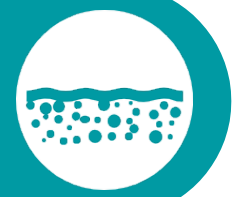


# SuDSmart Plus



## Sustainable Drainage Assessment

### Site Address

Land Adjacent to  
8 Lavender Road  
Hillingdon  
UB8 3PY

### Date

2023-10-30

### Report Status

FINAL

### Site Area

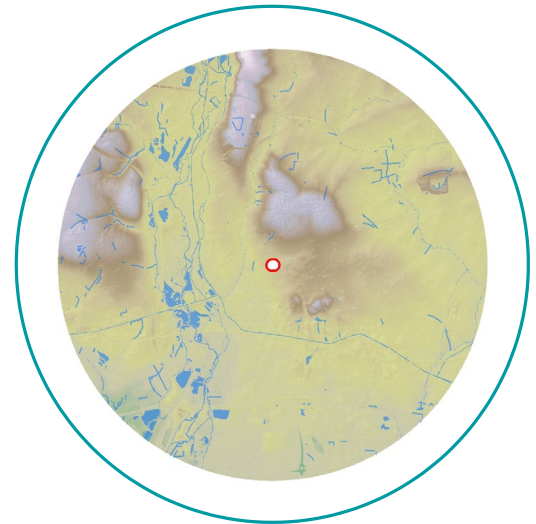
0.06 ha

### Grid Reference

506855, 181656

### Report Reference

80646R1



### Report Prepared for

Gori Holdings Ltd.

## Infiltration to ground

The proposed Sustainable Drainage Scheme (SuDS) strategy is comprised of permeable paving and rainwater harvesting butts to attenuate surface water runoff during the 1 in 100 plus 40% climate change event.

Surface water will continue to discharge via the existing connection to the public sewer network, subject to confirmation from the sewer utility provider, and the incorporation of SuDS.

### Report Author

Nathan Montgomery  
Consultant

### Report Checker

Jessica Bayliff  
Senior Consultant

### Report Reviewer

Bob Sargent  
Associate

GeoSmart Information Ltd  
Suite 9-11, 1<sup>st</sup> Floor, Old Bank Buildings,  
Bellstone, Shrewsbury, SY1 1HU  
+44(0)1743 298 100  
info@geosmartinfo.co.uk  
www.geosmartinfo.co.uk

# 1 Executive summary



This report assesses the feasibility of a range of Sustainable Drainage Scheme (SuDS) options in support of the Site development process. A SuDS strategy is proposed to ensure surface water runoff can be managed effectively over the lifetime of the development.

## SuDS suitability

Risk	Issue	Result
Discharge Location	What is the infiltration potential at the Site?	Moderate
	What is the potential to discharge to surface water features?	Low
	What is the potential to discharge to sewers?	High
	What is the potential to discharge to highway drains?	High
Flooding	What is the river (fluvial) flood risk at the Site?	Very Low
	What is the surface water (pluvial) flood risk at the Site?	Very Low to High
	What is the groundwater flood risk at the Site?	Negligible
Pollution	Is the groundwater a protected resource?	No
	Is the surface water feature a protected resource?	No

## Summary of existing and proposed development

The Site is currently used within a domestic capacity. At present there is a row of domestic lock up garages and associated hardstanding. Development proposals comprise the demolition of the existing garages and the erection of two semi-detached dwellings with associated access, landscaping and 2 electric vehicle charging stations.

## Summary of discharge routes

GeoSmart's SuDS Infiltration Potential (SD50) map indicates the Site has a Moderate potential for infiltration, primarily due to the variable permeability of the underlying geology (gravel and sand) overlying low permeability bedrock (London Clay)

Ordnance Survey (OS) mapping indicates a surface water feature is located within 45 m north of the Site. Discharging surface water runoff to this feature would require drainage pipework across third-party, urbanised land and therefore, discharge into this feature should not be considered.

The asset location plan search included in Appendix C confirms the Site currently discharges to a surface water sewer which serves the property. Due to this, discharge to the surface water sewer is likely to be the most practical option.

According to Google Streetview, highway gullies are located within Lavender Road, indicating the presence of the highway drainage network.

## Runoff rate and attenuation requirements

Discharging via infiltration requires 36.67 m<sup>3</sup> of attenuation to be provided to ensure there is no flooding as a result of the development in all storm events up to and including the 1 in 100 year including a 40% allowance for climate change. This volume is subject to the results of infiltration testing and would ensure runoff is not increased above the greenfield scenario.

Discharging off-Site requires 24.40 m<sup>3</sup> of attenuation to be provided to ensure there is no flooding within the development in all storm events up to and including the 1 in 100 year including a 40% allowance for climate change. This volume is subject to the discharge rate being restricted to 1 l/s (as close to the Greenfield 1 in 1 year rate as possible, without increasing the potential for blockages).

## Proposed SuDS strategy

SuDS features comprised of permeable paving and rainwater harvesting butts are proposed to attenuate a minimum of 48.45 m<sup>3</sup> of surface water runoff. The SuDS features would provide some water quality benefits (interception and filtration) prior to infiltration.

The proposed SuDS strategy would ensure surface water runoff is stored on-Site in SuDS features for the 1 in 100-year event including a 40% allowance for climate change and will not cause flooding to the proposed development in accordance with DEFRA's non-statutory technical standards (DEFRA, 2015).

## SuDS & drainage network maintenance

The management and maintenance of the SuDS features, in line with the details and schedules outlined in Section 10 of this report, will be undertaken by contractors appointed by the owners and occupiers of the new residential building, where payments for the works will form part of the property deeds and / or rental agreements.

## Recommendations / Next steps

A site investigation is recommended to confirm if ground conditions are conducive to infiltration and the groundwater table is sufficiently deep for an infiltration scheme. Where ground conditions are not conducive to infiltration, the capacity of the public sewer network should be confirmed with the utility provider and permission to connect gained where required.

## 2 Proposed SuDS strategy



The most suitable SuDS options are outlined below and a SuDS strategy schematic is shown overleaf. Supporting information is provided in subsequent sections.

**Table 1. Proposed SuDS type, features, discharge location and rate restriction**

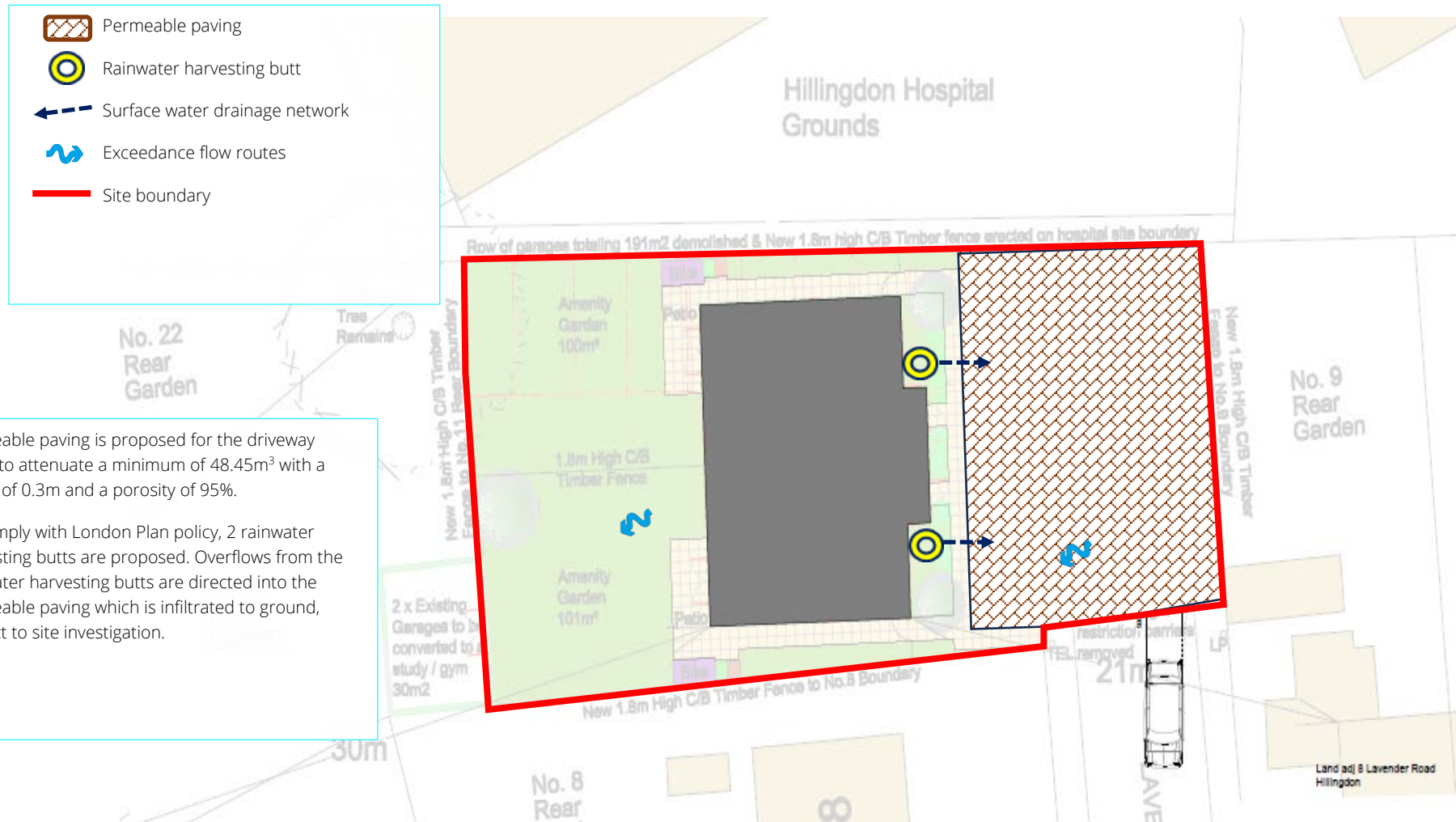
SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Permeable paving, Rainwater harvesting butts
Discharge location	Infiltration
Discharge rate	$1 \times 10^{-6}$ m/s

**Table 2. Proposed SuDS sizing (dimensions) and attenuation volumes**

Rainwater Harvesting	To comply with London Plan policy, rainwater harvesting butts should be established for each proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by Rainwater Harvesting has not been considered within the Preliminary SuDS schematic.
Permeable paving	A $170 \text{ m}^2$ area of permeable paving (underlain with geocellular crates) within the proposed driveway areas to a depth of 0.30 m, with a 95% porosity would result in c. $48.45 \text{ m}^3$ attenuation.
Total Attenuation Provided	<b><math>48.45 \text{ m}^3</math></b>

Figure 1. SuDS strategy schematic

# Figure 1. Proposed SuDS scheme



Permeable paving is proposed for the driveway areas to attenuate a minimum of 48.45m<sup>3</sup> with a depth of 0.3m and a porosity of 95%.

To comply with London Plan policy, 2 rainwater harvesting butts are proposed. Overflows from the rainwater harvesting butts are directed into the permeable paving which is infiltrated to ground, subject to site investigation.

Schematic is not to scale



## 3 Site analysis

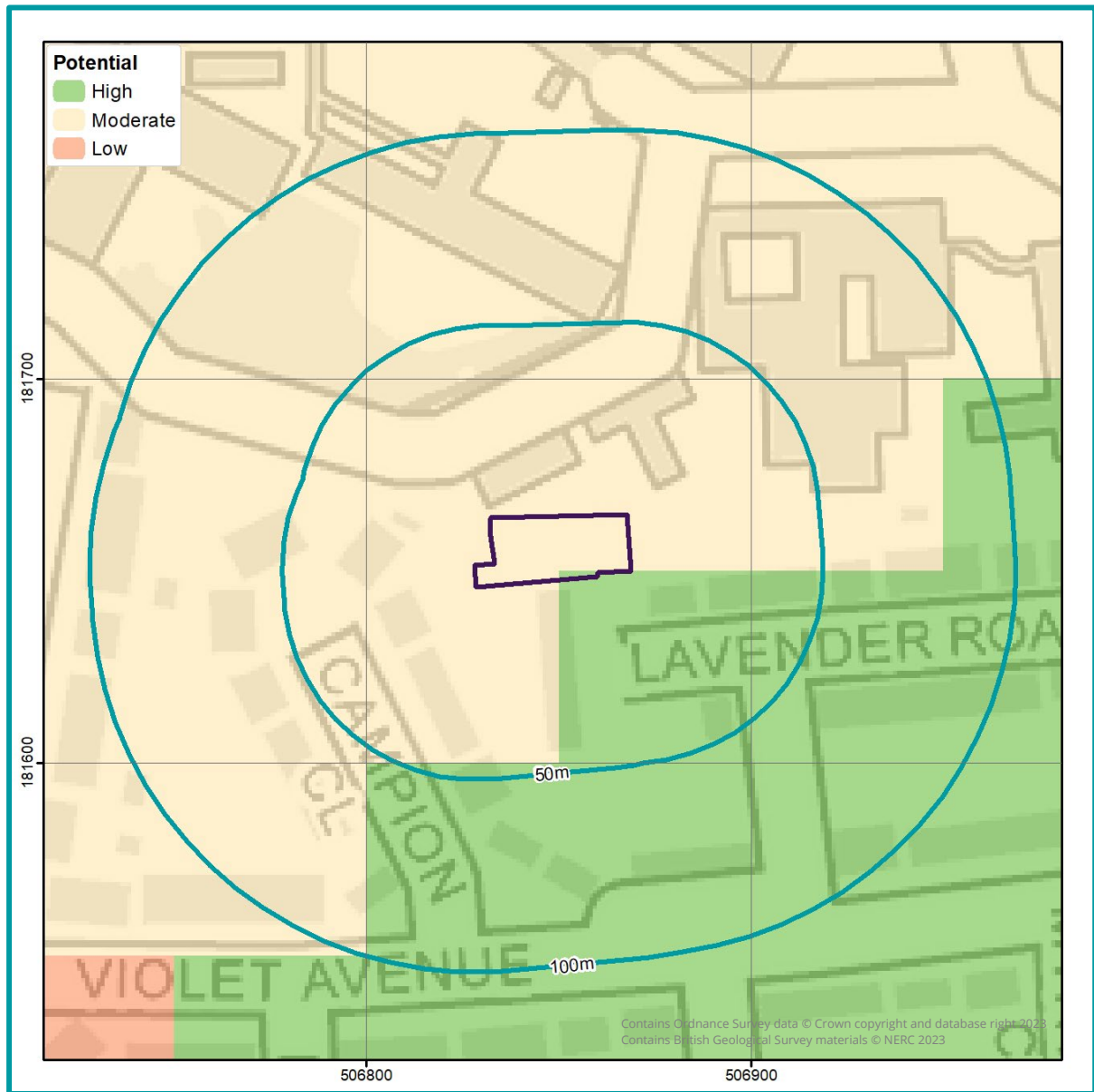


### Site location

Figure 2. Aerial Imagery (Bluesky, 2023)



