GeoSmart Information

SuDSmart Plus

Sustainable Drainage Assessment

Site Address

Land Adjacent to 4 Whitsbury Road
Havant
PO9 5SP

Grid Reference

472494, 108269

Report Prepared for

Stop Domestic Abuse
PO Box 53
Havant
PO9 1UA

Date Issued

2023-12-11

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2024-10-02

Report Status

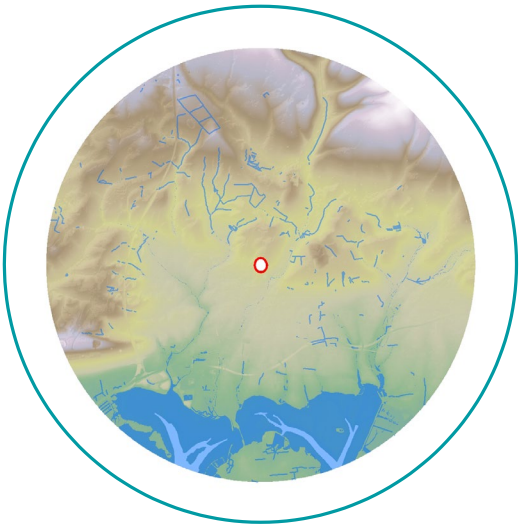
FINAL

Site Area

0.10 ha

Report Reference

76896.01.01R1



Discharge to Sewer

The proposed Sustainable Drainage Scheme (SuDS) strategy is comprised of rainwater harvesting butts, a green roof, lined permeable paving, and an attenuation tank to attenuate surface water runoff during the 1 in 100 plus 45% climate change event.

Surface water will discharge at a controlled rate of 1 l/s via a connection to the nearby public surface water sewer network, subject to confirmation from the sewer utility provider, and the incorporation of SuDS.

Foul water produced by the development should be discharged via a separate drainage network to the nearby foul sewer network, subject to confirmation from the sewer utility provider.

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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 to Medium
	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

Summary of existing and proposed development

The Site is currently brownfield land surrounded by numerous residential properties. There are two existing lock-up garage structures on-Site, located along the western and northern boundaries. Access to the Site is provided by an access road to the north, as well as a public footpath to the south west.

Development proposals comprise the demolition of the garage structures and the construction of a two-storey communal residential building with associated parking, cycle and bin storage, external children's play area, and landscaped areas. Access to the Site is to be retained as existing. Site plans are included within Appendix A of this report.

Summary of discharge routes

GeoSmart's SuDS Infiltration Potential (SD50) map indicates the Site has a Low potential for infiltration, primarily due to the anticipated low permeability of the underlying geology (London Clay). Infiltration to ground is therefore unlikely to be feasible.

Ordnance Survey (OS) mapping indicates that there are no mapped surface water features within 100 m of the Site. Due to the significant distance pipework would have to travel across third-party urbanised land, discharge to surface watercourse is not considered to be feasible for the Site.

The asset location plan search included in Appendix C confirms that there is an existing public surface water sewer within the Site boundaries. Due to the short distance, discharging surface water runoff to the sewer is considered to be feasible.

According to Google Streetview, highway gullies are located within Whitsbury Road, indicating the presence of the highway drainage network. However, the drains are located a significant distance from the proposed development, at a higher elevation, which would likely mean that much of the Site could not be drained via gravity to this location.

Runoff rate and attenuation requirements

Discharging off-Site requires 50.40 m^3 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 45% allowance for climate change. This volume is subject to the discharge rate being restricted to 1 l/s (as close to the equivalent Greenfield 1 in 100-year rate as possible, without increasing the potential for blockages).

Proposed SuDS strategy

SuDS features comprised of a rainwater harvesting butt, green roof, lined permeable paving, and an attenuation tank are proposed to attenuate a minimum of 54.11 m^3 of surface water runoff. The SuDS features would provide some water quality benefits (interception and filtration) prior to discharging to the nearby surface water sewer.

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 45% allowance for climate change and will not cause flooding to the proposed development in accordance with DEFRAs non-statutory technical standards (DEFRA, 2015).

Foul water should be discharged to the nearby public foul sewer, with the proposed development potentially generating 4,050 litres (4.05 m^3) per day.

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 of the new residential building.

Recommendations / Next steps

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

As the proposed development is above the public sewer network, a build-over agreement or easement may be required with the relevant utility provider.

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	Rainwater harvesting, green roof, lined permeable paving, and an attenuation tank.
Discharge location	Public surface water sewer network.
Discharge rate	1 l/s.

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

Rainwater Harvesting	Rainwater harvesting butts should be established for the 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.
Green Roof	A green roof covering a total area of c. 235 m^2 with a green roof mix example volume of 47 m^3 (0.2 m depth) and Geocomposite example volume of 3.53 m^3 (0.015 m depth) would attenuate for c. 8.81 m^3.
Lined Permeable Paving	A 140 m^2 area of lined permeable paving (underlain with a Type 3 aggregate material) within the proposed driveway and parking areas to a depth of 0.4 m, with a 30% porosity would result in c. 16.80 m^3 attenuation.
Attenuation Tank	An attenuation tank with a length of 6 m, width of 5 m, depth of 1 m and a void ratio of 95% would provide c. 28.50 m^3 attenuation.
Total Attenuation Provided	54.11 m^3
Total Attenuation Required	50.40 m^3
Freeboard Storage Provided	3.71 m^3

GeoSmart Information

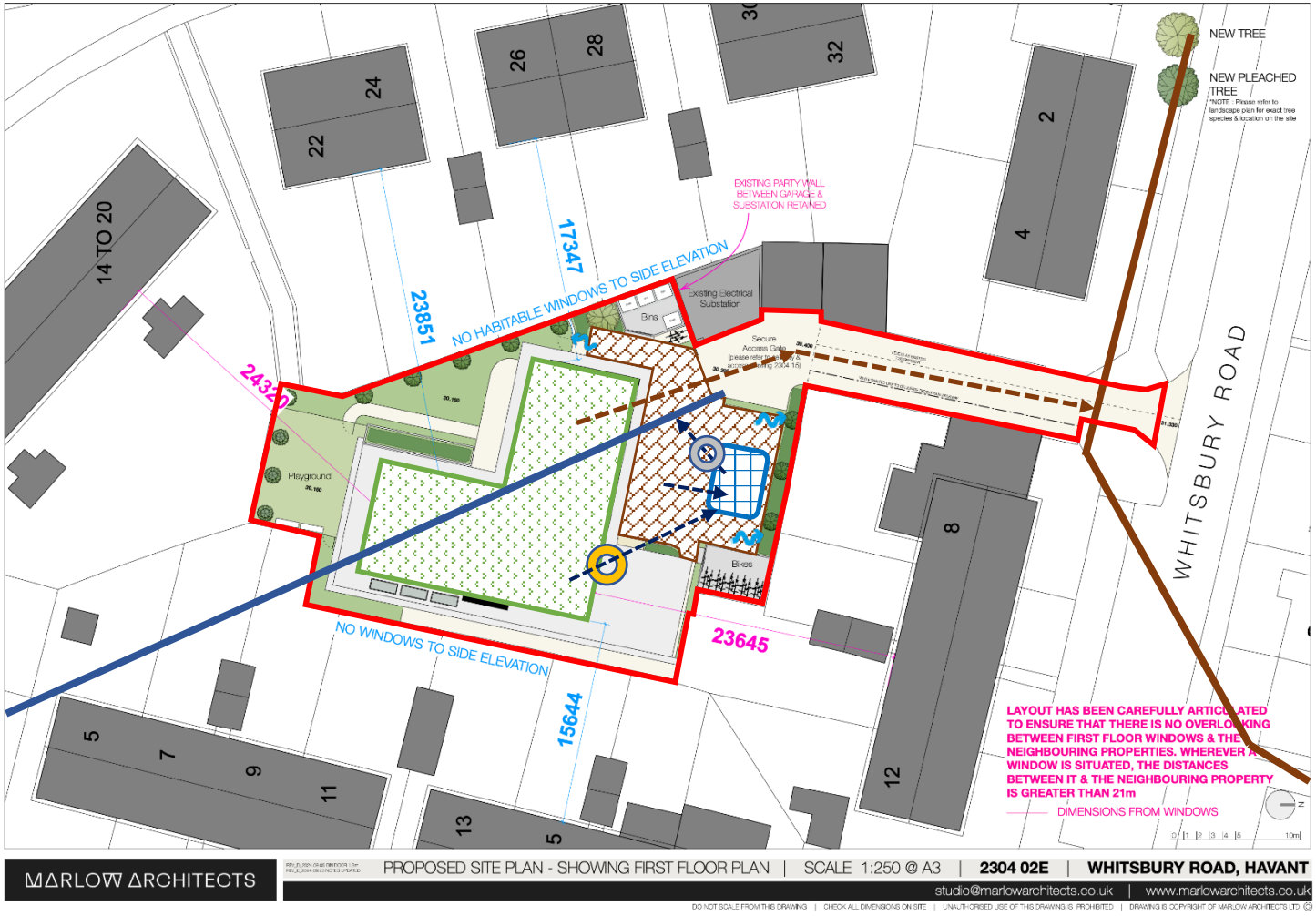
Figure 1. Proposed SuDS scheme

- Attenuation tank
- Lined permeable paving
- Green roof
- Rainwater harvesting butt
- Surface water drainage network
- Foul water drainage network
- Flow control
- Public surface water sewer
- Public foul sewer
- Exceedance flow routes
- Site boundary

Surface water from the proposed dwelling should be captured by the proposed green roofs and guttering system to be conveyed into the rainwater harvesting butt, lined permeable paving, and attenuation tank for discharge to the on-Site surface water sewer.

Foul water from the proposed development should be conveyed by a separate drainage network to the nearby foul sewer.

Exceedance flows are directed towards non-essential areas on Site where possible.



