



Flood Risk Assessment

Development at
59 Elm Avenue, Ruslip, HA4 8PE



On behalf of
Rajan Patel

Date: 5th January 2021

Reference: WTFR-FRA-2020/12/Q22

WTFR-FRA-2020/12/Q22

Issue sheet

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1. Introduction

WtFR Ltd has been commissioned by John Philips to undertake a Flood Risk Assessment (FRA) in connection with the planning application for the proposed development at 59 Elm Avenue, Ruslip, HA4 8PE.

This FRA has been produced to demonstrate how risks from all sources of flooding to the site and flood risk to others from the development will be managed, in order to satisfy the requirements, set out in the National Planning Policy Framework (NPPF).

A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development has been considered as part of this analysis.

Data has been gathered from a number of other sources including: the Environment Agency (EA), the British Geological Society (BGS), National Soil Research Institute (NSRI), aerial photographs, Ordnance Survey (OS), commercially available historical mapping and relevant strategic documents developed by the London Borough of Hillingdon, in their capacity as Local Planning Authority and Lead Local Flood Authority.

2. Site Description

Area Size: 400m²

Grid reference: TQ 10808 87553

The proposals are for the demolition of existing bungalow and the construction of a three-storey dwelling at 59 Elm Avenue, Ruslip, HA4 8PE.

Figures 1 and 2 below show location details of the development site. Figure 3 shows an oblique aerial photograph of the development site.



Figure 1 – Location of the site, highlighted.



Figure 2 –detailed location of the development site, highlighted.



Figure 3 –aerial photograph of the development site.

3. Flood Risk Assessment

3.1 National Planning Policy

Paragraph 163 of the NPPF states "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁰. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- b) the development is appropriately flood resistant and resilient;
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- d) any residual risk can be safely managed; and
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan".

Footnote 50 states "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use".

Furthermore paragraph 30 of the Planning Practice Guide on Flood Risk and Climate Change states "A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

The objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- evidence for the local planning authority to apply (where necessary) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable".

Continuing paragraph 31 of the Planning Practice Guidance quotes "The information provided in the flood risk assessment should be credible and fit for purpose. Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk

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Assessment for the area, and the interactive flood risk maps available on the Environment Agency's web site.

A flood risk assessment should also be appropriate to the scale, nature and location of the development. For example, where the development is an extension to an existing house (for which planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, the local planning authority would generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the local planning authority would need a more detailed assessment".

3.2 Local Planning Policy

Local Authorities consider flood risk through relevant environmental and climate change policies which enforce the requirements of the NPPF. Relevant local policy is contained within the;

- i) Strategic Flood Risk Assessment
- ii) Local Flood Risk Management Strategy

The Strategic Flood Risk Assessment (SFRA) and the Local Flood Risk Management Strategy (LFRMS) are key sources of flood risk specific information for the area. The SFRA provides a more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF.

3.3 Flood Risk Zones, Vulnerability and Classification

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning available on the Environment Agency's web site, as indicated in the table below.

Table 1 – Flood Zones

Flood Zone	Definition
Zone 1 <i>Low Probability</i>	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 <i>Medium Probability</i>	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 <i>High Probability</i>	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 flooding. (Land shown in dark blue on the Flood Map)
Zone 3b <i>The Functional Floodplain</i>	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)

Table 2 – Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
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 and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; 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 working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water Compatible Development	
• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of 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 and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.	

* Landfill as defined in Schedule 10 to the Environmental Permitting (England and Wales) Regulations 2010.

Table 3 - Flood risk vulnerability and flood zone 'compatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a†	Exception Test required†	X	Exception Test required	✓	✓
Zone 3b*	Exception Test required*	X	X	X	✓*

Key:

✓ Development is appropriate

X Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;

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- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, 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 and not increase flood risk elsewhere.

4. Sources of flooding

4.1 Fluvial/Tidal

The Environment Agency's Flood Map for Planning (Rivers and Sea) identifies fluvial and tidal flood zones and provides an indication of whether or not these zones are protected, due to the presence of flood defences (also highlighted). Figure 4, below, presents the Flood Map for the surrounding area.

