preliminary hydraulic modelling demonstrates that the proposed SuDS components would be viable for the surface water drainage strategy for the site, in order to achieve the targeted discharge rates, whilst mitigating flood risk to the site and surrounding area. Targeted discharge rates are subject to change, following the review and verification by a structural/drainage engineer during the detailed design stages.

An outline management plan has been developed for the proposed SuDS components, providing indicative schedules of monitoring, management and maintenance activities to be implemented after handover of the development. Note that a detailed management plan will be developed during the detailed design stages. Where applicable, guidance on management and maintenance from system manufacturer's must be adhered to.

Appendix A: Existing Drawings

SuDS Strategy

Boyton Road



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Client:
London Borough of Haringey

KEY :

Red boundary line showing the extent of the development

Areas of enhanced public realm, landscaping and play space

F	21.11.29	Green Boundary Line updated	MB	CM
E	21.11.18	Boundary line colour and description revised	MB	CM
D	21.11.08	Blue Boundary Line updated	MB	CM
	21/10/18	Consultant Design Freeze	MB	CM
C	21/08/09	Consultant Design Freeze	WO	CM
B	21/08/19	Issued for information	MB	CM
A	21/05/25	Issued for information	MB	CM
-	21/01/25	Issued for comments	MB	CM
REV	DATE	DESCRIPTION	DWN	CHK

GENERAL NOTE:
This drawing is to be read in conjunction with all other drawings, structural, mechanical & electrical engineer's drawings. Written dimensions take precedence over scaled. All dimensions to be confirmed on site. All areas and dimensions are approximate and subject to change. All details are indicative of design intent. Specialist design subcontractors are to develop and co-ordinate final details for the contract administrators comments. All installations are to be in accordance with manufacturers recommendations, any discrepancy is to be notified to the contract administrator immediately. Kiran Curtis Ltd. accept no responsibility for the accuracy of the existing building survey upon which these drawings are based. This drawing is protected by copyright and must not be copied or reproduced without the written consent of Kiran Curtis Ltd.

Key Plan:

Project:
0535 - Boyton Road, Wat Tyler N8 7AW

Drawing Title:
Existing Site Plan

CONSULTANT DESIGN FREEZE

Drawing Number:
KCA-0535-0003

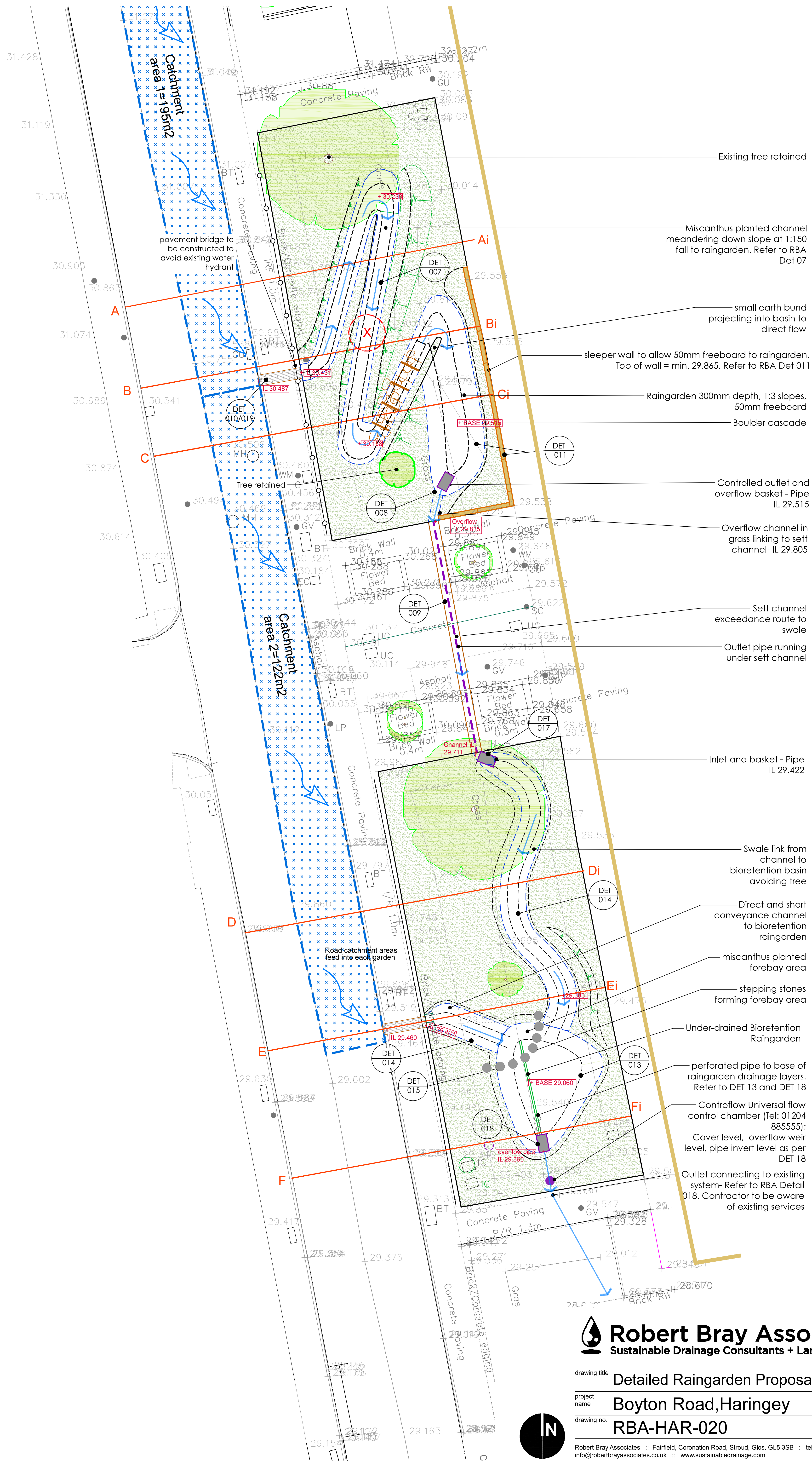
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As indicated A3 F



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Robert Bray Associates
Sustainable Drainage Consultants + Landscape Architects

drawing title	Detailed Rain garden Proposals	scale @	A1 1:100
project name	Boyton Road, Haringey	project ref.	HAR
drawing no.	RBA-HAR-020	date	09.09.14

Robert Bray Associates :: Fairfield, Coronation Road, Stroud, Glos. GL5 3SB :: tel 01453 764885
info@robertbrayassociates.co.uk :: www.sustainabledrainage.com