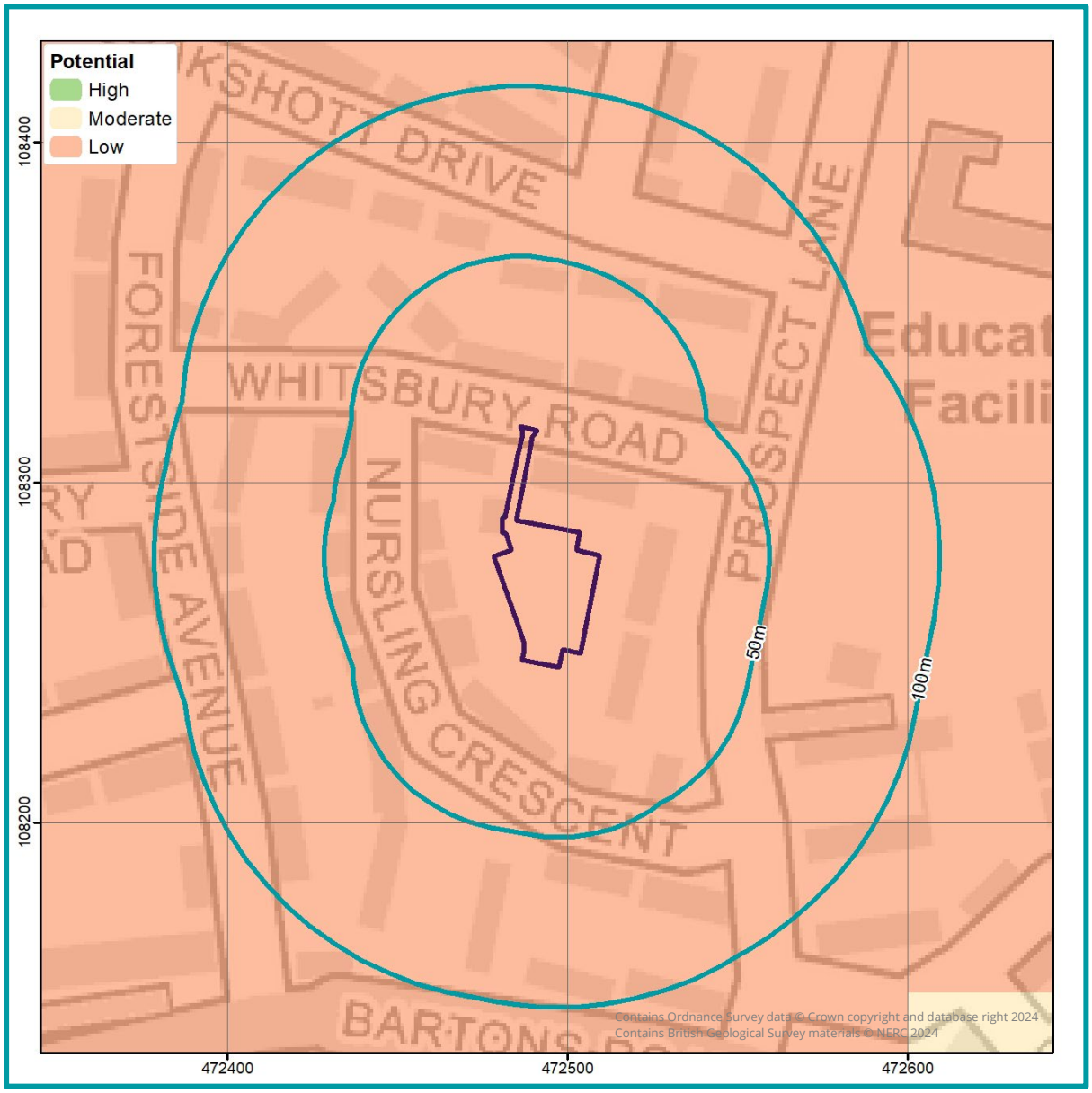
Schematic is not to scale

3 Site analysis

Site location

Figure 2. Aerial Imagery (Bluesky, 2024)

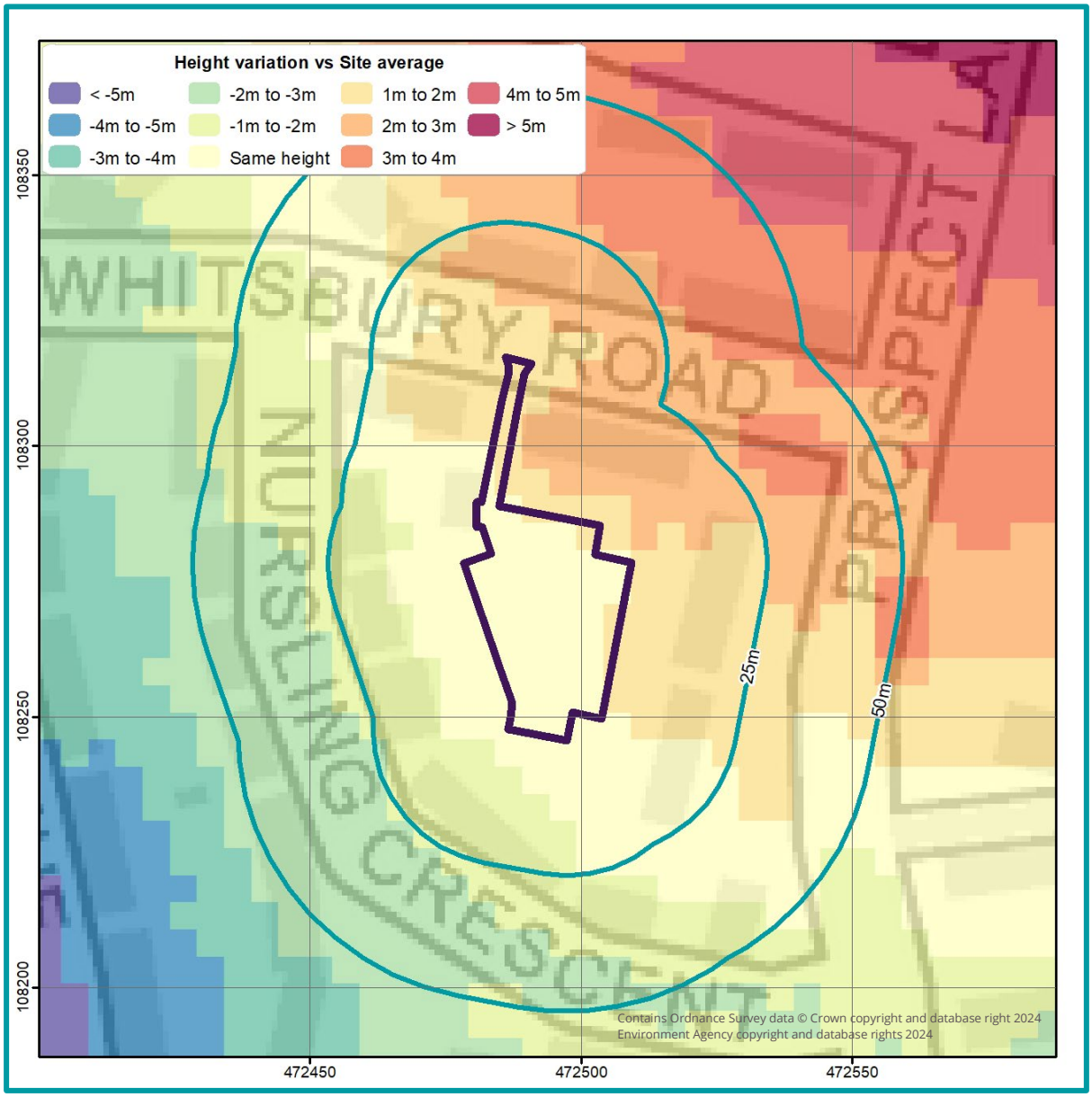
Figure 3. SuDS infiltration suitability (SD50) map (GeoSmart, 2024)



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 Low potential for infiltration SuDS across the Site. It is likely that the underlying geology at the Site has low permeability which would limit the effectiveness of a proposed infiltration SuDS scheme.

Figure 4. Site topography (GeoSmart, 2024)



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 that the general ground levels on-Site fall to the south west.

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

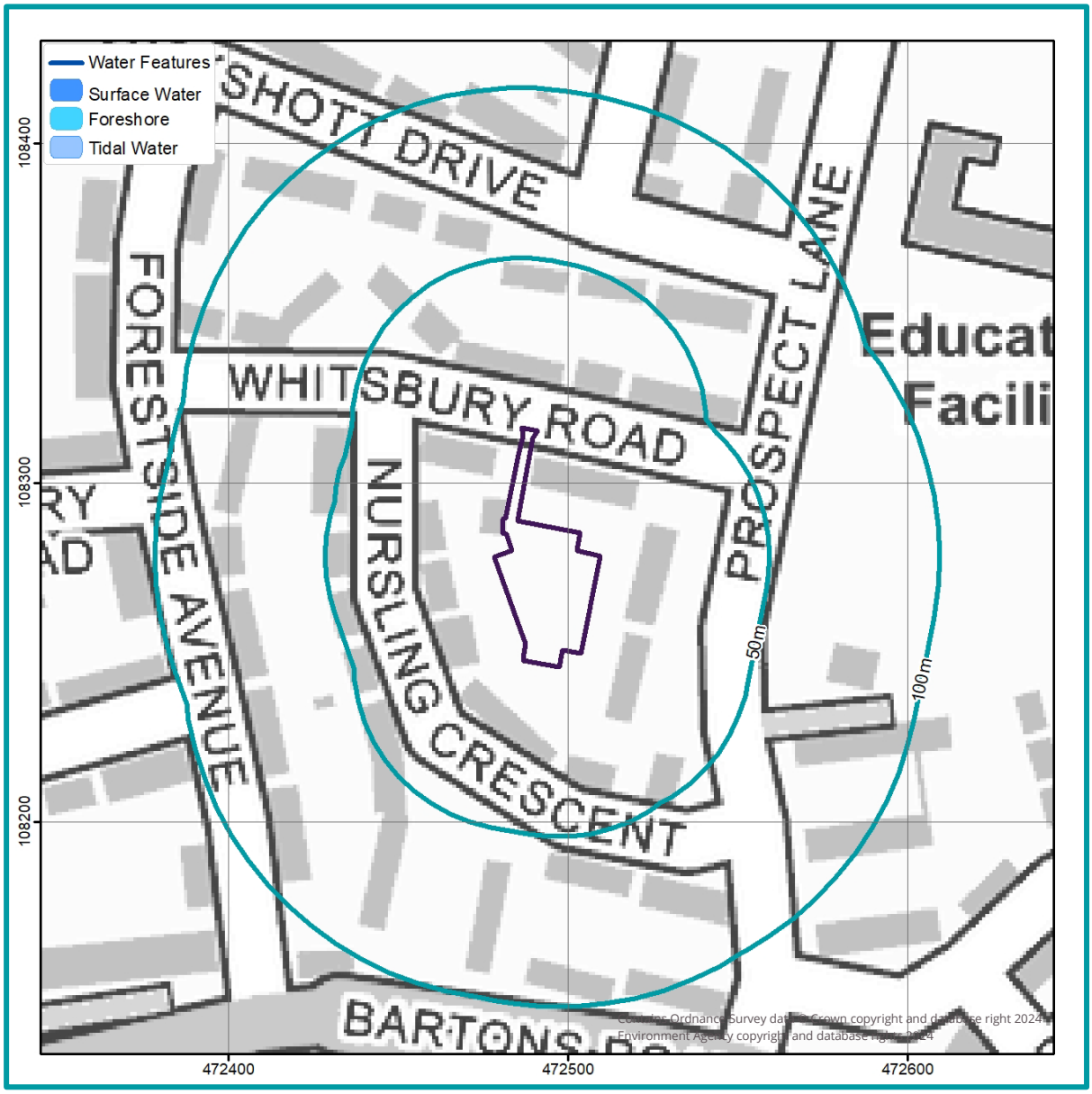
Figure 5. Source protection zone map (EA, 2024)

An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site lies within a subsurface inner groundwater Source Protection Zone (SPZ 1c).

