



Surface Water Drainage & SuDS Assessment

Jacksons Corner,
1-9 King's Road,
Reading
RG1 2EA

30th March 2016

Ref: 8/1290

Prepared for:
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Prepared by: **Greg Scott B.Eng.(Hons), C.Eng., M.I.Struct.E****CAVEAT**

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TABLE OF CONTENTS

1.0	INTRODUCTION.....	4
2.0	LOCAL POLICY	6
3.0	SITE CHARACTERISTICS	7
4.0	SURFACE WATER DRAINAGE STRATEGY.....	10
5.0	SUDS TECHNICAL STANDARD REQUIREMENTS	12
6.0	FOUL WATER DRAINAGE	14
7.0	CONCLUSIONS AND RECOMMENDATIONS	15

APPENDICES

Appendix A	Existing Topographic Survey
	Green Roof & Soft Landscape Areas
	Schematic Drainage Plan
	Surface Water Storage and Drainage Strategy
Appendix B	Calculations

1.0 INTRODUCTION

1.1 General

- 1.1.1 This report has been prepared on instructions received from S333 Architecture & Urbanism Ltd on behalf of their client SG Capital, International House, 1-6 Yarmouth Place, W1J 7BU and relates to the proposed redevelopment of Jacksons Corner, 1-9 King's Road, Reading.
- 1.1.2 The site currently comprises of a retail building with storage/ office ancillary areas and six flats. It is proposed to redevelop the site to provide a 5-7 storey building with commercial retail property at ground level, basement storage and plant areas and residential property to the upper floors.
- 1.1.3 This report sets out the results of a Sustainable Drainage Assessment required by the Local Planning Authority in support of the planning application for this development. The assessment has been carried out in accordance with the general principals set out in National Planning Policy Framework and Technical Guidance published in April 2015.
- 1.1.4 This report is prepared solely for the benefit of the Client. This report may not be assigned without prior written permission from Clancy Consulting.
- 1.1.5 This report is for Planning Application purposes only. Detailed design of drainage, specialist engineers will be required prior to construction.

1.2 Background Information

- 1.2.1 Following recent consultation, planning guidance was issued which came into force on 6 April 2015 and concerns all "major" housing developments (developments of 10 dwellings or more).

This guidance sets out the following main points;

LPAs will be required to consider SuDS in connection with planning applications, rather than a separate local government body.

Lead Local Flood Authorities (LLFAs) will become statutory consultees on surface water management regarding planning applications. LPAs must satisfy themselves that operational standards and maintenance are provided for the lifespan of the development using for example planning conditions or Section 106 agreements.

The operation and on-going maintenance of SuDS must also be economical.

A clear set of non-statutory technical standards for SuDS has been produced by the Government working closely with the Environment Agency, local authorities and developers to reduce the risk of surface water flooding, improve water quality and the environment and to ensure that SuDS are robust, safe and affordable.

They should be read in conjunction with a Planning Practice Guide which is now available on line.

The Technical Guidance previously published has now been replaced with a

Web based Practice Guide – Flood Risk and Coastal Change.

<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/reducing-the-causes-and-impacts-of-flooding/why-are-sustainable-drainage-systems-important/>

2.0 LOCAL POLICY

Reference has been made to The Reading Council Core Strategy 2008 (with alteration adopted 27th January 2015)

Policy CS1: Sustainable Construction and Design

Developments incorporate sustainable urban drainage facilities and techniques as part of the layout of a development as appropriate and as advised by the Environment Agency, including minimising the size of impermeable areas so that peak run-off and annual water run-off is reduced where possible and in any case is no greater than the original conditions of the site. Particular care will be needed in areas of flood risk where different solutions may be required.

3.0 SITE CHARACTERISTICS

3.1 Location

3.1.1 The site is located as detailed as below.

OS X (Eastings)	471731
OS Y (Northings)	173416
Nearest Post Code	RG1 2EA
Lat (WGS84)	N51:27:19 (51.455190)
Long (WGS84)	W0:58:08 (-0.969022)
LR	SU717734 / SU7173173416
mX	-107871
mY	6668769

3.2 Site Description

3.2.1 The overall site is approximately 946m² and located at the corner of High Street and King's Road. The site is currently fully developed and entirely covered with roof area.

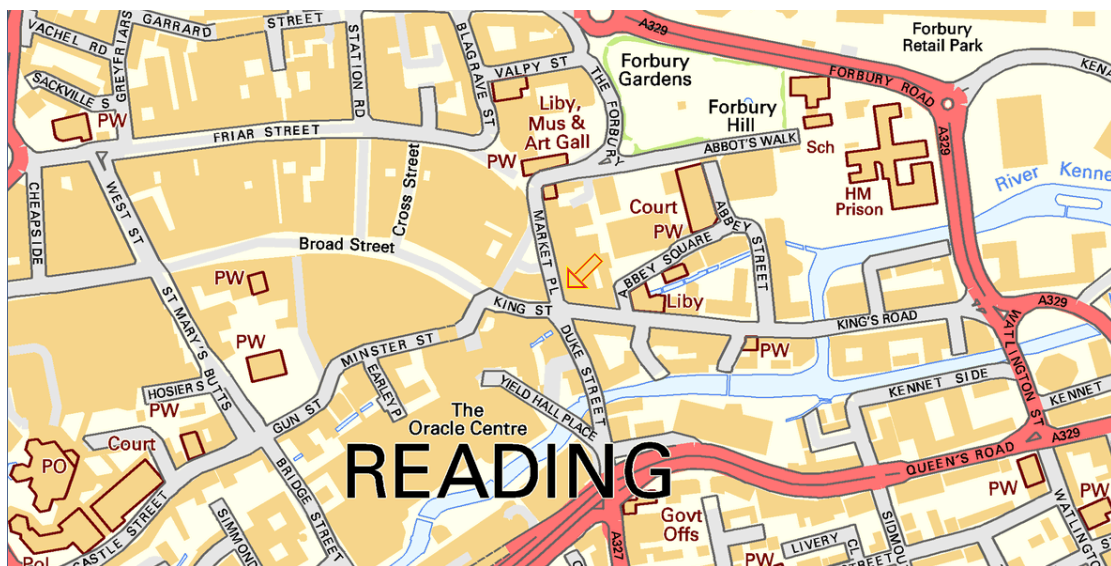


Fig 1 – Site Plan view

- 3.2.2 The whole of the site is currently impermeable to rainfall and rainwater runs is collected in below ground systems before being discharged to the public drainage system in the High Street and Kings Road.
- 3.2.3 A topographic survey of the existing buildings is provided in Appendix A. Floor levels vary due to the slope down from the high street to King's Road. Levels vary from 40.50 down to 39.40 m AOD.

3.3 Existing Drainage

- 3.3.1 Public Sewer records for the site have been obtained from Thames Water. These indicate that there is a network of foul and surface water sewers in King Street and the High Street. The foul sewers discharge into Abbey Square and head in an easterly direction. The surface water system discharges into the Holy Brook culvert which crosses Kings Street and clips the south east corner of the site.

