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469 Gander Green Lane

Flood Risk and SuDS Assessment

April 2022

Quality Management

Job No	LE2022135		
Project	469 Gander Green Lane Flood Risk and SuDS Assessment		
Location	469 Gander Green Lane, North Cheam, SM3 9RA		
Title	Flood Risk and SuDS Assessment		
Document Ref	LE2022135FRASUDS	**Issue / Revision**	P01
Date	April 2022		

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared
P01	April 2022	Final	ZY

Contents

Appendices

Executive Summary

Site Name	469 Gander Green Lane Flood Risk and SuDS Assessment
Location	469 Gander Green Lane, North Cheam, SM3 9RA
Grid Reference	524370, 165653
Area (m2)	Approximately 0.04ha
EA Flood Zone Classification	Flood Zone 1
Current Site Use	Residential
Description of proposed	Demolition of existing annexe and erection of an attached two storey dwelling with accommodation within the roof comprising of 2 self contained dwellings and erection of a single storey rear extension
Vulnerability Classification	Residential accommodation – 'more vulnerable'
Summary of Pre-development Risks	• Fluvial Flood Risk: Low Risk • Tidal Flood Risk: Negligible Risk • Flood Risk from Land, Surface Water and Sewers: Low Risk • Groundwater Flood Risk: Low Risk • Flood Risk from Artificial Sources: Low Risk • Residual Flood Risk: Negligible Risk

1. Introduction

1.1 Requirement

1.1.1 Liska Environmental has been commissioned by Mr Nazeer Baig to undertake a desk based Flood Risk and SuDS Assessment for a development at 469 Gander Green Lane, North Cheam, SM3 9RA (Figure 3-1). It is understood by Liska Environmental that this report is to support a planning application for the Demolition of existing annexe and erection of an attached two storey dwelling with accommodation within the roof comprising of 2 self contained dwellings and erection of a single storey rear extension.

1.2 Report Objectives

1.2.1 The contents of this FRA describe the assessment of the proposal and the implications of the proposed development on flood risk. The FRA has been prepared following guidance provided in the revised National Planning Policy Framework (July 2018) and the Planning Policy Guidance (November 2016).

1.2.2 The aim of this assessment is to provide the level of detail necessary to demonstrate that the potential effects of flood risk (to the proposal) have been addressed by:

- Identifying the source and probability of flooding to the application site, including the possible effects of climate change;
- Determining the consequences of flooding to and from the proposed development proposal and advising on the how this will be managed, if necessary; and
- Demonstrating the flood risk issues described in this assessment are compliant with the relevant guidance.

1.3 Limitations

1.3.1 This report relies on publicly available information which Liska Environmental assumes to be correct: Liska Environmental cannot and does not verify accuracy of this data, and it is outside the scope of this commission to do so.

1.4 Sources of Information

1.4.1 Sources of information used during the compilation of this report include:

- Environment Agency (EA) website – '*Flood Map for Planning'* [Accessed 03/04/2022];
- British Geological Survey (BGS) website – *'GeoIndex'* and *'Lexicon of Named Rock Units'* [Accessed 03/04/2022];
- Department of Environment, Food, and Rural Affairs (DEFRA) website – *'MAGIC Map Application'* [Accessed 03/04/2022];
- Environment Agency (EA) website - '*Catchment Data Explorer'* [Accessed 03/04/2022].

2. Policy and Guidance

2.1 Thames Catchment Flood Management Plan (CFMP), 2009

2.1.1 A Catchment Flood Management Plan (CFMP) is a high-level strategic plan prepared by the EA, which identifies long-term (50 to 100 year) policies for sustainable flood risk within a catchment.

2.1.2 The relevant key messages contained within the Thames Region CFMP (2009) are that:

- Climate change will be the major cause of increased flood risk in the future; in urban areas and areas of narrow floodplain, flooding from heavy rainfall will be more regular and more severe. Surface water, sewer and fluvial flooding can occur within minutes of a severe rainfall event. Flooding can therefore occur at any time of the year, and there is very little time to provide flood warnings.
- Development and urban regeneration provide a crucial opportunity to manage flood risk; the location, layout and design of development can all reduce flood risk. For example, the use of SuDS can help to control surface water runoff.
- NPPF should be applied to ensure that flood risk is managed appropriately.

2.2 Flood and Water Management Act, 2010

2.2.1 Combined with the Flood Risk Regulations 2009 (‘the Regulations’), (which enact the EU Floods Directive in the England and Wales) the Flood and Water Management Act 2010 (‘the Act’) places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues. The Act and the Regulations together raise the requirements and targets Local Authorities need to meet, including:

- Playing an active role leading Flood Risk Management;
- Development of Local Flood Risk Management Strategies (LFRMS);
- Implementing requirements of Flood and Water Management legislation;
- Development and implementation of drainage and flooding management strategies; and
- Responsibility for first approval, then adopting, management and maintenance of Sustainable Drainage Systems (SuDS) where they service more than one property.

2.2.2 The Act also clarifies three key areas that influence development:

1. ***Sustainable Drainage Systems (SuDS) -*** the Act makes provision for a national standard to be prepared on SuDS, and developers will be required to obtain local authority approval for in accordance with the standards, likely with conditions. Supporting this, the Act requires local authorities to adopt and maintain SuDS, removing any ongoing responsibility for developers to maintain SuDS if they are designed and constructed robustly.
2. ***Flood risk management structures -*** the Act enables the EA and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent from the relevant authority.
3. ***Permitted flooding of third party land -*** The EA and local authorities have the power to carry out work, which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people’s enjoyment of the environment or of cultural heritage.

2.3 National Planning Policy Framework (NPPF), July 2018

2.3.1 In determining an approach for the assessment of flood risk for the proposal there is a need to review the policy context. The National Planning Policy Framework requires that consideration be given to flood risk in the planning process. The National Planning Policy Framework was revised and issued in July 2018 and outlines the national policy position on development and flood risk assessment.

2.3.2 The Framework states that the appropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, it can be permitted provided it is made safe without increasing flood risk elsewhere.

2.3.3 The essence of NPPF is that:

- Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards;
- Polices in development plans should outline the consideration, which will be given to flooding issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change;
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Opportunities offered by new developments should be used to reduce the causes and impacts of flooding;
- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains; and
- Development is based on the concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the “Exception Test”.

3. Development Site Planning Considerations

3.1 Location

3.1.1 The site, of approximately 0.04ha, is located at 469 Gander Green Lane, North Cheam, SM3 9RA at Ordinance Survey (OS) coordinates 524370, 165653.

Figure 3-1 Site Boundary. Source: Google Map

3.2 Proposed Development

3.2.1 The proposal consists of the demolition of existing annexe and erection of an attached two storey dwelling with accommodation within the roof comprising of 2 self contained dwellings and erection of a single storey rear extension. Further details about the proposals have been provided in Appendix A.

3.3 Local Geology

3.3.1 A review of the published geological information was carried out, including information from the BGS GeoIndex and Lexicon of Named Rock Units websites[1]. The geological sequence underlying the Site is summarised in Table 3-1.

[1] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Table 3-1 Underlying Geological Sequence

Stratum	Name	Location	Parent Unit	Description
Bedrock Geology	London Clay Formation - Clay, Silt and Sand	Onsite	Thames Group (THAM)	Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.
Superficial Deposits	None recorded	N/A	N/A	N/A

3.3.2 The BGS geological mapping shows that the Site bedrock comprises London Clay Formation - Clay, Silt and Sand. These sedimentary rocks are marine in origin. They are detrital and comprise coarse- to fine-grained slurries of debris from the continental shelf flowing into a deep-sea environment, forming distinctively graded beds.

3.4 Hydrogeology

3.4.1 The bedrock London Clay Formation is designated as Unproductive. These are geological strata with low permeability that have negligible significance for water supply or river base flow Aquifers previously designated as major and minor have now become principal and secondary respectively.

3.4.2 The nearest surface water feature is Pyl Brook which is located at approximately 135m to the west of the site.

3.5 Flood Zone

3.5.1 Flood Zones describe the extent of flooding that would occur on the assumption that no flood defences are in place. The definition of Flood Zones is provided in Table 1 of the PPG and in table 3.1 below:

Table 3-1: Flood zone terminology

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as ‘clear’ on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea

Flood Zone	Definition
	flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

3.5.2 The site lies within the Environment Agency's Flood Zone 1, which is described within PPG Table 1 as having a 'Low Probability' of flooding. The Environment Agency's flood zone map is shown in Appendix B.

3.6 Vulnerability Classification

3.6.1 The proposed development is considered to fall under the classification of 'More Vulnerable' land uses based on Table 2 of PPG Technical Guidance. Table 3: Flood Risk Vulnerability and Flood Zone Compatibility in PPG, states that these land uses are compatible in Flood Zone 1 (without the requirement to apply the Exception Test) (as in Table 3.2 below).

Table 3.2: Flood Zone Risk and Vulnerability

Flood Zones	Flood Risk Vulnerability				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Key: ✓Development is appropriate ✗Development should not be permitted

3.7 Sequential Test and Exception Test

3.7.1 Paragraph 101 of the NPPF sets out guidance on the application of the Sequential Test, the aim of which is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. Where areas of lower risk are not available, the Exception Test, as set out in paragraph 102 of the NPPF can be applied, to ensure that flood risk to people and property will be managed satisfactorily.

3.7.2 As the proposed development is located in Flood Zone 1, the exception test and sequential test are not required.

4. Sources of Flooding – Actual Flood Risk

4.1.1 The NPPF describes potential sources of flooding. It is necessary to consider the risk of flooding from all sources within a FRA. This section provides a review of flooding from land, sewers, groundwater and artificial sources, in addition to that from rivers and the sea.

4.2 Fluvial Flood Risk

4.2.1 The Environment Agency's Flood map for Planning, was used to identify risk of flooding at site (refer Appendix B). These confirm that the site is in Flood Zone 1.

4.3 Flood Risk from Land, Surface Water and Sewers

4.3.1 Flooding from land can be caused by rainfall being unable to infiltrate into the natural ground or entering the drainage systems due to blockage, or flows being above design capacity. This can then result in (temporary) localised ponding and flooding. The natural topography and location of buildings/structures can influence the direction and depth of water flowing off impermeable and permeable surfaces.

4.3.2 Surface water flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm. The Environment Agency classifies the site, as being within area at very low risk of flooding (i.e. each year this area has a chance of flooding of less than 0.1%).