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, 2024)

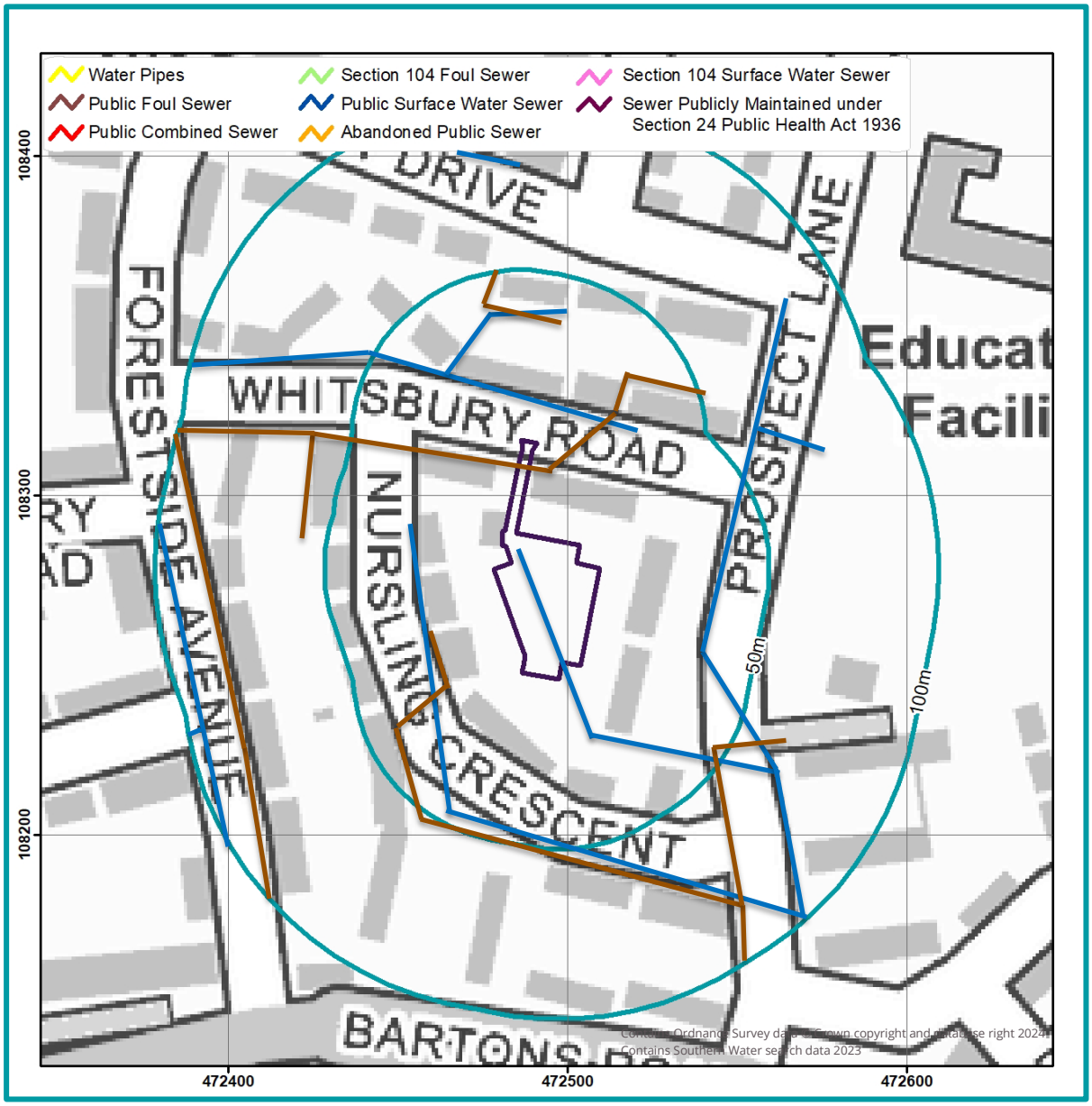


OS mapping indicates that there are no reported surface water features within 100 m of the Site. Due to the significant distance to the nearest surface water feature, discharge to surface watercourse should not be considered.

According to 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.

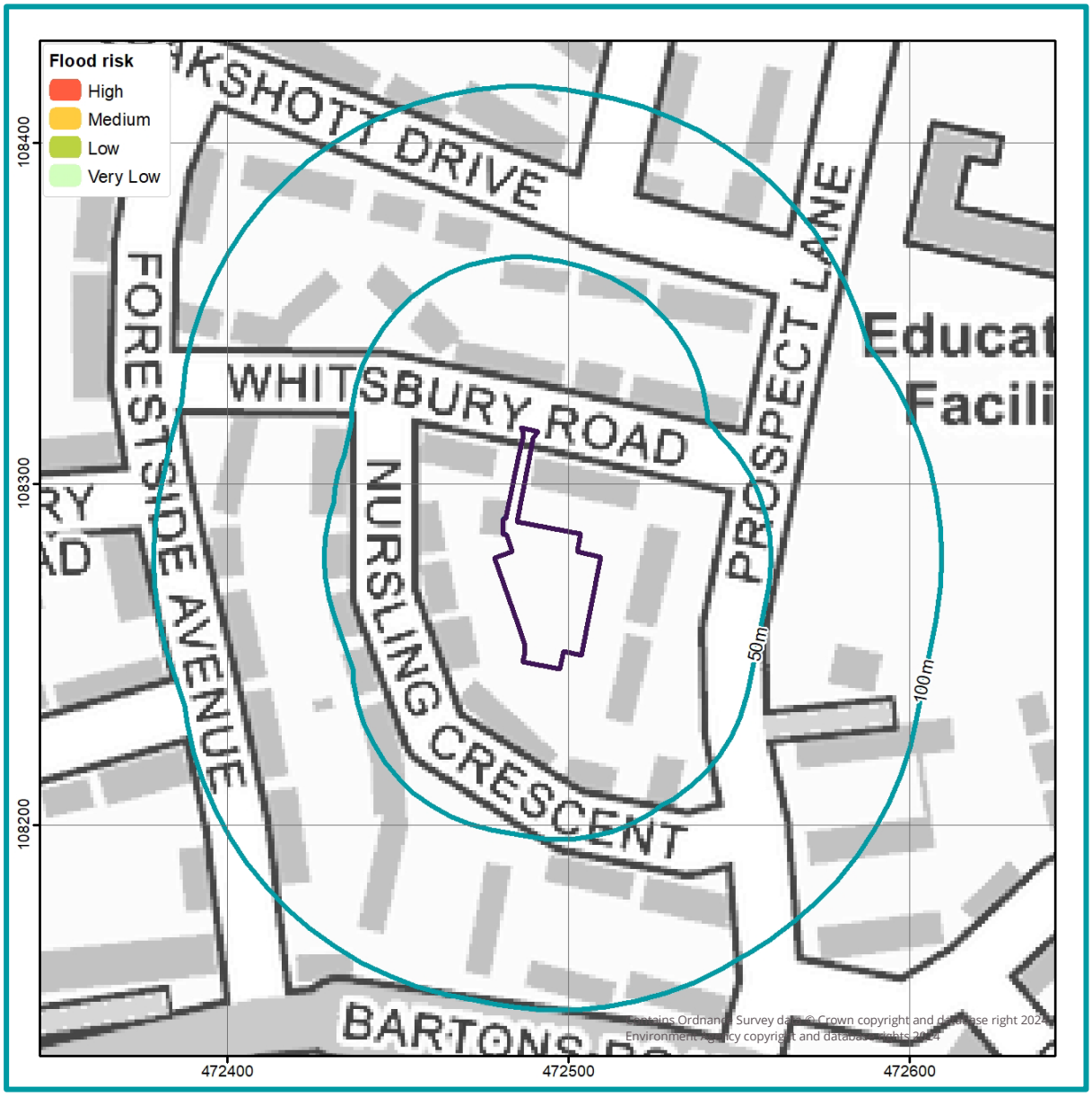
Figure 7. Sewer features map (OS, 2024; Southern Water, 2024)



The Southern Water asset plan obtained for the Site (Appendix C) indicates that there is a public surface water sewer located within the Site boundary. Due to the short distance, discharge to sewer is likely to be appropriate. As the proposed development is above the public sewer network, a build-over agreement or easement may be required with the relevant utility provider.

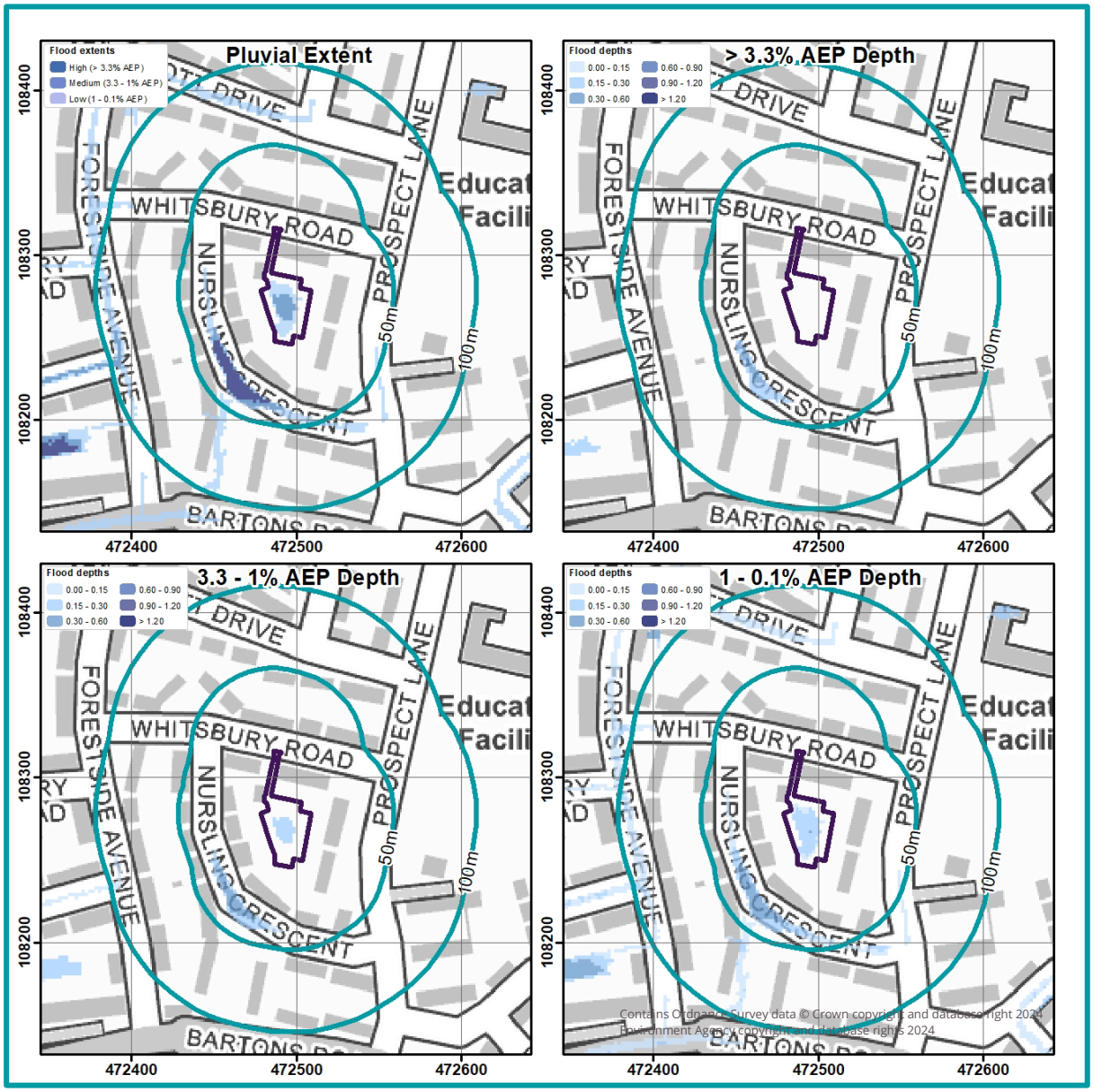
Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location, and condition of the sewer. Consultation with the drainage provider 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, 2024)



