

Code for Sustainable Homes (CSH) Sur2 Report

SUR2 FLOOD RISK ASSESSMENT

SCHOOL APPROACH, FREDORA AVENUE, HAYES

UB4 8RH

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A Perkins
Median Properties

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Executive Summary

River Thames Flood Risk Consultants has been commissioned by Mr A. Perkins to prepare this Flood Risk Assessment (FRA) in accordance with the requirements of SUR 2 of the Code for Sustainable Homes, in support of a proposed residential development at School Approach, Fredora Avenue, Hayes UB4 8RH. The proposal involves construction of a one-bedroom dwelling house with a direct access from School Approach.

The entire site lies within Flood Zone 1 as described in Table 1 of the Planning Practice Guidance to the National Planning Policy Framework, with annual probability of fluvial flooding less than 0.1% AEP (1 in 1000 year).

The main source of information to undertake flood risk assessment is the flood maps and data of the Environment Agency. The proposed site had never been flooded in the history. The flood risk map indicated that the risk of fluvial flooding is low. The surface water flood map indicates that there is a low risk of flooding to the site. In addition, there is a low risk of flooding from other sources including groundwater, sewer and reservoir.

The site will not require any flood mitigation measures in principle; however, it may be benefited from surface water management through the adoption of Sustainable Drainage System (SUDS). An underground rainwater harvesting tank has been proposed as part of the development.

This report demonstrates that the proposed residential development will be safe, in terms of flood risk, for its design life and will not impose any flood risk elsewhere. The development can obtain the two credits available in SUR 2 (Flood Risk), as it is situated in Flood Zone 1 and the site specific FRA has suggested that there is low risk of flooding from all sources.

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Abbreviations

Abbreviation	Definition
AOD	Above Ordnance Datum
DEFRA	Department for Environment, Food, and Rural Affairs
EA	Environment Agency
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
PFRA	Preliminary Flood Risk Assessment
SuDS	Sustainable Drainage Systems

1.0 Introduction

1.1. Terms of Reference

River Thames Flood Risk Consultants has been commissioned by Mr A. Perkins to prepare this Flood Risk Assessment (FRA) in accordance with the requirements of SUR 2 of the Code for Sustainable Homes, in support of a proposed residential development at School Approach, Fredora Avenue, Hayes UB4 8RH. The proposal involves construction of a one-bedroom bungalow house with a direct access from School Approach.

This report addresses the required issues regarding the acquisition of the 2 available credits, as described in SUR 2 (Code for Sustainable Homes) for the development site.

1.2. Aim

SUR 2 refers to the evaluation of the flood risk. Its aim is to promote housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding. Two credits are available for developments situated in Zone 1 – low annual probability of flooding (as defined in PPS25 Development and Flood Risk) and where the site-specific Flood Risk Assessment (FRA) indicates there is low risk of flooding from all sources.

1.3. FRA Requirements

It is a requirement for development applications to consider the potential risk of flooding to a proposed development over its expected lifetime and any possible impacts on flood risk elsewhere, in terms of its effects on flood flows and runoff.

Where appropriate, the following aspects of flood risk should be addressed in all planning applications in flood risk areas:

- The area liable to flooding.
- The probability of flooding occurring now and over time.
- The extent and standard of existing flood defences and their effectiveness over time.
- The likely depth of flooding.
- The rates of flow likely to be involved.
- The likelihood of impacts to other areas, properties and habitats.
- The effects of climate change.
- The nature and currently expected lifetime of the development proposed and the extent to which it is designed to deal with flood risk.

This FRA follows government guidance on development and flood risk (National Planning Policy Framework).

