

Brunel Walk Redevelopment and Turner Avenue Estate Improvements

Below Ground Drainage Strategy

Issue P05 – 09 September 2022

Doc. Ref.: 2821-MHT-CV-RP-002



BRUNEL WALK REDEVELOPMENT AND TURNER AVENUE ESTATE IMPROVEMENTS

BELOW GROUND DRAINAGE STRATEGY

ISSUED FOR COMMENT

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
P01	26/02/21	Mr. D. Heyna-Francis	Mr C. Ryan	Mr C. Ryan	Issued for Comment
P02	20/02/22	Mr. L. Hornblow	Mr. G. Bansal	Mr. G. Bansal	Issued for Comment
P03	11/08/22	Mr. L. Hornblow	Mr. G. Bansal	Mr. G. Bansal	Issued for Comment
P04	16/08/22	Mr. L. Hornblow	Mr. G. Bansal	Mr. G. Bansal	Issued for Comment
P05	09/09/22	Mr. L. Hornblow	Mr. G. Bansal	Mr. G. Bansal	Issued for Comment

Table of Contents

Executive Summary	3
1 Introduction	4
2 Existing Site	5
2.1 Site Description and Location	5
2.2 Ground Conditions	6
2.3 Existing Drainage	7
3 Development Proposal	8
4 Surface Water Drainage Strategy	9
4.1 Design Parameters	9
4.2 Initial Consultations	9
4.3 Surface Water Discharge Rates	10
4.4 SuDS Assessment and Proposed Strategy	11
4.5 Sustainable Drainage Maintenance Strategy	12
5 Foul Water Drainage Strategy	14
5.1 Design Parameters	14
5.2 Initial Consultations	14
5.3 Foul Water Discharge Rates	14
6 Conclusions	15
Appendix A – Proposed Drainage Strategy Layout	
Appendix B – Topographical Survey	
Appendix C – Thames Water Asset Records	
Appendix D – Development Proposals	
Appendix E – Existing Drainage Calculations	
Appendix F – Proposed Drainage Calculations	
Appendix G – Suds Proforma	

Executive Summary

Meinhardt UK Ltd has been appointed by the London Borough of Haringey (LBH) to undertake foul and surface water drainage design for the proposed development at 1-36 Brunel Walk, Tottenham, London, N15 5HQ.

The proposed new build development will increase the impermeable area within the Brunel Walk development, however surface water will be attenuated as close to Greenfield runoff rates as reasonably practicable, as per the Sustainable Urban Drainage Systems (SuDS) Non-Statutory Technical Standards and London Borough of Haringey (LBH) requirements. The site will reduce surface water to a rate of 2.5 l/s for the 1 in 100 year plus climate change rainfall event. This provides a 92.2% betterment on the existing 1 in 1 year peak discharge rate and a 98.0% improvement on the existing 1 in 100 year peak discharge rate. The scheme achieves this by providing SuDS in the form of green roofs on all buildings, as well as raingardens and traditional below ground attenuation.

Thames Water have been consulted on the surface water discharge rate and foul water discharge rate for the new development and have agreed this is a suitable rate and the associated sewers can cater for these flows.

For the wider Turner Estate, the proposed landscaping scheme as indicated with reference to drawing "5350-OOB-ZZ-00-DR-L-0050" from the landscape architect (Oobe) provides new areas of permeable paving which in turn will aid in any reductions of surface water runoff from the Turner Estate which has the further benefit of reducing surface water rates from the development as a whole.

Overall the scheme complies with National and local policy requirements in terms of SuDS and drainage by providing SuDS features and reducing surface water runoff rates.

1 Introduction

Meinhardt UK Ltd has been appointed by the London Borough of Haringey (LBH) to undertake foul and surface water drainage design for the proposed development at 1-36 Brunel Walk, Tottenham, London, N15 5HQ. This report outlines the proposed below ground drainage strategy to date.

This report has been carried out in accordance with the National Planning Policy Framework (NPPF) and DEFRA's Non-Statutory Technical Standards for Sustainable Drainage Systems (NTSSUDS). LBH policies and guidance have also been referred to, including the Sustainable Drainage Design & Evaluation Guide (SDDED), the LBH Surface Water Management Plan (SWMP) and the LBH Strategic Flood Risk Assessment (SFRA). This report also incorporates advice and guidance from the Environment Agency and CIRIA documents.