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, 2024)

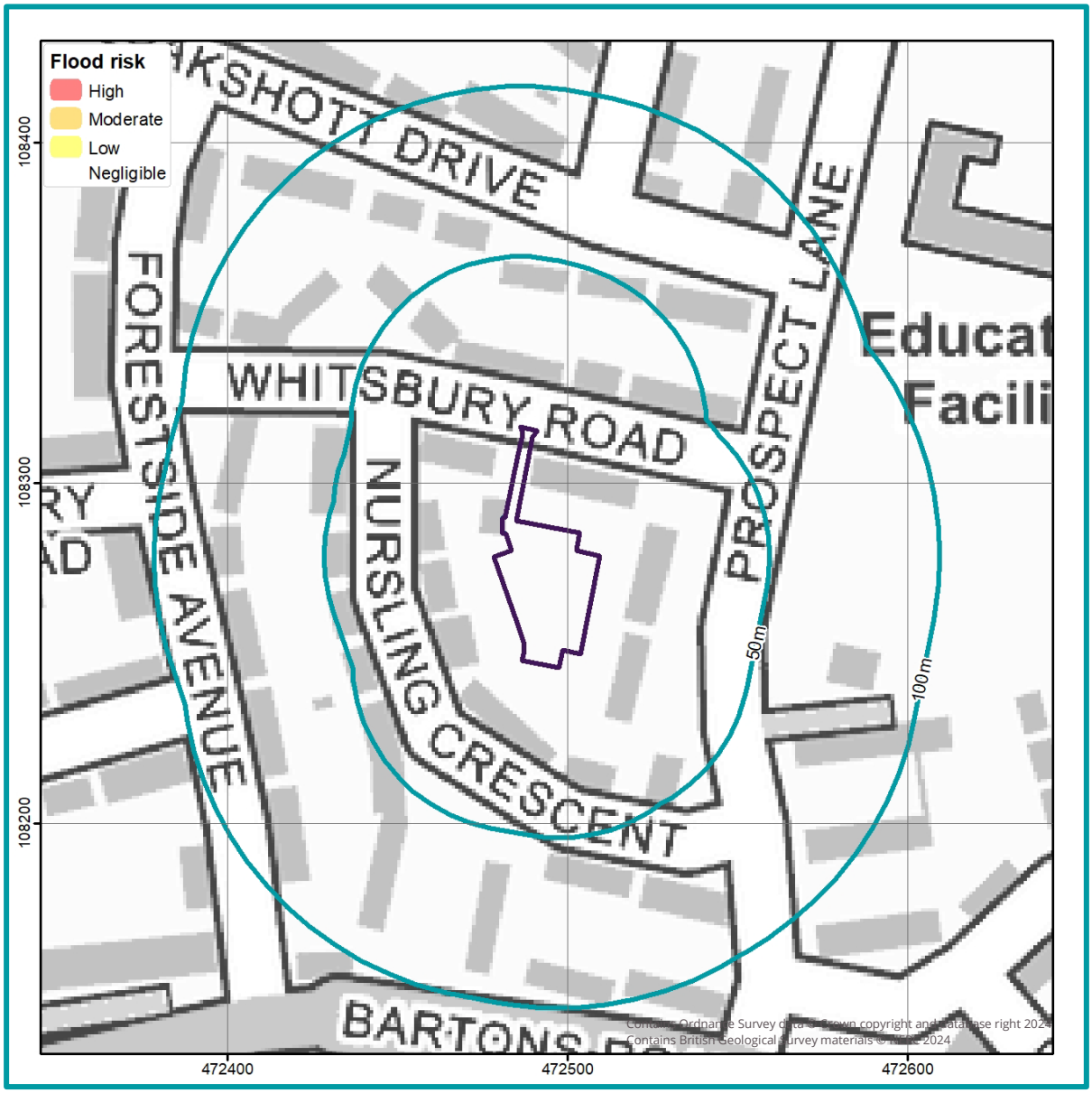


The EA's Risk of Flooding from Surface Water (RoFSW) mapping confirms the Site is considered to be at Very Low to Medium risk of surface water flooding.

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 the 1 in 100 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, 2024)



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 Adjacent to 4 Whitsbury Road, Havant, PO9 5SP (the Site). The Site is located within a setting of mixed commercial and residential use.

The land falls towards the centre of the Site from 31.25 mAOD (along the access road to the north) to 30.09 mAOD. This is based upon a Site specific topographic survey undertaken by Redline Surveys, included within Appendix A.

Development

The Site is currently brownfield land surrounded by numerous residential properties. There are two existing lock-up garage structures on-Site, located along the western and northern boundaries. Access to the Site is provided by an access road to the north, as well as a public footpath to the south west.

Development proposals comprise the demolition of the garage structures and the construction of a two-storey communal residential building with associated parking, cycle and bin storage, external children's play area, and landscaped areas. Access to the Site is to be retained as existing. Site plans are included within Appendix A of this report.

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)	No superficial deposits	N/A
Bedrock geology (Figure 12)	London Clay (LC) (clay, silt and sand)	X

The permeability of the underlying material at the Site shown within the BGS mapping is low, thus confirmation of the infiltration capacity is not considered to be required.

A review of the BGS website borehole database has confirmed that there are no nearby borehole records mapped within the same geological strata as the Site from which the underlying hydrogeological conditions can be inferred.

Figure 11. Superficial Geology (BGS, 2024)

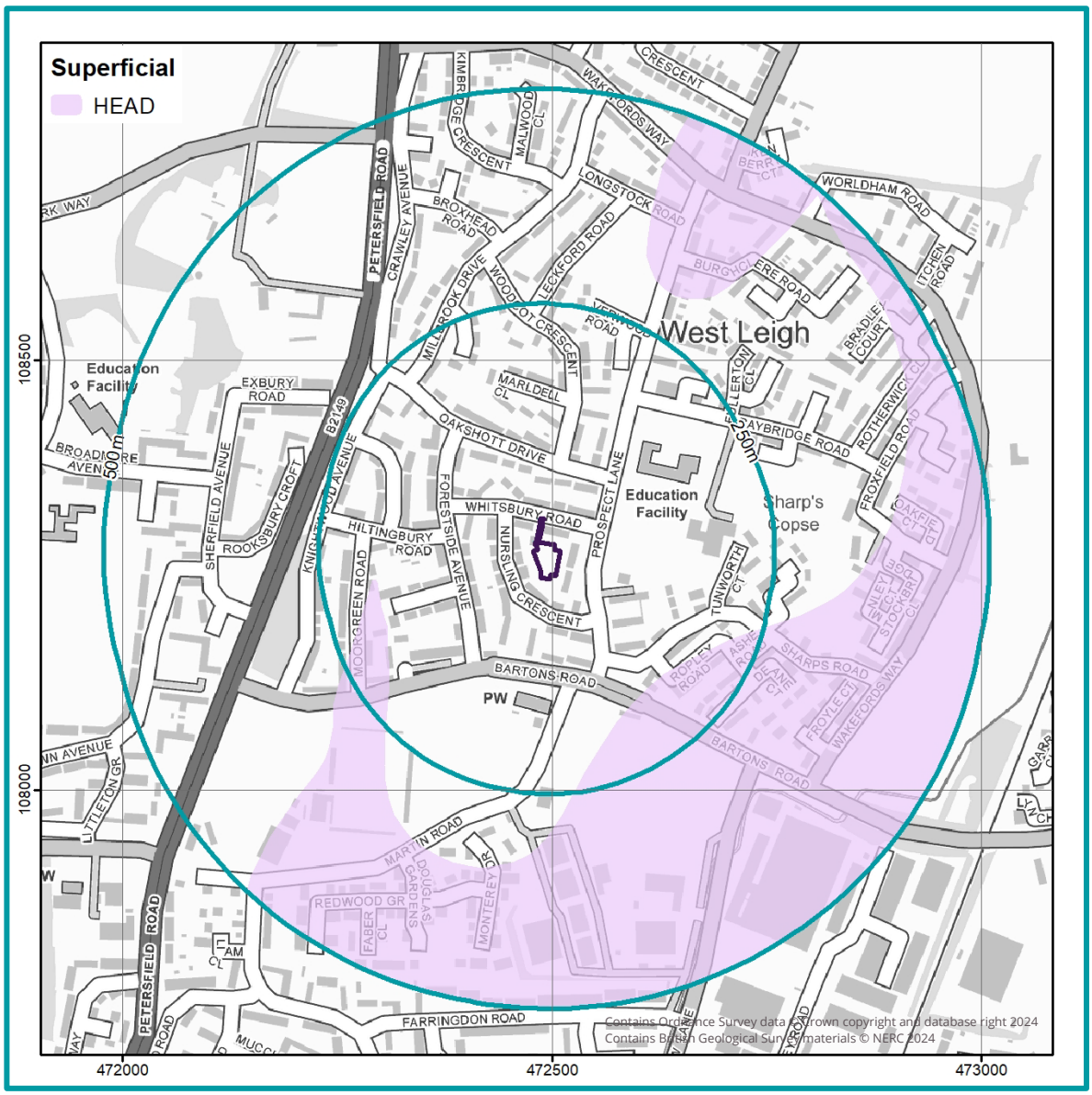
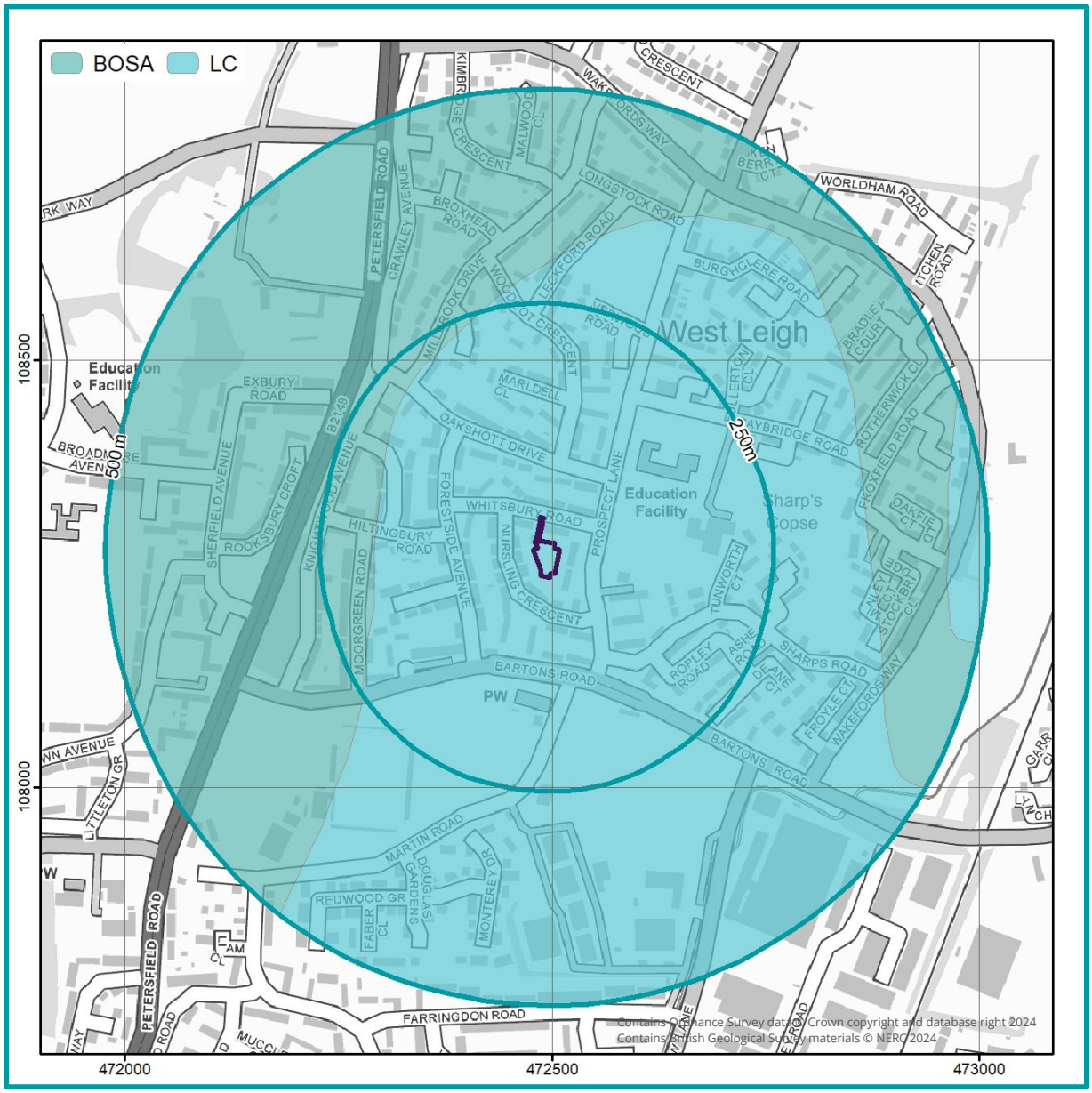