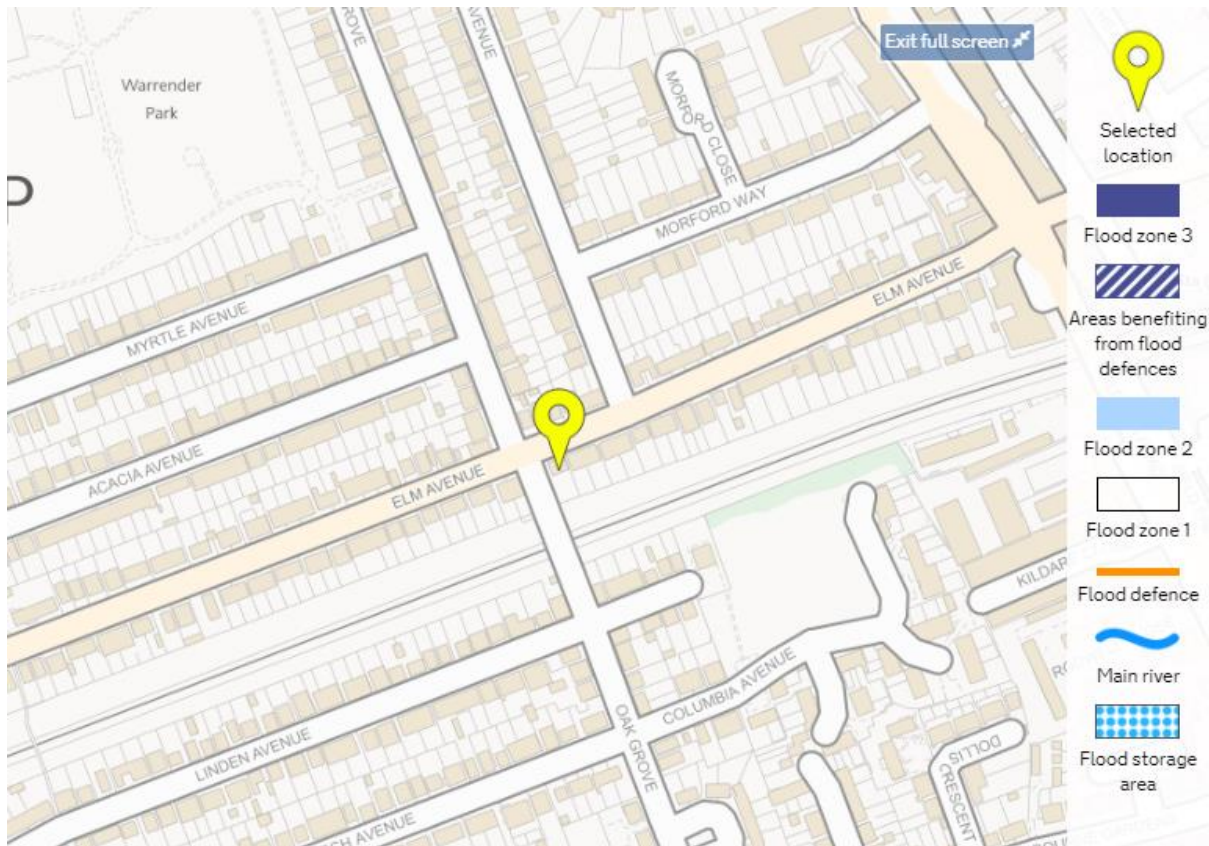


Figure 4 –Rivers and Sea Flood Risk – EA Flood Map.

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

4.2 Historic Flooding

Analysis of strategic flood risk documents developed by the London Borough of Hillingdon does not indicate any historic flooding.

4.3 Surface Water Flooding

The Environment Agency's updated Flood Map for Surface Water (uFMfSW) identifies pluvial flood risk. Figure 5, below, presents the uFMfSW for the development site and the surrounding area.

