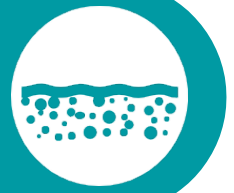


SuDSmart Plus



Sustainable Drainage Assessment

Site Address

Land off Swallow Street
Levenshulme
Manchester
M12 4GD

Date

2022-07-20

Report Status

FINAL

Grid Reference

387252, 394808

Site Area

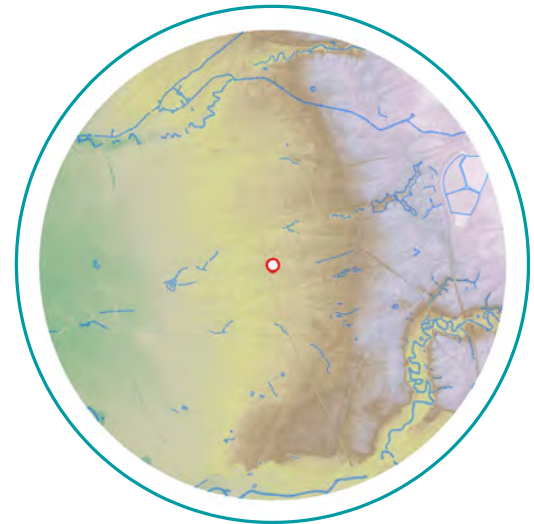
0.033 ha

Report Prepared for

Pinnacle Estates
Attention: Zeeshan Shahid
1009 Stockport Road
Manchester
M19 2TB

Report Reference

76555.01R2



Discharge to Sewer

The proposed Sustainable Drainage Scheme (SuDS) strategy is comprised of a lined permeable paving for surface water runoff. The scheme is designed to attenuate surface water runoff during a 1 in 100 plus 40 % climate change event.

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

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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?	Low*
	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?	Low
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
	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?	N/A

*Whilst initial mapping indicates the Site has a Moderate potential for infiltration due to the spatial constraints this has been reduced to Low.

Summary of existing and proposed development

The Site is currently used within a commercial capacity comprising of a single part three-storey, part two-storey unit. Development proposals comprise a vertical and side extension to the existing building as well as an internal conversion to mixed use with office space on the lower ground floor and residential apartments. Site plans and drawings are provided in Appendix A.

Summary of discharge routes

GeoSmart's SuDS Infiltration Potential (SD50) map indicates the Site has a Moderate potential for infiltration, primarily due to the anticipated variable permeability of the underlying geology. Although the ground conditions have the potential to be conducive to infiltration, the spatial constraints of the Site means that the requirement of a 5 m buffer between infiltration features and buildings and 2.5 m from the Site boundary (Building Regulations, 2010) are unable to be met. As such infiltration to ground is not considered feasible.

Ordnance Survey (OS) mapping indicates there is no surface water feature within 100 m of the Site. Therefore, discharge to surface water is not considered feasible and thereby not proposed.

The regulated drainage and water search included in Appendix C confirms the Site is located within 5 m of the public sewer network. Due to the short distance to nearby sewers discharging surface water runoff to the sewer is considered feasible and the most appropriate destination for surface water runoff.

According to Google Streetview, highway gullies are located within the adjacent highways Lane, indicating the presence of the highway drainage network.

Runoff rate and attenuation requirements

Discharging off-Site requires 13.48 m³ 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 2.0 l/s. This is as close to 50% of the existing runoff rate for the Site in accordance with Manchester City Council Policy EN14 without increasing the potential for blockages (see appendix B for associated calculations).

Proposed SuDS strategy

SuDS features comprised of lined permeable paving to attenuate a minimum of 14.25 m³ of surface water runoff providing 0.77 m³ of freeboard storage.

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

The capacity of the public sewer network should be confirmed with the utility provider and gain permission to connect 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.

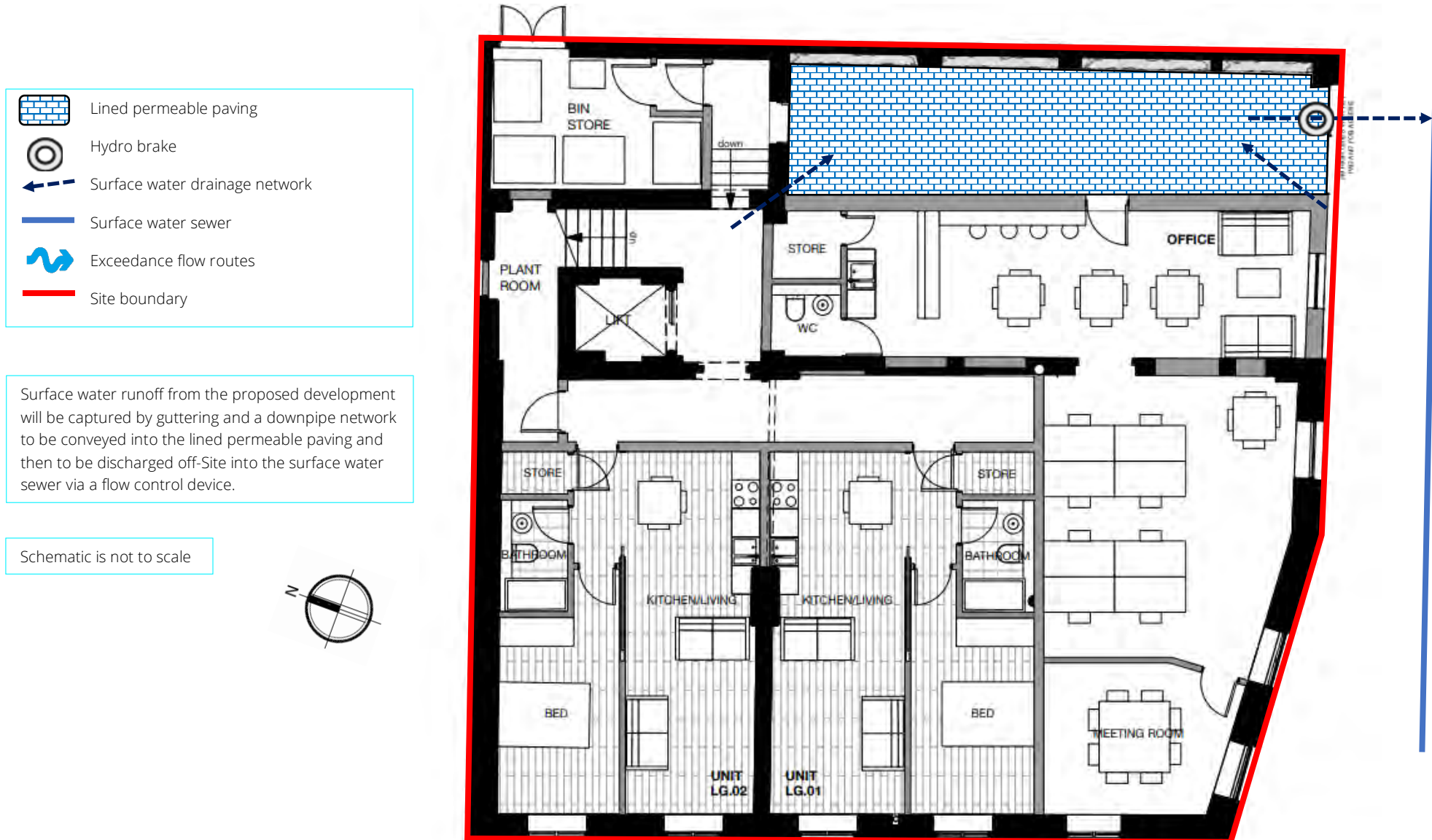
Table 1. Proposed SuDS type, features, discharge location and rate restriction

SuDS type	Source control (interception) and attenuation SuDS.
SuDS features	Lined permeable paving
Discharge location	Surface water sewer
Discharge rate	2.0 l/s

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

Permeable paving	A 30 m ² area of permeable paving (underlain with plastic geo-cellular crates) within the proposed paved areas to a depth of 0.5 m, with a 95% void ratio would result in c. 14.25 m ³ attenuation.
Total Attenuation Provided	14.25 m ³
Total Attenuation Required	13.48 m ³
Freeboard Storage Provided	0.77 m ³

