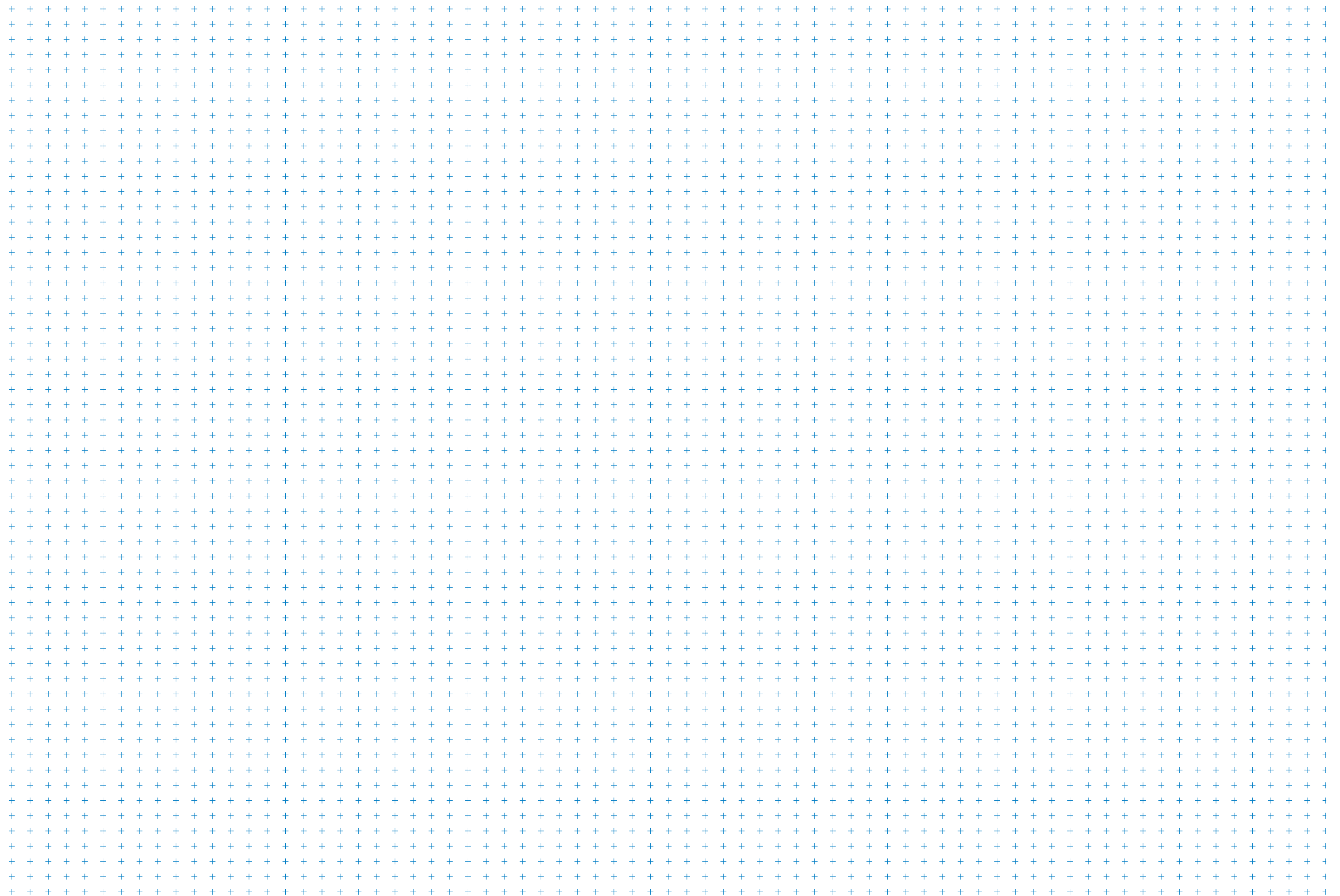




Contents	Appendices
1 Introduction	A Site location plan
2 Site Description	B Topographical Survey & Existing Site Information
3 Policy and Statutory Requirements	C Proposed Development
4 Flood Risk	D Landscaping Proposals
5 Sources of Flood Risk	E Environment Agency’s Flood Map & PFRA extracts
6 Existing Drainage	F Thames Water Asset Plan
7 Surface Water Hierarchy	G Proposed Surface Water Strategy
8 Proposed Surface Water Drainage	H Surface Water Calculations
9 Proposed Foul Water Drainage	I Foul Water Calculations
10 Maintenance	J Thames Water Pre-development correspondence
11 Conclusion	K SuDS Flows and Volumes – Hillingdon LLFA Technical Assessment Proforma

Status: Issued for Planning Application
Date: 30/11/2018
Revision: A
Job no: 2006
Prepared by: Alex Herman
Approved by: Carmel Lennon

1. Introduction

Heyne Tillett Steel Limited have been instructed by Healey Development Solutions (Hayes) Ltd to undertake a Flood Risk Assessment (FRA) and Drainage Strategy Report for the proposed development at 9 Nestles Avenue, London, UB3 4SA in the London Borough of Hillingdon.

The report has been based on the following available information:

- Proposed development/planning drawings by Brimelow McSweeney Architects.
- Proposed landscape drawings by Outerspace.
- Asset Location Search Sewer Map by Thames Water.
- Topographical Survey by Greenhatch Group.

2. Site Description

2.1 Site Location

The site is located at 9 Nestles Avenue, London (National Grid reference of 509852 E, 179229 N). The site is neighbouring Squirrels Trading Estate to the north of the site, a factory site to the north east and Hayes & Harlington station beyond. 7 Nestles Avenue neighbours the site immediately to the west, with open scrubland/grassland to the east and Nestles Avenue to the south.

The site has an area of approximately 0.255 Ha, or 2,550 m².

Please refer to Appendix A for a site location plan.

2.2 Existing Development

The existing site comprises of a single commercial building measuring 2 floors in height, as well as a small car parking area at the front. The building covers most of the site area.

The building on site has a ground floor level of approximately 31.4m AOD and the car park falls gently from north to south at an approximate gradient of 1:60.

The existing site is considered to be 100% impermeable.

