Drainage Statement & Flood Risk Assessment

20 Crediton Hill, Camden

SD Structures Project Reference

SDS1585

Issuing Date

19/04/2023

Revision Number

Rev P01

SD Structures Ltd is a Limited Liability Company
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1.0 Introduction

1.1. SD Structures have been commissioned by Scenario Architecture to undertake a Flood Risk Assessment & Drainage Strategy to be submitted along with the additional documents to request planning approval for a residential development located at 20 Crediton Hill, Camden, London, NW6 1HP.

1.2. The report has been completed in accordance with guidance presented within the National Planning Policy Framework and its associated Planning Practice Guidance.

2.0 Existing Site & Proposed Site

2.1. The site is located at 20 Crediton Hill, Camden (Coordinate reference: E: 525732, N: 185068) with a total site area of 0.016ha. An extract of the redline boundary can be seen in Figure 1 below.

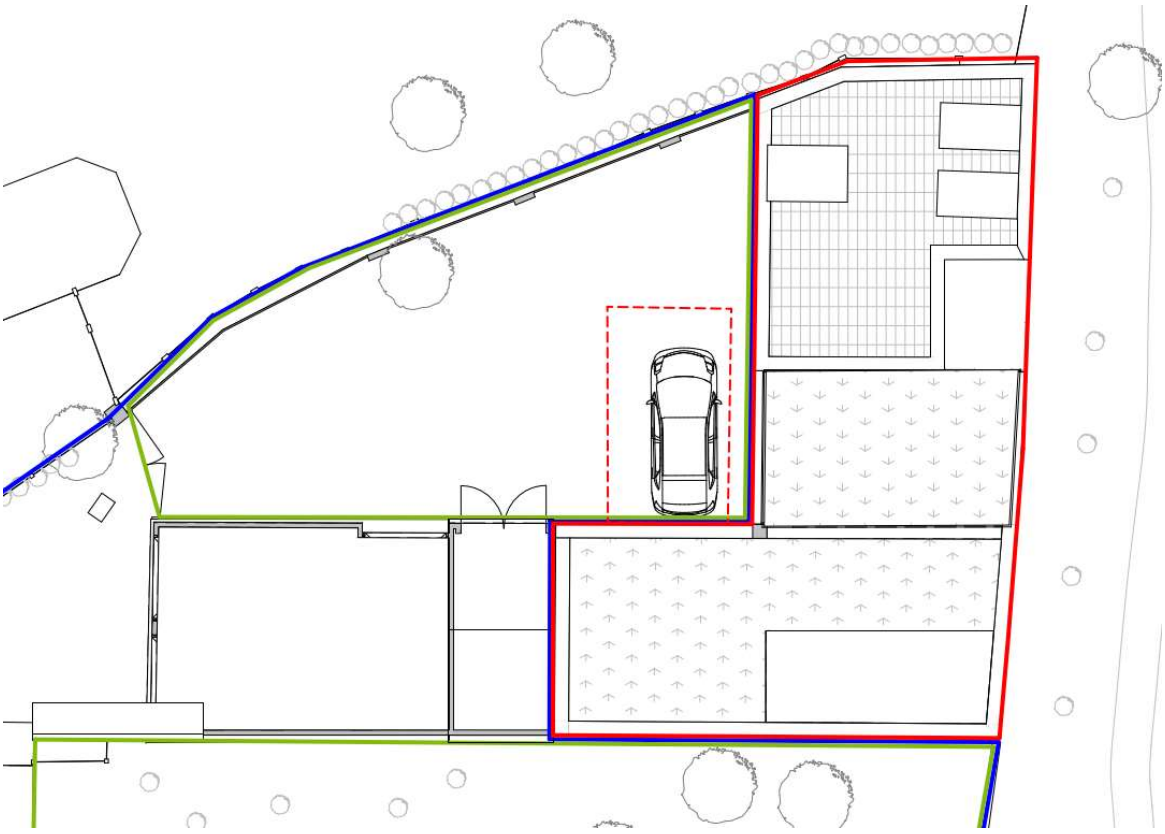


Figure 1 - Proposed redline boundary.

2.2. The site is currently consisting of a single residential dwelling and is made up of 100% impermeable area.

2.3. Based on the British Geological Survey mappings, the underlying geology is made up of London Clay Formation Bedrock with no overlying superficial deposit.

2.4. The proposed development comprises of the demolition of the existing residential dwelling and the erecting of a new 2 story dwelling, which will also include a new basement.

2.5. The existing drainage on site has been surveyed. From the survey it is evident that the existing drainage from the development discharged into a private combined network, discharging into a public combined sewer within Crediton Hill. The survey has been included within the appendices.

2.6. Greenfield and Pre-development discharge rates have been calculated using synthetic rainfall data derived from the Flood Study Report (FSR).

2.7. Greenfield runoff rates have been calculated using the IH124 methodology, whereas Pre-development rates have been calculated using the Modified Rational Method. These rates are outlined in Table 1 below.

Return Period	Greenfield Runoff Rates (l/s/ha)	Pre-Development Discharge Rates (l/s)
1:1yr	0.49	3.2
QBAR	0.58	N/A
1:30yr	1.33	7.8
1:100yr	1.85	10.1

Table 1 - Existing discharge rates

3.0 Policy and Climate Change

3.1. The proposed development is smaller than 1000m^2 in total floor space making the proposed development a minor development.

3.2. The Royal Borough of Camden's Local Plan states under Policy CC3 that developments will be required to utilise Sustainable Drainage Systems in line with the drainage hierarchy to achieve a greenfield runoff rate where feasible.

3.3. Additionally, due to the development being located within a Critical Drainage Area, the proposed development will also require a Flood Risk Assessment addressing the potential risk of all sources of flooding.

3.4. In addition to Royal Borough of Camden's Local Plan Policy SI13 of the London Plan will also apply to this development.

3.5. From the online data provided by the Department for Environment Food & Rural Affairs states that the proposed development is in the London Catchment. This catchment will require developments to increase their peak discharge rate by 40% to allow for future climatic changes.

4.0 Flood Risk Assessment

4.1. **Risk of Tidal Flooding:** The site is located a significant distance inland and is elevated above predicted extreme tide levels. Consequently, the risk of flooding from this source is considered to be low.

4.2. **Risk of Flooding from Fluvial Sources:** Inspection of the EA's 'Flood Map for Planning' identifies that the site is situated in Flood Zone 1 and OS mapping shows that there are no main rivers, ordinary or manmade watercourses near to the site. Consequently, the risk of flooding to the site from rivers is considered to be low.

4.3. **Risk of Flooding from Pluvial Sources:** After inspection of the EA's 'Extent of flooding from Surface Water' it is evident that the site is not located within an area of very low risk of surface water flooding. The EA's mapping is a national dataset which can provide an indication of the surface water flood risk to an area.

The London Borough of Camden has also undertaken detailed modelling of the extent of surface water flooding within the borough. From this mapping it is evident that the proposed development is located outside of the modelling extent. Therefore, it is concluded that the risk of flooding from this source is low.

4.4. **Risk of Flooding from Sewer:** From the CCTV survey it is assumed that the public sewer network within Crediton Hill is a combined system. During an unlikely event of a combined sewer surcharging, i.e., following an extreme rainfall event or a blockage within the system, surcharging sewer water would likely leave the system at a location lower than the development. Nonetheless the proposed development will be fitted with a non-return valve and positive pump device for any basement drainage. Consequently, it is concluded that the risk of flooding from this source is low.

4.5. **Risk of Flooding from Groundwater:** From the mappings provided within the Strategic Flood Risk Assessment developed by London Borough of Camden, show that the development is in a location of low risk of groundwater flooding. Nonetheless, to reduce the risk of groundwater flooding to the proposed development a two-tier waterproofing system will be implemented within the basement construction, consisting out of a Type A or B system in combination with a Type C system. Consequently, with the inclusion of the mitigation measure the risk of flooding from this source is considered to be low.

4.6. The proposed development has been asset for all sources of flooding, and it has been concluded the risk is considered to be low from these sources.

5.0 Drainage Hierarchy

5.1. Policy S13 of the London Plan set out a drainage hierarchy to provide the most sustainable method of discharging surface water runoff from developments. Policy S13 states that the preferred method of managing surface water runoff is by utilising it on site. If this is not feasible, discharging it via infiltration, or discharging it into a watercourse should be considered. The least favourable method of discharging surface water runoff is to connect it into a public sewer system, with a surface water sewer being more favourable than a public foul sewer.

5.2. **Infiltration:** The underlying geology has been assessed using the mapping provided by the British geological Survey. From the mapping it is evident that the underlying geology is made up of London Clay formation with no overlying superficial deposit. London Clay is commonly associated with very low infiltration rates, due this discharging all surface water runoff via infiltration-based SuDS has been deemed not viable for this development.

5.3. **Connection into Watercourse:** There is no watercourse or drainage ditch located in close proximity to the development. Due to this discharging surface water runoff via a connection into a watercourse or drainage ditch has been discounted.

5.4. **Connection into Public Sewer:** From the CCTV survey it is evident that the existing development has an existing connection into the assumed public combined sewer running along Crediton Hill. The existing connection into this sewer will be utilised to discharge all surface water runoff from the development.

6.0 Surface Water Drainage Strategy

6.1. From Figure 1, it is evident that the proposed redline boundary only overs the extent of the development and does not include any open space or garden areas. Due to this there is limited opportunity to implement SuDS within the development.

6.2. The Architectural layout has suggested the utilisation of green roofs for the development. To provide benefits regarding water quantity controls a minimum of 80mm sub-base should be provided. These are designed by a specialist to delay the peak discharge rate by slowing down infiltrating surface water. The green roof should be design with an adequate drainage layer to avoid stagnation within the sub-base, additionally and overflow should be designed to reduce the risk of overflowing surface water runoff in the event the downpipe becomes blocked. In Figure 2 below the areas of green roof have been shown. The proposed green roof will also provide a betterment regarding biodiversity and water quality.

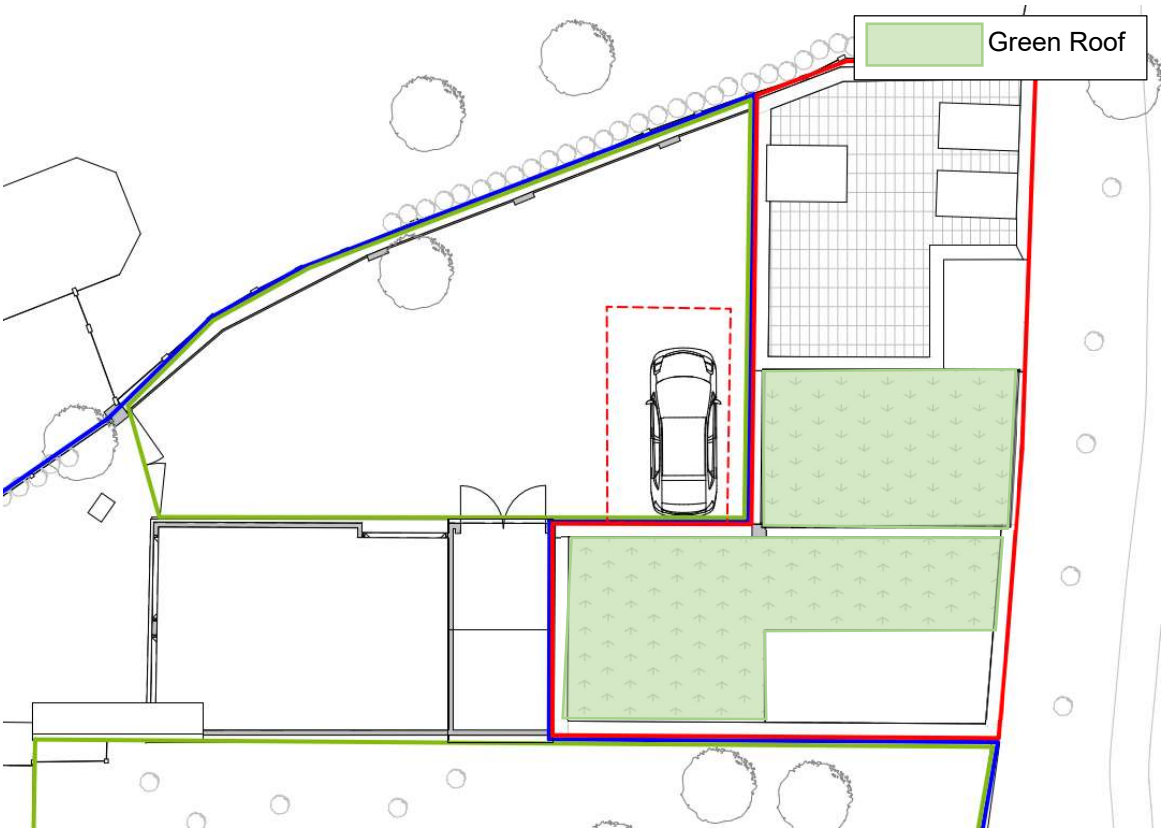


Figure 2 - Location of proposed green roofs.

