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Surface Water and SuDS Assessment Rev2

Rear of 106 Downhills Park Road,
Tottenham,
London,
N17 6PA

12 July 2024

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Appendices

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Appendix D - Greenfield Runoff Calculation

Prepared by	Checked by	Date
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This document has been prepared solely as a Surface Water and SuDS Assessment for FPS Planning Ltd. Base Energy accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

1. Introduction

This Surface Water and SuDS Assessment has been prepared to support the planning application for the proposed residential development on land to the rear of 106 Downhills Park Road.

A site location plan is provided in **Appendix A**.

Existing Site Description

The existing site comprises a garage and associated hardstanding areas.

A copy of the existing site layout is shown in **Appendix B**.

Development Proposals

Proposals are for the demolition of the existing garage and the erection of a two storey two-bedroom house with associated hard and soft landscaped areas.

A copy of the proposed site layout is shown in **Appendix C**.

2. Planning Policy - Surface Water Management

The London Plan 2021

Policy SI 13 Sustainable drainage:

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.

9.13.1 London is at particular risk from surface water flooding, mainly due to the large extent of impermeable surfaces. Lead Local Flood Authorities have responsibility for managing surface water drainage through the planning system, as well as ensuring that appropriate maintenance

arrangements are put in place. Local Flood Risk Management Strategies and Surface Water Management Plans should ensure they address flooding from multiple sources including surface water, groundwater and small watercourses that occurs as a result of heavy rainfall.

9.13.2 Development proposals should aim to get as close to greenfield run-off rates as possible depending on site conditions. The well-established drainage hierarchy set out in this policy helps to reduce the rate and volume of surface water run-off. **Rainwater should be managed as close to the top of the hierarchy as possible. There should be a preference for green over grey features, and drainage by gravity over pumped systems.** A blue roof is an attenuation tank at roof or podium level; the combination of a blue and green roof is particularly beneficial, as the attenuated water is used to irrigate the green roof.

9.13.3 For many sites, **it may be appropriate to use more than one form of drainage**, for example a proportion of rainwater can be managed by more sustainable methods, with residual rainwater managed lower down the hierarchy. In some cases, direct discharge into the watercourse is an appropriate approach, for example rainwater discharge into the tidal Thames or a dock. This should include suitable pollution prevention filtering measures, ideally by using soft engineering or green infrastructure.

In addition, if direct discharge is to a watercourse where the outfall is likely to be affected by tide-locking, suitable storage should be designed into the system. However, in other cases direct discharge will not be appropriate, for example discharge into a small stream at the headwaters of a catchment, which may cause flooding. This will need to be assessed on a case-by-case basis, taking into account the location, scale and quality of the discharge and the receiving watercourse. The maintenance of identified drainage measures should also be considered in development proposals.

9.13.4 The London Sustainable Drainage Action Plan complements this policy. It contains a series of actions to make the drainage system work in a more natural way with a particular emphasis on retrofitting

Haringey Council

Local SuDS Standards

Haringey Council Local SuDS Standards document states:

SuDS Principles

LS1a Sustainable drainage systems are to be designed to control surface water run off close to where it falls as rainfall and mimic natural drainage as closely as possible in accordance with National Planning Practice Policy.

LS1b Proposals for SuDS must result in capture for reuse, discharge into the ground, to a surface water body or, where these are demonstrated to be not achievable, to the storm sewer or combined sewer where no storm sewer is available. The destination of runoff for proposed SuDS must be justified using a methodology acceptable to Haringey.

LS1c Storage and treatment of surface runoff should be provided through provision of a management train.

Peak flow control

LS2a For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

LS2b The design of the drainage system accounts for the likely impacts of climate change and potential changes in impermeable area over the design life of the development.

LS3a 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.

LS3b Where Greenfield rates cannot be achieved Haringey request that 50% of the Greenfield runoff rate attenuation volume be provided and outflows controlled to Greenfield runoff rates.