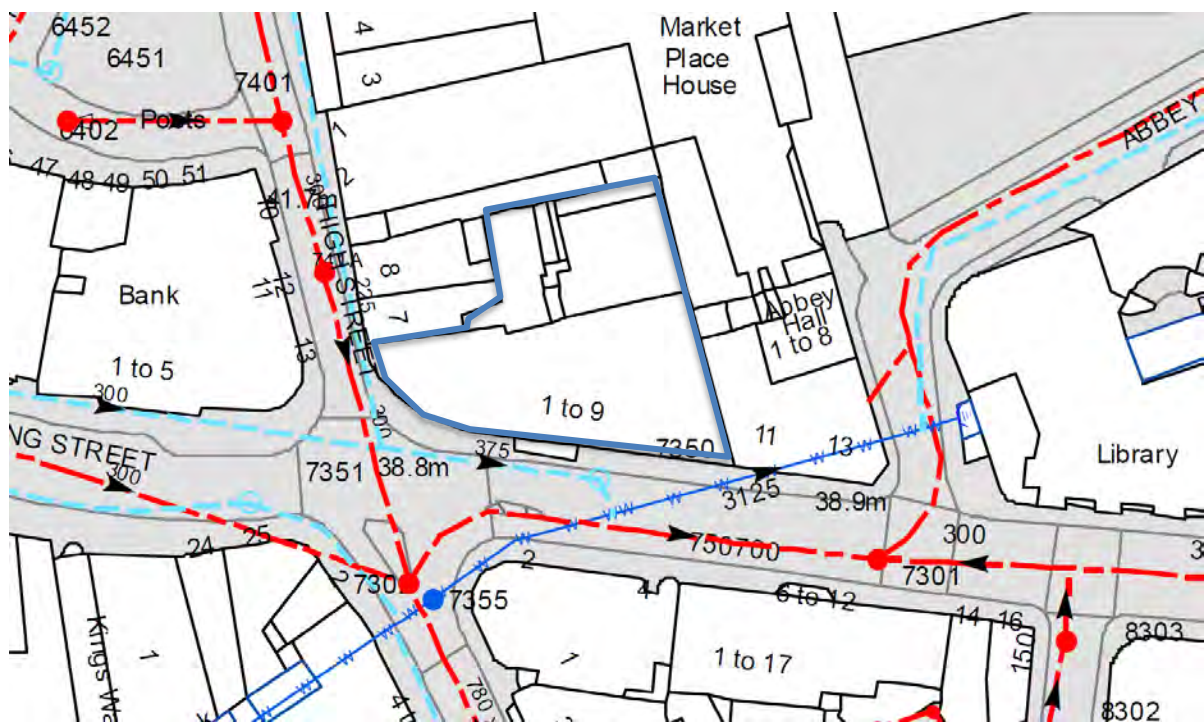


Fig 2 – Public Sewer Network

- 3.3.2 We have no mapping for the existing drainage system on site but there are numerous down pipes noted to each of the elevations.

3.4 Ground Conditions and Geology

- 3.4.1 Data has been obtained from the British Geological Survey

The underlying geology is described as follows;

Superficial – Alluvium - Clay, Silt, Sand and Gravel

Bedrock – Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) - Chalk

There is a high probability of made ground on the site due to its past use and previous development.

- 3.4.2 Subsoil Permeability

Alluvium – permeability is very variable.

3.5 Development Proposals

- 3.5.1 The proposal is to provide a 6-8 storey building with commercial property at ground level, basement storage and plant rooms with residential property to the upper floors. The building footprint at ground level occupies 100% of the site area however there is an external court yard area at first floor level within the centre of the development.



Fig 5 – First Floor Development Proposals – Showing external court yard area.

4.0 SURFACE WATER DRAINAGE STRATEGY

4.1 Surface Water Disposal Hierarchy

The disposal of surface water should be considered in the following order of priority;

1. Infiltration into the subsoil via soakaways or permeable paving.
2. Discharge to a water course or the sea.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

If it is not possible to discharge to a soakaway, then surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

4.2 SuDS Hierarchy

	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable ↑ ↓ Least Sustainable	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storm cells	✓		

4.3 Disposal Strategy for Jacksons Corner

Infiltration

Infiltration for this development will not be possible due to the space constraints.

It is necessary to position soakaways at least 5m from building structures to prevent potential damage to the structure by weakening sub-soils close to foundations. There is no space on this site to locate a soakaway at least 5m from the building.

There are no significant external areas of paving so the provision of permeable paving with discharge to the soil is not possible for this site.

Water Course

The Holy Brook runs very close to the site but it is enclosed with a culvert in this location so access will not be practicable.

Surface water Sewer

It is likely that the existing drainage system discharges to the surface water sewer network adjacent to the site. The intention will be to re-use these connections or make new connections from the development.

4.4 SuDS Strategy for Jackson Corner

Living Roof

One hundred percent of the site receiving surface water is roof area or upper level courtyard deck.

The most sustainable solution to control run-off at its source is to provide a living or green roof areas. These roof areas retain part of the rainwater, slow down the speed of run-off and also reduce water pollution.

Green roof areas are being proposed as highlighted on the drawings. This accounts for 205m² or approximately 21% of the site area. Other areas are not suitable due to the need for sloping roofs for architectural reasons or they are required for more frequent maintenance access to plant and solar panels.

Ponds/ Basins and Swales.

There is no space on site to provide these systems.

Permeable Paving and Tanked System

While providing no significant volume reduction or pollution reduction permeable paving and sub-base storage using a void system will be a possible solution for this site. The flow rate can be restricted such that water is stored below the external paving area.

Rainwater Harvesting.

Reservoirs could also be provided to retain water on site for re-use within the courtyard planters and tree pits. This will provide an element of surface water volume reduction during the summer season.

5.0 SuDS TECHNICAL STANDARD REQUIREMENTS

5.1 Peak Flow

5.1.1 S3 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.

5.1.2 Refer to calculations in Appendix B.

The Existing 1 in 1 year run-off for the site is 10.1 l/s

The Existing 1 in 100 year run-off for the site is 32.5 l/s

The greenfield run-off rate (Qbar) for the site is 0.01 l/s

It is proposed to control the surface water run-off to 5 litres per second. This will provide the lowest practical control rate without significantly increasing the risk of blockages in the system.

Storage will be provided for all storm events up to and including the 1 in 100 year event with an allowance for climate change.

The volume of surface water storage required for this site for the 1 in 100 year event plus climate change based on a flow rate off site of 5 litres per second is approximately 20-34m³. It is proposed that this volume can be stored between the finished external paving and the concrete slab at first floor level.

5.2 Volume Control

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Volume reductions will be achieved with the maximum use of green roof areas and the use of rainwater harvesting for landscaped areas. For the remaining volume the rate of discharge will be reduced to the minimum possible as above.

5.3 Flood Risk within the Development

S7 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.

S8 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.

S9 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.

It is proposed to design the below ground storage system for the 1 in 100 year plus climate event as there is no practical storage place for water above ground.

Levels will be designed such that in the event of a more extreme rainfall event water will discharge away from buildings.

5.4 Structural Integrity

S10 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.

S11 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.

The detailed design of the system and product selection for the storage and pipe solution will be made at the detailed design stage when all the site constraints can be considered. There are numerous products available for storage of water below the paving and care will be needed to ensure that the right product is chosen for the final loading conditions.

Permavoid is a suitable product for this situation.

5.5 Designing for Maintenance considerations

S12 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.

Pumps will only be required from the basement for foul water drainage.

5.6 Construction

S13 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.

S14 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.

A section 106 application will be required for the connection to the public sewer. Thames Water will provide details of how the connection be allowed to be made to their assets.

6.0 Foul Water Drainage

- 6.1. Within the existing retail, office and storage spaces there are 8 WC's / Basins and a canteen area with a kitchen sink. There are also 6 flats.

The peak flow for the existing development assuming congested use in the commercial areas can be calculated as follows.

Max. Discharge Units

Basins $8 \times 0.6 = 4.8$

WC's $8 \times 2.5 = 20$

Kitchen Sink $1 \times 1.3 = 1.3$

Flats $6 \times (2.5 + 0.6 + 1.3 + 0.8 + 0.8 + 1.3) = 43.8$

Total peak flow = between 1 and $0.5 \times \text{root of } 44 + 1.3 + 20 + 4.8 = 4.2 - 8.4 \text{ l/s.}$

The 24 hour design flow rate is likely to be in the region of $8.4 / 6 = 1.4 \text{ l/s.}$

- 6.2 The proposed development is for 34 flats plus the ground floor retail units.

The Peak flow from Building Regulations for can be estimated at approximately 6.0 l/s.

In accordance with Sewers for Adoption the design flow will be 4000 litres per unit per day to give **1.7 l/s**

It is understood that a number of the retail units will be food and beverage outlets.

While the total number are not yet known the number it is estimated that there will be approximately 20 WC's and basins and three kitchen areas with sinks and dishwashers.

Discharge units

Basins $20 \times 0.6 = 12$

WC's $20 \times 2.5 = 50$

Sink $3 \times 1.3 = 3.9$

DW $3 \times 0.8 = 2.4$

Total = 68

Peak flow = $\text{root} \times 68 = 8.2 \text{ l/s}$

Estimated daily flow rate = 1.4 l/s

The total proposed design flow will be in the region of 3.0 l/s.