6.3. The proposed drainage system has been modelled using the industry standard Causeway Flow+ software. The undertaken hydraulic calculations use synthetic rainfall data derived using the Flood Estimation Report (FSR). A 40% allowance in rainfall has been made to allow for any future climatic changes.

6.4. To represent the green roof's ability to delay peak discharge rates within the hydraulic model, a time of entry of 10 minutes for the green roof catchments has been used.

6.5. In Table 2 the proposed and existing discharge rates have been provided.

Return Period	Greenfield Runoff Rates (l/s)	Proposed Runoff Rates (l/s)
1:1yr	3.2	2.3
1:30yr	7.8	5.6
1:100yr	10.1	7.2
1:100yr+CC	14.2	9.6

Table 2 – Pre & post discharge rates.

6.6. Based on the above table and the included results of the hydraulic model it is evident that the proposed drainage system can accommodate up to and including the design event. Additionally, with the inclusion of the proposed green roofs the proposed development will provide a reduction in discharge rates when compared to the existing situation.

7.0 Management and Maintenance

7.1. The proposed drainage system will be located within a private garden; therefore, the owner of the development will be required to manage and maintain the proposed SuDS.

7.2. Typical management requirements have been outlined in Table 4 below. The management company should also refer to any manufacture's specific management and maintenance requirements.

Drainage Asset	Responsible Organisation	Maintenance Work	Frequency
General Pipework and manholes	Private ownership	Inspect pipework and manholes and clear any blockages; Repair to any defects over long-term usage	Annually or after severe storm events
Green Roof	Private ownership	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually or after severe storm events
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		If erosion channels are evident, these should be stabilised with extra soil substrate like the original material, and sources of erosion damage should be identified and controlled	As required
		Inspect underside of roof for evidence of leakage	Annually and after severe Storms

Table 3 – Maintenance Schedule

7.3. The manufacturers management and maintenance requirements for the green roof should be provided to the owners and should be followed for the lifetime of the development.

8.0 Summary

8.1. This report has been undertaken to be accompanied for the planning application for the development located at land off 20 Crediton Hill, Camden, London, NW6 1HP.

8.2. As part of the assessment, the risk of flooding from a wide range of sources has been assessed, it has been identified that the risk of the proposed development is low. In order to minimise the impact of offsite flooding from the proposed development, the opportunities for managing surface water at the site have been analysed.

8.3. The report outlines that the most viable method of discharging surface water runoff is via the existing connection into the public combined sewer system.

8.4. Due to the limited space within the redline boundary, there has been a limited possibility to included SuDS within the development. Nonetheless green roofs have been proposed for the roof area to provide a reduction in peak runoff rates and increase biodiversity within the development.

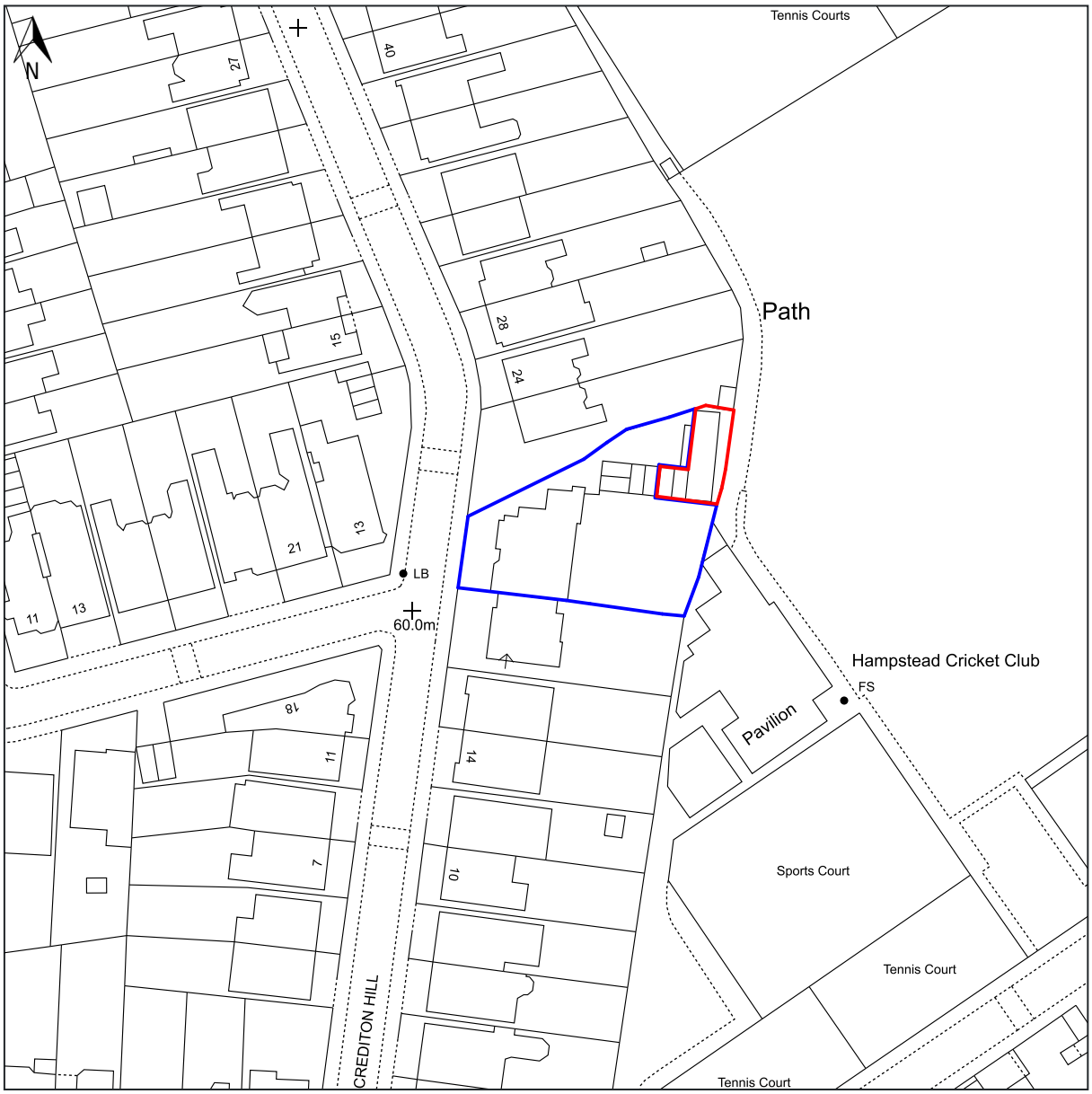
8.5. Typical management and maintenance requirements have been included within this report. Before commissioning the development, a manual outlining the management and maintenance requirements for each proposed SuDS system should be provided to the end owner and user.

APPENDIX A

ARCHITECTURAL DRAWINGS

EXISTING
Not For Construction

Rev	Date



01 Location Plan
Scale 1:1250

N

SCALE 1:1250
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S A
10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

Scale @ A4
1:1250

Project No.
168

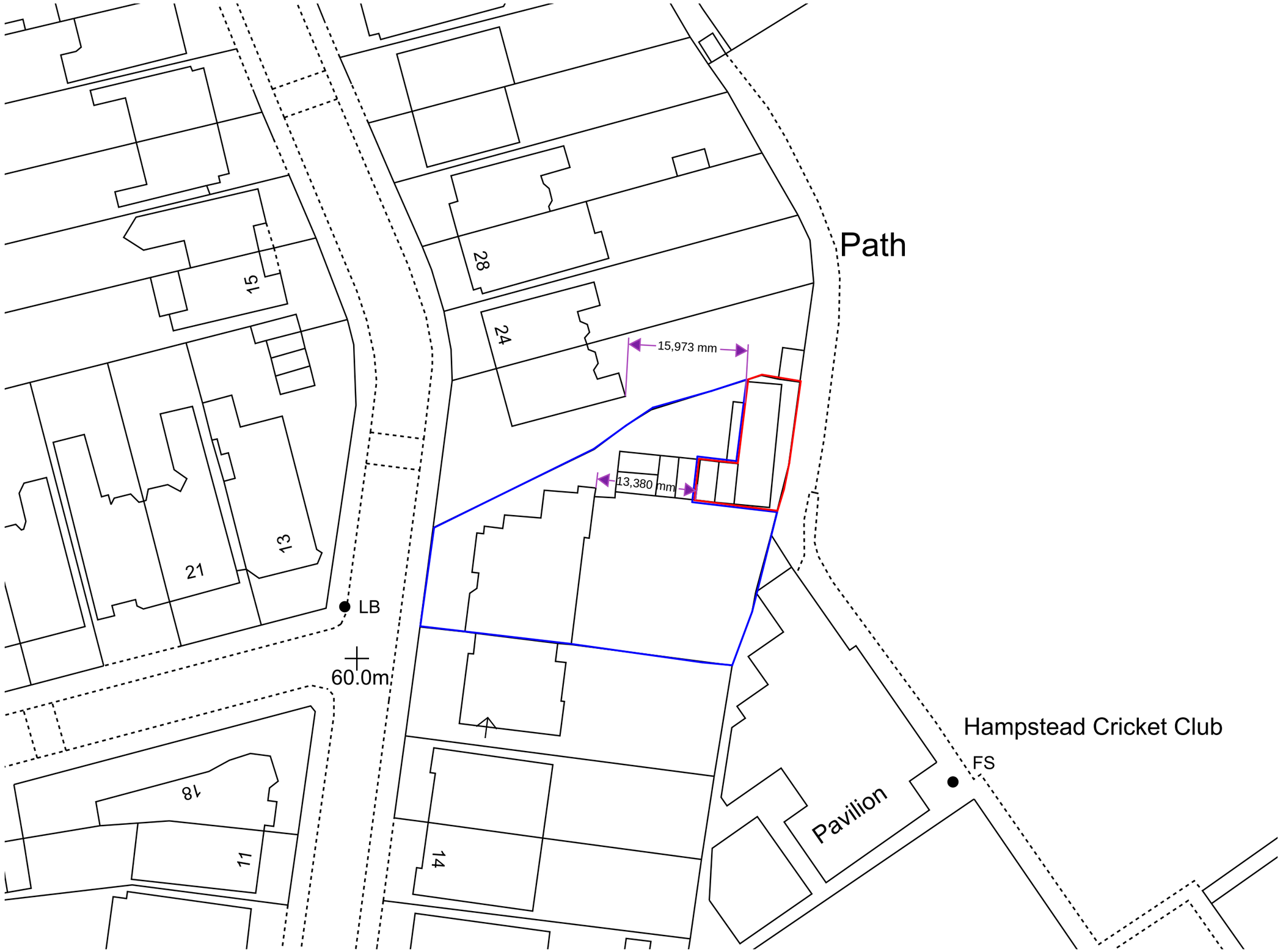
Drawing Name
Location Plan

Drawing Number
LO-A-01

Rev

EXISTING
Not For Construction

Rev	Date



01 Block Plan
Scale 1:500

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S A
10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

