

**FLOOD RISK ASSESSMENT & SuDS REPORT FOR 44-
46 HAMPSTEAD LANE, LONDON,
N6 4LL**

DOCUMENT NUMBER: C2823-R1-REV-A

PREPARED BY



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1. SITE DETAILS

Site Name	44-46 Hampstead Lane
Site Address	44-46 Hampstead Lane, London, N6 4LL
Purpose of Development	Care Home
Existing Land Use	Residential
OS NGR	527093E, 187635N
County	Greater London
Country	England
Local Planning Authority	London Borough of Haringey

1.1. Site Location

The location of the project site is shown in Figure 1 below.

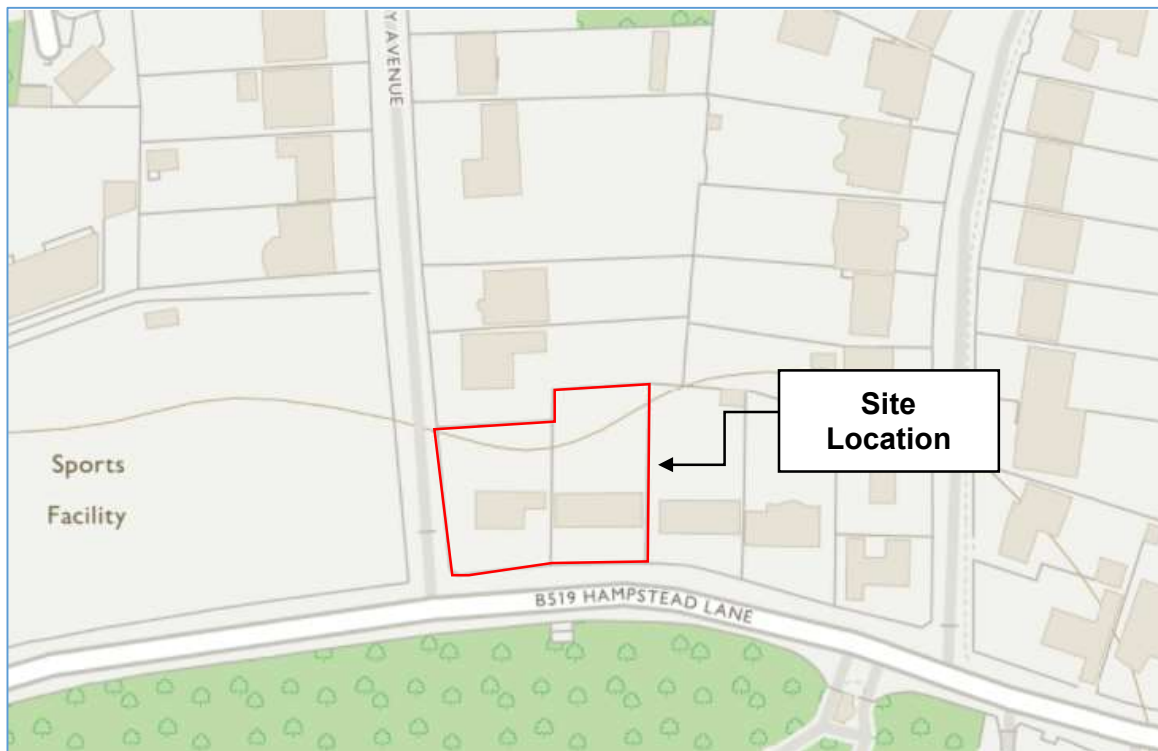


Figure 1- Location of Project Site (Source: OS Opendata).

1.2. Existing Site Description and Topography

The existing site is shown on the topographical survey drawing, included in Appendix A, and this shows the levels fall from the south to the north of the site by approximately 4 to 5 metres.

We have also provided a 'Pre-development Impermeable Area Exceedance Route Plan', drawing number C2823-01, provided in Appendix A.

1.3. Geology of The Area

According to the British geological survey, there was no superficial deposit information available for the site, as shown in Figure 2 below. The bedrock at the area is part of the Bagshot Formation; consisting of sand, as shown in Figure 3 overleaf.

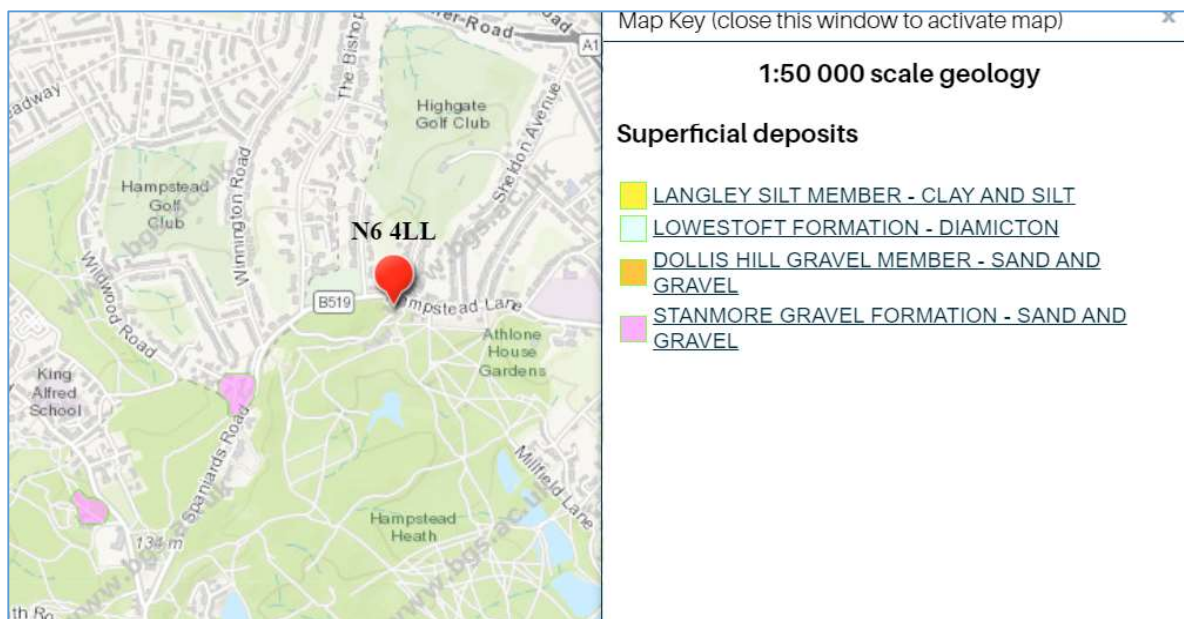


Figure 2 - Superficial Deposits at the site. (Source: British Geological Survey website (contains British Geological Survey materials © NERC2022)).

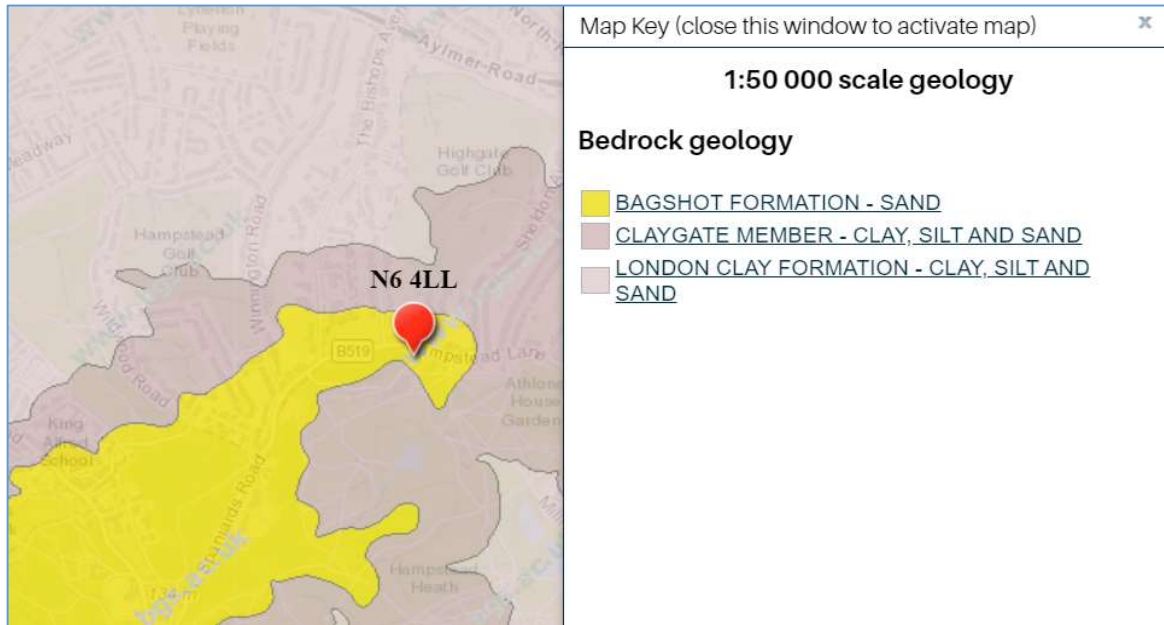


Figure 3 - Bedrock at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2022)).