This report will outline the proposed drainage strategy for the site including a detailed Sustainable Drainage Systems (SuDS) assessment. The NTSSUDS states that *"for developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event"*.

This report aims to adopt the most sustainable drainage solution for the proposed development, aiming to reduce the run-off from the proposed development to Greenfield rates.

Reference should be made to the Flood Risk Assessment (document ref: 2844-MHT-CV-RP-001).

2 Existing Site

2.1 Site Description and Location

The site is Brownfield and is located at 1-36 Brunel Walk, Tottenham, London, N15 5HQ. Brunel Walk is bound by the wider Turner Avenue estate both of which are owned by LBH. Brunel Walk and Turner Estate are bound by West Green Road to the north, Elmar Road to the west, residential properties to the south, and Kirkton Road and Braemar Road to the east. Brunel Walk and Turner Avenue Estate are access via Elmar Road and Kirkton Road. The Brunel Walk site is currently occupied by five two-storey buildings including 35 single person flats, 1 family house and communal facilities, along with associated soft landscaping and paths. Parking for Brunel Walk is available from Braemar Road to the south east.

The site has approximate OS coordinates of 533110, 189010 at Grid Reference TQ331890.

The Brunel Walk new build development area is shown by a red line and the wider Turner Estate Improvements boundary by a blue line in Figure 2.1 below.



Figure 2.1: Site Location Plan

The site is relatively flat, falling slightly northwest-southeast, from approximately 13.50mAOD to 12.22mAOD, with a step down to the carpark in the east portion of the site with a level of approximately 10.53mAOD. The Topographical survey can be found in Appendix B.

2.2 Ground Conditions

A detailed site investigation report was not available at the time of writing, it is anticipated that a detailed ground investigation will be completed to confirm the onsite ground conditions prior to detailed design. However, the BGS map shown in Figure 2.2 shows that the site is underlain by bedrock of London Clay (clay, silt and sand) with no recorded superficial deposits.