Scale @ A3
1:500

Project No.
168

Drawing Name
Block Plan

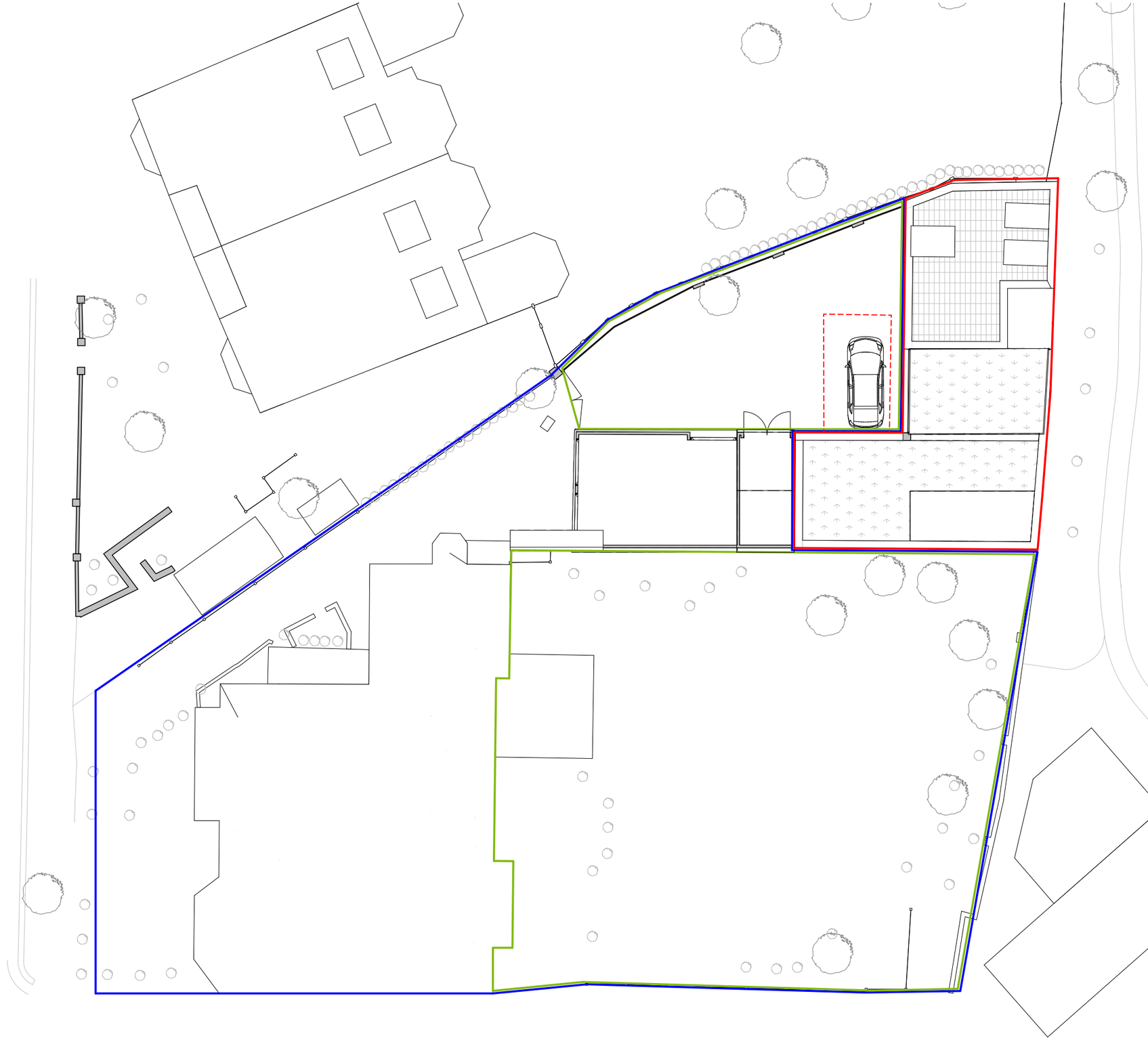
Drawing Number
LO-A-02

Rev

EXISTING

Not For Construction

Rev	Date



LEGEND

- Area of Freehold Site and Premises subject of Application
- Ownership form below existing ground level
- Adjacent land over which Application Site and Premises have the established full unconditional legal rights of pedestrian and vehicular access, parking/garaging, all other general uses, full use of Communal Gardens, own Services: Gas, Mains Water, Mains Electricity, Drainage, Cable Services, communal General Waste and Recycle Waste Bin facilities, own CCTV Security system
- Full use of Communal Gardens

2 Proposed Site Plan 1:200

SCALE 1:200 0 4 8m

S A

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:

20 Crediton Hill, London NW6 1HP London UK

Scale @ A3 **1:200**

Project No. **168**

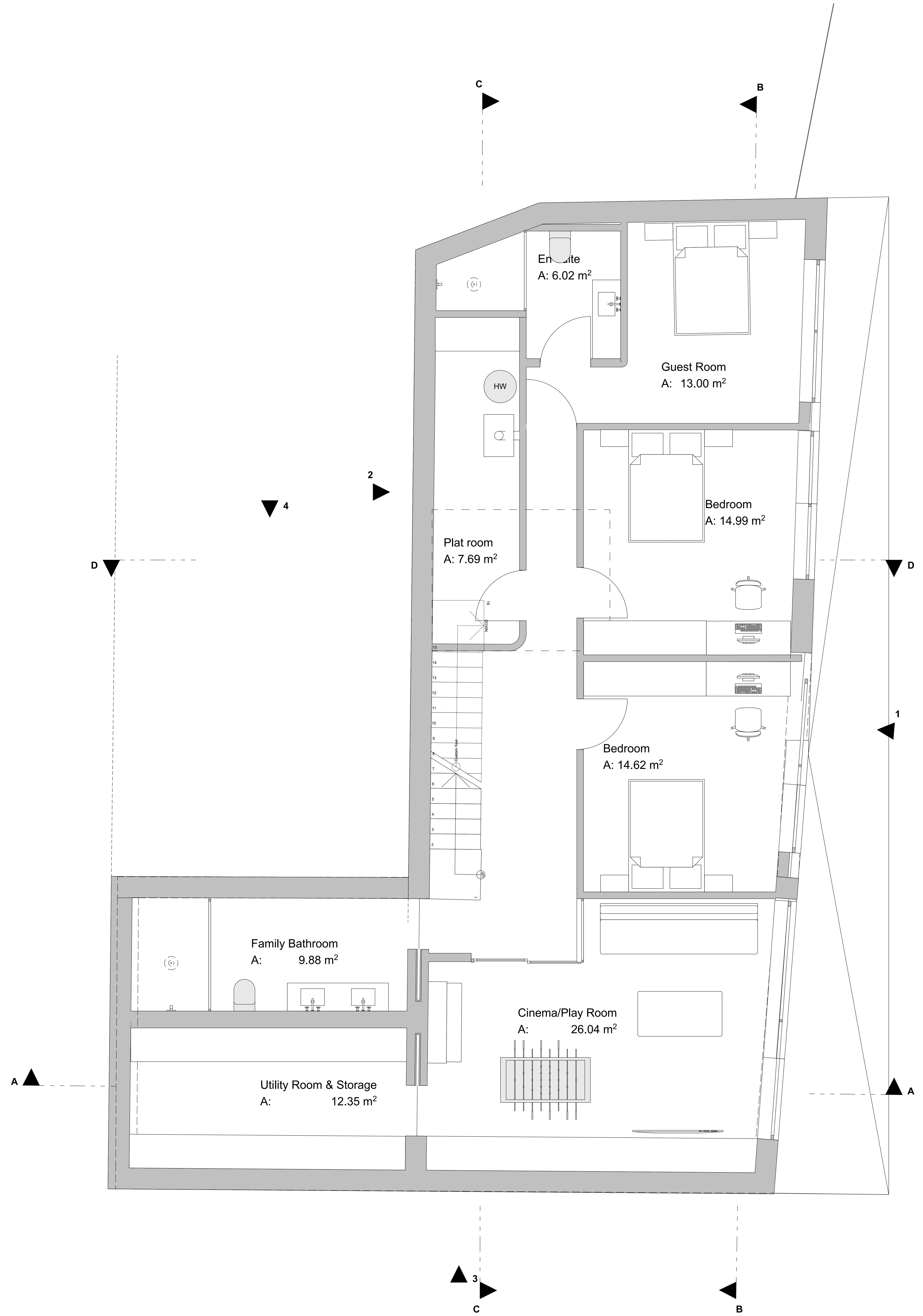
Drawing Name
Site Plan

Drawing Number **PR-A0.01**

Rev

EXISTING
Not For Construction

Rev	Date



1 Basement 1:50

SCALE 1:50 0 1000 2000mm

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

Drawing not to be used other than the purpose for which it was prepared. It's supplied without liability for errors or omissions. All dimensions are to be checked on site. This drawing is to be read in conjunction with all other drawings. Notes on this drawing will apply to all other drawings where a similar position exists.