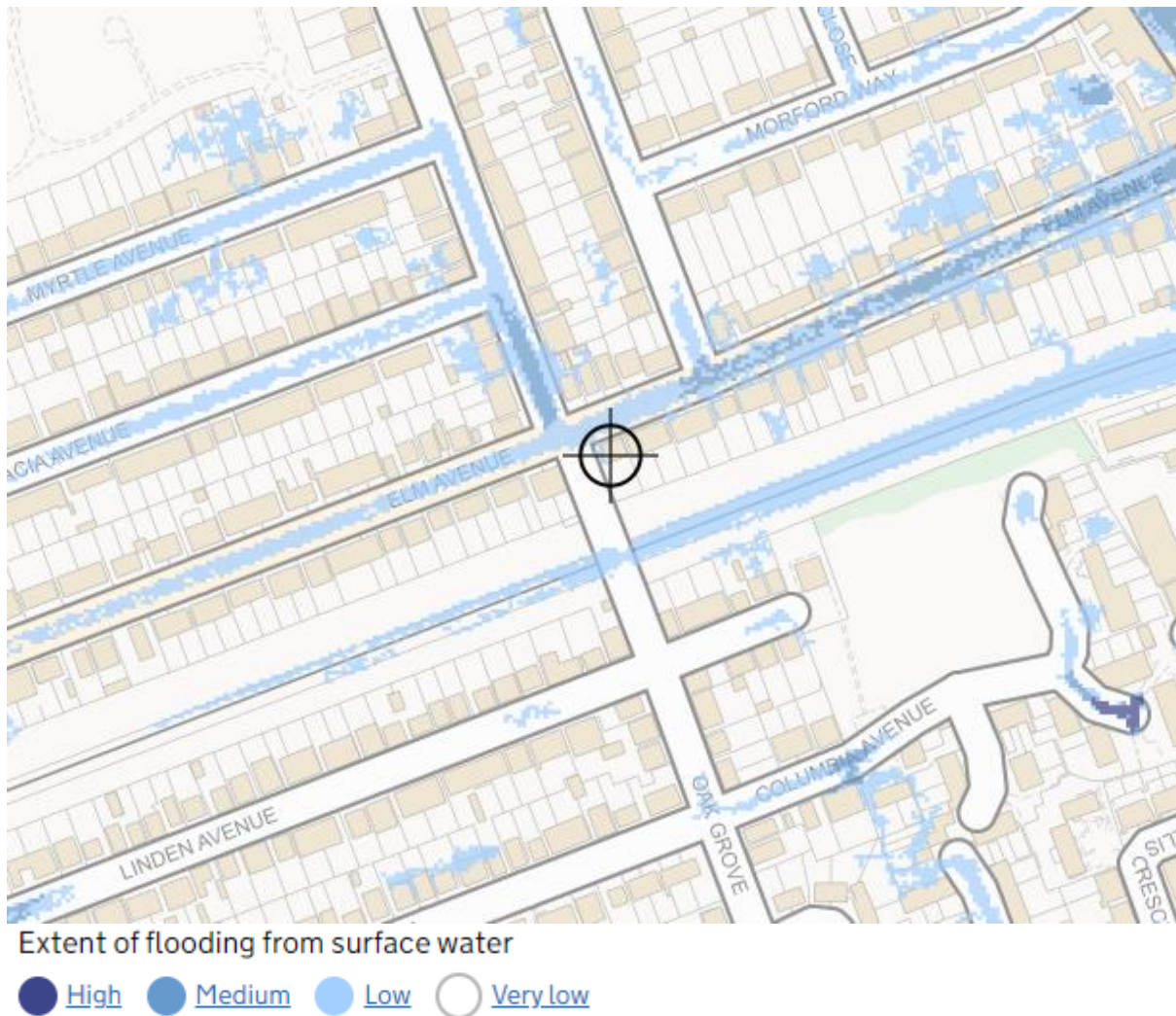


Figure 5 – Flooding from surface water sources, uFMfSW, site highlighted.

The uFMfSW shows that area in the vicinity of the development site is at low risk of surface water flooding. Low risk means that the probability of flooding in any given year is between 1 in 1000 (0.1%) and 1 in 100 (1%).

4.4 Reservoir

The Environment Agency's Risk of Reservoir Flooding Map identifies the maximum extent of flooding that may be expected in the unlikely event that a reservoir dam failed. The development is not at risk of a reservoir failing.

4.5 Groundwater

The Environment Agency's Groundwater Vulnerability Map identifies the maximum groundwater flood risk. The map indicates that the development site is situated over a medium ground water vulnerability area shown in Figure 6. Further analysis shows that the development site is not situated over a Groundwater Source Protection Zone as shown in Figure 7.