Figure 12. Bedrock Geology (BGS, 2024)



Depth to groundwater

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

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

Relevant borehole/trial pit records were not available within the vicinity of the Site.

Infiltration features are not proposed at the Site, given the anticipated low permeability of the underlying geology.

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 lies within an SPZ; however, as infiltration features are not proposed, for the purposes of the sustainable drainage assessment further consideration of the historical land uses (and any associated contamination risks) 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 (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 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event.

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

Table 4. East Hampshire Management Catchment peak rainfall allowances

East Hampshire 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%	40%	40%	45%

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

Havant Borough Core Strategy (Havant Borough Council, Adopted 2011)

Policy CS15 Flood and Coastal Erosion Risk

All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDs are provided arrangements must be put in place for their whole life management and maintenance.

6 Storage, volume and peak flow rate

Suggested minimum and aspirational storage requirements for an 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)

<table>
<tr><th colspan="2">Attenuation scenario</th><th>Attenuation required (m^3)</th><th colspan="2">Explanation</th></tr>
<tr><td rowspan="3">Discharge runoff to surface water sewer</td><td>1 in 30 year</td><td>23.45</td><td>Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 30 year (2 hour, Critical Storm Duration) event*.
Flooding of the Site of 7.76 m^3 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.</td><td rowspan="2">A further 19.19 m^3 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 45% allowance for climate change.</td></tr>
<tr><td>1 in 100 year</td><td>31.21</td><td>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*.</td></tr>
<tr><td>1 in 100 year including 45% CC</td><td>50.40</td><td colspan="2">Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (4 hour, Critical Storm Duration) event including a 45% allowance for climate change*.</td></tr>
</table>

*See Appendix B for associated runoff and discharge calculations. Discharge rates are all restricted to 1 l/s (as close to the greenfield 1 in 1 rate as possible without increasing the risk of blockages).

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	985 m^2
Impermeable area (and as a percentage of the total Site area)	
Pre-development	Post-development
985 m^2 (100%)	785 m^2 (80%)
Impermeable land use: Garage structure footprint, paved areas	New impermeable land use: Building footprint, paved areas* New permeable land use: landscaped areas

*Please note, while these areas will be utilised 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[1] (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.20	N/A	N/A	N/A
6 hour 1 in 1 year	0.17	1.21	1.03	-0.17
6 hour 1 in 10 year	0.33	1.80	1.55	-0.25
6 hour 1 in 30 year	0.45	2.30	1.98	-0.33
6 hour 1 in 100 year	0.64	2.84	2.44	-0.40
6 hour 1 in 100 year + 20% CC	N/A	N/A	2.92	0.08
6 hour 1 in 100 year + 45% CC	N/A	N/A	3.53	0.69

[1] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 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 overleaf 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	8.23	N/A	N/A	N/A
6 hour 1 in 1 year	7.81	26.04	22.34	-3.70
6 hour 1 in 10 year	12.08	38.94	33.48	-5.45
6 hour 1 in 30 year	14.92	49.73	42.66	-7.07
6 hour 1 in 100 year	18.41	61.37	52.64	-8.72
6 hour 1 in 100 year + 20% CC	N/A	N/A	63.17	1.81
6 hour 1 in 100 year + 45% CC	N/A	N/A	76.33	14.97

[2] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 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 (45%) 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^3)
1 in 30 year	1.00	2.00	23.45
1 in 100 year	1.00	2.00	31.21
1 in 100 year including a 45% climate change	1.00	4.00	50.40

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 low potential for infiltration, with anticipated low permeability underlying London Clay. As such, infiltration SuDS features are not proposed for the Site.

The nature of any possible contaminant hazards is discussed further within the Phase 1 Contaminated Land Assessment also undertaken by GeoSmart (ref: 76896). The Site is located within an SPZ, however as infiltration is not proposed, further consideration of contamination risks is not considered to be necessary.

Discharge to surface watercourse

According to OS mapping, no surface watercourse is located within 100 m of the Site. Due to the significant distance across third-party, urbanised land that pipework would have to travel to the nearest surface water feature, this would not be considered a feasible discharge method for the Site.

Discharge to sewer

A Southern Water asset location plan undertaken at the Site indicates that there is a public surface water sewer located within the Site boundaries at its closest point; therefore, discharge to sewer is likely to be appropriate.

The topographic gradient on the Site falls gradually towards the centre of the Site, where the public surface water sewer is located. As such, it would likely be possible to drain the majority of the Site under gravity to the existing sewer network.

As the proposed development is above the public sewer network, a build-over agreement or easement may be required with the relevant utility provider.

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 lie within an SPZ and therefore additional treatment stages may be 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 of 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.

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	Rainwater harvesting, green roof, lined permeable paving, and an attenuation tank.
Discharge location	Public surface water sewer network.
Discharge rate	1 l/s.

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

Rainwater Harvesting	Rainwater harvesting butts should be established for the 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.
Green Roof	A green roof covering a total area of c. 235 m^2 with a green roof mix example volume of 47 m^3 (0.2 m depth) and Geocomposite example volume of 3.53 m^3 (0.015 m depth) would attenuate for c. 8.81 m^3.
Lined Permeable Paving	A 140 m^2 area of lined permeable paving (underlain with a Type 3 aggregate material) within the proposed driveway and parking areas to a depth of 0.4 m, with a 30% porosity would result in c. 16.80 m^3 attenuation.

Attenuation Tank	An attenuation tank with a length of 6 m, width of 5 m, depth of 1 m and a void ratio of 95% would provide c. 28.50 m^3 attenuation.
Total Attenuation Provided	54.11 m^3
Total Attenuation Required	50.40 m^3
Freeboard Storage Provided	3.71 m^3

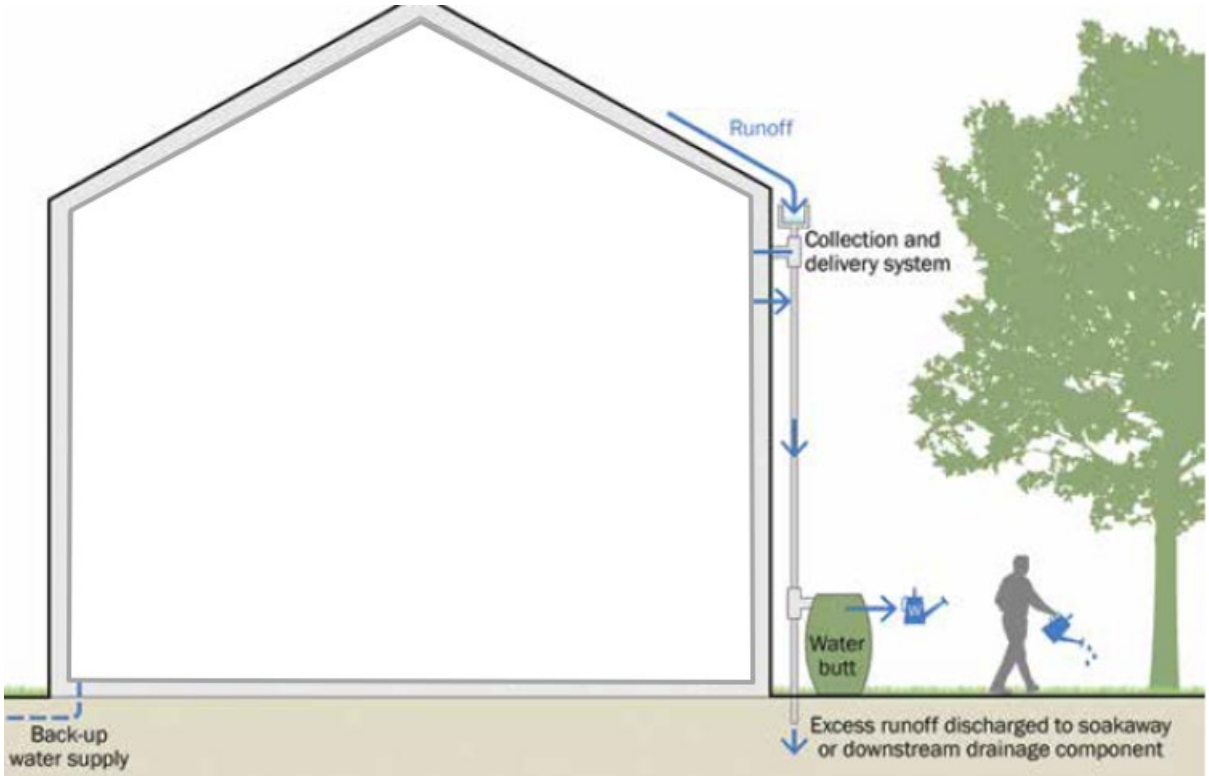
Rainwater harvesting

The run-off from the proposed development roof should be led into rainwater harvesting butts via rainwater downpipes and guttering to catch run-off. Overflow from the butts should be discharged into the storage system provided by the permeable paving and attenuation tank.