LS3c For developments which were previously developed, the design of the drainage system accounts for the likely impacts of climate change and potential changes in impermeable area over the design life of the development.

Volume control

LS4 To ensure no increase in flood risk elsewhere, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

LS5 To make provision for reduction in catchment flood risk, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. Haringey will seek to ensure that all means of volume reduction have been fully explored.

LS6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with **S4** or **S5** above, the runoff volume must be discharged at a rate that does not adversely affect flood risk. Haringey will request this rate to be a maximum discharge rate of Q_{bar} for the 1 in 100 year rainfall event with allowance made for climate change and application of urban creep where appropriate. Where development proposals do not meet these proposals Haringey will request that detailed hydraulic modelling be provided to demonstrate that there is no increased flood risk elsewhere in the receiving catchment.

Flood risk within the development

LS7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

LS8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

LS9a The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

LS9b SuDS design to ensure resilience to blockage and provide for exceedance. Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure, blockage of inlets or outlets, blockage of pipes, impediments along conveyance routes), and the associated flood risks reduced where possible.

LS9c Where development proposals do not meet these proposals Haringey will request that detailed hydraulic modelling be provided to demonstrate the risk of flooding within the development is manageable and that there is no increased flood risk elsewhere in the receiving catchment.

Structural integrity

LS10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

LS11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

Designing for maintenance considerations

LS12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity. Designs should ensure accordance with **S1a** before pumping is considered.

Construction

LS13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.

LS14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

Water Quality

LS15 For greenfield developments, the frequency of runoff from the development to any highway drain, sewer or surface water body should not be increased. The surface water runoff should be managed to prevent any discharge of surface water from the site for rainfall events less than 5mm in depth and prevent runoff from the first 5mm of rainfall for larger events. This should be achieved for the majority of all rainfall events that take throughout the year. **S1a** should be adhered to, otherwise the design should demonstrate that there is no runoff from 80% of rainfall events during summer events and 50% for winter rainfall events using time series rainfall hydraulic modelling analysis.

LS16 Where surface water is likely to be contaminated, effective management is required to reduce contaminant loads and concentrations in the runoff to acceptable levels, in order to minimise the risk of pollution of receiving waterbodies and/or protect receiving sewers.

3. Surface Water and SuDS

The whole site comprises approximately 130m².

As previously noted, the existing site comprises a garage and associated hardstanding areas.

Following redevelopment, the proposed site areas are broken down as follows:

- Roof areas - ~65m²
- Hardstanding (paving, parking areas, terraces etc) - ~30m²
- Landscaped areas - ~35m²

The proposals will result in a decrease in hardstanding areas.

Policy 9.13.2 of the London Plan 2021 states: *Development proposals should aim to get as close to greenfield run-off rates as possible depending on site conditions. The well-established drainage hierarchy set out in this policy helps to reduce the rate and volume of surface water run-off. Rainwater should be managed as close to the top of the hierarchy as possible. There should be a preference for green over grey features, and drainage by gravity over pumped systems.*

As such, in the first instance the **ICP SuDS** method within Micro Drainage has been used to calculate flow rates from the total site (as detailed in **Appendix D** and shown in **Table 1**).

Table 1 – ICP SuDS – Total Site Greenfield Runoff Rates (l/s)

Return Period	Flow Rate from 130m ² (0.013ha) (l/s)
Qbar	0.1
1 in 30 year	0.1
1 in 100 year	0.2

The London Plan 2021 Hierarchy

The following outlines the most feasible ways to manage surface water runoff in line with the London Plan hierarchy.

1) Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

There is the potential for simple rainwater harvesting. See the following section of this report.

2) Rainwater infiltration to ground at or close to source

At the time of writing, no site / ground investigation or infiltration testing (to BRE Digest 365) has been undertaken to confirm the underlying ground conditions.

As such, and as previously detailed, reference has been made to the Soilscales Maps provided by Cranfield University. These indicate that the soils at the site and surrounding areas are 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' with impeded drainage.