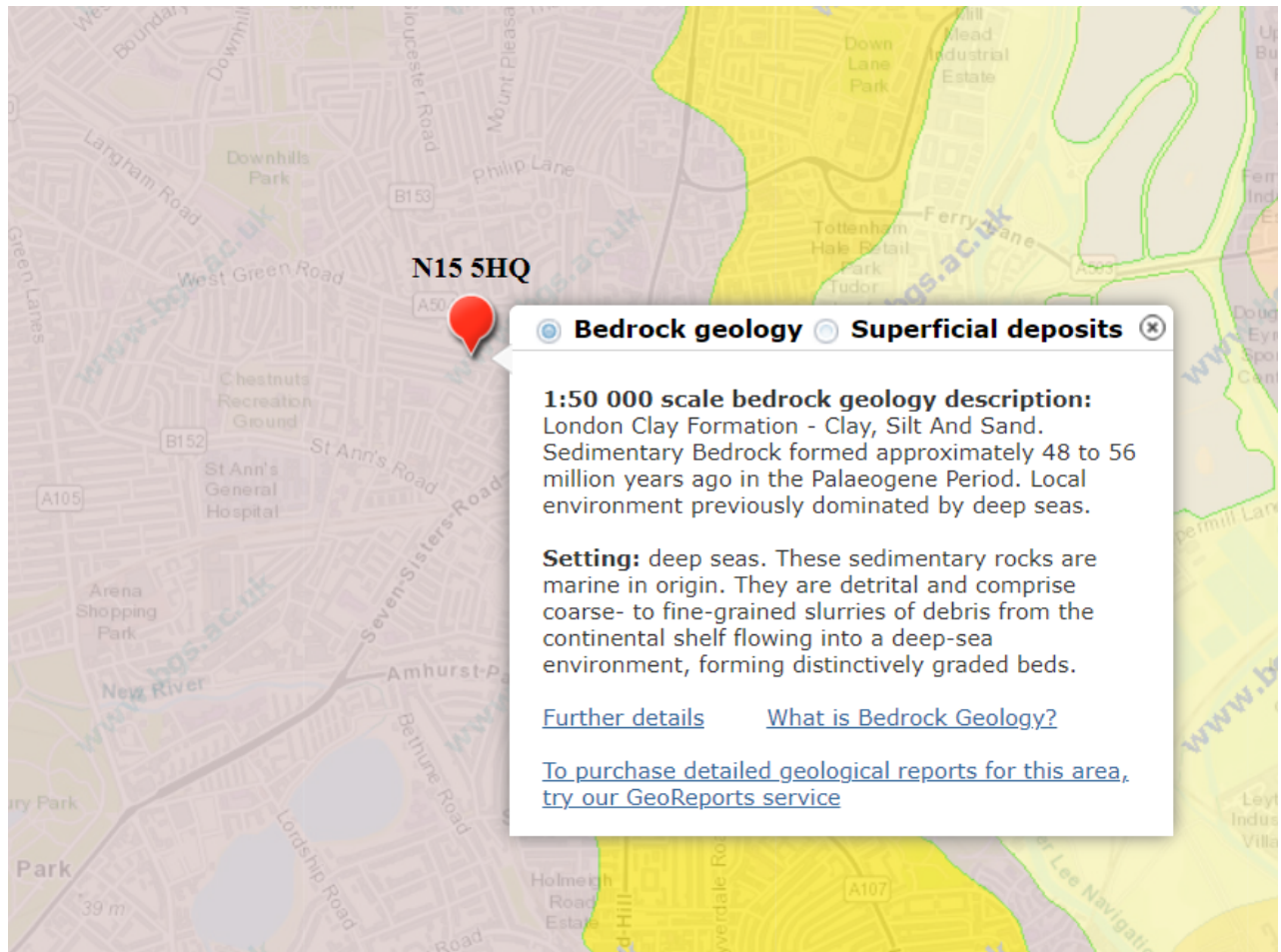


Figure 2.2: Local Geology (BGS, 2021)

2.3 Existing Drainage

2.3.1 Thames Water Sewers

Thames Water (TW) has provided asset records of the site and the immediate surrounding area, shown below in Figure 2.3. The records show that the site is served by a separate foul and surface water sewers.

There are surface water sewers bounding the site to the north in West Green Road (606mm dia.), to the east in Kirkton Road and Braemar Road (300mm dia.), to the south along the southern boundary of Brunel Walk (300mm dia.), to the south west serving an allotment (300mm dia.), and to the west in Elma Road (225mm dia.). Foul sewers bound the site to the north in West Green Road (300mm dia.), to the east in Kirkton Road (229mm dia.) and Braemar Road (686x457mm) and the west in Elmar Road (229mm dia.). The records show that there is a 300mm Thames Water surface water sewer within the site boundary running along the southern boundary of the site, discharging into the sewers in Braemar Road. The records also show that there are two Thames Water foul sewers within the ownership boundary, a 150mm dia. sewer along Turner Avenue (part of the Turner Avenue estate) which discharges into West Green Road, and 150mm dia. sewer serving the houses in the eastern section of Brunel Walk which discharges into the sewer in Braemar Road.

Refer to Appendix C for the complete TW Asset Records.