1.4. Site Details

Figure 1 - Summary of site details

Site name	School Approach, Fredora Avenue, Hayes UB4 8RH
Site area	Approximately 124m ²
Existing land-use	Garages and hardstanding
Purpose of development	New build 1-bedroom bungalow with parking and amenity
Nearest water body	Yeading Brook
OS NGR	509952,182102
Country	England (NPPF applies)
Local planning authority	London Borough of Hillingdon
Other authorities	Environment Agency Hertfordshire and North London



1.5. Site Description

The proposed site is the existing land at School Approach, Fredora Avenue, Hayes UB4 8RH. The total area of the site is approximately 124m². The vehicular and pedestrian access to the site is provided from School Approach. The site is currently being utilised as garage.

1.6. Development Proposals

The proposal involves construction of a one-bedroom bungalow house with a building footprint of approximately 53m². The access to the property is to be provided from School Approach. The development will comprise parking space and an underground rainwater harvesting tank. Approximately 40m² of the site will be utilised as amenity space. Details on the proposal have been provided in Appendix A.

2.0 Development and Flood Risk Policy

2.1. Planning Context

2.1.1. Applicable Planning Policy

National Planning Policy Framework (NPPF) was issued by the Department for Communities and Local Government in March 2012. NPPF deals specifically with development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map. The main study requirement is to identify the Flood Zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

2.1.2. Flood Zones

The Environment Agency has developed a Flood Map that shows the risk of flooding in England and Wales for different return period events. It should be noted that the Environment Agency's Flood Map is based on broad scale hydraulic modelling and is an indication of the potential flood risk to a site and the actual risk may differ. The Flood Zone Maps (without climate change) provide the information required by NPPF for planning purposes, as described in Section 3.2. The Flood Zones do not take account of the effect of flood defences.

2.1.3. Sequential and Exception Tests

The Sequential and Exception Tests should be applied when choosing the location of new development and the layout of the development site. The Sequential Test aims to promote development in areas with low flood risk. The Exception Test is used where no suitable development areas can be found in low risk areas, the risk of flooding is clearly outweighed by other sustainability factors, and the development will be safe for its lifetime, taking climate change into account.

As the development site is located within flood zone 1, there will be no requirement for the sequential test.

2.1.4. Exception Test

The proposal does not need the Exception Test as it is located in Flood Zone 1. Still it is a good practice to ensure that the development meets the requirements of part (2) of the Exception Test:

'A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall'.

This FRA aims to demonstrate that the development will remain safe for its lifetime and not increase flood risk elsewhere.

2.2. NPPF Flood Zones

Table 1 shows how the Flood Zones relate to a sequential planning process.

Table 1 - NPPF Flood Zones and Requirements

Zone 1: Low Probability	
Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	Appropriate uses All uses of land are appropriate in this zone. FRA requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. Policy aims Developers and local authorities should seek opportunities to reduce the overall level of flood risk through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 2: Medium Probability	
Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.	Appropriate uses The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 2-2 are appropriate in this zone. Highly vulnerable uses in Table 2-2 are only appropriate in this zone if the Exception Test is passed. FRA requirements All proposals in this zone should be accompanied by a FRA. Policy aims Developers and local authorities should seek opportunities to reduce the overall level of flood risk through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a: High Probability	
Land assessed as having a 1 in 100 or greater annual probability of river flooding (<1%) or a 1 in 200 or greater	Appropriate uses The water-compatible and less vulnerable uses of land in Table 2-2 are appropriate in this zone. The highly vulnerable uses (Table 2-2) should not be permitted in

annual probability of flooding from the sea (>0.5%) in any year.	this zone. The more vulnerable and essential infrastructure uses in Table 2-2 should only be permitted in this zone if the Exception Test is passed. FRA requirements All proposals in this zone should be accompanied by a FRA. Policy aims Developers and local authorities should seek opportunities to: • reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land with a lower probability of flooding; • create space for flooding to occur by allocating and safeguarding open space for flood storage.
Zone 3b: Functional Floodplain	
Land where water has to flow or be stored in times of flood. (Land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the local planning authority and the Environment Agency, including water conveyance routes).	Appropriate uses Only the water-compatible uses and the essential infrastructure listed in Table 2-2 that has to be there should be permitted. It should be designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows; • not increase flood risk elsewhere. FRA requirements All proposals in this zone should be accompanied by a FRA. Policy aims In this zone, developers and local authorities should seek opportunities to: • reduce the overall level of flood risk through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land with a lower probability of flooding.