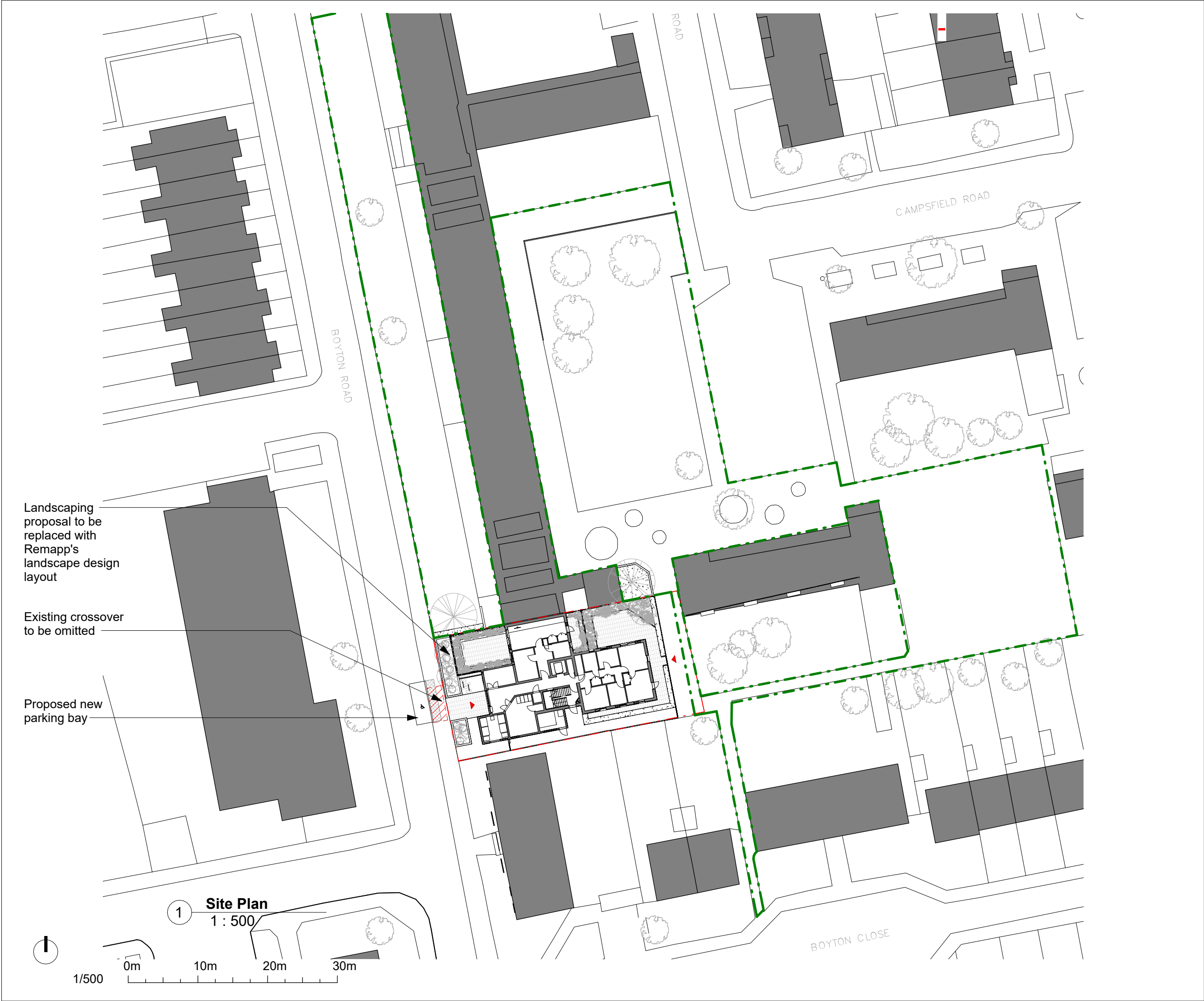
Appendix B: Proposed Drawings

SuDS Strategy

Boyton Road



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Client:

London Borough of Haringey

KEY :

Red boundary line showing the extent of the development

Areas of enhanced public realm, landscaping and play space

G	22.07.08	Issued for Design Freeze REV A	MB	KC
F	21.11.29	Green Boundary Line updated	MB	CM
E	21.11.18	Boundary line colour and description revised	MB	CM
D	21/10/18	Proposed parking bays removed. Issued for Design Freeze	MB	CM
	21/10/05	Consultant Design Freeze	MB	CM
C	21/09/09	Consultant Design Freeze	WO	CM
B	21/05/25	Issued for information	MB	CM
	21/05/24	Issued for information	MB	CM
	21/02/05	Issued for information	MB	CM
A	21/01/25	Issued for comments	MB	CM
-	14/04/20	Issue for QRP	MFF	CM
REV	DATE	DESCRIPTION	DWN	CHK

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Key Plan:

Project:

0535 - Boyton Road, Wat Tyler N8 7AW

Drawing Title:

Proposed Site Plan

CONSULTANT
DESIGN FREEZE
REV A

Drawing Number:

KCA-0535-1000

Scale:

Paper Size:

Revision:

As indicated

A3

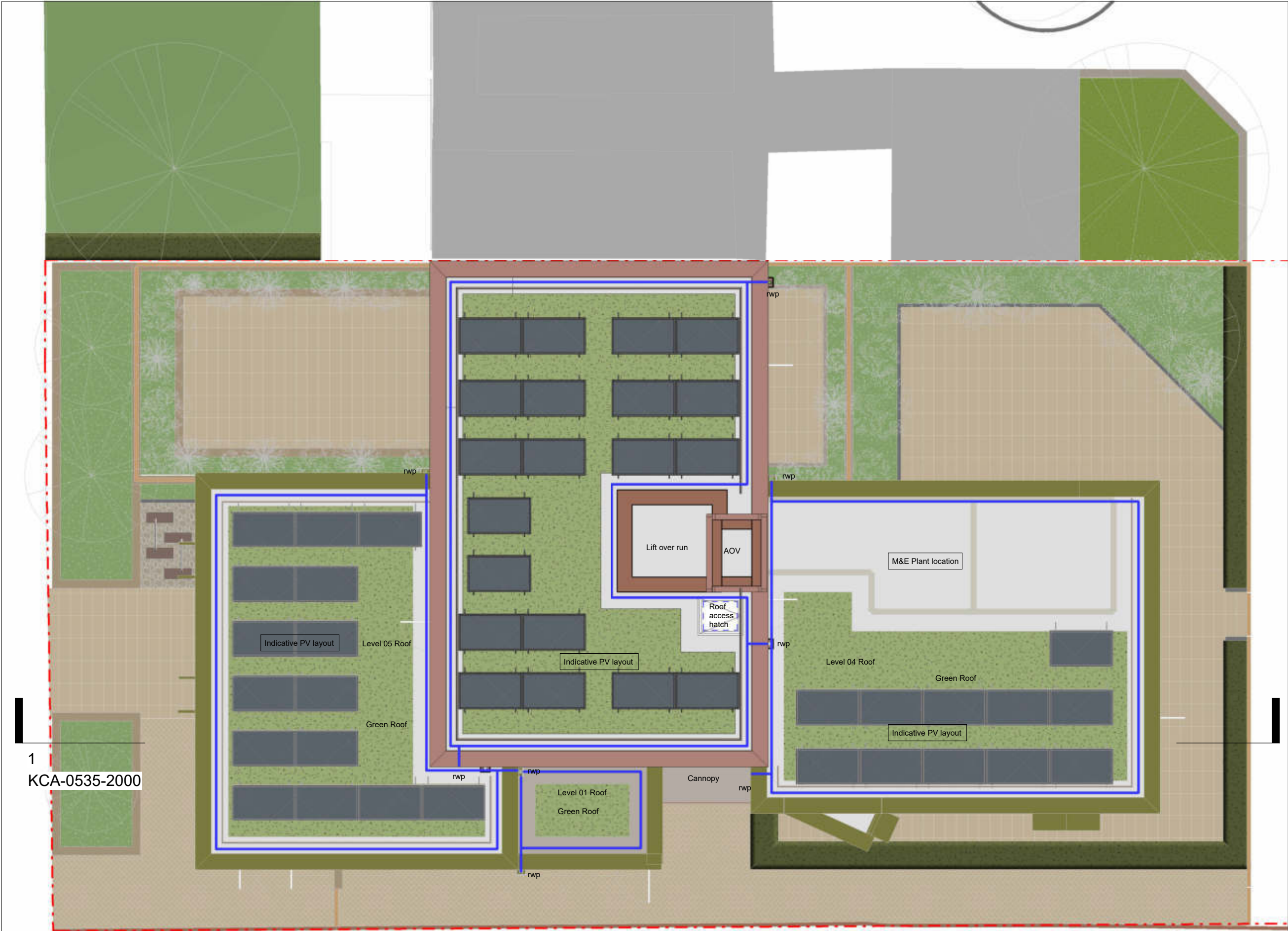
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London, N1 7EU, UK



