123 Broadhurst Gardens, NW6

Surface Water Management Plan

SPILLWAYS
CIVIL ENGINEERING & INFRASTRUCTURE

Revision	Report Name	Date	Comment	By
F1	1149-SWMP-180420	20.04.18	Issued for Information	S.Kanadia
F2	1149-SWMP-180420	25.04.18	Issued for Information	S.Kanadia

Table of Contents

1. Introduction

1.1 Scope of Surface Water Management Plan

1.1.1 This Surface Water Management Plan has been prepared by Spillways Ltd to support the development works at 123 Broadhurst Gardens.

1.1.2 The report aims to analyse the pre and post-development surface water run-off rates generated during different rainfall events and to deliver an appropriate surface water management strategy to ensure that the development remains sustainable and safe during its design life.

1.1.3 Use of SuDS devices will be explored in greater detail in this report using the information available and the overall aim is to achieve an appropriate level of sustainability.

1.2 Policy Context

1.2.1 This Surface Water Management Plan has been prepared in accordance with the following national, regional and local planning policy and statutory authority guidance:

(i) National policy regarding flood risk as contained within the NPPF dated March 2012, issued by Communities and Local Government, and the online PPG released in March 2014;

(ii) London Plan (Revised 2015);

1.2.2 The lead guidance document that this surface water management strategy is based on is the London Plan (2015). In particular Policy 5:13 (Sustainable Drainage).

Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. *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 discharge rainwater to the combined sewer.*

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation.

2. Existing Site and Proposals

2.1 Site Description

2.1.1 The site currently offers itself as a residential unit set within a densely developed residential area.

2.1.2 The nearest postcode for the site is NW6 3BJ and the grid reference using publicly available mapping services is TQ 25763 84576.

2.1.3 The site falls under the jurisdiction of Camden Council and the site has a total footprint of approximately 459m².

2.1.4 Figure 1 below illustrates the site location with reference to its surroundings. Refer to Appendix A for the existing site drawings and levels.

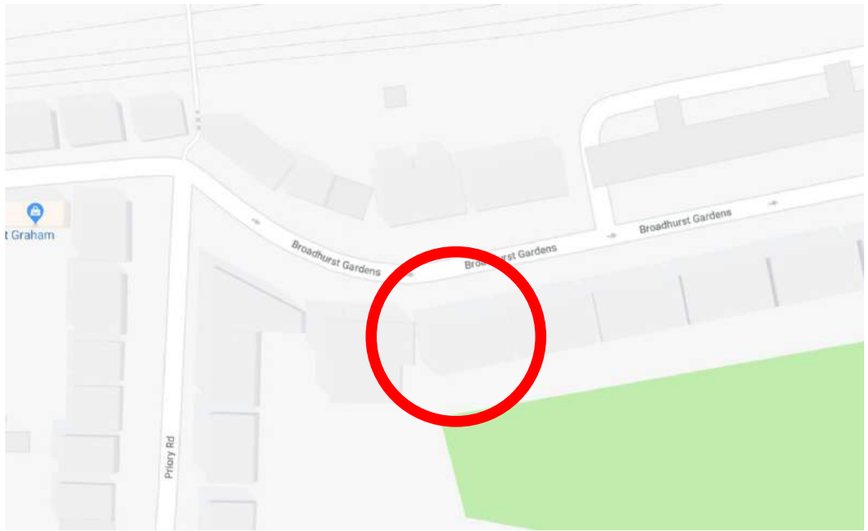

Figure 1 – Site Location Plan

2.2 Surface Area Study

2.2.1 123 Broadhurst gardens comprises of a mixture of impermeable and permeable surfaces. The split in areas are illustrated in Table 1 (below).

Surface Type	Area (m²)
Impermeable	229 m²
Permeable	230 m²
Total	459m²

Table 1 – Surface Area Schedule

2.2.2 Both roofed areas and paving contribute to the impermeable area for this site.

2.3 Proposed Development

2.3.1 The proposed development has been described using the plans reproduced in Appendix B of this report.

2.3.2 The plans identify for the site to be redeveloped and as a result the impermeable area of the site has been increased. The landscaping works allow for 183m² of permeable space in the form of gardens and planter areas.