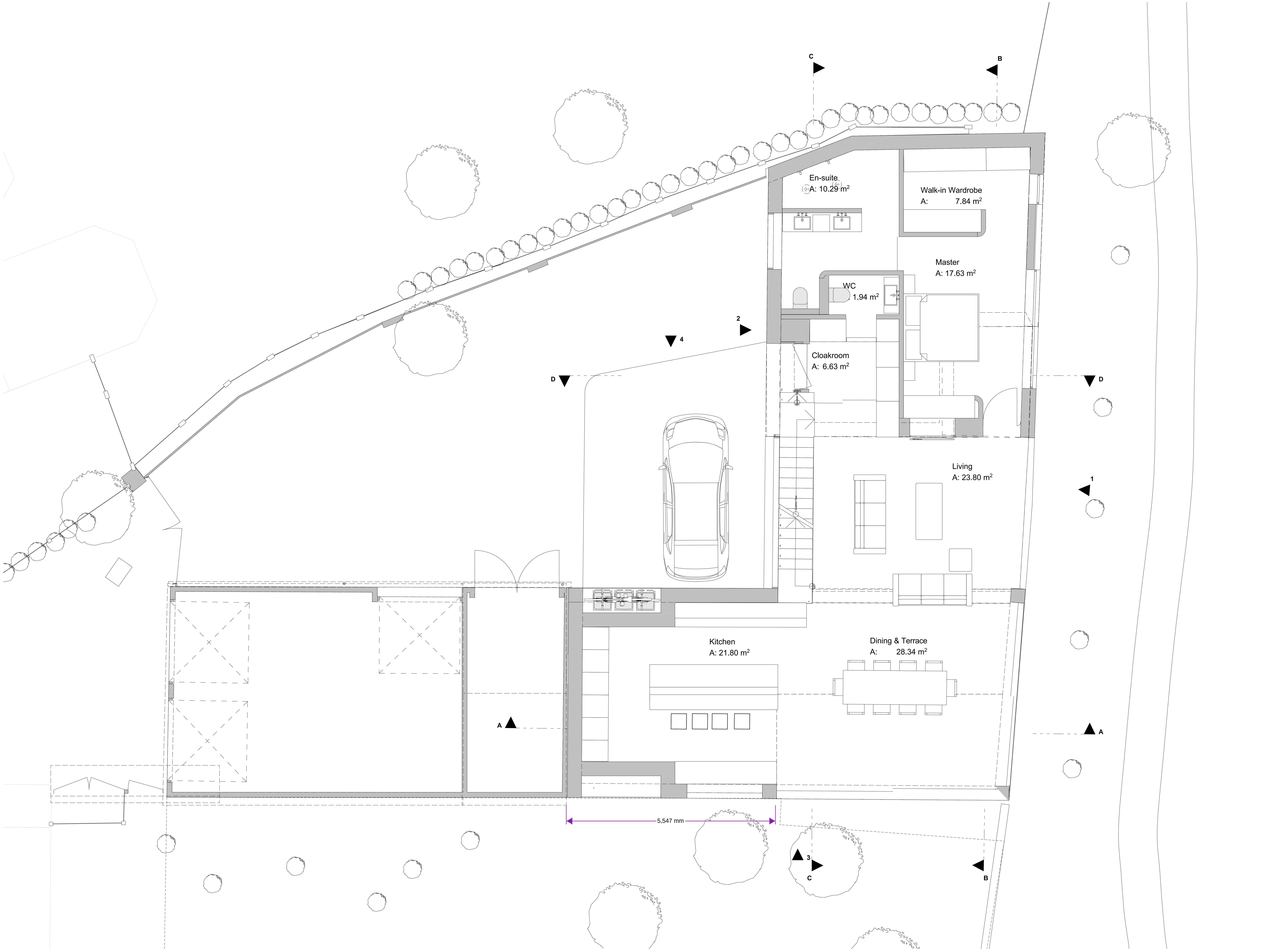
Scale @ A1: **1:50**
Project No. **168**

Drawing Name
Proposed Basement Floor Plan

Drawing Number: **PR-A1.01**
Rev

EXISTING
Not For Construction

Rev	Date



1 Ground Floor 1:50

SCALE 1:50 0 1000 2000mm

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

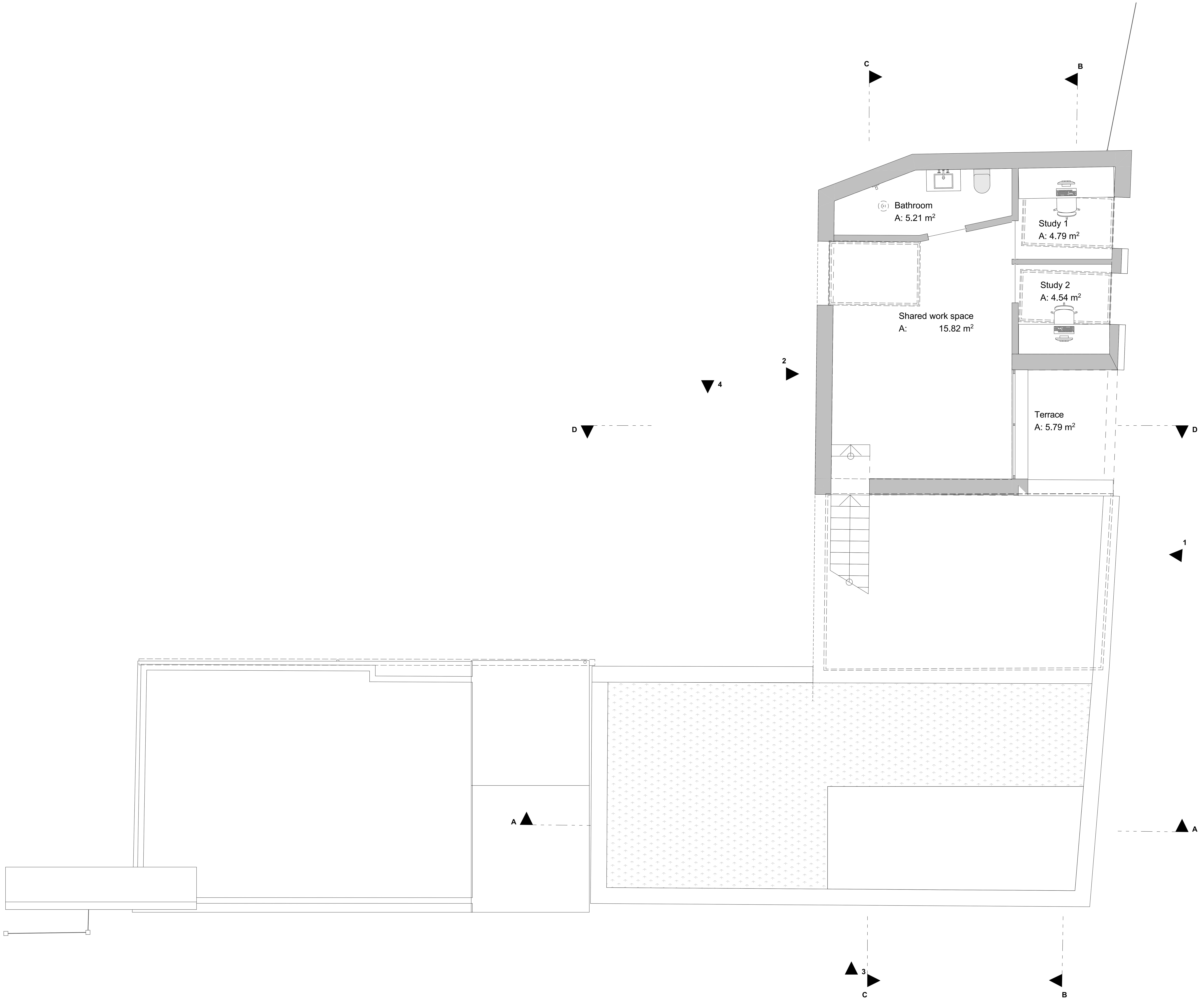
Scale @ A1 **1:50** Project No. **168**

Drawing Name
Proposed Ground Floor Plan

Drawing Number Rev
PR-A1.02

EXISTING
Not For Construction

Rev	Date



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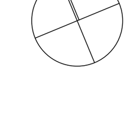

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

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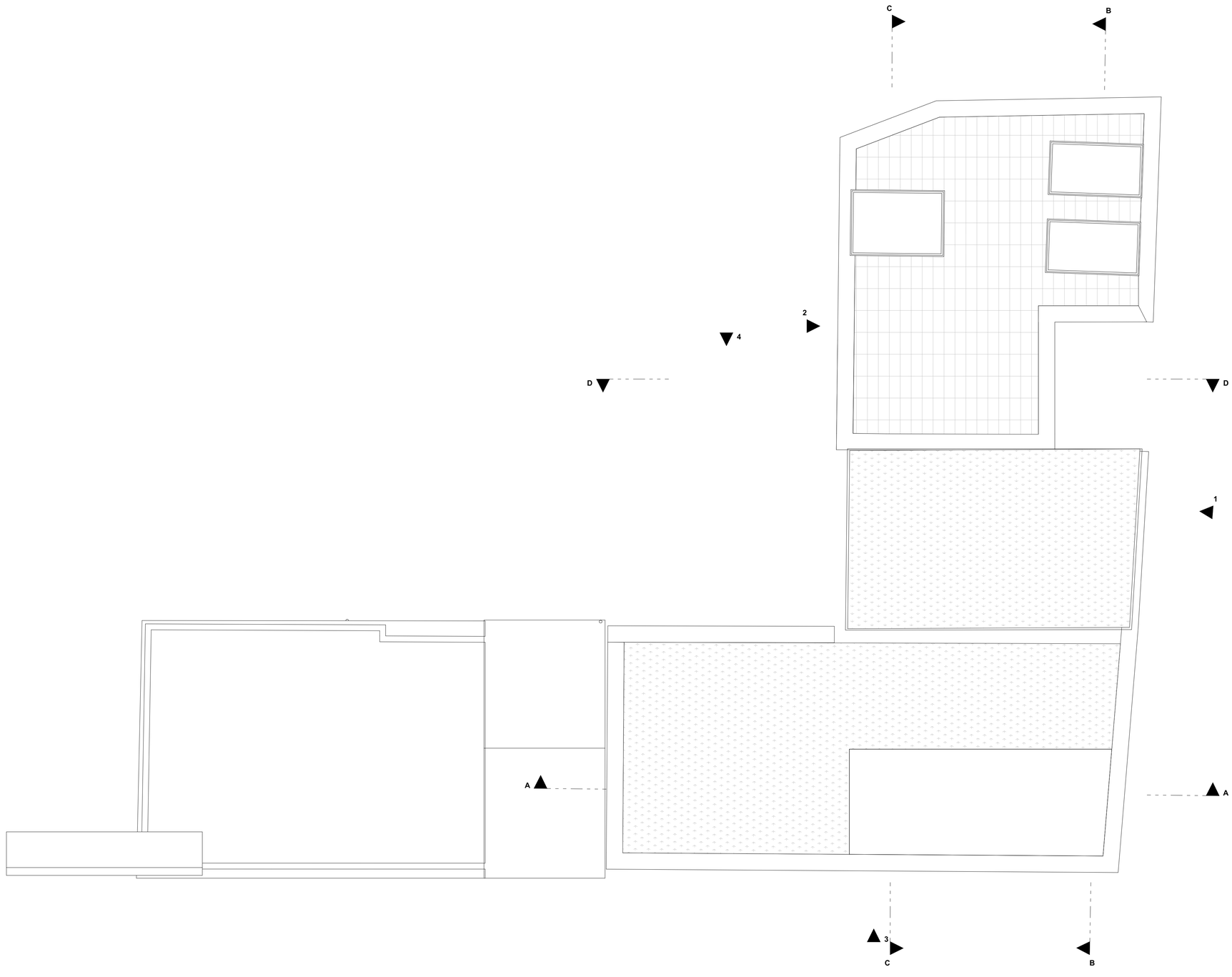
Proposed First Floor Plan