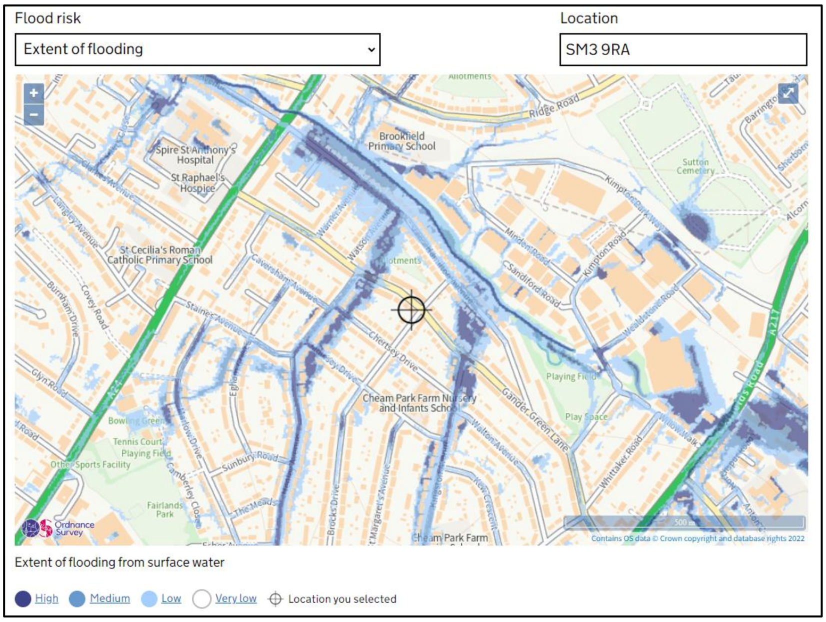


Figure 4-1: Surface Water Flood Map (Source Environment Agency[2])

[2] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?&topic=ufmfsw#x=357683&y=355134&scale=2 [accessed *03/04/2022]*

4.4 Tidal Flood Risk

4.4.1 Tidal flooding occurs when a high astronomical tide and storm (tidal surge) exceeds the level of coastal land or coastal flood defences. Tidal flooding can also be caused by 'tide locking' of rivers or estuaries. Tide locking prevents a river from discharging into the sea, causing 'backing up' and resulting in tidal/fluvial flooding.

4.4.2 The Site is not located within an area at risk from tidal flooding.

4.5 Groundwater Flood Risk

4.5.1 According to the Sutton SFRA Appendix Figure 4.4 - Area susceptibility to groundwater flooding, the site is not located in an area with potential for groundwater flooding to occur.

4.5.2 As the proposed development is on the ground floor and above, the risk to the site from groundwater flooding could be considered low.

4.6 Flood Risk from Artificial Sources

4.6.1 Artificial sources of flooding include reservoirs, canals, ponds and mining abstraction.

4.6.2 A review of the Environment Agency Reservoir Maps indicates that the site is not within an area at risk from reservoir flooding.

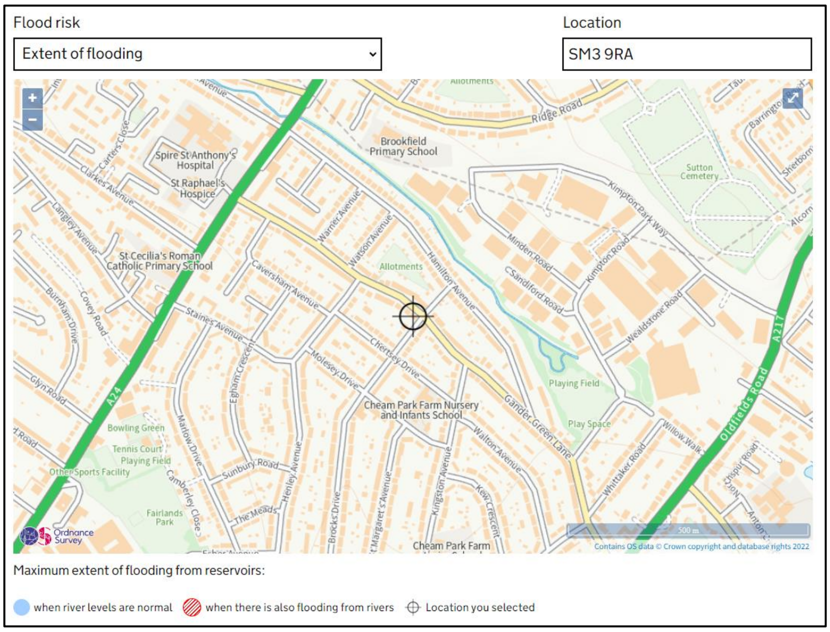


Figure 4-3: Extent of flooding from reservoirs Flood Map (Source Environment Agency[3])

[3] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?&topic=ufmfsw#x=357683&y=355134&scale=2 [accessed *03/04/2022]*

4.7 Residual Flood Risk

4.7.1 Residual Risk is defined as 'the risk which remains after risk avoidance, reduction and mitigation measures have been implemented'. For the purpose of assessing flood risk, it is assumed that events greater than those assessed as Actual Risk are considered a 'Residual Risk'.

4.7.2 As the site is located in a low flood risk zone, the residual flood risk is assessed as negligible.

4.8 Summary of flood risk

4.8.1 Table 4.1 below summarises the types of flood risk at the Site:

Table 4-1: Summary of flood risk

Source of risk	**Ongoing risk**
Fluvial Flood Risk	Low Risk
Tidal Flood Risk	Negligible Risk
Flood Risk from Land, Surface Water and Sewers	Low Risk
Groundwater Flood Risk	Low Risk
Flood Risk from Artificial Sources	Low Risk
Residual Flood Risk	Negligible Risk

5. Surface Water Drainage Strategy

5.1 SuDS Principles

5.1.1 The Local Authority expects all developments to take advantage of any suitable opportunities to reduce surface water runoff. Developers should utilise SuDS on all developments, unless there are practical reasons for not doing so. Therefore, it is expected to see suitable consideration given to using sustainable measures in line with the following drainage hierarchy:

- Store rainwater for later use
- Use infiltration techniques, such as porous surfaces in non-clay areas
- Attenuate rainwater in ponds or open water features for gradual release
- Attenuate rainwater by storing in tanks or sealed water features for gradual release
- Discharge rainwater direct to a watercourse
- Discharge rainwater to a surface water sewer / drain
- Discharge rainwater to the combined sewer

5.2 Surface Water Drainage Design

5.2.1 The existing and proposed areas are summarised below.

Table 5-1 Site areas

Parameter	Existing (m^2)	Existing (%)	Proposed (m^2)	Proposed (%)
Impermeable area	237.9	62%	264.5	69%
Permeable area	143.7	38%	117.1	31%
Total area	381.6		381.6	

5.2.2 It is assumed that the surface water runoff from the site is currently picked up in the site drainage system and discharges into the sewer in Gander Green Lane.

Existing Site Characteristics

5.2.3 The existing hydrological characteristics for the site are as follows:

- M5_60min=20
- Ratio r=0.4
- IH 124 Soil Type: 4
- Total Site Area = 381.6 m^2
- Total Existing Impermeable Area = 237.9 m^2
- Percentage Impermeable (PIMP) = 62%

5.2.4 The discharge rates for the greenfield and existing site are summarised below (calculations in Appendix C). The greenfield discharge rates are calculated based on IH 124 and 'Rainfall runoff management for developments'. The existing discharge rates were determined using an analytical model based on the assumption that the existing site discharges via a 150mm outfall pipe.

Table 5-2: Greenfield and Existing Discharge Rates

	Discharge Rates (l/s)				
	1 year	**Qbar**	**30 year**	**100 year**	**100 year +40% CC**
Greenfield Rates	0.05	0.06	0.14	0.20	-
Existing discharge rates	2.2	-	5.1	6.7	-

SuDS Considerations

5.2.5 The aim of SuDS is to identify "at source" water management measures to reduce surface water runoff. The most appropriate means of surface water control and discharge has been determined based on the hierarchy as set out in the NSTS: CIRIA SuDS Manual (C753). The following SuDS featured have been considered as part of the development.

- **Rainwater harvesting system** – Water butt is proposed
- **Infiltration** –Infiltration testing has been carried out (Appendix F) and Soakaway is proposed
- **Swales, detention basins, ponds** – There is insufficient space to appropriately incorporate these elements within the small private garden and as such these have not been considered.
- **Watercourse** – No nearby watercourse
- **Permeable paving** – Permeable paving is proposed on external paving and parking area.

Proposed Runoff Characteristics

5.2.6 The proposed runoff characteristics are as follows:

- Proposed Impermeable Area = 264.5 m^2
- Percentage Impermeable (PIMP) = 69%
- Net increase of impermeable area after development = 26.6m^2
- Infiltration rate = 1.82 $x10^{-5}$ m/s

5.2.7 The discharge rates for the existing and proposed site are summarised below (calculations in Appendix C).

Table 5-3: Existing and Proposed Discharge Rates

	Discharge Rates (l/s)				
	1 year	**Qbar**	**30 years**	**100 years**	**100 year +40% CC**
Existing discharge rates	2.2	-	5.1	6.7	-
Proposed discharge rates	0.1	-	0.1	0.1	0.1

Proposed SuDS Solution

5.2.8 It is proposed that a combination of permeable paving and soakaways will be used to dispose of runoff from the development. The proposed SuDS solutions will attenuate run-off rates down to greenfield.

5.2.9 The permeable paving/soakaway attenuation system provide sufficient attenuation for all storm events up to and including the 100-year storm +40% climate change.

5.2.10 Details of the drainage system and attenuation structures are presented in the design drawings and calculations in Appendix D.

Drainage Exceedance

5.2.11 The area is not subject to overland flow routes or surface water flooding.

5.2.12 The drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. Thus, the overland flow route will only be in use in the event of drainage network failure, storms in excess of the 1 in 100 year + 40% climate change storm.

5.2.13 All overland flow will discharge into the drainage system. See overland flow plan in Appendix D.

5.3 SuDS Maintenance and Ownership

5.3.1 All drainage on-site will remain private. There are no elements that could be adopted by the Public Sewer authority or by the Council. A long-term maintenance regime schedule can be found in Appendix E.

6. Flood Risk Management

Principles of Flood Risk Management

6.1.1.1 NPPF requires a precautionary approach to be undertaken when making land use planning decisions regarding flood risk. This is partly due to the considerable uncertainty surrounding flooding mechanisms and how flooding may respond to climate change. It is also due to the potentially devastating consequences of flooding to the people and property affected.

6.1.1.2 NPPF requires flooding from tidal, fluvial, land, surface water & sewerage and from groundwater to be considered. The flood risk management measures discussed in this section are based on the sources of flooding identified in Section 4 that are considered to pose a risk to the development proposals.

Flood Resistance/Resilience Measures

6.1.2 The Environment Agency classifies the development area of the site is located in an area with a low risk of surface water flooding.

Wall construction

6.1.3 It is recommended to use a twin-skin wall construction (E.g. Solid brickwork, Brick-brick cavity or brick-blockwork cavity) in line with British Standards. This can provide have high quality pointing and will offer suitable resistance to floodwater entry. We recommend the use of lime plaster or cement render rather than conventional gypsum plaster.