Figure 1. Proposed SuDS scheme layout



3 Site analysis

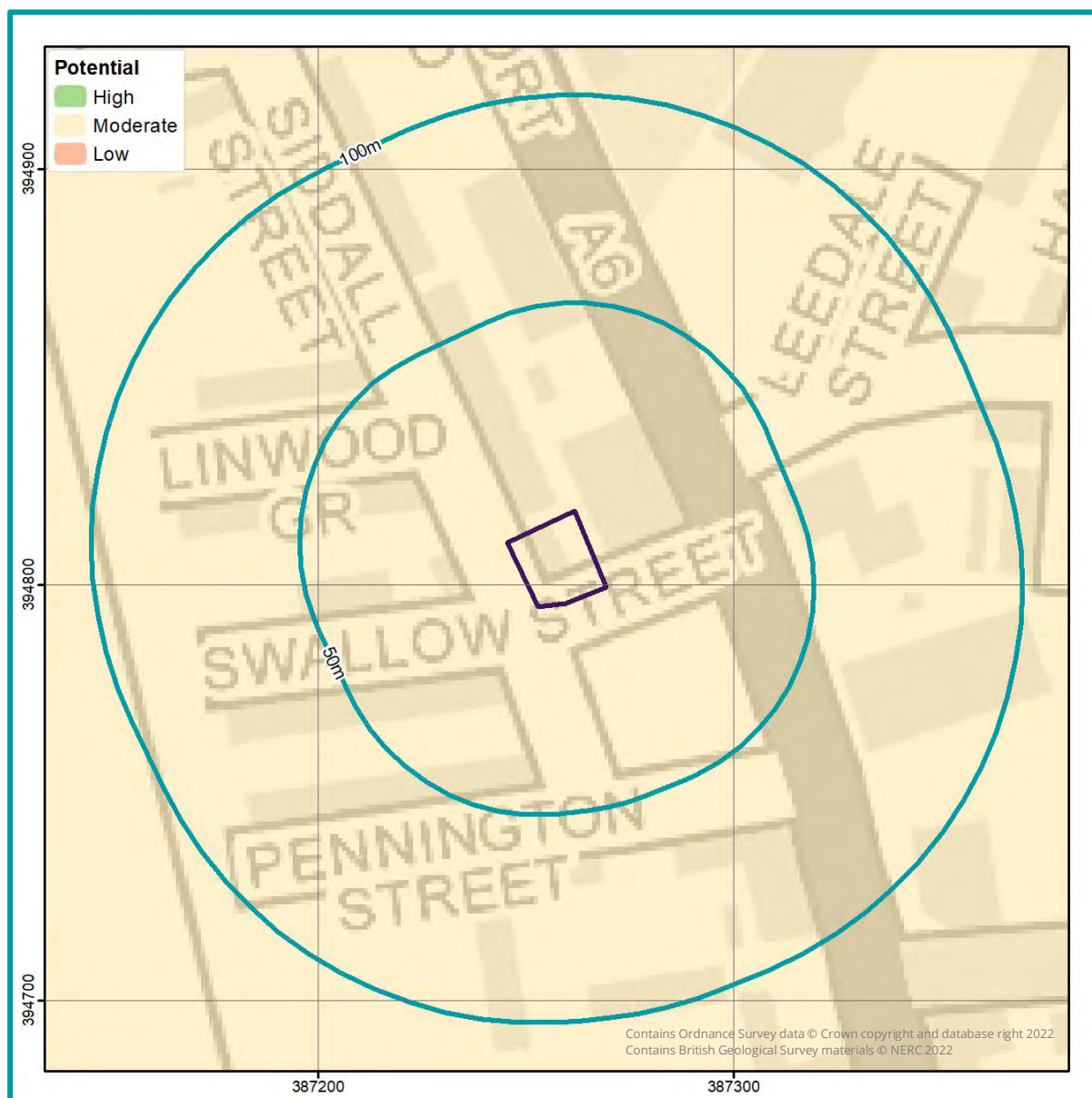


Site location

Figure 2. Aerial Imagery (Bluesky, 2022)



Figure 3. SuDS infiltration suitability (SD50) map (GeoSmart, 2022)



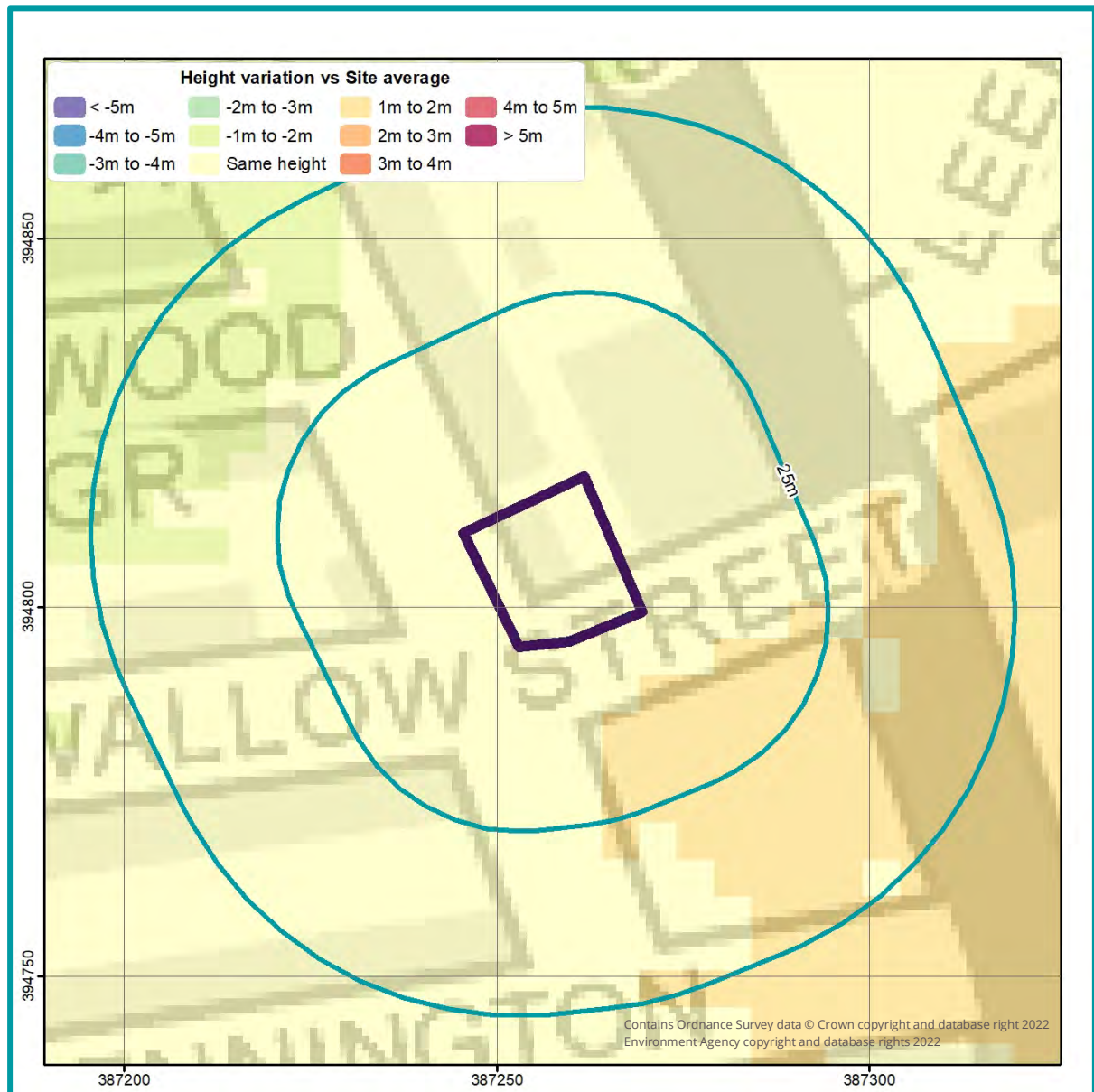
The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table.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

Whilst the ground conditions at the Site have the potential to be conducive to infiltration, due to the spatial constraints of the Site, being confined by the adjacent buildings and boundaries, focused infiltration is not considered feasible. This is due to the requirement of a 5 m buffer

between infiltration features and buildings and 2.5 m from the Site boundary (Building Regulations, 2010) being unable to be met.

Figure 4. Site topography (GeoSmart, 2022)



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 Site is on a gradual slope falling to the northwest from 54.48 mAOD to 53.83 mAOD. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ± 150 mm (EA, 2022).

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, 2022)



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.