Drawing Number Rev
PR-A1.03

EXISTING
Not For Construction

Rev	Date



1 Roof 1:50

SCALE 1:50
0 1000 2000mm

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

Scale @ A1
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Project No.
168

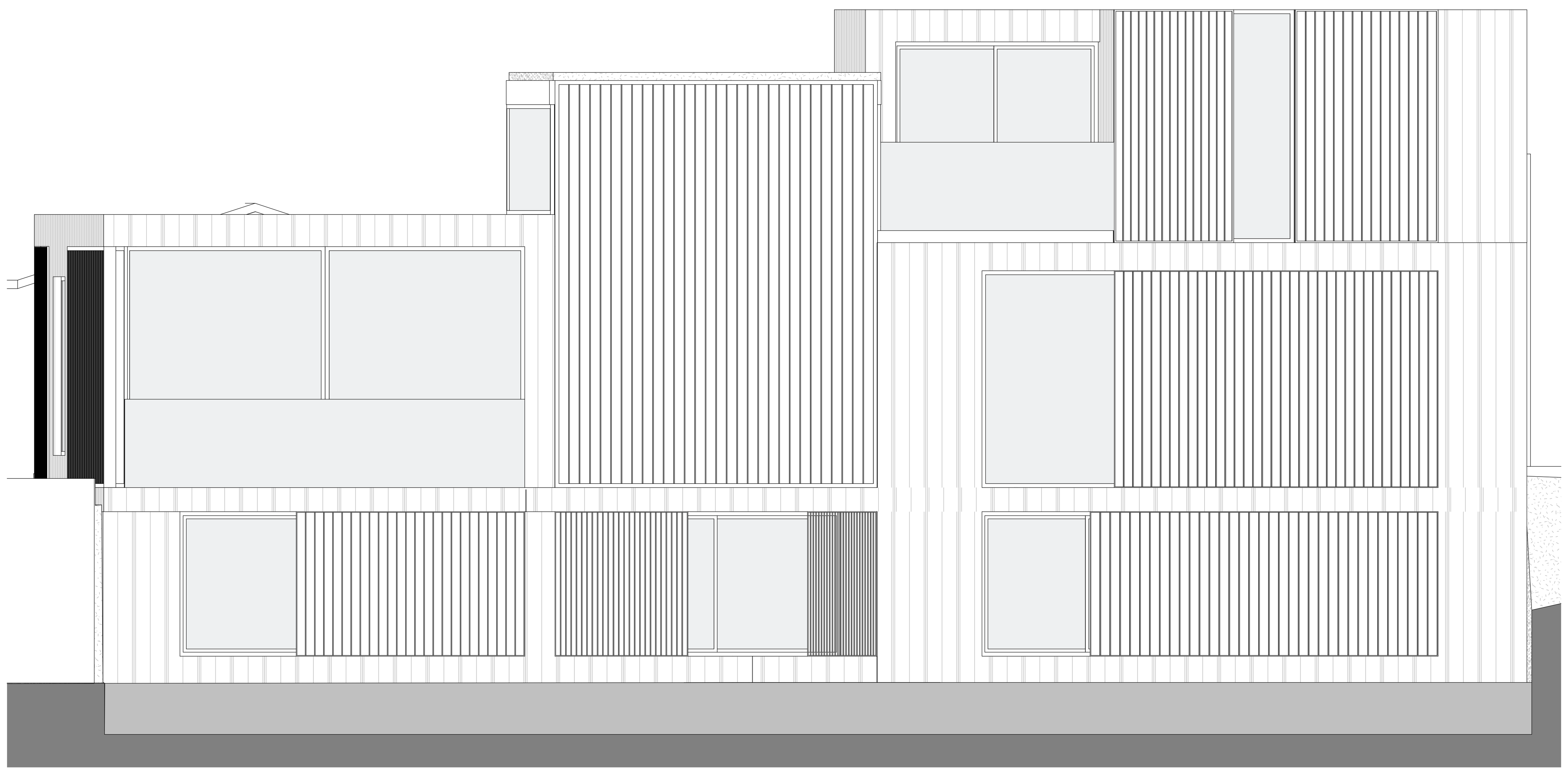
Drawing Name
Proposed Roof Plan

Drawing Number
PR-A1.04

Rev

EXISTING
Not For Construction

Rev	Date



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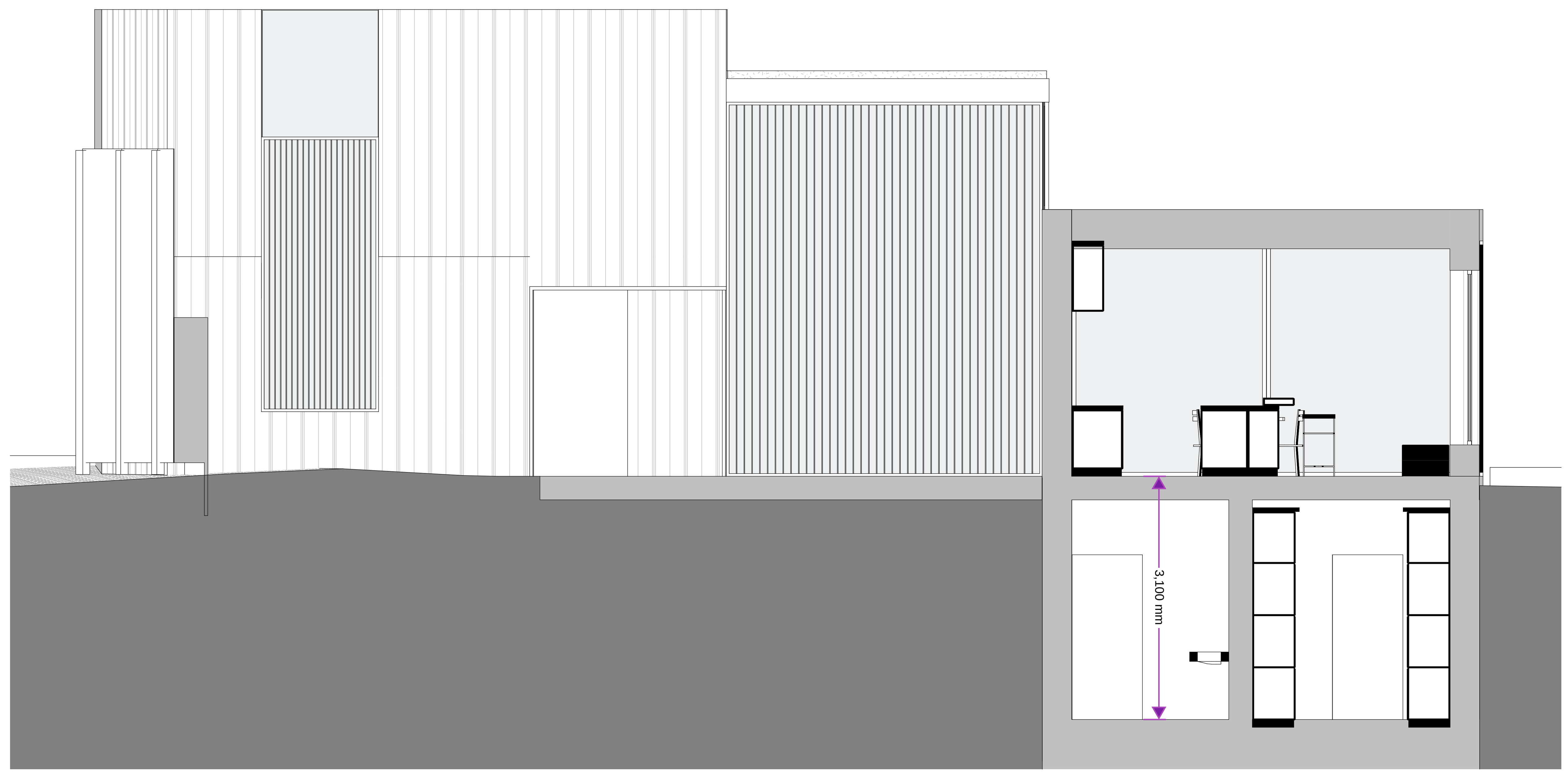

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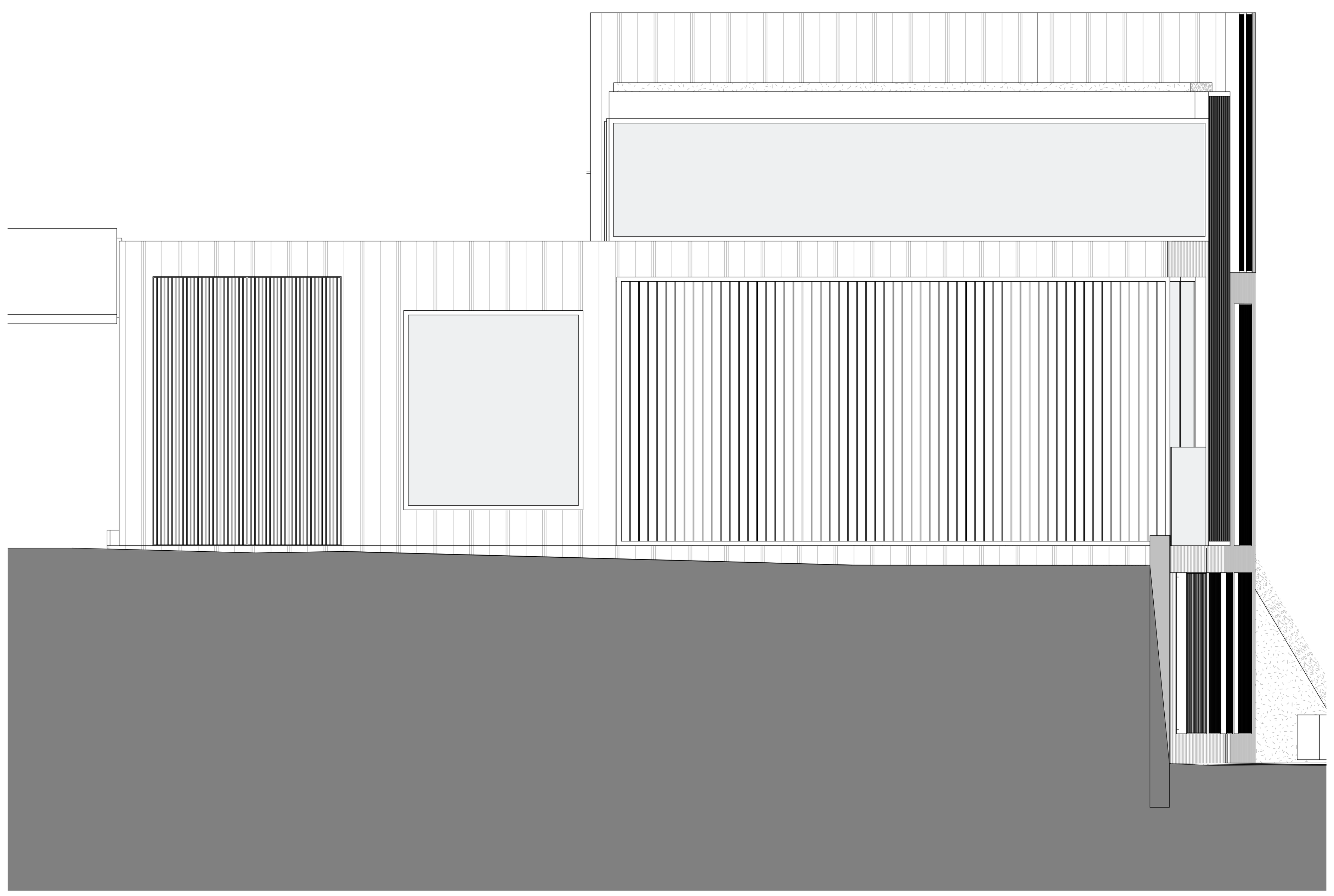
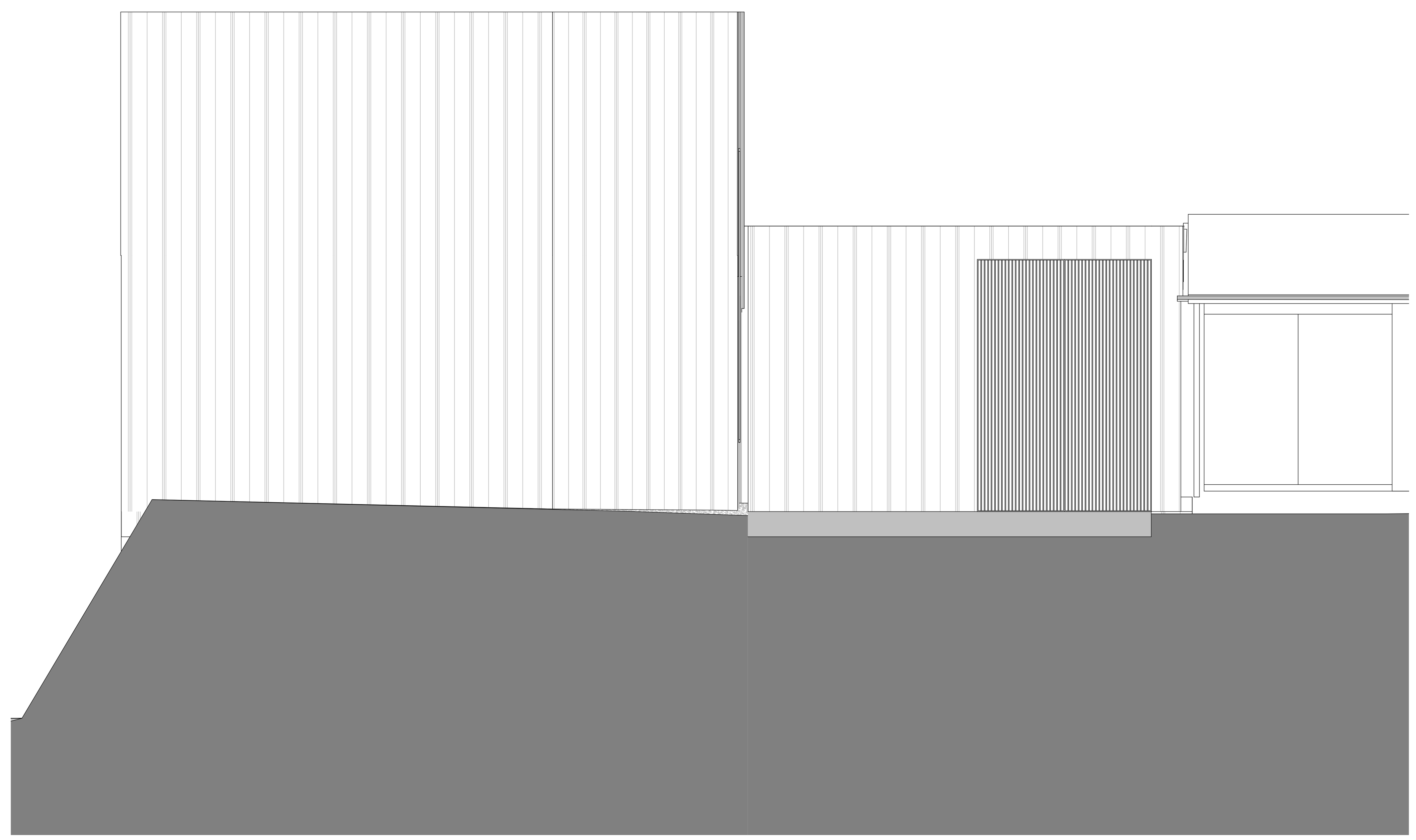