Floor construction

6.1.4 Concrete ground-supported floors are the preferred option and concrete slabs of at least 100mm thickness should be specified.

Doorways and Windows

6.1.5 For any new external opening doors, PAS 1188 or similar certified doors should be used to keep in line with the current standards.

6.1.6 Standard moveable flood barriers should be available for doors and windows in exterior walls.

Service entries (Cables and pipes)

6.1.7 Non-return valves will be used in the drainage system to prevent back-flow of diluted sewage in situations where there is an identified risk of the foul sewer surcharging.

6.1.8 Wiring for telephone, TV, Internet and other services will be protected by suitable insulation to minimise damage.

6.1.9 Wall sockets will be raised to as high as is feasible and practicable to avoid damage if flood waters inundate the property.

7. Conclusions & Recommendations

7.1.1 An assessment of areas potentially at risk from flooding has been undertaken and the development proposals have been examined in relation to their potential to increase flood risk both on and off site. This desk based FRA accompanies the full planning application for the Demolition of existing annexe and erection of an attached two storey dwelling with accommodation within the roof comprising of 2 self contained dwellings and erection of a single storey rear extension at 469 Gander Green Lane, to demonstrate that flood risk has been given material consideration throughout the development planning process and development should not be restricted at this Site due to flood risk.

7.1.2 The site is located within Flood Zone 1 according to the Environment Agency Flood Zones Maps. The current and proposed development Site use is classified as a 'More Vulnerable' land use according to NPPF. Therefore, the site is compatible with the Environment Agency's vulnerability tests.

7.1.3 In line with the NPPF, all sources of flooding have been considered and assessed, using readily available sources of information. The site is located in the area with low risk from all sources including fluvial/tidal risk, surface water, sewer, groundwater and reservoir.

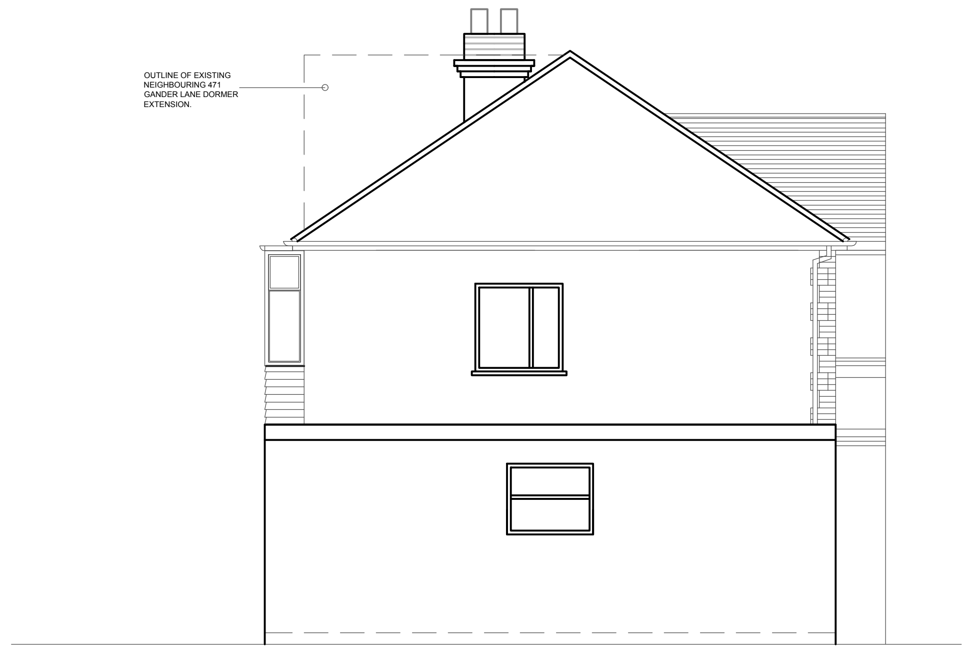
7.1.4 The development proposal has considered flood risk at all stages throughout the development of the final layout and reflects the flood risk constraints and the need to manage, and where possible reduce, flood risk in compliance with the guidance in NPPF. The proposal will not increase the risk of flooding to others and as a result, proposed development at this site should not be restricted as a result of flood risk.

Appendix A Existing Site and Proposed Plans

FRONT ELEVATION

EXISTING ELEVATIONS

REAR ELEVATION



SIDE ELEVATION

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4. The contractor has ensured, during demolition work, no distress or movement to walls, floors and roof to the subject and adjoining building.
5. All structural concrete to be grade C35 UNO
6. All Structural steel to be grade S275 UNO.
7. All Steel to be covered with 2 layers of 12.5mm plasterboard to achieve 30 min fire resistance.
8. All supporting walls and structural works to be read in conjunction with structural engineer's details. structural steelwork (where used) to meet current building regulations.
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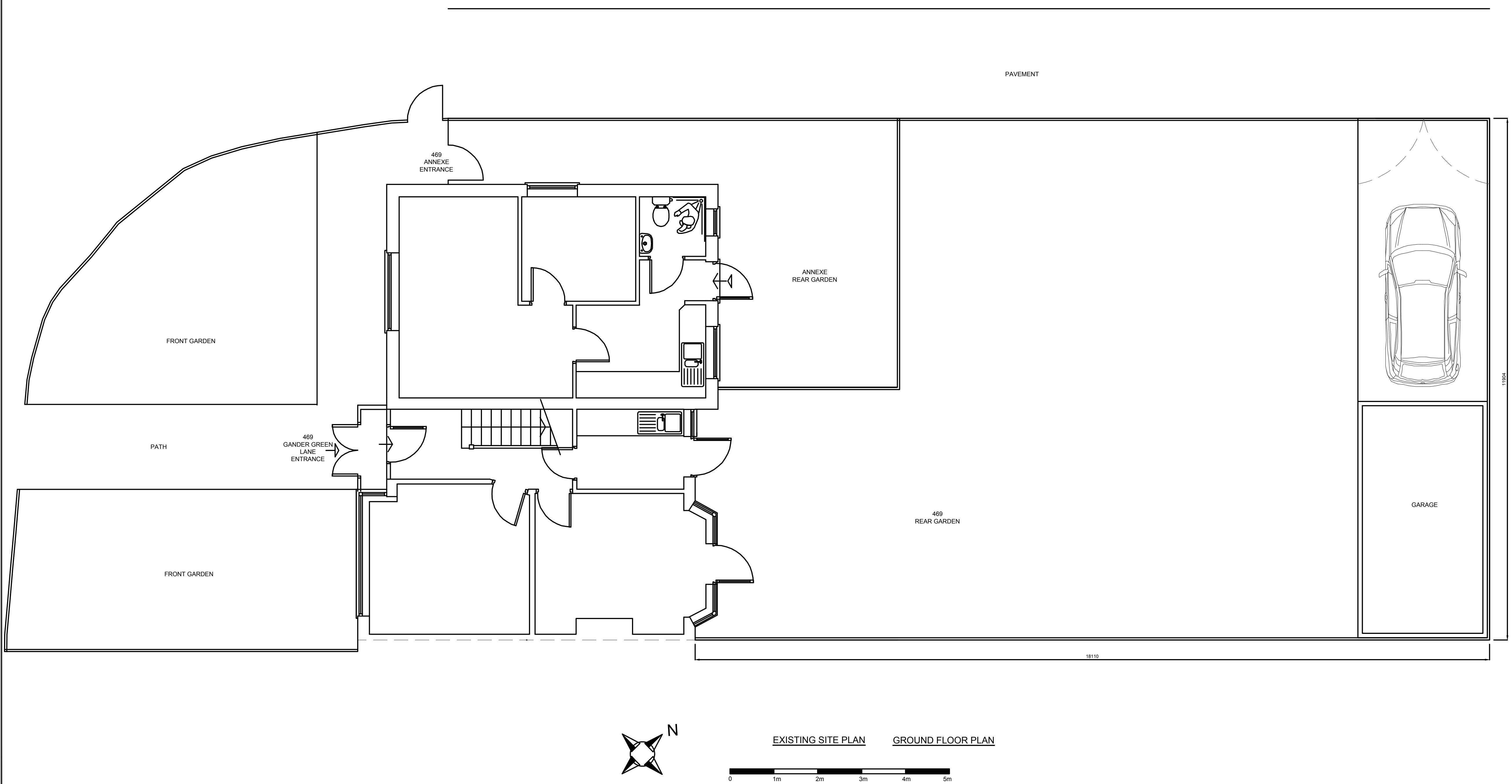