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, 2022)

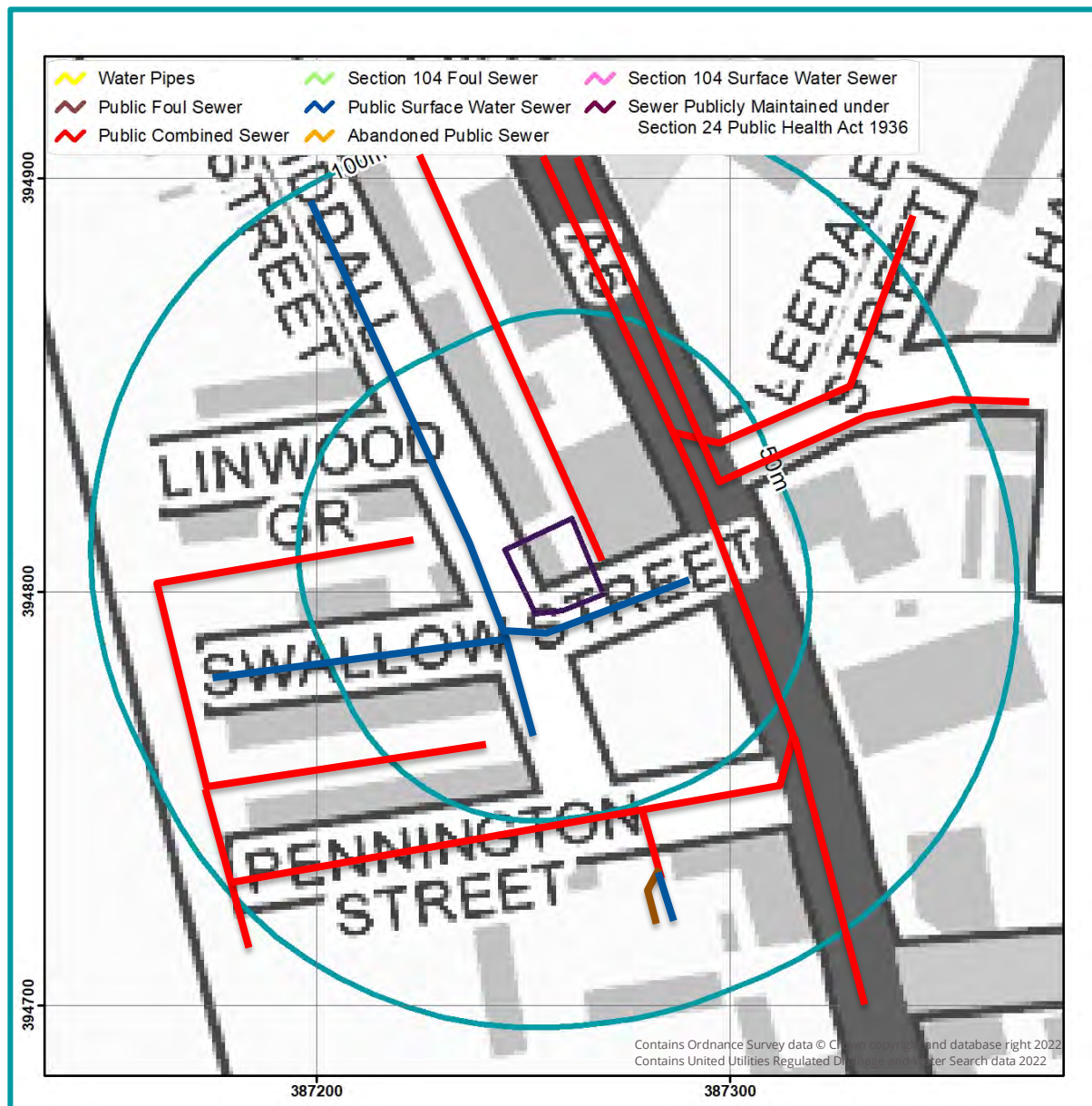


OS mapping indicates there is no surface water feature within 100 m of the Site. Discharging surface water runoff to a surface water feature would require drainage pipework to cross a significant distance across third-party, urbanised land and therefore is not considered feasible.

According to the DEFRA's Magic Map, the Site is not within 250m of a SSSI or SPA.

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 unmapped surface water features.

Figure 7. Sewer features map (OS & United Utilities, 2022)



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 5 m to the south and west of the Site beneath Swallow Street and Siddall Street, respectively. Due to the close proximity discharge to sewer is likely to be appropriate.

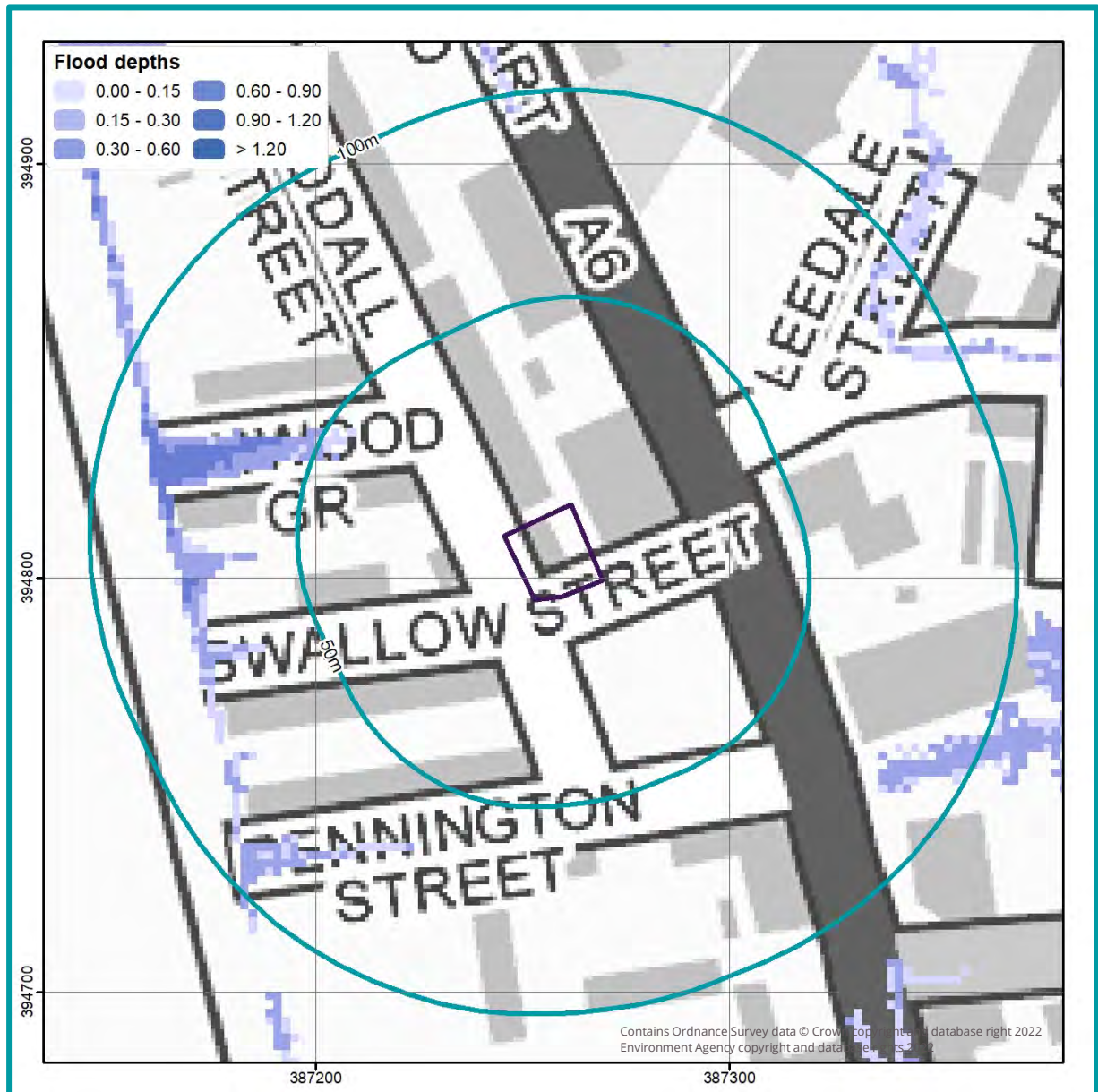
Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider 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, 2022)



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,2022)



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 risk of surface water flooding.

The above map shows the extent and depth of flooding during a 0.1% annual probability (1 in 1000 year) event, this confirms there are no areas on the Site which would be affected by flooding in the 1000 year event.

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, 2022)



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 Land off Swallow Street, Levenshulme, Manchester, M12 4GD (the Site). The Site is located within Manchester in a setting of residential and commercial use

Development

The Site is currently used within a commercial capacity comprising of a single part three-storey, part two-storey unit. Development proposals comprise a vertical and side extension to the existing building as well as an internal conversion to mixed use with office space on the lower ground floor and residential apartments. Site plans and drawings are provided in Appendix A.