Figure 3. SuDS infiltration suitability (SD50) map (GeoSmart, 2023)

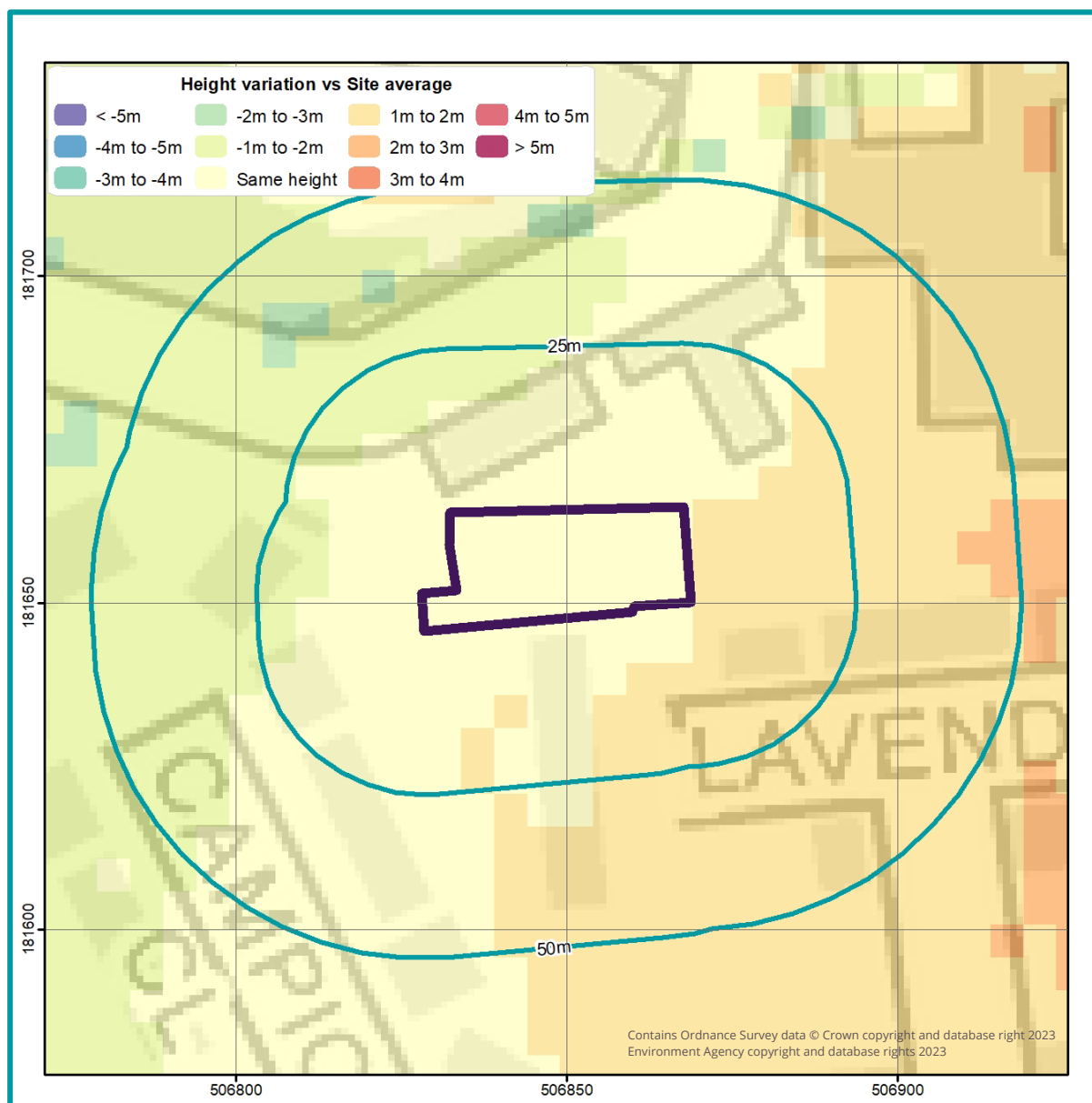


The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual Site drainage design and the planning of further Site investigation.

There is a Moderate potential for infiltration SuDS across the Site. It is likely that the underlying geology at the Site has variable permeability, and an infiltration SuDS scheme may be possible at the Site.



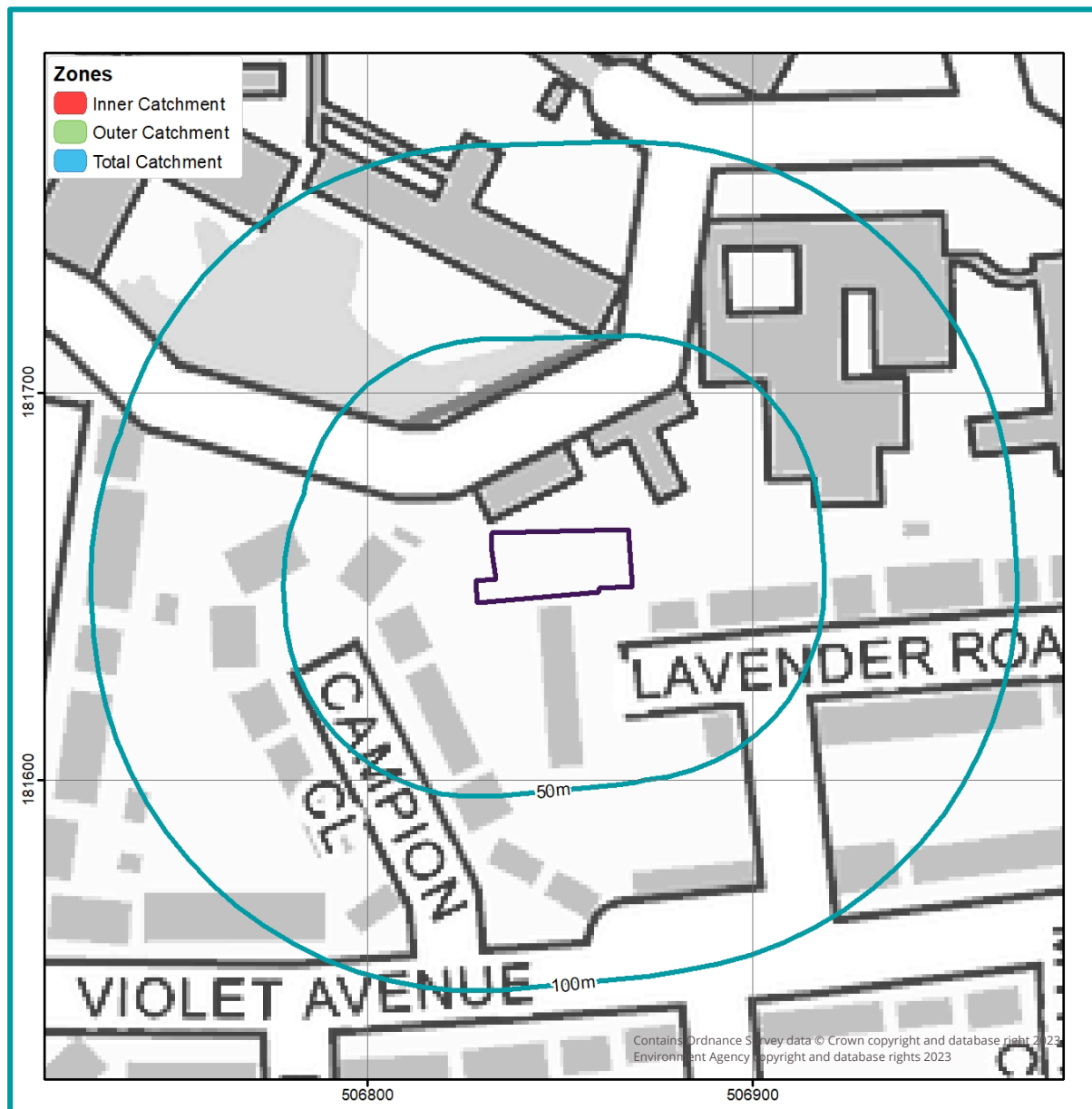
Figure 4. Site topography (GeoSmart, 2023)



An assessment of the topography at the Site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localised depressions. The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area. The mapping confirms the overall Site is generally level, with the surrounding ground levels sloping to the north west.

Further analysis could be undertaken by visiting the Site or by collecting additional topographic survey to provide further confirmation of ground levels.

Figure 5. Source protection zone map (EA, 2023)

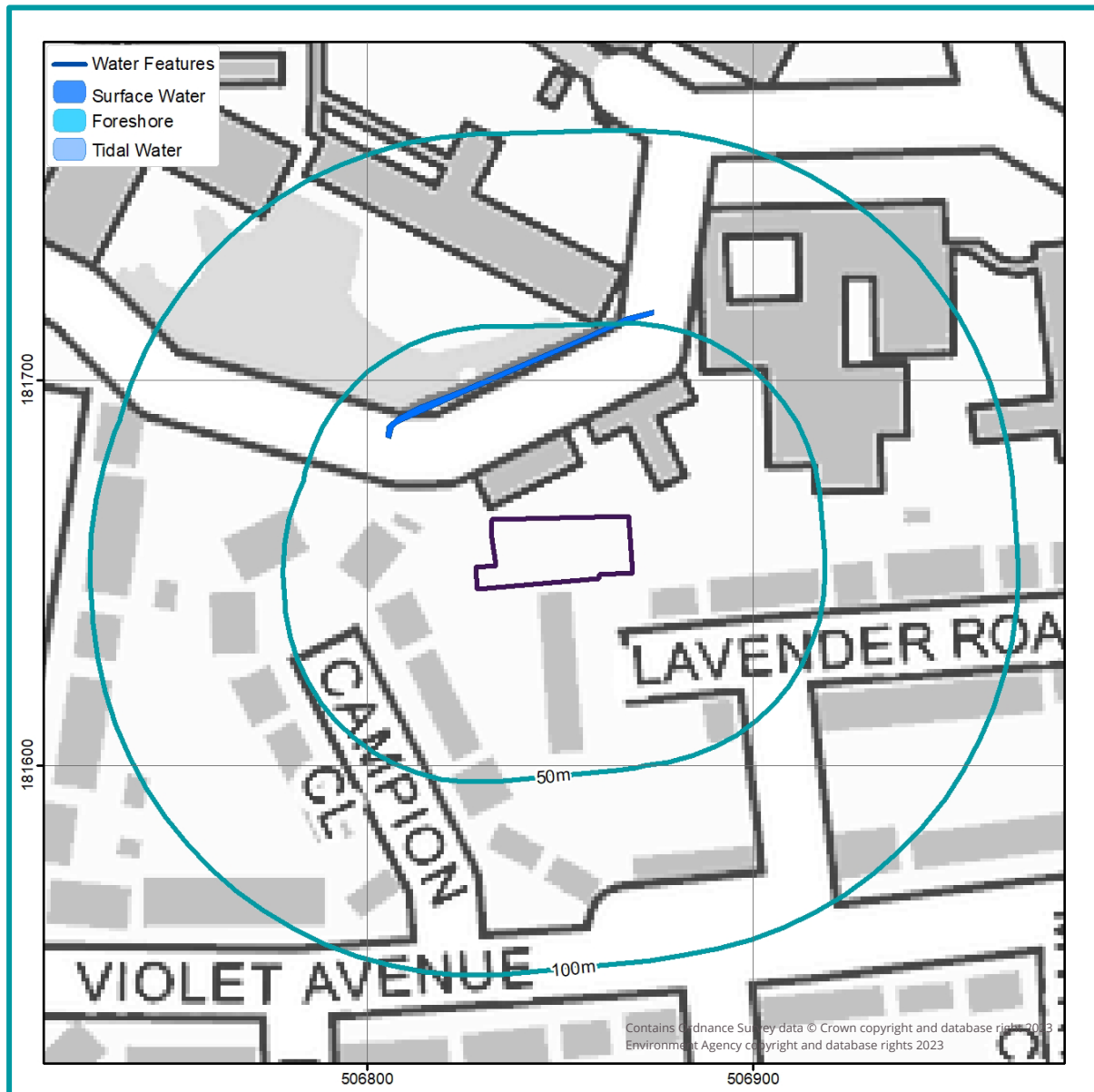


An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site is not located within an SPZ.

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. If hazards are identified, it is recommended that the Local Authority and the Environment Agency are contacted to confirm the susceptibility of any SPZs within the wider area.