The BGS geology maps indicate that the site is underlain by London Clay.

On this basis, we would not recommend a SuDS strategy based on infiltration of surface water.

3) Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

The proposals include areas of gardens and planting.

A rain garden will be incorporated to manage some surface water from the roof areas. More details are provided overleaf.

4) Rainwater discharge direct to a watercourse (unless not appropriate)

There are no watercourses in the immediate vicinity of the site.

5) Controlled rainwater discharge to a surface water sewer or drain

It is understood that surface water runoff currently connects into the public sewer system and it is proposed that surface water runoff continues to drain as existing.

6) Controlled rainwater discharge to a combined sewer.

See above.

SuDS Options

SuDS aim to mimic natural drainage and can achieve multiple objectives such as removing pollutants from urban runoff at source, controlling surface water runoff from developments, ensuring that flood risk is not increased further downstream and combining water management with green space which can increase amenity and biodiversity value. When selecting SuDS, consideration needs to be given to a range of factors including the ground conditions, type of proposals, and the constraints of the site.

Based on the review of the London Plan 2021 drainage hierarchy, and given that the proposals will result in a decrease in hardstanding areas, the following SuDS are proposed:

- Simple rainwater recycling (water butt) - minimum 120l internal capacity
- Rain Garden

Water Butts

In order to provide a level of rainwater recycling, a minimum 120l water butts will be provided.

Water butts afford the opportunity to reduce the impact on already stretched potable water supply by enabling future occupants to reuse water collected in the water butt, for example when watering the garden/or washing cars etc. If this supply is used frequently this may also ensure that some additional storage is available during an extreme rainfall event.

Rain Garden

An area of rain gardens (~6m²) will be provided to manage flows from the front section of the roof (~25m²).

Design

- Freeboard – 100mm
- Topsoil – 300mm (ratio of approximately 50% sand, 30% topsoil and 20% compost)
- Subbase – 400mm, underdrain needs to be above the base.
- Underdrain at 550mm below ground level
- Orifice to reduce flows to 0.1l/s
- Overflow into newly constructed gully.
- Connecting into manhole – public sewer Planting to be shrubs / wildflowers / perennial flowering plants
- The downpipe will feed water directly onto the rain planter. Stones or gravel will be used to dissipate the energy of the water and prevent heavy flows from washing away soil.

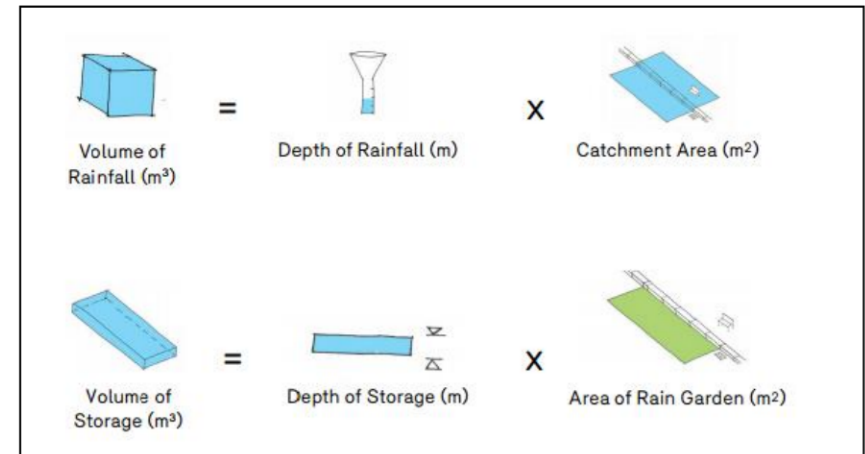


Figure 1 - Calculation

Calculations

As a general rule a rain garden should be 5-10% of the catchment area. A good aim is to store the first 20mm of rainfall – in London this is the estimated depth of rainfall for an hour storm with an annual probability of 1 in 5. Storing this amount of water contributes to reducing flood risk. Storing more water is even better, if there is adequate space to do so.