2.3.3 Table 2 (below) illustrates the new permeability status of the site.

Surface Type	Area (m²)
Impermeable	276 m²
Permeable	183 m²
Total	459 m²

Table 2 – Surface Area Schedule

2.4 Existing Sewer Network

2.4.1 Thames Water are the local sewerage undertaken for the area which means they are responsible for the operation and maintenance of the infrastructure. A copy of the Thames Water sewer records has been attached as Appendix C of this report.

2.4.2 The development site is densely surrounded by Thames Water infrastructure according to the mapping data. The site benefits from a combined water sewer network. A detailed description of the sewer is provided in the section below.

2.5 Combined Water Sewer

2.5.1 A combined water conveying structure of size 940x610mm is laid under Broadhurst Gardens and is laid to fall in an easterly direction along Broadhurst Gardens.

2.5.2 This combined water sewer is assumed to have the profile of an inverted egg however this is to be confirmed.

2.5.3 The invert level of the sewer is identified to be 44.53m however the exact invert level of the pipe connection from 123 Broadhurst Gardens into the public sewer is to be confirmed. For the purposes of this report and design; the existing pipe connection into the public sewer is considered to remain untouched and is assumed to be of adequate condition to convey flows.

2.5.4 The contractor is to confirm the condition of the pipe into the public sewer.

2.6 Private Sewer Network

2.6.1 The contractors on site have confirmed a rectangular brick-built manhole to the front of the existing building. This rectangular manhole is a combined water manhole which is linked via an assumed 150mm diameter pipe into the outfall sewer.

2.6.2 The manhole is identified to be 2.830m below the existing ground level.

3. Surface Water Management Strategy

3.1 Climate Change

3.1.1 In considering for a suitable surface water management strategy for the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development.

3.1.2 The Environment Agency's 'Climate Change Allowances for Planners' guidance (which supports the NPPF) provides contingency allowances for potential sea level rise and for potential increases in peak river flow and rainfall intensity in Table 6 of the NPPF (it is noted that these allowances are consistent with the figures previously provided in the Technical Guidance to the NPPF and PPS25).

3.1.3 In accordance with Table 6 of the NPPF and PPG Section 7, a climate change allowance of 30% has been used within the Preliminary Drainage Strategy to allow for an increase in rainfall intensity for the lifetime of the development.

3.2 Greenfield Run-off

3.2.1 In line with the London Plan (2015), developments should be steered towards a Greenfield run-off rate as far as practicably possible. This section of the report aims to derive the Greenfield run-off rates for the site; Greenfield run-off rates being the equivalent discharge rate for an entirely undeveloped plot of land.

3.2.2 The pre-development run-off has been calculated using industry approved modelling software (PDS FLOW).

3.2.3 Table 3 (below) summarises the Greenfield run-off for different return periods. A copy of the greenfield run-off calculations have been shown in Appendix D.

Return Period	Run-off
Qbar	0.1 l/s
Q1YR	0.1 l/s
Q30YR	0.3 l/s
Q100YR	0.4 l/s

Table 3 - Greenfield Run-off Rate

3.3 Pre-Development surface water run-off

3.3.1 The site offers itself as a developed site consisting of a residential unit with both impermeable and permeable surface types therefore the site is brownfield in nature.

3.3.2 Table 4 (right) illustrates the surface water run-off rates for the site in this current state which contribute into the existing drainage network. The landscaped areas have not been incorporated into this modelling as rainwater would infiltrate into the ground.

3.3.3 The surface water run-off rates have been calculated using the Wallingford procedure adopted by on industry approved surface water modelling software. PDS Flow enables sustainable urban drainage systems (SUDS) to be designed, audited and tested for exceedance. The SUDS design process covers a systematic approach to sustainable drainage design.