Client:
London Borough of Haringey

KEY:
Drainage area

NOTE: Pending input from M&E,
Energy consultant and Fire consultant.

G	22.07.08	Issued for Design Freeze REV A	MB	KC
	21/10/18	Consultant Design Freeze	MB	CM
F	21/10/05	Position of lift and AOV revised	MB	CM
E	21/09/09	Consultant Design Freeze	WO	CM
D	21/06/18	Issued for information	MB	CM
C	21/06/10	Pv panels added	MB	CM
B	21/06/08	Issued for information	MB	CM
A	21/05/25	Issued for information	MB	CM
	21/05/24	Issued for information	MB	CM
-	21/01/21	Issued for comments	MB	CM
REV	DATE	DESCRIPTION	DWN	CHK

GENERAL NOTE:
This drawing is to be read in conjunction with all other drawings, structural, mechanical & electrical engineer's drawings. Written dimensions take precedence over scaled. All dimensions to be confirmed on site. All areas and dimensions are approximate and subject to change. All details are indicative of design intent. Specialist design subcontractors are to develop and co-ordinate final details for the contract administrators comments. All installations are to be in accordance with manufacturers recommendations, any discrepancy is to be notified to the contract administrator immediately. Kiran Curtis Ltd. accept no responsibility for the accuracy of the existing building survey upon which these drawings are based. This drawing is protected by copyright and must not be copied or reproduced without the written consent of Kiran Curtis Ltd.

Key Plan:

Project:
0535 - Boyton Road, Wat Tyler N8 7AW

Drawing Title:
Proposed Roof Plan
**CONSULTANT
DESIGN FREEZE
REV A**

Drawing Number:
KCA-0535-1107

Scale: 1 : 100 Paper Size: A3 Revision: G



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1

Proposed Roof Plan

1 : 100

1/100

0m

1

2

3

4

5m

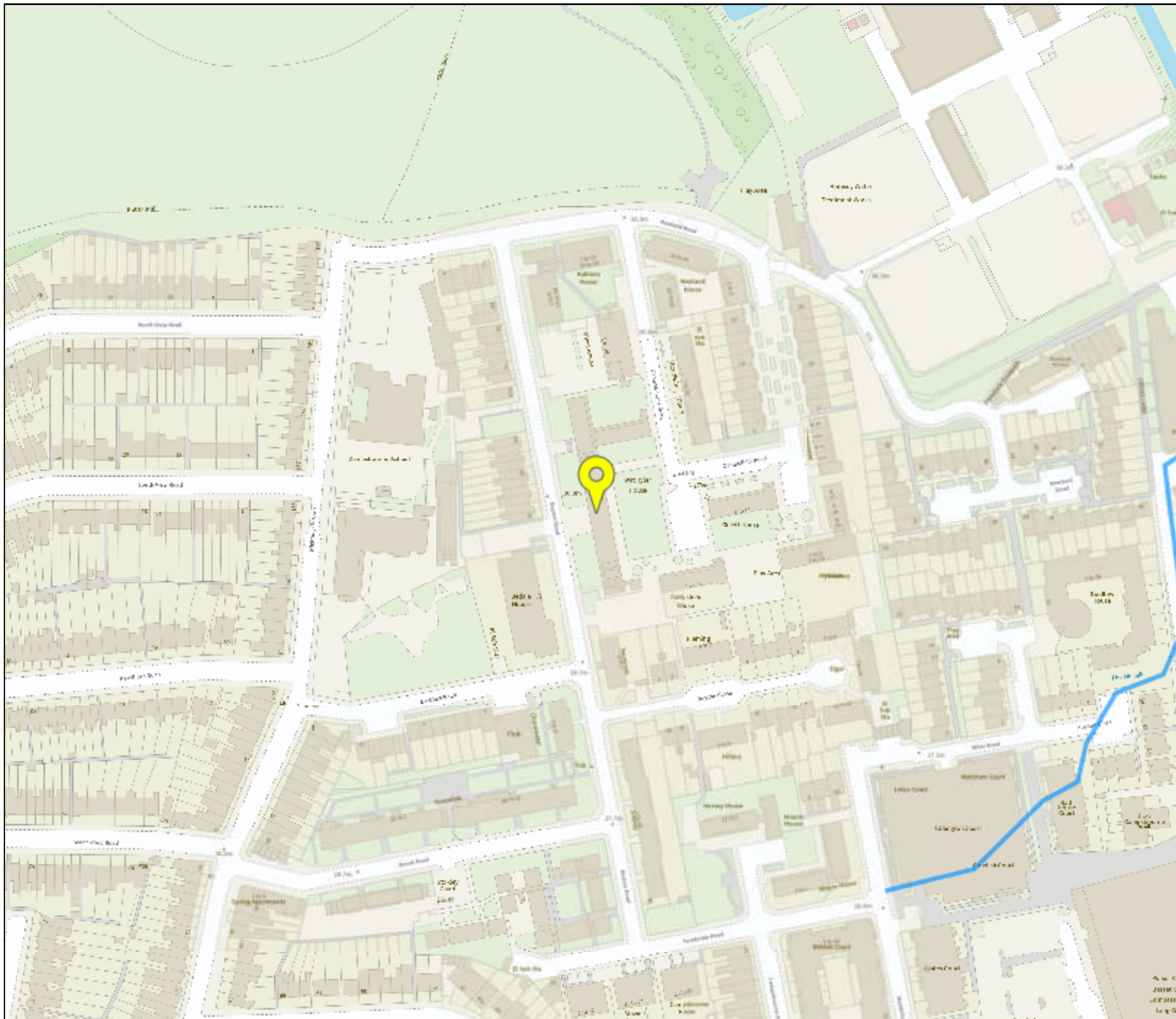
Appendix C: Environment Agency Flood Map