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)	Till, Devensian- diamicton (TILLD)	✓
Bedrock geology (Figure 12)	Chester Formation- sandstone (CHES)	✓

The BGS website was used to extract ground information from the nearest borehole record to the Site (ref: SJ89SE13), located approximately 45 m to the northeast at an elevation of 53.74 mAOD.

The borehole records confirm the underlying geology is comprised of 'filled up stuff' (no further description was provided) to a depth of 0.91 m below ground level, overlying brown clay to a depth of 5.33 m bgl, where the borehole was terminated. Groundwater was not encountered throughout the borehole log.

Figure 11. Superficial Geology (BGS, 2022)

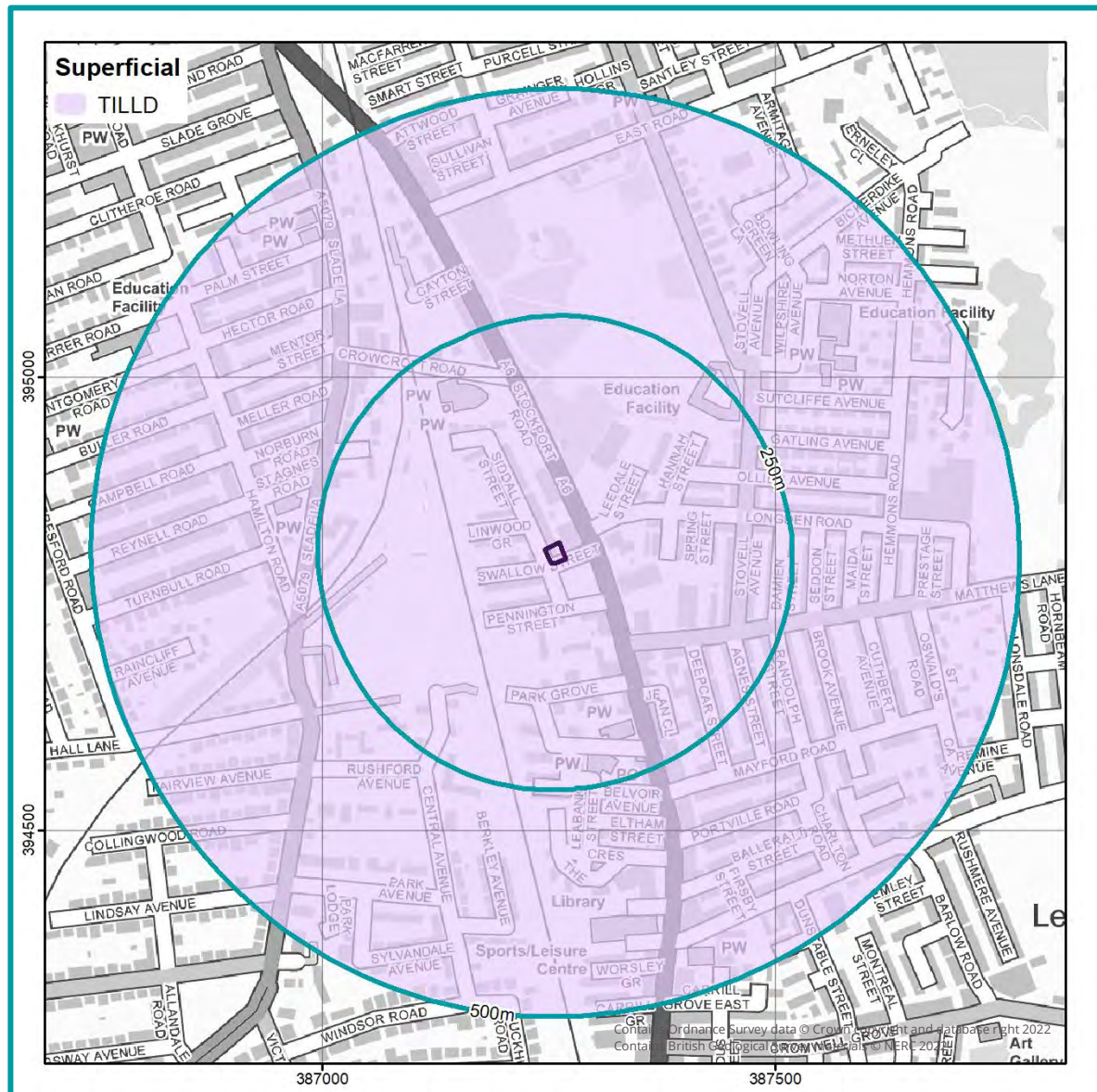


Figure 12. Bedrock Geology (BGS, 2022)



Depth to groundwater

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

According to borehole data and GeoSmart's Groundwater Flood Risk (GW5) map, shallow groundwater is unlikely to be an issue at the Site.

Infiltration features are not proposed at the Site due to the spatial constraints, being confined by the adjacent buildings and boundaries, focused infiltration is not considered feasible.

Ground conditions

Infiltration SuDS features are not proposed at the Site, therefore a detailed investigation into the ground conditions is not required.

Water quality

The Site does not lie within an SPZ and infiltration features are not proposed therefore further assessment of historical land uses is not considered necessary.

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 (2014)

The Peak rainfall intensity allowances section provides advice on the increased rainfall effects on river levels and land and urban drainage systems. The anticipated changes in peak rainfall intensity in small catchments (less than 5 km²) and urban catchments are shown in Table 4.

For large rural catchments use the alternative allowances defined for rivers.

In order to understand the range of impact, both the central and upper end allowances should be assessed.

Table 4. Peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

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.

Local Policy

Manchester City Council – Core Strategy Development Plan Document (July 2012).

All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required.

Manchester City Council – Local Flood Risk Management Strategy (March 2014).

Within Critical Drainage Areas (the Site is located within Levenshulme and Fallowfield Critical Drainage Area), and consistent with Core Strategy policy EN14 Flood Risk, developers should aim to minimise surface water runoff from developments, and achieve at least the following runoff rates:

- Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, including consideration of climate change.
- A 50% runoff rate reduction for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, including consideration of climate change.

These are not local Sustainable Drainage System (SuDS) standards but adopted planning policy, provided because of the overlapping nature of Planning and SuDS Approving Body processes.

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.

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

Attenuation scenario		Attenuation required (m ³)	Explanation	
Discharge runoff to surface water sewer	1 in 30 year	4.75	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 30 year (0.50 hour, Critical Storm Duration) event*. Flooding of the Site of 3.30 m³ 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 5.43 m³ 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	8.05	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (0.75 hour, Critical Storm Duration) event*.	
	1 in 100 year including 40% CC	13.48	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (1 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	330 m ²
Impermeable area (and as a percentage of the total area of the proposed development footprint of 330 m ²)	
Pre-development	Post-development
330 m ² (100%)	330 m ² (100%)
Impermeable land use: existing building footprint and yard Permeable land use: N/A	New impermeable land use: proposed building footprint with extension and paved areas New permeable land use: N/A

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 ¹ (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.21	N/A	N/A	N/A
6 hour 1 in 1 year	0.18	0.36	0.36	0.00
6 hour 1 in 10 year	0.29	0.56	0.56	0.00
6 hour 1 in 30 year	0.35	0.78	0.78	0.00
6 hour 1 in 100 year	0.43	1.06	1.06	0.00
6 hour 1 in 100 year + 20% CC	N/A	N/A	1.27	0.21
6 hour 1 in 100 year + 40% CC	N/A	N/A	1.48	0.42

¹ 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 2.0 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 ³)	Existing runoff volume ² (m ³)	Potential runoff volume without attenuation (m ³)	Potential minus existing (m ³)
QBAR	3.83	N/A	N/A	N/A
6 hour 1 in 1 year	3.63	7.72	7.72	0.00
6 hour 1 in 10 year	5.91	12.13	12.13	0.00
6 hour 1 in 30 year	7.87	16.74	16.74	0.00
6 hour 1 in 100 year	10.73	22.83	22.83	0.00
6 hour 1 in 100 year + 20% CC	N/A	N/A	27.40	4.57
6 hour 1 in 100 year + 40% CC	N/A	N/A	31.96	9.13

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

Proposed Discharge Rates

Manchester City Council Core Strategy policy EN14 Flood Risk requires for all developments located within CDAs should aim to reduce runoff from brownfield sites by 50%. For the 1 in 100 year event the existing runoff rate has been calculated as 1.06 l/s, using the Greenfield loH124 method, and 1.5 l/s using the Modified Rational Method. The associated calculations for this are included within Appendix B.