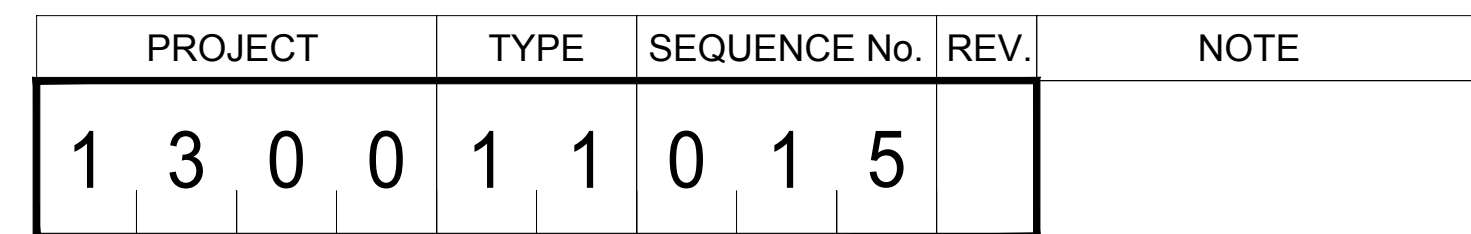
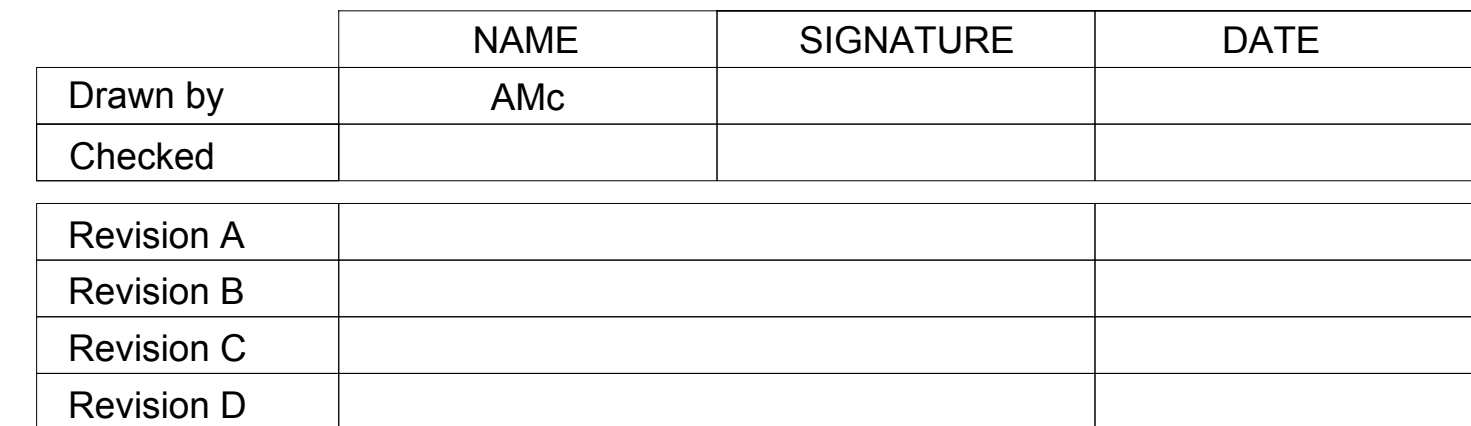
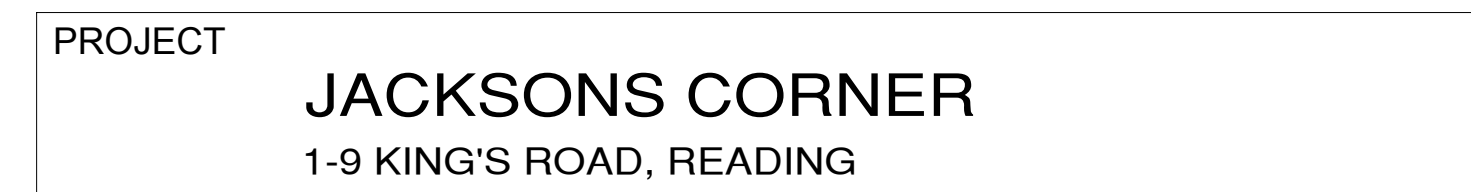
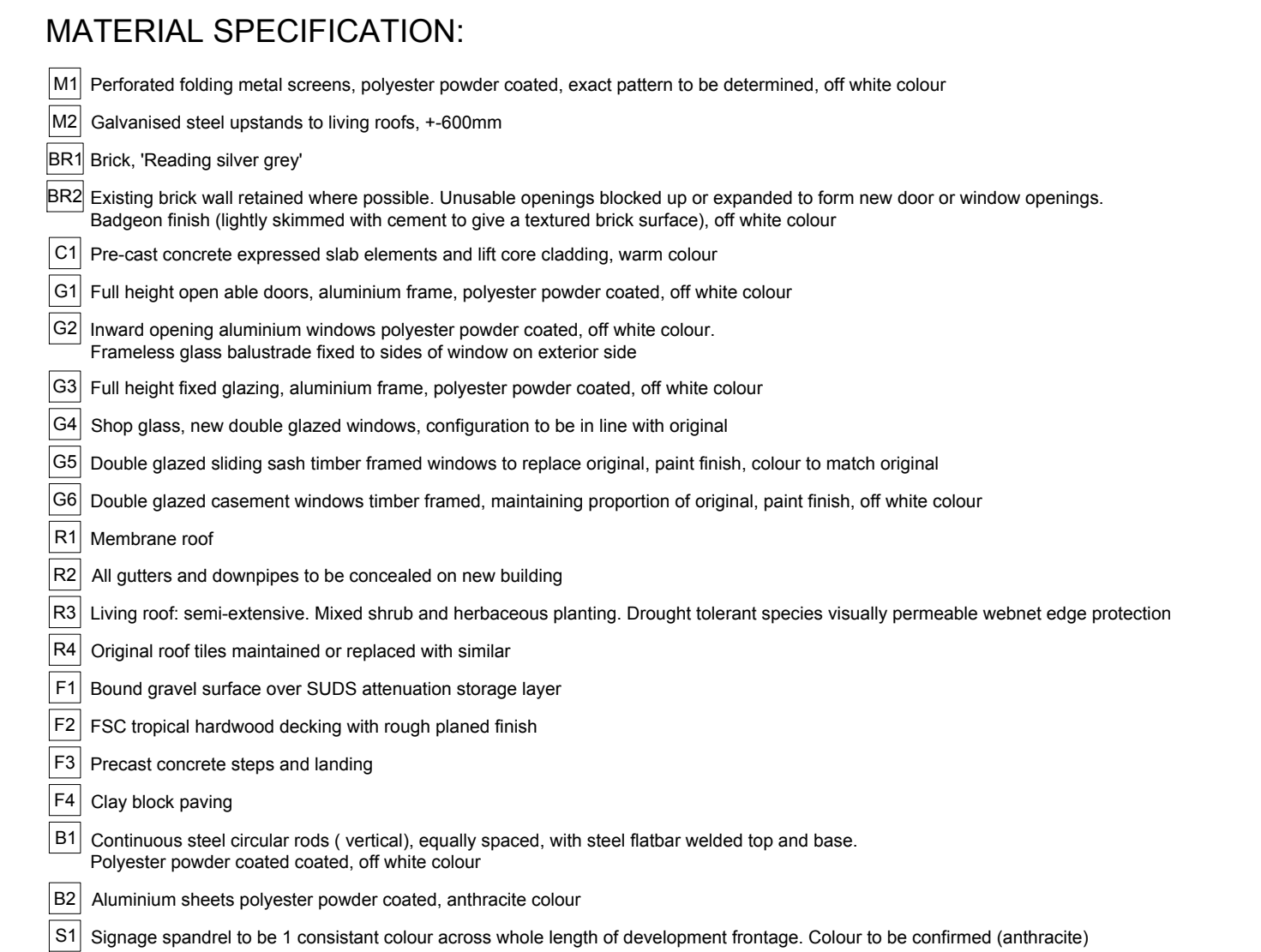
- 6.3 While the increase in the daily flow rates will be minimal, a Section 106 connection application will need to be made with Thames Water. It is unlikely that this will be an issue in this location but further capacity checks will need to be made.

