FLOOD RISK ASSESSMENT
(focus on residual surface water flood risk)

Compliant with Camden “Basements Planning Policy” & SUDS Guidance

Basement under footprint / impermeable areas, extensions & Internal alterations

No increase in impermeable areas (evidence provided)

Increase in permeable areas

- Site remains as one dwelling
- No change to site operations or sensitivity
- All site users have access to upper levels for lifetime of the development
- Commensurate SUDS incorporated

at:

59 Solent Road, West Hampstead, NW6 1TY

12 December 2016

ARK Environmental Consultancy Ltd

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If this report has been released electronically, the appendices referred to herein can be found in the annexed zip folder/s as .pdf or .dwg files. If this report has been released in hard copy the appendices will be bound into the back of this report. Plans may be annexed separately as A1 or A0 copies where a bound-in A3 copy is not appropriate.

1.0 Scope

This report contains the details of a Flood Risk Assessment carried out by Ark Environmental Consulting Limited ("ARK Ltd") for 59 Solent Road, West Hampstead, NW6 1TY, henceforth referred to as "the site" in this report.

This report has been prepared for Mahesh Varia and must not be relied upon by any other party without the explicit written permission of ARK Ltd.

All parties to this report do not intend any of the terms of the Contracts (Right of Third Parties Act 1999) to apply to this report.

Please note this report does not purport to provide definitive legal advice nor can it be used to demonstrate that the site will never flood in the future.

The Executive Summary contains an overview of key findings and conclusions. However, no reliance should be placed on the Executive Summary until the whole of the report has been read.

Other sections of the report may contain information which puts into context the findings noted within the Executive Summary.

2.0 Executive Summary

This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF) and PPG 2015. It is to be used to assist the Local Planning Authority (LPA) and Environment Agency (EA) when considering the flooding issues of the proposed development as part of a planning application.

The proposed development comprises a basement room under existing footprint & impermeable areas with extensions over existing impermeable areas; no increase in impermeable areas.

REDUCES FLOOD RISK OVERALL: 10% INCREASE IN PERMEABLE AREAS

Site remains as one dwelling; no change to site operations or sensitivity; all site users have access to upper levels for lifetime of the development. Minimal SUDS and flood protection measures could still incorporated as appropriate.

This is categorized as a "More Vulnerable" in FZ1: in accordance with the NPPF/PPG classifications the Exception Test does not need to be passed. The main source of flooding is potential surface water flooding.

There are no significant sources of flooding; site no inundated even in Camden 1in1000year extreme event. Site is in NO hazard area.

No change to operation / sensitivity at the site.

Given the residual risk flood setting, the level, extent and depth of flooding on the site can be managed in terms of resilient measures and precautionary mitigation measures.

Based on the likely flooding risk and small scale of the proposed development (extension of existing), it is considered that the proposed development can be constructed and continue to be operated safely in flood risk terms, without increasing flood risk elsewhere; it is therefore considered appropriate development in accordance with the NPPF / PPG 2015.

3.0 Introduction

The site boundary is provided in the location plan in Appendix A.

The FRA combined a desktop study, review of available information, consultations and an assessment of all sources of flooding posed to and from the site and proposed development, in accordance with National Planning Policy Framework (NPPF). Appropriate flood mitigation measures were then considered, either as already incorporated within the scheme or recommended for inclusion at detailed design stage. The suitability of the proposed development was also reviewed in the context of the NPPF and the technical guidance accompanying the NPPF.

4.0 Purpose of the Report

This FRA has been carried out in accordance with National Planning Policy Framework (NPPF). It is to be used to assist the Local Planning Authority (LPA) and Environment Agency (EA) when considering the flooding issues of the proposed development as part of a planning application.

The report provides the following information:

- An assessment of the flood risk posed to the site based on flood information and mapping provide by the EA and Strategic Flood Risk Assessment (SFRA);
- An assessment of the proposed development in terms of surface water run-off; and
- Proposals for measures to mitigate the flood risks posed to and from the development where appropriate.