Source: NPPF Technical Guidance Table 1

Table 2 - Flood Risk Vulnerability Classification

Essential Infrastructure	Essential transport infrastructure and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations and emergency dispersal points. Basement dwellings, caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent.
More Vulnerable	Hospitals, residential institutions such as residential care homes, children's homes, Social services homes, prisons and hostels. Buildings used for: dwelling houses, student halls of residence, drinking establishments, nightclubs, hotels and sites used for holiday or short-let caravans and camping. Non-residential uses for health services, nurseries and education. Landfill and waste management facilities for hazardous waste.
Less Vulnerable	Buildings used for shops, financial, professional and other services, restaurants and cafes, offices, industry, storage and distribution, and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities), minerals working and processing (except for sand and gravel). Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place).
Water-compatible Development	Flood control infrastructure, water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Docks, marinas and wharves, navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation. Essential sleeping or residential accommodation for staff required by uses in this category, subject to a warning and evacuation plan.

Source: NPPF Technical Guidance Table 2

Table 3 - Flood Risk Vulnerability and Flood Zone 'compatibility'

Vulnerability Classification (Table 3)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (Table 2)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test	✓	✓
	Zone 3a	Exception Test	✓	✗	Exception Test	✓
	Zone 3b	Exception Test	✓	✗	✗	✗

Source: NPPF Technical Guidance Table 3

Key:

- ✓ Development is appropriate
- ✗ Development should not be permitted

3.0 Assessment of Flood Risk

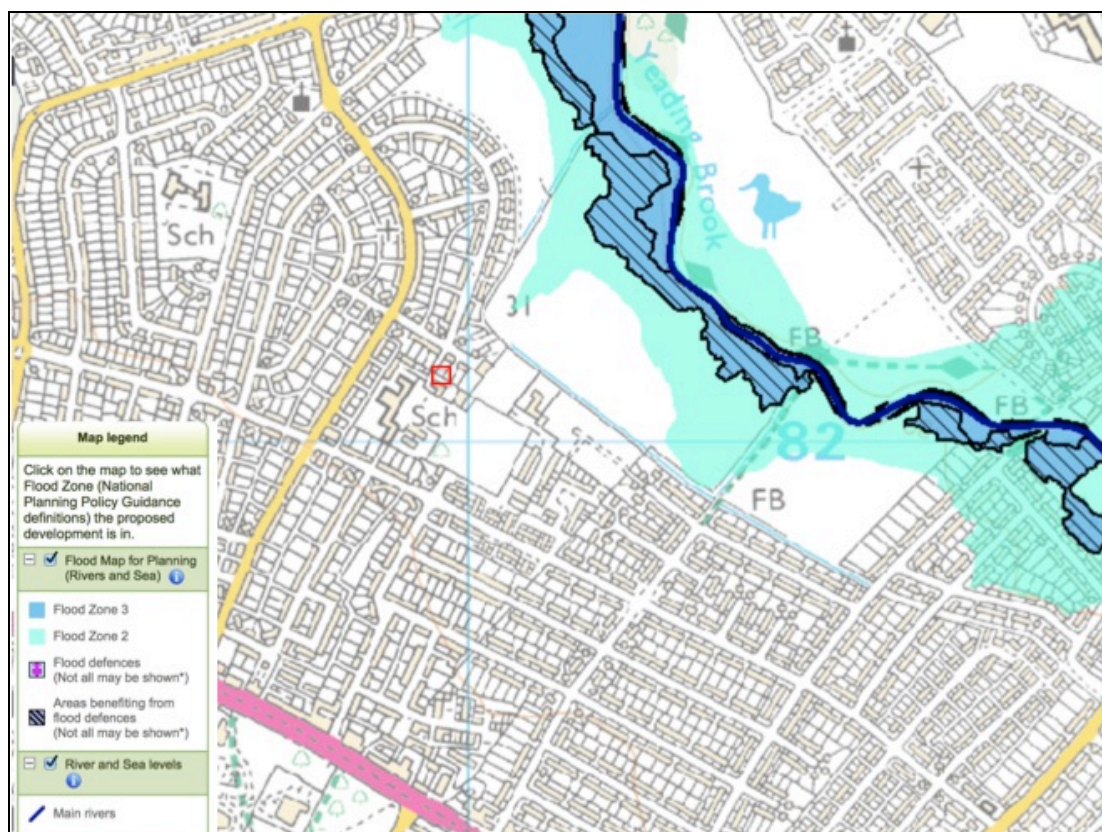
3.1. Previous Flood History

The London Borough of Hillingdon's Surface Water Management Plan (Evidence Base) and the Preliminary Flood Risk Assessment (PFRA) 2011 indicated that there were no records of previous flooding around the site.

3.2. Fluvial Flood Risk

The proposed development site lies within the Environment Agency's Flood Zone 1 and is a low risk zone as indicated in Figure 2. Flood Zone 1 is a low risk probability zone with a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Figure 2 - Environment Agency Flood Map



3.3. Tidal Flood Risk

The site is located at considerable distance from the sea and upstream of any tidal impact. Therefore, there is no tidal flood risk to the site.

3.4. Flood Defence Breach and Overtopping

There are no formal flood defences protecting the proposed development site. Consequently there is no risk of flooding from this source.