In order to ascertain the possibility of infiltration, we have consulted historic boreholes in the vicinity of the site, as shown in figure 4 overleaf and the borehole logs are provided in Appendix B. These borehole logs show that although the underlying bedrock is shown to be of Bagshot sand, this is in fact, silty sand with a high content of clay, and therefore infiltration will not be feasible at this site.

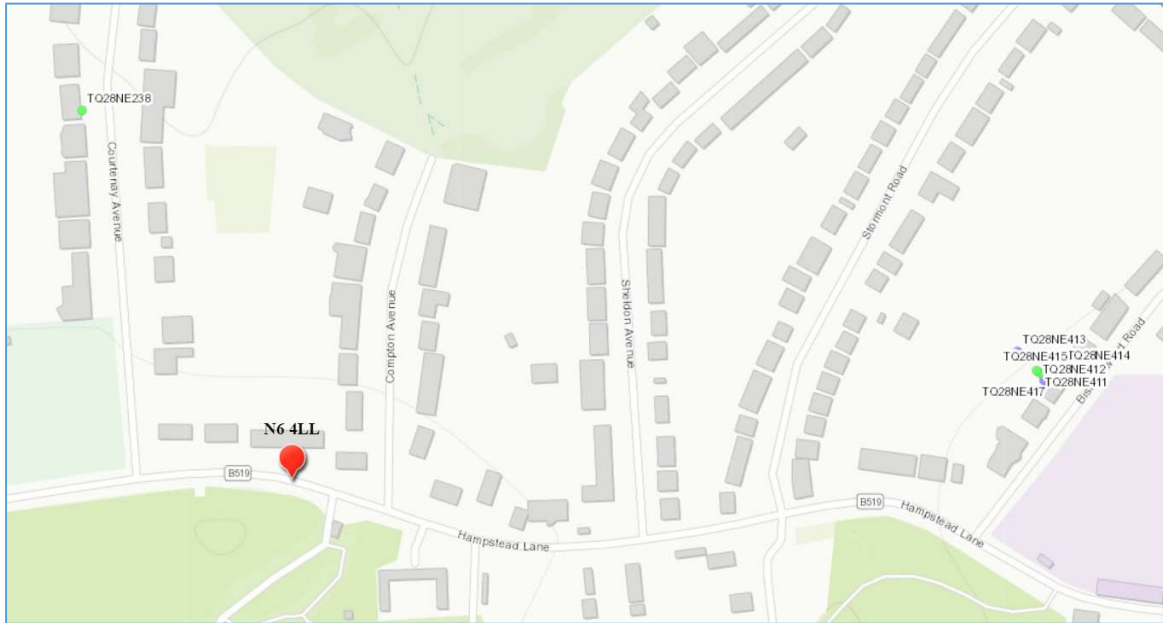


Figure 4 - Bedrock at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2022)).

1.4. Proposed Development

The proposals involve demolition of the existing two buildings at the site, and the construction of a care home with associated facilities, car parking and landscaping. The proposed site plans, and a 'Post Development Impermeable Area and Exceedance Route plan', drawing number C2823-02, can be found in Appendix A.

2. PLANNING POLICIES

2.1. National Planning Policy

- NPPF's technical guidance states:

“The effect of development is generally to reduce the permeability of at least part of the site. This markedly changes the Site's response to rainfall. Without specific measures, the volume of water that runs off the site and the peak run-off flow rate is likely to increase. Inadequate surface water drainage arrangements in new development can threaten the development itself and increase the risk of flooding others”.

- Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance
- CIRIA SUDS manual (C753)

2.2. Local Planning Policy

This report has been written in conjunction with the following local planning policies:

- Surface Water Management Plan for London Borough of Haringey;

- SFRA Level 1 and 2 for London Borough of Haringey;
- Defra/EA Rainfall Runoff Management for new Developments science report, Revision E
- The London Plan, Policy SI. 12, which states:
 - A Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.
 - B Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.
 - C Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

- D Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.
- E Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.
- F Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.
- G Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

- The London Plan, Policy SI 13 Sustainable drainage, which states:
 - A Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.
 - B Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:
 - 1) Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
 - 2) Rainwater infiltration to ground at or close to source
 - 3) Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
 - 4) Rainwater discharge direct to a watercourse (unless not appropriate)
 - 5) Controlled rainwater discharge to a surface water sewer or drain

6) Controlled rainwater discharge to a combined sewer.

- C Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.
- D Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

3. FLOOD RISK

The possible causes of flooding set out in NPPF are considered in this section in relation to flood risk to the site itself and the effects of the development of the site on the flood risk elsewhere.

3.1. Flood Zones

The Environment Agency has developed a flood risk map which shows the relative risk of flooding for different return periods. Flood zones assume that no defences are present and so where these do exist, they are only indicative of the potential for flooding.

The development lies within flood zone 1 of the Environment Agency's Flood risk map, as shown in Figure 5 overleaf. Land located within flood zone 1 is at low risk of flooding, having an associated annual probability of less 1 in 1000.

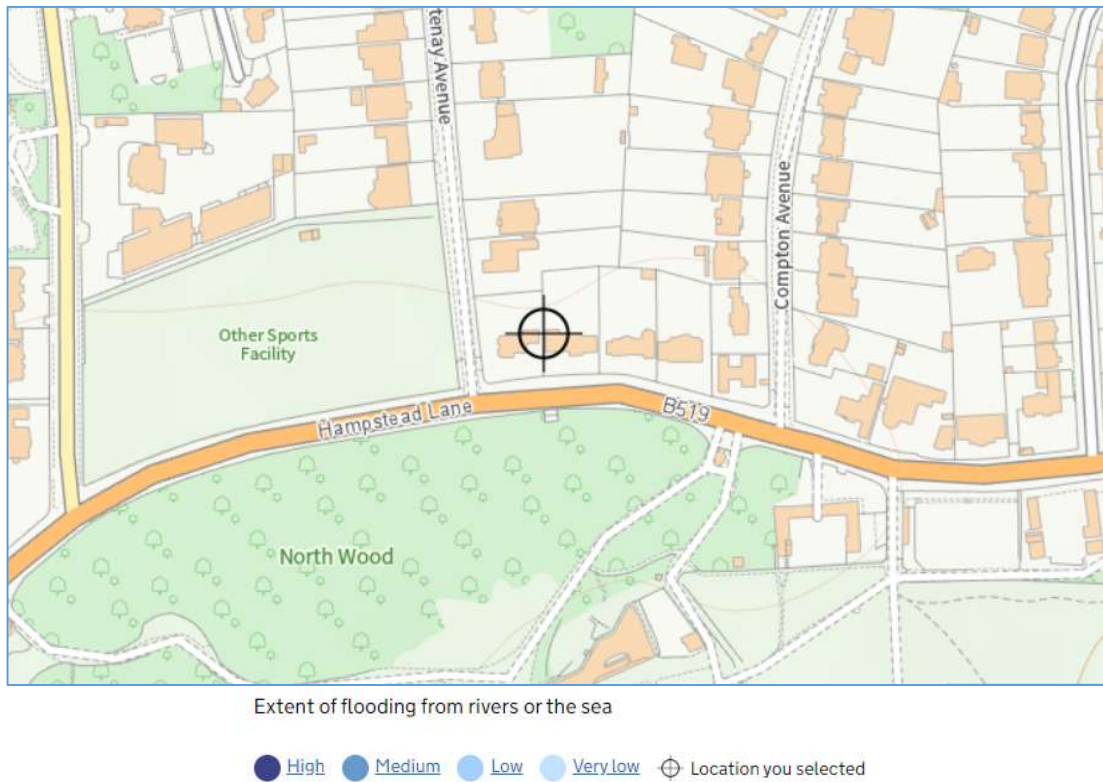


Figure 5 – Environment Agency Flood Map for flooding extent from rivers and sea for the proposed development.