Figure 6. Surface water features map (EA, 2023)

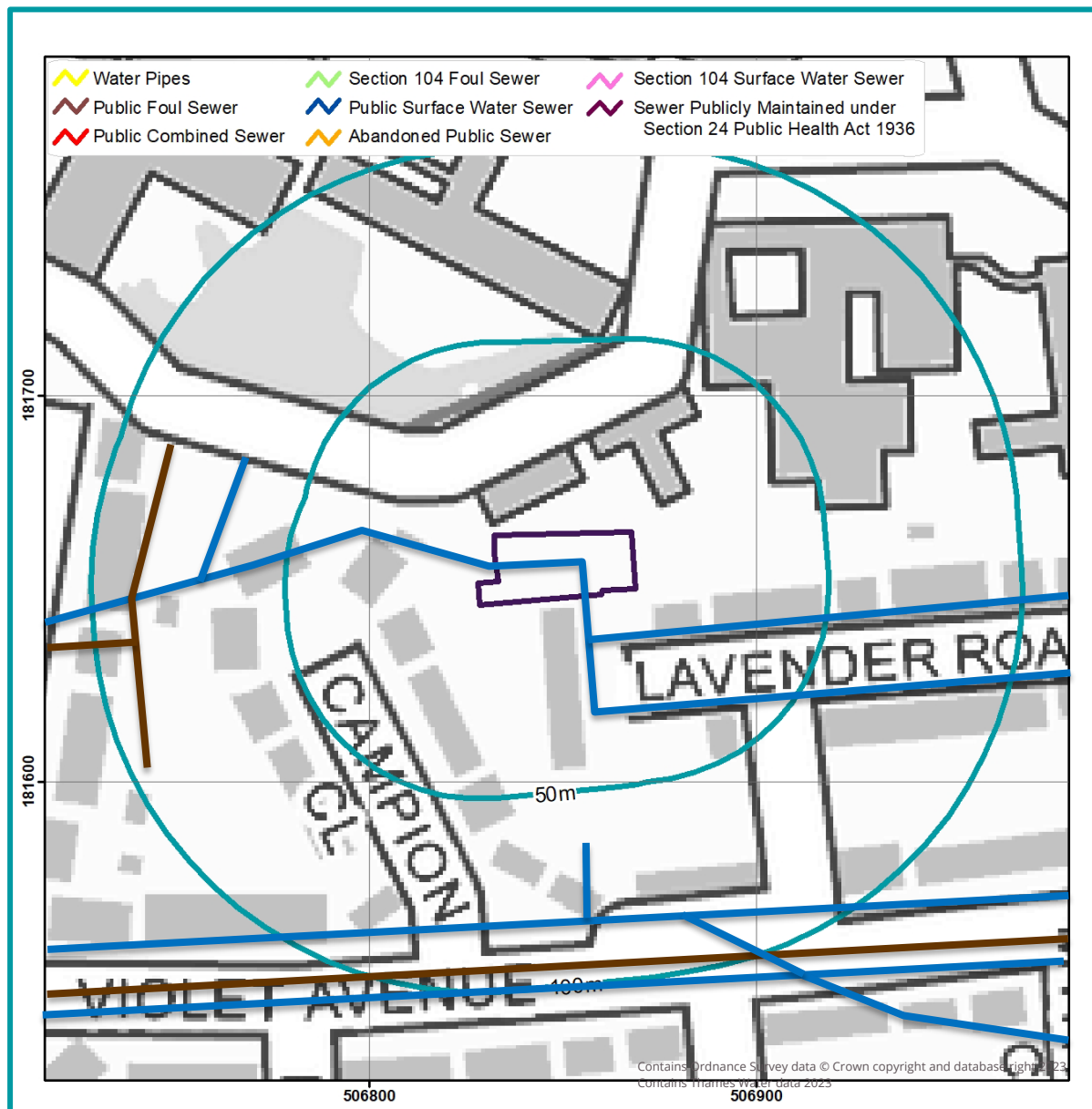


OS mapping indicates a surface water (minor drain) feature is located within 45 m north of the Site. According to DEFRA's Magic Map, the Site is not within 250m of a SSSI or SPA.

Discharging surface water runoff to this feature would require drainage pipework to cross a distance across third-party, urbanised land and therefore, discharge into this feature should not be considered.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency (EA) to confirm the presence, location and condition of any mapped or additional unmapped surface water features.

Figure 7. Sewer features map (OS & Thames Water 2023)



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 within the vicinity of the Site, therefore discharge to sewer is likely to be appropriate.

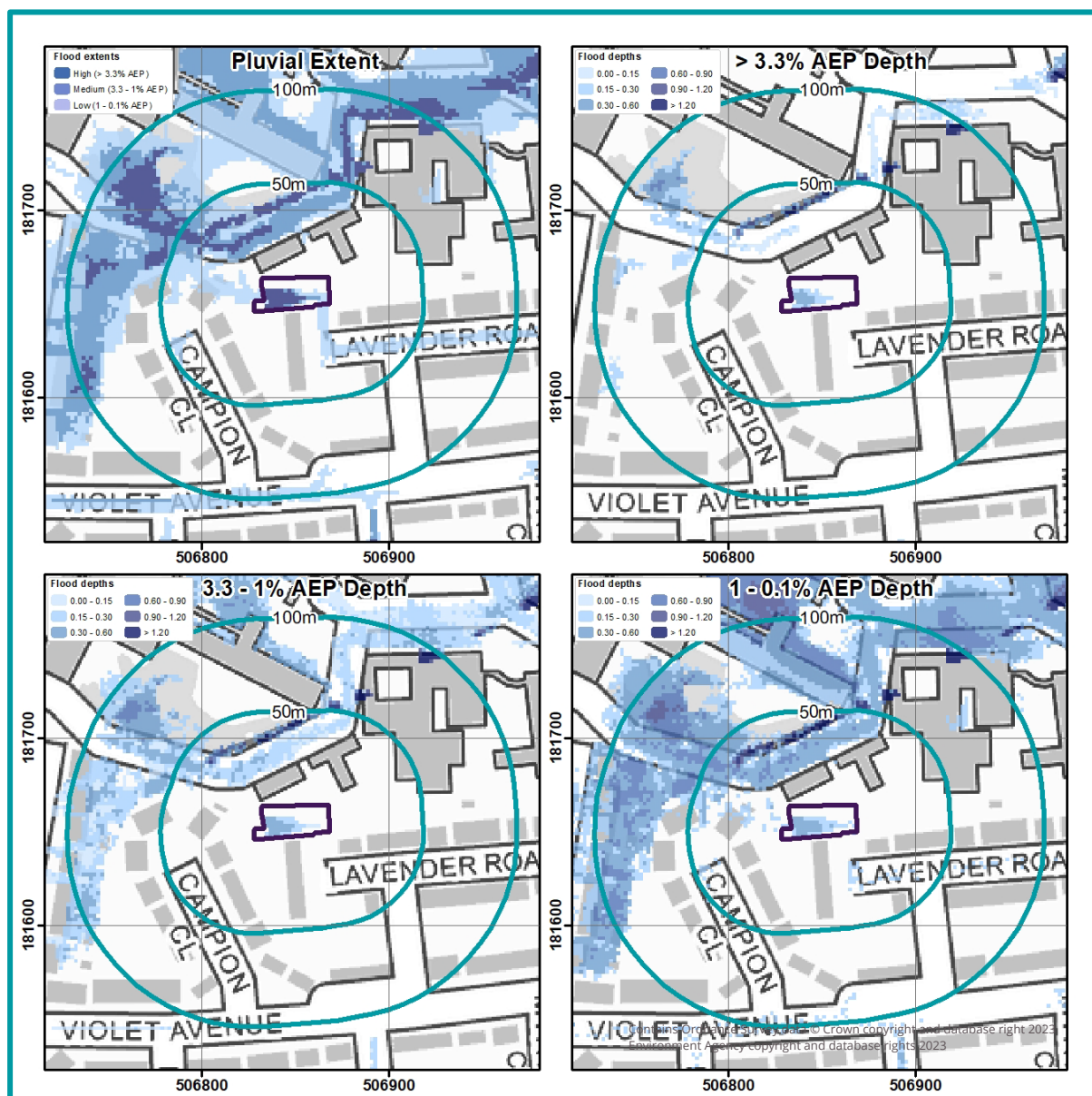
Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider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

Figure 8. Risk of flooding from rivers & sea map (EA, 2023)



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, therefore the SuDs design is unlikely to be affected.

Figure 9. Risk of surface water flooding map (EA,2023)



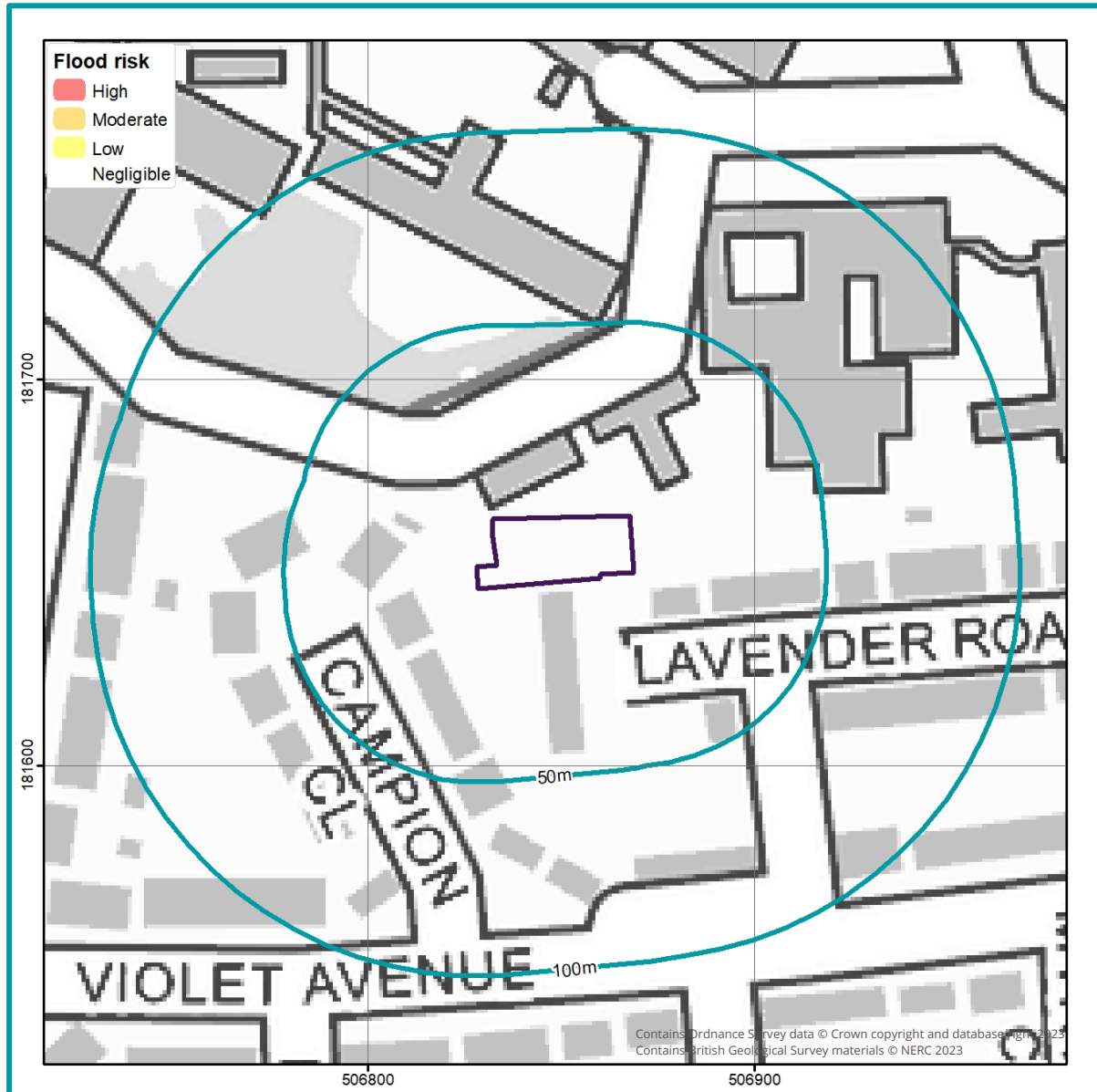
GeoSmart have undertaken an assessment of the risk of flooding from surface water (pluvial) sources within the vicinity of the Site using the EA's Risk of Flooding from Surface Water (RoFSW) mapping. The EA's mapping confirms the Site is considered to be at Very Low to High risk of surface water flooding.

The above map shows the extent and depth of flooding during the >3.3% annual probability (AEP) (1 in 30 year – High risk), 3.3 – 1% AEP (1 in 100 year – Medium risk) and 1 – 0.1% AEP (1 in 1000 year – Low risk) events. This confirms there are areas where flooding could occur in a 1 in 30 year, 1 in 100 year and 1 in 1000-year events. Flooding in these areas may constrain certain types of SuDS features being used.



Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency to confirm the pluvial flood risk, flood depths and velocities where applicable.

Figure 10. Groundwater flood risk (GW5) map (GeoSmart, 2023)



GeoSmart have undertaken an assessment of the risk of flooding from groundwater within the vicinity of the Site. GeoSmart's Groundwater Flood Risk Screening (GW5) map confirms the Site has a Negligible risk of groundwater flooding during a 1% annual probability (1 in 100 year) event.

## 4 Site context



### Site information

The purpose of this report is to assess the potential for disposing of surface water through a Sustainable Drainage System (SuDS) for the site of 8 Lavender Road, UB8 3PY (the Site). The Site is located in a setting of commercial and residential use. The general ground levels on Site are between 36.68 and 37.11 mAOD. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of  $\pm 150$  mm. Site plans and drawings are provided in Appendix A.

### Development

The Site is currently used within a domestic capacity. At present there is a row of domestic lock up garages and associated hardstanding. Development proposals comprise the demolition of the existing garages and the erection of 2 new semi-detached dwellings with associated access, landscaping and electric vehicle charging points.

### Geology, permeability, and thickness

British Geological Survey (BGS) national superficial and bedrock geology mapping confirms the geological formations underlying the Site and each formation may have a range of permeability.

**Table 3. Site Geology**

Geology present on-Site		Potentially permeable?
Superficial geology (Figure 11)	Boyn Hill Gravel Member (BHT)	✓
Bedrock geology (Figure 12)	London Clay (LC)	X

The permeability of the underlying material at the Site shown within the BGS mapping is variable ranging from high to low and confirmation of the infiltration capacity is recommended.

The BGS website was used to extract ground information from the nearest borehole records to the Site (ref: TQ08SE1). This borehole is located approximately 200 m to the north of the Site.

The borehole records confirm the underlying geology is comprised of made ground to a depth of 0.76 m below ground level (bgl) overlying sandy mottled clay and stones to a depth of 1.52 m bgl, overlying sand and gravel with clays to a depth of 2.13 m bgl, overlying gravel and sand to a depth of 4.72 m bgl, overlying sandy brown clay to a depth of 5.03 m bgl, overlying gravel to a depth of 5.64 m bgl, overlying brown clay and stones to a depth of 5.87 m bgl, overlying London Clay to a depth of 9.14 m bgl, where the borehole is completed.