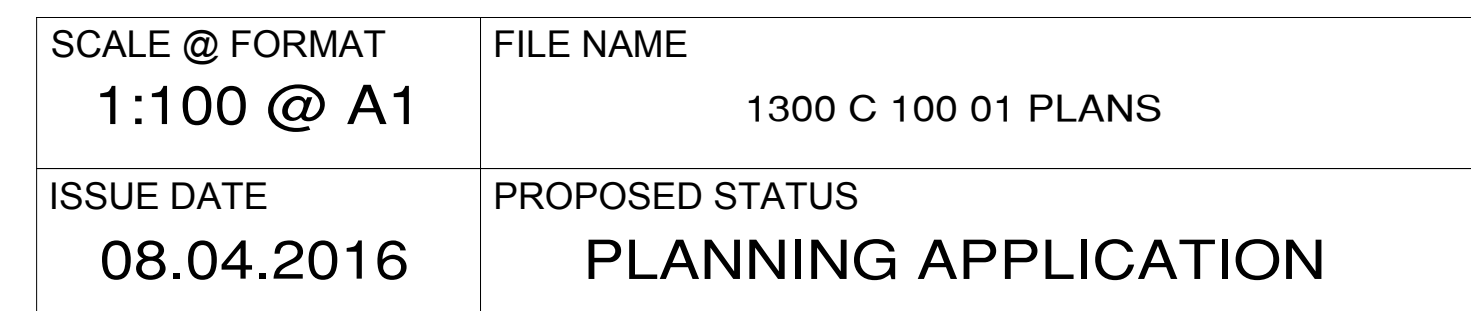
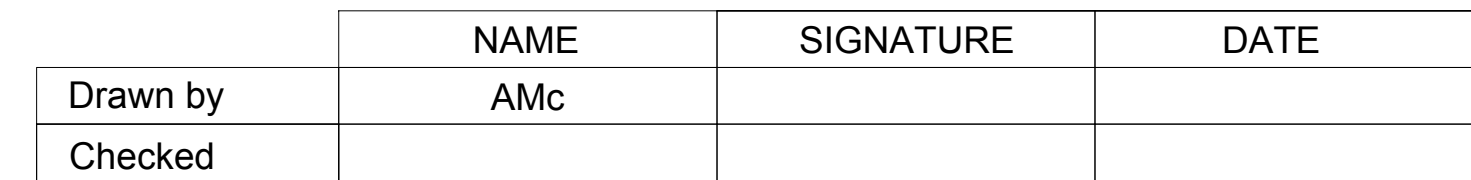
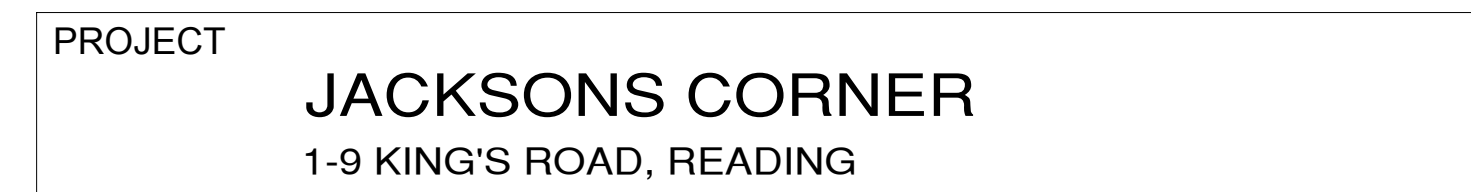
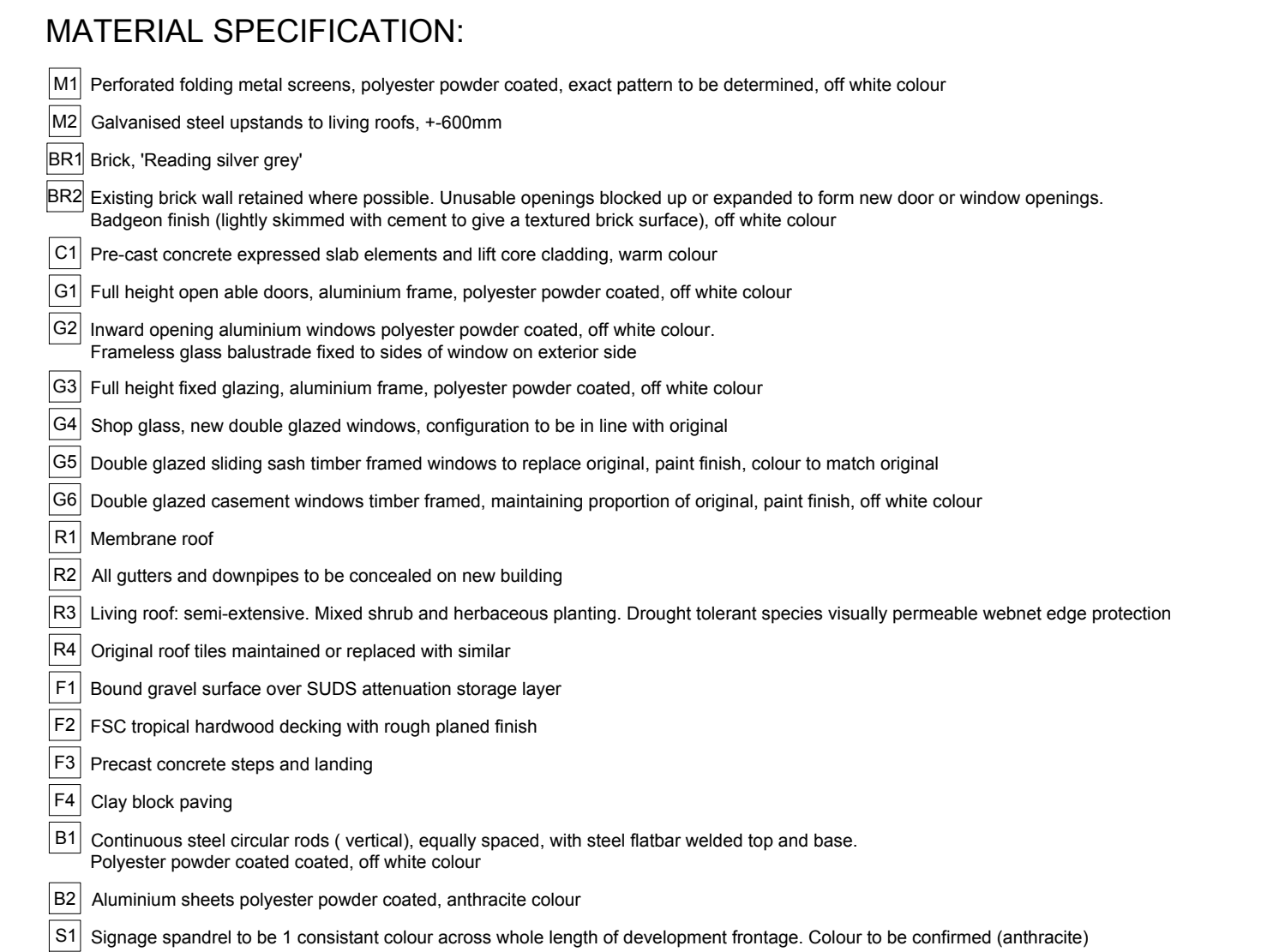
7.0 CONCLUSIONS AND RECOMMENDATIONS

- 7.1 This report gives details of the Drainage and SuDS Assessment, which has been carried out in relation to the proposed development of 1-9 Kings Road, Reading.
- 7.2 The existing site is currently 100% impermeable and discharges surface water run-off to the public surface water sewer system.
- 7.3 The proposed development provides an opportunity to reduce local area flood risk by controlling surface water on site. Following the SuDS and water disposal hierarchy it has been determined that surface water will be controlled using, green roof areas, rainwater harvesting, permeable paving and flow controls with storage areas within the court yard paving before being discharged to the public surface water sewer system.
- 7.4 The proposed system will be designed to control surface water run-off for all storms up to and including the 100 year plus climate change event. Water will be stored on site below ground before being discharged at the lowest practical rate of 5 litres per second.
- 7.5 The proposed system will be designed to meet the Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems, March 2015.
- 7.6 Foul Water rates are likely to increase slightly as a result of the development. Further consultation with Thames Water will be required to check final capacity in the public system however due to the marginal increase this is not expected to be an issue.