SuDS Strategy

Boyton Road



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info@eightversa.com



Flood map for planning

Your reference

5641

Location (easting/northing)

530297/189647

Scale

1:2500

Created

28 Oct 2021 9:41

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m

Appendix D: Hydraulic Modelling Results

SuDS Strategy

Boyton Road



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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	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	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
GR.2	0.014	5.00	0.000	1200	3688.200	-1220.800	1.300
AT			0.000	1200	3701.000	-1209.900	1.740
BR.1		5.00	0.000	1200	3693.500	-1212.200	1.300
GR.1		5.00	0.000	1200	3682.200	-1213.300	1.300
GR.3		5.00	0.000	1200	3688.500	-1214.600	1.300
GR.4		5.00	0.000	1200	3701.200	-1216.700	1.300
Outfall			0.000	1200	3727.100	-1209.900	2.179
PP.1		5.00	0.000	1200	3680.500	-1208.800	1.300
PP.2		5.00	0.000	1200	3676.300	-1218.600	1.300
PP.3		5.00	0.000	1200	3691.000	-1223.900	1.300
PP.4		5.00	0.000	1200	3703.200	-1211.600	1.300
PP.5		5.00	0.000	1200	3693.400	-1210.100	1.300

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)
7.000	BR.1	AT	7.845	0.600	-1.300	-1.432	0.132	59.4	100	5.13	50.0
3.000	GR.1	AT	19.105	0.600	-1.300	-1.740	0.440	43.4	100	5.27	50.0
5.000	GR.2	AT	16.812	0.600	-1.300	-1.740	0.440	38.2	100	5.22	50.0
6.000	GR.3	AT	13.354	0.600	-1.300	-1.525	0.225	59.4	100	5.22	50.0
9.000	GR.4	AT	6.803	0.600	-1.300	-1.415	0.115	59.2	100	5.11	50.0
2.000	PP.1	AT	20.529	0.600	-1.300	-1.740	0.440	46.7	100	5.30	50.0
1.000	PP.2	AT	26.187	0.600	-1.300	-1.740	0.440	59.5	100	5.44	50.0
4.000	PP.3	AT	17.205	0.600	-1.300	-1.740	0.440	39.1	100	5.23	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)
7.000	1.001	7.9	1.9	1.200	1.332	0.014	0.0	33	0.820
3.000	1.173	9.2	0.0	1.200	1.640	0.000	0.0	0	0.000
5.000	1.251	9.8	0.0	1.200	1.640	0.000	0.0	0	0.000
6.000	1.001	7.9	0.0	1.200	1.425	0.000	0.0	0	0.000
9.000	1.003	7.9	0.0	1.200	1.315	0.000	0.0	0	0.000
2.000	1.131	8.9	0.0	1.200	1.640	0.000	0.0	0	0.000
1.000	1.000	7.9	0.0	1.200	1.640	0.000	0.0	0	0.000
4.000	1.237	9.7	0.0	1.200	1.640	0.000	0.0	0	0.000

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)
10.000	PP.4	AT	2.780	0.600	-1.300	-1.347	0.047	59.2	100	5.05	50.0
8.000	PP.5	AT	7.603	0.600	-1.300	-1.428	0.128	59.4	100	5.13	50.0
1.001	AT	Outfall	26.100	0.600	-1.740	-2.179	0.439	59.5	100	5.87	50.0

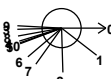
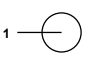
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
10.000	1.003	7.9	0.0	1.200	1.247	0.000	0.0	0	0.000
8.000	1.001	7.9	0.0	1.200	1.328	0.000	0.0	0	0.000
1.001	1.001	7.9	1.9	1.640	2.079	0.014	0.0	33	0.820

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)
7.000	7.845	59.4	100	Circular	0.000	-1.300	1.200	0.000	-1.432	1.332
3.000	19.105	43.4	100	Circular	0.000	-1.300	1.200	0.000	-1.740	1.640
5.000	16.812	38.2	100	Circular	0.000	-1.300	1.200	0.000	-1.740	1.640
6.000	13.354	59.4	100	Circular	0.000	-1.300	1.200	0.000	-1.525	1.425
9.000	6.803	59.2	100	Circular	0.000	-1.300	1.200	0.000	-1.415	1.315
2.000	20.529	46.7	100	Circular	0.000	-1.300	1.200	0.000	-1.740	1.640
1.000	26.187	59.5	100	Circular	0.000	-1.300	1.200	0.000	-1.740	1.640
4.000	17.205	39.1	100	Circular	0.000	-1.300	1.200	0.000	-1.740	1.640
10.000	2.780	59.2	100	Circular	0.000	-1.300	1.200	0.000	-1.347	1.247
8.000	7.603	59.4	100	Circular	0.000	-1.300	1.200	0.000	-1.428	1.328
1.001	26.100	59.5	100	Circular	0.000	-1.740	1.640	0.000	-2.179	2.079

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	BR.1	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
3.000	GR.1	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
5.000	GR.2	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
6.000	GR.3	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
9.000	GR.4	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
2.000	PP.1	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
1.000	PP.2	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
4.000	PP.3	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
10.000	PP.4	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
8.000	PP.5	1200	Manhole	Adoptable	AT	1200	Manhole	Adoptable
1.001	AT	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
GR.2	3688.200	-1220.800	0.000	1.300	1200		0	5.000	-1.300	100
AT	3701.000	-1209.900	0.000	1.740	1200		1	10.000	-1.347	100
						2	9.000	-1.415	100	
						3	8.000	-1.428	100	
						4	7.000	-1.432	100	
						5	6.000	-1.525	100	
						6	5.000	-1.740	100	
						7	4.000	-1.740	100	
						8	3.000	-1.740	100	
						9	2.000	-1.740	100	
						10	1.000	-1.740	100	
						0	1.001	-1.740	100	
BR.1	3693.500	-1212.200	0.000	1.300	1200		0	7.000	-1.300	100
GR.1	3682.200	-1213.300	0.000	1.300	1200		0	3.000	-1.300	100
GR.3	3688.500	-1214.600	0.000	1.300	1200		0	6.000	-1.300	100
GR.4	3701.200	-1216.700	0.000	1.300	1200		0	9.000	-1.300	100
Outfall	3727.100	-1209.900	0.000	2.179	1200		1	1.001	-2.179	100
PP.1	3680.500	-1208.800	0.000	1.300	1200		0	2.000	-1.300	100
PP.2	3676.300	-1218.600	0.000	1.300	1200		0	1.000	-1.300	100
PP.3	3691.000	-1223.900	0.000	1.300	1200		0	4.000	-1.300	100
PP.4	3703.200	-1211.600	0.000	1.300	1200		0	10.000	-1.300	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
PP.5	3693.400	-1210.100	0.000	1.300	1200		0	8.000	-1.300	100