A topographical survey was produced by Greenhatch Group, this can be found in Appendix B.

2.3 Proposed Development

Architects drawings of the proposal can be seen in Appendix C, landscaping plans can be found in Appendix D.

The proposals include demolition of the existing building and redevelopment to provide a building up to 10 storeys high, with 868 sqm of Class B floorspace at ground and first floor level and 81 residential units to the upper floors, with associated landscaping, access, car parking and cycle parking.

Proposed ground floor level of the building is set at approximately 31.290 m AOD.

3. Policy and Statutory Requirements

The report aims to incorporate and demonstrate compliance with the following national, regional and local planning policy guidance and statutory requirement as far as reasonably possible.

- National Planning Policy Framework (NPPF) – July 2018
- National Planning Practice Guidance (NPPG) – October 2018
- The London Plan – March 2016
- Hillingdon Local Plan: Part 1 – Strategic Policies – November 2012
- LB of Hillingdon Unitary Development Plan (adopted 1998) Saved Policies – September 2007
- Hillingdon Local Plan: Part 2 – Screening for Appropriate Assessment – August 2014
- LB of Hillingdon Local Flood Risk Management Strategy (LFRMS) – 2016
- LB of Hillingdon Preliminary Flood Risk Assessment (PFRA) – 2011
- LB of Hillingdon Surface Water Management Plan (SWMP) – Evidence Base – January 2013
- LB of Hillingdon Sustainable Drainage Design & Evaluation Guide – 2018
- LB of Hillingdon Sustainable Drainage Design & Evaluation Guide – 2018

Extracts for various relevant policies are set out below:

Hillingdon Local Plan: Part 1 – Strategic Policies – November 2012

Policy EM6: Flood Risk Management

“The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF).

...

The Council will require all development across the borough to use sustainable urban drainage systems (SuDS) unless demonstrated that it is not viable. The Council will encourage SuDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SuDS is to an appropriate standard.

...

8.91 SuDS come in a variety of different types, from infiltration techniques through to water harvesting. Wherever possible, a SuDS technique should seek to contribute to each of the three goals identified below with the favoured system contributing significantly to each objective. Where possible SuDS solutions for a site should seek to:

- *Reduce flood risk (to the site and neighbouring areas);*
- *Reduce pollution; and*
- *Provide landscape and wildlife benefits.”*

Policy EM7: Biodiversity and Geological Conservation

“Hillingdon’s biodiversity and geological conservation will be preserved and enhanced with particular attention given to:

...

6. The provision of green roofs and living walls which contribute to biodiversity and help tackle climate change.

7. The use of sustainable drainage systems that promote ecological connectivity and natural habitats.”

From LB of Hillingdon website, ‘Sustainable drainage requirements for planning applications’

“SuDS information required for major applications:

1. To speed up the review of proposals by the Lead Local Flood Authority, please provide summary information in the form of the ... ‘Volumes and Flows Proforma’.
2. Detailed site layout at an identified scale.
3. Topographical survey of the site.
4. Inclusion of maps showing the current risks to and from the site, from topography, such as overland flow routes.
5. Plans, drawings and specification of SuD’s proposed. This should include detail of hard construction, soft landscaping and planting, as well as routes flow will take should the drainage system be exceeded.
6. Demonstration of the consideration of the spectrum of SuD’s in accordance with the SuD’s hierarchy, and clear justification provided where a traditional piped drainage system is provided.
7. Calculations must adhere to the revised Environment Agency guidance on Climate Change produced in Jan 2016. This requires attenuation to be provided for Commercial 1 in 100year plus 20% and residential 1 in 100 year plus 40%.
8. Calculations should be provided to demonstrate water is controlled to green field run off rates, at a variety of return periods- off site works.
9. A 5l/s rate should not be used as a minimum, as

flow control devices have evolved to allow smaller discharge rates.

10. S106 may be considered for off site works where space is limited.
11. Information on the receptors of the drainage system. Where infiltration is proposed a suitable site investigation must be provided including information on groundwater levels, or sizing for a tanked or no infiltration must be assumed, together with necessary consents ie statement from any water utilities that there is suitable capacity in the foul and surfaces water networks or if not that suitable upgrades have been agreed. Methods of appropriate water quality control to be provided.
12. Management and maintenance plan for all SuD’s to be provided. To ensure there is ongoing maintenance over the lifetime of the development, a management and maintenance plan will be expected to be provided along with the details of the body legally expected to maintain the system where it is anyone other than a single private land owner. Conditions will be added to planning decisions, or developers will be expected to enter into a legal agreement under S106 of the Town and Country Planning Act 1990 (as amended). An example of an appropriate management plan can be found on Susdrain – Useful frameworks and checklists.”

4. Flood Risk

4.1. Planning Policy Context

The latest Gov.uk Flood Zone maps show that the site is located in Flood Zone 1 – an area with a low probability of flooding.

As confirmed by the SWMP (extract included in Appendix E), the site is not located in a Critical Drainage Area (CDA).

The risk of flooding to the site will be assessed in accordance with the technical guidance document to the NPPF and the NPPG for flood risk and coastal change.

Table 2 of the technical guidance document to the NPPF states that the flood risk vulnerability classification of the proposed development is “More Vulnerable”.

More Vulnerable	
Hospitals Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	

NPPF Table 2 – Flood risk vulnerability classification

Flood risk vulnerability classification	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3a	Exception Test required	✓	x	Exception Test required	✓
Zone 3b functional floodplain	Exception Test required	✓	x	x	x

NPPF Table 3 – Flood risk vulnerability and flood zone ‘compatibility’

Key: ✓ Development is appropriate.
 x Development should not be permitted.

Table 3 above confirms that the development is appropriate and the Sequential and Exceptions Test are therefore passed.

5. Sources of Flood Risk

5.1 Flooding from Rivers and Sea

The latest Gov.uk flood zone maps (Appendix E) show that the site is located in Flood Zone 1 – an area with a low probability of flooding. Figure 1 illustrates the risk of flooding from rivers and sea in the area surrounding the site.

The risk of flooding from Rivers and Sea is therefore considered to be low.