5.0 Report Information Sources

The information source used to undertake this FRA has been collected from the following sources:

- British Geological Survey Website & iGeology App
- EA Website
- Camden Hydrological and Geological Study: ARUP
- Camden SFRA – with 2014 mapping update
- Camden Flood Risk Management Plan (2013)
- Camden SUDS Guidance
- Internet mapping and searches

6.0 Consultation

The EA / council have been consulted as appropriate to confirm data availability.

7.0 Overview of British Legislation

7.1 National Planning Policy

Note: when this report references NPPF this also covers NPPG 2015

The National Planning Policy Framework (NPPF) and PPG 2015 supercede all Planning Policy Statements (PPS's) and remaining Planning Policy Guidance (PPG's). Flood risk is retained as a key development consideration and is incorporated within Section 10: "Meeting the challenge of climate change, flooding and coastal change":

> "Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

The Sequential and Exception Tests are retained as part of the NPPF. The accompanying NPP Technical Guidance also includes Tables 2 and 3 to assist with flood risk vulnerability classifications and development suitability.

7.2 Local Policy

Camden and The London Plan (as amended) consider flood risk through relevant environmental and climate change policies which enforce the requirements of the NPPF.

The Strategic Flood Risk Assessment (SFRA) and Surface Water Management Plan (SWMP) for Camden are key sources of flood risk specific information for the area. The SFRA/SWMP provide more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF. Greater detail is provided in the report.

8.0 Site Status and Environmental Setting

8.1 Site Location and Status

The site is c. 0.06 hectares and located > 6km to the north of the River Thames. The site location & existing floor plans can be seen in Appendix A.

Expected Geology based on example investigations: "underlying the Made Ground, London Clay comprising stiff to very stiff brown grey silty CLAY with rare calcareous nodules and fine sand partings."

8.2 Current Site Description

The following description is based on information made available from architects plans, internet mapping and aerial photography. The site is currently occupied by an existing residential dwelling ground floor to 1st floor), hardstanding front garden area, hardstanding patio to rear and soft landscaped remaining rear garden.

8.3 Existing Flood Risk

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site is in Flood Zone FZ1 Low Risk	Proposed development is to an existing property to remain a single dwelling Best practice to manage risks during construction / de-watering if necessary but founding in the London Clay
Groundwater	Refer to Basement Impact Study	The basement extension can be engineered / waterproofed appropriately Low Risk

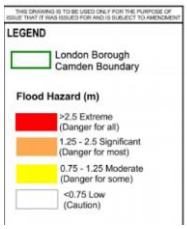
	Site specific window sampling and monitoring confirmed Made ground over London Clay and no groundwater was detected	
Artificial Sources	No artificial sources within 250m	Low Risk
Surface Water / Sewer Flooding	Site is located in surface water risk zone Within general London Critical Drainage Area At potential risk of future surface water flooding Condition, depth and location of surrounding infrastructure uncertain	NO INCREASE IN IMPERMEABLE AREAS: hence no impact but scheme can include betterment of increasing permeable areas as an appropriate response commensurate with the scale and sensitivity of the scheme If required: external landscaping mitigation to encourage floodwaters away from access /egress points & flood gates Development will utilise existing connection to sewers, gravity drainage and non-return valves Development will not increase the peak flow or volume of discharge from the site: Low Risk No further drainage assessment required
Climate Change	Included in the flood modelling extents Site not within climate change flood extent area	Development will not significantly increase the peak flow and volume of discharge from the site Low risk posed to and from the development

8.4b SFRA, Surface Water Modelled Depth & Hazard

- 2014 updated mapping: site is within Group3_005 Critical Drainage Area
- Site not within a Camden Local Flood Risk Zone
- Figure 3 v from the SFRA & also Figure 5 from Core Strategy: Solent Road was
    - not within 2002 historic surface flood
    - not within 1975 historic flood
    - regardless highway is a preferential pathway