Return Period (Years)	Permeable Area Run-off Rate (Litres/sec)
Q1 – 15	3.2 l/s
Q30 – 15	7.9 l/s
Q100 – 15	10.2 l/s

Table 4 – Surface Water Run-off

3.3.4 A full copy of the modelled calculations can be found reproduced in Appendix E.

3.4 Post-Development Surface Water Run-off

3.4.1 The proposed site layout plan suggests that there is an increase in the impermeable areas and therefore the discharge rates are anticipated to increase. Table 5 (overleaf) illustrates the proposed run-off rates as a result of the development.

3.4.2 The development site will need to remain sustainable throughout is design life and therefore a reduction in surface water run-off has been proposed. The following options have been considered for the development:

(i) Greenfield Runoff

(1) The discharge rate into the sewer is 0.1 l/s. This option has been discounted due to the volume of water required to be stored on site and the useable space available on this plot of land to accommodate such volume. Furthermore; the half drain time of the tank exceeds 24 hours and there are concerns regarding the prolonged exposure of the force of the mass volume of water on the retaining structure both onsite and offsite.

(ii) 50% Betterment of the existing 1 Year Return Period

(1) The discharge rate into the sewer is 1.6 l/s. This option is considered to be feasible. A volume of 6m³ is required for the 100 Year + 30% climate change event. This option will be developed in more detail as part of this report.

3.4.3 The London Plan (2015) requires new developments to be steered towards Greenfield run-off rates as far as practicably possible and therefore, the surface water discharge rate would be equivalent to 0.1 litres per second which will be the 1-year equivalent pre-development Greenfield run-off rate as illustrated in Table 3 (previous).

3.4.4 The proposed development type increases the impermeable area on site and therefore to meet the sustainability criteria required by Camden Council; the discharge of surface water into the public sewer has been restricted to 50% of the 1 Year pre-development run-off rate. Table 5 (below) illustrates the percentage betterment of post-development run-off rates compared to the pre-development run-off rates.

Return Period	Proposed Run-off Rate (l/s)	Betterment to existing Run-off (%)
1 Year	1.6 l/s	50 %
30 Year	1.6 l/s	80 %
100 Year	1.6 l/s	84 %

Table 5 – Post-Development Surface Water Run-off Percentage Betterment

3.4.5 The report will focus on how to best achieve these reduced run-off rates using different SuDS techniques.

3.5 Sustainable Drainage

3.5.1 SuDS should be introduced to mimic natural processes. SuDS help 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. This principle will be used as the forefront of achieving the bettered run-off rate. The Environment Agency SuDS hierarchy has been reproduced as Table 6 (right) and it explores the various options available to the site.

3.5.2 The table explains the benefits of SuDS devices and has been modified so that the justification for and against each device can be provided.

3.5.3 To summarise, the following SuDS will be used as part of the proposed surface water management strategy:

(i) Tanked systems

Rank	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Comment
1	Living Roofs	✓	✓	✓	No roof areas will be proposed as part of the development.
2	Basins and Ponds Construction Wetlands Balancing Ponds Detention Basins Retention Ponds	✓	✓	✓	Above ground SuDS devices are anticipated to be large in size to serve their purpose and strategically do not work with the type of development.
3	Filter Strips and Swales	✓	✓	✓	Above ground SuDS devices are anticipated to be large in size to serve their purpose and strategically do not work with the type of development.
4	Infiltration Devices Soakaways Infiltration trenches and basins	✓	✓	✓	A minimum of 5m should be maintained between a soakage device and a structure/boundary. This criterion has not been met.
5	Permeable Surfaces and filter drains Gravelled Areas Solid Paving Blocks Porous Paviors	✓	✓		Additional permeable areas have been introduced.
6	Tanked systems Over-sized pipes/tanks Storm-cells	✓			Tanked systems are unlikely to be used for this site.