03 Elevation SOUTH 1:50



04 Elevation NORTH 1:50

SCALE 1:50 0 1000 2000mm

10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

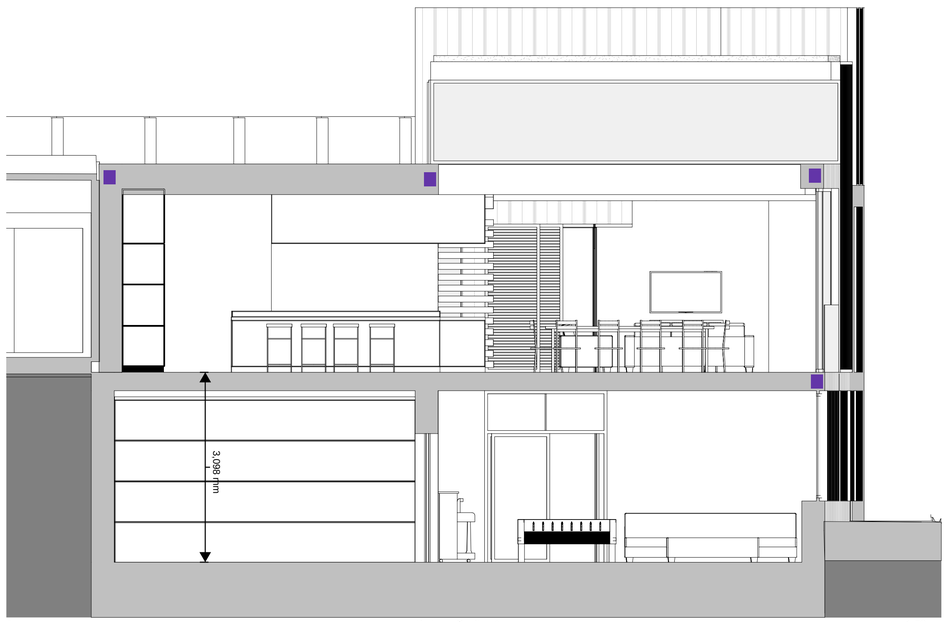
Scale @ A1 **1:50**
Project No. **168**

Drawing Name
Proposed Elevations

Drawing Number **PR-A2.01**
Rev

EXISTING
Not For Construction

Rev	Date



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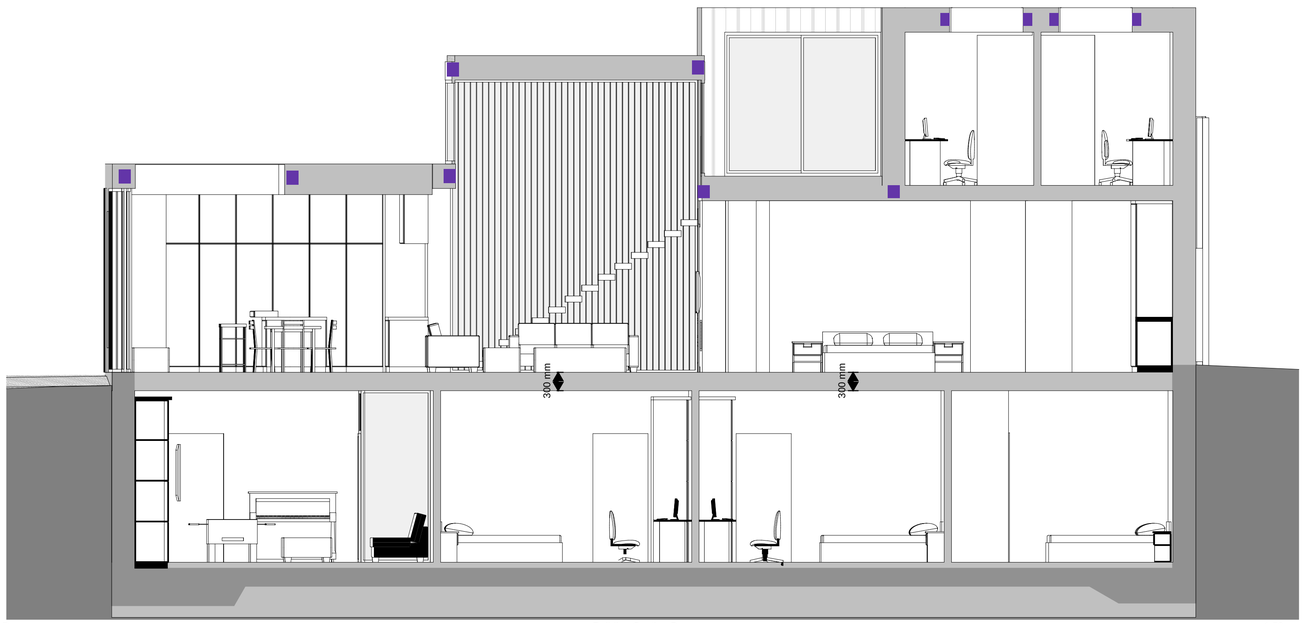

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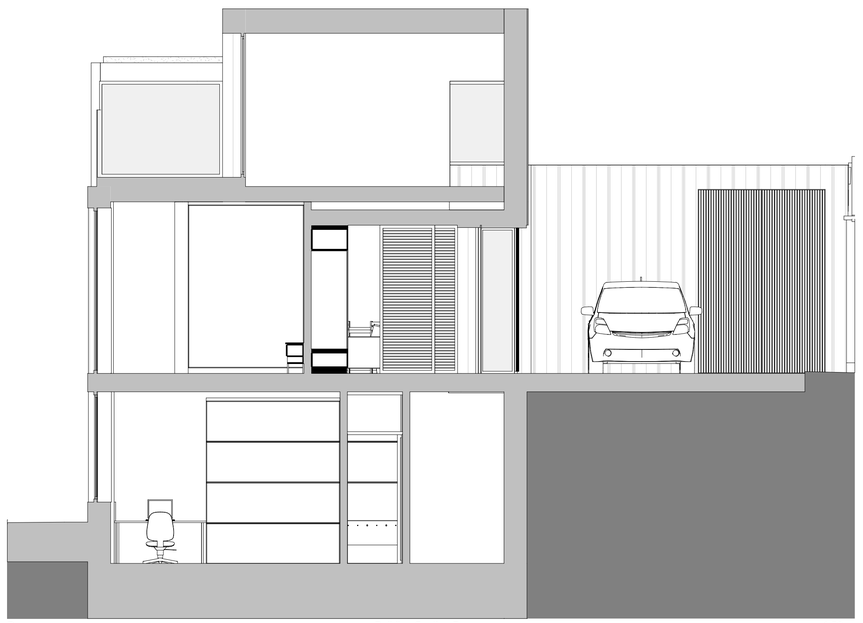
C — Building Section C — 1:50



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S/A
10b Branch Place
London N1 5PH
p: 0207 686 3445
e: info@scenarioarchitecture.com
w: www.scenarioarchitecture.com

Project Name:
20 Crediton Hill

Client:
Sendi & Daniel Young

Site Location:
20 Crediton Hill, London NW6 1HP London UK

Scale @ A1
1:50

Project No.
168

Drawing Name
Proposed Sections

Drawing Number
PR-A3.01

Rev

APPENDIX B1

CALCULATIONS: Greenfield rates

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elijah Sserunjogi
Site name:	SDS1531
Site location:	20 Crediton Hill

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.55186° N
Longitude:	0.18892° W
Reference:	1231945196
Date:	Apr 19 2023 15:15

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1311

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	650	650
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0.58	0.58
1 in 1 year (l/s):	0.49	0.49
1 in 30 years (l/s):	1.33	1.33
1 in 100 year (l/s):	1.85	1.85
1 in 200 years (l/s):	2.17	2.17

APPENDIX B2

CALCULATIONS: Pre-Development rates

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.650
Ratio-R	0.400	Preferred Cover Depth (m)	0.000
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Modified Rational Method	0.016	4.00	10.000	1900	0.000	0.000	1.000
Outlet			9.900	1900	10.000	0.000	1.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1	Modified Rational Method	Outlet	10.000	0.600	9.000	8.000	1.000	10.0	1000	4.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1	10.602	8327.0	4.0	0.000	0.900	0.016	0.0	17	1.443

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1	10.000	10.0	1000	Circular	10.000	9.000	0.000	9.900	8.000	0.900

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1	Modified Rational Method	1900	Manhole	Adoptable	Outlet	1900	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Modified Rational Method	0.000	0.000	10.000	1.000	1900	 0	1	9.000	1000
Outlet	10.000	0.000	9.900	1.900	1900	1 	1	8.000	1000