EXISTING SITE PLAN   GROUND FLOOR PLAN

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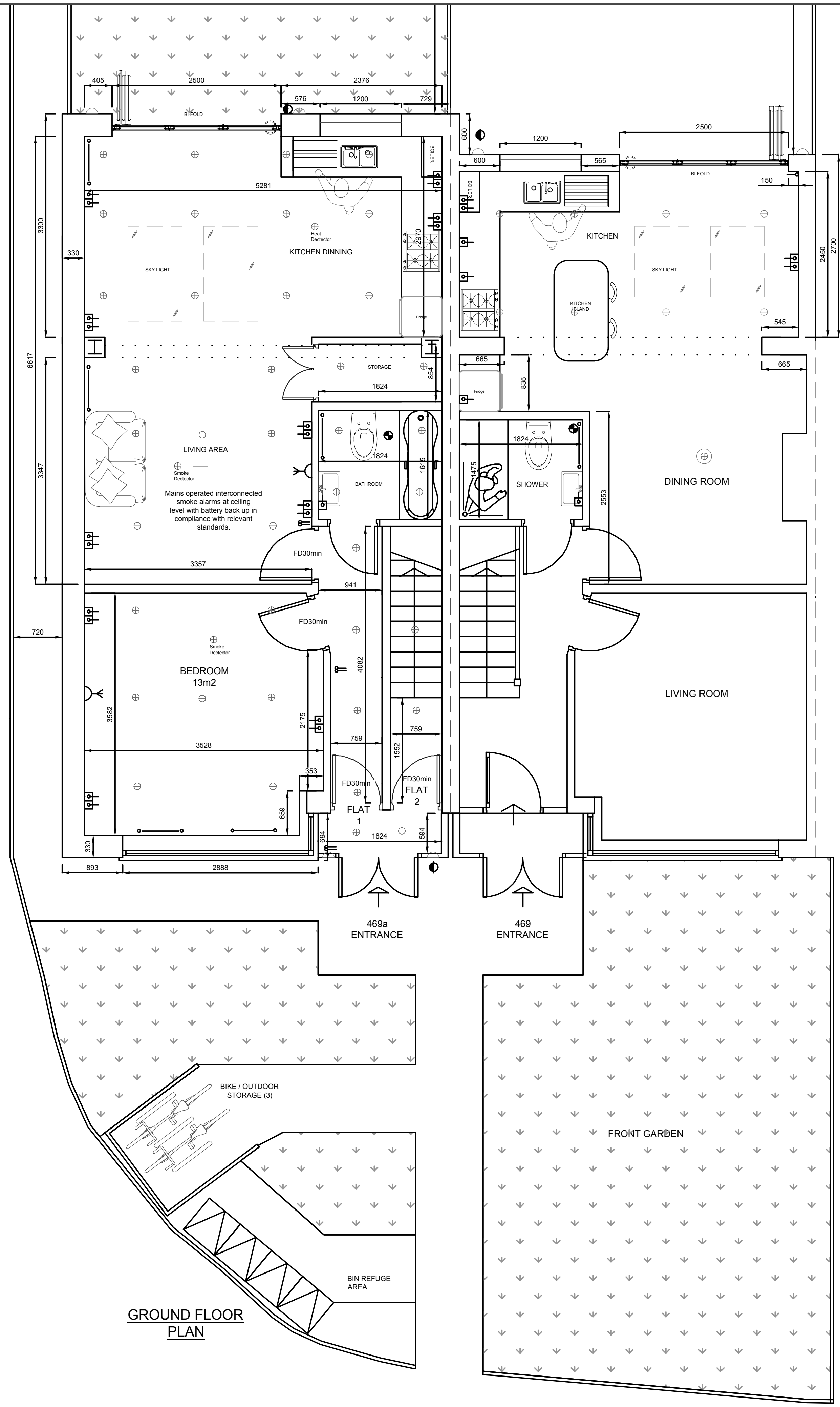
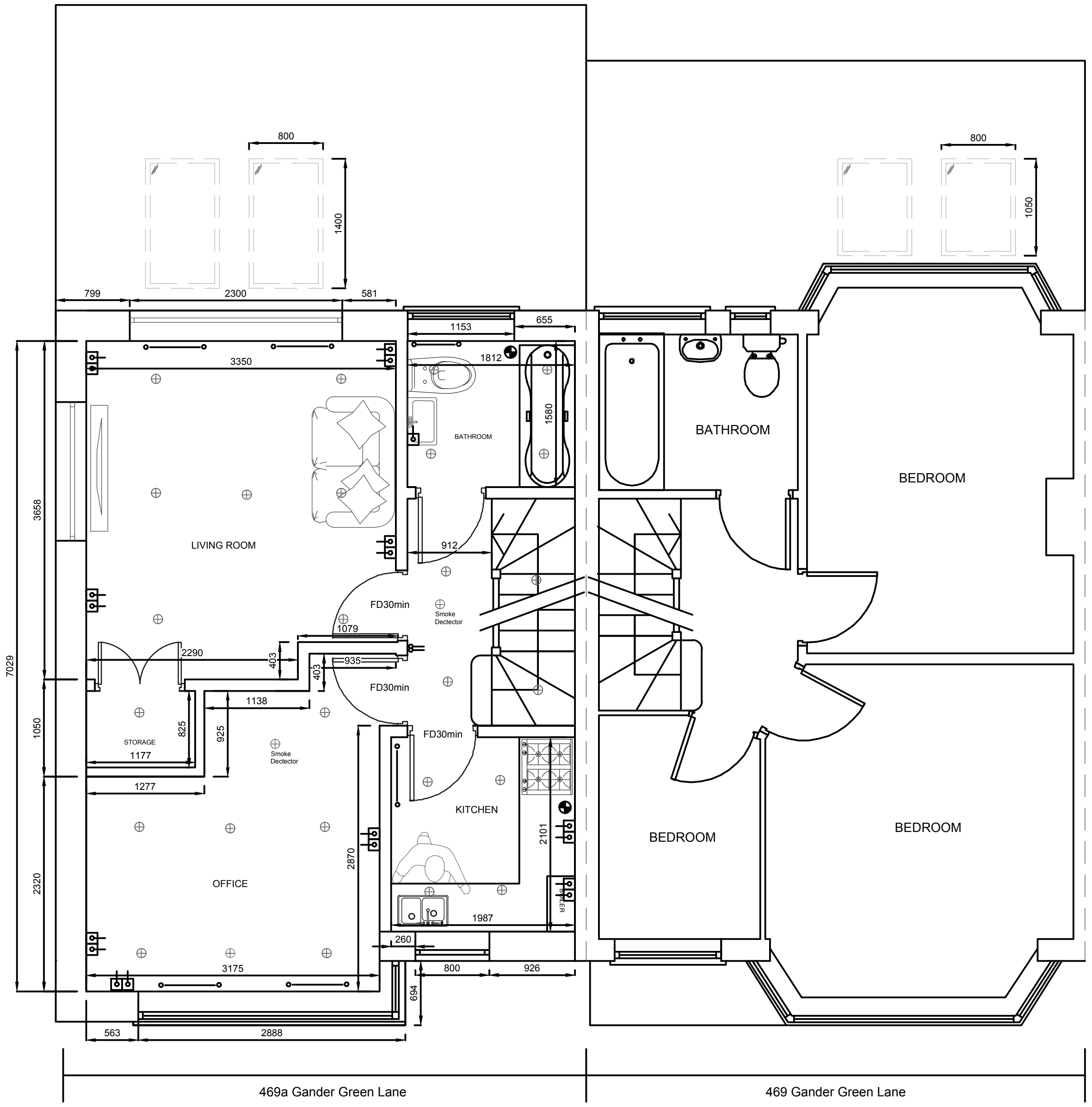




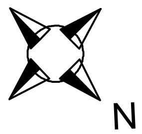
1ST FLOOR PLAN

FLAT 1 - 1 Bedroom Flat (2 Persons) 50m2

FLAT 2 - 1 Bedroom Flat (2 Persons) 58m2

KEY

- CHANDELIER CENTRAL LIGHTING	MECHANICAL EXTRACT FAN
- WALL LIGHT	DOUBLE / SINGLE SWITCHED FLOOR SOCKETS
- RADIATOR	2 GANG LIGHT SWITCH
- TV AERIAL POINT	EXTERNAL LIGHT



PROPOSED PLAN

0 1m 2m 3m 4m 5m

Notes:

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3. All works if applicable, must comply with current Building and Water Regulations.
4. The contractor has ensured, during demolition work, no distress or movement to walls, floors and roof to the subject and adjoining building.
5. All structural concrete to be grade C35 UNO
6. All Structural steel to be grade S275 UNO.
7. All Steel to be covered with 2 layers of 12.5mm plasterboard to achieve 30 min fire resistance.
8. All supporting walls and structural works to be read in conjunction with structural engineer's details. structural steelwork (where used) to meet current building regulations.
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ARCHITECT: AA DRAFTING SOLUTIONS
41 Knighton Park Rd
London
SE26 5RN

SITE: 469 Gander Green Lane SM3 9RA

TITLE: PROPOSED DRAWINGS DETAIL

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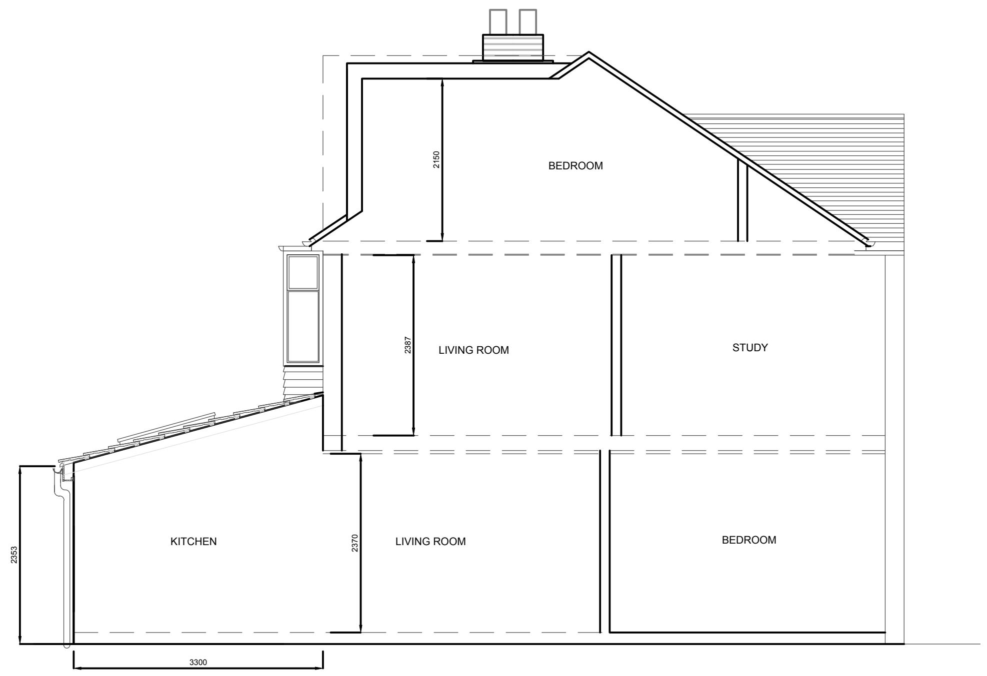
NTS	03/02/20	AM	AM
PROJECT NO:	DRAWING NO:		REVISION:
0344	A3/13		A