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	4.4
Summer CV	0.750	30 year (l/s)	10.5
Winter CV	0.840	100 year (l/s)	13.3
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +40% 360 minute (m³)	20

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Time of Concentration (mins)	5.00
Brownfield Method	MRM	Betterment (%)	50
Contributing Area (ha)	0.060	Q 1 year (l/s)	4.4
PIMP (%)	100	Q 30 year (l/s)	10.5
CV	0.750	Q 100 year (l/s)	13.3

Pre-development Discharge Volume

Site Makeup	Brownfield	CV	0.750	Betterment (%)	50
Brownfield Method	MRM	Return Period (years)	100	PR	0.750
Contributing Area (ha)	0.060	Climate Change (%)	40	Runoff Volume (m³)	20
PIMP (%)	100	Storm Duration (mins)	360		

Node GR.1 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	-1.300	Design Flow (l/s)	40.0
Replaces Downstream Link	✓	Design Depth (m)	1.000		

Depth (m)	Flow (l/s)
1.000	40.000

Node GR.2 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	-1.300	Design Flow (l/s)	40.0
Replaces Downstream Link	✓	Design Depth (m)	1.000		

Depth (m)	Flow (l/s)
1.000	40.000

Node GR.3 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	-1.300	Design Flow (l/s)	40.0
Replaces Downstream Link	✓	Design Depth (m)	1.000		

Depth (m)	Flow (l/s)
1.000	40.000

Node GR.4 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	-1.300	Design Flow (l/s)	40.0
Replaces Downstream Link	✓	Design Depth (m)	1.000		

Depth (m)	Flow (l/s)
1.000	40.000

Node AT Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	-1.740	Design Flow (l/s)	2.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)
2.500	1.300

Node PP.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.4	0.0	0.210	43.4	0.0	0.211	0.0	0.0

Node PP.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.4	0.0	0.210	43.4	0.0	0.211	0.0	0.0

Node PP.3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.4	0.0	0.210	43.4	0.0	0.211	0.0	0.0

Node PP.4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.4	0.0	0.210	43.4	0.0	0.211	0.0	0.0

Node PP.5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.4	0.0	0.210	43.4	0.0	0.211	0.0	0.0