5.2 Flooding from Surface Water

Surface water flooding is caused when the volume of rainwater falling does not drain away through the existing drainage systems or soak into the ground, but lies on or flows over the ground instead.

The map obtained from the Gov.uk website shows that there are small patches of low risk areas within the vicinity of the site, see figure 2 below. These risks are linked to topographical variance in the existing site levels.

As part of the development, the site levels will be locally adjusted, and all low points will be adequately drained. There are no known recorded incidents of surface water flooding in the vicinity of the site. This source of flooding is therefore considered to be low risk.

5.3 Flooding from Sewers

Flooding from sewers often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away. It can also occur when the sewer becomes blocked or is of inadequate capacity.

The PFRA contains a map titled ‘Summary Map of Past Floods – Sewer Incidents’. It indicates there are no historical sewer flooding events within the site postcode (UB3 4). The extract can be found in Appendix E.

The risk of flooding from sewers is therefore considered to be low.

5.4 Flooding from Reservoirs, Canals and other Artificial Water Sources

The map obtained from the Gov.uk website shows that there is no identified risk of flooding from Reservoirs within the vicinity of the site, see Figure 3. This source of flooding is therefore considered to be very low risk.

5.5 Flooding from Groundwater

High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the ground’s surface.

The PFRA contains a map titled ‘Summary Map of Past Floods – Ground Water Incidents’. It indicates there are no historical ground water flooding events within the site proximity.

The PFRA also contains a map of ‘Increased Potential for Elevated Groundwater’. It indicates that the site is located within an area of Permeable Superficial Deposits. As there is no proposed basement, this type of flooding is considered to be low risk.

Relevant extracts from the PFRA can be seen in Appendix E.

Based on the above the risk of flooding from groundwater on site is considered to be low.



Figure 1 – Flood Risk from Rivers and Sea



Figure 2 – Flood risk from Surface Water

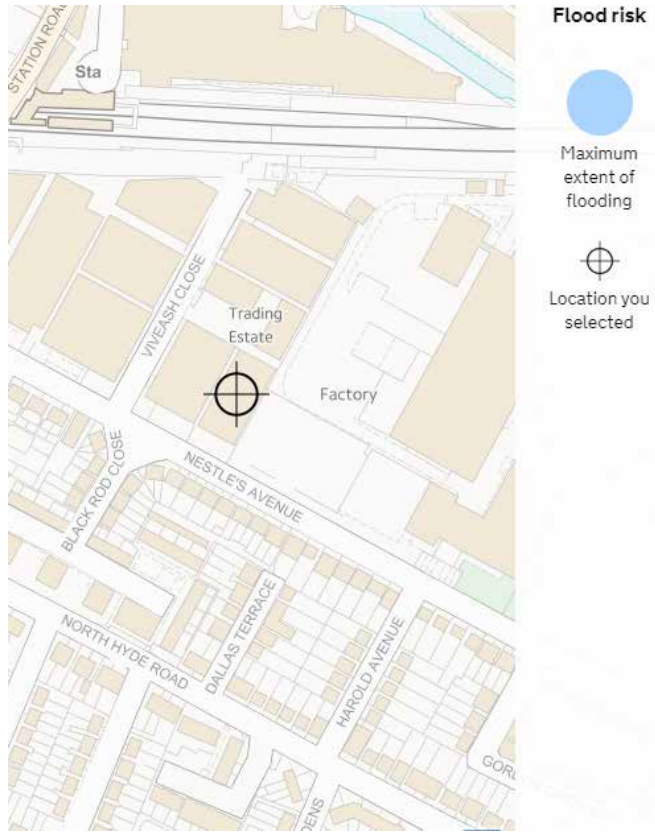


Figure 3 – Flood Risk from Reservoirs

6. Existing Drainage

6.1 Private Drainage

The topographical survey found in Appendix B provides locations of existing manholes on site. It can be seen that there are a number of inspection chambers and gullies located around the perimeter of the building and in the car park. Unfortunately, due to a lack of CCTV drainage survey data existing outfall locations are unknown.

6.2 Public Drainage

The Thames Water asset location map confirms the location of surface and foul water sewers near the site. A copy of the Thames Water Asset Map is included as Appendix F.

There are two sewers in Nestles Avenue to the south of the site, a 225mmØ FW sewer and a 450mmØ SW sewer, both running in a west to east direction. Close to the site cover levels are at 31.07 m AOD and Close to the site the sewer cover levels are at 31.07 m AOD and invert levels are estimated to be approximately 29.40 m AOD for FW and 29.75 m AOD for SW – this gives approximate depths of 1.445 m and 0.870 m respectively to soffits of the public sewer pipes.

Overall the surface water sewers are very shallow and are run at shallow gradients due to relatively small variance in topographical levels, with minimal depth of soil/road cover above the pipes.

6.3 Pre-development Runoff Rates

QMED Urban In accordance with the Modified Rational Method, the peak existing run-off from the site is calculated from the formula:

$$Q = 3.61 \times C_v \times i \times A$$

Where:

- C_v is the volumetric runoff coefficient (0.95 as recommended by the Hillingdon LLFA Technical Assessment Proforma),
- A is the catchment area in hectares.
- i is the peak rainfall intensity in mm/hour (using FEH rainfall data for 15min storm)

For the peak 1 in 2-year return period storm event this gives an existing discharge rate from the site of:

$$Q_2 = 3.61 \times 0.95 \times 30.16 \times 0.255 = 26.4 \text{ l/sec}$$

For the peak 1 in 30-years return period storm event this gives an existing discharge rate from the site of:

$$Q_{30} = 3.61 \times 0.95 \times 87.88 \times 0.255 = 76.9 \text{ l/sec}$$

For the peak 1 in 100-years return period storm event this gives an existing discharge rate from the site of:

$$Q_{100} = 3.61 \times 0.95 \times 114.36 \times 0.255 = 100.0 \text{ l/sec}$$

The QMED Urban Greenfield rate for the site was calculated to be 0.9 l/s, using MicroDrainage software. Extract can be seen in Appendix H.

7. Surface Water Hierarchy

The surface water drainage system for the development will be designed to convey surface water only, with foul water being discharged separately. The design will be in accordance with BS EN 752 – Drain and Sewer Systems Outside Buildings and Approved Document H to the Building Regulations.