Table 6 - Environment Agency SuDS Hierarchy

3.5.4 The Mayor will, and boroughs should, seek to ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy. Table 7 (overleaf) sets to explain the principles of the drainage strategy,

3.5.5 The idea is to use the principles higher up the rank unless there are reasons against.

Rank	Preference	Usage	Reason
1	Store rainwater for later use	✓	Rainwater Butts can be incorporated into the project.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	**X**	The ground is found to be clay in parts of the site and therefore primary infiltration techniques are considered to be unfeasible.
3	Attenuate rainwater in ponds or open water features for gradual release.	**X**	There is inadequate space for ponds or open water features to be used on this site however the option to allow flood water to store above ground during the low probability events can be explored at detail design.
4	Attenuate rainwater by storing in tanks or sealed water features for gradual release.	✓	Tanked systems will be required for attenuation.
5	Discharge rainwater direct to a watercourse	**X**	There are no watercourses within the vicinity of the site.
6	Discharge rainwater to a surface water sewer/drain	**X**	There are no separate surface water sewers within the vicinity of the site.
7	Discharge rainwater to the combined sewer.	✓	It is assumed that the manhole within the site is a combined sewer.

Table 7 - The London Plan Drainage Hierarchy

3.6 Design Principles for Surface Water Management

3.6.1 Key design principles in the following guidance documents steer the approach to managing surface water runoff at the site:

(i) Building Regulations hierarchy of drainage (H3);

(ii) Interim Code of Practice for SuDS;

(iii) CIRIA best practice guidance, including the use of the 'SuDS management train';

(iv) Flood and Water Management Act 2010 (part 1 – clause 27 (1)); and

(v) Flood and Water Management Act 2010 (part 1 – clause 9 (1)).

3.7 Surface Water Management and SuDS features

3.7.1 Surface Water is proposed to be captured on the proposed impermeable surface areas and routed towards gullys and gutters. Surface water will then be conveyed towards the below ground drainage system.

3.7.2 Below ground pipework is designed to direct the flows towards a flow control device which restricts the discharge rate. The Hydro-Brake® Flow Control is a device has been proposed for this site. It is self-activating, utilising the upstream hydraulic head to generate an air-filled vortex within the centre of the casing.

3.7.3 During heavy rainfall events; when the rate of flow into the Hydrobrake chamber is greater than 1.6 l/s; the rainwater will start to backup into the drainage system and store within the cellular storage tank.

3.7.4 The entire drainage system should be regularly inspected and maintained throughout its operating lifetime. This should be carried out by a competent and certified body.

3.7.5 As part of the proposed development, the existing Thames Water owned assets are to be protected from damage at all times during the construction as far as practicably possible.

4. Residual Risk

4.1 Residual Risk

4.1.1 It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, it is practicable to minimise the risk by allowing a freeboard (safety margin) and by using suitable construction and management techniques.

4.1.2 This surface water management plan has been prepared in accordance with the NPPF and Local Planning Policy. Any recommendations are based on the relevant British Standards, the standing advice provided by the Environment Agency or based on common practice.

4.1.3 However, it should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers to seek further guidance prior to commencing development.

4.1.4 Spillways do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

4.1.5 The owner/occupier of the site will be required to carry out maintenance on any SuDS devices within the site boundary. It will be the owners/occupiers responsibility to regular upkeep the drainage network (below and above ground) on site throughout the lifetime of the development to ensure that flood risk on and off site is managed effectively.

4.1.6 The report has been prepared using information made available at the time. Any recommendations have been provided within the report to ensure the development is designed appropriately.

5. Conclusion

5.1 Summary

5.1.1 This Surface Water Management Plan has been prepared by Spillways Ltd to support the development works at 123 Broadhurst Gardens.

5.1.2 The calculations presented within the report is proposed to be used to arrive with an appropriate surface water management strategy to ensure that the development remains sustainable and safe during its design life.

5.1.3 The report has been prepared to meet the requirements of the London Plan (2015) and incorporates the SuDS hierarchy.