Node AT Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.740
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	15.0	0.0	1.000	15.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 95.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	GR.2	20	-1.293	0.008	0.3	0.0091	0.0000	OK
600 minute winter	AT	405	-1.371	0.369	1.1	5.9598	0.0000	SURCHARGED
15 minute winter	BR.1	10	-1.264	0.036	2.0	0.0478	0.0000	OK
60 minute winter	GR.1	45	-1.293	0.007	0.3	0.0091	0.0000	OK
60 minute winter	GR.3	47	-1.294	0.006	0.3	0.0070	0.0000	OK
60 minute winter	GR.4	45	-1.293	0.008	0.3	0.0091	0.0000	OK
15 minute summer	Outfall	1	-2.179	0.000	0.0	0.0000	0.0000	OK
600 minute winter	PP.1	375	-1.292	0.008	0.1	0.1073	0.0000	OK
600 minute winter	PP.2	375	-1.292	0.008	0.1	0.1135	0.0000	OK
600 minute winter	PP.3	375	-1.293	0.007	0.1	0.1031	0.0000	OK
600 minute winter	PP.4	375	-1.292	0.008	0.1	0.1153	0.0000	OK
480 minute winter	PP.5	312	-1.292	0.008	0.1	0.1141	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	GR.2	Depth/Flow	AT	0.3				
600 minute winter	AT	Depth/Flow	Outfall	0.2				4.8
15 minute winter	BR.1	7.000	AT	2.0	0.811	0.250	0.0190	
60 minute winter	GR.1	Depth/Flow	AT	0.3				
60 minute winter	GR.3	Depth/Flow	AT	0.2				
60 minute winter	GR.4	Depth/Flow	AT	0.3				
600 minute winter	PP.1	2.000	AT	0.1	0.021	0.011	0.0830	
600 minute winter	PP.2	1.000	AT	0.1	0.021	0.013	0.1062	
600 minute winter	PP.3	4.000	AT	0.1	0.021	0.010	0.0695	
600 minute winter	PP.4	10.000	AT	0.1	0.342	0.013	0.0008	
480 minute winter	PP.5	8.000	AT	0.1	0.343	0.013	0.0063	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	GR.2	27	-1.280	0.020	0.8	0.0242	0.0000	OK
1440 minute winter	AT	930	-1.173	0.567	1.1	9.1496	0.0000	SURCHARGED
1440 minute winter	BR.1	930	-1.173	0.127	0.2	0.1713	0.0000	SURCHARGED
30 minute winter	GR.1	27	-1.280	0.020	0.8	0.0242	0.0000	OK
30 minute winter	GR.3	27	-1.280	0.020	0.8	0.0242	0.0000	OK
30 minute winter	GR.4	27	-1.280	0.020	0.8	0.0242	0.0000	OK
15 minute summer	Outfall	1	-2.179	0.000	0.1	0.0000	0.0000	OK
1440 minute winter	PP.1	930	-1.173	0.127	0.2	1.8101	0.0000	SURCHARGED
1440 minute winter	PP.2	930	-1.173	0.127	0.1	1.8101	0.0000	SURCHARGED
1440 minute winter	PP.3	930	-1.173	0.127	0.2	1.8100	0.0000	SURCHARGED
1440 minute winter	PP.4	930	-1.173	0.127	0.2	1.8099	0.0000	SURCHARGED
1440 minute winter	PP.5	930	-1.173	0.127	0.3	1.8100	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	GR.2	Depth/Flow	AT	0.8				
1440 minute winter	AT	Depth/Flow	Outfall	0.3				17.0
1440 minute winter	BR.1	7.000	AT	0.2	0.424	0.025	0.0614	
30 minute winter	GR.1	Depth/Flow	AT	0.8				
30 minute winter	GR.3	Depth/Flow	AT	0.8				
30 minute winter	GR.4	Depth/Flow	AT	0.8				
1440 minute winter	PP.1	2.000	AT	0.1	0.021	0.011	0.1606	
1440 minute winter	PP.2	1.000	AT	0.1	0.021	0.013	0.2049	
1440 minute winter	PP.3	4.000	AT	-0.1	-0.031	-0.015	0.1346	
1440 minute winter	PP.4	10.000	AT	-0.1	0.342	-0.013	0.0218	
1440 minute winter	PP.5	8.000	AT	-0.2	0.344	-0.020	0.0595	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	GR.2	28	-1.275	0.025	1.0	0.0302	0.0000	OK
1440 minute winter	AT	990	-1.094	0.646	1.1	10.4136	0.0000	SURCHARGED
1440 minute winter	BR.1	990	-1.094	0.206	0.3	0.2767	0.0000	SURCHARGED
30 minute winter	GR.1	28	-1.275	0.025	1.0	0.0302	0.0000	OK
30 minute winter	GR.3	28	-1.275	0.025	1.0	0.0302	0.0000	OK
30 minute winter	GR.4	28	-1.275	0.025	1.0	0.0302	0.0000	OK
15 minute summer	Outfall	1	-2.179	0.000	0.2	0.0000	0.0000	OK
1440 minute winter	PP.1	990	-1.094	0.206	0.2	2.9250	0.0000	SURCHARGED
1440 minute winter	PP.2	990	-1.094	0.206	0.2	2.9250	0.0000	SURCHARGED
1440 minute winter	PP.3	990	-1.094	0.206	0.2	2.9249	0.0000	SURCHARGED
1440 minute winter	PP.4	990	-1.094	0.206	0.1	2.9248	0.0000	SURCHARGED
1440 minute winter	PP.5	990	-1.094	0.206	0.1	2.9248	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	GR.2	Depth/Flow	AT	1.0				
1440 minute winter	AT	Depth/Flow	Outfall	0.3				20.5
1440 minute winter	BR.1	7.000	AT	0.3	0.424	0.036	0.0614	
30 minute winter	GR.1	Depth/Flow	AT	1.0				
30 minute winter	GR.3	Depth/Flow	AT	1.0				
30 minute winter	GR.4	Depth/Flow	AT	1.0				
1440 minute winter	PP.1	2.000	AT	0.1	0.021	0.011	0.1606	
1440 minute winter	PP.2	1.000	AT	0.1	0.021	0.013	0.2049	
1440 minute winter	PP.3	4.000	AT	0.1	0.021	0.010	0.1346	
1440 minute winter	PP.4	10.000	AT	0.1	0.342	0.013	0.0218	
1440 minute winter	PP.5	8.000	AT	0.1	0.344	0.013	0.0595	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	GR.2	28	-1.265	0.035	1.4	0.0423	0.0000	OK
600 minute winter	AT	525	-0.536	1.204	2.3	16.3698	0.0000	SURCHARGED
600 minute winter	BR.1	525	-0.535	0.765	0.8	1.0291	0.0000	SURCHARGED
30 minute winter	GR.1	28	-1.265	0.035	1.4	0.0423	0.0000	OK
30 minute winter	GR.3	28	-1.265	0.035	1.4	0.0423	0.0000	OK
30 minute winter	GR.4	28	-1.265	0.035	1.4	0.0423	0.0000	OK
15 minute summer	Outfall	1	-2.179	0.000	0.3	0.0000	0.0000	OK
600 minute winter	PP.1	525	-0.536	0.764	0.5	3.6642	0.0000	SURCHARGED
600 minute winter	PP.2	525	-0.536	0.764	0.5	3.6642	0.0000	SURCHARGED
600 minute winter	PP.3	525	-0.536	0.764	0.5	3.6642	0.0000	SURCHARGED
600 minute winter	PP.4	525	-0.536	0.764	0.5	3.6642	0.0000	SURCHARGED
600 minute winter	PP.5	525	-0.536	0.764	0.5	3.6642	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	GR.2	Depth/Flow	AT	1.4				
600 minute winter	AT	Depth/Flow	Outfall	0.6				17.0
600 minute winter	BR.1	7.000	AT	0.8	0.553	0.096	0.0614	
30 minute winter	GR.1	Depth/Flow	AT	1.4				
30 minute winter	GR.3	Depth/Flow	AT	1.4				
30 minute winter	GR.4	Depth/Flow	AT	1.4				
600 minute winter	PP.1	2.000	AT	-0.2	0.040	-0.025	0.1606	
600 minute winter	PP.2	1.000	AT	-0.2	0.039	-0.029	0.2049	
600 minute winter	PP.3	4.000	AT	-0.2	0.040	-0.022	0.1346	
600 minute winter	PP.4	10.000	AT	-0.2	0.387	-0.028	0.0218	
600 minute winter	PP.5	8.000	AT	-0.2	0.338	-0.028	0.0595	

Appendix E: Preliminary SuDS Layout

SuDS Strategy

Boyton Road



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Legend

- Site boundary
- Hardstanding
(impermeable)
- c. 2,022m² total
- Landscape
(permeable)
- c. 1,291m² total
- Existing Rain Gardens
- c. 404.8m² total



Notes

This drawing shows measured areas of the existing site, as shown in the topographical plan. This drawing should be read in conjunction with the Eight Associates SuDS Strategy report.

Where areas are not shown on the topographical plan, aerial imagery has been used to estimate the areas relevant to this plan. This drawing is not to scale.

Project name

Boyton Road

Drawing name

Existing - Areas

Date

08/09/2022

Drawing number

5641_A_01

Legend

- Site boundary
- Buildings
(impermeable)
- c. 216m² total
- Hardstanding
(permeable)
- c. 174m² total
- Landscape
(permeable)
- c. 1,298m² total
- Green Roof
(permeable)
- c. 160.5m² total
- Existing Rain Gardens
- c. 404.8m² total
- Hardstanding
(impermeable)
- c. 1,423m² total

Notes

This drawing shows measured areas of the proposed development site, as shown in architect drawings. This drawing should be read in conjunction with the Eight Associates SuDS Strategy report.

The areas on the site are subject to change during the detailed design stages and should be reviewed by the design team. This drawing is not to scale.