Due to the risk of blockages occurring restricting discharge to a 50% betterment is not considered feasible and therefore a minimum rate of 2.0 l/s shall be used in lieu considered the lowest rate without increasing the risk of blockages occurring.

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 2.0 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 ³)
1 in 30 year	2.0	0.50	4.75
1 in 100 year	2.0	0.75	8.05
1 in 100 year including a 40% climate change	2.0	1	13.48

7 Runoff destination



Options for the destination for the runoff generated on-Site have been assessed in line with the prioritisation 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 a Moderate potential for infiltration features with potentially permeable underlying deposits. Despite this, the Site is constrained by the proposed building footprint and adjacent boundaries meaning the required 5 m buffer between focused infiltration features and building foundations and 2.5 m from Site boundaries (Building Regulations, 2010) cannot be provided. As a result of this infiltration to ground is not considered a feasible method of surface water management and therefore not proposed.

Discharge to surface watercourse

The Site is not located within 100 m of a surface water feature, due to the significant drainage pipework that would be required this is not considered a feasible option for discharging runoff.

Discharge to sewer

According to the regulated water and drainage search (Appendix C) there is a surface water sewer to the south and west of the Site beneath Swallow Road and Siddall Street, respectively that runs adjacent to the Site, it is anticipated that there is an existing connection. Discharge to sewer is likely to be feasible and the most appropriate method of discharge. The local sewer company (United Utilities) should be contacted to confirm the capacity of the sewer to accept the additional runoff from the development.

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 comprised exclusively of very low (residential roof drainage) hazard. 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

Lined permeable paving would offer sufficient treatment stages (storage/attenuation, filtration through sub-base).

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.

SuDS Strategy:

Infiltration to ground is not achievable at the Site, and water features were not identified or available, therefore surface water runoff will be managed within SuDS features and discharged to the public sewer network.

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

SuDS type	Source control (interception) and attenuation SuDS.
SuDS features	Lined permeable paving
Discharge location	Surface water sewer
Discharge rate	2.0 l/s

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

Permeable paving	A 30 m ² area of permeable paving (underlain with plastic geo-cellular crates) within the proposed paved areas to a depth of 0.5 m, with a 95% void ratio would result in c. 14.25 m ³ attenuation.
Total Attenuation Provided	14.25 m ³
Total Attenuation Required	13.48 m ³

Freeboard Storage Provided	0.77 m ³
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Permeable paving

Permeable Paving is proposed for the paved areas to intercept runoff. Plastic geo-cellular systems are proposed to be used, which increases 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 m³ there is 0.95 m³ of space available for water storage), which has been factored into the storage capacity calculations.

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 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.

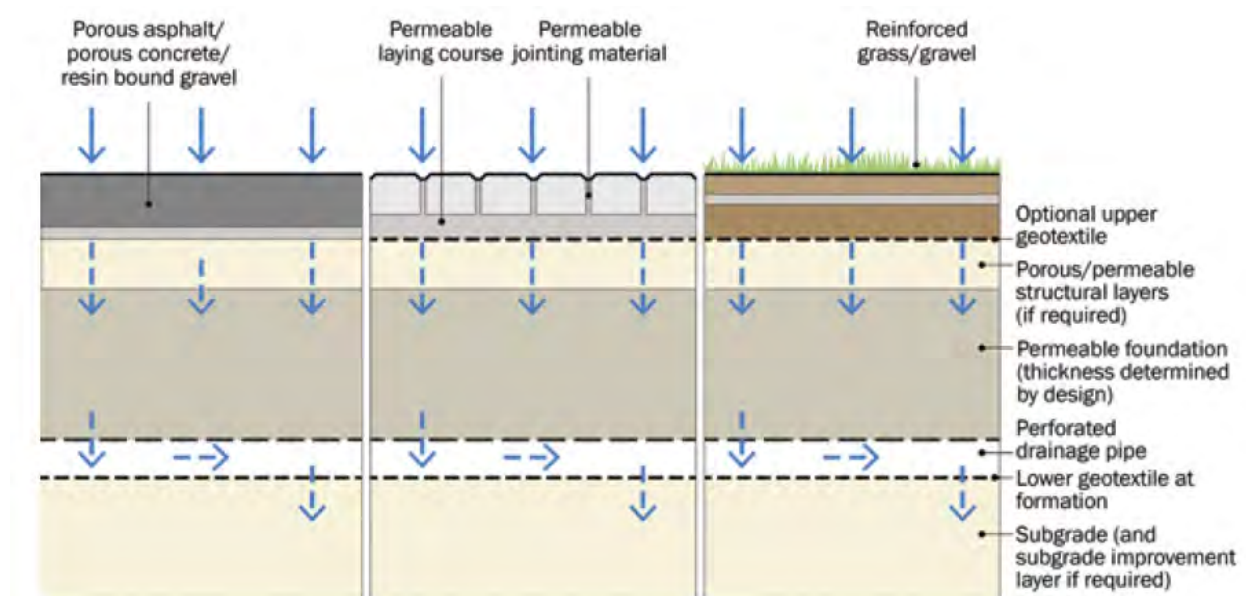


Figure 20.13 of the CIRIA SuDS Manual (C753) (2015)

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. 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 14. SuDS operation and recommended maintenance requirements

Asset type	Maintenance schedule (and frequency)
Permeable pavements	Regular maintenance: • Brushing and vacuuming (three times per year). • Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required). Monitoring: • Initial inspection (monthly). • Inspect for poor performance and inspection chambers (annually).
Hydro-Brake Flow Control	Low amounts of maintenance required as there are no moving parts within the Hydro-Brake® Flow Control. • Initial monthly inspection at the manhole once the construction phase is over. 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. Inspection should be undertaken annually or when a storm event occurs.
Underground drainage pipe network	Regular maintenance: • Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber (annually). • Cleaning of gutters and any filters on downpipes (annually). • Trimming any roots that may be causing blockages (annually or as required). Monitoring: • Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually).
Geo-cellular storage	Regular maintenance: • Remove litter and debris from inlets and outlets (monthly). • Trimming any roots and surrounding grass blockages (as required). Monitoring:

Asset type	Maintenance schedule (and frequency)
	- Inspect inlets, outlets and overflows for blockages (monthly or after a heavy storm). - Inspect inlets and outlets for silt accumulation (half yearly). - Inspect infiltration surfaces for compaction and ponding (monthly).

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 15. 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 16. 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

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: FloodSmart Report		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. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. 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. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

14 References and glossary



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- Manchester City Council (2012).** Core Strategy Development Plan Document. Accessed from: https://www.manchester.gov.uk/downloads/download/5672/core_strategy on 04/04/2022.
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- Ministry of Housing, Communities & Local Government. (2014).** National Planning Policy Guidance (NPPG).
- Ministry of Housing, Communities & Local Government. (2021).** National Planning Policy Framework (NPPF).
- NERC (2009)** WINFAP-FEH CD-ROM version 3.0.

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 2022 BlueSky copyright and database rights 2022
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (RoFRS/Pluvial/Surface Water Features/SPZ)	Environment Agency copyright and database rights 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2022) Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Sewer Location	Contains Ordnance Survey data © Crown copyright and database right 2022 Contains STL Regulated Drainage and Water Search data 2022
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2022 Environment Agency copyright and database rights 2022