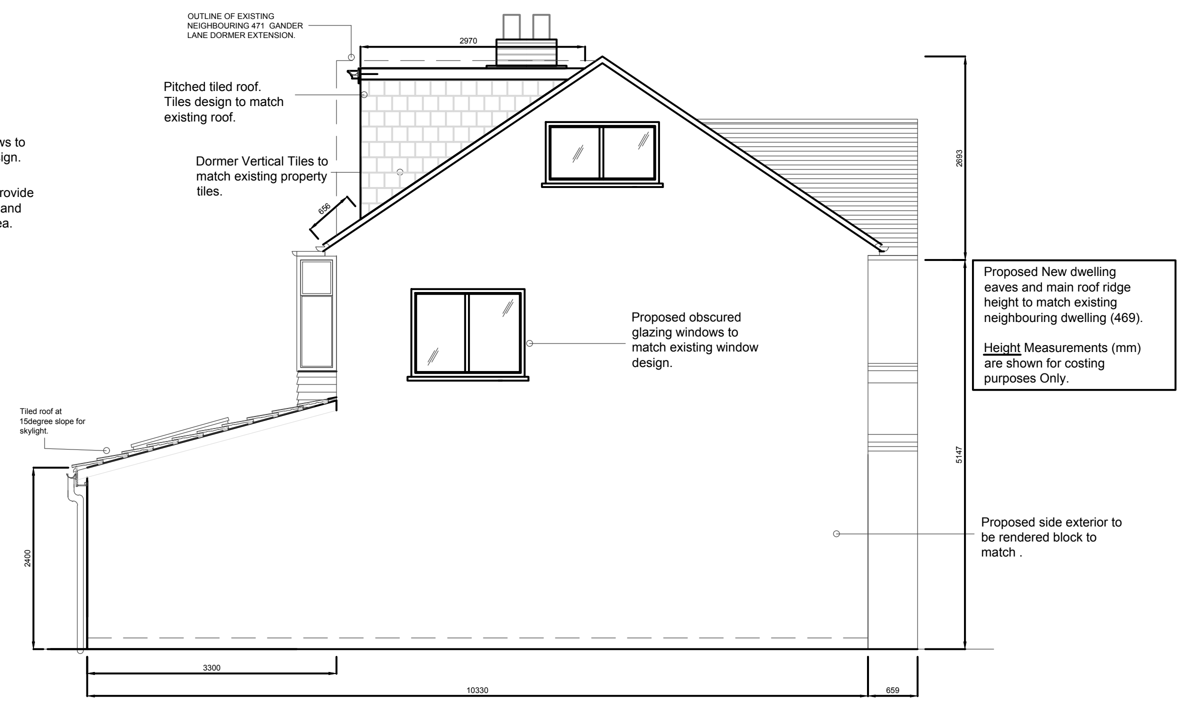
FRONT ELEVATION



SECTION VIEW A-A

REAR ELEVATION

PROPOSED ELEVATIONS



SIDE ELEVATION

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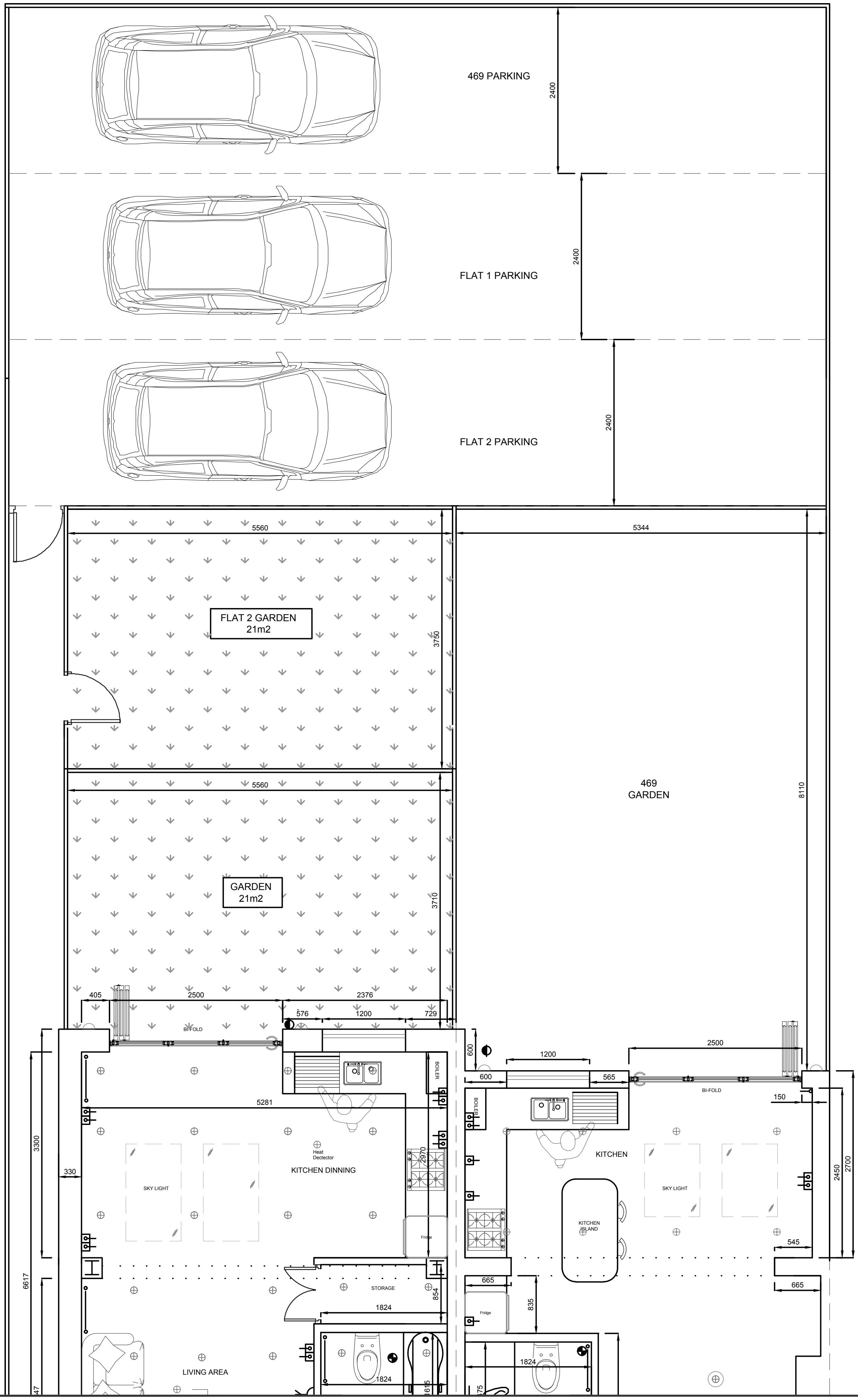
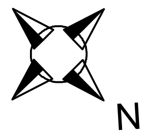
41 Knighton Park Rd
London
SE26 5RN

SITE: 469 Gander Green Lane
SM3 9RA

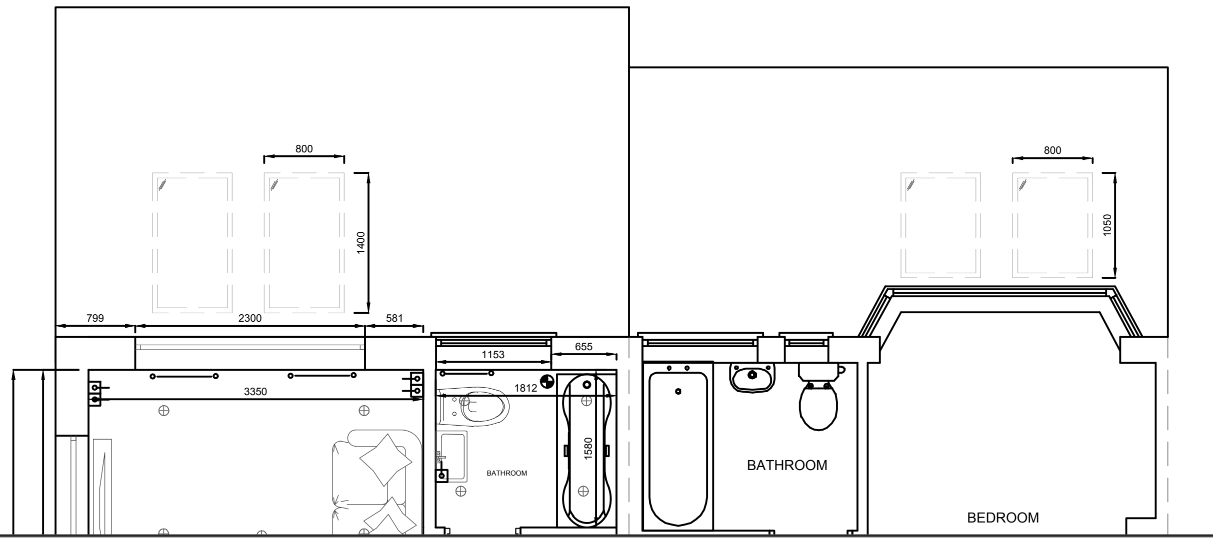
TITLE: PROPOSED DRAWINGS ELEVATIONS

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:100	03/06/2020	AM	AM
PROJECT NO:	DRAWING NO:		REVISION:
0344	A3/06		A





PROPOSED PLAN



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SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	03/02/20	AM	AM

PROJECT NO:	DRAWING NO:	REVISION:
0344	A3/13	A

Appendix B Environment Agency Flood Map for Planning

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
SM3 9RA	**524371/165653**	**3 Apr 2022 17:17**

Your selected location is in flood zone 1, an area with a low probability of flooding.

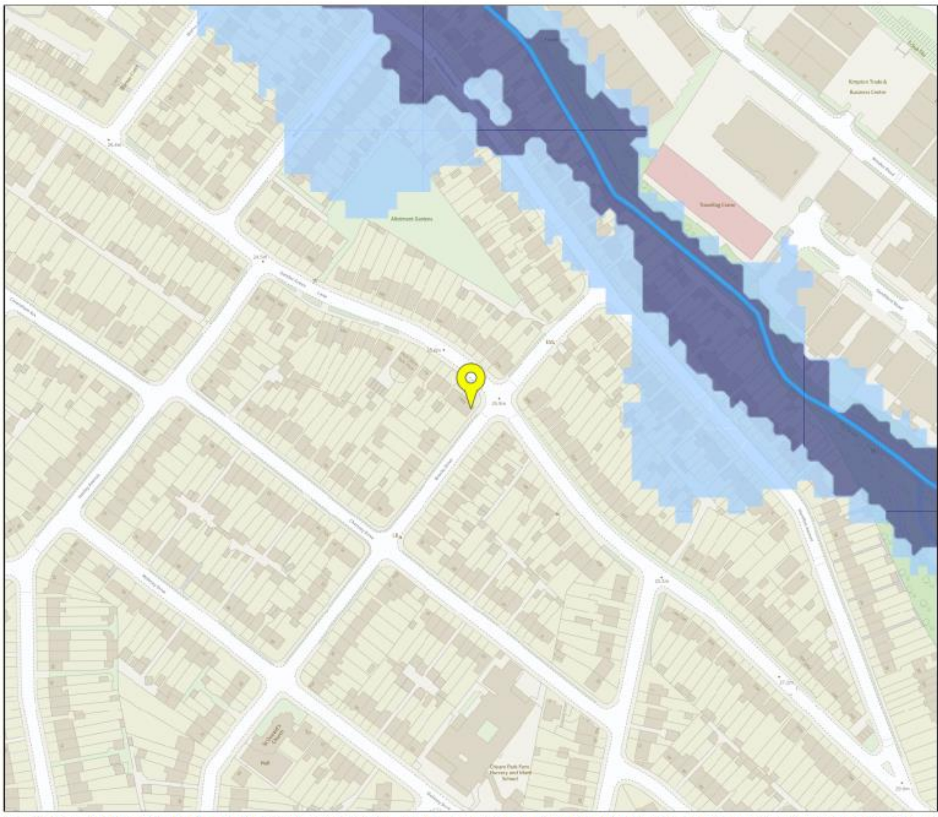
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
SM3 9RA

Location (easting/northing)
524371/165653

Scale
1:2500

Created
3 Apr 2022 17:17

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

Page 2 of 2

Appendix C Discharge Run-off Calculations

Print | Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Liska Environmental
Site name:	469 Gander Green Lane, North Cheam, SM3 9RA
Site location:	469 Gander Green Lane, North Cheam, SM3 9RA

Site Details

Latitude:	51.37628° N
Longitude:	0.2145° W
Reference:	3575247303
Date:	Apr 10 2022 18:22

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.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 50

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	638	638
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.