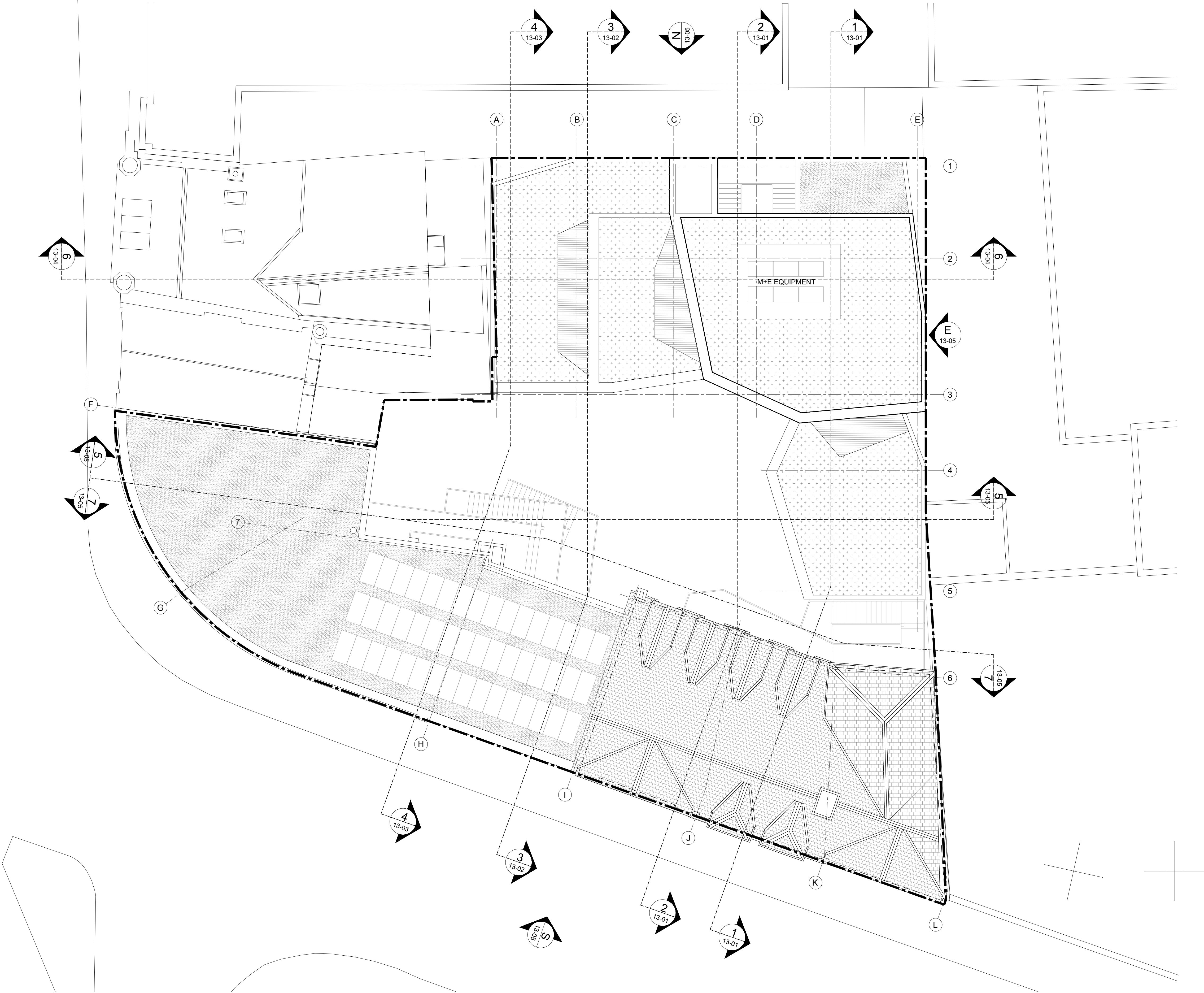
APPENDIX A

- **Existing Topographical Survey**
- **Green Roof & Soft Landscape Areas**
 - **Schematic Drainage Plan**
- **Surface Water Storage & Drainage Strategy**



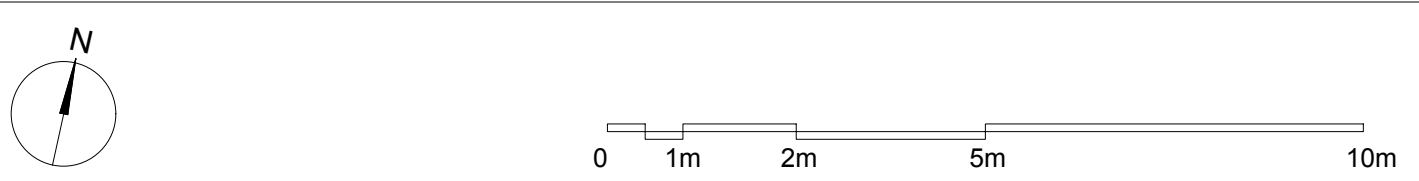


PROJECT				TYPE		SEQUENCE No.			REV.	NOTE
1	3	0	0	1	1	0	1	6		



MATERIAL SPECIFICATION:

- M1
- Perforated folding metal screens, polyester powder coated, exact pattern to be determined, off white colour
- M2
- Galvanised steel upstands to living roofs, +600mm
- BR1
- Brick, 'Reading silver grey'
- BR2
- Existing brick wall retained where possible. Unusable openings blocked up or expanded to form new door or window openings. Badgeon finish (lightly skimmed with cement to give a textured brick surface), off white colour
- C1
- Pre-cast concrete expressed slab elements and lift core cladding, warm colour
- G1
- Full height open able doors, aluminium frame, polyester powder coated, off white colour
- G2
- Inward opening aluminium windows polyester powder coated, off white colour. Frameless glass balustrade fixed to sides of window on exterior side
- G3
- Full height fixed glazing, aluminium frame, polyester powder coated, off white colour
- G4
- Shop glass, new double glazed windows, configuration to be in line with original
- G5
- Double glazed sliding sash timber framed windows to replace original, paint finish, colour to match original
- G6
- Double glazed casement windows timber framed, maintaining proportion of original, paint finish, off white colour
- R1
- Membrane roof
- R2
- All gutters and downpipes to be concealed on new building
- R3
- Living roof: semi-extensive. Mixed shrub and herbaceous planting. Drought tolerant species visually permeable webnet edge protection
- R4
- Original roof tiles maintained or replaced with similar
- F1
- Bound gravel surface over SUDS attenuation storage layer
- F2
- FSC tropical hardwood decking with rough planed finish
- F3
- Precast concrete steps and landing
- F4
- Clay block paving
- B1
- Continuous steel circular rods (vertical), equally spaced, with steel flatbar welded top and base. Polyester powder coated coated, off white colour
- B2
- Aluminium sheets polyester powder coated, anthracite colour
- S1
- Signage spandrel to be 1 consistant colour across whole length of development frontage. Colour to be confirmed (anthracite)



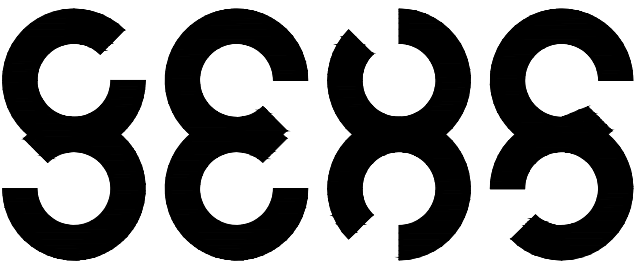
PROJECT

JACKSONS CORNER
1-9 KING'S ROAD, READING

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INTERNATIONAL HOUSE, 1-6 YARMOUTH PLACE, W1J 7BU