5.1.4 The drainage plan illustrated as part of this report is a preliminary strategy only and is subject to change during the design stages. Gullies, pipes and pump devices do not account for foundations or finalised site layouts. The exact strategy is to be confirmed at design stages.

5.1.5 The condition of the outfall pipe is to be checked prior to connection works.

5.1.6 SuDS devices should be maintained in line with the manufacturer's recommendations to ensure the system remains operational and effective throughout the intended design life.

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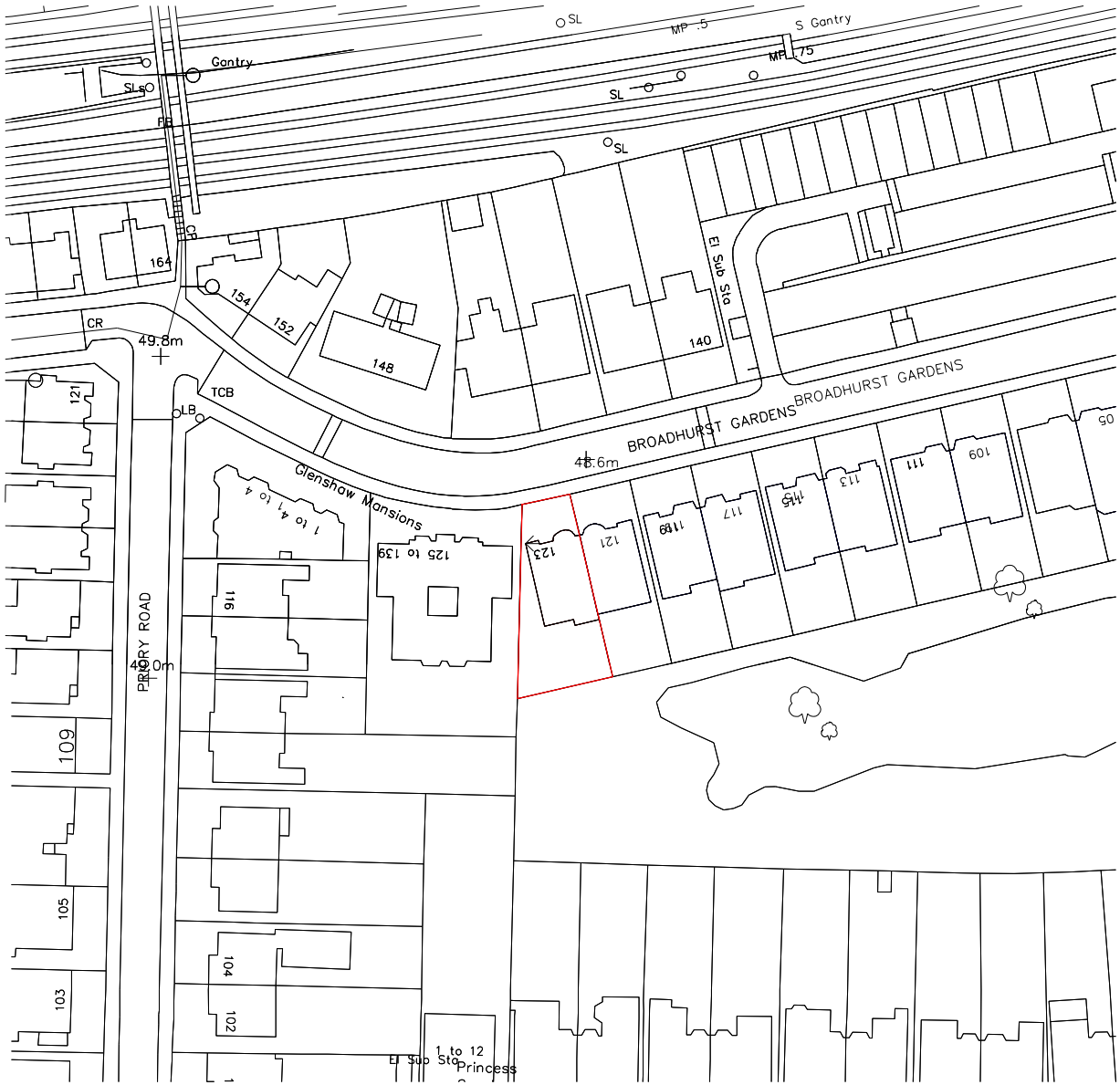
APPENDIX A – Existing Site