15 Appendices



Appendix A



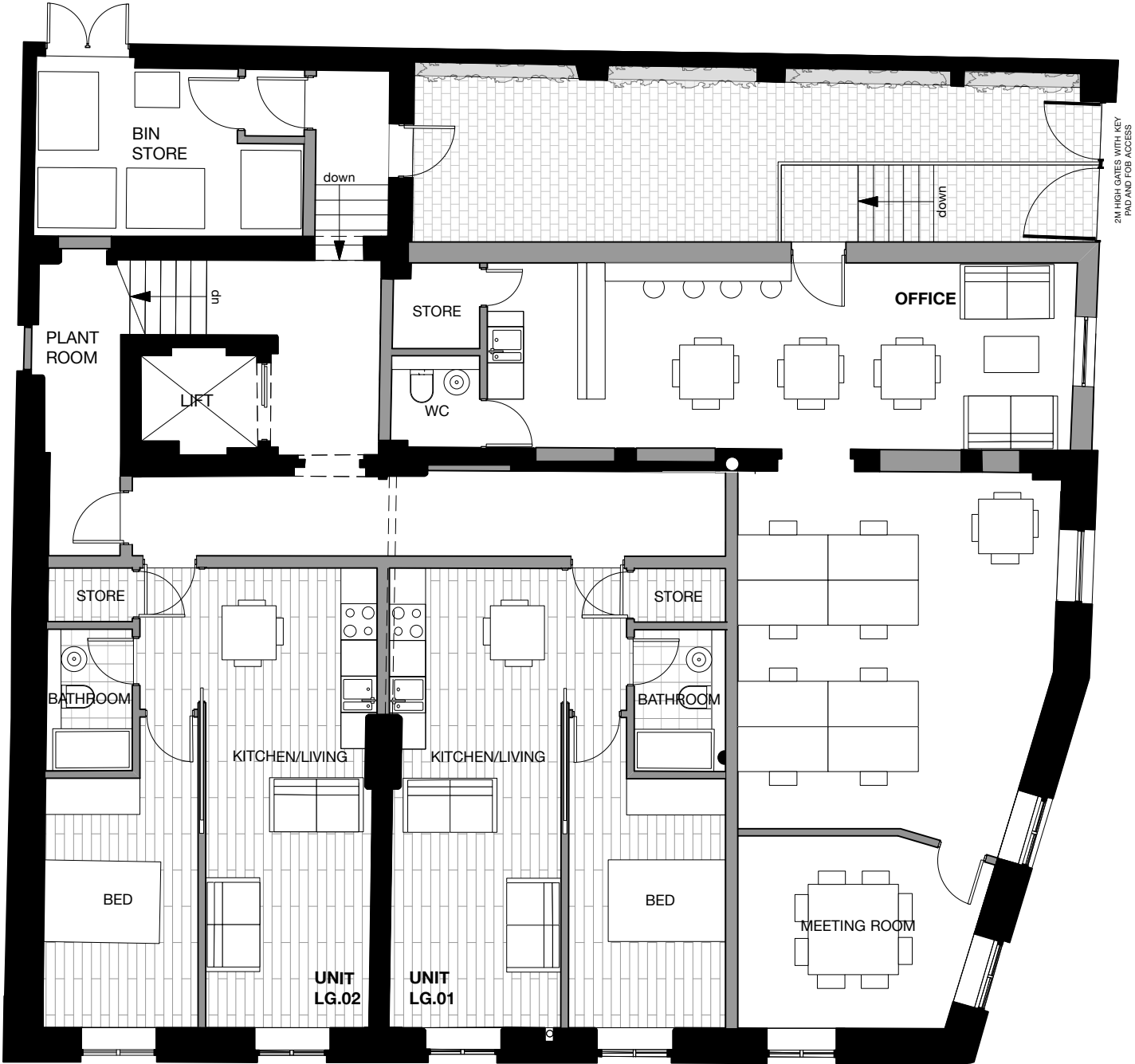
Site plans



SIDDAL STREET

STOCKPORT ROAD

SWALLOW STREET



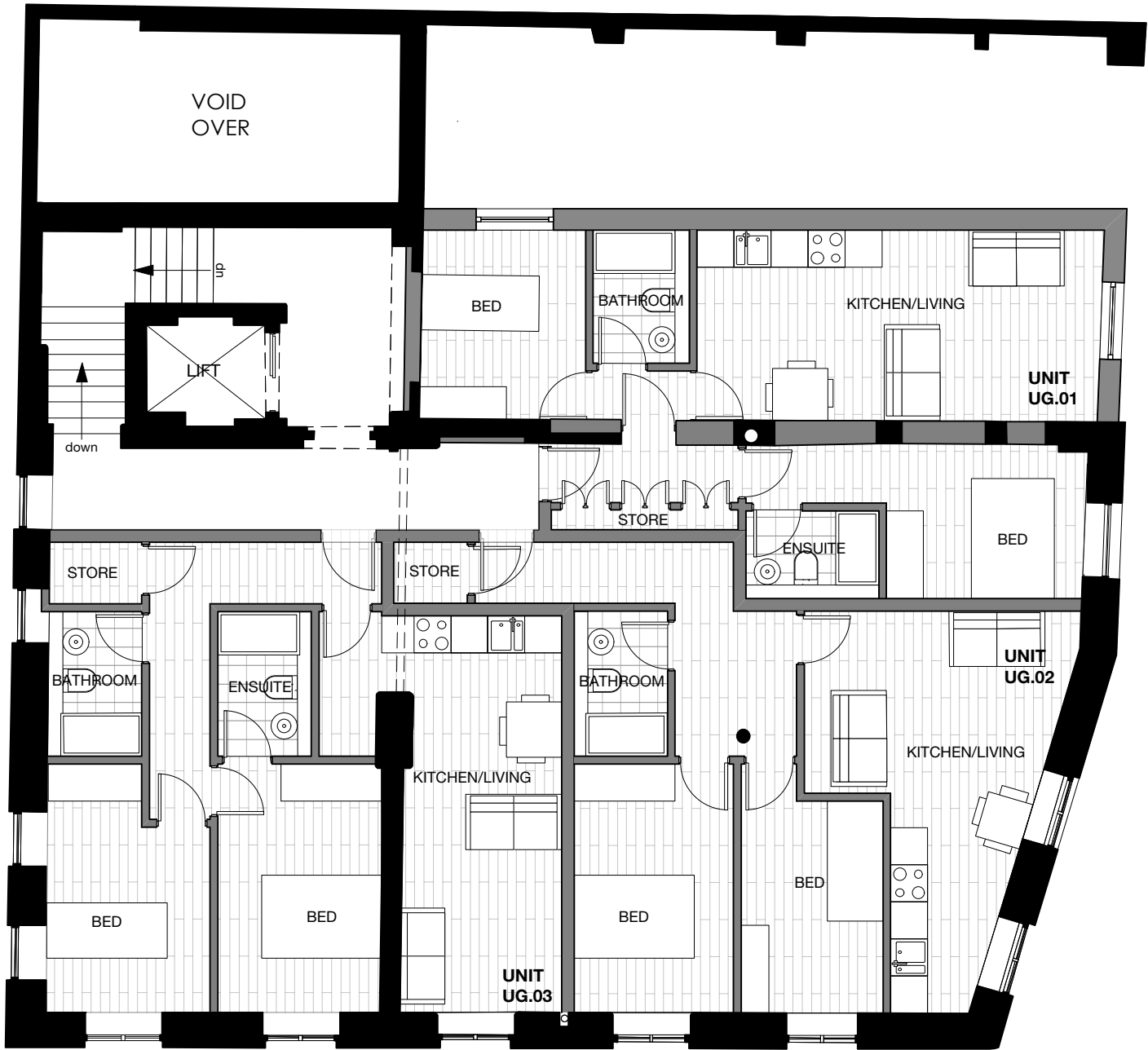
LOWER GROUND FLOOR

PROPOSED LOWER GROUND FLOOR PLAN
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SCALE: 1:100 @ A3	DATE: MARCH 2022
DRAWING NO: A619_P_100B	

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UPPER GROUND FLOOR

PROPOSED UPPER GROUND FLOOR PLAN
1:100 @ A3

REVISION	DATE	DESCRIPTION

CLIENT:	
PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT	
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DRAWING TITLE: PROPOSED UGF PLAN	
SCALE: 1:100 @ A3	DATE: MARCH 2022
DRAWING NO: A619_P_101	