The nearby borehole (ref: TQ08SE1) struck water at 2.29 m bgl, with the standing water level rising to 1.4 m bgl.

The soil infiltration coefficient must be sufficient to accommodate the constraints on the dimensions of the soakaway and its emptying time.

## Depth to groundwater

The SuDS system should be designed to operate in periods of extreme groundwater levels.

According to borehole data, shallow groundwater is potentially a problem at the Site, however in the absence of any closer boreholes to the Site, this should be investigated further.

Infiltration features are proposed where Site investigation confirms ground conditions are conducive to infiltration and the groundwater table is sufficiently deep, as focused infiltration features are required to be 1m above the groundwater table. Care should be taken to prevent groundwater ingress to the surface water attenuation features.

Figure 11. Superficial Geology (BGS, 2023)

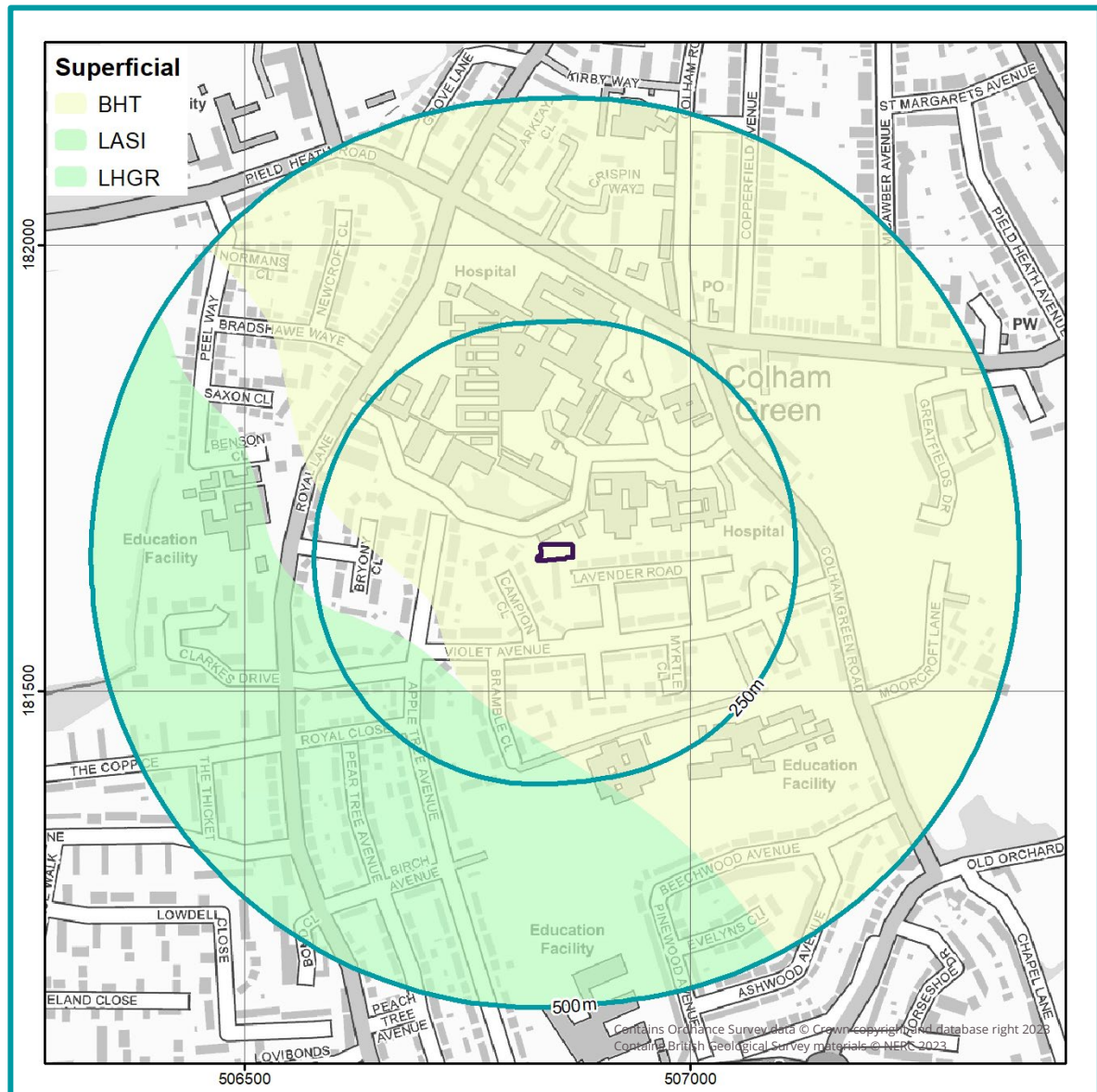
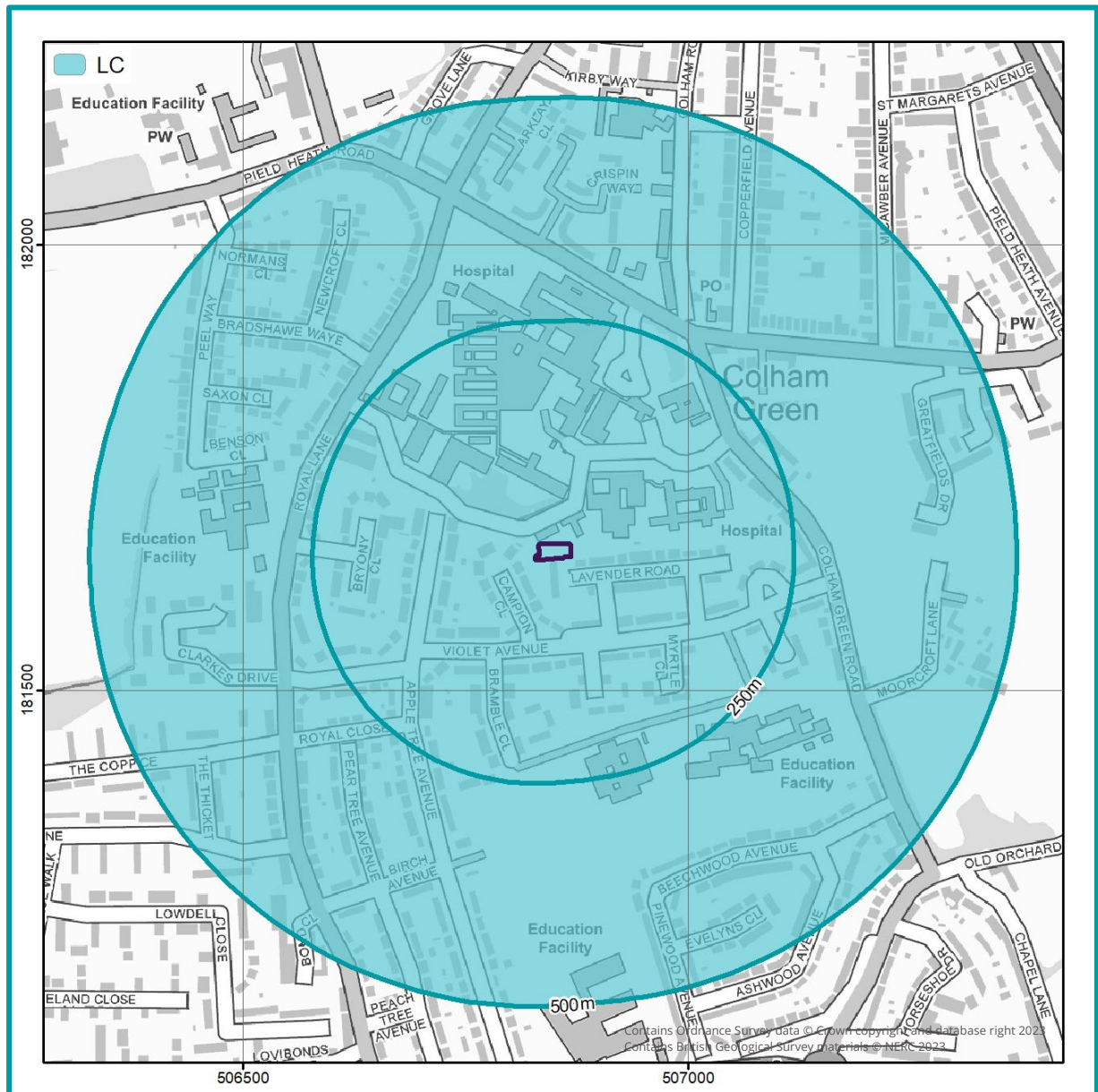


Figure 12. Bedrock Geology (BGS, 2023)



## Ground conditions

A Site-specific review of underlying ground conditions is recommended to ensure focused infiltration does not cause ground instability as a result of landslide or collapse associated with dissolution or shallow mining. Hazards that should be considered include soluble rocks, landslides, compressible ground, collapsible ground, shrink-swell clays, running sand and shallow mining.

Soakaways should be a minimum of 5m away from the foundations of a building and local guidance may recommend a greater distance, such as 10m on some areas of the Chalk. A detailed ground assessment is recommended: on steep slopes where infiltrating water would

produce saturation and instability downslope; or within layered geology, where infiltrating water would produce springs down gradient.

## Water quality

The Site does not lie within an SPZ. The infiltrated water quality should be of sufficient quality that it does not give rise to pollution of the underlying groundwater. Further consultation with the water company is unlikely to be required.



## 5 National & local policy context



### National Guidance

#### *CIRIA SuDS Manual (C753) (2015)*

A development should utilise sustainable drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. Use infiltration techniques, such as porous surfaces in non-clay areas,
2. attenuate rainwater in ponds or open water features for gradual release,
3. attenuate rainwater by storing in tanks or sealed water features for gradual release,
4. discharge rainwater direct to a watercourse,
5. discharge rainwater to a surface water sewer / drain,
6. discharge rainwater to the combined sewer.

#### *Defra - Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems (2015)*

##### Peak Flow control

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

##### Volume control

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. The runoff volume must be discharged at a rate that does not adversely affect flood risk.

The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30 year rainfall event.

## Ministry of Housing, Communities & Local Government – National Planning Practice Guidance: Flood risk assessments: climate change allowances (2022)

The Peak rainfall intensity allowances section provides advice on the increased rainfall effects on river levels and land and urban drainage systems. As of May 2022, the applicable climate change allowance is defined by specific Management Catchment for the 1 in 30 ( $\geq 3.3\%$  AEP) and 1 in 100 ( $< 3.3$  to  $1\%$  AEP) year event.

As the Site is located within the Colne Management Catchment the following climate change allowances are applicable.

**Table 4. Colne Management Catchment peak rainfall allowances**

Colne Management Catchment	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	2050s	2070s	2050s	2070s
Central	20%	25%	20%	25%
Upper end	35%	35%	40%	40%

The drainage system should be designed to make sure there is no increase in the rate of runoff discharged from the Site for the upper end allowance.

Where on-Site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant flood hazard to people from on-Site flooding for the central allowance.

## Sub-national Drainage Policy (i.e. county/London plan level)

### London Plan - Policy SI13 Sustainable drainage (2021)

Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed. Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

1. Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation);

2. Rainwater infiltration to ground at or close to source;
3. Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens);
4. Rainwater discharge direct to a watercourse (unless not appropriate);
5. Controlled rainwater discharge to a surface water sewer or drain;
6. Controlled rainwater discharge to a combined sewer.

Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.

Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

Development proposals should aim to get as close to greenfield run-off rates as possible depending on Site conditions. The well-established drainage hierarchy set out in this policy helps to reduce the rate and volume of surface water run-off. Rainwater should be managed as close to the top of the hierarchy as possible. There should be a preference for green over grey features, and drainage by gravity over pumped systems. A blue roof is an attenuation tank at roof or podium level; the combination of a blue and green roof is particularly beneficial, as the attenuated water is used to irrigate the green roof.

For many sites, it may be appropriate to use more than one form of drainage, for example a proportion of rainwater can be managed by more sustainable methods, with residual rainwater managed lower down the hierarchy. In some cases, direct discharge into the watercourse is an appropriate approach, for example rainwater discharge into the tidal Thames or a dock. This should include suitable pollution prevention filtering measures, ideally by using soft engineering or green infrastructure. In addition, if direct discharge is to a watercourse where the outfall is likely to be affected by tide-locking, suitable storage should be designed into the system. However, in other cases direct discharge will not be appropriate, for example discharge into a small stream at the headwaters of a catchment, which may cause flooding. This will need to be assessed on a case-by-case basis, taking into account the location, scale and quality of the discharge and the receiving watercourse. The maintenance of identified drainage measures should also be considered in development proposals.

### *London Plan - Sustainable design and Construction SPG: Section 3.4.9 (2014)*

Most developments have been able to achieve at least 50% attenuation of the site's (prior to re-development) surface water runoff at peak times. This is the minimum expectation from development proposals.

On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. The only exceptions to this, where greater discharge rates may be acceptable, are where a pumped discharge would be required to meet the standards or

where surface water drainage is to tidal waters and therefore would be able to discharge at unrestricted rates provided unacceptable scour would not result.

#### Discharge to surface water course/sewer

There may be situations where it is not appropriate to discharge at greenfield runoff rates. These include, for example, sites where the calculated greenfield runoff rate is extremely low and the final outfall of a piped system required to achieve this would be prone to blockage.

## Local Policy

### *Hillingdon Local Plan Strategic Policies (2012)*

8.87 The mismanagement of surface water flooding can also result in the increased risk of flooding. Sewage and drainage systems struggle to keep pace with the rate of development. The unchecked loss of natural drainage areas through increased hardstanding puts significant pressure on drainage systems, particularly in times of heavy rain. As development progresses and/or urban areas expand these systems become inadequate for the volumes and rates of storm water they receive, resulting in increased flood risk and/or pollution of watercourses. Allied to this are the implications of climate change on rainfall intensities, leading to flashier catchment/ site responses and surcharging of piped systems.

8.88 The impacts of climate change will add to the pressure on the drainage systems and it is therefore essential that all new development is managed to minimise the problems.

8.89 The management of surface water drainage for new development comes in the form of Sustainable Urban Drainage Systems (SUDS). These seek to manage storm water as close to its source as possible, mimicking storm water flows arising from the site, prior to the proposed development. Typically this approach involves a move away from piped systems to softer engineering solutions inspired by natural drainage processes.