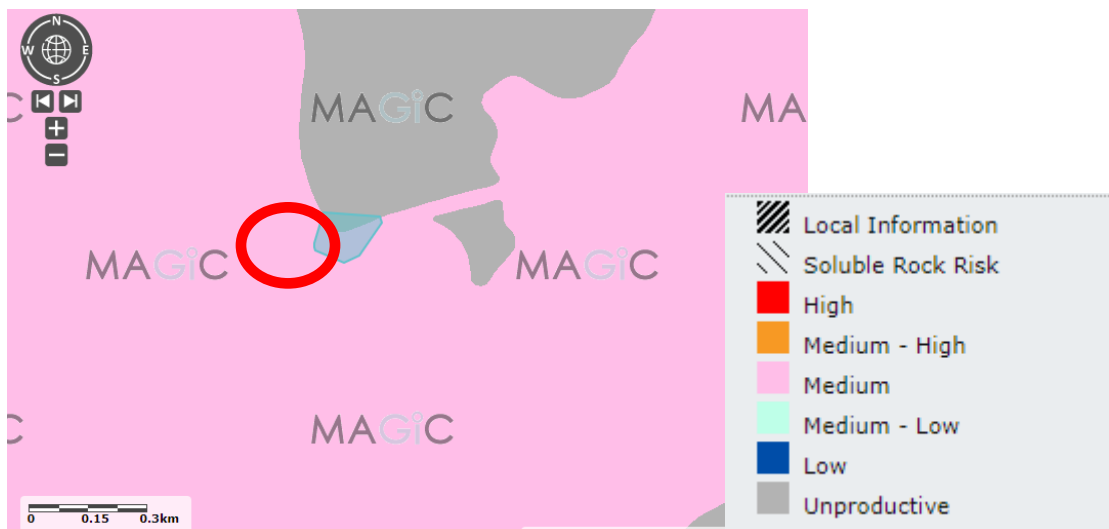


Figure 6 – Groundwater vulnerability map, site highlighted.



Figure 7 – Groundwater source protection zones, site highlighted.

Due to the minimal groundworks (for the construction of shallow foundations) the impact on groundwater is considered to be negligible.

However, it is recommended that a groundwater mitigation plan is developed that may be implemented if groundwater is encountered during construction.

4.6 Geology

Figures 8 and 9 present information from the British Geological Survey.



Figure 8 – Superficial Geology of the development.

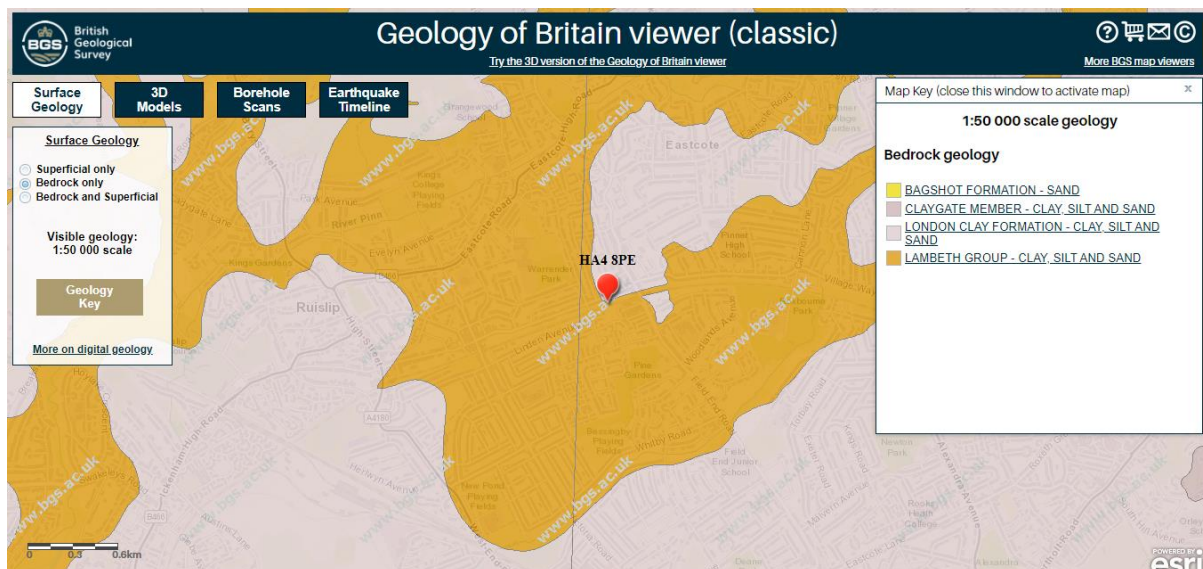


Figure 9 – Bedrock geology of the development.