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Modified Rational Method	10	9.016	0.016	3.2	0.0513	0.0000	OK
15 minute summer	Outlet	10	8.014	0.014	3.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Modified Rational Method	1	Outlet	3.2	1.363	0.000	0.0235	1.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Modified Rational Method	10	9.024	0.024	7.8	0.0767	0.0000	OK
15 minute summer	Outlet	10	8.024	0.024	7.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Modified Rational Method	1	Outlet	7.8	1.718	0.001	0.0454	3.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Modified Rational Method	10	9.027	0.027	10.1	0.0862	0.0000	OK
15 minute summer	Outlet	10	8.026	0.026	10.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Modified Rational Method	1	Outlet	10.1	1.861	0.001	0.0543	3.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Modified Rational Method	10	9.032	0.032	14.2	0.1008	0.0000	OK
15 minute summer	Outlet	10	8.030	0.030	14.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Modified Rational Method	1	Outlet	14.2	2.061	0.002	0.0689	5.5

APPENDIX B3

CALCULATIONS: Proposed rates

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.960
Ratio-R	0.400	Preferred Cover Depth (m)	0.750
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
green roof 1	0.006	10.00	10.000	1200	0.000	0.000	0.850
Green roof 2	0.003	10.00	10.000	1200	0.000	10.000	0.850
3	0.007	4.00	10.000	1200	0.000	20.000	0.850
Combined manhole			9.000	1200	10.943	9.416	0.850
5			9.000	1200	17.016	9.374	0.953

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	3	Combined manhole	15.224	0.600	9.150	8.150	1.000	15.2	100	4.13	50.0
3.000	Green roof 2	Combined manhole	10.959	0.600	9.150	8.150	1.000	11.0	100	10.08	50.0
2.000	green roof 1	Combined manhole	14.436	0.600	9.150	8.150	1.000	14.4	100	10.12	50.0
1.001	Combined manhole	5	6.073	0.600	8.150	8.047	0.103	59.0	100	10.22	50.0

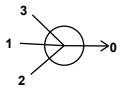
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.990	15.6	1.8	0.750	0.750	0.007	0.0	23	1.328
3.000	2.347	18.4	0.8	0.750	0.750	0.003	0.0	14	1.134
2.000	2.044	16.1	1.5	0.750	0.750	0.006	0.0	21	1.280
1.001	1.005	7.9	4.0	0.750	0.853	0.016	0.0	50	1.008

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.224	15.2	100	Circular	10.000	9.150	0.750	9.000	8.150	0.750
3.000	10.959	11.0	100	Circular	10.000	9.150	0.750	9.000	8.150	0.750
2.000	14.436	14.4	100	Circular	10.000	9.150	0.750	9.000	8.150	0.750
1.001	6.073	59.0	100	Circular	9.000	8.150	0.750	9.000	8.047	0.853

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	3	1200	Manhole	Adoptable	Combined manhole	1200	Manhole	Adoptable
3.000	Green roof 2	1200	Manhole	Adoptable	Combined manhole	1200	Manhole	Adoptable
2.000	green roof 1	1200	Manhole	Adoptable	Combined manhole	1200	Manhole	Adoptable
1.001	Combined manhole	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
green roof 1	0.000	0.000	10.000	0.850	1200		0	2.000	9.150	100
Green roof 2	0.000	10.000	10.000	0.850	1200		0	3.000	9.150	100
3	0.000	20.000	10.000	0.850	1200		0	1.000	9.150	100
Combined manhole	10.943	9.416	9.000	0.850	1200		1 2 3 0	3.000 2.000 1.000 1.001	8.150 8.150 8.150 8.150	100 100 100 100
5	17.016	9.374	9.000	0.953	1200		1	1.001	8.047	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	green roof 1	14	9.164	0.014	0.7	0.0182	0.0000	OK
30 minute summer	Green roof 2	20	9.160	0.010	0.4	0.0119	0.0000	OK
15 minute summer	3	10	9.170	0.020	1.4	0.0263	0.0000	OK
15 minute summer	Combined manhole	11	8.189	0.039	2.4	0.0437	0.0000	OK
15 minute summer	5	11	8.084	0.037	2.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	green roof 1	2.000	Combined manhole	0.7	0.569	0.044	0.0251	
30 minute summer	Green roof 2	3.000	Combined manhole	0.4	0.312	0.020	0.0162	
15 minute summer	3	1.000	Combined manhole	1.4	0.826	0.090	0.0299	
15 minute summer	Combined manhole	1.001	5	2.3	0.841	0.288	0.0164	1.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	green roof 1	13	9.172	0.022	1.7	0.0281	0.0000	OK
30 minute summer	Green roof 2	20	9.165	0.015	0.9	0.0180	0.0000	OK
15 minute summer	3	10	9.182	0.032	3.4	0.0412	0.0000	OK
15 minute summer	Combined manhole	10	8.218	0.068	5.8	0.0773	0.0000	OK
15 minute summer	5	10	8.109	0.062	5.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	green roof 1	2.000	Combined manhole	1.7	0.687	0.106	0.0500	
30 minute summer	Green roof 2	3.000	Combined manhole	0.9	0.390	0.048	0.0332	
15 minute summer	3	1.000	Combined manhole	3.4	0.937	0.218	0.0597	
15 minute summer	Combined manhole	1.001	5	5.6	1.035	0.707	0.0328	3.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	green roof 1	20	9.175	0.025	2.2	0.0319	0.0000	OK
30 minute summer	Green roof 2	21	9.167	0.017	1.1	0.0200	0.0000	OK
15 minute summer	3	10	9.186	0.036	4.4	0.0472	0.0000	OK
15 minute summer	Combined manhole	11	8.235	0.085	7.4	0.0962	0.0000	OK
15 minute summer	5	11	8.122	0.075	7.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	green roof 1	2.000	Combined manhole	2.2	0.691	0.137	0.0595	
30 minute summer	Green roof 2	3.000	Combined manhole	1.1	0.403	0.060	0.0417	
15 minute summer	3	1.000	Combined manhole	4.4	0.997	0.282	0.0733	
15 minute summer	Combined manhole	1.001	5	7.2	1.073	0.913	0.0407	3.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	green roof 1	20	9.180	0.030	3.1	0.0380	0.0000	OK
30 minute summer	Green roof 2	20	9.170	0.020	1.6	0.0240	0.0000	OK
15 minute summer	3	10	9.194	0.044	6.2	0.0569	0.0000	OK
15 minute summer	Combined manhole	11	8.340	0.190	10.5	0.2151	0.0000	SURCHARGED
15 minute summer	5	11	8.141	0.094	9.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	green roof 1	2.000	Combined manhole	3.1	0.729	0.193	0.0706	
30 minute summer	Green roof 2	3.000	Combined manhole	1.6	0.408	0.087	0.0490	
15 minute summer	3	1.000	Combined manhole	6.2	1.090	0.397	0.0847	
15 minute summer	Combined manhole	1.001	5	9.6	1.231	1.221	0.0469	5.5

APPENDIX C

DRAINAGE DRAWINGS

Below Ground Drainage Key

General Notation

100mmØ ID (pipe diameter) at 1/80 (approximate gradient)	Pipework other than that covered by the general drainage notes will be identified as adjacent BD - Backdrop connection UIL - Upper Invert Level

Existing Drainage

	Existing Drainage - Combined Water
	Existing Drainage - Foul Water
	Existing Drainage - Surface Water
	Existing Drainage - to be abandoned
	Existing Drainage - Manholes Sizes as shown on plan / schedules Information as per services survey
PPM	Existing Drainage - Pump and Rising Main Sizes shown indicatively Information as per services survey

Combined Water

	Proposed Drainage - Combined Water drain
	Proposed Drainage - Combined Water Manholes Sizes are per plan and schedules PPIC - Polypropylene Inspection Chamber PCC - Pre-Cast Concrete

Foul Water

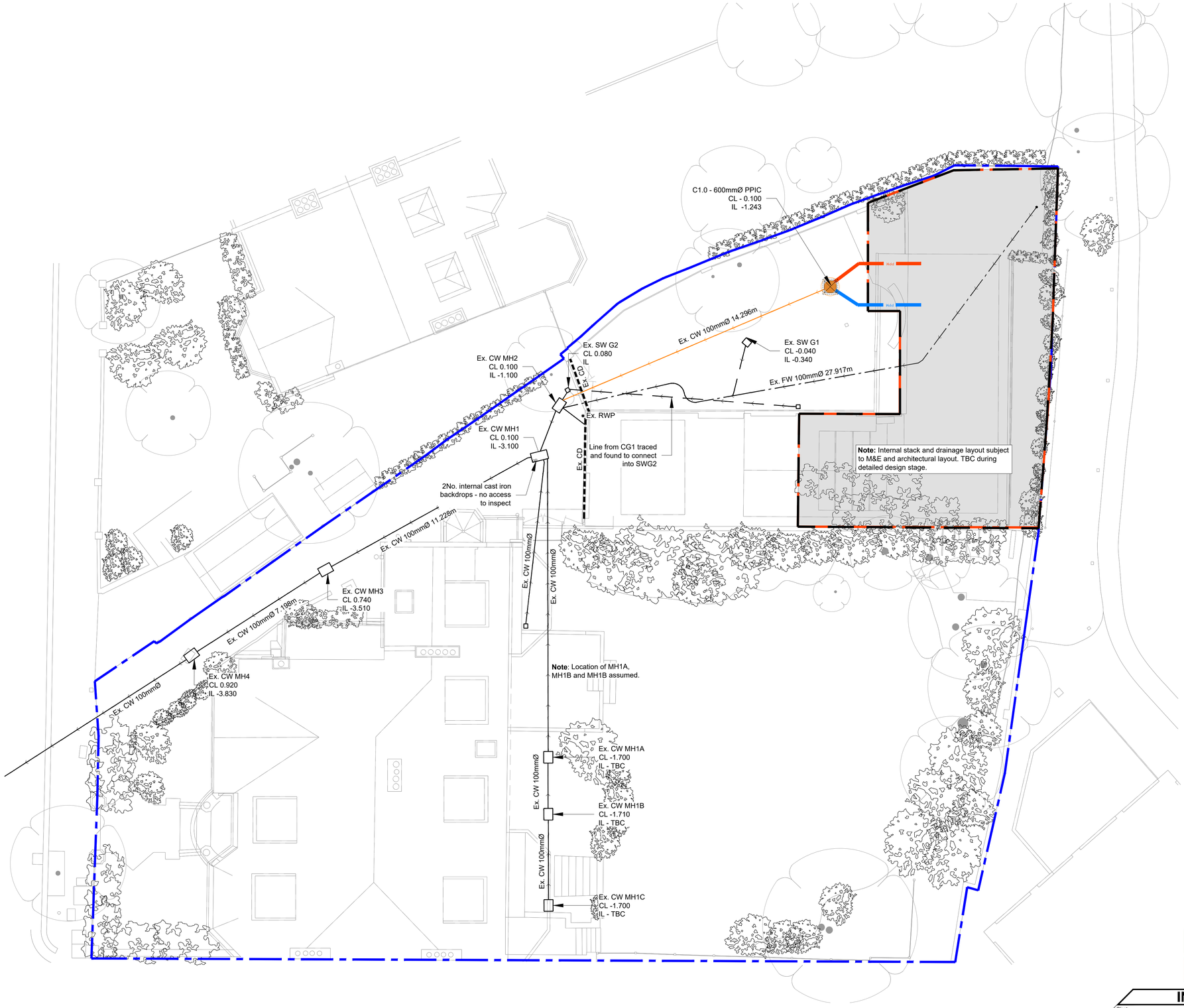
	Proposed Drainage - Foul Water drain
	Proposed Drainage - Foul Water Manholes Sizes are per plan and schedules PPIC - Polypropylene Inspection Chamber PCC - Pre-Cast Concrete
PPM	Proposed Drainage - Foul Water Pumping Chamber and Rising Main Sizes shown indicatively Refer to pump manufacturers' specification
	Foul Connection: SVP - Soil Vent Pipe SS - Stub Stack AAV - Air Admittance Valve FA - From Above (refer to Architectural / M&E plans) FS - Floor Socket (for internal gullies / shower drains)
	FG - Foul Gully (trapped and roddable)