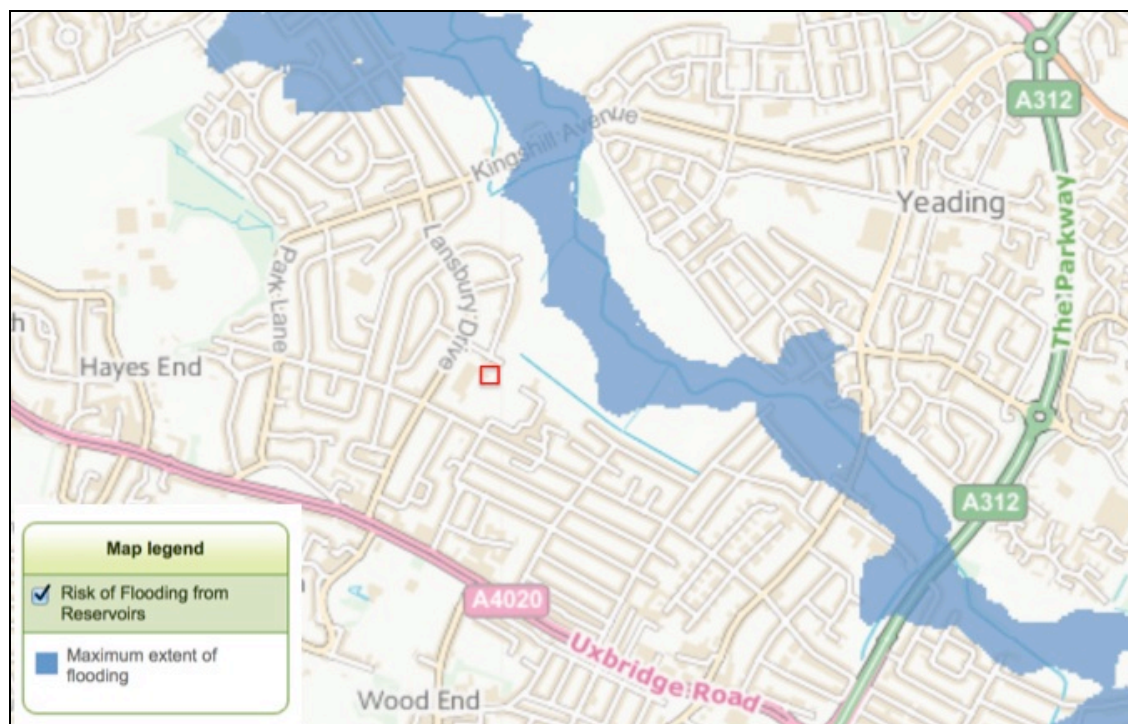
3.5. Canal Flood Risk

The proposed development is located at considerable distance from a canal and consequently there is no risk of flooding from canal sources.

3.6. Reservoir Flood Risk

According to the Environment Agency's reservoir flood risk map, the site is located outside of the maximum extent of reservoir flooding and therefore there is low risk of flooding from this source (Figure 3).

Figure 3 - Environment Agency Reservoir Flood Risk Map



3.7. Groundwater flooding

The London Borough of Hillingdon's Surface Water Management Plan (Evidence Base) and the Preliminary Flood Risk Assessment (PFRA) 2011 have no records of groundwater flooding within the site.

3.8. Surface Water Flood Risk

When the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded, excess rainwater flows overland; this water will collect in topographic depressions and at obstructions, and can inundate development downslope. The severity of the rainfall event, the degree of saturation of the soil before the event, the permeability of soils and geology, hill slope steepness and the intensity of land use all contribute to and affect the severity of overland flow.

The Environment Agency most recent flood map for surface water published in December 2013 is freely available online at their website and can be used to see the approximate areas that would experience surface water flooding from a variety of rainfall return periods. The risk is categorised based on annual probability of occurrence. The different risk categories are displayed below in Table 4.

Table 4 - Environment Agency Surface Water Risk Categories

Environment Agency Surface Water Risk Category	Surface water flooding annual probability of occurrence
Very Low	Less than 0.1% (1 in 1000 years)
Low	Between 1% and 0.1% (1 in 100 years and 1 in 1000 years)
Medium	Between 1% and 3.3% (1 in 100 years and 1 in 30 years)
High	Greater than 3.3% (1 in 30 years)

The Environment Agency's surface water flood map indicates that there is low risk of surface water flooding at the site (Figure 4). In addition, the London Borough of Hillingdon's Surface Water Management Plan (Evidence Base) indicates that the site does not lie within any Critical Drainage Area (CDA).

Figure 4 - Environment Agency Surface Water Flood Map



3.9. Drainage and Sewage Infrastructure

Sewer flooding is often caused by excess surface water entering the drainage network causing sewers to surcharge. Thames Water, who are responsible for the management of urban drainage and sewerage within the Borough, maintain a DG5 register of sites affected by sewer flood incidents on a post code by post code basis.

According to the Preliminary Flood Risk Assessment (PFRA) 2011, there were no instances of drainage infrastructure flooding recorded near the site.

3.10. Climate Change

There is clear scientific evidence that global climate change is happening now. In the UK sea level has risen and more winter rain has fallen in intense wet spells over the past century. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models.

Looking ahead, greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

The Department for Environment, Food and Rural Affairs FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts (October 2006) provided information on sensitivity ranges for peak rainfall intensities and peak river flows (Table 5). This report also provides information on net sea level rise relative to 1990 (Table 6).

Table 5 - Defra recommended national precautionary sensitivity ranges for peak rainfall intensities and peak river flows

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak Rainfall Intensity	+5%	+10%	+20%	+30%
Peak River Flow	+10%	+20%		

On a more localised scale, if emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are:

- Winter precipitation increases of around 15% (very likely to be between 2 and 32%);
- Precipitation on the wettest day in winter up by around 15% (very unlikely to be more than 31%);
- Peak river flows in a typical catchment likely to increase between 8 and 18%.