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 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 devises 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 contaminates that collect on a residential roof.



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

Green Roof

Green Roofs are proposed on the development roof space which will aim to intercept and store runoff within a porous substrate (depth of 0.2 m) over a total area of 235 m^2 would attenuate up to 8.81 m^3 of surface water runoff (green roof calculations based on calculations within best practice guidance document - London Borough of Tower Hamlets SuDS Guidance, Section 3.5).

Interception via green/brown roofs will enable the storage of run-off and infiltrate collected water gradually into the underlying substrate; this provides various levels of storage depending on the surface area of the feature and the thickness / type of the substrate being use. The different types of green roof include the following:

- Extensive roofs have low substrate depths (and therefore low loadings on the building structure), simple planting and low maintenance requirements; these tend not to be accessible.
- Intensive roofs (or roof gardens) have deeper substrates (and therefore higher loadings on the building structure) that can support a wide variety of accessible planting but which tend to require more intensive maintenance.

Green roofs can also provide improvements to water quality as they intercept water at the source, and the layering of the substrate can incorporate filtration measures to remove pollutants from the system. Green Roofs are roofs which incorporate planting, often sedum or wildflower and meadow planting, grasses and mosses. In fact, some can even be planted with trees and shrubs. Brown roofs are similar to green roofs, the main difference is that

whilst green roofs are often installed partly for the aesthetic value, brown roofs tend to be installed for environmental reasons, mainly, to encourage plants and wildlife.

In addition, although green roofs absorb most of the rainfall that they receive during frequent events, there will always be a need to discharge excess water to the building's drainage system and these areas should be positively drained. The hydraulic performance of green roofs once saturated tends to be fairly similar to standard roofs. Therefore, the hydraulic design of green roof drainage should follow the advice in BS EN 12056-3:2000. Useful information is also provided in BS 6229:2003. Detailed guidelines for the planning, execution and upkeep of green roof sites are contained within GRO (2014).

It is recommended that attenuation should be provided in the form of a high porosity substrate underlying the growing medium (approximately 50% depending on the supplier), which would provide sufficient storage (depending on loading requirements of a fully saturated substrate). It is likely that the high porosity medium would only have to be relatively thin in order to achieve the attenuation requirements. Surface water would then be throttled to a suitable rate at a downpipe entrance before discharging to the surface water sewer system.

Permeable paving

Permeable Paving is proposed for driveway and parking 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.

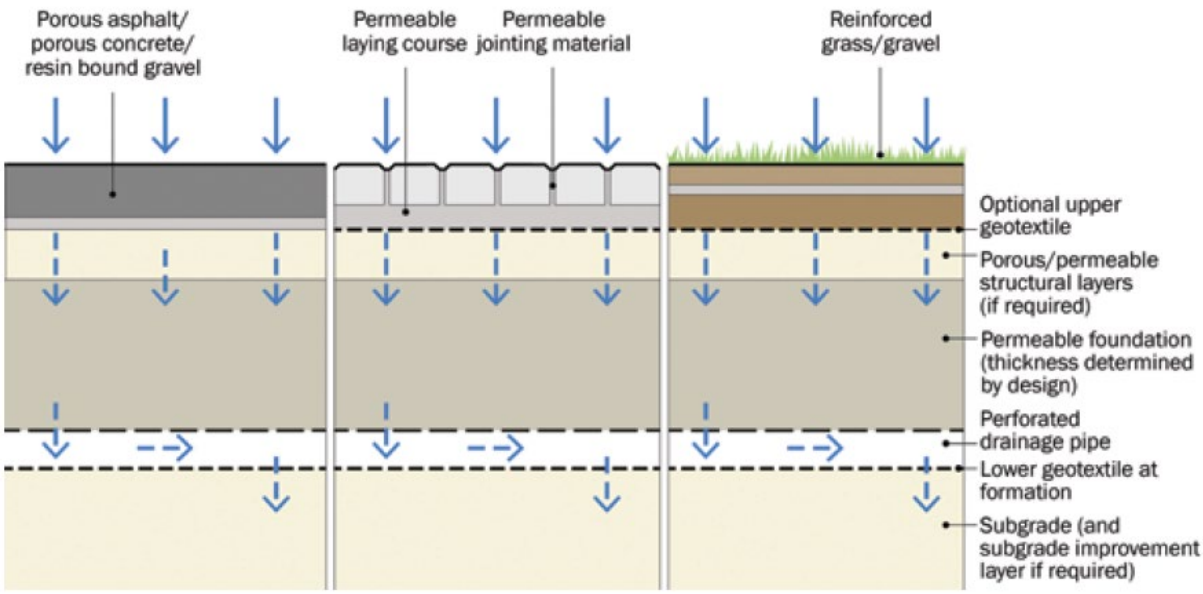


Figure 20.13 of the CIRIA SuDS Manual (C753) (2015)

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^3 there is 0.95 m^3 of space available for water storage), which has been factored into the storage capacity calculations.

Attenuation Tanks

Attenuation tanks provide a below-ground void space for use of temporary storage via controlled release. They can also be modified to suit specific characteristics of a site. DEFRA, 2015 states that the run-off volume from the development to drain to any sewer of surface water body in the 1 in 100 year rainfall event must be constrained to a value as close as is reasonably practical to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development prior to redevelopment from the Site. Issues with attenuation tanks are the level of accessibility, lack of treatment performance and cost in comparison to surface systems.

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 landscaped areas. The SuDS system recommended for the Site should provide enough storage that this method would only be utilised during a worst case scenario.

Foul drainage strategy

The foul water from the proposed development should be drained as sustainably as possible for the lifetime of the proposed development. Foul water discharge must also demonstrate compliance with the established drainage hierarchy. The national Planning Practice Guidance and Building Regulations Approved Document H provide a hierarchy of drainage options that must be considered and discounted in the following order:

- Connection to the public sewer;
- Package sewage treatment plant (which can be offered to the Sewerage Undertaker for adoption);
- Septic tank;
- If none of the above are feasible, a cesspool.

Proposed drainage regime

Development proposals comprise demolition of the existing lock-up garage structures, and the construction of a new residential building, as well as associated areas of soft and hard landscaping and car parking and bicycle storage areas.

It is proposed that the foul effluent produced by the development is discharged to the public foul sewer network, which is located within the Site boundary at its closest point.

Proposed drainage volumes

The estimated volume of foul water produced by the proposed development has been calculated using the British Water guidance 'Flows and Loads 4', utilising the following:

Residential development (comprised of dwellings):

- 3 x 1 bed rooms: 3 persons (P) per dwelling for a total of 9P
- 6 x 2 bed rooms: 4P per dwelling for a total of 24P

The total population equals 33 persons and so in accordance with Flows and Loads 4 a reduction factor of 0.8 has been applied. This gives a total population of 27P with an estimated usage of 150 litres per person, per day, equivalent to 4,050 litres (or 4.05 m^3) per day.

Confirmation of the sewer capacity and permission to connect will be required from the foul sewer network agency (Southern Water).

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).
Green Roof	Regular inspection: • Inspect all components (soil substrate, vegetation, drainage, irrigation systems, membranes and roof structure, waterproofing, structural stability (annually and after severe storms)

Asset type	Maintenance schedule (and frequency)
	• Inspect soil substrate for evidence of erosion channels (annually and after severe storms). • Inspect drain inlets for unrestricted run-off (annually and after severe storms). • Inspect underside of roof for leakage (annually and after severe storms). Regular maintenance: • Remove litter and debris from inlet drains (six monthly, annually or as required). • Cleaning of clippings (six monthly or as required). • Trimming of grasses and removal of nuisance weeds and invasive vegetation (six monthly or as required). • Replace dead plants (annually or as required). Monitoring: • Stabilise any erosion channels with extra soil substrate (as required). • Identify sources of erosion and control (as required). Investigate and repair drain inlet if inlet has settled, cracked or moved (as required).
Rainwater Harvesting	Regular maintenance: • Inspection of tank for debris and sediment build up (annually and following poor performance). • Inspection of inlets, outlets, overflow areas, pumps and filters (annually and following poor performance). • Cleaning of tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required). Remedial actions: • Repair or overflow erosion damage or damage to tank and associated components (as required)
Attenuation Tanks	Regular maintenance: • Remove litter and debris from inlets and outlets (monthly). • Trimming any roots and surrounding grass blockages (as required). Monitoring: • 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, 2023). 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.

14 References and glossary

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Ministry of Housing, Communities & Local Government. (2022). National Planning Policy Guidance (NPPG).

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.