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FIRST FLOOR

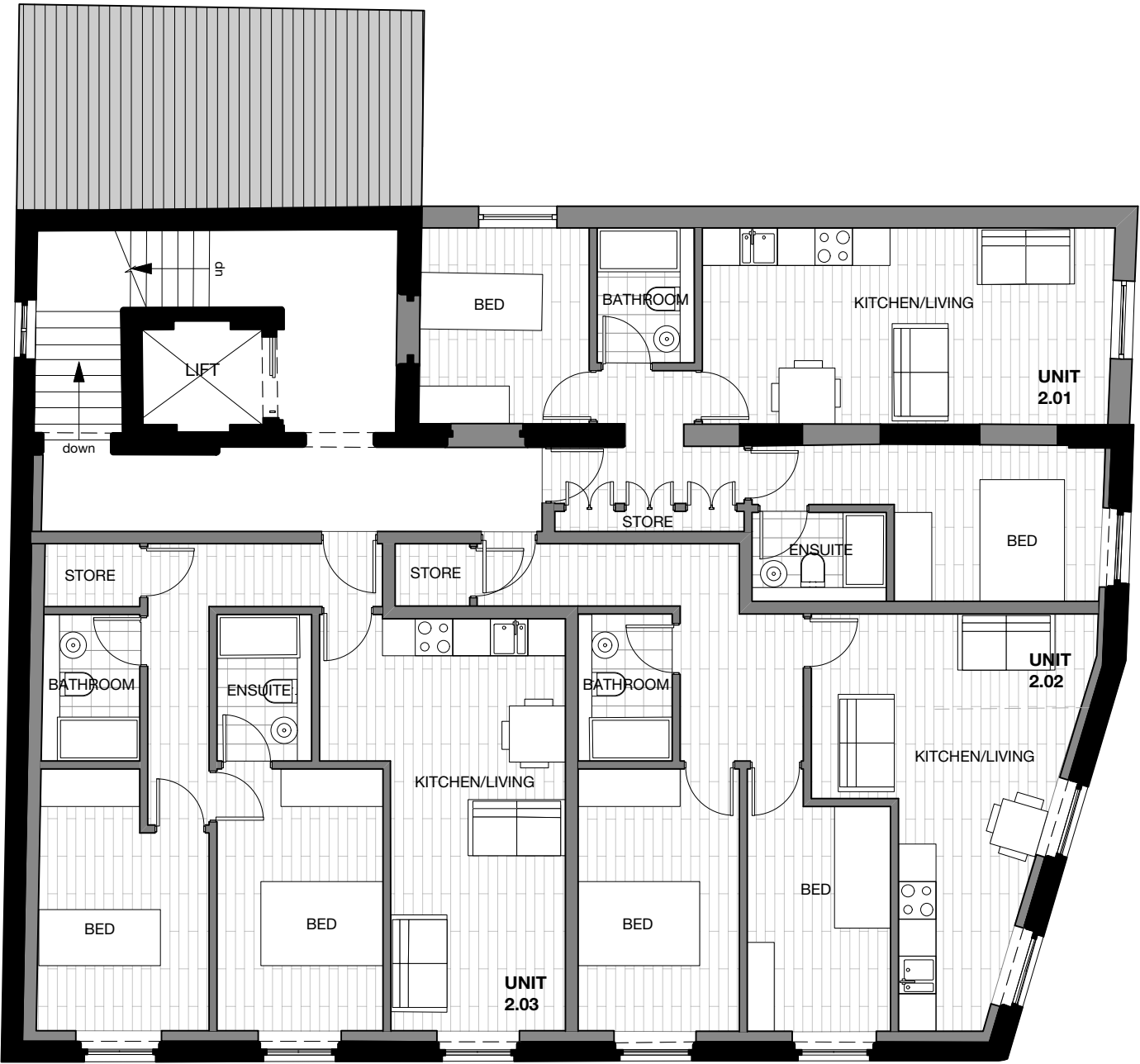
PROPOSED FIRST FLOOR PLAN
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REVISION	DATE	DESCRIPTION
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SCALE: 1:100 @ A3	DATE: MARCH 2022
DRAWING NO: A619_P_102	

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SECOND FLOOR

PROPOSED SECOND FLOOR PLAN
1:100 @ A3

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SCALE: 1:100 @ A3	DATE: MARCH 2022
DRAWING NO: A619_P_103	

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THIRD FLOOR

PROPOSED THIRD FLOOR PLAN
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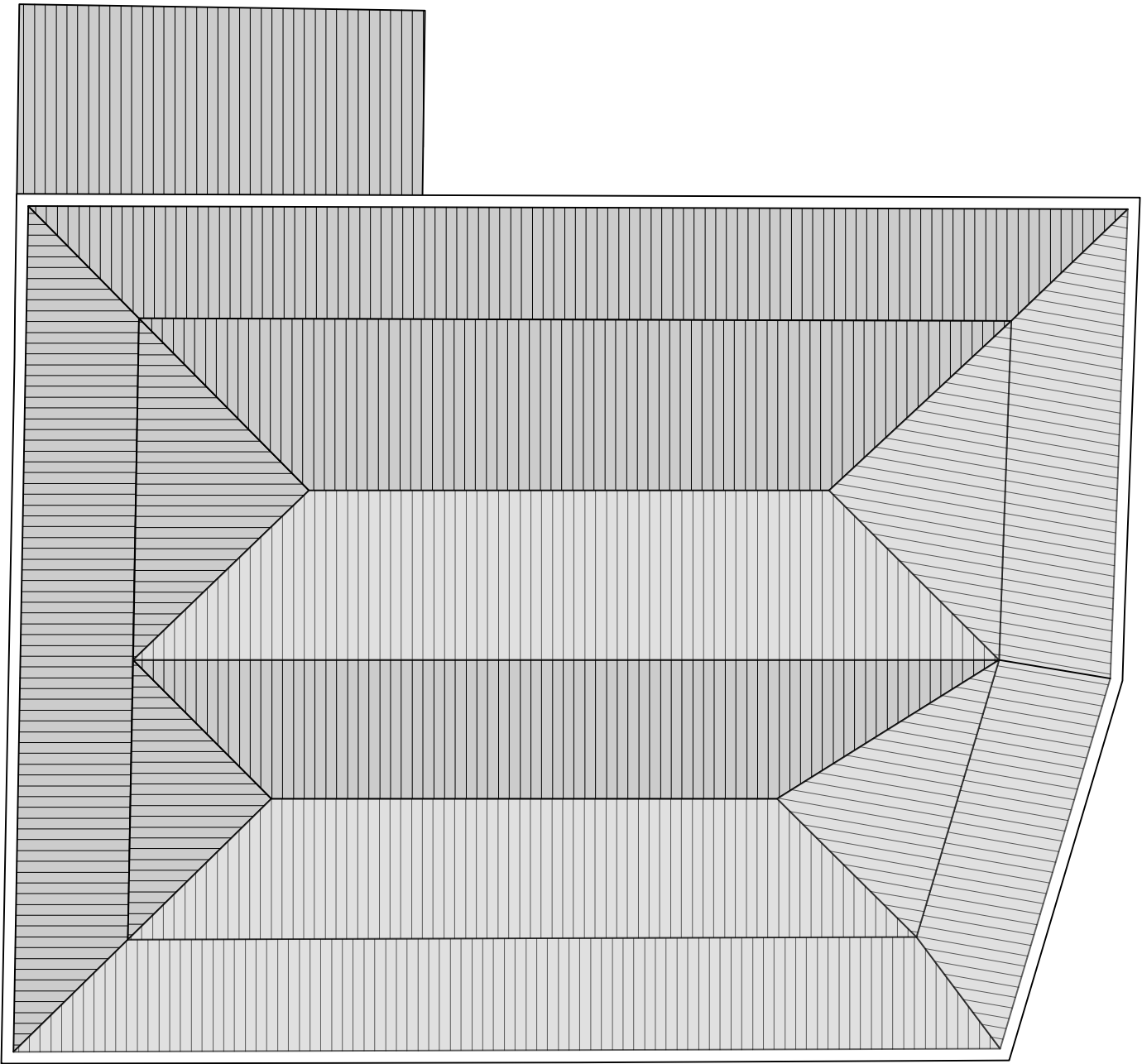
REVISION	DATE	DESCRIPTION
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ROOF PLAN

PROPOSED ROOF PLAN
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Appendix B



Rainfall runoff calculations

Design Settings

Rainfall Methodology	FEH-13	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)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	x	2 year (l/s)	0.4
Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	1.1
Winter CV	0.840	Additional Storage (m³/ha)	20.0	100 year (l/s)	1.5
Analysis Speed	Normal	Check Discharge Rate(s)	✓	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 %)
30	0	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Time of Concentration (mins)	5.00
Brownfield Method	MRM	Betterment (%)	0
Contributing Area (ha)	0.033	Q 2 year (l/s)	0.4
PIMP (%)	100	Q 30 year (l/s)	1.1
CV	0.850	Q 100 year (l/s)	1.5

Greenfield Site Run-Off Calculations using the loH124 method

Greenfield peak run-off rate (QBAR):

Parameters	Input	Units	Comments
Area	50	ha	minimum 50ha
SAAR	876	mm	FEH CD ROM (NERC, 2009)
SPR	0.47	N/A	Soil run-off coefficient
Region	10	N/A	Region on Hydrological area map

QBAR

$$Q_{\text{BAR(rural)}} = 1.08 \text{AREA}^{0.89} \text{SAAR}^{1.17} \text{SPR}^{2.17}$$

Where:

$Q_{\text{BAR(rural)}}$	is the mean annual flood (a return period of 2.3 years) in l/s
AREA	is the area of the catchment in km ² (minimum of 0.5km ²)
SAAR	is the standard average rainfall for the period 1941 to 1970 in mm
SPR	is the soil run-off coefficient

$Q_{\text{BAR(rural)}}$ can be factored by the UK Flood Studies Report regional growth curves to produce peak flood flows for any return period.