8.90 SUDS should be designed to take into account the surface run-off quantity, rates and also water quality ensuring their effective operation up to and including the 1 in 100-year design standard flood including an increase in peak rainfall of up to 30% to account for climate change.

8.91 SUDS come in a variety of different types, from infiltration techniques through to water harvesting. Wherever possible, a SUDS technique should seek to contribute to each of the three goals identified below with the favoured system contributing significantly to each objective. Where possible SUDS solutions for a site should seek to: Reduce flood risk (to the site and neighbouring areas); Reduce pollution; and Provide landscape and wildlife benefits.

8.92 Foul water flooding is also a problem that occurs where there is a lack of capacity or blockages within the receiving system. The Council will continue to work with the water authorities to identify problem drainage areas, particularly where new development could worsen the impacts.

## 6 Storage, volume and peak flow rate



Suggested minimum and aspirational storage requirements for an infiltration or attenuation SuDS scheme for the development footprint are set out below, with more detail provided in subsequent sections. Storage volumes may be reduced (but not below the minimum level) if the design incorporates off-Site discharge.

**Table 5. Storage requirements at the proposed development Site (Discharge runoff to surface water sewer)**

Attenuation scenario		Attenuation required (m <sup>3</sup> )	Explanation	
Discharge runoff to surface water sewer	1 in 30 year	10.25	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 30 year (1 hour, Critical Storm Duration) event*.  Flooding of the Site of 5.07 m <sup>3</sup> should be contained within permeable landscaped areas within the Site to ensure no flooding of internal areas during the 1 in 100 year storm event.	A further 9.08 m <sup>3</sup> should be managed within overland flow routes to ensure there is no increase in flood risk in all events up to the 1 in 100 year including 40% allowance for climate change.
	1 in 100 year	15.32	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (2 hour, Critical Storm Duration) event*.	
	1 in 100 year including 40% CC	24.40	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (3 hour, Critical Storm Duration) event including a 40% allowance for climate change*.	

\*See Appendix B for associated runoff and discharge calculations. Discharge rates all restricted as close as possible to greenfield rates in their respective events.

### Surface water runoff

An increase in impermeable area on-Site will result in greater rainfall runoff. Reduction in runoff will help mitigate flood risk both on and off-Site. Further information on the surface water runoff calculations is provided in Section 12 'Background Information'.

## Guidance

The Non-Statutory Technical Guidance for SuDS (Defra, March 2015) states:

*"Where reasonably practicable, for Greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the Greenfield runoff volume for the same event. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event."*

**Table 6. Change in impermeable area associated with the development**

Total Site area	606 m <sup>2</sup>
Impermeable area (and as a percentage of the total area of the proposed development footprint of 606 m <sup>2</sup> )	
Pre-development	Post-development
606 m <sup>2</sup> (100%)	396 m <sup>2</sup> (65%)
Impermeable land use: Garages, hardstanding.	New impermeable land use: 2 new residential dwellings  New permeable land use: 170 m <sup>2</sup> of permeable paving*

\*Please note, while these areas will be utilized for SuDS, for the calculations these areas will be classed as impermeable in order to assess the potential run-off volumes and rates for the Site post- development and the potential holding capability of the proposed SuDS features.

## Guidance

*"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event' and 'flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development"*

(Defra, March 2015, non-statutory guidance).



## Peak discharge rates

The table below presents peak discharge rates for a range of storm events used to assess the impact of the proposed development and select the maximum permitted discharge rate. Further information on the calculation and control of peak discharge rates is provided in Section 12 'Background Information'.

**Table 7. Peak discharge rates associated with the development**

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates <sup>1</sup> (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.10	N/A	N/A	N/A
6 hour 1 in 1 year	0.08	0.71	0.54	-0.17
6 hour 1 in 10 year	0.16	1.21	0.92	-0.29
6 hour 1 in 30 year	0.22	1.60	1.21	-0.39
6 hour 1 in 100 year	0.31	2.08	1.57	-0.50
6 hour 1 in 100 year + 20% CC	N/A	N/A	1.89	-0.19
6 hour 1 in 100 year + 40% CC	N/A	N/A	2.20	0.13

<sup>1</sup> Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the loH124 method.

Relevant national, regional and local planning policy has been consulted in Section 5 to determine restrictions on runoff from previously developed and greenfield sites. In some cases, greenfield rates may be requested, but in practice it is difficult to restrict discharge rates at any one control point to less than 1 l/s, without increasing the risk of any potential blockages occurring in the drainage network.

## Total discharge volumes

The table below presents discharge volumes for a range of storm events used to assess the impact of the proposed development and calculate the required storage volumes. Further information on the calculation of total discharge volumes is provided in Section 11 'Methodology and Limitations'.

**Table 8. Total discharge volumes associated with the development**

Rainfall event	Greenfield runoff volume (m <sup>3</sup> )	Existing runoff volume <sup>2</sup> (m <sup>3</sup> )	Potential runoff volume without attenuation (m <sup>3</sup> )	Potential minus existing (m <sup>3</sup> )
QBAR	4.96	N/A	N/A	N/A
6 hour 1 in 1 year	4.61	15.36	11.64	-3.73
6 hour 1 in 10 year	8.09	26.23	19.95	-6.29
6 hour 1 in 30 year	10.38	34.60	26.20	-8.39
6 hour 1 in 100 year	13.46	44.88	33.99	-10.89
6 hour 1 in 100 year + 20% CC	N/A	N/A	40.79	-4.09
6 hour 1 in 100 year + 40% CC	N/A	N/A	47.59	2.71

<sup>2</sup> Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the loH124 method.

## Critical storm duration and volume requirements

Storage volumes for a range of return periods including the 1 in 30 year, 1 in 100 year and 1 in 100 year plus climate change (40%) events have been calculated to assess the impact of the proposed development. The required storage volumes for attenuation features have been calculated for the critical storm durations, limited to a maximum discharge rate of 1 l/s.

**Table 9. Critical Storm Duration and Attenuation volume requirements**

Return Period	Runoff rate restriction (l/s)	Critical Storm Duration (hr)	Attenuation volume required (m <sup>3</sup> )
1 in 30 year	1	1	10.25
1 in 100 year	1	2	15.32
1 in 100 year including a 40% climate change	1	3	24.40

## 7 Runoff destination



Options for the destination for the runoff generated on-Site have been assessed in line with the 28rioritization set out in the Building Regulations Part H document (HM Government, published in 2010 and updated in 2015) and Defra's Non-statutory Technical Standards for SuDS (2015).

Flow attenuation using infiltration SuDS (discharge to ground) is generally the preferred option. If discharge to ground is not available, runoff discharge to surface water is the other preferred method. Only if these two options are impractical should discharge to the sewer network be considered.

### Discharge to ground

The Site has moderate potential for infiltration, with permeable underlying gravel. The nearest available borehole ~200 m from the Site indicates shallow groundwater. Due to the distance from the Site this should be investigated further by site investigation, to establish whether infiltration is feasible at the Site

There are no known issues identified relating to Site contamination or the presence of a SPZ.

### Discharge to surface watercourse

There is a small drain located 45m north of the Site, however connection would be accessed via party urbanized land and hence discharge to the drain is not considered feasible.

### Discharge to sewer

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 within the boundary of the Site, therefore discharge to sewer is likely to be appropriate.

Discharge to sewer is not likely to be the optimum sustainable drainage option for the new development area. If required consultation with the local sewer undertaker should be undertaken. Discharge to sewer would only be accepted if it can be demonstrated that none of the above options are reasonably practical. Discharge would have to be controlled and on-Site attenuation would be required.

## 8 Water quality



A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate “train” or sequence of SuDS components that are connected in series. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015). The proposed development is a combination of Very Low (roof water) to Low hazard (runoff from car parking and road). The Site does not lie within an SPZ and therefore additional treatment stages are not required.

**Table 10. Level of hazard**

Hazard	Source of hazard
Very Low	Residential roof drainage
Low	Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste (incl. scrap-yards).

The recommended minimum number treatment stages suggested for the different runoff waters identified for the proposed development is highlighted in the table below.

**Table 11. Minimum number of treatment stages for runoff**

		Sensitivity of the receiving water body		
		Low	Medium	High
Hazard	Low	1	1	1
	Med	2	2	2
	High	3	3	3

## 9 Proposed SuDS strategy



### Sustainable drainage systems

DEFRA's non-statutory requirements for SuDS require the below ground drainage systems to have the capacity to accommodate at least the 1 in 30 year event and to manage the 1 in 100 year event without flooding of on-site buildings and substations. All runoff should be managed on-Site though for the 1 in 100 year event, accounting for the maximum impacts of climate change to ensure flood risk is not increased to third-parties.

It is assumed that drainage from areas outside the development footprint will continue to use existing drainage arrangements.

A surface water drainage strategy (summarised in Section 2 of this report) includes the following SuDS features to intercept, attenuate and treat surface water runoff.

### Primary SuDS Strategy:

Ground conditions at the Site are conducive to infiltration, surface water runoff will be managed within SuDS features and infiltrated to ground.

**Table 12. Proposed SuDS type, features, discharge location and rate restriction**

SuDS type	Source control (interception) and infiltration SuDS
SuDS features	Permeable paving, rainwater harvesting butts
Discharge location	Infiltration
Discharge rate	$1 \times 10^{-6}$ m/s

**Table 13. Proposed SuDS sizing (dimensions) and attenuation volumes**

Rainwater Harvesting	To comply with London Plan policy, rainwater harvesting butts should be established for each proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by Rainwater Harvesting has not been considered within the Preliminary SuDS schematic.
Permeable paving	A 170 m <sup>2</sup> area of permeable paving (underlain with a geocellular crates within the proposed driveway areas to a depth of 0.3 m, with a 95% porosity would result in c. 48.45 m <sup>3</sup> attenuation.
Total Attenuation Provided	48.45 m <sup>3</sup>

## Secondary SuDS Strategy:

If infiltration to ground is not achievable at the Site, and as discharge to water features is not feasible surface water runoff will be managed within SuDS features and discharged to the public sewer network.

**Table 14. Proposed SuDS type, features, discharge location and rate restriction**

SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Rainwater harvesting butts, permeable paving
Discharge location	Surface water sewer network.
Discharge rate	1l/s

**Table 15. Proposed SuDS sizing (dimensions) and attenuation volumes**

Rainwater Harvesting	To comply with London Plan policy, rainwater harvesting butts should be established for each proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by Rainwater Harvesting has not been considered within the Preliminary SuDS schematic.
Permeable paving	A 170 m <sup>2</sup> area of permeable paving (underlain with a Type 3 aggregate material) within the proposed driveway areas to a depth of 0.66 m, with a 30% porosity would result in c. 33.66 m <sup>3</sup> attenuation.



Total Attenuation Provided	33.66 m <sup>3</sup>
Total Attenuation Required	24.40 m <sup>3</sup>
Freeboard Storage Provided	9.26 m <sup>3</sup>

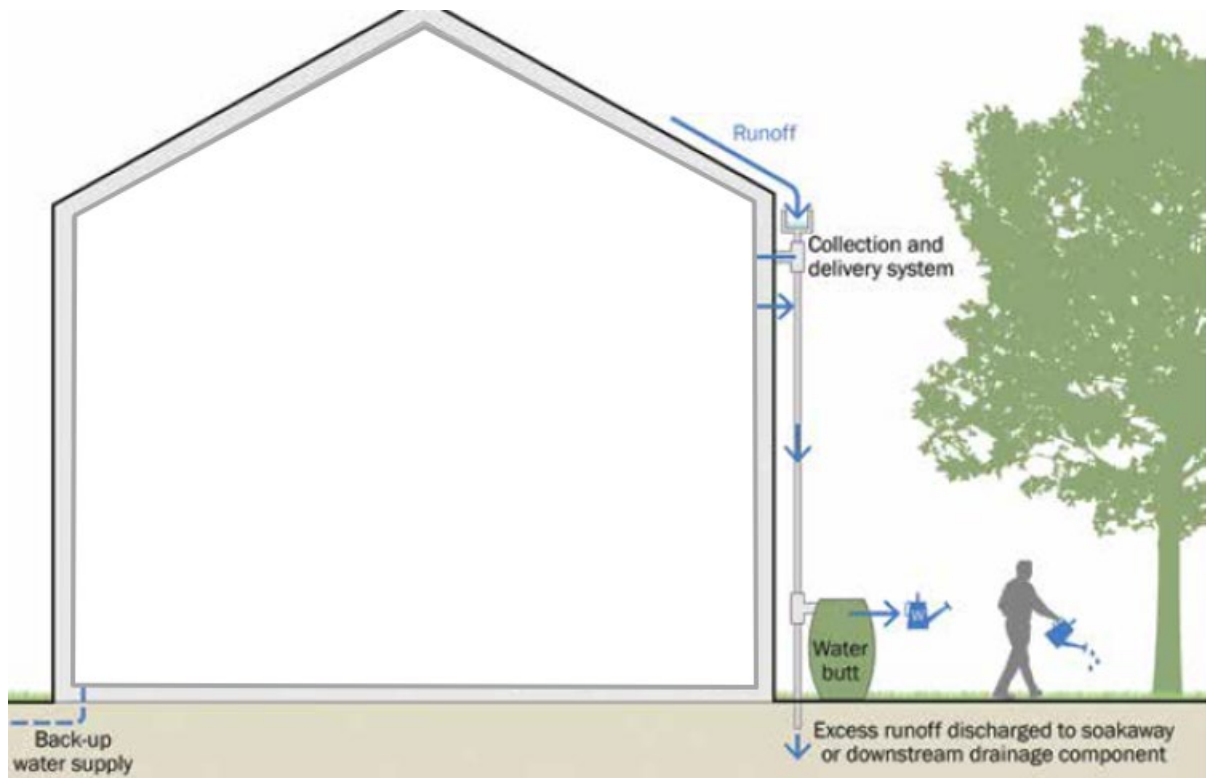
### Rainwater harvesting

To comply with London Plan policy, a rainwater harvesting butt is proposed for each property. The run-off from the proposed development roof should be led into rainwater harvesting butts via rainwater downpipes and guttering to catch run-off from the extension roof. Overflow from the butts should be discharged into the storage system provided by the permeable paving.