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TITLE

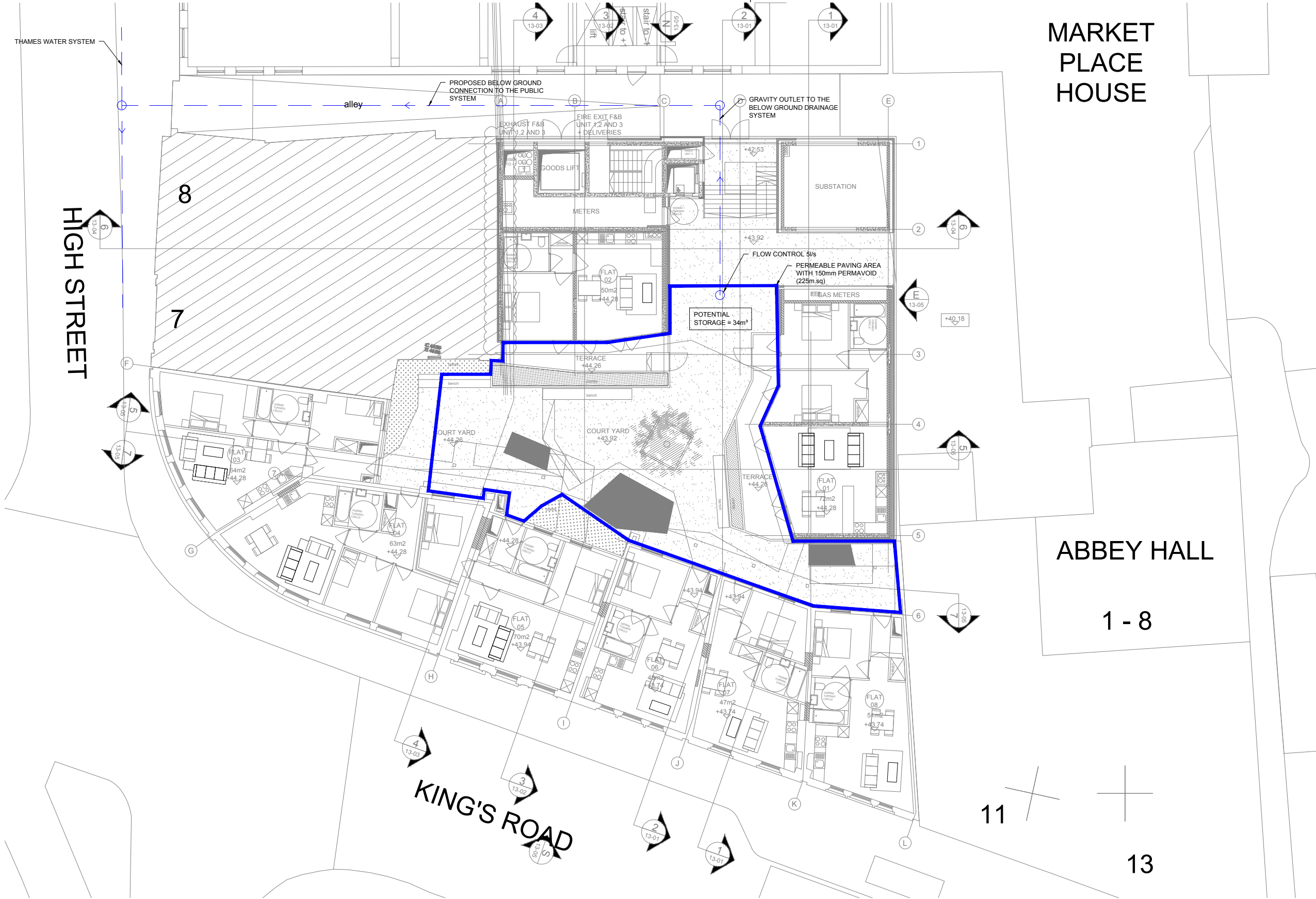
ROOF PLAN

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Drawn by	AMc		
Checked			

Revision A		
Revision B		
Revision C		
Revision D		

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ISSUE DATE	PROPOSED STATUS
08.04.2016	PLANNING APPLICATION

PROJECT	TYPE	SEQUENCE No.	REV.	NOTE
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1	1	0	1	7



NOTES
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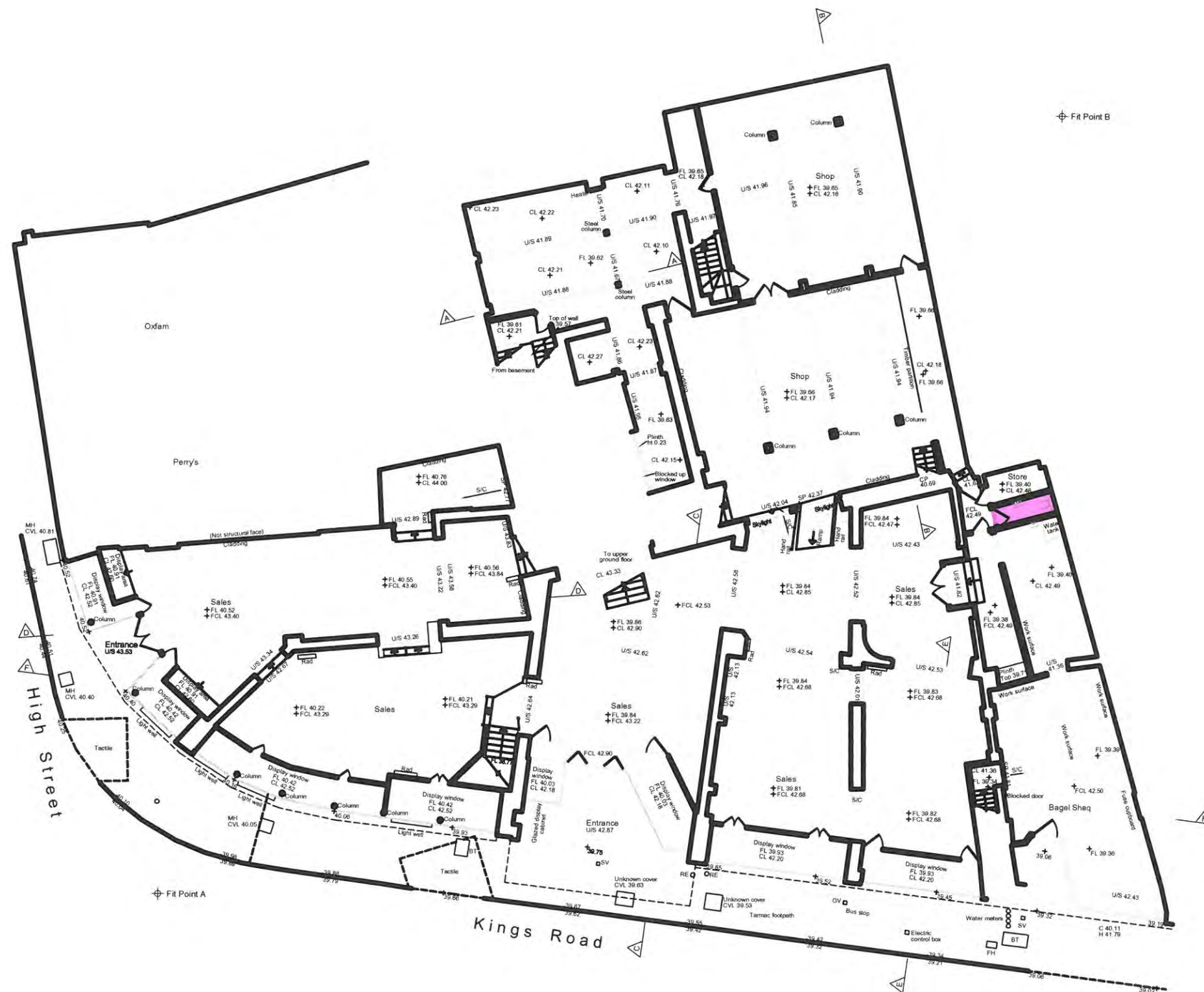
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Project	JACKSONS CORNER
Office	NORWICH - 01603 305 190
Title	SURFACE WATER STORAGE & DRAINAGE STRATEGY
Scale @ A1	1:100
Status	PRELIMINARY