As seen, the site is located within Flood zone 1, and in accordance with Table 1 from the NPPF's technical guidance, land within Flood zone 1 is suitable for any use.

Assessment of this site has been based upon the Environment Agency's flood map, the topographical site survey, and the architect's proposed development layout.

Table 1: NPPF Flood Zone Guidance

Flood Zone Classification	Definition of Zone	Appropriate uses	FRA Requirements	Policy Aims
Zone 1 Low Probability	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (0.1%<).	All uses of land are appropriate in this zone.	For development proposals on sites compromising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through addition of hard surfaces and the effect of new development on surface water run-off should be incorporated in a FRA. This need only be brief unless the factors above or other considerations require particular attention. See Annex E for minimum requirements.	In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of development, and the appropriate application sustainable drainage techniques.
Zone 2 Medium Probability	This zone comprises land assessed as having between a 1 in 1000 annual probability	The water-compatible less vulnerable and more vulnerable uses of land and essential infrastructure in	All development proposals should be accompanied by a	In this zone developers and local authorities should seek opportunities to reduce the overall level of flood risk in the

Flood Zone Classification	Definition of Zone	Appropriate uses	FRA Requirements	Policy Aims
	of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year	Table D 2 are appropriate in this zone. Infrastructure in Table D.2 are appropriate in this zone. Subject to the sequential Test being applied the highly vulnerable uses in Table D.2 are only appropriate in this zone if the exception Test (see para. D.9) is passed.	FRA. See Annex E for minimum requirements.	area through the layout of form and development, and the appropriate application of sustainable drainage techniques.
Zone 3a High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 greater annual probability of flooding from sea (>0.5%) in any year.	The water compatible and less vulnerable uses of land in Table D.2 are appropriate in this Zone. The highly vulnerable uses in Table D.2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in D.2 should only be permitted in this zone if the Exception Test (see para.	All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.	In this zone, developers and local authorities should seek opportunities to: i. reduce the overall level of flood risk in the area through the layout and form of the development and appropriate application of sustainable drainage techniques. ii. relocate existing development to land in zones with a lower probability of flooding; and iii. create space for flooding to occur by restoring functional

Flood Zone Classification	Definition of Zone	Appropriate uses	FRA Requirements	Policy Aims
		D.9) is passed Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.		floodplain and flood pathways and by identifying, allocating and safeguarding open space for flood storage.
Zone 3b The Functional Floor Plan	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual	Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted on this zone. It should be designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows; and • not increase flood risk elsewhere • Essential infrastructure in this zone should pass the Exception Test.	All development proposals in this zone should be accompanied by an FRA. See Annex E for minimum requirements.	In this zone, developers and local authorities should seek opportunities to: - reduce the overall level of flood risk area through the layout and form of the development and appropriate application of sustainable drainage techniques; and - relocate existing development to land with a lower probability of flooding.

Flood Zone Classification	Definition of Zone	Appropriate uses	FRA Requirements	Policy Aims
	probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood should provide a starting point for consideration and discussions to identify the functional floodplain.			

3.2. Flood Vulnerability

Table 2 below, which has been extracted from NPPF's technical guidance, highlights the flood risk vulnerability of various developments. This information is based partly on DEFRA/Environment Agency research and 'Flood Risks to People' (FD2321/Tr2) and also on the need of some uses to keep functioning during flooding.

Buildings that combine a mixture of uses should be places into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

The impact of a flood on a particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and risk mitigation measures needed ensure the development is may differ between uses within a particular vulnerability classification.

Table 2: NPPF's Flood Risk Vulnerability Classification

Essential Infrastructure	Essential transport infrastructure and strategic utility infrastructure, including electricity generating stations and grinds and primary substations.
Highly Vulnerable	- Police, Ambulance and Fire stations and command centres, and telecommunications installations and emergency disposal points. - Basement Dwellings, caravans, mobile homes and park homes intended for permanent residential use. - Installations requiring hazardous substance consent.
More Vulnerable	- Hospitals, residential institutions such as care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling house, student halls of residence, drinking establishments, nightclubs, hotels and sites used for holiday or short-let caravans and camping.

	• Non-residential uses for health service, nurseries and educations. • Landfill and waste management facilities for hazardous waste.
Less Vulnerable	• Buildings used for shops, financial, professional and other services, restaurants and cafes, offices, industry, storage and distribution and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities), mineral workings and processing (except for sand and gravel). • Water treatment plants and sewerage treatment plans (if adequate pollution control measures are in place.)
Water-compatible Development	• Flood control infrastructure, water transmission infrastructure and pumping stations. • Sewerage transmission infrastructure and pumping stations. • Sand and Gravel workings • Docks, marinas and wharves, navigational facilities. • MOD defence installations • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation) • Lifeguard and coastguard stations • Amenity open space, nature conservation and sports recreation. • Essential sleeping or residential accommodation for staff required by users in this category, subject to a warning and evacuation plan.

From the flood risk vulnerability classification table above, taken from the NPPF's Technical Guidance, buildings used for dwelling come within the 'more vulnerable' classification. However, based on the Environmental Agencies flood map, the development site is located within Flood Zone 1 and in accordance with table 3, overleaf, is therefore suitable for any development. Furthermore, neither a sequential or exception test is required as a part of this Flood Risk Assessment.

Table 3: NPPF's Flood Risk Vulnerability and Flood Zone Compatibility

Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception Test	✓	✓
Flood Zone 3a	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b	Exception Test	✓	X	X	X

Key: ✓ Development is appropriate
 X Development should not be permitted

4. FLOOD RISK ASSESMENT

The possible causes of flooding set out in NPPF's technical guidance are considered in this section in relation to the flood risk to the site itself and the effects of the development of the site on flood risk elsewhere.

4.1. Fluvial or Tidal Flooding

There are no main rivers adjacent to the site. Therefore, there is no risk of flooding to the proposed development site from fluvial flooding.

The site is also not at risk of tidal flooding, this can also be confirmed by the Environment Agency's Flood map in Figure 4, see Section 3.1.

4.2. Flooding from Land (Overland Flow)

The majority of the proposed development site is at a very low risk of surface water flooding, with no areas within the site boundaries showing any signs of flooding. This can also be confirmed by the Environment Agency's Flood map shown in Figure 6 overleaf.