Due to the relatively insignificant amounts of attenuation provided by rainwater harvesting tanks in this instance and the requirement to retain water for non-potable uses such as garden maintenance, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the report.

As there is an issue with the storage capability of Rainwater Harvesting tanks, this method should have a fixed attenuation volume and a controlled outlet to discharge into the proposed SuDS feature. An overflow system will be required for implementation on the Site due to exceedance events (where the pumps fail or there is a blockage within the system / or the number of residents and subsequent water usage is reduced).

Roof run-off is generally less polluted than run-off from road surfaces but can still generate pollutants such as sediments. Pollutants would be captured by the collection and filtration system and, by reducing the volume of run-off generated from the Site. Primary screening devices are used to prevent leaves and other debris from entering the butt and first flush devices can be designed to divert the first part of the rainfall away from the main storage tank and can pick up most of the dirt, debris and contaminants that collect on a residential roof.



Modified from Figure 11.3 of the CIRIA SuDS Manual (C753) (2015)

### Permeable paving

Permeable Paving is proposed for driveway areas to intercept runoff. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2015) will improve water quality due to their filtration capacity and usually work to a 30% porosity. A geotextile layer will be required for paving underlain by aggregate material to intercept silt/particles. Permeable pavements are multi-layered surfacing systems. The surface layer is constructed out of permeable material allowing infiltration of water through gaps along its surface. A geomembrane isolates stored water from the surrounding soil, especially in contaminated areas and a geotextile layer prevents clogging and damage to the geo-cellular modules.

The geotextile layer works to intercept silt/particles flowing through the system via direct rainfall, or through vehicle use deposited onto the car park area and into the permeable paving. The majority of silt would be trapped within the top 30mm of the joining material between the paving blocks. Rainfall flowing into the permeable paving directly from the development roof/rainwater butts would not contain enough volumes of silt and or particles to cause blockage so will be fed directly into underlying porous substrate via rainwater pipes. Downpipes from the development roofs/rainwater butts should extend through the paving for c.5 meters to divert roof run-off away from building foundations. Paving could also implement an impermeable liner close to the building or creating a separate compartment within the permeable sub-base close to the building to further divert attenuated water away from building foundations.

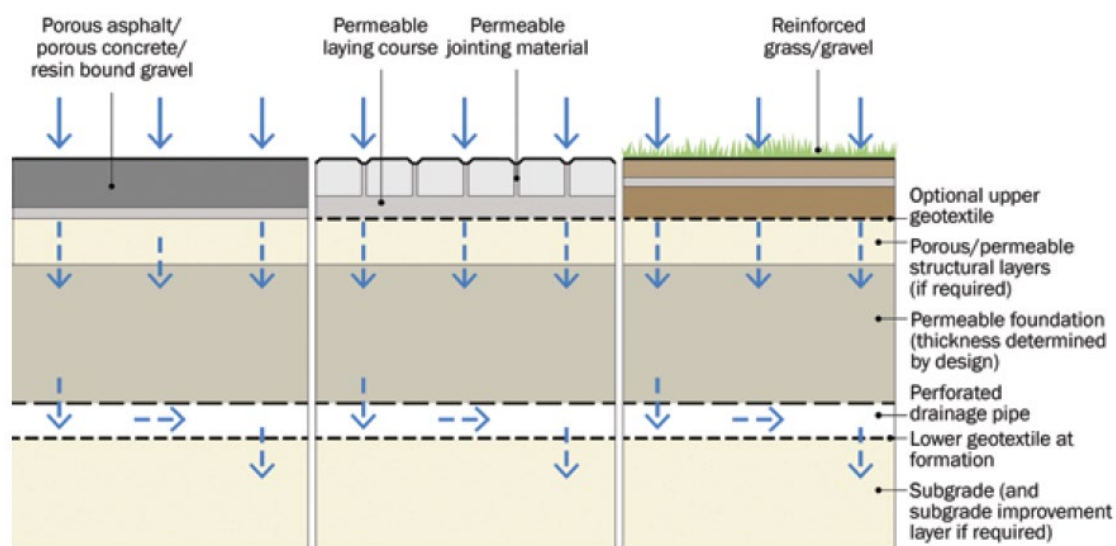


Figure 20.13 of the CIRIA SuDS Manual (C753) (2015)

Plastic geo-cellular systems could also be used, which can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles which could increase their storage potential by up to 20%. Geo-cellular modules also have the added advantage of reducing the amount of aggregate sub base required, thus keeping costs lower. Void systems, such as permavoids, have a void ratio of 95% (i.e. for every 1 m<sup>3</sup> there is 0.95 m<sup>3</sup> of space available for water storage), which has been factored into the storage capacity calculations.

### Flow control devices and systems

Hydrobrake Flow control systems can be used to reduce the runoff rate from the Site. These are usually a device used for controlling water flow into a connecting feature, such as a sewer, to a specific attenuation performance. The design consists of an intake, a volute and an outlet and the configuration is critical to ensure discharge control. For drainage areas which are less than 3 ha, outlet throttle diameters would have to be small (<150mm diameter) to achieve outflow rates which could result in blockage. For most SuDS features, a flow control device will comprise a fixed orifice or a throttle such as a short pipe.

A Vortex Control is usually a self-activating vortex flow device which directs water into a volute to form a vortex. For the Site, rainwater down pipes from the development roof should drain directly into the attenuation feature to reduce infill from potential flood water.

### Drainage protection devices

A non-return flap valve is recommended for outflow pipes to reduce the risk of backflow from the sewer during a large scale rainfall event.

### Exceedance Flows

Exceedance flow routes are included within the proposed SuDS drainage layout. Where possible, exceedance flows should be directed away from buildings and into non-essential areas of the Site such as the car park and garden. The SuDS system recommended for the

Site should provide enough storage that this method would only be utilised during a worst case scenario.

## 10 SuDS maintenance



Regular maintenance is essential to ensure effective operation of the SuDS features over the intended lifespan of the proposed development. The SuDS Manual (C753) (CIRIA, 2015) provides a maintenance schedule for SuDS with details of the necessary required actions as shown in the Table below.

**Table 16. SuDS operation and recommended maintenance requirements**

Asset type	Maintenance schedule (and frequency)
Permeable pavements	<p>Regular maintenance:</p> <ul style="list-style-type: none"> <li>• Brushing and vacuuming (three times per year).</li> <li>• Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required).</li> </ul> <p>Monitoring:</p> <ul style="list-style-type: none"> <li>• Initial inspection (monthly).</li> <li>• Inspect for poor performance and inspection chambers (annually).</li> </ul>
Hydro-Brake Flow Control	<p>Low amounts of maintenance required as there are no moving parts within the Hydro-Brake® Flow Control.</p> <ul style="list-style-type: none"> <li>• Initial monthly inspection at the manhole once the construction phase is over.</li> </ul> <p>If blockages occur they normally do so at the intake. Hydro-Brake® Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.</p> <p>Inspection should be undertaken annually or when a storm event occurs.</p>
Underground drainage pipe network	<p>Regular maintenance:</p> <ul style="list-style-type: none"> <li>• Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber (annually).</li> <li>• Cleaning of gutters and any filters on downpipes (annually).</li> <li>• Trimming any roots that may be causing blockages (annually or as required).</li> </ul> <p>Monitoring:</p> <ul style="list-style-type: none"> <li>• Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually).</li> </ul>
Rainwater Harvesting	<p>Regular maintenance:</p> <ul style="list-style-type: none"> <li>• Inspection of tank for debris and sediment build up (annually and following poor performance).</li> </ul>

Asset type	Maintenance schedule (and frequency)
	<ul style="list-style-type: none"> <li>• Inspection of inlets, outlets, overflow areas, pumps and filters (annually and following poor performance).</li> <li>• Cleaning of tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required).</li> </ul> <p>Remedial actions:</p> <ul style="list-style-type: none"> <li>• Repair or overflow erosion damage or damage to tank and associated components (as required)</li> </ul>
Bioretention area/Rain garden	<p>Regular maintenance:</p> <ul style="list-style-type: none"> <li>• Remove litter and debris from basin (monthly).</li> <li>• Trimming any roots and surrounding grass blockages (as required).</li> </ul> <p>Monitoring:</p> <ul style="list-style-type: none"> <li>• Inspect inlets, outlets and overflows for blockages,(monthly or after a heavy storm).</li> <li>• Inspect inlets and outlets for silt accumulation (half yearly).</li> <li>• Inspect infiltration surfaces for compaction and ponding (monthly).</li> </ul>

## Client checklist

A drainage strategy has been recommended as suitable on the basis of the information provided. Prior to installation of the Site drainage system it is recommended that the client carries out the following checks to confirm the development proposals. GeoSmart would be able to support with any updates required to the drainage scheme, please contact us and we would be happy to provide you with a proposal to undertake the work.



**Table 17. Potential SuDS limitations**

Conditions in Non-Statutory Technical Standards (Defra, 2015), limitations to infiltration SuDS	Do these conditions arise at the Site?
Is the surface runoff greater than the rate at which water can infiltrate into the ground?	
Is there an unacceptable risk of ground instability?	
Is there an unacceptable risk of mobilising contaminants?	
Is there an unacceptable risk of pollution to groundwater?	
Is there an unacceptable risk of groundwater flooding?	
Is the infiltration system going to create a high risk of groundwater leakage to the combined sewer?	

**Table 18. SuDS design considerations**

Confirm that potential flooding on-Site in excess of the design storm event and exceedance flow routes have been considered.	
Review options for the control of discharge rates (e.g. hydrobrake).	
Confirm the owners/adopters of the drainage system. Consider management options for multiple owners.	
Is there an unacceptable risk of pollution to groundwater?	
Review access and way leave requirements.	
Review maintenance requirements.	

## Health and safety considerations for SuDS

GeoSmart reports may include outline strategies or designs to support with development plans. Any drawings or advice provided do not comprise any form of detailed design. Implementation of any conceptual scheme options may constitute 'Construction Work' as defined by CDM Regulations (2015).

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional.

GeoSmart does not provide health and safety advisory services but we are required to advise you of your general responsibilities under CDM (visit <http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/> for more information).

Please remember that detailed design work should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

## 11 Methodology and limitations of study



This report assesses the feasibility of infiltration SuDS and alternative drainage strategies in support of the Site development process. From April 6th 2015 SuDS are regulated by Local Planning Authorities and will be required under law for major developments in all cases unless demonstrated to be inappropriate. What is considered appropriate in terms of costs and benefits by the Planning Authority will vary depending on local planning policy, and Site setting. The Lead Local Flood Authority will require information as a statutory consultee on major planning applications with surface water drainage implications. The National Planning Policy Framework requires that new developments in areas at risk of flooding should give priority to the use of SuDS and demonstrate that the proposed development does not increase flood risk downstream to third parties.

### How was the suitability of SuDS estimated for the Site?

There are a range of SuDS options available to provide effective surface water management that intercept and store excess runoff. When considering these options, the destination of the runoff should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2010) and Defra's National Standards for SuDS (2015):

1. Discharge to the ground;
2. Discharge to a surface water body;
3. Discharge to a surface water sewer;
4. Discharge to a local highway drain; and
5. Discharge to a combined sewer.

Data sets relating to each of the potential discharge options have been analysed to assess the feasibility of each option according to the hierarchy set out above. Hydrogeological characteristics for the Site are assessed in conjunction with the occurrence of SPZ's to assess infiltration suitability. The Site has been screened to determine whether flood risk from groundwater, surface water, fluvial or coastal sources may constrain SuDS. The distance to surface water bodies and sewers has been reviewed gauge whether these provide alternative options.

### GeoSmart SuDS Infiltration Suitability Map (SD50)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the suitability for infiltration drainage in different parts of the Site and indicates where further assessment is recommended. In producing the SuDS Infiltration Suitability Map (SD50), GeoSmart used data from the British Geological Survey on groundwater levels, geology and permeability to screen

for areas where infiltration SuDS may be suitable. The map classifies areas into 3 categories of High, Medium and Low suitability for infiltration SuDS. This can then be used in conjunction with additional data on Site constraints to give recommendations for SuDS design and further investigation.

The primary constraint on infiltration potential is the minimum permeability of the underlying material and in some cases the range in permeability may be considerable, ranging down to low. The map classifies these areas as moderate infiltration suitability requiring further investigation. In cases where the thickness of the receiving permeable horizon is less than 1.5 meters then additional Site investigation is recommended. If the Site is at risk of groundwater flooding for up to the 1% annual occurrence the map classifies these areas as moderate infiltration suitability requiring further investigation.

The GeoSmart SuDS Infiltration Suitability Map (SD50) is a national screening tool for infiltration SuDS techniques but a Site specific assessment should be used before final detailed design is undertaken. Further information on the GeoSmart SuDS Infiltration Suitability Map (SD50) is available at [geosmartinfo.co.uk](http://geosmartinfo.co.uk)

## How is the suitability to discharge to sewers and watercourses calculated?

The suitability to discharge to discharge to sewers and watercourses has been calculated using the distance from the Site to both. For example, where the Site is within 50 m of a surface water body. Discharge to surface water is potentially appropriate subject to land access arrangements and a feasibility assessment. Where the Site is within 50 m of a sewer, discharge to sewer is potentially appropriate subject to land access arrangements and a feasibility assessment. The utility company should be contacted to agree connection feasibility and sewer capacity.

Further information relating to sewers available in the area can be found in Appendix C.

## What is a Source Protection Zone?

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied. The zones are used to set up pollution prevention measures in areas which are at a higher risk. The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors. Inner zone (Zone 1) is defined as the 50 day travel time from any point below the water table to the source (minimum radius of 50 metres). Outer zone (Zone 2) is defined by a 400 day travel time. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

## How was surface water runoff estimated from the Site?

In accordance with The SuDS Manual (C753) (CIRIA, 2015), the Greenfield runoff from the Site has been calculated using the IoH124 method and is assumed representative of the runoff generated on the undeveloped surfaces that are affected by the proposed development. The method used for calculating the runoff complies with the NPPF (MHCLG, 2021). For the impermeable surfaces, it has been assumed that 100% runoff will occur (calculations provided in Appendix B). Rainfall data is derived from the Flood Estimation Handbook (FEH), developed by NERC (2009). Only areas affected by the proposed development are considered in the flow and volume calculations. Permeable areas that remain unchanged are not included in the calculations as it is assumed these will not be actively drained and attenuated.