The development area is 2,550 m² which consists of the building footprint, as well as soft and hard-landscaping. The total hardstanding area of the site is 1,780 m² and soft landscaping is 770 m². The total hardstanding area of the site is 1,780 m² and soft landscaping is 770 m². The drainage strategy chapter of the report will focus on managing the surface water runoff from the site.

In line with the Building Regulations and the forthcoming National Standards for Sustainable Drainage Systems, the following hierarchy of surface water disposal should be adhered to, in decreasing order of preference:

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

7.1 Store rainwater for later use

From a flood risk perspective rainwater harvesting can help reduce volumes of run-off from a severe storm event provided that the harvesting tank is not already full when the storm occurs. However, the principle reason for the inclusion of rainwater harvesting is as a supplement to the mains water supply.

If the harvesting tank is full or nearly full when a storm event occurs, then rainwater will very rapidly fill the tank and thereafter continue to discharge to sewer. The effectiveness of rainwater harvesting as a means of controlling rainwater run-off is therefore questionable. This method of attenuation is not considered in the design at this stage.

There is potential to utilise an active rainwater harvesting system to minimise potable water usage for the building. However, its viability and technical feasibility will be further assessed at the detailed design stage.

Infiltration techniques

There is potential for infiltration or partial infiltration through permeable paving located in the access road adjacent to the building – keeping the design in accordance with BS 8301 which suggests 5 metre easements from any building or its foundations.

A desktop study indicated that there may be difficulty with utilising infiltration techniques as a neighbouring development's soil investigations indicate unfavorable soil conditions. The BGS data confirms presence of London Clay Formation, which also suggests that the infiltration rates may be unfavorable.

7.2 Attenuate rainwater in ponds or open water features for gradual release

The architectural proposals look to utilise rain gardens located at the frontage of the development along Nestles Avenue. These will only receive rainfall from the frontage of the development, due to limited available area and depth for attenuation in this area.

As London is a highly urbanised area and ponds or open water features occupy a large amount of land, it is difficult to fit a significant volume of storage within the proposed layout. In addition, the combination of shallow sewers and minimum free-board requirements recommended by the CIRIA SuDS Manual 2015 restrict the effectiveness of open water features for this development.

7.3 Attenuate rainwater by storing in tanks or sealed water features for gradual release

Proposals are to use a mixture of blue / green roofs and permeable paving to store surface water and then release at a restricted discharge rate to the sewer. Attenuating rainwater for gradual release is therefore a viable option.

There is potential to provide further storage in the form of shallow below ground geocellular tanks located beneath the footprint of the building. The proposals are currently only conceptual and will be further developed at the detailed design stage.

7.4 Discharge rainwater direct to a watercourse

There is no viable route to a watercourse near the site therefore this method of surface water disposal is not suitable.

7.5 Discharge rainwater to a surface water sewer/drain

The Thames Water asset map confirms that there are surface water sewers located within the proximity of the site (as described in previous sections). Therefore, this is a viable option of discharging surface water from the site.

7.6 Discharge rainwater to the combined sewer

There are no combined sewers within the vicinity of the site.

8. Proposed Surface Water Drainage

The proposed surface water drainage strategy for the site has been developed based on the following design standards aimed at providing a sustainable drainage system:

- Building Regulations 2015 – Part H (Drainage and Waste Disposal)
- Sewers for Adoption 7th Edition
- BS EN 75, BS EN 12056
- CIRIA (C753) – The SuD Manual
- Sustainable Design and Construction Supporting Planning Guidance (SDCSPG)
- Hillingdon Sustainable Drainage Design & Evaluation Guide
- Hillingdon Sustainable Drainage Design & Evaluation Guide
- Hillingdon LLFA Technical Assessment Proforma

All calculations can be seen in Appendix H.

From previous discussions with Vicky Boorman from LB Hillingdon, it is understood that pumping of surface water is not considered acceptable. However, gravity discharge at rates as close as possible to the greenfield value will be considered.

As described in previous sections, the existing Thames Water storm sewer near the site is very shallow, with approximately 0.87m of cover. This creates a problem with providing sufficient storage to discharge via gravity at greenfield runoff rates.

A number of options were considered but most attenuation tank manufacturers require min. 0.75m of cover, which would place the level of the tank below the TW sewer, before any sufficient storage was provided.

However, it has been considered that to achieve a suitable limiting discharge rate, it will be possible to locate a shallow attenuation tank beneath part of the ground floor structure of the building. A shallow tank of 300mm depth and with a volume of approximately 106m³ will be able to contain the discharge from the entire footprint of the proposed building.

However, it has been considered that to achieve a suitable limiting discharge rate, it will be possible to locate a shallow attenuation tank beneath part of the ground floor structure of the building. A shallow tank of 300mm depth and with a volume of approximately 106m³ will be able to contain the discharge from the entire footprint of the proposed building.

Permeable paving, although not as efficient in storage as other methods (due to low void ratio of 30%), can

provide shallow storage as part of the road/pavement build-up. Assuming approximately 250mm depth of top courses not being utilised for storage (due to structural reasons), it is possible to provide approximately 0.195m depth of storage across the site.

An approximate area of 257m² has potential to provide permeable paving, as illustrated in Appendix G. With a flat base & consistent depth of 0.195m this could provide up to 15m³ of storage.

Further storage can be achieved on roofs and podium levels by utilising blue roofs. Unfortunately, not all roofs can be equipped with blue roofs due to plant and other uses. The current layout allows for approximately 260m² of blue roof attenuation across the site.

ABG Limited (blue roof specialists) have produced detailed calculations providing a storage volume required and a maximum discharge rate based on the strategy shown in Appendix G. All calculations can be seen in Appendix H.

The blue roof in the current scenario provides a total storage of approximately 25m³ and discharges at a rate of 0.5 litres per second.

From initial design co-ordination with the Architect and Landscape Architect it has been determined that an area of approximately 468m² is available at upper floor levels to provide green roofs.

From initial design co-ordination with the Architect and Landscape Architect it has been determined that an area of approximately 468m² is available at upper floor levels to provide green roofs.