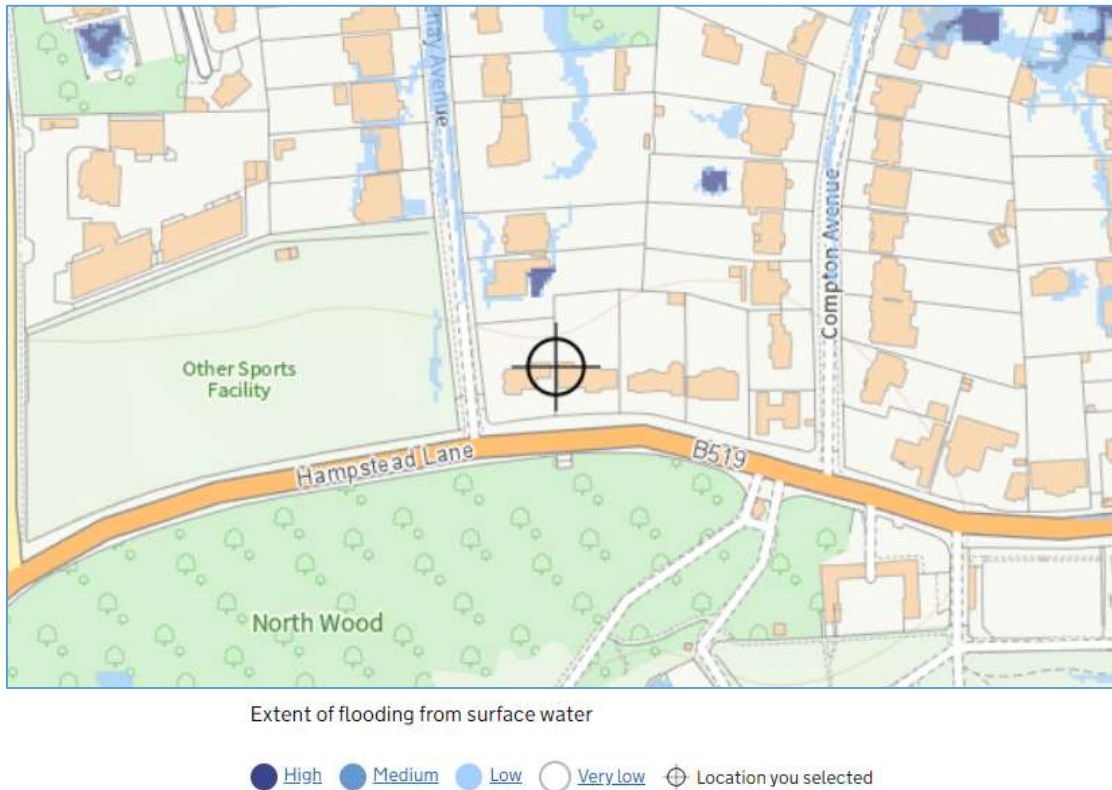


Figure 6– Environment Agency Surface Water Flood Map for the proposed development.

The surface water runoff that will be produced as a result of this development will be dealt with through the use of Sustainable urban Drainage Systems (SuDS), and therefore reduce the peak rate of flow leaving the site. This SuDS solution will be discussed in greater detail further on in this report.

4.3. Flooding from Groundwater

The London Borough of Haringey Preliminary Flood Risk Assessment identifies the site to not be at risk of groundwater flooding. However, as the proposals involve construction of a basement, it is imperative that long term groundwater monitoring is carried out at detailed design stage; in order to ascertain this risk. If groundwater is encountered during the excavation and build of the basements, the following mitigation measures are to be adhered to.

The proposed structures will be designed to resist any potential hydrostatic uplift forces which may be imparted by the presence of groundwater.

The basement will be designed as watertight elements. It should also be appreciated that the soils at the proposed foundation/basement depth will deteriorate rapidly in the prolonged presence of water. Therefore, a waterproof membrane such as delta membrane or equivalent should be used. Consequently, it may be prudent to apply a blinding layer of lean-mix concrete to all excavations, if continuous working cannot be achieved.

Pumps will also be provided to remove excess water should the basement flood.

Additional mitigation measures will include:

- Fixtures and fittings for the basement will be located to ensure that if any

flood water does enter the building, the impact of floodwater on the property will be minimal;

- Electricity sockets for the basement will be 600mm above the finished floor level and wired from the ceiling down;
- Non-return valves will be employed in the drainage design for the basement, to prevent back up of flow;
- Water resistant paint to be used for internal walls.
- Appropriate damp proofing measures such as delta membrane for the basement floor to ensure any future groundwater flooding risk is mitigated.

4.4. Flooding from Sewers

The London Borough of Haringey, Preliminary Flood Risk Assessment report, states:

“The LB of Haringey SWMP collated data from Thames Water with regard to the mechanisms of sewer flooding. The data provided was at a high level, where incidents of sewer related flooding were reported at a broad scale. Locations of sewer flooding were identified using a four digit post code e.g. N15 4. Data showed that the majority of the incidents of sewer flooding were located in Haringey Council - Strategic Flood

Risk Assessment - February 2015 24 the south of the borough, around southeast Tottenham and Crouch End extending through to Highgate and Muswell Hill.

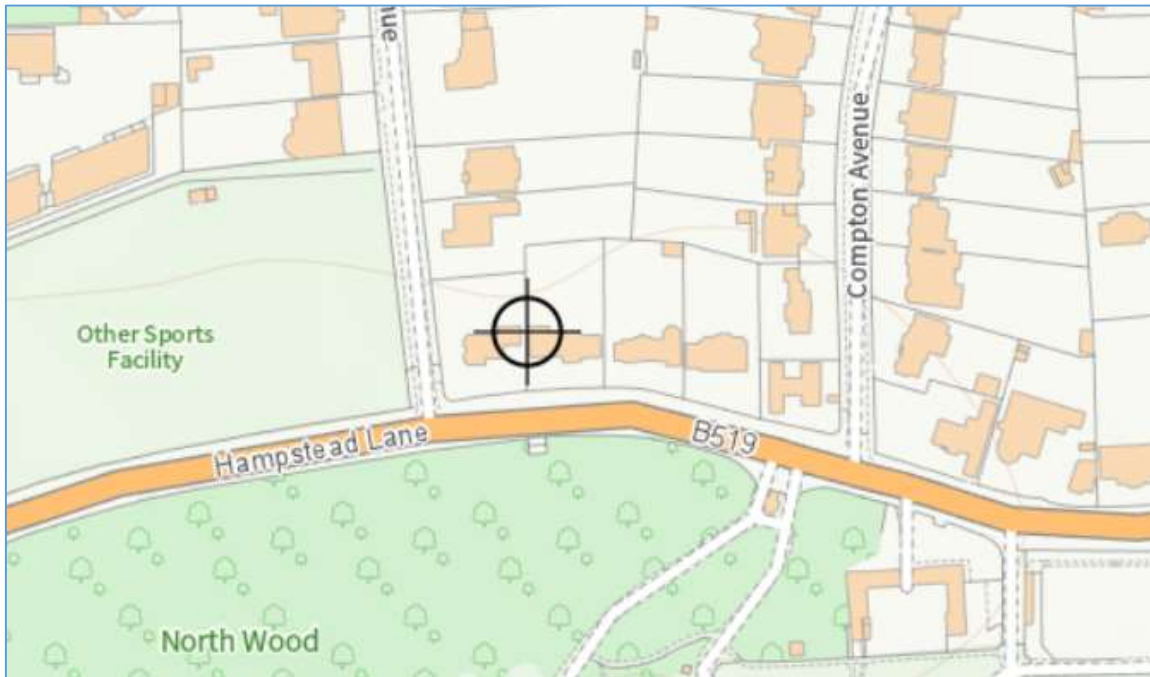
Southeast Tottenham is located at the low point of the catchment, which drains into the River Lee. Restricted free flow, from surface water sewer outfalls, when the river level is higher than the soffit of the sewer outfalls would result in surcharging/ backing up of the sewer system. This could provide an explanation for the number of recorded incidents of sewer flooding incidents in this area. It should also be noted that the number of incidents were recorded at postcode level. Further details are provided within Table 3.5 of the LB of Haringey SWMP.

Any proposed development located within the postcodes described in the LB of Haringey SWMP should demonstrate how, through the use of SuDS the amount of surface water entering the sewer systems is managed. It is particularly important to show how any excess surface water resulting from an increase in hard surface areas as part of the development is to be managed.”

Due to the distance of the site to the areas mentioned in the above statement, and the general area having no history of sewer flooding, it can be confirmed that the site is at no risk of sewer flooding.

4.5. Flooding from Reservoirs, Canals or Other Artificial Sources

There is no risk of flooding to this site from any reservoirs, canals or other artificial sources in the vicinity of the site. This can also be confirmed by the Environment Agency's Flood map shown in Figure 7 below.



Extent of flooding from reservoirs



Maximum extent of flooding

Location you selected

Figure 7 – Environment Agency Flood Map from reservoirs for the proposed development

5. SUSTAINABLE URBAN DRAINAGE SYSTEMS

The total site area is 3,262m², and the impermeable areas of the site prior to development are 2,265m². Following the development at this site, the impermeable areas will have decreased to 2092m². These areas consist of, the roof areas of the proposed building, as well as the hard standing areas, prior to any mitigation by using Sustainable Urban Drainage Systems.

Pre and post development surface water runoff calculations showing the peak flow rate leaving the site can be found in Appendix C.

Surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

Reducing the rate of surface water discharge from Urban Sites is one of the most effective ways of reducing and managing flood risk.