Project name

Boyton Road

Drawing name

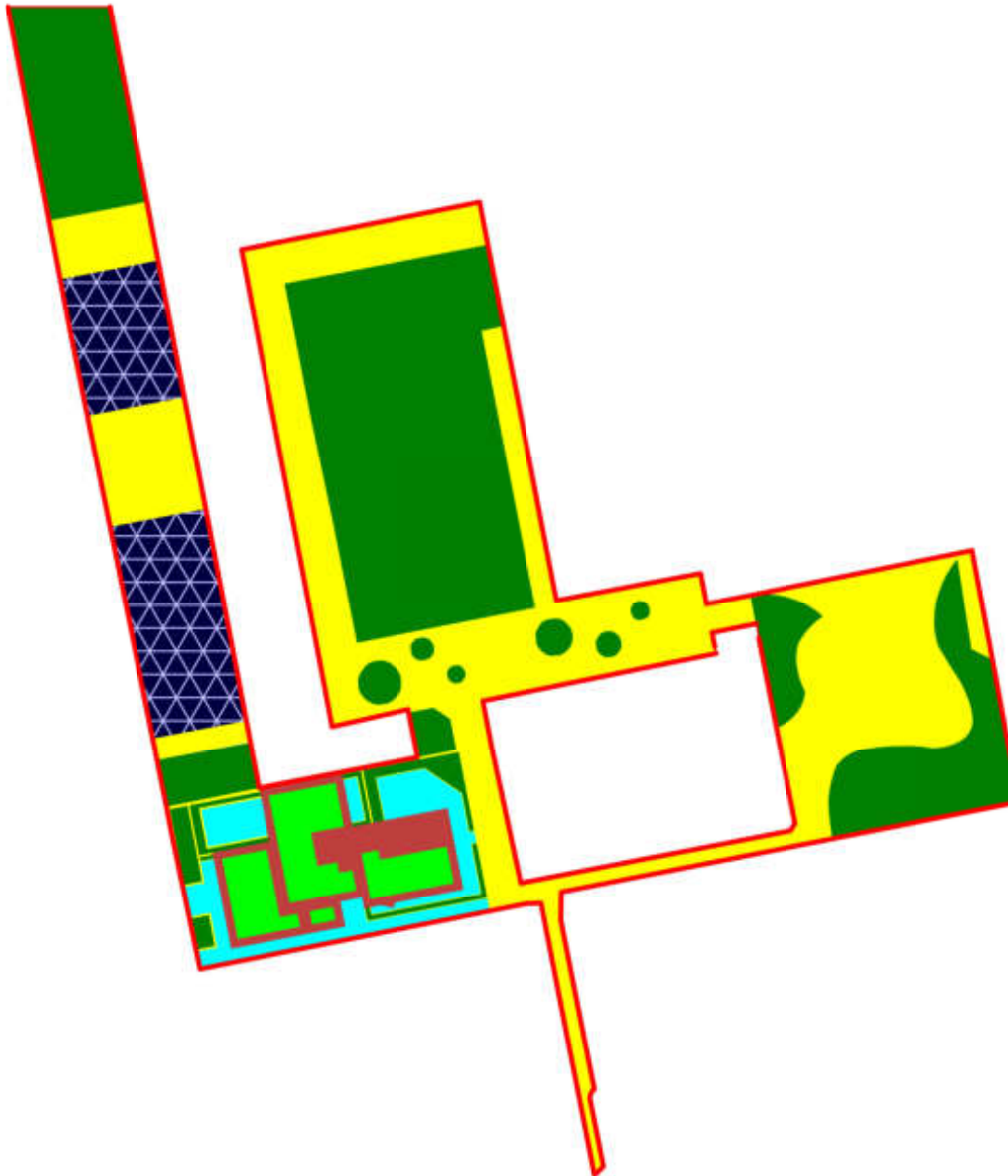
Proposed - Areas

Date

08/09/2022

Drawing number

5641_A_02



Legend

- Site boundary
- Approximate location of existing surface water sewer
- [Grid Pattern] Sub-surface geocellular attenuation storage
- ⊠ Proposed notional pumped flow control device
- Proposed notional surface water drainage network
- Proposed notional drainage junctions, inspection chambers, manholes
- Exceedance and overland flow routes

Notes

This drawing shows potential locations of sustainable drainage systems (SuDS) components and a preliminary notional surface water drainage network layout. This drawing should be read in conjunction with the Eight Associates SuDS Strategy report.

The locations and arrangements of SuDS components in this drawing are indicative and should be subject to a detailed review of feasibility by a structural or drainage engineer during the detailed design stages. This drawing is not to scale.

Project name

Boyton Road

Drawing name

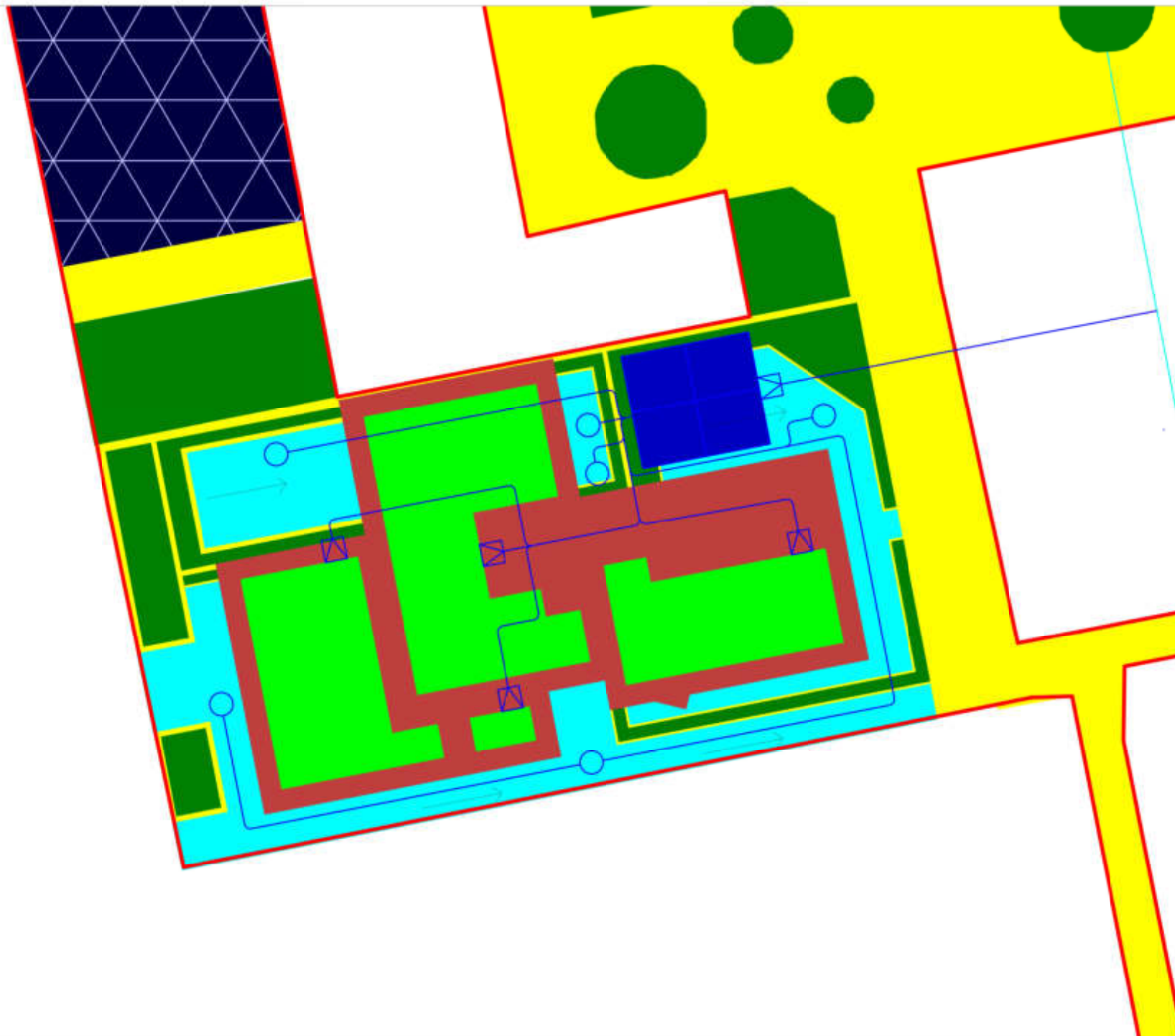
Proposed - Preliminary SuDS Layout

Date

08/09/2022

Drawing number

5641_A_03



Appendix F: SuDS Management Plan

SuDS Strategy

Boyton Road



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Management Plan

SuDS Strategy

Boyton Road



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Outline SuDS Management Plan