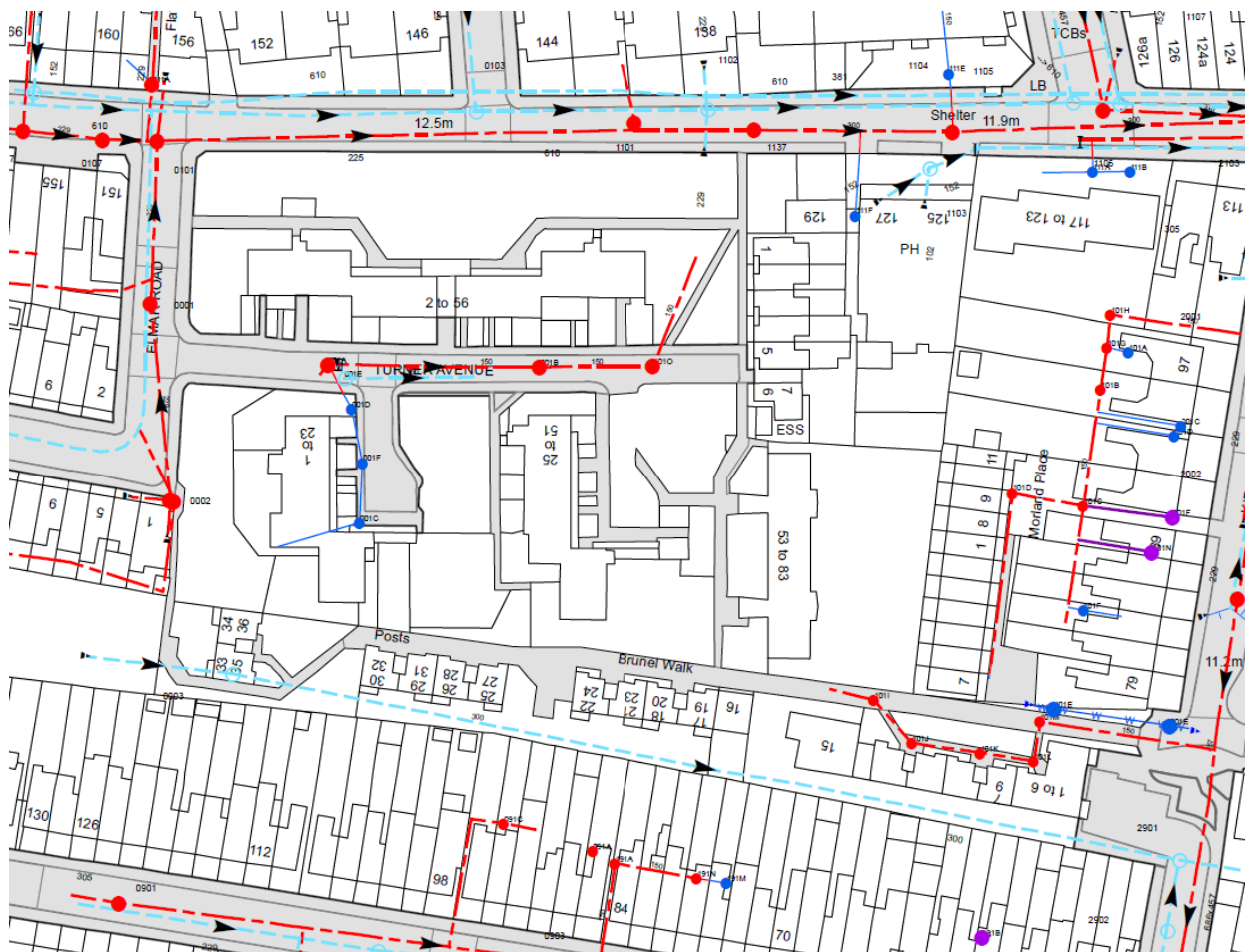


Figure 2.3: TW Asset Records Plan

2.3.2 Existing Onsite Drainage

A utility survey was carried out by Site Engineering Surveys Ltd and a CCTV survey by Insewer in January 2021. The utility survey results indicated that the existing site drains surface water unrestricted via gravity to the TW surface water sewer in Braemar Road. Foul was shown to drain via gravity to the foul sewer in Kirkton and Braemar Road.

3 Development Proposal

Redevelopment of Brunel Walk to provide 45 new Council rent homes in four buildings ranging from 3 to 4-storeys high including 39 apartments and 6 maisonettes. Provision of associated amenity and play space, cycle and refuse/recycling stores and 4 wheelchair parking spaces. Reconfiguration and enhancement of existing parking areas and outdoor communal areas and play spaces on the Turner Avenue Estate.

The full development proposals can be found in Appendix D.

4 Surface Water Drainage Strategy

The surface water strategy outline below focuses on the new build development, it is proposed that as part of the wider Turner Estate landscape improvements, lined permeable paving is being introduced into the site to help improve surface water runoff as well as some raingardens. The full details of the improvement are referred to in the landscaping strategy. The addition of permeable paving in the wider Turner Estate has not been considered as part of the drainage strategy below, the full details of the strategy within the Turner Estate will be determined post planning, however with the additional pockets of permeable paving their will be a further reduction of surface water runoff from the wider Turner Estate site.