The storage depth is a combination of the freeboard and the sub-base storage. Only 30% of the depth of sub-base is used because this is the typical porosity of the gravel layer, i.e. 30% of gravel volume is space available for storing water.

For a given design standard, if the Volume of Storage is greater than the Volume of Rainfall it can be assumed that the Design Standard has been achieved.

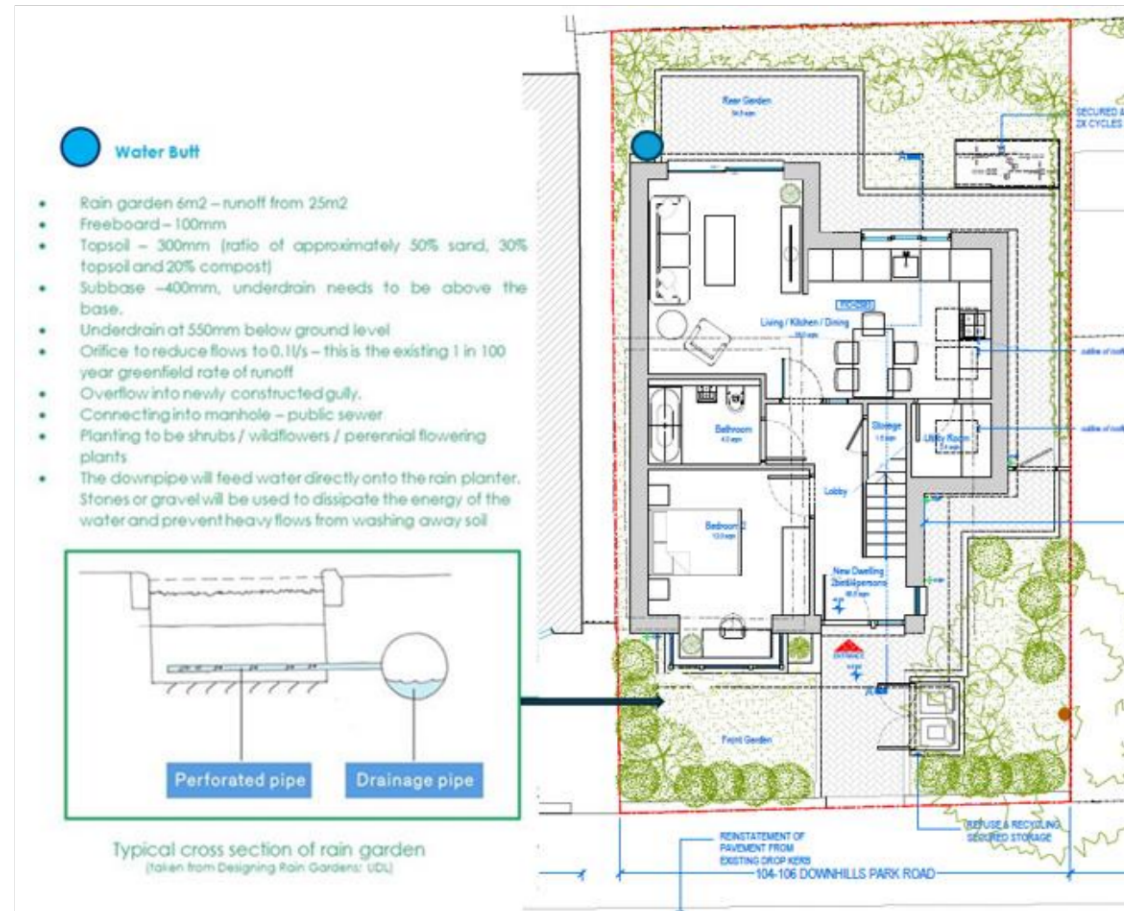
- **Area of Rain Gardens = 6m²**
- **Catchment Area (front section of roof area) = 25m²**
- **Depth of Freeboard = 0.1m / Depth of Sub-base = 0.4m**