Table 6 - Defra recommended national precautionary sensitivity ranges for net sea level rises

	Net sea level rise (mm per year) relative to 1990			
	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected. Drainage systems in the district have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but may also need to be managed differently. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. Even small rises in sea level could add to very high tides so as to affect places a long way inland.

4.0 Mitigation Measures

4.1. Recommended Finished Floor Levels

In order to afford a level of protection against flooding it is normally recommended that finished floor levels are set a nominal 300mm above the 1 in 100 year annual probability fluvial flood (1%) in any year (including an allowance for climate change). Raising finished floor levels above ground level would reduce the risk of flooding from other sources such as drainage infrastructure flooding.

However, as the site has a low risk of fluvial flooding, there will be no requirement of raising finished floor level on the ground of flood risk.

4.2. Surface Water Runoff

There is potentially an opportunity for improvement at the proposed development site through the implementation of suitable Sustainable Drainage Systems (SuDS).

4.2.1. SuDS

Paragraph 1.3.2 from the SuDS manual (C697) discusses the SuDS 'management train' which is intended to mimic the natural catchment process as closely as possible. The hierarchy of techniques used to achieve the management train are shown below in Table 7.

Table 7 Hierarchy of SuDS techniques

Technique	Description
Prevention	The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater harvesting/reuse).
Source control	Control of runoff at or very near its source (e.g. soakaways, porous and pervious surfaces, green roofs).
Site control	Management of water in a local area or site (e.g. routing water to large soakaways, infiltration or detention basins)
Regional control	Management of runoff from a site or several sites (e.g. balancing ponds, wetlands).

There is an opportunity for the application of minimal SuDS techniques (Table 8):

Table 8 Feasible SuDS techniques for the site

Technique	Issues	Feasible? Y/N
Prevention Good site design and housekeeping/rainwater harvesting/infiltration devices/education.	The proposed development could utilise water butts for rainwater harvesting to reduce runoff. Education to prospective homeowners about how to manage flood risk could be implemented.	Y Y
Source Control Porous and pervious materials/soakaways/green roof/infiltration trenches/disconnect downpipes to drain to lawns or infiltrate to soakaway.	Field infiltration test might be required to inform design of soakaway or porous paving A green roof could be considered but would be out of character with the area and therefore is thought to be unfeasible	N N
Site and Regional Control Infiltration/detention basins/balancing ponds/wetlands/underground storage/swales/retention ponds.	There is thought to be some scope for the use of site and regional control techniques especially underground storage tanks	N

It is proposed that the development will incorporate an underground rainwater harvesting tank. The collected water will be recycled for W.C., W.M. etc. The tank will be fitted with flow restriction valve to prevent surcharge to rainwater system. The approximate outline of the tank is shown in Appendix A.

5.0 Awarded Credits

The Code for Sustainable Homes SUR 2 offer 2 credits to new developments, provided that they are designed under particular specifications and they are satisfying specific criteria.

The development can obtain the two credits available in SUR 2 (Flood Risk), as it is situated in Flood Zone 1 and this site specific FRA has suggested that there is a low risk of flooding from all sources.

6.0 Conclusion

The proposed development site at School Approach, Fredora Avenue lies within Flood Zone 1 with a low probability of fluvial flooding. Accordance to the SFRA, there are no records of historical flooding incidents around the site. The Environment Agency's surface water flood map indicated that there is a low risk of flooding. In addition, the site has a low risk of flooding from other sources.

The site will not require any flood mitigation measures in principle; however, it may be benefited from surface water management through the adoption of Sustainable Drainage System (SUDS). An underground rainwater harvesting tank has been proposed as part of the development.

This report demonstrates that the proposed residential development will be safe, in terms of flood risk, for its design life and will not impose any flood risk elsewhere. The development can obtain the two credits available in SUR 2 (Flood Risk), as it is situated in Flood Zone 1 and the site specific FRA has shown that there is low risk of flooding from all sources.

Appendix A Development Proposals

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