Traditional piped surface water systems work by removing the surface water from our developments as quickly as possible, however this can cause various adverse impacts:

- Increased downstream flooding, and sudden rises in flow rates and water levels in local water courses.
- Reduction in groundwater levels dry weather flows in watercourses.
- Reduce amenity and adversely affect biodiversity due to the surface water runoff containing contaminants such as oil, organic matter and toxic materials.

SuDS are defined as a sequence of management principles and control structures designed to drain surface water in a more sustainable fashion than conventional piped drainage techniques. SuDS should utilise the environmental, ecological and social benefits.

These include:

- Protection and enhancement of water quality – As well as providing on-site attenuation, SuDS treat the water, resulting in an improved quality of water leaving the site. This is achieved when the water passes through the fine soils and the roots of specially selected plants, pollutants washed off the hard landscaping by rainfall will be safely removed before the water reaches the natural water course.

- A sympathetic approach to the environmental setting by providing the opportunities to create habitats for flora and fauna in urban watercourses and open spaces.
- Meeting the amenity and social needs of the local community and residents in the creation of attractive green spaces.

The various types of SuDS include:

Permeable paving	
Soakaways;	
Swales and basins;	
Bioretention/ rain gardens;	
Green roofs and rainwater re-use;	
Infiltration trenches and filter drains	
Ponds and wetlands	

Preferably a combination of these techniques should be used as part of the surface water management train, and it is important for all stakeholders, such as developers, architects, landscape architects and engineers to work together at the planning stage in order to determine a feasible solution.

The SuDS management train is shown below, and this has been followed when proposing the proposed Sustainable Urban Drainage Systems for this site.

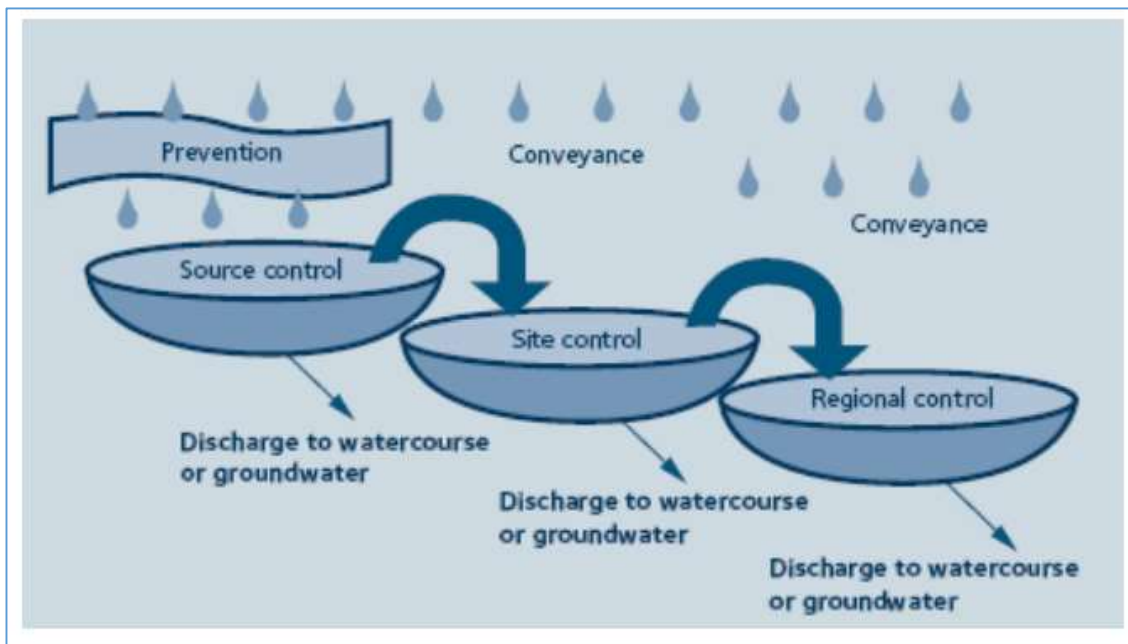


Figure 8 – SuDS Management Train

6. SuDS PROPOSALS FOR DEVELOPMENT

In accordance with the CIRIA SuDS Manual C753 and Policy SI 13 of the London Plan, the SuDS hierarchy has been considered in relation to the site-specific constraints and its surroundings. Table 4 below outlines the hierarchical approach considered for the development at 44-46 Hampstead Lane.

Sustainable Drainage Proposal	Description	Constraints/Comments	Appropriate
Rainwater Use as a Resource	Use of rainwater runoff for reuse, e.g. Rainwater harvesting tanks, Blue Roofs for irrigation	All rainwater pipes from the building are being taken, internally, to basement level therefore rainwater reuse is not feasible.	No
Rainwater Full Infiltration to Ground (Source Control)	Infiltration devices and/or soakaways. Surface water runoff stored on site and gradually percolating into receiving ground	Although the bedrock geology states that it is of the Bagshot sand formation. Consultation of historic boreholes within the vicinity of the site show this to be silty, clayey sand which would be unsuitable for infiltration. There is also a nearby surface water sewer to site, therefore full infiltration was deemed as a non-appropriate option	No
Rainwater Partial Infiltration to Ground (Source Control)	Installation of permeable/porous surfacing	Permeable Paving is proposed on all hardstanding areas out with the basement extents to allow for partial infiltration in low intensity storm events	Yes
Rainwater attenuation in green infrastructure features for gradual release	The onsite storage of all surface water runoff which can then be gradually conveyed to a nearby watercourse, sewer or infiltration into the ground. Forms of green infrastructure features:	Six raingarden planters have been proposed at in unintrusive locations to provide a level of treatment and to slow the runoff. Also, green roofs have been installed where feasible onsite to provide a level of treatment and to	Yes

	Green Roofs, Raingardens, Ponds, Swales, Detention basins, Infiltration Trenches and Raingarden Planters	reduce the park rate of surface water runoff rate into below ground storage.	
Rainwater discharge direct to a watercourse	All surface water runoff on site discharged at a restricted rate to a nearby watercourse	Consultation of EA Maps and survey information shows no nearby watercourses to site	No
Controlled rainwater discharge to a surface water sewer or drain	All surface water runoff on site is discharged at a restricted rate to a nearby surface water sewer or drain, all rainwater runoff stored in below ground attenuation features. E.g. oversized pipes or geo-cellular tanks	All surface water runoff will discharge into a below ground attenuation tank, as seen in Appendix A, sized for a 1 in 100 year +40% CC storm event. This will then discharge into an existing surface water sewer, found to the north in an adjacent property, at a reduced rate of 3.788l/s.	Yes
Controlled rainwater discharge to a combined sewer	All surface water runoff on site discharged at a restricted rate to a nearby combined sewer all rainwater runoff stored in below ground attenuation features. E.g. oversized pipes or geo-cellular tanks	N/A due to the above.	No

Table 4: SuDS Hierarchy

7. PROPOSED SuDS SOLUTION

The total site area is 3,262m², and the impermeable areas of the site prior to development are 2,265m². Following the development at this site, the impermeable areas will have decreased to 2092m², prior to any SuDS mitigation. These areas include some self-draining areas, which are not included within the model.

Due to the underlying geology consisting of sandy, silty-clay, infiltration forms of SuDS were deemed unsuitable. Therefore, all surface water run off had to be attenuated and discharge at a Qbar (greenfield runoff) rate of 3.788l/s.

Due to the nature of the site and the solution involving the contributing areas having to be split, a hydraulic model was built to ensure a feasible solution was proposed. A detailed hydraulic model was built, using Infodrainage, to simulate rainfall events for a 1 in 100 year storm event, with a 40% allowance for climate change using FEH Rainfall data with a restricted combined flow discharging at QBar of 3.788 l/s. The results of the hydraulic model can be found in Appendix C.

In order to ensure that the SuDS management train has been considered fully, green or sedum roofs will be installed on four areas of flat roofs, these green or sedum roof areas equate to 295m².

These areas of green or sedum roof have been proposed to slow the surface water runoff from the roof areas and to provide a level of treatment prior to entering the basement attenuation tank.

All hardstanding areas out with the basement extents will be formed of permeable surfacing underlain by a hydrocarbon removing geotextile membrane at the car parking areas, in order to deal with as much of the surface water run off at source, with the surface water runoff from all sloped areas to be caught by slot drains. The hardstanding areas at the rear of the building shall be self-draining.