Figure 3 ix from the SFRA 1in1000year extreme event surface water flooding – see extract below

- Floodwaters not likely to reach the property in question:
    - Site not in flood hazard area



Design Response:

- **NO INCREASE IN IMPERMEABLE AREAS**
- **REDUCE FLOOD RISK OVERALL**: Increase in permeable areas
- Fully waterproof (new basement & existing lower ground structures to be tied in appropriately)
- Light wells to have proprietary 'Flood boards' to seal against flooding
- Basement to have concrete render not plaster
- No change to existing site operations
- Non-return valves
- Cavity with sump pump as per Building Regs

9.0 Assessment of Proposed Development

9.1 Proposed Development

The proposed development can be seen in Appendix B.

The proposed scheme comprises:

- New basement under:
    - existing footprint and impermeable areas
- Extensions over existing impermeable areas (eg: lightwell areas)
- REDUCES FLOOD RISK OVERALL:
    - Increase in permeable areas on the site

This meets Camden basement planning policy as no increase in impermeable areas.

- Internal changes
- However, London Plan suggests some form of SUDS still required for no increase in impermeable areas in line with the options provided by the SUDS toolkit;
- NOT REQUIRED BUT: Options which can be secured as a condition given it is part of detailed design:
    - Either increase in SUDS storage with granular trench in rear garden for storage
    - OR: rainwater harvesting tank
    - No other SUDS required given the scale and nature of the scheme (no significant roof changes) and constrained nature of the site

Given the flood hazard setting and re-use of existing house, raised floor levels are not considered necessary.

Potential Precautionary Additional Mitigation (not necessary given LOW hazard and scheme):

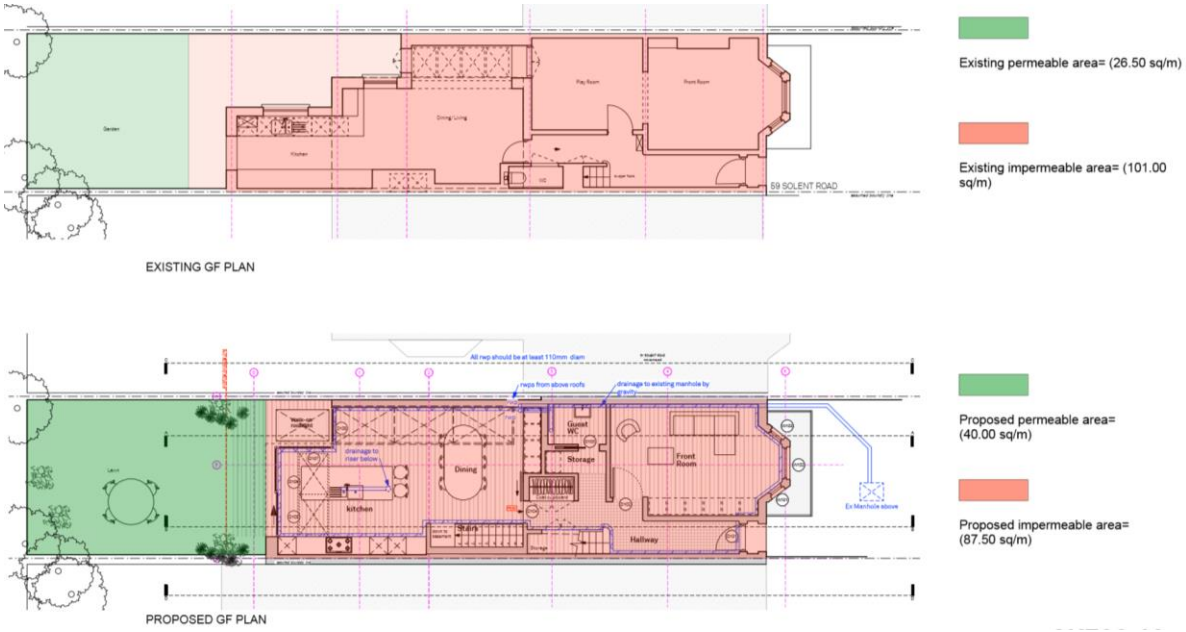
- Waterproofed door frames / floodgates at ground and lower ground access points

These are considered precautionary and not necessary given the residual risk.