$$\begin{aligned}
 \text{Depth of storage (m)} &= \text{depth of freeboard (m)} + 30\% \text{ depth of subbase (m)} \\
 &= 0.1\text{m} + 30\% \text{ of } 0.4\text{m} \\
 &= \mathbf{0.22\text{m}}
 \end{aligned}$$

$$\begin{aligned}
 \text{Volume of storage (m}^3\text{)} &= \text{depth of storage (m)} \times \text{area of rain garden (m}^2\text{)} \\
 &= 0.22\text{m} \times 6\text{m}^2 \\
 &= \mathbf{1.32\text{m}^3}
 \end{aligned}$$

Design Standard	Depth of Rainfall	Volume of Rainfall (m ³)	Volume of Storage (m ³)	Result
First flush	5mm	0.12	1.32	Okay
1 in 5 year	20mm	0.50	1.32	Okay
1 in 100 year	50mm	1.25	1.32	Okay

Indicative SuDS Layout



SuDS Maintenance

Operation and maintenance schedules are provided below (taken from Ciria C753 The SuDS Manual): these, or similar schedules, will be adopted by the property owners.

Water Butt

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	<i>The water butt should be routinely checked for litter – leaves can become trapped in the water butt which could lead to blockage of the taps and overflow</i>	Monthly
	<i>Where appropriate, and if safe to do so, the water butt should be cleaned annually to prevent smells associated with stagnant water, and to remove any algae.</i>	Annually

Rain Garden

Maintenance Schedule	Required Action	Typical Frequency
<i>During Establishment Period (Years 1 and 2)</i>	Watering Weeding Litter picking Pruning and trimming Check / clean channels, inlets and outlets Mulching	Weekly 3 Monthly Annually or as required
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding Litter picking Pruning and trimming Check / clean channels, inlets and outlets Replanting	6 Monthly Annually or as required

4. Conclusions

This Surface Water and SuDS Assessment has been prepared to support the planning application for the proposed residential development on land to the rear of 106 Downhills Park Road.

Proposals are for the demolition of the existing garage and the erection of a two storey two-bedroom house with associated hard and soft landscaped areas.

Based on the review of the London Plan 2021 drainage hierarchy, and given that the proposals will result in a decrease in hardstanding areas, the following SuDS are proposed:

- Simple rainwater recycling (water butt) – minimum 120l internal capacity
- Rain Garden - (~6m²) to manage flows from the front section of the roof (~25m²).

Operation and maintenance schedules have been provided. These or similar should be adopted by the property owner.

Appendices

Appendix A - Site Location Plan



[01] O.S. MAP (LOCATION PLAN) 1:1250 @ A3



[02] EXISTING BLOCK PLAN 1:500 @ A3

NOTE:
DO NOT SCALE FROM DRAWINGS – EXCEPT FOR PLANNING PURPOSES.
ALL DISCREPANCIES TO BE REPORTED TO ARCHITECT IMMEDIATELY.
ALL DIMENSIONS TO BE VERIFIED BY CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

P1 16/11/22 Pre planning application Issue
P2 XX/XX/XX Planning application drawings

Scale 1:1250 0 10 30 60 120m
Scale 1:500 0 5 12.5 25 50m



3.1 - Aerial view from South



3.2 - Aerial view from West

[03] AERIAL VIEWS



4.1 - View of the existing garage from Higham Road



4.2 - View of the property at No.106 Downhills Park Road from Higham Road



4.3 - View of the neighboring property at No.106 Downhills Park Road



4.4 - View of the existing gap between the existing garage and the property at No.194 Higham Road



4.5 - View of the existing garage and the property at No. 194 Higham Road

[04] SITE VIEWS

ISO-A3

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CLIENT:
Mr. T. Vassiliou

PROJECT TITLE:
104 - 106 Downhills Park Road, London N17 6PA

DRAWING TITLE:
Existing Location (O.S. Map) and Block Plans, Aerial and Site views