For catchments less than 50 Ha the greenfield runoff rate is obtained by factoring the calculated value by the catchment area.

Greenfield runoff rates

	Default	Edited		
Q_{BAR} (l/s):	81.75	81.75		0.06
1 in 1 year (l/s):	69.49	69.49		0.05
1 in 30 years (l/s):	188.03	188.03	X (0.038/50)	0.14
1 in 100 year (l/s):	260.79	260.79		0.20
1 in 200 years (l/s):	305.75	305.75		0.23

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)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
front main roof	0.002	5.00	8.400		0.700
rear main roof	0.002	5.00	8.400		0.700
annexe	0.004	5.00	8.400		0.700
front garden	0.007	5.00	8.400		0.700
rear garden	0.005	5.00	8.400		0.700
rear parking area	0.004	5.00	8.300		0.700
s1			8.300	1200	0.919
s2			8.300	1200	1.138
s3			8.200	450	1.106
out			8.200	1200	1.123

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	front main roof	s1	5.000	0.600	7.700	7.381	0.319	15.7	100	5.04	50.0
1.001	front garden	s1	5.000	0.600	7.700	7.381	0.319	15.7	100	5.04	50.0
1.002	s1	s2	9.300	0.600	7.381	7.162	0.219	42.5	100	5.17	50.0
2.000	rear main roof	s2	2.000	0.600	7.700	7.666	0.034	58.8	100	5.03	50.0
2.001	annexe	s2	11.200	0.600	7.700	7.682	0.018	622.2	100	5.62	50.0
2.002	rear garden	s2	3.000	0.600	7.700	7.615	0.085	35.3	100	5.04	50.0
3.001	rear parking area	s3	5.300	0.600	7.600	7.568	0.032	165.6	100	5.15	50.0
3.002	s2	s3	4.000	0.600	7.162	7.094	0.068	58.8	100	5.69	50.0
3.003	s3	out	1.000	0.600	7.094	7.077	0.017	58.8	100	5.70	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	1.961	15.4	0.4	0.600	0.819	0.002	0.0	11	0.798
1.001	1.961	15.4	1.3	0.600	0.819	0.007	0.0	20	1.199
1.002	1.186	9.3	1.7	0.819	1.038	0.009	0.0	29	0.908
2.000	1.006	7.9	0.4	0.600	0.534	0.002	0.0	15	0.518
2.001	0.301	2.4	0.8	0.600	0.518	0.004	0.0	39	0.267
2.002	1.302	10.2	0.9	0.600	0.585	0.005	0.0	21	0.814
3.001	0.595	4.7	0.8	0.600	0.532	0.004	0.0	27	0.433
3.002	1.006	7.9	3.8	1.038	1.006	0.020	0.0	49	0.996
3.003	1.006	7.9	4.6	1.006	1.023	0.024	0.0	54	1.040

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	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

60	120	180	240	360	480	600	720	960	1440

Return Period (years)	**Climate Change (CC %)**	**Additional Area (A %)**	**Additional Flow (Q %)**
1	0	0	0
30	0	0	0
100	0	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
60 minute summer	front main roof	34	7.708	0.008	0.2	0.0005	0.0000	OK
60 minute summer	rear main roof	35	7.711	0.011	0.2	0.0006	0.0000	OK
60 minute summer	annexe	33	7.728	0.028	0.4	0.0032	0.0000	OK
60 minute summer	front garden	33	7.714	0.014	0.6	0.0027	0.0000	OK
60 minute summer	rear garden	33	7.715	0.015	0.5	0.0022	0.0000	OK
60 minute summer	rear parking area	33	7.620	0.020	0.4	0.0023	0.0000	OK
60 minute summer	s1	34	7.401	0.020	0.8	0.0225	0.0000	OK
60 minute summer	s2	33	7.197	0.035	1.9	0.0395	0.0000	OK
60 minute summer	s3	33	7.137	0.043	2.2	0.0068	0.0000	OK
60 minute summer	out	33	7.113	0.036	2.2	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	front main roof	1.000	s1	0.2	0.314	0.013	0.0035	
60 minute summer	rear main roof	2.000	s2	0.2	0.422	0.025	0.0009	
60 minute summer	annexe	2.001	s2	0.4	0.260	0.155	0.0160	
60 minute summer	front garden	1.001	s1	0.6	0.742	0.039	0.0043	
60 minute summer	rear garden	2.002	s2	0.5	0.666	0.049	0.0022	
60 minute summer	rear parking area	3.001	s3	0.4	0.362	0.084	0.0057	
60 minute summer	s1	1.002	s2	0.8	0.495	0.086	0.0164	
60 minute summer	s2	3.002	s3	1.8	0.655	0.234	0.0113	
60 minute summer	s3	3.003	out	2.2	0.768	0.280	0.0029	2.2

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
60 minute summer	front main roof	34	7.711	0.011	0.4	0.0006	0.0000	OK
60 minute summer	rear main roof	34	7.716	0.016	0.4	0.0009	0.0000	OK
60 minute summer	annexe	33	7.743	0.043	0.9	0.0049	0.0000	OK
60 minute summer	front garden	33	7.721	0.021	1.5	0.0042	0.0000	OK
60 minute summer	rear garden	33	7.723	0.023	1.1	0.0033	0.0000	OK
60 minute summer	rear parking area	33	7.630	0.030	0.9	0.0034	0.0000	OK
60 minute summer	s1	33	7.412	0.031	1.9	0.0347	0.0000	OK
60 minute summer	s2	33	7.222	0.060	4.3	0.0681	0.0000	OK
60 minute summer	s3	33	7.167	0.073	5.1	0.0115	0.0000	OK
60 minute summer	out	33	7.136	0.059	5.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	front main roof	1.000	s1	0.4	0.354	0.026	0.0063	
60 minute summer	rear main roof	2.000	s2	0.4	0.518	0.051	0.0015	
60 minute summer	annexe	2.001	s2	0.9	0.343	0.370	0.0287	
60 minute summer	front garden	1.001	s1	1.5	0.935	0.097	0.0081	
60 minute summer	rear garden	2.002	s2	1.1	0.833	0.108	0.0040	
60 minute summer	rear parking area	3.001	s3	0.9	0.456	0.192	0.0104	
60 minute summer	s1	1.002	s2	1.9	0.561	0.204	0.0324	
60 minute summer	s2	3.002	s3	4.2	0.770	0.537	0.0220	
60 minute summer	s3	3.003	out	5.1	0.940	0.648	0.0054	5.5

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
60 minute summer	front main roof	33	7.714	0.014	0.6	0.0008	0.0000	OK
60 minute summer	rear main roof	33	7.719	0.019	0.6	0.0011	0.0000	OK
60 minute summer	annexe	34	7.748	0.048	1.1	0.0055	0.0000	OK
60 minute summer	front garden	33	7.724	0.024	2.0	0.0049	0.0000	OK
60 minute summer	rear garden	34	7.726	0.026	1.4	0.0037	0.0000	OK
60 minute summer	rear parking area	34	7.634	0.034	1.1	0.0038	0.0000	OK
60 minute summer	s1	33	7.417	0.036	2.6	0.0409	0.0000	OK
60 minute summer	s2	33	7.237	0.075	5.7	0.0847	0.0000	OK
60 minute summer	s3	33	7.184	0.090	6.8	0.0143	0.0000	OK
60 minute summer	out	33	7.148	0.071	6.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	front main roof	1.000	s1	0.6	0.396	0.039	0.0080	
60 minute summer	rear main roof	2.000	s2	0.6	0.580	0.076	0.0021	
60 minute summer	annexe	2.001	s2	1.1	0.369	0.464	0.0334	
60 minute summer	front garden	1.001	s1	2.0	1.010	0.130	0.0101	
60 minute summer	rear garden	2.002	s2	1.4	0.891	0.137	0.0047	
60 minute summer	rear parking area	3.001	s3	1.1	0.483	0.236	0.0121	
60 minute summer	s1	1.002	s2	2.6	0.583	0.279	0.0411	
60 minute summer	s2	3.002	s3	5.7	0.822	0.717	0.0274	
60 minute summer	s3	3.003	out	6.7	0.999	0.853	0.0067	7.3

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)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
front main roof	0.002	5.00	8.400		0.700
rear main roof	0.003	5.00	8.400		0.700
front new build roof	0.002	5.00	8.400		0.700
rear new build roof	0.004	5.00	8.400		0.700
front garden	0.003	5.00	8.400		0.700
rear garden	0.004	5.00	8.300		0.700
rear parking area	0.008	5.00	8.300	1200	0.700
s1			8.300	1200	0.919
s2			8.300	1200	1.138
s3			8.200	450	1.106
out			8.200	1200	1.123

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	front main roof	s1	5.000	0.600	7.700	7.381	0.319	15.7	100	5.04	50.0
1.001	front garden	s1	5.000	0.600	7.700	7.381	0.319	15.7	100	5.04	50.0
1.002	front new build roof	s1	3.000	0.600	7.700	7.649	0.051	58.8	100	5.05	50.0
1.003	s1	s2	9.300	0.600	7.381	7.162	0.219	42.5	100	5.18	50.0
2.000	rear main roof	s2	2.000	0.600	7.700	7.666	0.034	58.8	100	5.03	50.0
2.001	rear new build roof	s2	11.200	0.600	7.700	7.682	0.018	622.2	100	5.62	50.0
2.002	rear garden	s2	3.000	0.600	7.600	7.515	0.085	35.3	100	5.04	50.0
3.001	rear parking area	s3	5.300	0.600	7.600	7.568	0.032	165.6	100	5.15	50.0
3.002	s2	s3	4.000	0.600	7.162	7.094	0.068	58.8	100	5.69	50.0
3.003	s3	out	1.000	0.600	7.094	7.077	0.017	58.8	100	5.70	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	1.961	15.4	0.4	0.600	0.819	0.002	0.0	11	0.798
1.001	1.961	15.4	0.6	0.600	0.819	0.003	0.0	13	0.911
1.002	1.006	7.9	0.4	0.600	0.551	0.002	0.0	15	0.518
1.003	1.186	9.3	1.3	0.819	1.038	0.007	0.0	25	0.837
2.000	1.006	7.9	0.6	0.600	0.534	0.003	0.0	18	0.583
2.001	0.301	2.4	0.8	0.600	0.518	0.004	0.0	39	0.267
2.002	1.302	10.2	0.8	0.600	0.685	0.004	0.0	18	0.756
3.001	0.595	4.7	1.5	0.600	0.532	0.008	0.0	39	0.532
3.002	1.006	7.9	3.4	1.038	1.006	0.018	0.0	46	0.967
3.003	1.006	7.9	4.9	1.006	1.023	0.026	0.0	57	1.062