Rev.		
-	11.08.17	Issued for Planning

PLANNING

Project No.
16009

Client
Ms Bryony Marshall and Mr Matthew Lenczner

Date
July 2017

Scale
1:1250 @ A4

Project
123 Broadhurst Gardens

Drawing Title:
Site Location Plan

Drawing No.	Rev.
E_00	–

Drawn	Approved	Signed
MWH	RD	

Marek Wojciechowski Architects Ltd.
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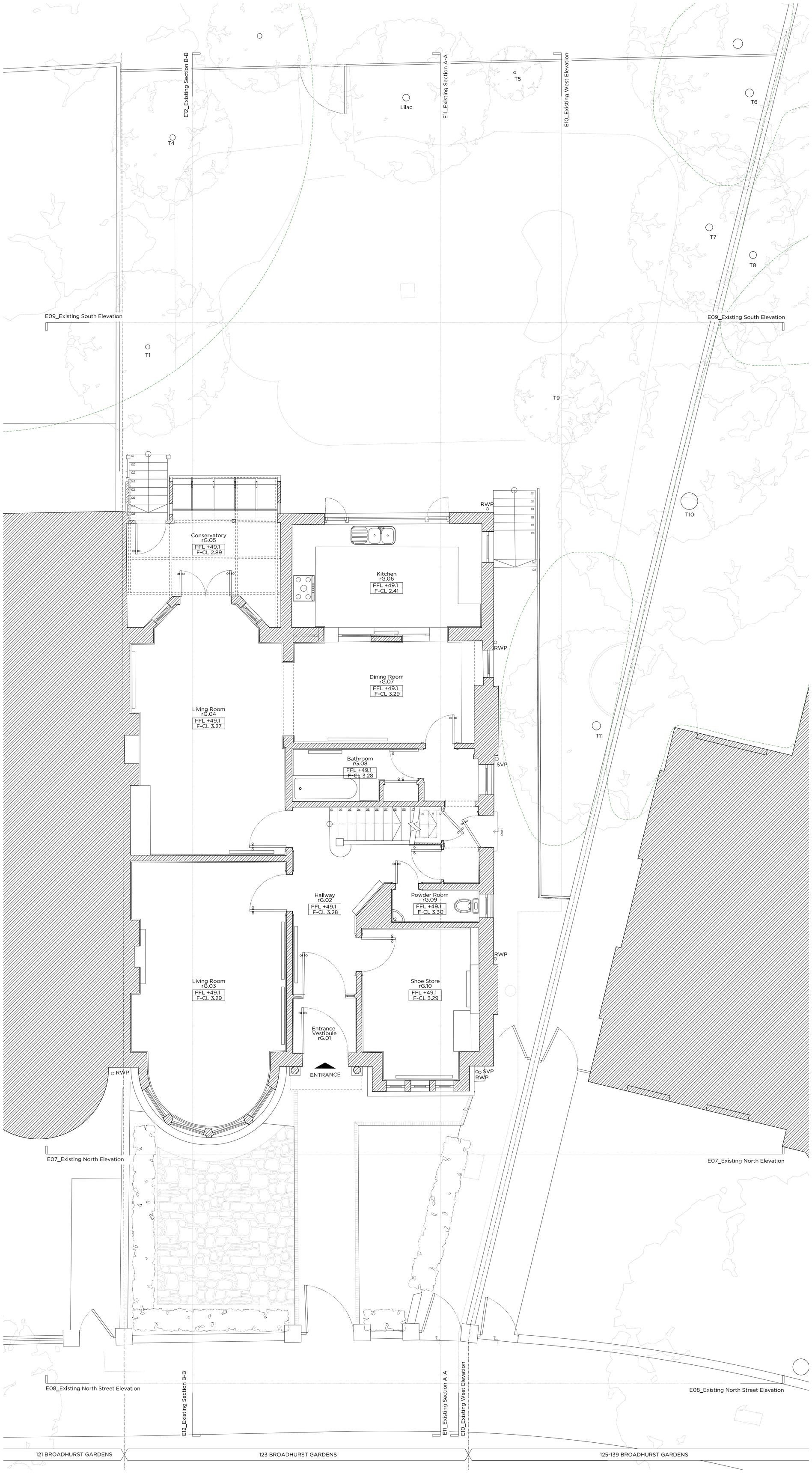
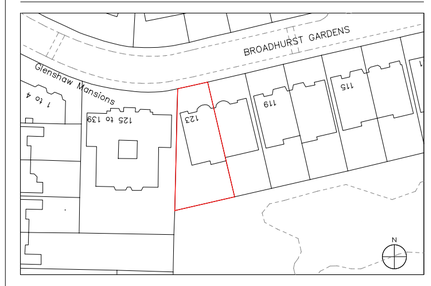