4.1 Design Parameters

The industry standards, best practice and Sewers for Adoption 8th Edition dictate for below ground surface water drainage that:

- There will be no surcharging of the drainage system for a 1 in 2 year storm;
- The drainage can be surcharged with no flooding for a 1 in 30 year storm; and
- The drainage can flood on-site for a 1 in 100 year storm with a 40% climate change allowance provided the flood water remains on site and does not flood habitable areas or affect safe ingress and egress to the site for occupiers.

All surface water drainage alterations outlined in this report adhere to these principles.

4.2 Initial Consultations

4.2.1 Council/Lead Local Flood Authority

LBH will be contacted to discuss the proposed development and surface water strategy for the site.

The LBH Local SuDS requirements states that runoff is to be restricted in line with the SuDS Non-Statutory Technical Standards (NSTS), which state that *“For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event”*.

The proposed surface water drainage has been designed to restrict runoff rates as close as practicable to the Greenfield run-off rates.

4.3 Surface Water Discharge Rates

The total site area for the wider Turner Estate is approximately 1.45 ha of which 0.86 ha is impermeable. However, works on the Turner Avenue Estate are limited to landscaping improvements and as such the scheme will attempt to reuse as much of the existing drainage serving the Turner Avenue estate as possible, subject to replacement/remedial works and/or modifications. Therefore, this area is not considered in the existing surface water discharge calculations or the proposed surface water drainage design.

4.3.1 Existing Discharge Rates

The development area for the new residential blocks in the southern portion of the site is 0.4564 ha of this 0.2990 ha is impermeable. It is assumed that the existing site discharges unrestricted into the TW surface water sewer located in Braemar Road to the east of the site.

The existing peak run-off rate for the design storm events was calculated using Microdrainage with calculations as found within Appendix E.

FEH data was used to calculate the existing and proposed discharge rates for a range of storm events, using the worst case result for each storm to determine the discharge rate.

A summary of results is provided in Table below. Refer to Appendix E for the full existing surface water calculations.

Storm Event	Contributing Area	Existing Discharge Rate
1 in 1 year	2,168m ²	31.9 l/s
1 in 30 year	2,168m ²	95.9 l/s
1 in 100 year	2,168m ²	126.5 l/s

Table 4.1: Existing Surface Water Discharge Rate

4.3.2 Climate Change

The current EA guidance states that for the years 2070 to 2115 there is a 50% chance the peak rainfall intensity will increase by 20% or more and that there is a 10% change it will increase by 40% or more. For this building, which is classed as More Vulnerable with a design life of 100 years an allowance of an additional 40% is considered appropriate.

4.3.3 Proposed Discharge Rates

DEFRA's Non-statutory technical standards for SuDS states *"For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event."* This is in line with the The LBH Local SuDS Standards states requires runoff to be restricted in line with the SuDS Non-Statutory Technical Standards.

The Greenfield run off-rate was calculated using the UKSuds Greenfield Run-off Rate Calculator. The calculations showed that Qbar for the site is 1.79 l/s and the 1 in 100 year rate is 5.71 l/s. However, Microdrainage software shows flooding on site, as the design fails to meet the Building Regulations requirements (75mm diameter is the minimum for surface water drainage). A flow control of at least 75mm

was therefore used in Microdrainage software to calculate the minimum peak rate for the development for storm events up to the 1 in 100 year storm (+40% climate change allowance); this was found to be 2.5 l/s.

Critical Storm	Existing Discharge Rate	Proposed Maximum Discharge Rate	% Betterment
1 in 1 year	31.9 l/s	2.5 l/s	92.2%
1 in 30 year	95.9 l/s	2.5 l/s	97.4%
1 in 100 year	126.5 l/s	2.5 l/s	98.0%
1 in 100 year (+40% climate change allowance)	176.9 l/s	2.5 l/s	98.6%

Table 4.2: Proposed Surface Water Discharge Rates

Greenfield run-off calculations and Microdrainage calculations in Appendices E and F.