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	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

60	120	180	240	360	480	600	720	960	1440

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

Node out Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.06500	Invert Level (m)	7.077	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.06500	Time to half empty (mins)	421	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.000	Number Required	1
Porosity	0.95	Pit Length (m)	2.000		

Node rear garden Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.06500	Invert Level (m)	7.600	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.06500	Time to half empty (mins)	32	Depth (m)	0.200
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node front garden Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.06500	Invert Level (m)	7.700	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.06500	Time to half empty (mins)	0	Depth (m)	0.200
Safety Factor	2.0	Width (m)	3.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node rear parking area Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.06500	Invert Level (m)	7.600	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.06500	Time to half empty (mins)	32	Depth (m)	0.200
Safety Factor	2.0	Width (m)	8.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.500		

Results for 1 year Critical Storm Duration. Lowest mass balance: 94.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	front main roof	34	7.708	0.008	0.2	0.0005	0.0000	OK
60 minute summer	rear main roof	34	7.714	0.014	0.3	0.0012	0.0000	OK
60 minute summer	front new build roof	35	7.711	0.011	0.2	0.0006	0.0000	OK
60 minute summer	rear new build roof	33	7.728	0.028	0.4	0.0032	0.0000	OK
60 minute summer	front garden	34	7.709	0.009	0.3	0.0193	0.0000	OK
60 minute summer	rear garden	34	7.612	0.012	0.4	0.0435	0.0000	OK
60 minute summer	rear parking area	36	7.616	0.016	0.7	0.1816	0.0000	OK
60 minute summer	s1	34	7.399	0.018	0.6	0.0202	0.0000	OK
240 minute winter	s2	168	7.293	0.131	0.5	0.1479	0.0000	SURCHARGED
240 minute winter	s3	168	7.293	0.199	0.6	0.0316	0.0000	SURCHARGED
240 minute winter	out	168	7.293	0.216	0.6	1.4737	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	front main roof	1.000	s1	0.2	0.368	0.013	0.0031
60 minute summer	rear main roof	2.000	s2	0.3	0.476	0.038	0.0013
60 minute summer	front new build roof	1.002	s1	0.2	0.424	0.025	0.0014
60 minute summer	rear new build roof	2.001	s2	0.4	0.260	0.155	0.0160
60 minute summer	front garden	1.001	s1	0.2	0.595	0.016	0.0032
60 minute summer	front garden	Infiltration		0.0			
60 minute summer	rear garden	2.002	s2	0.3	0.571	0.029	0.0016
60 minute summer	rear garden	Infiltration		0.0			
60 minute summer	rear parking area	3.001	s3	0.3	0.320	0.055	0.0042
60 minute summer	rear parking area	Infiltration		0.2			
60 minute summer	s1	1.003	s2	0.6	0.446	0.069	0.0343
60 minute summer	s2	3.002	s3	1.6	0.563	0.203	0.0303
60 minute summer	s3	3.003	out	1.6	0.637	0.199	0.0078
240 minute winter	out	Infiltration		0.1			

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	front main roof	34	7.711	0.011	0.4	0.0006	0.0000	OK
60 minute summer	rear main roof	33	7.721	0.021	0.7	0.0018	0.0000	OK
60 minute summer	front new build roof	34	7.716	0.016	0.4	0.0009	0.0000	OK
60 minute summer	rear new build roof	33	7.743	0.043	0.9	0.0049	0.0000	OK
60 minute summer	front garden	33	7.713	0.013	0.7	0.0430	0.0000	OK
120 minute winter	rear garden	114	7.621	0.021	0.4	0.1007	0.0000	OK
60 minute summer	rear parking area	36	7.629	0.029	1.7	0.4950	0.0000	OK
120 minute winter	s1	114	7.621	0.240	0.7	0.2718	0.0000	SURCHARGED
120 minute winter	s2	114	7.621	0.459	1.7	0.5195	0.0000	SURCHARGED
120 minute winter	s3	114	7.621	0.527	1.8	0.0838	0.0000	SURCHARGED
120 minute winter	out	114	7.621	0.544	1.6	3.7170	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	front main roof	1.000	s1	0.4	0.426	0.026	0.0200
60 minute summer	rear main roof	2.000	s2	0.7	0.606	0.089	0.0023
60 minute summer	front new build roof	1.002	s1	0.4	0.521	0.051	0.0023
60 minute summer	rear new build roof	2.001	s2	0.9	0.343	0.370	0.0287
60 minute summer	front garden	1.001	s1	0.6	0.591	0.039	0.0201
60 minute summer	front garden	Infiltration		0.1			
60 minute summer	rear garden	2.002	s2	0.8	0.754	0.075	0.0050
120 minute winter	rear garden	Infiltration		0.1			
60 minute summer	rear parking area	3.001	s3	0.8	0.433	0.166	0.0095
60 minute summer	rear parking area	Infiltration		0.4			
60 minute summer	s1	1.003	s2	1.4	0.449	0.149	0.0728
60 minute summer	s2	3.002	s3	3.1	0.502	0.387	0.0313
60 minute summer	s3	3.003	out	3.3	0.755	0.416	0.0078
120 minute winter	out	Infiltration		0.1			

Results for 100 year Critical Storm Duration. Lowest mass balance: 94.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	front main roof	33	7.714	0.014	0.6	0.0008	0.0000	OK
60 minute summer	rear main roof	33	7.724	0.024	0.9	0.0020	0.0000	OK
60 minute summer	front new build roof	33	7.719	0.019	0.6	0.0011	0.0000	OK
60 minute summer	rear new build roof	34	7.748	0.048	1.1	0.0055	0.0000	OK
60 minute summer	front garden	33	7.715	0.015	0.9	0.0551	0.0000	OK
120 minute winter	rear garden	88	7.653	0.053	1.1	0.2920	0.0000	OK
120 minute winter	rear parking area	92	7.651	0.051	1.6	1.0878	0.0000	OK
120 minute winter	s1	88	7.653	0.272	0.9	0.3075	0.0000	SURCHARGED
120 minute winter	s2	88	7.653	0.491	2.2	0.5549	0.0000	SURCHARGED
120 minute winter	s3	92	7.652	0.558	2.4	0.0887	0.0000	SURCHARGED
120 minute winter	out	92	7.652	0.575	2.1	3.9278	0.0000	OK

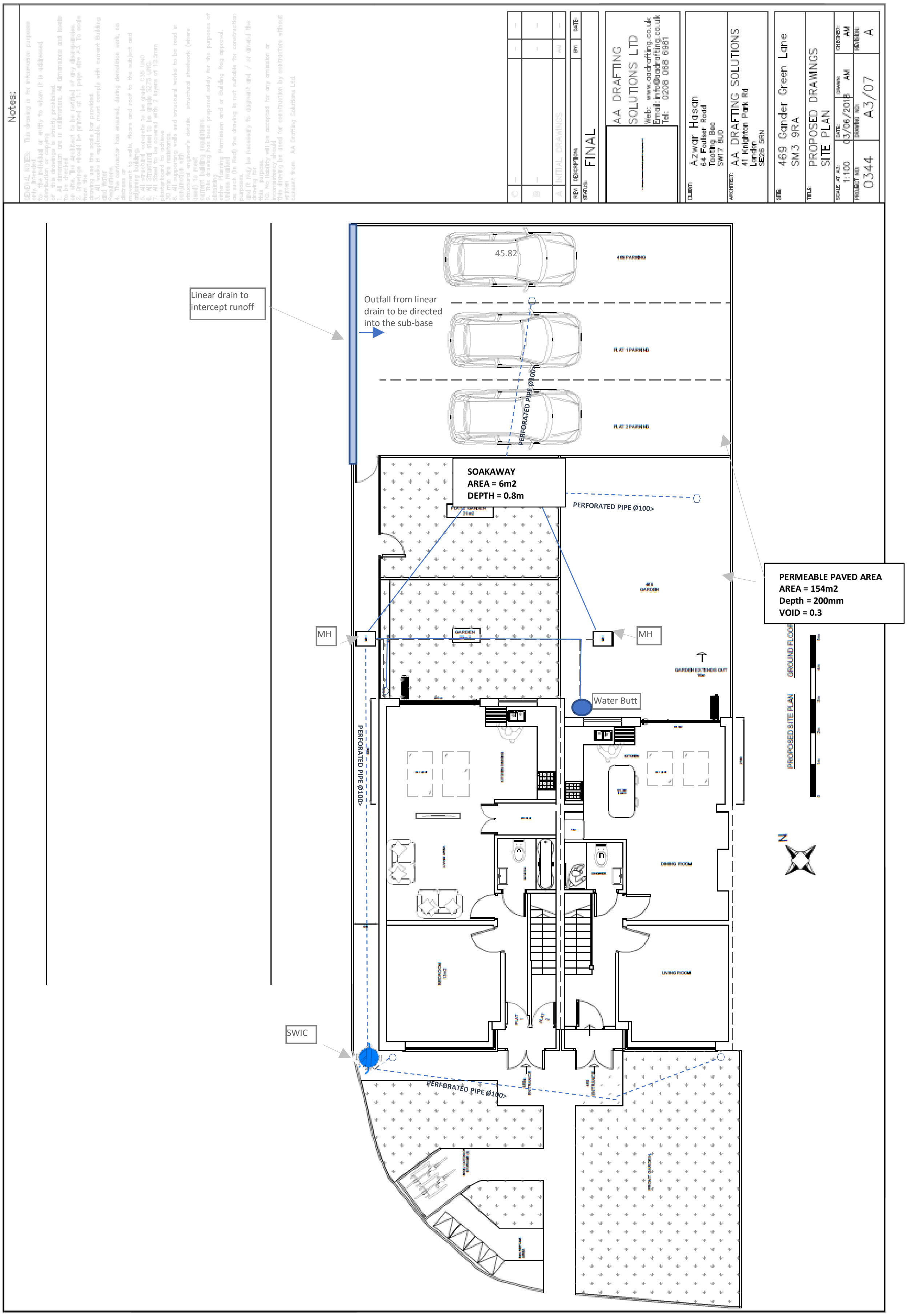
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	front main roof	1.000	s1	0.6	0.469	0.039	0.0208
60 minute summer	rear main roof	2.000	s2	0.9	0.650	0.114	0.0028
60 minute summer	front new build roof	1.002	s1	0.6	0.585	0.076	0.0031
60 minute summer	rear new build roof	2.001	s2	1.1	0.369	0.464	0.0334
60 minute summer	front garden	1.001	s1	0.8	0.580	0.050	0.0212
60 minute summer	front garden	Infiltration		0.1			
60 minute summer	rear garden	2.002	s2	1.0	0.813	0.098	0.0149
120 minute winter	rear garden	Infiltration		0.2			
60 minute summer	rear parking area	3.001	s3	1.1	0.474	0.233	0.0190
120 minute winter	rear parking area	Infiltration		0.8			
60 minute summer	s1	1.003	s2	1.9	0.432	0.205	0.0728
60 minute summer	s2	3.002	s3	4.0	0.516	0.511	0.0313
60 minute summer	s3	3.003	out	4.3	0.819	0.543	0.0078
120 minute winter	out	Infiltration		0.1			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	front main roof	96	7.724	0.024	0.4	0.0014	0.0000	OK
60 minute summer	rear main roof	33	7.728	0.028	1.2	0.0024	0.0000	OK
120 minute winter	front new build roof	92	7.723	0.023	0.4	0.0013	0.0000	OK
60 minute summer	rear new build roof	33	7.758	0.058	1.6	0.0066	0.0000	OK
120 minute winter	front garden	92	7.720	0.020	0.6	0.0926	0.0000	OK
120 minute winter	rear garden	96	7.720	0.120	1.5	0.7043	0.0000	SURCHARGED
120 minute winter	rear parking area	94	7.719	0.119	3.2	2.9006	0.0000	SURCHARGED
120 minute winter	s1	94	7.720	0.339	1.3	0.3837	0.0000	SURCHARGED
120 minute winter	s2	92	7.721	0.559	2.9	0.6321	0.0000	SURCHARGED
120 minute winter	s3	92	7.719	0.625	3.4	0.0994	0.0000	SURCHARGED
120 minute winter	out	96	7.719	0.642	2.8	4.3878	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
60 minute summer	front main roof	1.000	s1	0.8	0.497	0.052	0.0215
60 minute summer	rear main roof	2.000	s2	1.2	0.703	0.152	0.0034
60 minute summer	front new build roof	1.002	s1	0.8	0.635	0.101	0.0043
60 minute summer	rear new build roof	2.001	s2	1.6	0.414	0.670	0.0429
60 minute summer	front garden	1.001	s1	1.1	0.554	0.069	0.0219
120 minute winter	front garden	Infiltration		0.1			
60 minute summer	rear garden	2.002	s2	1.5	0.901	0.147	0.0221
120 minute winter	rear garden	Infiltration		0.2			
60 minute winter	rear parking area	3.001	s3	-2.2	0.509	-0.480	0.0415
120 minute winter	rear parking area	Infiltration		0.8			
60 minute summer	s1	1.003	s2	2.0	0.428	0.219	0.0728
60 minute summer	s2	3.002	s3	4.8	0.610	0.604	0.0313
60 minute summer	s3	3.003	out	5.5	0.847	0.696	0.0078
120 minute winter	out	Infiltration		0.1			