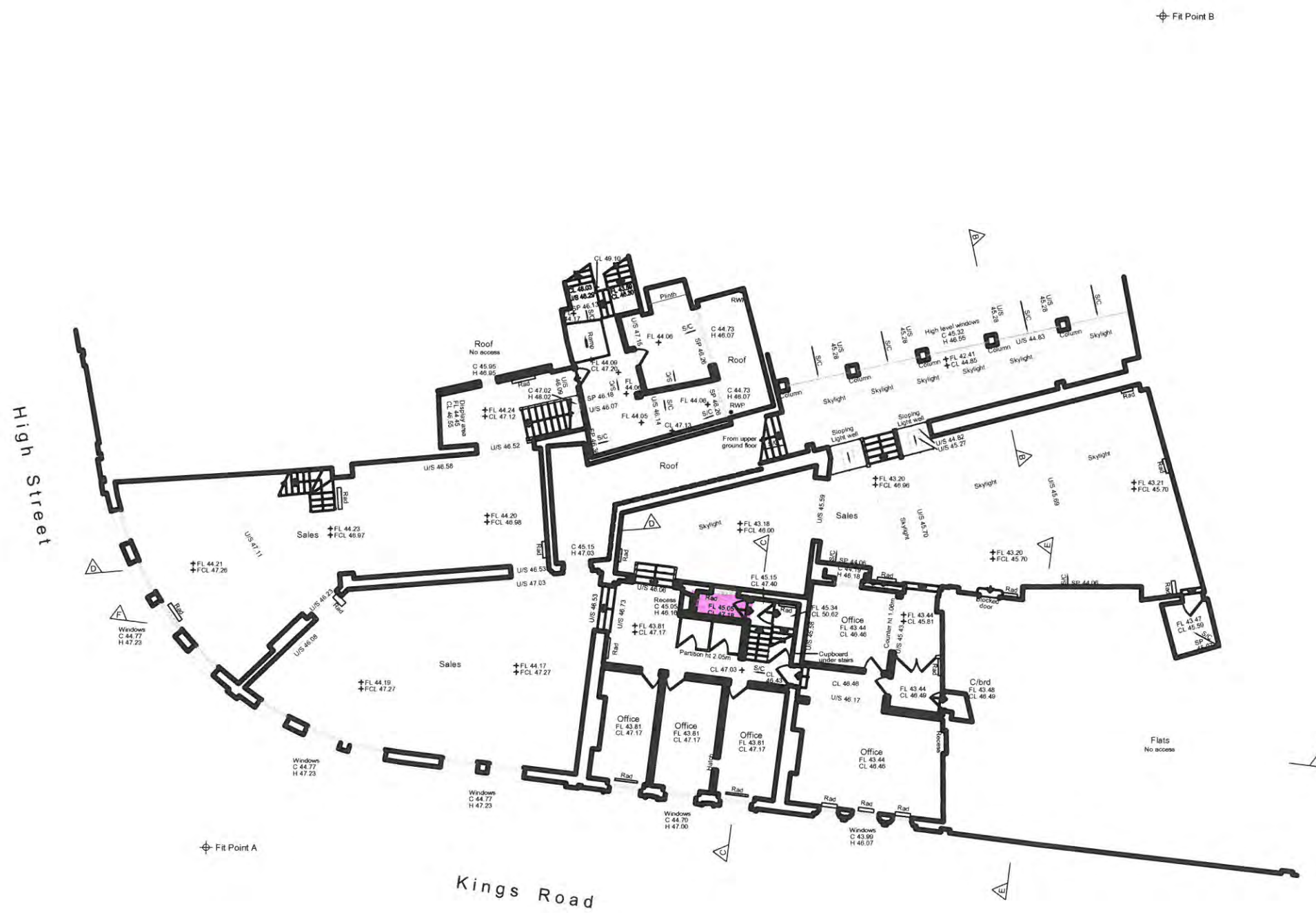
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Type	Level	Drawing No.	Revision
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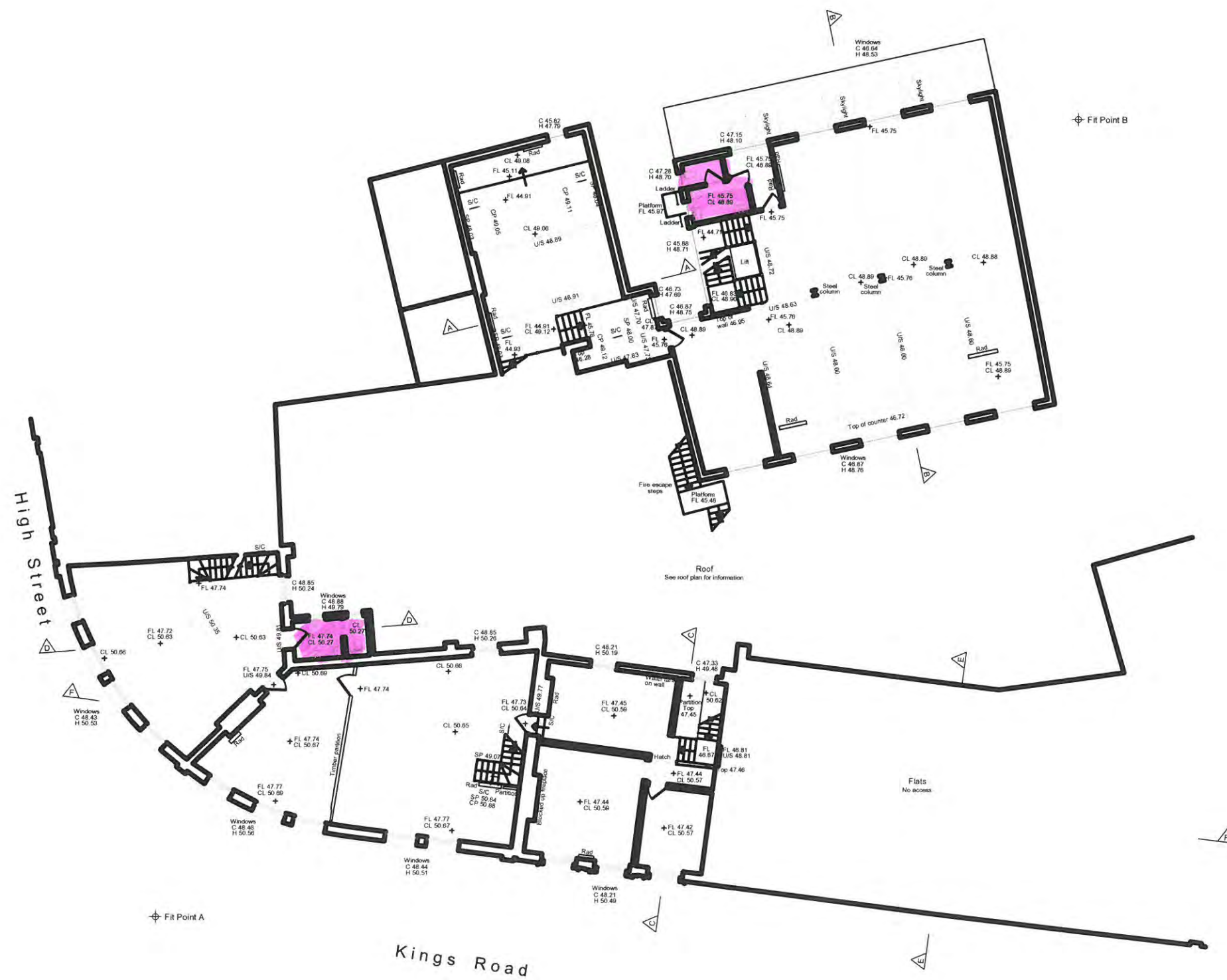
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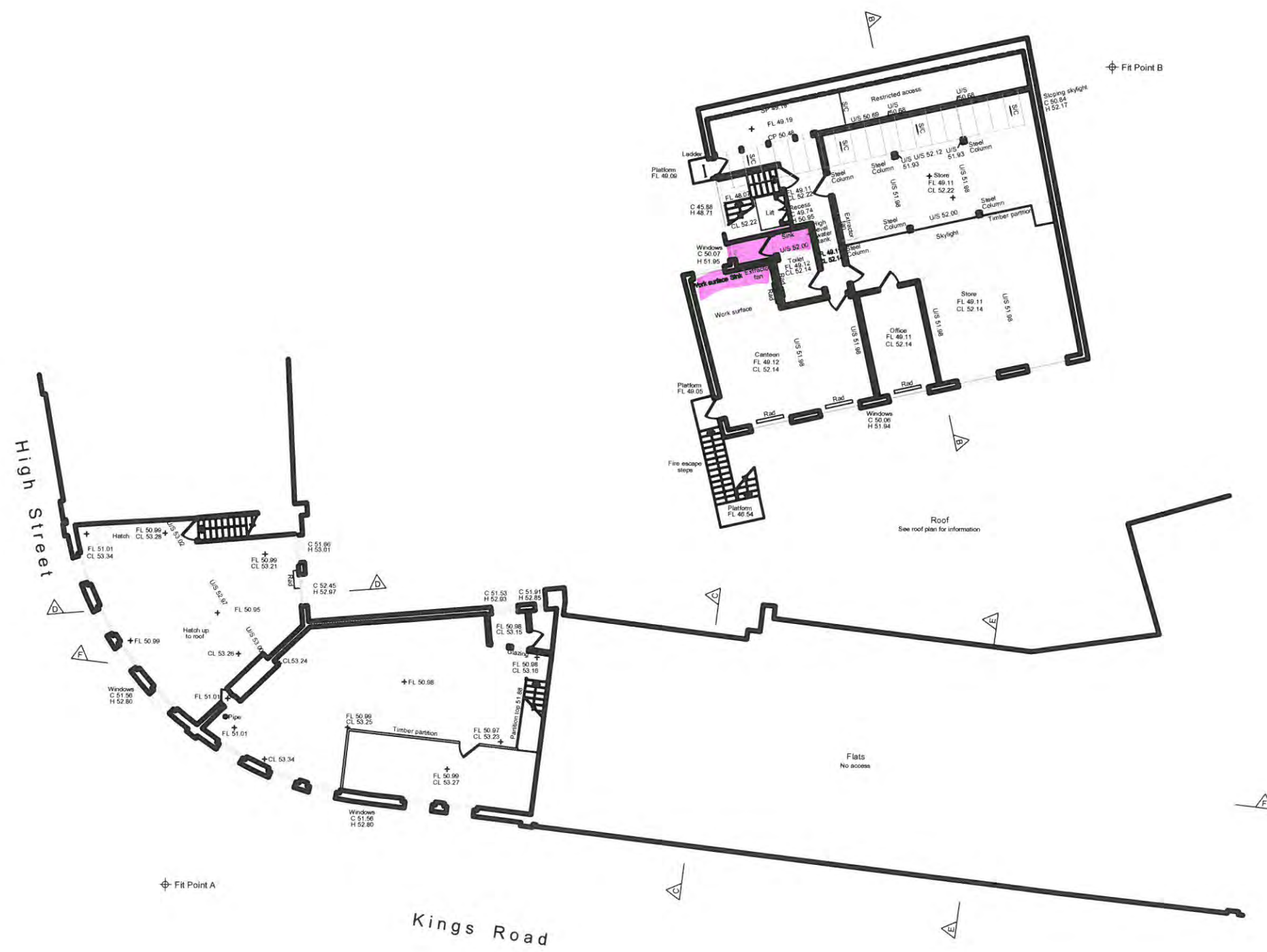
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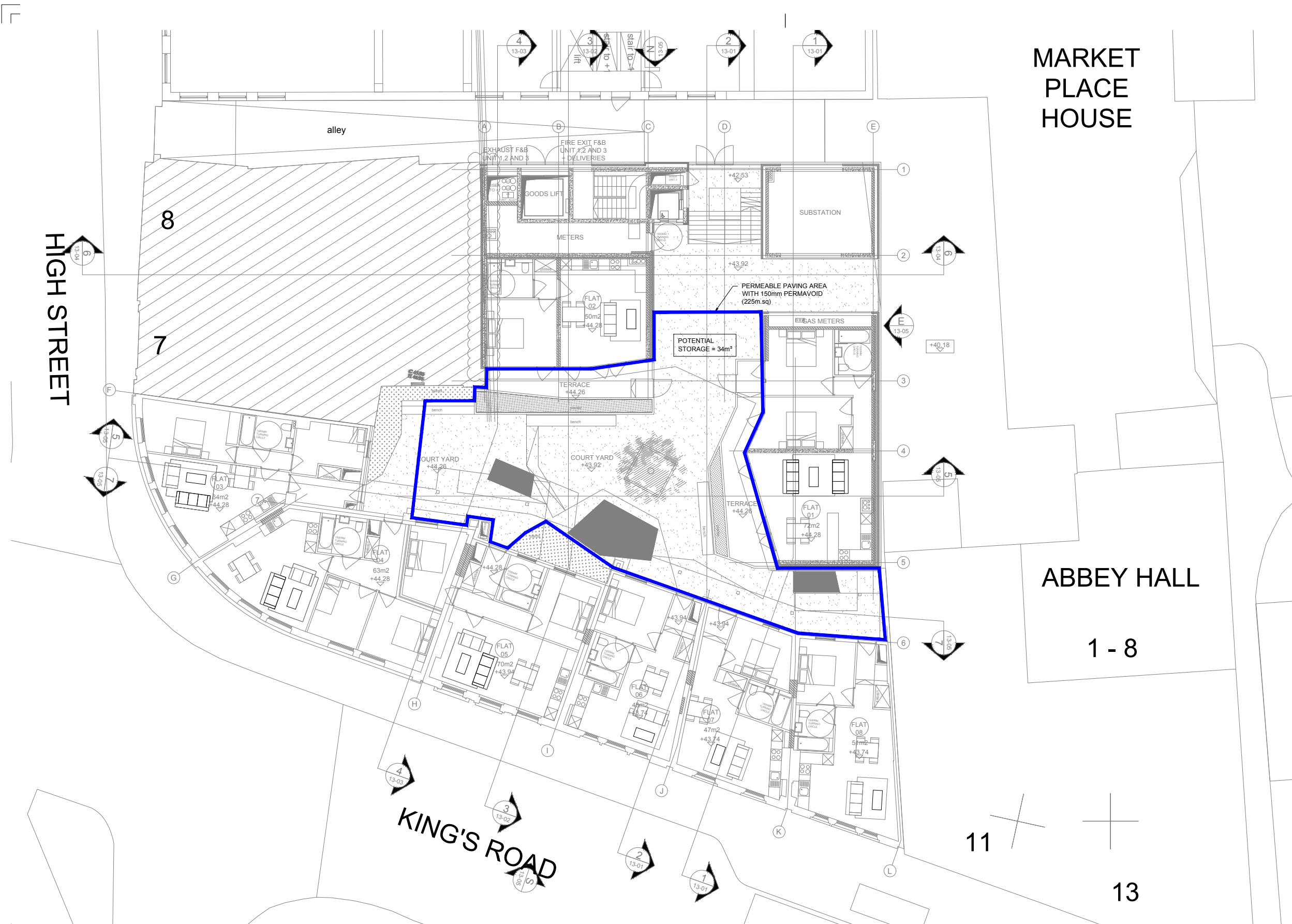