The optimal solution as per the Infodrainage hydraulic model was to have all surface water runoff from the proposed building conveyed into a crate system attenuation tank, situated in the rear garden. This tank has been sized for a 1 in 100 year plus 40% climate change storm event, with a flow restriction set to 3.8 l/s, the total storage required within this tank was 98.180m³. This restricted discharge via gravity as shown in Appendix A.

The outflow of this tank connects into manhole the flow control chamber which will discharge at a maximum rate of 3.8 l/s into the existing surface water sewer in within the adjacent property as shown in Appendix A.

We believe the Sustainable Urban Drainage System hierarchy has been considered fully with respect to the type of development, the proposals will reduce flood risk at the site and elsewhere. The proposed SuDS layout plans are shown on drawing number C2823-03 and C2823-04 Appendix A.

All surface water run off calculations and the hydraulic modelling report have been provided in Appendix C. The hydraulic modelling report contains storm simulations for 1 in 2 (as Infodrainage cannot simulate a 1 in 1 year storm), 1 in 30 and 1 in 100 Year + 40% CC storm events.

The reduction in surface water run off for a 1 in 100 year storm event following the inclusion of the SuDS proposed will be 93.35%.

8. TIMESCALE AND MAINTENANCE OF DRAINAGE WORKS

All drainage works shall be completed prior to first occupation and there shall be no adoption of any of the drainage works within the site, and a management company will be responsible to oversee the long-term maintenance of the communal drains.

The following outline maintenance strategy sets out recommended timescales for maintenance of the proposed drainage works, in line with CIRIA SuDS Design Guide:

- Regular inspection will comprise the inspection and cleaning of catchment, gutters, filters and tanks to reduce the likelihood of contamination, this is recommended to be carried out every 3 to 6 months.
- Any flow control device should be checked every 3 months for the accumulation of debris/ silt, in order to ensure that there are no blockages.
- The catchpit chamber and flow control/pumping station to the attenuation tank should be checked and cleaned every 3 months for the accumulation of debris/ silt, in order to ensure that there are no blockages.
- Regular jet-washing of permeable block paving can be used to keep joints and voids clear, this should be carried out every 3 to 6 months.

The following table outlines the maintenance requirements for the porous paving:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations or clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this is the most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in six months
	Inspect slit accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 5: Operation and maintenance requirements for pervious pavements.

The following table outlines the maintenance requirements for the attenuation tank:

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

Table 6: Operation and maintenance requirements for attenuation storage tanks

The following table outlines the maintenance requirements for green roofs/sedum roofs:

Maintenance schedule	Required action	Typical Frequency
Regular Inspections	Inspect all components including soil substrate vegetation, drains irrigation systems (if applicable), membranes and roof structure for proper operation integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one) replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required- clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 7: Operation and maintenance requirement for green roofs

The following table outlines the maintenance requirements for filter drains:

Maintenance schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six Monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998 2010)	As required
	At location with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Table 8: Operation and maintenance requirement for filter drains

The following table outlines the maintenance requirements for the raingarden planters:

Maintenance schedule	Required action	Typical Frequency
Regular maintenance	Pipe inlets to the raingarden planters should be checked every month and especially after an extreme rainstorm to ensure that there are no blockages.	Monthly
	Periodic inspections & removal of debris or other items that represent blockage risks particularly in vicinity of the inlet to the raingarden planters	Monthly
	Weeding, cutting of plants and removal of any dead plants to ensure that the system works effectively	Every three months
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockages by sediment, algae or other matter: remove and replace surface infiltration medium as necessary.	Annually
Remedial actions	Repair inlets, outlets, overflows	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that the are in good condition and operating as designed	Annually

Table 9: Operation and maintenance requirement for raingarden planters

The following table outlines the maintenance requirements for the flow control chambers:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect from surface and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then 6 monthly intervals
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Orifice plates within plastic chambers or vortex controls to be jetted from the surface after heavy rainfall events to remove any debris or silt	As required
	Empty catchpits upstream of SuDS features to ensure no debris is passed downstream	3 months or as required
Remedial actions*	In the event of a blockage, a vortex flow control can be removed from the chamber via the lifting cabled located at the access, this will be cleaned at surface level and reinstalled into its original location	As required
	In the event of a blockage, the orifice plate should be jetted from surface, and if blockage is not cleared the orifice plate can be removed by removing fixing bolts. These fixing bolts should be checked and replaced if needed.	As required
Monitoring	Following installation it is important that any extraneous materials i.e. building materials: granular backfill, in-situ pour concrete etc are removed from the unit and the new flow control chamber is fully jetted down	Upon installation
	Inspect/check chamber channel for any debris or silt build-up. Upstream chambers should be checked at the same time as these monitoring works to ensure network is operating at full capacity.	Annually

Table 10: Operation and maintenance requirement for flow control chambers

*All Remedial Works should be carried out by a competent and certified contractor, with no entry or removal of parts to be undertaken by landowner.

If upstream network of flow control chamber is regularly maintained, little maintenance is required within the chamber as there are no moving parts

9. CONCLUSIONS

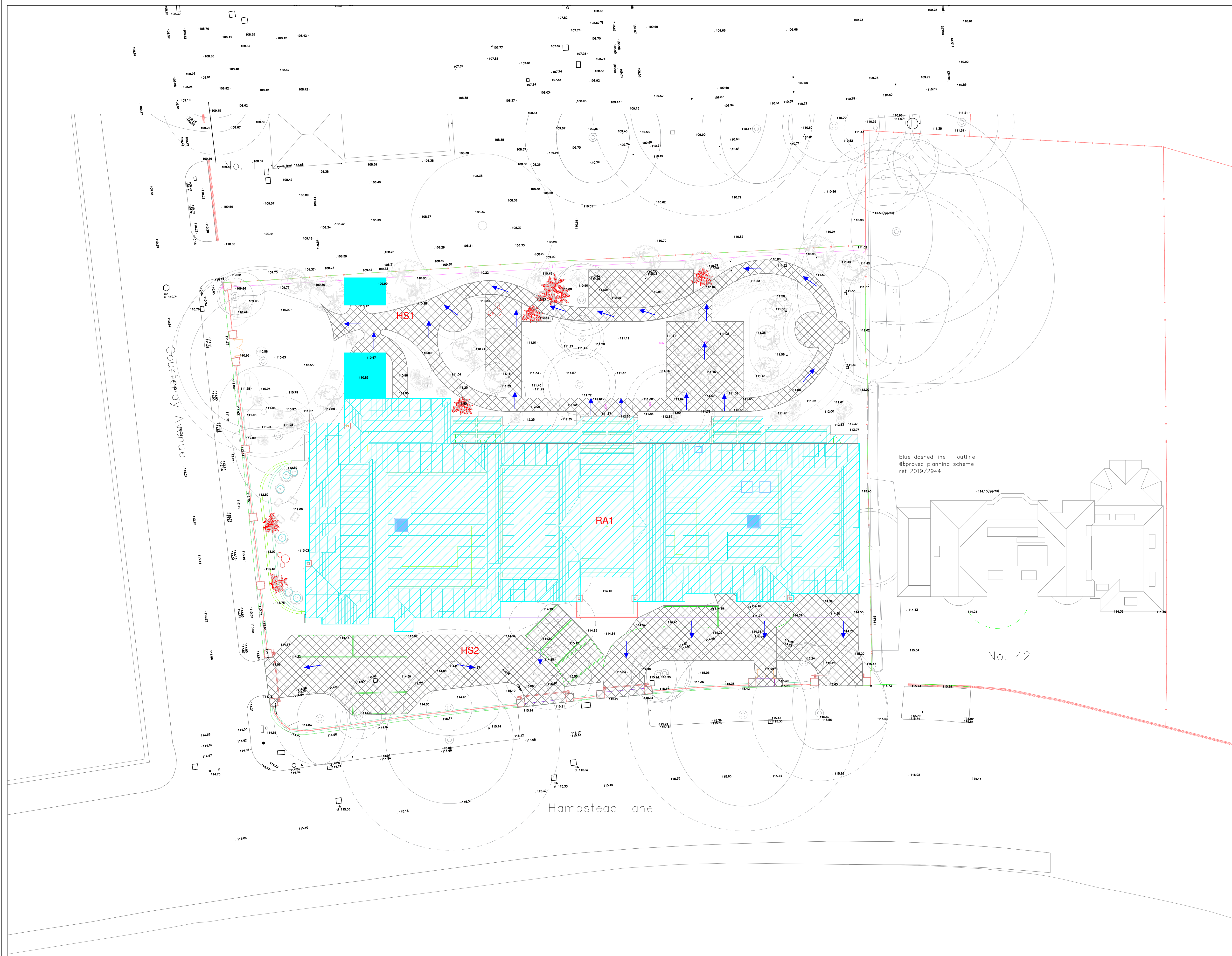
The purpose of this report is to satisfy the local planning authority that the proposed building is not a risk of flooding and will not increase flood risk at the site or elsewhere.