Appendix D Proposed Drainage Layout



Notes:
AA DRAFTING SOLUTIONS LTD
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Azwar Hasan
64 Foulser Road
Tooting Bec
SW17 8UD
AA DRAFTING SOLUTIONS
469 Gander Green Lane
SM3 9RA
PROPOSED DRAWINGS
SITE PLAN
1:100
03/06/2018
AM
0344
A3/07
A
Linear drain to intercept runoff
Outfall from linear drain to be directed into the sub-base
45.82
PERFORATED PIPE Ø100
SOAKAWAY
AREA = 6m2
DEPTH = 0.8m
PERFORATED PIPE Ø100>
PERMEABLE PAVED AREA
AREA = 154m2
Depth = 200mm
VOID = 0.3
MH
MH
Water Butt
PERFORATED PIPE Ø100>
SWIC
PERFORATED PIPE Ø100>
DINING ROOM
LIVING ROOM
N

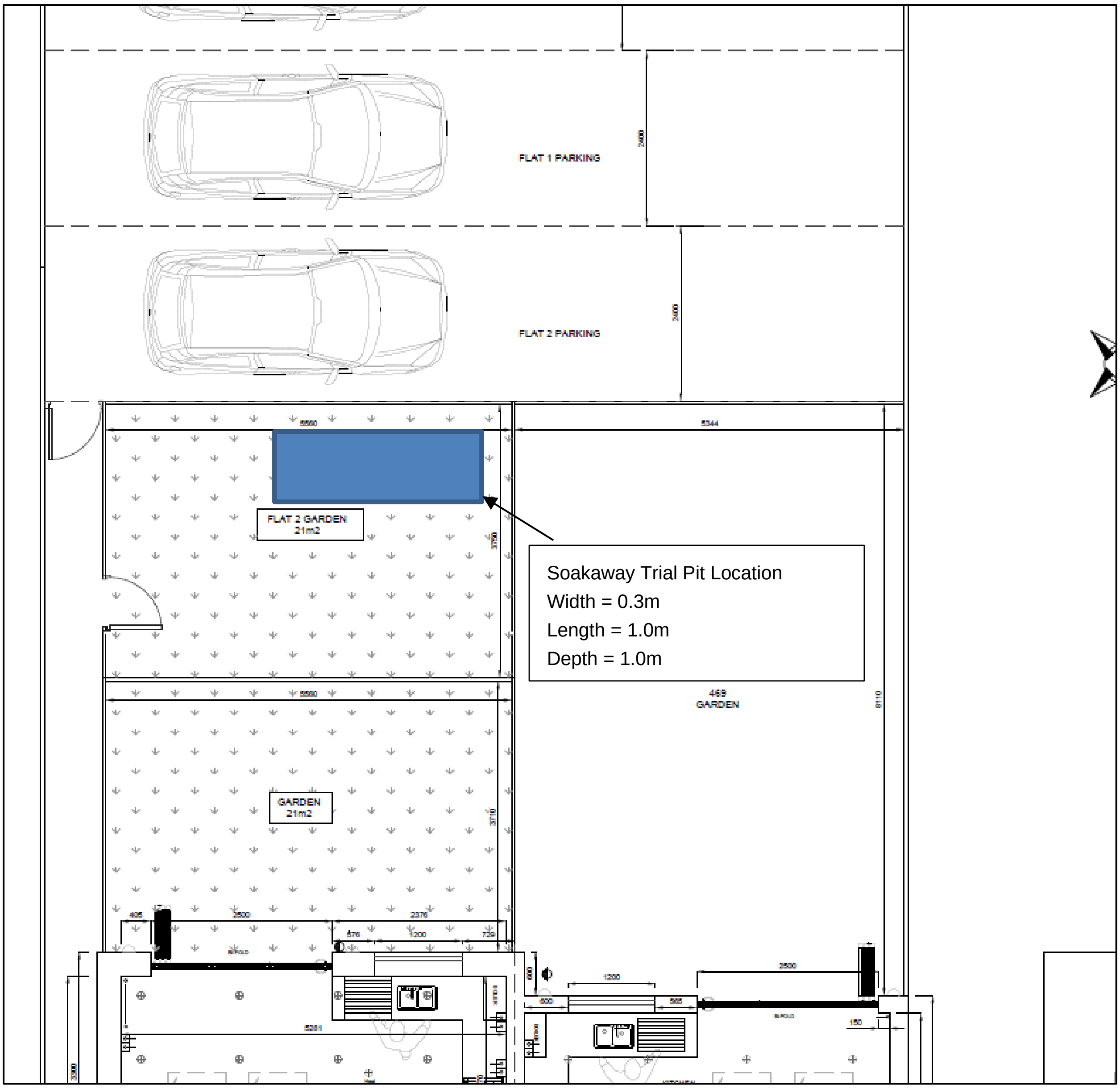
Appendix E SuDS Maintenance Plan

Soakaway Maintenance Schedule
Inspections & Monitoring (Every 6 Months)
Inspection of Soakaway Structures
Inspection of Inlets & Outlets
Monitoring of Performance after Heavy Rain
Inspection for Tree Roots
Inspection of Sediment Interception Methods
Inspection of Catchment for Erosion
Inspection of Surface for Settlement
Inspection for Signs of Pollution
Regular Maintenance (Every 3 Months)
Removal of Litter & Debris (Soakaway)
Removal of Litter & Debris (Sediment Interception Methods)
Sweeping of Paved Surfaces
Cleaning of Roof Gutters
Occasional Maintenance (Every 12 Months)
Removal of Tree Roots
Tree/Shrub Management
Sediment Removal (Soakaway)
Sediment Removal (Sediment Interception Methods)
Cleaning of Inlets & Outlets
Cleaning of Pipework
Remedial Maintenance (When Required)
Full Structure Rehabilitation
Infiltration Surface Reconditioning

Water Butt Maintenance Schedule			
Maintenance schedule	**Requirement**	**Frequency**	**Responsibility**
Regular maintenance	Clearing of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters and other debris	Annual (or following poor performance)	Landowner
Occasional maintenance	Replacement of any filters	As required	Landowner
Remedial actions	Repair any erosion damage, or damage to tank	As required	Landowner
Monitoring	Inspection of tank for debris and sediment build up	Annual (or following poor performance)	Landowner
	Inspection of inlets, outlets and withdrawal devices	Annual (or following poor performance)	Landowner
	Inspection of areas receiving overflow, for evidence of erosion	After extreme storms	Landowner
	Inspection of roof drain filters	Annual (or following poor performance)	Landowner

Permeable Pavements Maintenance Schedule		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturer's recommendations.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds and management of any weeds in the pavement or adjacent.	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the pavement.	As required
	Rehabilitation of surface and upper structure by remedial sweeping, or by removing top asphalt layer and rolling new asphalt	Every 10 to 15 years or as required (if infiltration performance reduced due to significant clogging)
Monitoring	Initial Inspection	Monthly for three month after installation
	Inspect for evidence of poor operation and/or weed growth – take remedial action if required.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

Appendix F BRE 365 Soakaway Test




1.00 M


1.00 M


0.75 M
0.50 M

BRE Digest 365 Soakaway Test		Job No:	LE2022135
		Site:	469 Gander Green Lane
Prepared By:	ZY	Date:	27/04/2022

Trial Pit DATA	
soakaway trial pit width 'W' [m] =	0.30
soakaway trial pit length 'L' [m] =	1.00
soakaway trial pit Depth 'D' [m] =	1.00

Volume outflowing between 75% and 25%

Vp75-25= 0.15 m3

Mean surface area through which outflow occurs

Ap50= 1.6 m2

The time taken in minutes for the water level to fall to 25% and 75% full

Test number	75%	25%	25%-75%
1	32	96	64
2	38	108	70
3	46	132	86

Soil Infiltration rate (worst scenario) = 1.82E-05 m/s

or **0.065 m/hr**