DRAWN:
SM
CHECKED:
PK
ISSUED BY:
PK
JOB AND DRAWING NO:

STATUS:
PLA
SCALE AT A3:
1:500/1:1250
REVISION:
P2

1882-E01-00

Appendix B - Existing Site Layout

Appendix C - Proposed Site Layout



[01] PROPOSED GROUND FLOOR PLAN

1:100 @ A3

NOTE:
DO NOT SCALE FROM DRAWINGS – EXCEPT FOR PLANNING PURPOSES.
ALL DISCREPANCIES TO BE REPORTED TO ARCHITECT IMMEDIATELY.
ALL DIMENSIONS TO BE VERIFIED BY CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

P1	03/03/22	Client issue
P2	07/09/23	Issued For Planning
P3	05/12/23	Issued For Planning: Alterations to side boundary position and rear 1st floor bedroom window design.
P4	09/04/24	Issued For Planning: Reduced scheme at 1.5 storeys in height, as agreed with Planning Officer Ms. Zara Seelig.

Scale 1:100
0 1 2.5 5

10m



ISO-A3

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PROJECT TITLE:

104 - 106 Downhills Park Road, London N17 6PA

DRAWING TITLE:

Proposed Ground Floor Plan

CLIENT:

Mr. T. Vassiliou

DRAWN:

SM

CHECKED:

PK

ISSUED BY:

PK

JOB AND DRAWING NO:

STATUS:

PLA

SCALE AT A3:

1:100

REVISION:

P4

1882-P02-00

Appendix D - Greenfield Runoff Calculation

Base Energy Services Limited		Page 1
44 Canal Street	Downhills Park Rd	
Bootle	Total Site	
Liverpool L20 8QU	Greenfield	
Date 23/08/2023	Designed by CC	
File	Checked by PK	
Micro Drainage		Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.013	Urban	0.000
SAAR (mm)	640	Region Number	Region 6

Results l/s

QBAR Rural	0.1
QBAR Urban	0.1
Q100 years	0.2
Q1 year	0.0
Q30 years	0.1
Q100 years	0.2