Evidence of No Increase in Impermeable Areas:

REDUCES FLOOD RISK OVERALL: 10% INCREASE IN PERMEABLE AREAS

Element:	Existing (m2)	Proposed (m2)
Impermeable (hardstanding - building footprint, concrete areas, basement with less than 1m cover)	101.00	87.5
Potentially permeable, if proposed basement extending outside ground footprint is involved: Where either existing or proposed Permeable / porous area is above a basement structure, it can be classed as truly Permeable if there is at least 1m depth of soil above the basement structure	n/a	n/a
Permeable (softscaping - grassed areas, (including green roof), permeable and porous paving)	26.50	40.0
Total (should be the site area and remain the same)	127.5	127.5



Drainage

The existing connections will be retained; non-return valves for the basement can be utilized as standard.

SUDS

Given the scheme is defined by majority of the footprint of the existing building (i.e. constrained), existing impermeable areas and the scheme will not increase impermeable

areas and is a basement extension with majority internal changes, no further SUDS appraisal is considered necessary.

The following flood resilient measures are to be incorporated as appropriate:

9.2 Flood Resilience

The proposed development will utilize the flood resilient techniques recommended in the NPPF Technical Guidance where appropriate and also the recommendations that have previously been issued by various councils.

The scheme is a new basement but the likely flood resilient measures, where new elements are required, could include (modern building techniques):

- Basement to be fully waterproofed (tanked) and waterproofing to be tied in to the existing ground floor slab as appropriate; details to be provided at detailed design to building regulations requirements
- Fully waterproofed lightwells as per industry standard
- Non return valves on all new units at ground and lower as appropriate
- Waterproofing to be installed to 500mm above ground level as appropriate
- Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event
- Basement linings to be concrete render rather than plaster
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property
- Any wood fixings on ground / lower ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event
- The Damp Proof Membrane and lower ground waterproofing will be installed above the main floor slab and tied in to the walls where appropriate, to reduce the turnaround time for returning the property to full operation after a flood event.
- As necessary: the concrete sub floor will likely be laid to fall to drains or gullies which will remove any build-up of ground water to a sump pump where it will be pumped into the mains sewer. This pump will be fitted with a non-return valve to prevent water backing up into the property should the mains sewer become full
- Insulation to the external walls will be specified as rigid board which has impermeable foil facings that are resistant to the passage of water vapour and double the thermal resistance of the cavity

9.3 Refuge and Evacuation

Based on the likely flood risk and associated warning time, evacuation is usually preferred and feasible at this site, floodwaters are also not likely to enter the building; refuge is a preferred flood response for the dwelling.

Range of Flood Events

The site is suitably outside of the flood extent in the unlikely event of a breach in the defences. The evacuation and flood management does not need to consider this fastest type of flood inundation.

The site is also in a low Camden surface water flood risk area.

Surface water flooding is unlikely to be of a long duration.

It is therefore considered likely that there would be sufficient time to seek refuge and/or evacuate to an area outside of the surface water flooding.

Preliminary Evacuation / Refuge Plan

Range of Flood Events

The site is within the residual surface water flood risk area; it is therefore considered that:

a) Evacuation is usually the preferred response and is feasible at this site with observations of flooding to the west

b) Refuge for all site users to at least ground level is the correct emergency strategy for all flood warning types

Floodwaters are not likely to reach the entrances given the highway is a preferential pathway; regardless, floodwaters are not likely to reach the site even in the 1in1000year; floodproofed basement means floodwaters are to be encouraged away from entering the building.