Surface Water

	Proposed Drainage - Surface Water drain
	Proposed Drainage - Surface Water land drain Perforated pipe laid within sub-base material
	Proposed Drainage - Surface Water channel drain (ACO or similar approved)
	Proposed Drainage - Foul Water Manholes Sizes are per plan and schedules PPIC - Polypropylene Inspection Chamber PCC - Pre-Cast Concrete FC - Flow Control chamber (Hydro-Brake™ by Hydro International or similar approved) CP - Catch Pit chamber
PPM	Proposed Drainage - Surface Water Pumping Chamber and Rising Main Sizes shown indicatively Refer to pump manufacturers' specification
	Proposed Drainage - Cellular storage structure or soakaway Sizes as per plan and schedules Refer to crate manufacturers' specification
	Proposed Drainage - Permeable surfacing Permeable paving / permeable asphalt Refer to Landscape Architect's / Construction build-ups drawings for more information
	RWP - Rain Water Pipe
	YG - Yard Gully (trapped and roddable) RG - Road Gully

General Notes:

1. Do not scale from this drawing manually or electronically. Written permission must be obtained from SD Structures prior to scaling.
2. Contact SD Structures in the event of any discrepancies between findings on site and these drawings.
3. This drawing is also to be read in conjunction with all relevant Architect's, Engineer's and Specialist's drawings and specifications.
4. 3D views are indicative only and any conflicting 2D information should take precedence. If in doubt contact SD Structures prior to starting work.
5. All work is to be carried out in accordance with the relevant British Standards, European norms, codes of practice and building practice.
6. The Contractor shall obtain licences from the Highway Authority prior to carrying out any workings within the existing Public Highway.



STRUCTURES

INFORMATION

Client: Scenario Architecture		SD Ref: SDS1584	
Project Name: 20 Crediton Hill		Eng: CC	Drawn: ES
Drawing title: Proposed Drainage Layout			

Rev	Amendment	Date	Drawn	Eng	Scale:
P01	Issued for information	19/04/2023	ES	CC	1:100 @ A1

Proj	Orig	Vol	Lev	Typ	Rol	No		Status	Rev
1584-SDS-00-XX-DR-C-1000									P01

60 Grays Inn Road, London WC1X 8AQ sd-structures.com

Below Ground Drainage Key

General Notation

100mmØ ID (pipe diameter) at 1/80 (approximate gradient)	Pipework other than that covered by the general drainage notes will be identified as adjacent BD - Backdrop connection UIL - Upper Invert Level

Existing Drainage

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	Existing Drainage - Foul Water
	Existing Drainage - Surface Water
	Existing Drainage - to be abandoned
	Existing Drainage - Manholes Sizes as shown on plan / schedules Information as per services survey
PPM	Existing Drainage - Pump and Rising Main Sizes shown indicatively Information as per services survey

Combined Water

	Proposed Drainage - Combined Water drain
	Proposed Drainage - Combined Water Manholes Sizes are per plan and schedules PPIC - Polypropylene Inspection Chamber PCC - Pre-Cast Concrete

Foul Water

	Proposed Drainage - Foul Water drain
	Proposed Drainage - Foul Water Manholes Sizes are per plan and schedules PPIC - Polypropylene Inspection Chamber PCC - Pre-Cast Concrete
PPM	Proposed Drainage - Foul Water Pumping Chamber and Rising Main Sizes shown indicatively Refer to pump manufacturers' specification
	Foul Connection: SVP - Soil Vent Pipe SS - Stub Stack AAV - Air Admittance Valve FA - From Above (refer to Architectural / M&E plans) FS - Floor Socket (for internal gullies / shower drains)
	FG - Foul Gully (trapped and roddable)

Surface Water

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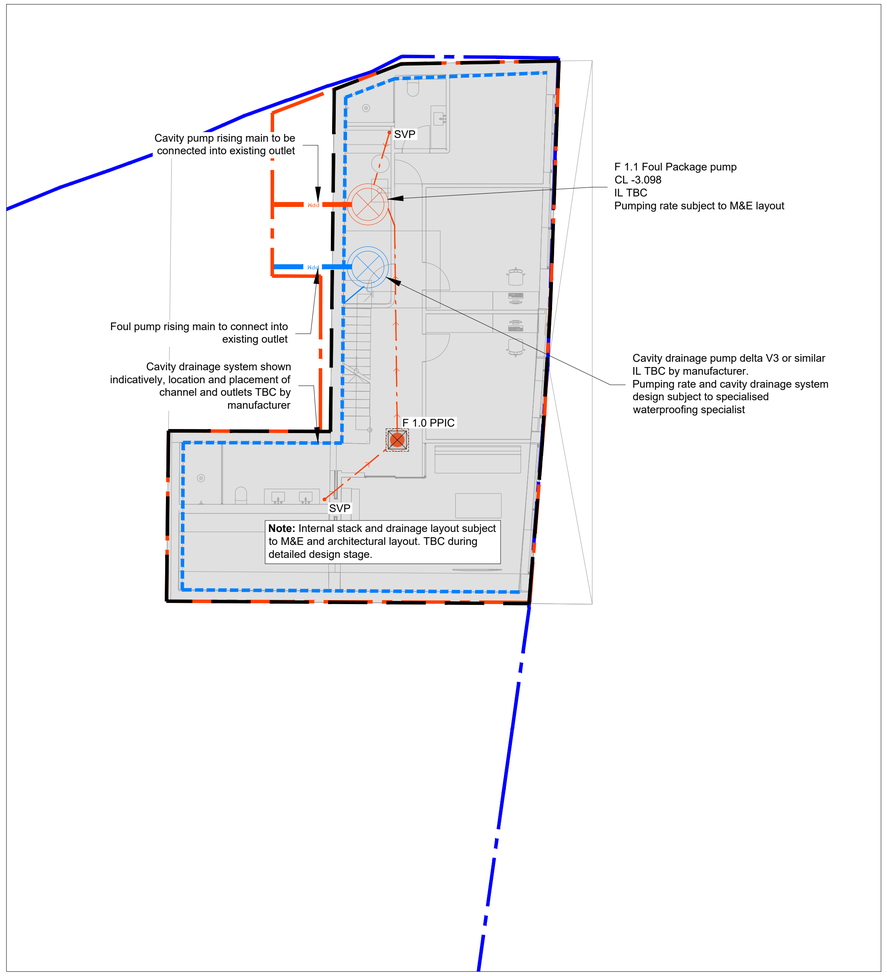
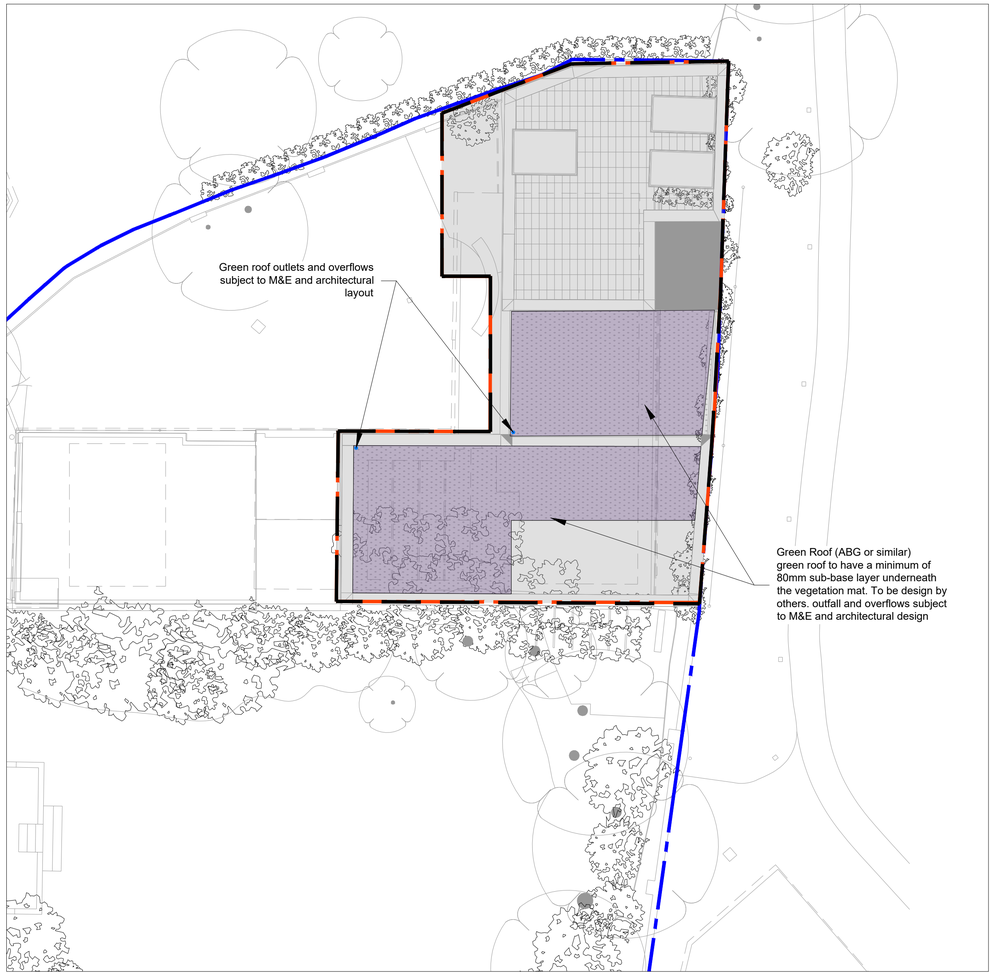


Basement Level
Scale 1:100



Roof Layout
Scale 1:100

STRUCTURES

INFORMATION

Client: Scenario Architecture		SD Ref: SDS1584	
Project Name: 20 Crediton Hill		Eng: CC	Drawn: ES
Drawing title: Proposed Drainage Layout			

Rev	Amendment	Date	Drawn	Eng
P01	Issued for information	19/04/2023	ES	CC

Scale: 1:100 @ A1

Proj	Orig	Vol	Lev	Typ	Rol	No		Status	Rev
1584-SDS-00-XX-DR-C-1010									P01

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APPENDIX D

CCTV SURVEY

INTEGRUM
SITE SERVICES

DRAINAGE LAYOUT PLAN (NTS)
20 Crediton Hill, London, NW6 1HP
31-01-2023
Ref: 1320

SCALE BAR
0 1 2 3 4 5 10[m]

Linear SW drainage channel

Line from SWG1 assumed to flow to junction A - unable to confirm as line heavily blocked

Line from CG1 traced and found to connect into SWG2

Line from MH4 downstream assumed to flow to Main Sewer in Crediton Hill - confined spaces access required into MH4 to remove interceptor access cap and survey section

2No. internal cast iron backdrops - no access to inspect

Locations of MH1A, MH1B and MH1C assumed

SWG1
SWG2
A
A1
CG1
WC1
RWG
MH1
MH1A
MH1B
MH1C
MH2
MH3
MH4
LP
DRAIN
PAVING
GRASS
-0.08
-0.08

100mmØ
100mmØ FW
100mmØ COMBINED
100mmØ LINED