The rain garden area along Nestles Avenue is assumed to be permeable and not included in the calculations. As a safety precaution, overflows will be provided to ensure flooding does not occur – these will connect to the surface water network at the frontage of the development from where it will discharge to the sewer.

An initial pre-planning discussion with Thames Water has confirmed that they have concerns about the capacity of the existing surface water sewer network. As such, Thames Water have asked for surface water discharge from the site to be limited to 2 – 3.8 litres per second. It is considered that 2 litres per second is a very low discharge rate that will require a large attenuation volume of approximately 125m³ that cannot be accommodated on the site with the constraints imposed on the proposed scheme. Additionally, it will not be possible to limit the discharge from the different attenuation systems to such a low limiting rate as 2 litres per second. However, it is considered that 3.8 litres per second is a more achievable target discharge rate when split between the different sources of attenuation.

It is therefore proposed that sewer network. As such, Thames Water have asked for surface water discharge from the site to be limited to 2 – 3.8 litres per second. It is considered that 2 litres per second is a very low discharge rate that will require a large attenuation volume of approximately 125m³ that cannot be accommodated on the site with the constraints imposed on the proposed scheme. Additionally, it will not be possible to limit the discharge from the different attenuation systems to such a low limiting rate as 2 litres per second. However, it is considered that 3.8 litres per second is a more achievable target discharge rate when split between the different sources of attenuation. It is therefore proposed that the current layout allows for a total discharge of 3.8 litres per second for all storm durations up to and including the 1 in 100-years + 40% climate change event. Pre-planning correspondence with Thames Water can be found in Appendix J.

A new surface water connection is proposed for the development, with one new 150mmØ lateral to connect to the Thames Water sewer in Nestles Avenue. An outfall manhole located on site and upstream flow control devices including a Hydrobrake vortex flow control device and a blue roof with outlet orifices is proposed to limit the overall discharge rate from the site to 3.8 l/srate from the site to 3.8 l/s.

It is important to note that the architectural layout and the associated achievable runoff rate may change as the development progresses (potential reduction in permeable paving area available due to buried services etc.). It is therefore recommended that a best endeavors approach to achieve the most optimum drainage strategy is accepted, rather than a target runoff rate or a betterment.

Reference should be made to the Proposed Drainage Plans included in Appendix G which illustrate how various parts of the site will be drained.

8.1 Post-development Runoff Rates (Unmitigated)

The proposed development with an exclusion of raingardens and other permeable areas contains 1,780m² of impermeable area therefore, again using the Modified Rational Method, the proposed peak run-off for the peak 1 in 2-year return period storm event this gives a proposed discharge rate from the site of:
 $Q_2 = 3.61 \times 0.95 \times 30.16 \times 0.178 = 18.4 \text{ l/sec}$

For the peak 1 in 30-years return period storm event this gives a proposed discharge rate from the site of:

$$Q_{30} = 3.61 \times 0.95 \times 87.88 \times 0.178 = 53.6 \text{ l/sec}$$

For the peak 1 in 100-years return period + 40% allowance for climate change storm event this gives a proposed discharge rate from the site of:

$$Q_{100+40\%} = 3.61 \times 0.95 \times 114.36 \times 0.178 \times 1.4 = 97.7 \text{ l/sec}$$

8.2 Post-development Runoff Rates (Mitigated)

As described above, the proposals are to restrict the surface water runoff at roof level using blue roofs and at ground level using permeable paving and a below ground attenuation tank.

The current layout allows for total discharge of 3.8 litres per second for all storm durations up to and including 1 in 100-years + 40% climate change. This is in line with the requirement of Thames Water.

This equates to a betterment of 86% for 1 in 2-year storm, 95% for 1 in 30-years storm and 96% betterment for 1 in 100-years storm over the existing scenario.

Achievable runoff rates are very dependent on the architectural layout and may change during detailed design stages.

8.3 Volumes of runoff

Due to an overall reduction in impermeable area, it is expected that the volume of surface water runoff from site will be reduced, as demonstrated in table below:

Storm Event	Existing Volume (m³)	Proposed Volume (m³)
Q_2	132	91
Q_{30}	215	150
Q_{100}	264	183
$Q_{100+40\%}$	–	257

Table 1 – Volumes of surface water runoff

It is important to note that volume of runoff will be further reduced through evapotranspiration from green roofs and evaporation from permeable paving and landscaping features, as both processes were not included in this calculation.

There is also potential for infiltration through permeable paving as described in section 7 of this report, but due to currently unknown ground conditions it is not included at this stage.

Similarly, there is potential for further volume of runoff reduction through use of rainwater harvesting which, as described in section 7 of this report, is currently only conceptual and will be further developed at the detailed design stage.

8.4 Sustainable Drainage Systems Summary

Sustainable Drainage Systems, known as SuDS mimic natural processes to drain surface water and encourage groundwater recharge to reduce the flow of surface water from a developed site to something akin to that of an undeveloped site.

As mentioned previously, the proposals will utilise rain gardens located at the frontage of the development along Nestles Avenue and green roofs where possible.

Green roofs and rain gardens are used to achieve environmental benefits including reducing storm water runoff, reduce energy use, water, air and noise pollution and the heat island effect. They also provide habitat for wildlife and space to relax and play.

Permeable paving will also be utilised to provide storage and allow for a restricted runoff rate from surfaces unable to drain into the blue roofs or the rain garden.

Permeable paving provides a shallow alternative to a typical storage tank design. In addition, permeable paving naturally reduces the rate of runoff and eliminates effects of pollution in runoff on the environment.

Use of these SuDS techniques satisfies planning policies EM6: Flood Risk Management and EM7: Biodiversity and Geological Conservation, described in section 3 of this report.

9. Proposed Foul Water Drainage

9.1 Design Standards

The design of the foul water drainage will be in accordance with:

- BS EN 752 (Drain and sewer systems outside buildings. Pumping Installations)
- BS EN 12056 (Gravity drainage systems inside buildings)
- Building Regulations 2015 – Approved Part H
- Sewer for Adoption 7th Edition

All foul and surface networks will be kept separate.