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Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2024) Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
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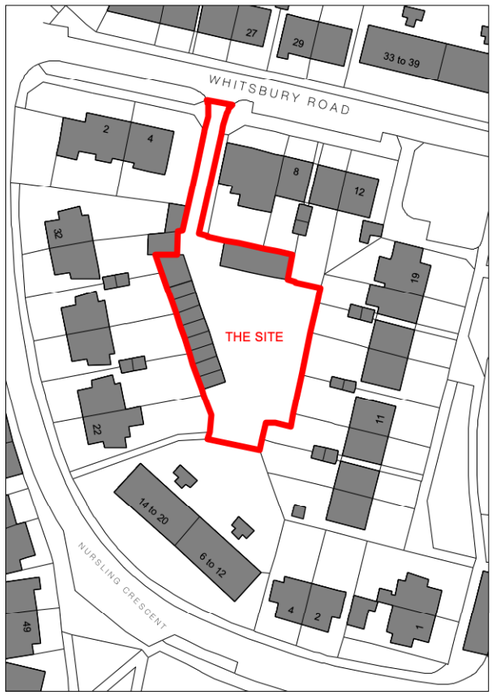
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2024 Environment Agency copyright and database rights 2024

15 Appendices

Appendix A

Site plans



LOCATION PLAN
SCALE 1:1250 @ A3

N

0 10 20 40m

BLOCK PLAN
SCALE 1:500 @ A3

0 2 4 6 8 10 20m

N

Outline of existing garages to be demolished

Outline of existing buttresses to be demolished

Outline of proposed building, bike & bins

MARLOW ARCHITECTS

REV_B_2024.04.10 TREES REMOVED
REV_C_2024.09.23 SUB STATION RETAINED AS EXISTING

LOCATION & BLOCK PLAN | SCALE AS SHOWN @ A3 | **2304 01C** | **WHITSBURY ROAD, HAVANT**

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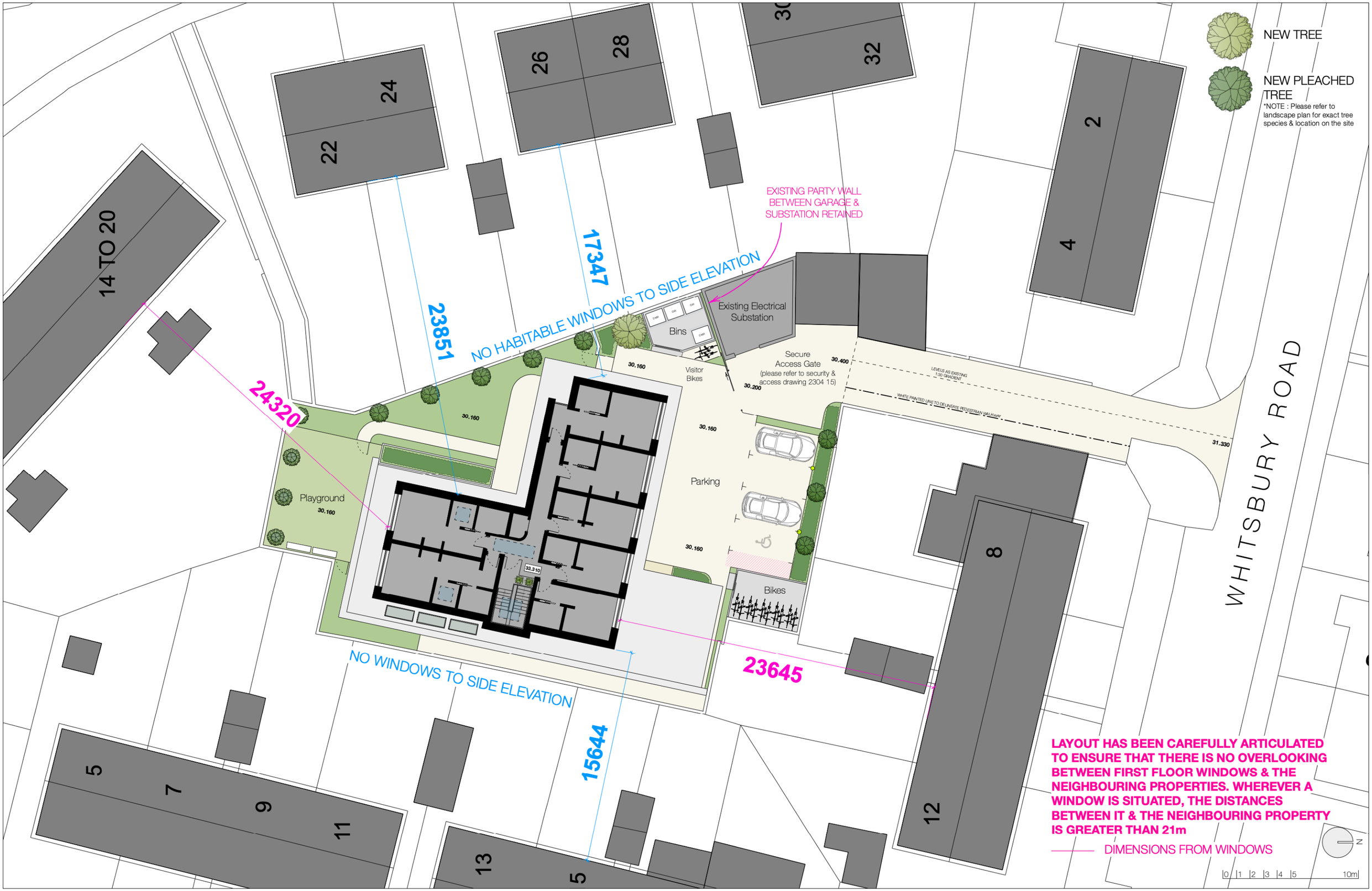

MARLOW ARCHITECTS

REV_D_2024.09.05 BIN DOOR 1.8m
REV_E_2024.09.23 NOTES UPDATED

PROPOSED SITE PLAN - SHOWING FIRST FLOOR PLAN | SCALE 1:250 @ A3 | **2304 02E** | **WHITSBURY ROAD, HAVANT**

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OG : OBSCURE GLAZING
AOV : AUTOMATIC OPENING VENT / WINDOW

0 1 2 3 4 5 10m

MARLOW ARCHITECTS

REV_A_2024.05.09 AOV ROOFLIGHT ADDED
REV_B_2024.09.23 FFL LEVEL ADDED

PROPOSED FIRST FLOOR PLAN | 1:100 @ A3 | **2304 04B** | **WHITSBURY ROAD, HAVANT**

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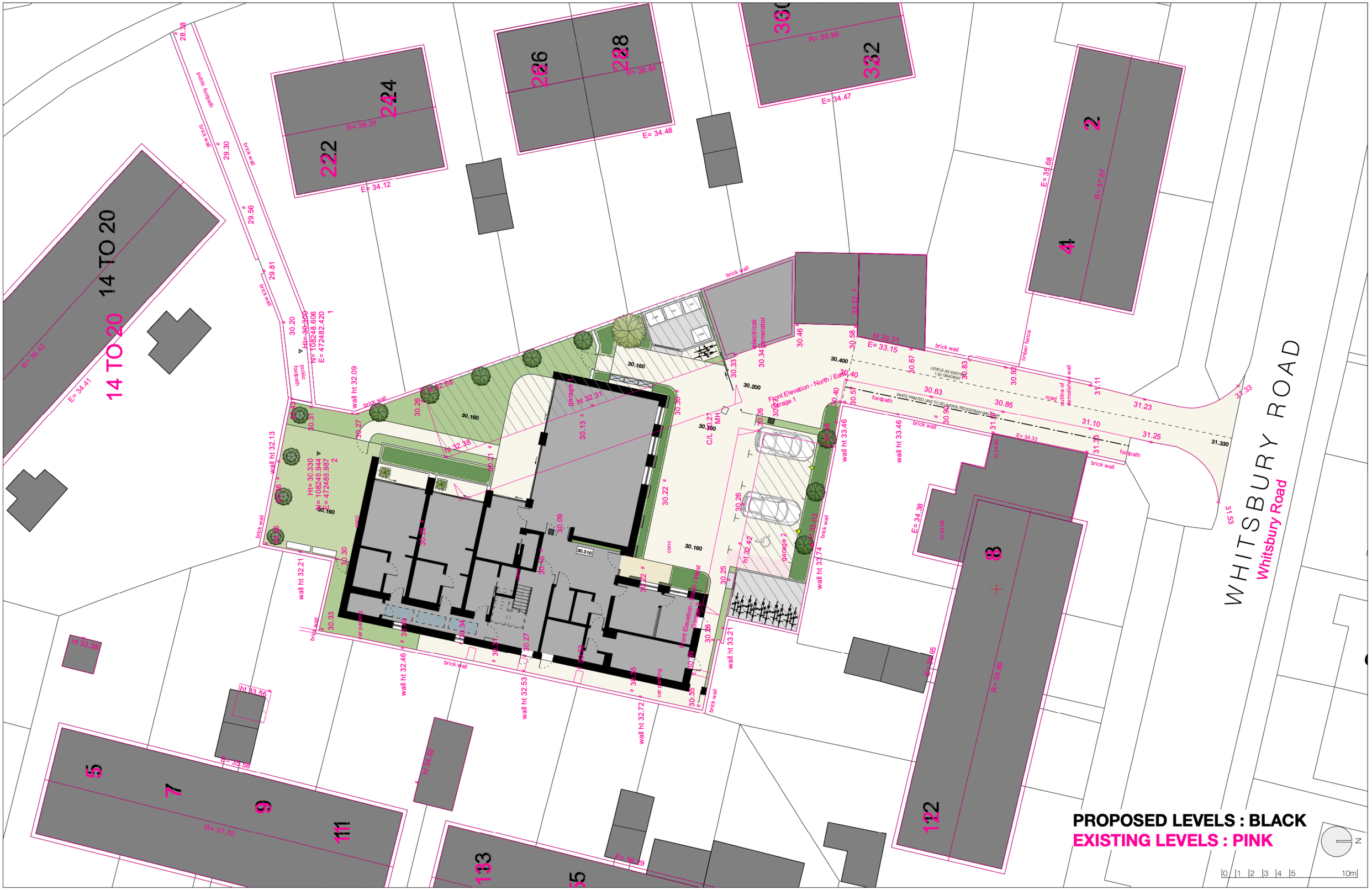

MARLOW ARCHITECTS

PROPOSED SITE PLAN - SHOWING LEVELS PROPOSED & EXISTING | SCALE 1:250 @ A3 | **2304 19** | **WHITSBURY ROAD, HAVANT**

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MARLOW ARCHITECTS

REV_B_2024.05.09 SITE PLAN UPDATED
REV_C_2024.09.23 FFL LEVEL ADDED

PROPOSED GROUND FLOOR PLAN | 1:100 @ A3 | **2304 03B** | **WHITSBURY ROAD, HAVANT**

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OG : OBSCURE GLAZING
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0 1 2 3 4 5 10m

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REV_A_2024.05.09 AOV ROOFLIGHT ADDED