The flood risk from all sources has been assessed and the proposed development will incorporate a suitable SuDS solution to ensure that the proposals do not increase flood risk.

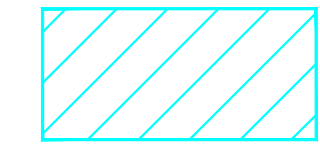
The reduction in surface water run off for a 1 in 100 year storm event following the inclusion of the SuDS proposed will be 93.35%.

APPENDIX A - DRAWINGS

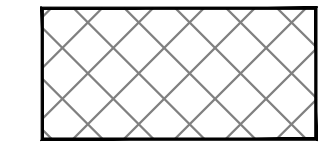
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DRN BY: F.G	SCALE: 1:200	DRAWING NUMBER: C2823-01	REV: A
DATE: 01-09-22	SIZE: A1		



KEY



ROOF AREAS



HARDSTANDING AREAS



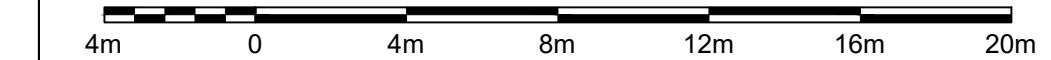
EXCEEDANCE ROUTE



SITE AREA

PRE-DEV IMPERMEABLE SURFACE	AREA (m ²)
ROOF AREA 1	1234.0
HARDSTANDING 1	387.5
HARDSTANDING 2	470.5

1:200



REV	DATE	DRAWN	DESCRIPTION	CHECK	APPR.
A	30/08/22	J.G	For Information	SL	SL

PROJECT:

44-46 HAMPSTEAD LANE, LONDON, N6 4LL

TITLE:

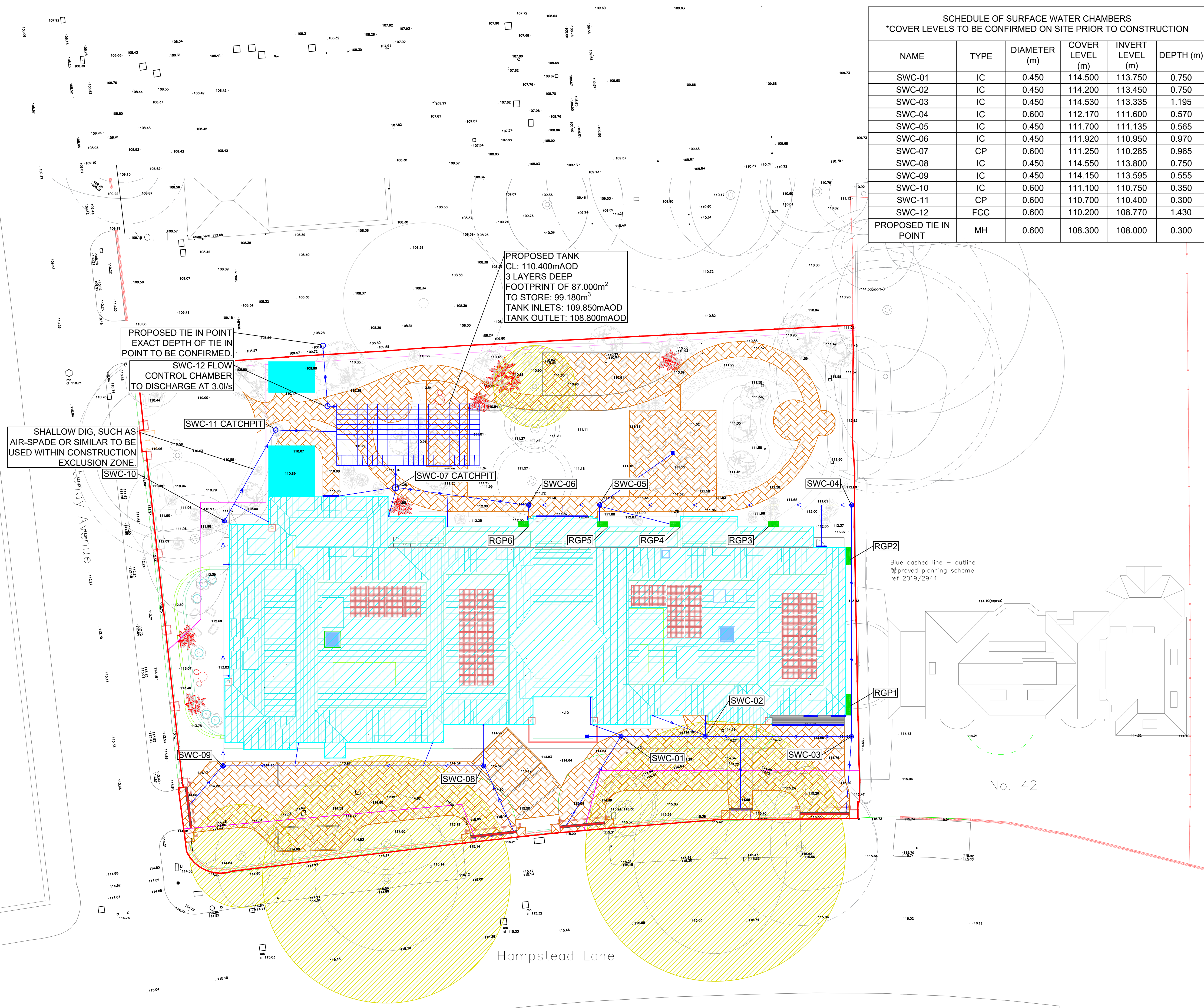
POST-DEVELOPMENT IMPERMEABLE AREA & EXCEEDANCE ROUTE PLAN

CLIENT:

HARRISON VARMA PROJECTS LTD.



CHECKED BY: S.L	DATE: 30/08/22	APPROVED BY: S.L	DATE: 30/08/22
DRN BY: J.G	SCALE: 1:200	DRAWING NUMBER: C2823-02	REV: A
DATE: 30/08/22	SIZE: A1		



SCHEDULE OF SURFACE WATER CHAMBERS					
*COVER LEVELS TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION					
NAME	TYPE	DIAMETER (m)	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH (m)
SWC-01	IC	0.450	114.500	113.750	0.750
SWC-02	IC	0.450	114.200	113.450	0.750
SWC-03	IC	0.450	114.530	113.335	1.195
SWC-04	IC	0.600	112.170	111.600	0.570
SWC-05	IC	0.450	111.700	111.135	0.565
SWC-06	IC	0.450	111.920	110.950	0.970
SWC-07	CP	0.600	111.250	110.285	0.965
SWC-08	IC	0.450	114.550	113.800	0.750
SWC-09	IC	0.450	114.150	113.595	0.555
SWC-10	IC	0.600	111.100	110.750	0.350
SWC-11	CP	0.600	110.700	110.400	0.300
SWC-12	FCC	0.600	110.200	108.770	1.430
PROPOSED TIE IN POINT	MH	0.600	108.300	108.000	0.300