Foul water from site will connect to the existing Thames Water network via gravity. Although currently possible to drain the entire site by gravity, until more detailed information is available (e.g. internal drainage points locations) there is a potential risk of pumping, primarily from block A, due to very shallow sewers, as described in previous sections of this report. In such case, foul water will be pumped towards the nearest onsite manhole and then continued to be drained by gravity.

Reference should be made to Appendix G, which illustrates the current foul water strategy.

9.2 Existing Foul Flows

The existing property comprises of a warehouse and office space. Using survey information provided by Greenhatch Group (Appendix B) floor areas and design flows were calculated. Calculations can be seen in Appendix I.

The existing peak FW discharge rate has been estimated as 1.6 l/s.

9.3 Proposed Foul Flows

The proposed peak foul flow has been assessed as 14.5 l/sec however this is based on preliminary design information and may vary slightly as the design process moves forward. The proposed foul flow was calculated for 81 residential units and 868 sqm of Class B floor space, based on BS 12056-2:2000 and using a frequency of factor of 0.5 for intermittent use (dwelling, guesthouse).

Calculations can be seen in Appendix I.

A pre-planning enquiry was submitted to Thames Water and they have confirmed that the existing foul sewer has sufficient capacity for discharge rates from the proposed development. Correspondence can be seen in Appendix J.

10.0 Maintenance

The following section captures the maintenance and operation requirements for each element of the proposed drainage design.

Before cleaning, final testing and immediately before handover the Contractor will:

- Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
- Thoroughly flush pipelines with water to remove silt and check for blockages. Rod pipelines between access points if there is any indication that they may be obstructed.
- Carry out a CCTV of the pipework to ensure that it is free of silt and blockages.

The End User shall then follow the “Waste Management, The Duty of Care – A Code of Practice (Revised 1996)” and shall ensure that their waste does not escape from their control and is transferred only to a registered waste carrier to be sent for recycling or disposal at a suitably licensed facility.

All waste arising from the maintenance of the drains and sewers shall be handled, stored and disposed of correctly to avoid pollution. Waste may be designated as hazardous / special waste and, as such, the End User shall ensure that they comply with the Hazardous Waste (England and Wales) Regulations 2005.

Reference shall be made to CIRIA publication C753 – The SuDS Manual by the Contractor and the End User. A suitable maintenance schedule must be developed, maintained, followed and updated as required to reflect observed performance. The following items are highlighted for guidance.

10.1 General drainage

The below ground drainage network will be designed in accordance with the requirements of the Building Regulations whilst acknowledging the need to limit the number of inspection chambers within “front of building” areas. To this end, all main runs will have rodding eyes, manholes or inspection chambers at the head of the run and at all changes of direction to provide access to rod or jet the main pipework.

Where possible, connections from stacks or gullies will be made directly to these manholes or inspection chambers to allow the connection to be rodded or jetted from the downstream end. Where this is not possible, each stack will be detailed to have an access hatch provided just above floor level to allow the connection to be rodded or jetted from the upstream end. Similarly, the gullies will have a rodding access

provided within their body allowing the pipework to be rodded or jetted from the gully downstream.

Gullies and channels will be specified with silt buckets and silt trap manholes will be provided upstream of all tanks and infiltration structures to prevent the ingress of silts into the drainage network and impairing the performance of the system.

10.2 Permeable Paving

The maintenance required for the permeable paving is as follows:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect for sediment and debris in the inlet chambers and trim any roots that may be causing blockages	Annually or as required based on inspections
	Cleaning of gutters and any filters on downpipes	
	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required,
Occasional maintenance	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required, based on inspections
Remedial Actions	Remedial work to any depressions, rutting, cracked or broken blocks considered detrimental to the permeable paving performance	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect inspection chambers and note rate of sediment accumulation and establish appropriate brushing frequencies.	Monthly in the first year and then annually
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Annually

Reference shall be made to CIRIA publication C753 (The SuDS Manual) and to the relevant maintenance guidance from the products manufacturers.

10.3 Flow Control (Hydrobrake)

Following installation of the Hydro-Brake® Flow Control it is vitally important that any extraneous material i.e. Building materials are removed from the unit and the chamber.

After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required.

If problems are experienced, please do not hesitate to contact the company (Hydro International) so that an investigation may be made.

Contact: enquiries@hydro-int.com (+44 (0)118 933 1325)

10.4 Blue Roofs

Following installation of the Hydro-Brake® Flow Control it is vitally important that any extraneous material i.e. Building materials are removed from the unit and the chamber.

After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required.

If problems are experienced, please do not hesitate to contact the company (Hydro International) so that an investigation may be made.

Contact: enquiries@hydro-int.com (+44 (0)118 933 1325)

10.5 Geocellular Tanks

The maintenance required for the Geocellular tank is as follows:

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then every six months.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly.
Remedial Action	Repair/rehabilitation of inlets, outlets, 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 or after large storms.

Note:
During construction surface water runoff should be prevented from entering the Geocellular storage structure.

10.5 Geocellular Tanks

The maintenance required for the Geocellular tank is as follows:

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then every six months.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly.
Remedial Action	Repair/rehabilitation of inlets, outlets, 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 or after large storms.

Table 1 – Storage Tank Maintenance

Note:
During construction surface water runoff should be prevented from entering the Geocellular storage structure.

11.0 Conclusion

The latest Gov.uk maps show that the site is located in Flood Zone 1 and the findings of this FRA suggest that the risks of flooding from all sources is considered as very low risk.

The Thames Water sewers surrounding the site are very shallow and as a result the runoff rates achievable from site are very dependent on the architectural layouts. During the detailed design stages, the areas available for storage may change, which will have a direct impact on the achievable runoff rates.

It is therefore recommended that a best endeavors approach to achieve the most optimum drainage strategy is accepted, rather than a target runoff rate or a betterment.

The proposals are to discharge surface water to the existing sewer network via gravity. The current layout utilizes a shallow below ground geocellular attenuation tank, permeable paving and blue roofs to achieve a total discharge of 3.8 litres per second for all storm durations up to and including 1 in 100-years + 40% climate change event, which equates to a betterment of up to 96% over the existing scenario.