## What is the peak discharge rate?

An estimation of peak runoff flow rate and volume is required to calculate infiltration, storage and discharge requirements. The peak discharge rate is the maximum flow rate at which surface water runoff leaves the Site during a particular storm event, without considering the impact of any mitigation such as storage, infiltration or flow control. Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. If all drainage is to infiltration there will be no discharge off-Site. Discharging all flow from Site at the existing 1 in 100 event would increase flood risk during smaller events. Flow restriction is generally required to limit the final discharge from Site during all events as a basic minimum to the green field QBAR rate. A more complex flow restriction which varies the final discharge rate from the Site depending on the storm event will reduce the volume of storage required on-Site. Drainage to infiltration SuDS is subtracted from the total discharge off-Site to achieve a beneficial net affect.

## What is the total discharge volume?

The total discharge volume is calculated on the basis of the surface water runoff that has the potential to leave the Site as a result of the assumed 6 hour duration design storm event. The runoff is related to the underlying soil conditions, impermeable cover, rainfall intensity and duration of the storm event. The total volume generated by the current Site is compared to the potential total volume from the developed Site (not taking into consideration any mitigation). The difference provides the minimum total volume that will need to be stored and infiltrated on-Site or released at a controlled rate. Guidance indicates that the total discharge volume should never exceed the runoff volume from the development Site prior to redevelopment for that event and should be as close as is reasonably practicable to the Greenfield runoff volume.

## 12 Background SuDS information



SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our website: <http://geosmartinfo.co.uk/>

### Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on-Site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on-Site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the Site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the Site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole Site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

### Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns.



According to the guidance in Building Research Establishment (BRE) Digest 365 (2016) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

## SuDS maintenance and adoption



Regular maintenance is essential to ensure effective operation of the soakaway(s) over the intended lifespan of the proposed development. A maintenance schedule for SuDs is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website: <http://geosmartinfo.co.uk/>

## 13 Further information



The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
✓	Additional assessment: <b>FloodSmart Report</b>		<p>The FloodSmart Report range provides clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at a Site. Our consultants assess available data to determine the level of risk based on professional judgement and years of experience.</p> <p>Please contact <a href="mailto:info@geosmartinfo.co.uk">info@geosmartinfo.co.uk</a> for further information.</p>
✓	Additional assessment: <b>EnviroSmart Report</b>		<p>Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective.</p> <p>Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements.</p> <p>Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions.</p> <p>Please contact <a href="mailto:info@geosmartinfo.co.uk">info@geosmartinfo.co.uk</a> for further information.</p>

## 14 References and glossary



- British Geological Survey (BGS). (2023).** Geology of Britain Viewer. Based on British Geological Survey materials © NERC 2023. Accessed from: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> on 24/10/23.
- Building Research Establishment (BRE) (2016).** Digest 365, Soakaway design.
- CEH (2023)** Online FEH web service Depth/duration/frequency modelling using the FEH 1999 and 2022 models. Accessed from: <https://fehweb.ceh.ac.uk/> on 24/10/23.
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- Environment Agency [EA] (2023).** MagicMap. Accessed from: <http://magic.defra.gov.uk/MagicMap.aspx> on 24/10/23.
- GeoSmart (2023)** GeoSmart GW5 Version 2.4.
- HM Government (2010).** The building regulations 2010 Part H drainage and waste disposal (2015 edition).
- LASOO (2015)** Practice Guidance, Local Authority SuDS Officer Organisation.
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- Ministry of Housing, Communities & Local Government. (2022).** National Planning Policy Guidance (NPPG).
- Hillingdon Council (2012).** Local Plan/Policy. Accessed from: <https://www.hillingdon.gov.uk/local-plan> on 24/10/23.

# Glossary

## General terms

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

The terms included in this glossary have been taken from CIRIA (2015) guidance.

## Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2023 BlueSky copyright and database rights 2023
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (RoFRS/Pluvial/Surface Water Features/SPZ)	Environment Agency copyright and database rights 2023 Ordnance Survey data © Crown copyright and database right 2023
Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2023) Contains British Geological Survey materials © NERC 2023 Ordnance Survey data © Crown copyright and database right 2023
Sewer Location	Contains Ordnance Survey data © Crown copyright and database right 2023 Contains Thames Water Search data 2023
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2023 Environment Agency copyright and database rights 2023

## 15 Appendices





## Appendix A



### Site plans



Mr Antonio Pascucci  
12 Birse Green  
Goldington  
Bedford  
MK41 0NL

Application Ref: 53742/APP/2022/3079

## TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

### GRANT OF PLANNING PERMISSION

The Council of the London Borough of Hillingdon as the Local Planning Authority within the meaning of the above Act and associated Orders **GRANTS** permission for the following:

**Description of development:**

Demolition of existing garage block and construction of 2 x semi-detached houses with associated parking and external works.

**Location of development:** Garage Site Adjacent To 8 Lavender Road Hillingdon

**Date of application:** 7th October 2022

**Plan Numbers:** See attached Schedule of plans

**Permission is subject to the condition(s) listed on the attached schedule:-**

**Interim Director of Planning, Regeneration & Public Realm**

**Date: 2 March 2023**

- NOTES:**
- (i) Please also see the informatives included in the Schedule of Conditions.
  - (ii) Should you wish to appeal against any of the conditions please read the attached sheet which explains the procedure.
  - (iii) This decision does not convey any approval or consent which may be required under any by-laws, building regulations or under any Act other than the Town and Country Planning Act 1990 (as amended).

# TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)

## GRANT OF PLANNING PERMISSION

Application Ref: 53742/APP/2022/3079

### SCHEDULE OF CONDITIONS

- 1 The development hereby permitted shall be begun before the expiration of three years from the date of this permission.

**REASON:**

To comply with Section 91 of the Town and Country Planning Act 1990

- 2 The development hereby permitted shall not be carried out except in complete accordance with the details shown on submitted plans numbers:

LAV01 Rev A

LAV02 Rev A

LAV03 Rev C

LAV04 Rev B

LAV06 Rev B

LAV07 Rev B

LAV08 Rev A

and shall thereafter be retained/maintained for as long as the development remains in existence.

**REASON:**

To ensure the development complies with the provisions of the Hillingdon Local Plan Part 1 (2012), Part 2 (2020) and the London Plan (2021).

- 3 Save for demolition and site clearance works, no above ground works shall take place until details of all materials and external surfaces have been submitted to and approved in writing by the Local Planning Authority. Thereafter the development shall be constructed in accordance with the approved details and be retained as such.

Details should include information relating to make, product/type, colour and photographs/images.

**REASON:**

To ensure that the development presents a satisfactory appearance in accordance with Policy DMHB 11 of the Hillingdon Local Plan Part 2 (2020).

- 4 Notwithstanding the provisions of the Town and Country Planning (General Permitted Development)(England) Order 2015 (or any order revoking and re-enacting that Order with or without modification), no additional windows, doors or other openings shall be constructed in the walls or roof slopes of the development hereby approved.

**REASON**

To prevent overlooking to adjoining properties in accordance with policy DMHB 11 of the Hillingdon Local Plan Part 2 (2020).

- 5 The first floor side elevation window(s) serving bathrooms (in both of the proposed dwellings) shall be glazed with permanently obscured glass to at least scale 4 on the Pilkington scale and be non-opening below a height of 1.8 metres taken from internal finished floor level for so long as the development remains in existence.

**REASON:**

To prevent overlooking to adjoining properties in accordance with policies DMHB 11 and DMHD 1 of the Hillingdon Local Plan Part 2 (2020).

- 6 Prior to the construction of the entrances of the hereby approved dwellings, details of step free access via the principal private entrances, and all other points of entry and exit of each dwelling, shall be submitted to, and approved in writing, by the Local Planning Authority. Such provision shall remain in place for the life of the building.

REASON:

To ensure that an appropriate standard of housing stock, in accordance with the 2021 London Plan policy D7 is achieved and maintained.

- 7 The dwelling(s) hereby approved shall accord with the requirements of Policy D7 of the London Plan, and shall not be occupied until certification of compliance with the technical specifications for an M4(2) dwelling, as set out in Approved Document M to the Building Regulations (2010) 2015, has been submitted to, and approved in writing, by the Local Planning Authority. All such provisions must remain in place for the life of the building.

REASON:

To not only allow the Building Control body to require the development to comply with the optional Building Regulations standards, but to also ensure the appropriate quantity and standard of accessible and adaptable housing is constructed and maintained in accordance with policy D7 of the London Plan.

- 8 Prior to commencement of the hereby approved development, (excluding demolition and site clearance) a scheme for the provision of sustainable water management shall be submitted to, and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate how the approved development will incorporate sustainable urban drainage (SuDs) in accordance with the hierarchy set out in Policy 5.13 of the London Plan and will:

- i. provide information on all SuDs features including the method employed to delay and control the surface water discharged from the site and:
- ii. provide a management and maintenance plan for the lifetime of the development of arrangements to secure the operation of the scheme throughout its lifetime. Including appropriate details of Inspection regimes, appropriate performance specification.

The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:

- iii. provide details of water collection facilities to capture excess rainwater; and how water usage will be reduced in the development.

Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence.

REASON

To ensure that surface water run off is controlled to ensure the development does not increase the risk of flooding and is to be handled as close to its source as possible and Conserve water supplies in compliance with: Hillingdon Local Plan: Part 1- Strategic Policies Policy EM6 Flood Risk Management in (2012), Hillingdon Local Plan Part 2 Development Management Policies Policy DMEI 10 Water Management, Efficiency and Quality (2020), as well as relevant SuDs guidance contained within the London Plan (2021) and NPPF (2021).

- 9 No development shall take place until a landscape scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme shall include:

1. Details of Soft Landscaping

1.a Planting plans (at not less than a scale of 1:100),

1.b Written specification of planting and cultivation works to be undertaken,

1.c Schedule of plants giving species, plant sizes, and proposed numbers/densities where appropriate

2. Details of Hard Landscaping

- 2.a Refuse Storage (storage facilities should be secure and enclosed)
- 2.b Cycle Storage (2 spaces per dwelling and the storage facilities should be secure and enclosed)
- 2.c All means of enclosure/boundary treatments
- 2.d Car Parking Layouts (including car parking allocation details and the provision of 2 active electrical charging points - 1 per dwelling)
- 2.e Hard Surfacing Materials
- 2.f External Lighting
- 2.g Other structures (such as play equipment and furniture)

3.a Existing and proposed functional services above and below ground

4. Schedule for implementation of the landscaping scheme.

Thereafter the development shall be carried out and maintained in full accordance with the approved details.

#### REASON

To ensure that the proposed development will preserve and enhance the visual amenities of the locality and provide adequate facilities in compliance with policies DMHB5, DMHB 11, DMHB 12, DMHB 14, DMEI 1 and DMT 2 of the Hillingdon Local Plan Part 2 (2020) and Policy G5 of the London Plan (2021).

- 10 Notwithstanding the provisions of the Town and Country Planning (General Permitted Development)(England) Order 2015 (or any order revoking and re-enacting that Order with or without modification); no garage(s), shed(s) or other outbuilding(s), nor extension or roof alteration to any dwellinghouse(s) subject of this permission shall be erected without the grant of further specific permission from the Local Planning Authority.

#### REASON

To protect the character and appearance of the area and amenity of residential occupiers in accordance with policies DMHB 5, DMHB 11 and DMHD 2 of the Hillingdon Local Plan Part 2 (2020)

- 11 Full details of how the existing garages will be converted into residential outbuilding(s) shall be submitted and approved by the local planning authority, prior to their conversion. Details shall include elevation plans, details of proposed materials and floor plan layouts. Thereafter the outbuilding shall be converted in accordance with the approved details and the building shall not be used for any commercial use or a separate unit of accommodation, remaining ancillary and used in conjunction with the main dwelling in perpetuity.

#### REASON

To avoid any future fragmentation of the curtilage or the creation of a separate residential or business use, so as to protect the amenity of adjoining residential properties in accordance with Policies DMH 4, DMHB 11, DMHB 16, DMHB 18 and DMT 6 of the Hillingdon Local Plan: Part Two - Development Management Policies (January 2020).

- 12 No development shall take place until a full and detailed Construction Logistics Plan (CLP) has been submitted to and approved in writing by the Local Planning Authority. The CLP will be a requirement given the constraints and sensitivities of the local residential road network in order to minimise/avoid potential detriment to the public realm.

#### REASON

To ensure that the proposed development will preserve and enhance the visual amenities of the locality and provide adequate facilities in compliance with policies DMT1 and DMT 2 of the Hillingdon Local Plan Part 2 (2020).

## INFORMATIVES

- 1 The decision to GRANT planning permission has been taken having regard to all relevant planning legislation, regulations, guidance, circulars and Council policies, including The Human Rights Act (1998) (HRA 1998) which makes it unlawful for the Council to act incompatibly with Convention rights, specifically Article 6 (right to a fair hearing); Article 8 (right to respect for private and family life); Article 1 of the First Protocol (protection of property) and Article 14 (prohibition of discrimination).
- 2 Nuisance from demolition and construction works is subject to control under The Control of Pollution Act 1974, the Clean Air Acts and other related legislation. In particular, you should ensure that the following are complied with:-

A. Demolition and construction works which are audible at the site boundary shall only be carried out between the hours of 08.00 and 18.00 hours Monday to Friday and between the hours of 08.00 hours and 13.00 hours on Saturday. No works shall be carried out on Sundays, Bank or Public Holidays.

B. All noise generated during such works shall be controlled in compliance with British Standard Code of Practice BS 5228:2009.

C. Dust emissions shall be controlled in compliance with the Mayor of London's Best Practice Guidance 'The Control of dust and emissions from construction and demolition.

D. No bonfires that create dark smoke or nuisance to local residents.

You are advised to consult the Council's Environmental Protection Unit ([www.hillingdon.gov.uk/noise](http://www.hillingdon.gov.uk/noise) Tel. 01895 250155) or to seek prior approval under Section 61 of the Control of Pollution Act if you anticipate any difficulty in carrying out construction other than within the normal working hours set out in (A) above, and by means that would minimise disturbance to adjoining premises.