Fit Point B





MARKET
PLACE
HOUSE

ABBEY HALL

1 - 8

11

13

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Rev	Date	Description	By	Check	App.

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Client **READING SECURITIES**

Project JACKSONS CORNER

Office **NORWICH - 01603 305 190**

Title SURFACE WATER STORAGE

Scale @ A1 1:100	Status PRELIMINARY
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Originator	Job Number	Discipline	Building/Zone
CCL	81290	C	ALL
Type	Level	Drawing No.	Revision
DRN	01	400001	P1

Date of Print = Apr 04 2016, File Name = Drawing3.dwg

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DRAWING REFERENCE LIST		
DRAWING NUMBER	REV	REC'D
..	..	..

APPENDIX B

Calculations

Project JACKSON CORNER				Job no.	
Calcs for EXISTING RUNOFF - 1 YEAR				Start page no./Revision 1	
Calcs by LP	Calcs date 04/04/2016	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	London
Storm duration	D = 15 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.440
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 20 %
Factor Z1 (Wallingford procedure)	Z1 = 0.65
Rainfall for 15min storm with 5 year return period	M5_15min _i = Z1 × M5_60min × (1 + p _{climate}) = 15.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.62
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × M5_15min _i = 9.7 mm
Design rainfall intensity	I _{max} = M1_15min / D = 38.6 mm/hr

Maximum surface water runoff

Catchment area	$A_{\text{catch}} = 946 \text{ m}^2$
Percentage of area that is impermeable	$p = 100 \%$
Maximum surface water runoff	$Q_{\text{max}} = A_{\text{catch}} \times p \times I_{\text{max}} = 10.1 \text{ l/s}$



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Project

JACKSON CORNER

Job no.

Calcs for

EXISTING RUNOFF - 100 YEAR

Start page no./Revision

1

Calcs by

LP

Calcs date

04/04/2016

Checked by

Checked date

Approved by

Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area London
Storm duration $D = 15$ min
Return period Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.440$
5-year return period rainfall of 60 minutes duration $M5_60\text{min} = 20.0$ mm
Increase of rainfall intensity due to global warming $p_{\text{climate}} = 20$ %
Factor Z1 (Wallingford procedure) $Z1 = 0.65$
Rainfall for 15min storm with 5 year return period $M5_15\text{min}_i = Z1 \times M5_60\text{min} \times (1 + p_{\text{climate}}) = 15.5$ mm
Factor Z2 (Wallingford procedure) $Z2 = 1.99$
Rainfall for 15min storm with 100 year return period $M100_15\text{min} = Z2 \times M5_15\text{min}_i = 30.9$ mm
Design rainfall intensity $I_{\text{max}} = M100_15\text{min} / D = 123.8$ mm/hr

Maximum surface water runoff

Catchment area $A_{\text{catch}} = 946$ m²
Percentage of area that is impermeable $p = 100$ %
Maximum surface water runoff $Q_{\text{max}} = A_{\text{catch}} \times p \times I_{\text{max}} = 32.5$ l/s

Greenfield runoff estimation for sites

Site name: Jacksons Corner

Site location: Reading

Site coordinates

Latitude: 51.45509° N

Longitude: 0.96897° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Reference: gcpk9zn7t7gx / 0.1

Date: 4 Apr 2016

Site characteristics

Total site area	0.1	ha
Significant public open space	0	ha
Area positively drained	0.1	ha

Methodology

Greenfield runoff method	IH124
Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	1
HOST class	N/A
SPR	0.10

Hydrological characteristics

	Default	Edited	
SAAR	642	642	mm
M5-60 Rainfall Depth	17	17	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.85	0.85	
Hydrological region	6	6	
Growth curve factor: 1 year	0.85	0.85	
Growth curve factor: 10 year	1.62	1.62	
Growth curve factor: 30 year	2.3	2.3	
Growth curve factor: 100 year	3.19	3.19	

Greenfield runoff rates

	Default	Edited	
Qbar	0.01	0.01	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.00	5.00	l/s
1 in 100 years	5.00	5.00	l/s

Please note that a minimum flow of 5 l/s applies to any site

STORAGE ESTIMATE

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall Cv (Summer)

Return Period (years) Cv (Winter)

Region Impermeable Area (ha)

Map M5-60 (mm) Maximum Allowable Discharge (l/s)

Ratio R Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 20 m³ and 34 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999