Peak surface water runoff rates for each storm event were calculated and are given in section 8 of this report. In addition to restricting flows from the development, it is proposed that green roofs and rain gardens are provided.

The proposed peak foul water flow rate was calculated as 14.5 l/sec using the method described in section 9 of this report. A pre-development enquiry to Thames Water was submitted and sufficient capacity within the surrounding network was confirmed.

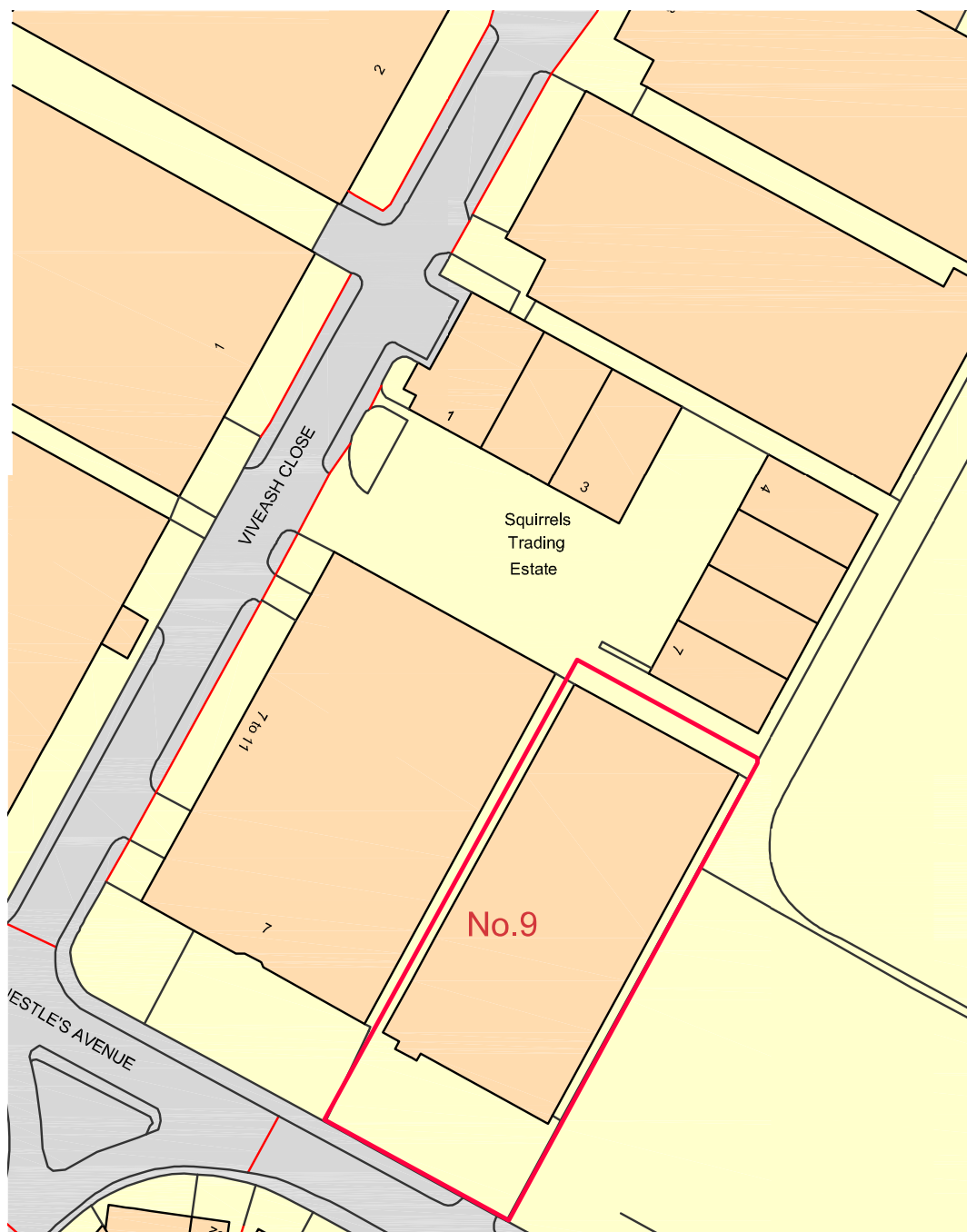
As required by Policy EM6: Flood Risk Management section 8.91 of the Hillingdon Local Plan, the development will provide reduction in flood risk, reduce pollution and provide landscape and wildlife benefits.

In addition, in line with Policy EM7: Biodiversity and Geological Conservation, the development will provide green roofs which contribute to biodiversity and help tackle climate change. It will also use SuDS that promote ecological connectivity and natural habitats.

SuDS Flows and Volumes – Hillingdon LLFA Technical Assessment Proforma can be found in Appendix K of this report.