- 3 The Council will recover from the applicant the cost of highway and footway repairs, including damage to grass verges.

Care should be taken during the building works hereby approved to ensure no damage occurs to the verge or footpaths during construction. Vehicles delivering materials to this development shall not override or cause damage to the public footway. Any damage will require to be made good to the satisfaction of the Council and at the applicant's expense.

For further information and advice contact - Highways Maintenance Operations, Central Depot - Block K, Harlington Road Depot, 128 Harlington Road, Hillingdon, Middlesex, UB3 3EU (Tel: 01895 277524).

For Private Roads: Care should be taken during the building works hereby approved to ensure no damage occurs to the verge of footpaths on private roads during construction. Vehicles delivering materials to this development shall not override or cause damage to a private road and where possible alternative routes should be taken to avoid private roads. The applicant may be required to make good any damage caused.

The decision to GRANT planning permission has been taken having regard to the policies and proposals in the Hillingdon Local Plan Part 1 (2012) and Part 2 (2020) set out below, including Supplementary Planning Guidance, and to all relevant material considerations, including The London Plan - The Spatial Development Strategy for London consolidated with alterations since 2011 (2016) and national guidance.

#### Part 1 Policies

PT1.BE1 (2012) Built Environment

#### Part 2 Policies

DMH 2	Housing Mix
DMHB 11	Design of New Development
DMHB 12	Streets and Public Realm
DMHB 14	Trees and Landscaping
DMHB 16	Housing Standards
DMHB 18	Private Outdoor Amenity Space
LLP D1	(2021) London's form character and capacity for growth
LPP GG2	(2021) Making the best use of land
LPP H10	(2021) Housing size mix
LPP H2	(2021) Small sites
DMT 2	Highways Impacts
DMT 6	Vehicle Parking
LPP D3	(2021) Optimising site capacity through the design-led approach
LPP D4	(2021) Delivering good design
LPP D5	(2021) Inclusive design
LPP D6	(2021) Housing quality and standards
LPP D7	(2021) Accessible housing
LPP T6.1	(2021) Residential parking
LPP T4	(2021) Assessing and mitigating transport impacts
NPPF11	NPPF 2021 - Making effective use of land
NPPF12	NPPF 2021 - Achieving well-designed places

## END OF SCHEDULE

### Address:

Development Management  
 Directorate of Place  
 Hillingdon Council  
 3 North, Civic Centre, High Street, Uxbridge UB8 1UW  
[www.hillingdon.gov.uk](http://www.hillingdon.gov.uk)



## **GRANT OF PLANNING PERMISSION**

Application Ref: 53742/APP/2022/3079

### **SCHEDULE OF PLANS**

LAV01 Rev A - received 28 Feb 2023

LAV02 Rev A - received 28 Feb 2023

LAV03 Rev C - received 28 Feb 2023

LAV04 Rev B - received 06 Feb 2023

LAV06 Rev B - received 06 Feb 2023

LAV07 Rev B - received 06 Feb 2023

DESIGN AND ACCESS STATEMENT - received 06 Feb 2023

LAV08 Rev A - received 06 Feb 2023

## **RIGHTS OF APPLICANTS AGGRIEVED BY DECISION OF LOCAL PLANNING AUTHORITY**

### **TOWN AND COUNTRY PLANNING ACT 1990 (AS AMENDED)**

If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the office of the First Secretary of State under Section 78 of the Town and Country Planning Act 1990.

If you want to appeal, then you must do so within six months of the date of this notice, using a form which you can get from the Planning Inspectorate at Customer Support Unit, Room 3/15 Eagle Wing, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6PN (Tel 0117 372 8424) Appeal forms can be downloaded from the Planning Inspectorate website at [www.Planning-inspectorate.gov.uk](http://www.Planning-inspectorate.gov.uk)

If you intend to submit an appeal that you would like examined by inquiry then you must notify the Local Planning Authority and Planning Inspectorate ([inquiryappeals@planninginspectorate.gov.uk](mailto:inquiryappeals@planninginspectorate.gov.uk)) at least 10 days before submitting the appeal.

Further details are available at [www.gov.uk/government/collections/casework-dealt-with-by-inquiries](http://www.gov.uk/government/collections/casework-dealt-with-by-inquiries)

The Secretary of State can allow a longer period for giving notice of an appeal, but he will not normally be prepared to use this power unless there are special circumstances, which excuse the delay in giving notice of an appeal.

The Secretary of State need not consider an appeal if it seems to him that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

In practice, the Secretary of State does not refuse to consider appeals solely because the local planning authority based their decision on a direction given by him.

#### **Purchase Notices.**

If either the local planning authority or the officer of the First Secretary of State refuses permission to develop land or grants it subject to conditions, the owner may claim that he can neither put the land to a reasonably beneficial use by carrying out of any development which has been or would be permitted.

In these circumstances, the owner may serve a purchase notice on the Council (District Council, London Borough Council or Common Council of the City of London) in whose area the land is situated. This notice will require the Council to purchase his interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

## Appendix B



# Rainfall runoff calculations

### Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)		Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

### Nodes

Name	Area (ha)	Cover Level (m)	Node Type	Depth (m)
Impermeable	0.040	10.000	Manhole	0.300

### Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

### 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 %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

### Node Impermeable Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Invert Level (m)	9.700	Slope (1:X)	300.0
Side Inf Coefficient (m/hr)	0.00360	Time to half empty (mins)	1	Depth (m)	0.300
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	17.000		

**Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute winter	Impermeable	705	9.773	0.073	0.6	7.4636	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
720 minute winter	Impermeable	Infiltration	0.1

**Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
960 minute winter	Impermeable	945	9.842	0.142	1.0	18.6475	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
960 minute winter	Impermeable	Infiltration	0.1

**Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute winter	Impermeable	720	9.879	0.179	1.6	24.8376	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
720 minute winter	Impermeable	Infiltration	0.1

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
960 minute winter	Impermeable	945	9.950	0.250	1.8	36.5015	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
960 minute winter	Impermeable	Infiltration	0.1



## Appendix C



# Thames Water Asset Location Plan

# Asset location search



## Property Searches

GeoSmart Information Ltd  
1st Floor Old Bank Buildings  
Suite 9-11 Bellstone  
SHREWSBURY  
SY1 1HU

**Search address supplied** 8  
Lavender Rd  
Uxbridge  
UB8 3PY

**Your reference** N/A

**Our reference** ALS/ALS Standard/2023\_4899193

**Search date** 18 October 2023

### Notification of Price Changes

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

Customers will be emailed with the new prices by January 1<sup>st</sup> 2023.

Any orders received with a higher payment prior to the 1<sup>st</sup> April 2023 will be non-refundable. For further details on the price increase please visit our website at [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)



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



[searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)  
[www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)



0800 009 4540

**Search address supplied:** 8, Lavender Rd, Uxbridge, UB8 3PY

Dear Sir / Madam

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

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

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

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

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

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

### Contact Us

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

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

Email: [searches@thameswater.co.uk](mailto:searches@thameswater.co.uk)

Web: [www.thameswater-propertysearches.co.uk](http://www.thameswater-propertysearches.co.uk)

## Waste Water Services

**Please provide a copy extract from the public sewer map.**

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

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

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

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

For your guidance:

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

## Clean Water Services

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

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

Affinity Water Ltd  
Tamblin Way  
Hatfield  
AL10 9EZ  
Tel: 0345 3572401



For your guidance:

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

### **Payment for this Search**

A charge will be added to your suppliers account.

### Further contacts:

#### Waste Water queries

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

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

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

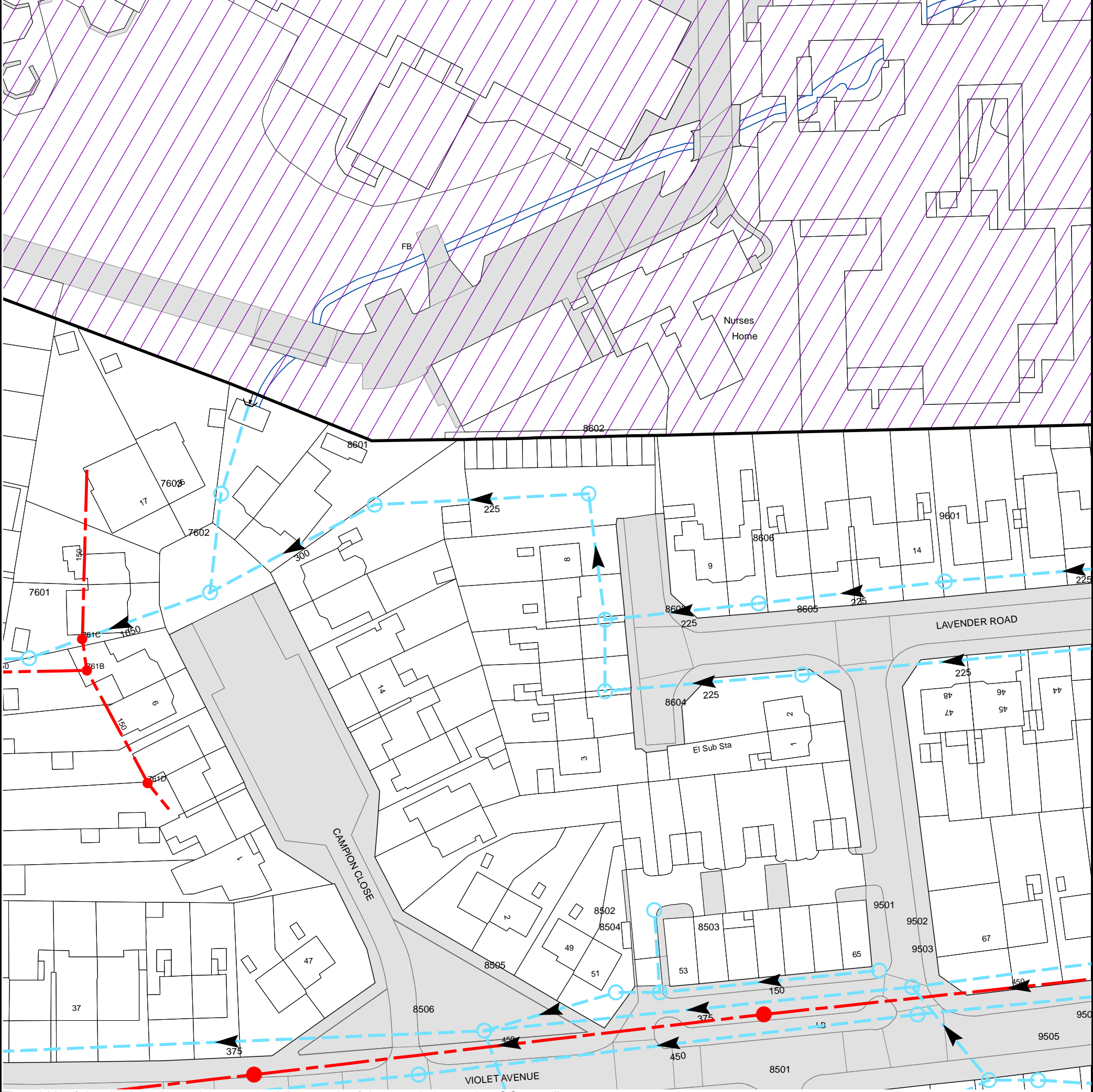
Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)

#### Clean Water queries

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

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

Tel: 0800 009 3921  
Email: [developer.services@thameswater.co.uk](mailto:developer.services@thameswater.co.uk)



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 506848,181645  
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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

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
















Manhole Reference	Manhole Cover Level	Manhole Invert Level
7502	36.32	33.04
8601	36.47	34.96
8506	36.7	34.62
8505	37.02	35.08
8602	n/a	n/a
8603	37.29	35.7
8604	37.35	35.83
8504	37.33	36.4
8502	37.54	36.65
8503	37.39	36.54
8606	37.71	36.2
8605	37.88	36.36
9501	37.85	37.04
9502	37.84	35.96
9503	37.94	35.03
9601	n/a	n/a
9505	38.1	36.45
9506	37.99	36.6
8501	37.5	34.01
761D	n/a	n/a
761B	n/a	n/a
7601	35.69	33.05
761C	n/a	n/a
7602	36.01	33.38
7603	35.82	33.61
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# Asset Location Search - Sewer Key

## Public Sewer Types (Operated and maintained by Thames Water)

	<b>Foul Sewer:</b> A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	<b>Surface Water Sewer:</b> A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	<b>Combined Sewer:</b> A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

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

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

### Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

## Sewer Fittings

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

	Air Valve		Meter
	Dam Chase		Vent
	Fitting		

## Operational Controls

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

	Ancillary		Drop Pipe
	Control Valve		Weir

## End Items

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

	Inlet		Outfall
	Undefined End		




## Other Symbols

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





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

## Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

## Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

## Payment Terms and Conditions

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

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

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

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

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

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

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### Ways to pay your bill

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

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

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## Further information

Information on confidence levels and ways to improve this report can be provided for any location on written request to [info@geosmart.co.uk](mailto:info@geosmart.co.uk) or via our website. Updates to our model are ongoing and additional information is being collated from several sources to improve the database and allow increased confidence in the findings. Further information on groundwater levels and flooding are being incorporated in the model to enable improved accuracy to be achieved in future versions of the map. Please contact us if you would like to join our User Group and help with feedback on infiltration SuDS and mapping suggestion.

## Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: [info@geosmartinfo.co.uk](mailto:info@geosmartinfo.co.uk)

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

### The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

### The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

## Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

*Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.*

### TPOs contact details:

The Property Ombudsman scheme  
Milford House  
43-55 Milford Street  
Salisbury  
Wiltshire SP1 2BP  
Tel: 01722 333306  
Fax: 01722 332296  
Email: [admin@tpos.co.uk](mailto:admin@tpos.co.uk)

You can get more information about the PCCB from [www.propertycodes.org.uk](http://www.propertycodes.org.uk).

Please ask your search provider if you would like a copy of the search code

## Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: [admin@tpos.co.uk](mailto:admin@tpos.co.uk).

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

[martinlucass@geosmartinfo.co.uk](mailto:martinlucass@geosmartinfo.co.uk)

## 16 Terms and conditions, CDM regulations and data limitations



Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>