$Q_{\text{BAR(rural)}}$	=	313.83	l/s for 50ha site
Divided by 50 to scale down	=	6.28	l/s/ha
Actual Area of the entire Site	=	0.03	ha

Return Periods (Growth curves obtained from DEFRA report)

Return Period		Growth Factor	l/s/ha	Peak site run-off rate (l/s)
1	$Q_{\text{BAR(rural)}} \times$	0.85	5.34	0.176
2	$Q_{\text{BAR(rural)}} \times$	0.93	5.84	0.19
5	$Q_{\text{BAR(rural)}} \times$	1.19	7.47	0.25
10	$Q_{\text{BAR(rural)}} \times$	1.38	8.66	0.29
25	$Q_{\text{BAR(rural)}} \times$	1.64	10.29	0.34
30	$Q_{\text{BAR(rural)}} \times$	1.68	10.54	0.348
50	$Q_{\text{BAR(rural)}} \times$	1.85	11.61	0.38
100	$Q_{\text{BAR(rural)}} \times$	2.08	13.06	0.43
200	$Q_{\text{BAR(rural)}} \times$	2.32	14.56	0.48

Greenfield total run-off volume:

= actual area of the entire site x SPR x 6 hour rainfall depth

Return Period	6 hour rainfall (mm) from FEH CD-ROM	Area (ha)	SPR	Total run-off (m ³)
2.3 (QBAR)	24.68	0.03	0.47	3.8
1	23.38	0.03	0.47	3.6
10	38.08	0.03	0.47	5.9
30	50.73	0.03	0.47	7.9
100	69.18	0.03	0.47	10.7

Developed site run-off calculation sheet															
1 in 1 year				1 in 30 year								1 in 100 year			
Proposed impermeable area		0.033 ha		Proposed impermeable area		0.033 ha						Proposed impermeable area		0.033 ha	
CC Factor		40%		CC Factor		40%						CC Factor		40%	
Total volume for surfaces during 6 hour event		7.72 m³		Total volume for surfaces during 6 hour event		16.74 m³						Total volume for surfaces during 6 hour event		22.83 m³	
Total volume for 6 hour event inc CC		10.80 m³		Total volume for 6 hour event inc CC		23.44 m³						Total volume for 6 hour event inc CC		31.96 m³	
Total volume for 6 hour event exc CC		7.72 m³		Total volume for 6 hour event exc CC		16.74 m³						Total volume for 6 hour event exc CC		22.83 m³	
Duration	Rainfall	Run-off rate	Run-off rate	Duration	Rainfall	Run-off volume	Run-off volume	Duration	Rainfall	Run-off volume	Run-off volume	Duration	Rainfall	Run-off volume	Run-off volume
	1 yr event	1 yr event	1 yr +c+ event		30 yr event	30 yr event	30 yr +c+ event		100 yr event	100 yr event	100 yr +c+ event		100 yr event	100 yr event	100 yr +c+ event
hours	mm	m³	m³	hours	mm	m³	m³	hours	mm	m³	m³	hours	mm	m³	m³
0.25	7.43	2.45	3.43	0.25	19.13	6.31	8.84	0.25	26.53	8.75	12.26	0.25	26.53	8.75	12.26
0.5	9.63	3.18	4.45	0.5	25.30	8.35	11.69	0.5	35.26	11.64	16.29	0.5	35.26	11.64	16.29
0.75	11.10	3.66	5.13	0.75	29.07	9.59	13.43	0.75	40.76	13.45	18.83	0.75	40.76	13.45	18.83
1	12.10	3.99	5.59	1	31.90	10.53	14.74	1	44.76	14.77	20.68	1	44.76	14.77	20.68
2	16.00	5.28	7.39	2	38.36	12.66	17.72	2	53.55	17.67	24.74	2	53.55	17.67	24.74
3	18.49	6.10	8.54	3	42.62	14.06	19.69	3	59.12	19.51	27.31	3	59.12	19.51	27.31
4	20.40	6.73	9.42	4	45.86	15.13	21.19	4	63.23	20.87	29.21	4	63.23	20.87	29.21
5	22.00	7.26	10.16	5	48.49	16.00	22.40	5	66.47	21.94	30.71	5	66.47	21.94	30.71
6	23.38	7.72	10.80	6	50.73	16.74	23.44	6	69.18	22.83	31.96	6	69.18	22.83	31.96
8	25.70	8.48	11.87	8	54.46	17.97	25.16	8	73.61	24.29	34.01	8	73.61	24.29	34.01
10	27.64	9.12	12.77	10	57.54	18.99	26.58	10	77.17	25.47	35.65	10	77.17	25.47	35.65
12	29.32	9.68	13.55	12	60.17	19.86	27.80	12	80.19	26.46	37.05	12	80.19	26.46	37.05
16	32.16	10.61	14.86	16	64.56	21.30	29.83	16	85.15	28.10	39.34	16	85.15	28.10	39.34
20	34.56	11.40	15.97	20	68.21	22.51	31.51	20	89.19	29.43	41.21	20	89.19	29.43	41.21
24	36.67	12.10	16.94	24	71.37	23.55	32.97	24	92.65	30.57	42.80	24	92.65	30.57	42.80
28	38.53	12.71	17.80	28	74.13	24.46	34.25	28	95.66	31.57	44.19	28	95.66	31.57	44.19
32	40.23	13.28	18.59	32	76.62	25.28	35.40	32	98.36	32.46	45.44	32	98.36	32.46	45.44
36	41.80	13.79	19.31	36	78.89	26.03	36.45	36	100.83	33.27	46.58	36	100.83	33.27	46.58
40	43.26	14.28	19.99	40	81.00	26.73	37.42	40	103.11	34.03	47.64	40	103.11	34.03	47.64
44	44.63	14.73	20.62	44	82.97	27.38	38.33	44	105.24	34.73	48.62	44	105.24	34.73	48.62
48	45.94	15.16	21.22	48	84.82	27.99	39.19	48	107.23	35.39	49.54	48	107.23	35.39	49.54

Appendix C



United Utilities Asset Location Plan

GeoSmart Information Ltd

**Suite 9-11, 1st Floor
Old Bank Buildings, Bellstone
Shrewsbury, Shropshire
SY1 1HU**

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: 76555
Our Ref: UUPS-ORD-383074
Date: 04/04/2022**

Dear Sirs

Location: 1009A STOCKPORT ROAD, MANCHESTER, M19 2TB

I acknowledge with thanks your request dated 04/04/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



Karen McCormack
Property Searches Manager

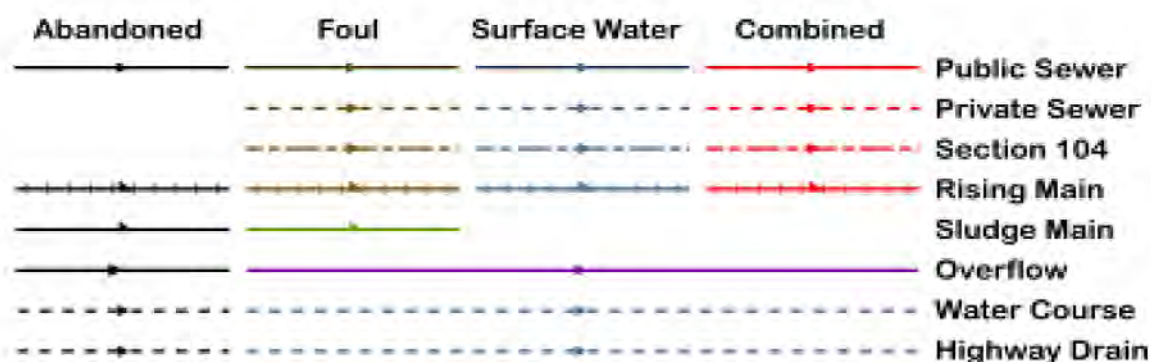
TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	



Scale: 1:1250
Date: 04/04/2022

SEWER RECORDS

Address or Site Reference: 1009A STOCKPORT ROAD, MANCHESTER, M19 2TB

Printed by: Property Searches



Water for the North West

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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For full T&Cs see <http://geosmartinfo.co.uk/terms-conditions>

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 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

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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.

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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.
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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

You can get more information about the PCCB from 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.

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

16 Terms and conditions, CDM regulations and data limitations



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

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