To ensure that SuDS features and components work effectively, it is essential that they are adequately maintained and working to their expected capacity. A detailed site-specific SuDS management plan will be produced for the development, including responsibilities and a programme of maintenance works and inspections. An outline management plan for the proposed SuDS components is provided below. A template SuDS inspection and maintenance checklist form, which may be used to record the site inspections and management and maintenance actions undertaken, is provided in Appendix F to this report.

Management and maintenance of all surface water drainage and SuDS components within the curtilages of the properties will be the responsibility of the respective property owners, for the lifetime of the development. All surface water drainage and SuDS components outside of the property curtilages, but within the curtilages of the overall development site, will be the shared responsibility of the respective property owners and will be managed and maintained via a management agreement or similar contractual arrangement, for the lifetime of the development.

To ensure that the maintenance requirements and responsibilities for the proposed SuDS components are met, information will be made available to the first owners of each property in a clear and concise format to clarify their requirements. The developer shall be responsible for providing a framework management agreement for SuDS outside of the property curtilages, for the future property owners.

Management and maintenance requirements should be determined in accordance with all best-practice guidance and the SuDS Manual (Chapter 32: Operation and Maintenance), including:

- Regular maintenance activities.
- Occasional maintenance activities.
- Remedial maintenance requirements.
- Ongoing monitoring requirements.

All management, monitoring and maintenance activities should follow guidance from the SuDS system manufacturer, where applicable.

Drains, Manholes and Pipes

All drains, manholes and pipes should be constructed, operated and maintained in accordance with Building Regulations Part H, Sewers for Adoption 7th Edition and BS EN 752:2017 'Drain and sewer systems outside buildings'.

Pumping System and Rising Mains

The surface water pumping station system be constructed, operated and maintained in accordance with Building Regulations Part H, Sewers for Adoption 7th Edition and BS EN 16932-1:2018 'Drain and sewer systems outside buildings - Pumping systems'.

Flow Control Devices

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the device and filter for debris and sediment build-up.	Annually (and following poor performance).
	Cleaning of device inlet/outlet, chamber and sump.	Annually (and following poor performance).
Occasional maintenance	Cleaning and/or replacement of any filters.	Three monthly (or as required).
Remedial actions	Repair of flow control device.	As required.
Monitoring	Visual inspection within chamber to ensure that the device is in good condition and operating as designed.	Annually.
	Survey from inside of chamber for sediment build-up and remove if necessary.	Every 5 years, or as required.

Management Plan

SuDS Strategy

Boyton Road

Pervious Paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall (or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations).
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator.	As required – once per year on less frequently used pavements.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).

Pervious Paving (continued)

Maintenance schedule	Required action	Typical frequency
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Regular inspection for surface ponding and pollution.	As required.
	Monitor inspection chambers.	Annually.

Green Roofs

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspections and remedial works to control weeds and invasive plants	Monthly
Occasional maintenance	Replacement of vegetation may be required, depending on the type of green roof	Quarterly
Remedial actions	Structural rehabilitation or repair may be required if inspections reveal damage to the underlying structure	Annually (or as required)

Management Plan

SuDS Strategy

Boyton Road

Attenuation Storage

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually.
	Remove sediment from pre-treatment structures and/ or internal forebays.	Annually, or as required.
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years, or as required.

Appendix G: Haringey SuDS Proforma

Boyton Road



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1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Boyton Road
	Address & post code	Land adjacent Wat Tyler house - Boyton Road, Hornsey, London, N8 7AU
	OS Grid ref. (Easting, Northing)	E 530309 N 189603
	LPA reference (if applicable)	
	Brief description of proposed work	Redevelopment of the car park adjacent Wat Tyler House to provide 15 new Council rent homes in a part-4, 5 and 7-storey building. Provision of associated amenity space, cycle and refuse/recycling stores, a wheelchair
	Total site Area	3718 m ²
	Total existing impervious area	2072 m ²
	Total proposed impervious area	1872 m ²
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
	Existing drainage connection type and location	-
	Designer Name	Nikita Vasilev
	Designer Position	Sustainability Consultant
Designer Company	Eight Versa	

2. Proposed Drainage Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	No superficial deposits recorded	
	Bedrock geology classification	London Clay Formation - Clay, silt and sand.	
	Site infiltration rate	n/a	m/s
	Depth to groundwater level	-	m below ground level
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		Feasible (Y/N)	Proposed (Y/N)
	1 store rainwater for later use	N	N
	2 use infiltration techniques, such as porous surfaces in non-clay areas	Y	Y
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	Y	Y
	7 discharge rainwater to the combined sewer.	N	N
2c. Proposed Discharge Details			
Proposed discharge location	-		
Has the owner/regulator of the discharge location been consulted?	-		

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m ³)	Proposed discharge rate (l/s)
Q _{bar}	0.2			
1 in 1	0.1	4.4		0.2
1 in 30	0.3	10.5		0.3
1 in 100	0.4	13.3		0.3
1 in 100 + CC			10	0.6
Climate change allowance used		40%		
3b. Principal Method of Flow Control				
3c. Proposed SuDS Measures				
	Catchment area (m ²)	Plan area (m ²)	Storage vol. (m ³)	
Rainwater harvesting	0		0	
Infiltration systems	0		0	
Green roofs	160.5	0	0	
Blue roofs	0	0	0	
Filter strips	0	0	0	
Filter drains	0	0	0	
Bioretention / tree pits	0	0	0	
Pervious pavements	173.9	0	0	
Swales	0	0	0	
Basins/ponds	0	0	0	
Attenuation tanks	0		15	
Total	334.4	0	15	

4a. Discharge & Drainage Strategy	Page/section of drainage report
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	16
Drainage hierarchy (2b)	28
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	29
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	56
Proposed SuDS measures & specifications (3b)	31
4b. Other Supporting Details	Page/section of drainage report
Detailed Development Layout	42
Detailed drainage design drawings, including exceedance flow routes	67
Detailed landscaping plans	46
Maintenance strategy	33
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	-
b) biodiversity?	-
c) amenity?	-