4.4 SuDS Assessment and Proposed Strategy

In accordance with the Haringey Council Strategic Flood Risk Assessment, EA guidelines and CIRIA documents, surface water run-off should be managed as close to its source as possible.

The possibility of implementing SuDS at the site was assessed using a hierarchy of preferred surface water management methods. The following paragraphs discuss the various methods in order of that hierarchy and evaluate the site's suitability for each method.

4.4.1 Infiltration

The site is underlain by London Clay which is relatively impermeable, therefore it has been assumed that infiltration techniques such as soakaways will not be possible and as such infiltration has not been allowed for in the surface water storage calculations.

4.4.2 Attenuation

0.299ha has been used in the MicroDrainage model, please refer to catchment plans within Appendix A. The MicroDrainage model 0.151 ha represented roof areas/green roofs areas, with the remaining (0.148ha indicated in the area summary within the MD calculations pipe network), equating to a total of 0.299ha.

Based on the above, storage volumes have been calculated without allowing for infiltration. It is proposed to attenuate surface water runoff using a below ground attenuation tank and green roofs.

Initial calculations in Microdrainage software determined that below ground modular attenuation with a volume of approximately 241.3m³ and void ratio of 0.95 will be required to achieve the desired discharge rate. Moreover, approximately 916m² of green roofs, as well as tree pits and raingardens where possible, subject to detailed design. All of the aforementioned systems will further improve the drainage conditions in the local area, as surface water from the site currently discharges unrestricted and untreated into the local sewers system. Attenuation on the site has been maximise as far as reasonably practicable.

The drainage strategy drawings can be found in Appendix A, Greenfield run-off calculations in Appendix E and Microdrainage calculations in Appendix F.

4.4.3 Discharge to Public Surface Water Sewer

As there are no nearby watercourses, it is proposed that the site will discharge via gravity and the existing site connection to the local Thames Water surface water sewer in Braemar Road.

The impermeable areas will be decreased post development. Attenuation has been proposed below the communal garden areas between each of the blocks. Surface water will be attenuated to a restricted peak discharge rate of 2.5 l/s which will provide a 92.2% betterment on the existing 1 in 1 year peak discharge rate and a 98.0% improvement on the existing 1 in 100 year peak discharge rate. Green roofs, tree pits, raingardens and permeable paving will be used where possible.

4.4.4 Site Sustainability Summary

Sustainability of the Site Sustainability is a key element to consider when working on any project in an urban environment and the use of SuDS can help a development to be more resilient to future climate change. Unlike more rural sites, where there is greater space to include larger SuDS methods; cities are a more challenging area to include sustainability into a development. The existing sewers have not been designed for an ever increasing demand for drainage and therefore the need to increase the amount of time the water takes to reach the sewer or reduce the amount of water entering the sewer can prevent future flooding. The drainage for the development has been made sustainable through the use of green roofs and permeable paving, which will slow the flow of water into the drainage network. The green roofs will mimic a greenfield site and provide an ecological benefit to the site by encouraging wild life and improving air quality. The green roofs and permeable paving will remove pollutants from the rain water that lands on each surface. This improves the water quality that enters the sewer, which eventually discharges into a water course. There is also a thermal benefit to having green roofs as they act as insulation to keep the building warm in the winter and cool in the summer. The attenuation tank will be fitted with flow control devices, which will limit the flow of water into the existing sewers, reducing the current intake of water. This will help to reduce the risk of future flooding in the local sewers and sewers further down the network.

4.5 Sustainable Drainage Maintenance Strategy

The proposed maintenance strategy is in line with the SuDS Manual as well as the manufacturer's guidance. An inspection checklist should be generated based on the maintenance strategy to facilitate consistent inspection of the condition of the system and as a method for recording inspections. Inspections should also be accompanied by photographic records to assist with the monitoring of the system.

The full maintenance regime is to be outlined in the Operation and Maintenance Manual and overseen by the Building Management team. The manufacturer's maintenance guidance shall be placed in the Operation and Maintenance Manual and it is recommended that an annual maintenance report should be prepared and retained within the Operation and Maintenance Manual.

Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit the specific requirements of the site.

All inspections of the SuDS system should comply with relevant health and safety legislation.