KEY

ROOF AREAS

POROUS SURFACING

SURFACE WATER UPVC PIPES

PROPOSED SURFACE WATER INSPECTION CHAMBERS

INFILTRATION TRENCHES
500mm(w) FOR TRAFFICKED AREAS
225mm(w) FOR PEDESTRIAN AREAS

ROOT PROTECTION AREAS

CONSTRUCTION EXCLUSION ZONES

1:200

4m

0

4m

8m

12m

16m

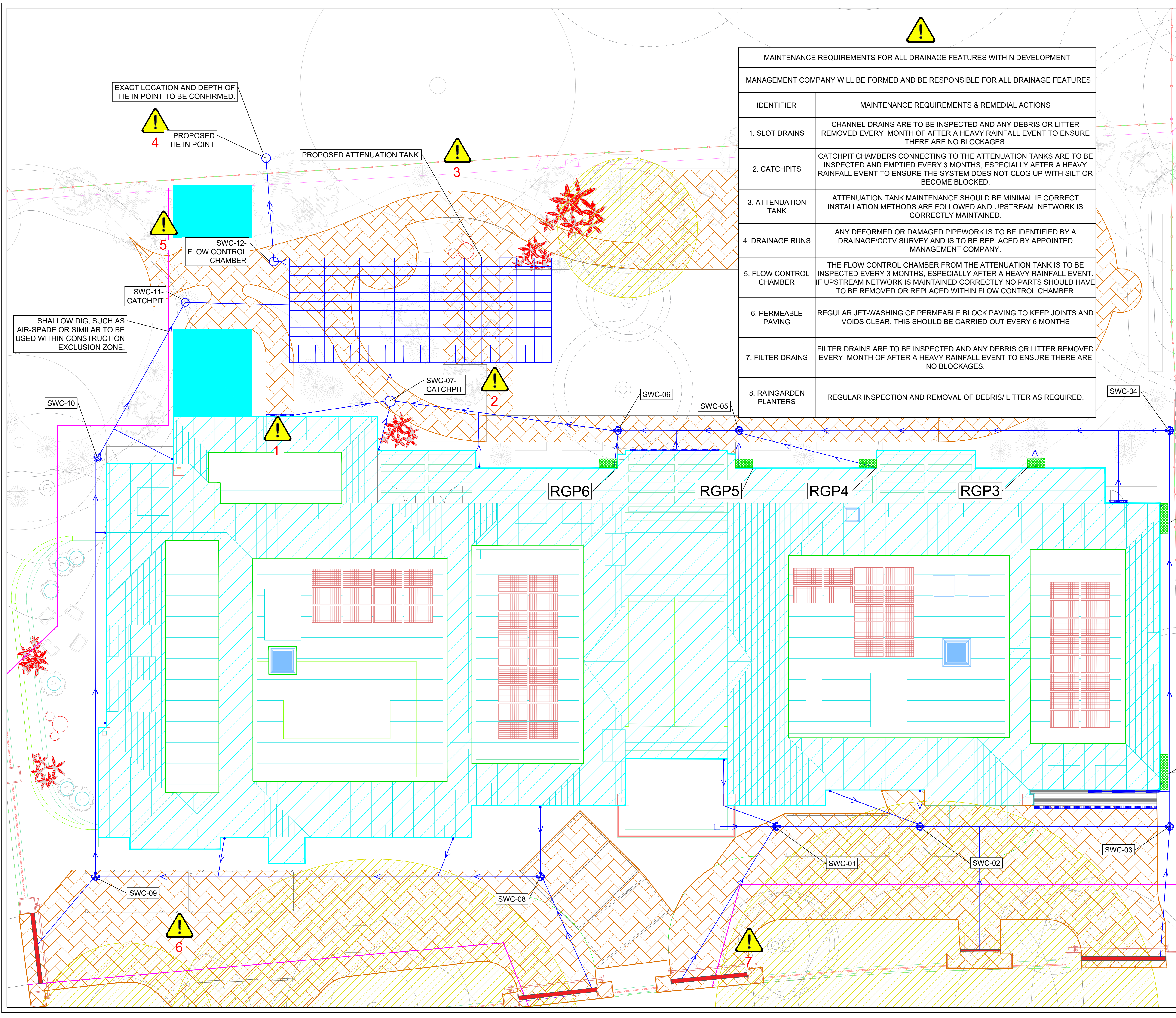
20m

PROJECT:
44-46 HAMPSTEAD LANE, LONDON, N6 4LLTITLE:
SURFACE WATER DRAINAGE & SuDS LAYOUT PLANCLIENT:
HARRISON VARMA PROJECTS LTD.

Nimbus
ENGINEERING CONSULTANTS
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CHECKED BY:
S.L

DATE:
30/08/22APPROVED BY:
S.LDRN BY:
J.GDRAWING NUMBER:
C2823-03DATE:
30/08/22



MAINTENANCE REQUIREMENTS FOR ALL DRAINAGE FEATURES WITHIN DEVELOPMENT	
MANAGEMENT COMPANY WILL BE FORMED AND BE RESPONSIBLE FOR ALL DRAINAGE FEATURES	
IDENTIFIER	MAINTENANCE REQUIREMENTS & REMEDIAL ACTIONS
1. SLOT DRAINS	CHANNEL DRAINS ARE TO BE INSPECTED AND ANY DEBRIS OR LITTER REMOVED EVERY MONTH OF AFTER A HEAVY RAINFALL EVENT TO ENSURE THERE ARE NO BLOCKAGES.
2. CATCHPITS	CATCHPIT CHAMBERS CONNECTING TO THE ATTENUATION TANKS ARE TO BE INSPECTED AND EMPTIED EVERY 3 MONTHS, ESPECIALLY AFTER A HEAVY RAINFALL EVENT TO ENSURE THE SYSTEM DOES NOT CLOG UP WITH SILT OR BECOME BLOCKED.
3. ATTENUATION TANK	ATTENUATION TANK MAINTENANCE SHOULD BE MINIMAL IF CORRECT INSTALLATION METHODS ARE FOLLOWED AND UPSTREAM NETWORK IS CORRECTLY MAINTAINED.
4. DRAINAGE RUNS	ANY DEFORMED OR DAMAGED PIPEWORK IS TO BE IDENTIFIED BY A DRAINAGE/CCTV SURVEY AND IS TO BE REPLACED BY APPOINTED MANAGEMENT COMPANY.
5. FLOW CONTROL CHAMBER	THE FLOW CONTROL CHAMBER FROM THE ATTENUATION TANK IS TO BE INSPECTED EVERY 3 MONTHS, ESPECIALLY AFTER A HEAVY RAINFALL EVENT. IF UPSTREAM NETWORK IS MAINTAINED CORRECTLY NO PARTS SHOULD HAVE TO BE REMOVED OR REPLACED WITHIN FLOW CONTROL CHAMBER.
6. PERMEABLE PAVING	REGULAR JET-WASHING OF PERMEABLE BLOCK PAVING TO KEEP JOINTS AND VOIDS CLEAR, THIS SHOULD BE CARRIED OUT EVERY 6 MONTHS
7. FILTER DRAINS	FILTER DRAINS ARE TO BE INSPECTED AND ANY DEBRIS OR LITTER REMOVED EVERY MONTH OF AFTER A HEAVY RAINFALL EVENT TO ENSURE THERE ARE NO BLOCKAGES.
8. RAINGARDEN PLANTERS	REGULAR INSPECTION AND REMOVAL OF DEBRIS/ LITTER AS REQUIRED.

KEY

ROOF AREAS

POROUS SURFACING

SURFACE WATER UPVC PIPES

PROPOSED SURFACE WATER INSPECTION CHAMBERS

INFILTRATION TRENCHES
500mm(w) FOR TRAFFICKED AREAS
225mm(w) FOR PEDESTRIAN AREAS

ROOT PROTECTION AREAS

CONSTRUCTION EXCLUSION ZONES

1:100
2m 0 2m 4m 6m 8m 10m

REV	DATE	DRAWN	DESCRIPTION	CHECK	APPR.
A	30/08/22	J.G	For Information	SL	SL

PROJECT:
44-46 HAMPSTEAD LANE, LONDON, N6 4LL

TITLE:
SuDS MANAGEMENT & MAINTENANCE PLAN

CLIENT:
HARRISON VARMA PROJECTS LTD.

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CHECKED BY: S.L	DATE: 30/08/22	APPROVED BY: S.L	DATE: 30/08/22
DRN BY: J.G	SCALE: 1:100	DRAWING NUMBER: C2823-05	REV: A
DATE: 30/08/22	SIZE: A1		