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Appendix E - Storage

Base Energy Services Limited					Page 1
44 Canal Street		Downhills Park Rd			
Bootle		Attenuation Storage			
Liverpool L20 8QU		100yr 40CC 0.3ls			
Date 23/08/2023		Designed by CH			
File Attenuation 100 yr 40cc...		Checked by PK			
Micro Drainage		Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.323	0.323	0.1	1.6	O K
30 min Summer	0.423	0.423	0.1	2.1	O K
60 min Summer	0.511	0.511	0.2	2.6	O K
120 min Summer	0.564	0.564	0.2	2.8	O K
180 min Summer	0.568	0.568	0.2	2.8	O K
240 min Summer	0.560	0.560	0.2	2.8	O K
360 min Summer	0.542	0.542	0.2	2.7	O K
480 min Summer	0.520	0.520	0.2	2.6	O K
600 min Summer	0.498	0.498	0.1	2.5	O K
720 min Summer	0.476	0.476	0.1	2.4	O K
960 min Summer	0.435	0.435	0.1	2.2	O K
1440 min Summer	0.360	0.360	0.1	1.8	O K
2160 min Summer	0.268	0.268	0.1	1.3	O K
2880 min Summer	0.193	0.193	0.1	1.0	O K
4320 min Summer	0.073	0.073	0.1	0.4	O K
5760 min Summer	0.042	0.042	0.1	0.2	O K
7200 min Summer	0.033	0.033	0.1	0.2	O K
8640 min Summer	0.028	0.028	0.1	0.1	O K
10080 min Summer	0.024	0.024	0.1	0.1	O K
15 min Winter	0.364	0.364	0.1	1.8	O K
30 min Winter	0.477	0.477	0.1	2.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	131.851	0.0	1.7	22	
30 min Summer	88.566	0.0	2.3	36	
60 min Summer	56.713	0.0	3.0	64	
120 min Summer	35.004	0.0	3.7	120	
180 min Summer	25.973	0.0	4.1	156	
240 min Summer	20.877	0.0	4.4	186	
360 min Summer	15.365	0.0	4.8	254	
480 min Summer	12.341	0.0	5.2	324	
600 min Summer	10.402	0.0	5.5	392	
720 min Summer	9.042	0.0	5.7	460	
960 min Summer	7.241	0.0	6.1	598	
1440 min Summer	5.284	0.0	6.7	864	
2160 min Summer	3.848	0.0	7.3	1252	
2880 min Summer	3.068	0.0	7.7	1640	
4320 min Summer	2.226	0.0	8.4	2252	
5760 min Summer	1.771	0.0	8.9	2936	
7200 min Summer	1.483	0.0	9.3	3672	
8640 min Summer	1.284	0.0	9.7	4392	
10080 min Summer	1.137	0.0	10.0	5136	
15 min Winter	131.851	0.0	1.9	22	
30 min Winter	88.566	0.0	2.6	35	
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Base Energy Services Limited					Page 2	
44 Canal Street Bootle Liverpool L20 8QU			Downhills Park Rd Attenuation Storage 100yr 40CC 0.3ls			
Date 23/08/2023			Designed by CH			
File Attenuation 100 yr 40cc...			Checked by PK			
Micro Drainage			Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
60 min Winter	0.581	0.581	0.2	2.9	O K	
120 min Winter	0.650	0.650	0.2	3.2	O K	
180 min Winter	0.658	0.658	0.2	3.3	O K	
240 min Winter	0.647	0.647	0.2	3.2	O K	
360 min Winter	0.623	0.623	0.2	3.1	O K	
480 min Winter	0.591	0.591	0.2	3.0	O K	
600 min Winter	0.558	0.558	0.2	2.8	O K	
720 min Winter	0.525	0.525	0.2	2.6	O K	
960 min Winter	0.462	0.462	0.1	2.3	O K	
1440 min Winter	0.354	0.354	0.1	1.8	O K	
2160 min Winter	0.226	0.226	0.1	1.1	O K	
2880 min Winter	0.095	0.095	0.1	0.5	O K	
4320 min Winter	0.037	0.037	0.1	0.2	O K	
5760 min Winter	0.028	0.028	0.1	0.1	O K	
7200 min Winter	0.022	0.022	0.1	0.1	O K	
8640 min Winter	0.019	0.019	0.1	0.1	O K	
10080 min Winter	0.017	0.017	0.0	0.1	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
60 min Winter	56.713	0.0	3.3	64		
120 min Winter	35.004	0.0	4.1	120		
180 min Winter	25.973	0.0	4.6	172		
240 min Winter	20.877	0.0	4.9	196		
360 min Winter	15.365	0.0	5.4	272		
480 min Winter	12.341	0.0	5.8	350		
600 min Winter	10.402	0.0	6.1	424		
720 min Winter	9.042	0.0	6.4	498		
960 min Winter	7.241	0.0	6.8	640		
1440 min Winter	5.284	0.0	7.5	914		
2160 min Winter	3.848	0.0	8.1	1324		
2880 min Winter	3.068	0.0	8.7	1620		
4320 min Winter	2.226	0.0	9.4	2208		
5760 min Winter	1.771	0.0	10.0	2936		
7200 min Winter	1.483	0.0	10.5	3672		
8640 min Winter	1.284	0.0	10.9	4336		
10080 min Winter	1.137	0.0	11.2	5088		
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Base Energy Services Limited		Page 3
44 Canal Street Bootle Liverpool L20 8QU	Downhills Park Rd Attenuation Storage 100yr 40CC 0.3ls	
Date 23/08/2023	Designed by CH	
File Attenuation 100 yr 40cc...	Checked by PK	
Micro Drainage		Source Control 2020.1.3

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.007

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.003	4	8	0.004