Key Plan, Scale 1:1250



Legend: Proposed Materials and Demolition Key

- Existing Structure/Earth
- Existing Brickwork
- Existing Slate Roof Finish
- Tree Root Protection Zone

Legend: Trees

Refer to corresponding Arboricutural Report by John Cromar Arboricultural Company Ltd.

T1. False Acacia
Remove: Grind stumps to below ground level
T4. Willow-leafed pear
Remove: Grind stumps to below ground level
T5. Willow-leafed pear
Remove: Grind stumps to below ground level
T6. Hoheria Sexstylosa
Prune to clear 2.5m over garden. Maximum cut size to be 30mm diameter
T7. False Acacia
Remove: Grind stumps to below ground level
T8. London Plane
Prune back to 2m spread over boundary
T9. Eucalyptus
Remove: Grind stumps to below ground level
T10. London Plane
Reduce overhang above no.123 to 2m
T11. Sycamore
Prune to pleached hedge form in plan as indicated: reduce overhang to west and to clear no.123 to east.

Rev.		
-	11.08.17	Issued for Pre-Planning

PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: April 2016

Scale: 1:100 @ A3 / 1:50 @ A1

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing Ground Floor Plan

Drawing No. E_01 Rev. -

Drawn	Approved	Signed
MWh	RD	

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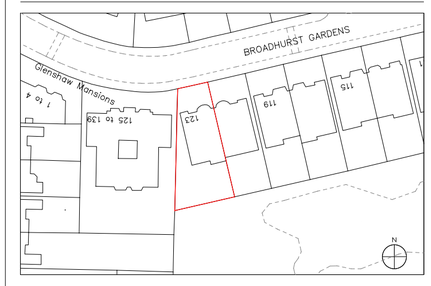
Key Plan, Scale 1:1250



Legend: Proposed Materials and Demolition Key

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Rev.		
-	11.08.17	Issued for Pre-Planning

PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: April 2016

Scale: 1:100 @ A3 / 1:50 @ A1

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing Lower Ground Floor Plan

Drawing No. E_02 Rev. -

Drawn	Approved	Signed
MWh	RD	

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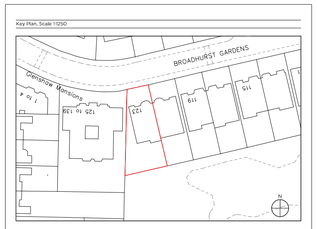

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PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: May 2017

Scale: 1:50 @ A1/1:100 @ A3

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing North Street Elevation

Drawing No. E_07 | Rev. -

Drawn: MWh | Approved: RD | Signed:

Marek Wojciechowski Architects Ltd.
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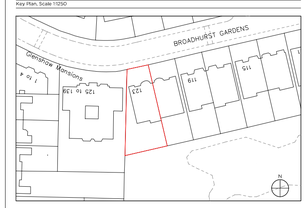

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Rev.- 11.08.17 Issued for Planning

PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: May 2017

Scale: 1:50 @ A1/1:100 @ A3

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing North Elevation

Drawing No. E_08 Rev. -

Drawn MWh | Approved RD | Signed

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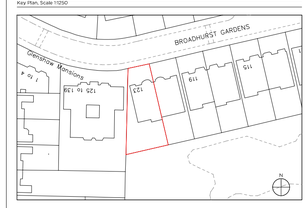
Key Plan, Scale 1:1250



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Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: May 2017

Scale: 1:50 @ A1/1:100 @ A3

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing South Elevation

Drawing No. E_09 | Rev. -

Drawn: MWh | Approved: RD | Signed:

Marek Wojciechowski Architects Ltd.
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E_07 Existing& Demo North Elevation

E_09 Existing & Demo South Elevation

123 BROADHURST GARDENS

Key Plan, Scale 1:1250

Legend: Proposed Materials and Demolition Key

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- Existing Slate Roof Finish
- Tree Root Protection Zone

Legend: Trees

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Remove: Grind stumps to below ground level
T4. Willow-leafed pear
Remove: Grind stumps to below ground level
T5. Willow-leafed pear
Remove: Grind stumps to below ground level
T6. Robinia Sexstylosa
Prune to clear 2.5m over garden. Maximum cut size to be 30mm diameter
T7. False Acacia
Remove: Grind stumps to below ground level
T8. London Plane
Prune back to 2m spread over boundary
T9. Eucalyptus
Remove: Grind stumps to below ground level
T10. London Plane
Reduce overhang above no.123 to 2m
T11. Sycamore
Prune to pleached hedge form in plan as indicated: reduce overhang to west and to clear no.123 to east.

Rev.		
-	11.08.17	Issued for Planning

PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: May 2017

Scale: 1:50 @ A1/1:100 @ A3

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing West Elevation

Drawing No.	Rev.
E_10	_

Drawn	Approved	Signed
MWh	RD	

Marek Wojciechowski Architects Ltd.

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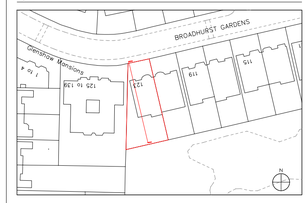
0 1m 2m 4m 6m 8m 10m

Key Plan, Scale 1:1250



Legend: Proposed Materials and Demolition Key

- Existing Structure/Earth
- Existing Brickwork
- Existing Slate Roof Finish
- Tree Root Protection Zone

Legend: Trees

Refer to corresponding Arboricutural Report by John Cromar Arboricultural Company Ltd.

T1. False Acacia
Remove: Grind stumps to below ground level
T4. Willow-leafed pear
Remove: Grind stumps to below ground level
T5. Willow-leafed pear
Remove: Grind stumps to below ground level
T6. Robinia Sexstylosa
Prune to clear 2.5m over garden. Maximum cut size to be 30mm diameter
T7. Falso Acacia
Remove: Grind stumps to below ground level
T8. London Plane
Prune back to 2m spread over boundary
T9. Eucalyptus
Remove: Grind stumps to below ground level
T10. London Plane
Reduce overhang above no.123 to 2m
T11. Sycamore
Prune to pleached hedge form in plan as indicated: reduce overhang to west and to clear no.123 to east.

Rev. - 11.08.17 Issued for Planning

PLANNING

Project No. 16009

Client: Ms Bryony Marshall and Mr Matthew Lenczner

Date: May 2017

Scale: 1:50 @ A1/1:100 @ A3

Project: 123 Broadhurst Gardens, NW6

Drawing Title: Existing Section A-A

Drawing No. E_11 Rev. –

Drawn MWh | Approved RD | Signed

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