9.4 Flood Response Management

Flood Safety Pack

Occupants should ensure a flood safety evacuation pack is kept in a safe and easily accessible place. This should include as a minimum:

- First aid kit
- Torch
- Warm clothing or blanket
- List of appropriate contact numbers
- Bottled water
- Waterproofs / Wellington boots
- Non-perishable food

9.5 Annual Monitoring

Occupiers should contact the EA on an annual basis to confirm the flood status of the property.

If the flood status has changed, the evacuation and refuge plan should be reviewed and updated by suitable flood risk consultants as appropriate.

9.6 Surface Water Runoff – Flood Risk from the Development

In accordance with the NPPF, this FRA also considers the risks posed from the development to surrounding areas.

Given there will be no increase in impermeable areas it is considered there will be no increase in discharge from the site; the proposed development will also continue to use existing connections to the adjacent existing sewers.

The proposals will incorporate new low-water demand devices where necessary and such that there is not likely to be an increase in peak flows or volume of flows.

Given the small scale of the proposed development it is considered likely that the development will have no effect on surrounding infrastructure. There will not be any significant increase in overland flow from the site.

9.7 Climate Change: including new allowances (Feb 2016)

The impact of climate change in accordance with the NPPF is likely to be an increase in the rainfall intensity in the future, which will increase peak storm flows to sewer. The proposed development will incorporate low flush and reduced water demand showers and toilets, such that the combined flows to sewer are likely to have a negligible impact. It is considered therefore that flows in the future are not likely to have a significant impact, even with an allowance for climate change.

The EA modelling includes an accommodation for climate change.

The Camden hazard mapping suggests the site is not inundated even in the 1in1000year extreme event which is an appropriate indication for this site to address climate change.

The scheme offers a betterment by reducing flood risk overall by increasing permeable areas on the site.

There is unlikely to be an unacceptable impact on the receiving sewers owing to the small scale of the development and no increase in impermeable areas.

Confirmation from Thames Water should be sought as appropriate.

9.8 Flood Risk Vulnerability

The site and surroundings are already in residential use. The proposal is to keep the site as residential use.

According to the NPPF & PPG 2015 retained Flood Risk Vulnerability Classification the existing and proposed dwelling would be classed as “More Vulnerable”.

The NPPF & PPG 2015 also retained Flood Risk Vulnerability and Flood Zone “Compatibility” Classification; this states that a “More Vulnerable” development in Flood Zone 1 is appropriate and does not require the Exception Test (retained by NPPF) to be passed.

Based on the data reviewed to date, the flood risk assessment recommends the extensions could be constructed and continue to be operated safely in flood risk terms, without increasing flood risk elsewhere.

10.0 Conclusion

The site is considered to be generally at a low risk from all sources of flooding except the potential residual surface water risk; the EA website map and SFRA indicate the site is in Flood Zone 1.

The proposed development is categorised as “More Vulnerable” in accordance with the NPPF & PPG 2015; it is therefore an appropriate type of development within Flood Zone 1. Suitable mitigation measures can be incorporated.

All site users have access to appropriate safe refuge at upper levels for the lifetime of the development.

The proposed scheme can incorporate suitable flood resilient measures and flood exclusion precautionary mitigation measures if considered necessary.

No specific SUDS are required as there is to be no increase in impermeable areas; rainwater harvesting (though not a SUDS measure) could also be incorporated regardless.

Based on the likely flooding risk, it is considered that the proposed development can be constructed and operated safely in flood risk terms, without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF/PPG 2015.

10.1 Recommendations for Further Work

1. Produce a House Flood Evacuation Plan if deemed necessary
2. Waterproofing and flood proofing details for basement to be confirmed

11.0 Appendices

A. Site Location & Existing Plans
B. Proposed Development Plans

Appendices A & B