PROPOSED ROOF PLAN | 1:100 @ A3 | **2304 05A** | **WHITSBURY ROAD, HAVANT**

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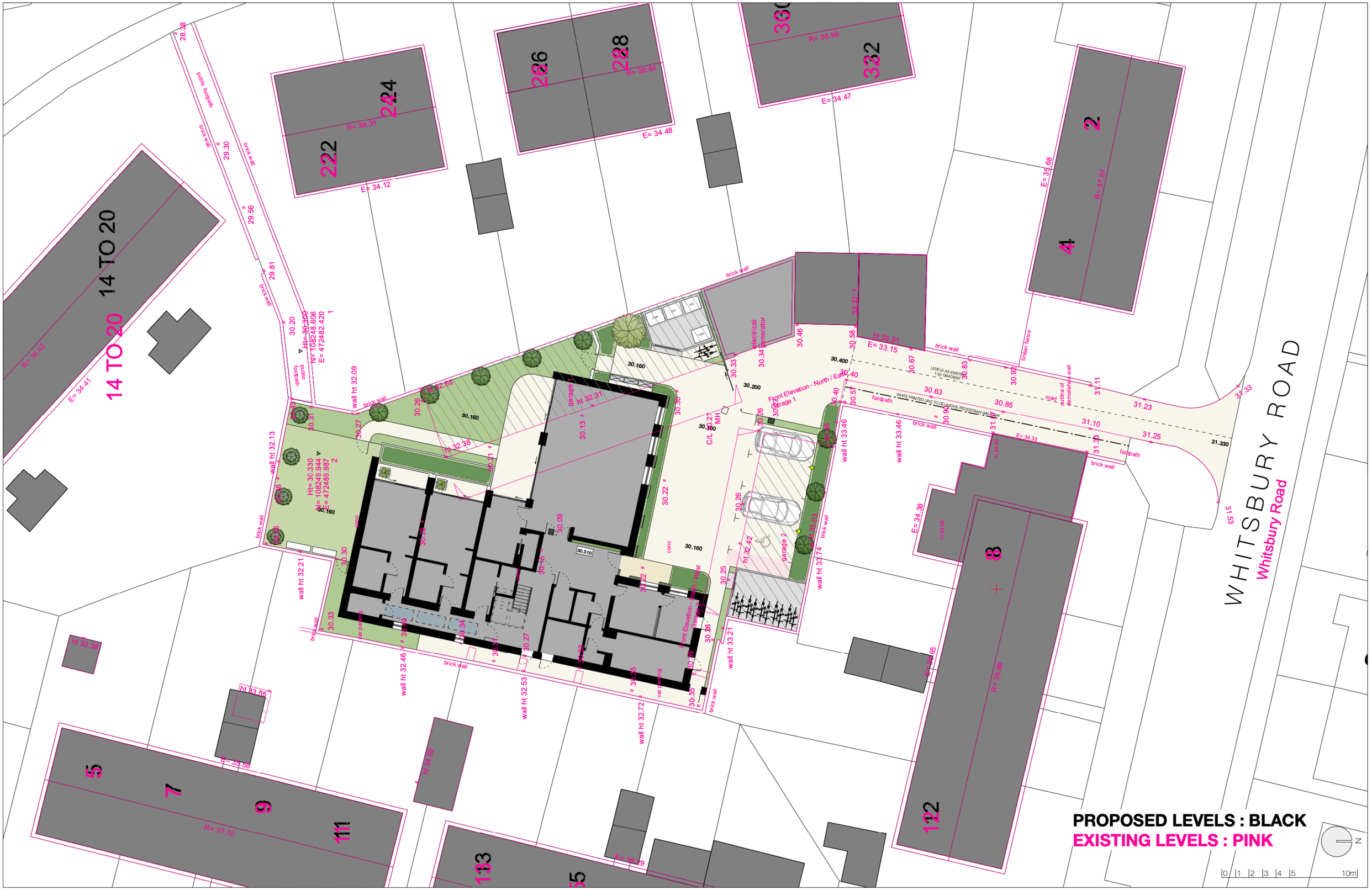

MARLOW ARCHITECTS

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GeoSmart Information

Appendix B

Rainfall runoff calculations

Input parameters for run-off calculations		
Country	England	
Total site area	985	m^2
Area proposed for development	985	m^2
Current permeable ground cover	0	m^2
Current impermeable ground cover	985	m^2
Proposed permeable ground cover	200	m^2
Proposed impermeable ground cover	785	m^2
Urban Creep Allowance	0%	
Final impermeable ground cover	785	m^2
SPR	0.3	
SAAR	772	mm
Region	7	
Climate change factor	45%	
Discharge Rate (l/s)	1.0	
Run-off coefficient	100%	

Current impermeable area as % of total	100%
Proposed impermeable area as % of total	80%
Change in permeable area (m2)	200
Change in impermeable area (m2)	-200
Change in impermeable area as % of total	-20%

Rainfall event	Greenfield run-off rates (l/s)	Existing run-off rates (l/s)	Potential run-off rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.20	N/A	N/A	N/A
6 hour 1 in 1 year	0.17	1.21	1.03	-0.17
6 hour 1 in 10 year	0.33	1.80	1.55	-0.25
6 hour 1 in 30 year	0.45	2.30	1.98	-0.33
6 hour 1 in 100 year	0.64	2.84	2.44	-0.40
6 hour 1 in 100 year + 20% CC	N/A	N/A	2.92	0.08
6 hour 1 in 100 year + 45% CC	N/A	N/A	3.53	0.69

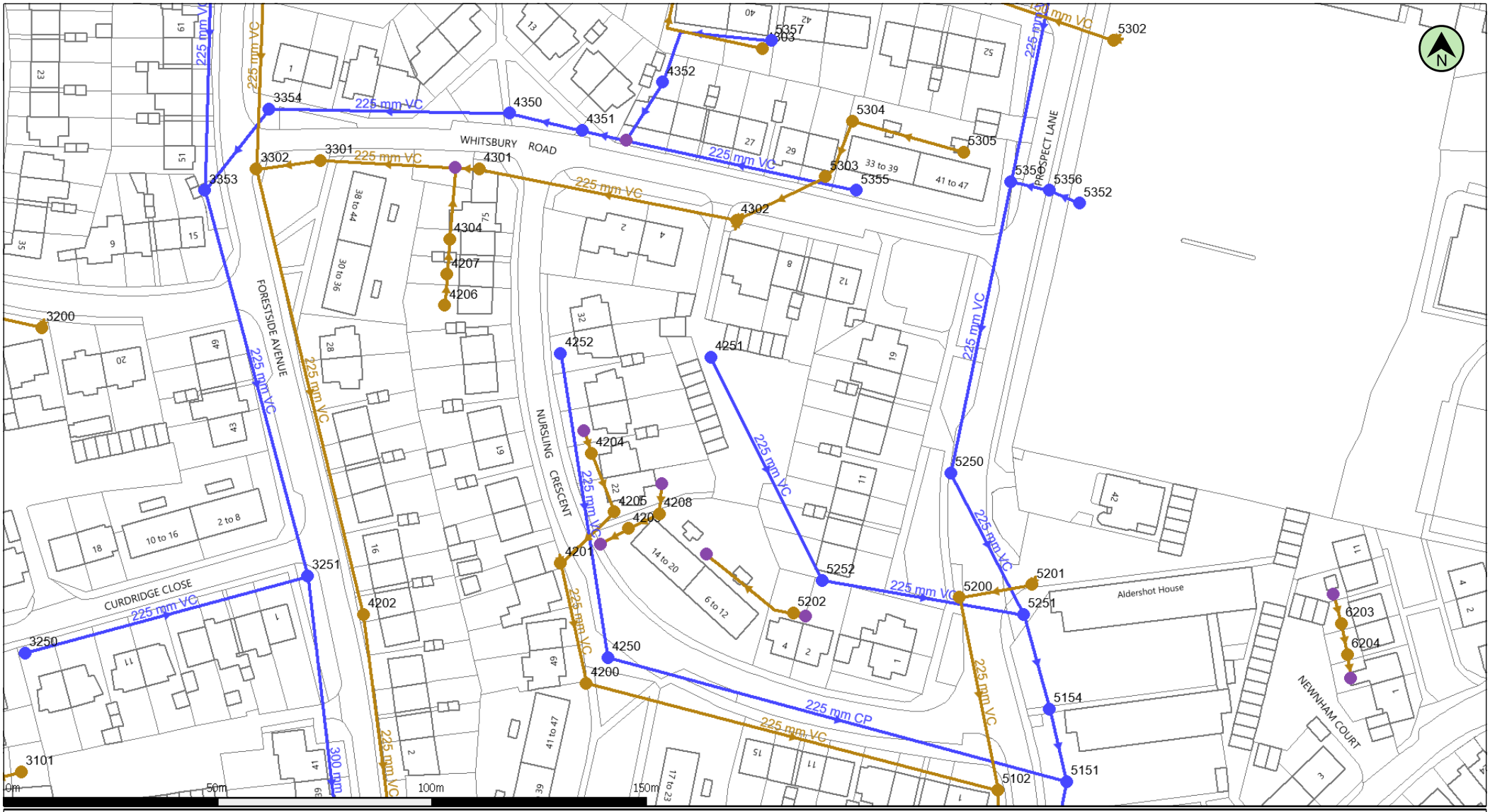
Rainfall event	Greenfield run-off volume (m^3)	Existing run-off volume (m^3)	Potential run-off volume without attenuation (m^3)	Potential minus existing (m^3)
QBAR	8.23	N/A	N/A	N/A
6 hour 1 in 1 year	7.81	26.04	22.34	-3.70
6 hour 1 in 10 year	12.08	38.94	33.48	-5.45
6 hour 1 in 30 year	14.92	49.73	42.66	-7.07
6 hour 1 in 100 year	18.41	61.37	52.64	-8.72
6 hour 1 in 100 year + 20% CC	N/A	N/A	63.17	1.81
6 hour 1 in 100 year + 45% CC	N/A	N/A	76.33	14.97

Return Period	Runoff rate restriction (l/s)	Critical Storm Duration (hr)	Attenuation Volume Required (m^3)	Volume required above previous return period
1 in 30 year	1.00	2	23.45	N/A
6 hour 1 in 100 year	1.00	2	31.21	7.76
6 hour 1 in 100 year + 45% CC	1.00	4	50.40	19.19

GeoSmart Information

Appendix C

Southern Water Asset Location Plan



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Date: 23/11/23 | Scale: 1:1250 | Map Centre: 472494,108269 | Data updated: 21/11/23 | Our Ref: 1328673 - 1 | Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
WWTW Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

davidsouth@geosmartinfo.co.uk

76896

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
3101	F	0.00	0.00	-
3200	F	27.09	25.15	-
3301	F	28.33	26.30	-
3302	F	27.95	26.01	-
4200	F	28.09	26.20	-
4201	F	28.56	26.57	-
4202	F	26.30	24.25	-
4203	F	0.00	0.00	-
4204	F	0.00	0.00	-
4205	F	0.00	0.00	-
4206	F	0.00	0.00	-
4207	F	0.00	0.00	-
4208	F	0.00	0.00	-
4301	F	29.21	27.09	-
4302	F	31.68	30.10	-
4303	F	0.00	0.00	-
4304	F	0.00	0.00	-
5102	F	28.86	25.60	-
5200	F	30.34	27.14	-
5201	F	30.06	27.46	-
5202	F	0.00	0.00	-
5302	F	34.88	32.92	-
5303	F	0.00	0.00	-
5304	F	0.00	0.00	-
5305	F	0.00	0.00	-
6203	F	0.00	0.00	-
6204	F	0.00	0.00	-
3250	S	25.36	24.16	-
3251	S	26.20	0.00	-
3353	S	28.05	26.50	-
3354	S	28.28	26.82	-
4250	S	28.41	26.80	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4251	S	30.26	29.01	-
4252	S	30.00	28.20	-
4350	S	29.53	27.42	-
4351	S	30.38	28.48	-
4352	S	0.00	0.00	-
5151	S	25.38	22.85	-
5154	S	25.74	23.41	-
5250	S	27.57	25.24	-
5251	S	26.35	24.03	-
5252	S	27.21	24.82	-
5351	S	29.95	27.39	-
5352	S	30.29	28.19	-
5355	S	29.27	27.46	-
5356	S	30.04	27.65	-
5357	S	0.00	0.00	-

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GeoSmart Information

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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GeoSmart Information

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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

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- 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.

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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

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