Appendix A

Site location plan



Site Plan



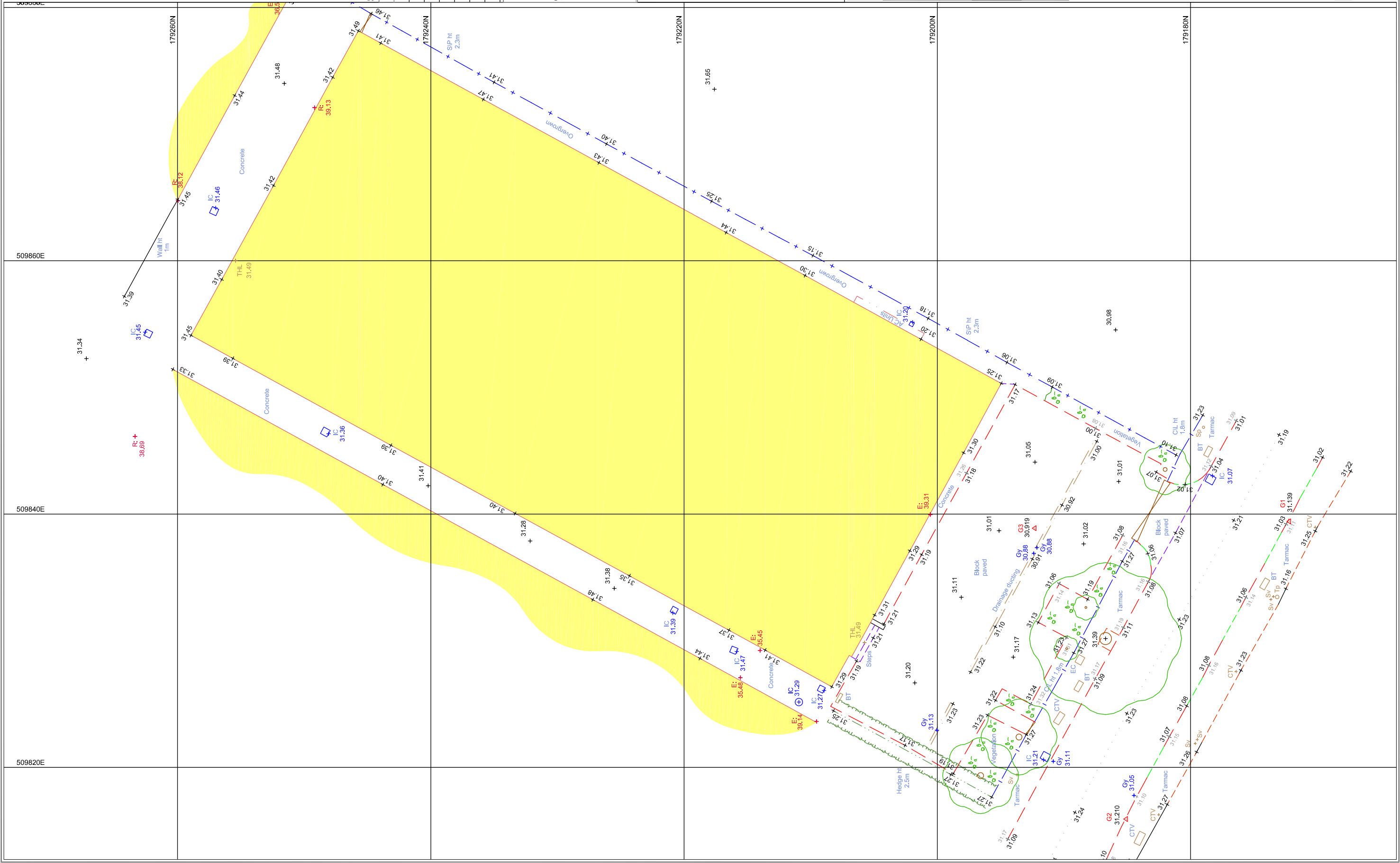
Aerial View from the South



Aerial View from the North

Appendix B

Topographical Survey & Existing
Site Information



Station Information:

Station	Easting (m)	Northing (m)	Level (m)
G1	509839.4210	179172.1980	31.1390
G2	509815.9270	179185.0840	31.2100
G3	509838.8850	179192.3060	30.9190
4			
5			
6			
7			

OS Note:
Some services may have been omitted due to parked vehicles.
The Ordnance Survey file is to be used as a guide only.

OS Buildings **Surveyed Buildings**

This survey has been orientated to the Ordnance Survey OS National Grid (OSNG) and the OS Active Network (OS AN).
A true OSGB38 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGB15GB transformation models.
The survey has been correlated to this point and a further one OSGB38 (15) coordinate has been established to create a true OS bearing for angle orientation.
No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.
The survey has been orientated to the OS National Grid of the on-site grid and datum.

Legend:

- Buildings: OS Buildings, Surveyed Buildings
- Topographical Features: Contour Lines, Spot Heights, Bench Marks, etc.
- Vegetation: Trees, Shrubs, etc.
- Drainage: Ditches, Gullies, etc.
- Other: Fences, Walls, etc.

greenhatch group

Rowan House
Duffield Road
Little Eaton
Derby

DE21 5DR
Tel: (01332) 830044
Fax: (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans
27 Cornhill
St Albans
Herts
AL1 1TA
Tel: (01727) 854881

London
27 Cornhill
London
WC1N 3LF
Tel: (0207) 241886

CLIENT
Meadow Residential LLP

PROJECT
**9 Nestles Avenue
Hayes
UB3 4SA**

TITLE
Topographical Survey

SCALE
A2@ 1:200

DATE
12.07.18

DRAWN
BG

QUALITY REF
GH3287

Level datum
See note

Grid orientation
See note

Job number
30977

Drawing No.
30977_T

Rev.
0

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for any errors or omissions. It is the responsibility of the original client to ensure that the plan is used for its intended purpose. All dimensions should be checked on site prior to design and construction. Drainage information (where applicable) has been taken from the original plan and should be treated as approximate only.

Notes:

Appendix C

Proposed Development



Do not scale from this drawing, except for town planning purposes.
Work to figured dimensions only.
This drawing is the property of Brimelow McSweeney Architects and copyright is reserved by them.
This drawing is issued on condition that it is not copied, used or disclosed by or to any unauthorised person without the prior written consent of Brimelow McSweeney Architects.
The areas on the drawing have been measured directly from a CAD drawing and have no tolerances added or subtracted.
The areas have been calculated in accordance with the Code of Measuring Practice, 5th Edition (2007) using the stated options N/A, GIA, GEA. They are approximate and relate to the likely areas of the building at the current state of the design. Any decisions to be made on the basis of these predictions, whether as to project viability, pre-letting, lease agreements and the like, should make allowance for the following:
- Design development
- Accurate site survey, site levels and dimensions need to be fully evaluated
- Allowance for construction methods and building tolerances.
- Local authority consents

rev	date	drawn by	checked	description
/	21/11-18	JT	SMD	First Issue
A	23/11-18	JT	SMD	General Update

status

PRELIMINARY

BRIMELOW
McSWEENEY
ARCHITECTS

25 Great Queen Street, Covent Garden, London WC2B 5BL
tel: 020 7831 7835 - email: admin@bm-architects.co.uk

project

9 Nestles Avenue
Hayes UB3 4SA

title

Ground Floor Plan
As Proposed

scale

1 : 200@ A3
1 : 100@ A1

date

21/11/13

drawn

JT

drawing no.

1820 - 1100

revision

A