SUDS Element	Maintenance		
	Activity	Required Action	Typical Frequency
Green Roofs	Monitoring / Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems, 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	
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	
		Inspect underside of roof for evidence of leakage	
	Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Half yearly and annually or as required
		During establishment i.e. year one, replace dead plants as required	Monthly -but usually responsibility of manufacturer
		Post establishment, replace dead plants where > 5% of coverage	Annually in autumn
		Remove fallen leaves and debris from deciduous plant foliage	Half yearly or as required
		Remove nuisance and invasive vegetation, including weeds	
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	
	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	
Attenuation Tank	Monitoring / Inspections	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are working as they should	Annually or after severe storms
		Inspect and identify any elements that are not operating correctly.	Monthly for three months, then half yearly or as required.
	Regular Maintenance	Remove sediments / debris from catch pits / gullies and control structures	Annually, after severe storms or as required
	Remedial Actions	Repair inlets, outlets, vents, overflows and control structures.	As required

Table 4.3: SuDS Maintenance Strategy taken from the CIRIA SUDS Manual

SuDS design must assess all foreseeable risks during construction and maintenance. These are to be mitigated during detailed design stages where effective design will aim to avoid, reduce and mitigate risks.

This process will also require input from the principle contractor who must ensure the construction of SuDS is carried out in a safe and sustainable manner.

5 Foul Water Drainage Strategy

5.1 Design Parameters

The belowground foul drainage network will be designed to Sewers for Adoption 8th Edition, BS EN 752 Parts 3 and 4, and the Building Regulations Document H where appropriate.

5.2 Initial Consultations

5.2.1 Thames Water

A pre-development enquiry has been submitted to TW. This application is for Thames Water to confirm capacity available in existing adopted networks to accommodate the proposed discharge from the development site and their approval in principle of the drainage scheme. TW have confirmed that capacity exists for the redevelopment. Please refer to Appendix C for consultation.

5.3 Foul Water Discharge Rates

Using Building Regulations Part H, Table 5, based on 36 dwellings the peak flow rate from the existing development is estimated to be 6.3 l/s. Proposed foul water calculations have been calculated by TW as part of the predevelopment enquiry.

6 Conclusions

- I. Surface water and foul water from the site currently drain via gravity at unrestricted rates to TW surface and foul water sewers. Surface water discharges via gravity through several connections to the TW surface water sewer running along the sites southern boundary. Foul water discharges via gravity through a single onsite connection in the western section Brunel Walk.
- II. The local geology suggests that infiltration techniques are not likely to be suitable, and there are no local watercourses for the site to discharge into
- III. Development proposals include the redevelopment of Brunel Walk to provide 45 new residential dwellings along with associated hard and soft landscape, and landscaping improvements to the Turner Avenue Estate.
- IV. The proposed development will increase the impermeable area within the Brunel Walk development from 0.2168 ha from 0.2990 ha. Surface water will be attenuated as close to Greenfield runoff rates as reasonably practicable, as per the Sustainable Urban Drainage Systems (SuDS) Non-Statutory Technical Standards and London Borough of Haringey (LBH) requirements.
- V. The surface water drainage strategy has assessed opportunities of implementing different SUDS using a hierarchy of preferred methods, and has provided justification for the SUDS that have been recommended. Attenuation has been proposed for the area affected by the new residential development, which will restrict surface water discharge to 2.5 l/s, for the 1 in 100 year plus climate change rainfall event. Providing a 92.2% betterment on the existing 1 in 1 year peak discharge rate and a 98.0% improvement on the existing 1 in 100 year peak discharge rate.
- VI. New foul and surface water networks will be constructed to serve the proposed residential development and will discharge via gravity and the existing connections to their respective public sewers.
- VII. The existing and proposed surface water discharge rates for the site are outlined in Table 6.1 below.

	Surface Water Discharge Rate (1 in 100 year storm)
Existing Site	126.5 l/s
Proposed Development	2.5 l/s

*NB: Surface water rates above are only for new residential development.

Table 6.1: Existing and Proposed Discharge Rates



Meinhardt (UK) Ltd
10 Aldersgate Street
London
EC1A 4HJ
T: +44 (0) 20 7831 7969 F: +44 (0) 20 7404 7872

www.meinhardt.co.uk