There are no superficial deposit records at the development site.

With regards to the bedrock, the site is underlain by the Lambeth Group - Clay, Silt and Sand. The sedimentary bedrock formed approximately 48 to 59 million years ago in the Palaeogene Period. The local environment was previously dominated by swamps, estuaries and deltas.

5. Proposed development

This FRA is prepared to support a planning application for the demolition of existing bungalow and the construction of a three-storey dwelling at 59 Elm Avenue, Ruslip, HA4 8PE.

Buildings used for residential dwellings are classified as being **More Vulnerable** development within Table 2 of the Planning Practice Guidance. More Vulnerable developments within Flood Zone 1.

Figures 10 and 11 show the existing floor layouts. Figures 11, 12 and 13 show the proposed floor layouts.

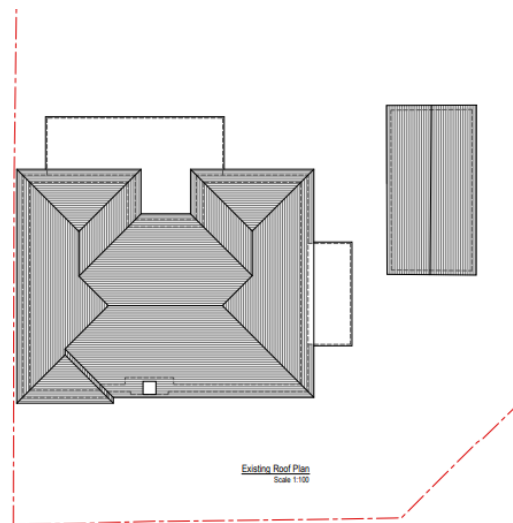


Figure 10 – Existing ground floor layout.

Figure 11 – Existing first floor layout.

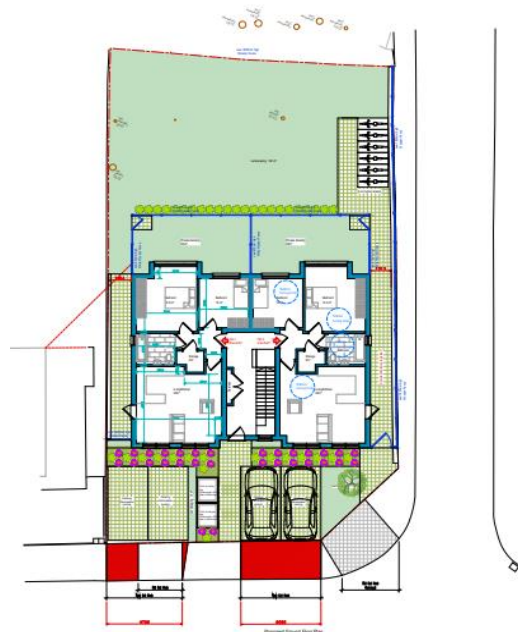


Figure 12 – Proposed ground floor layout.

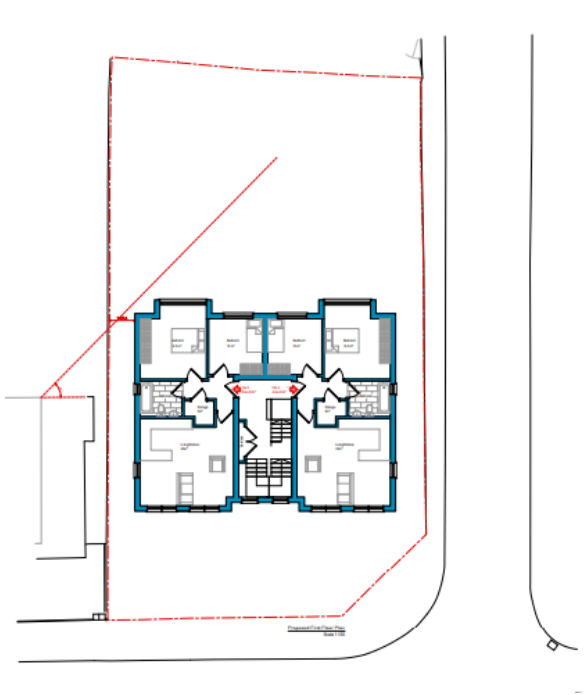


Figure 13 – Proposed first floor layout.

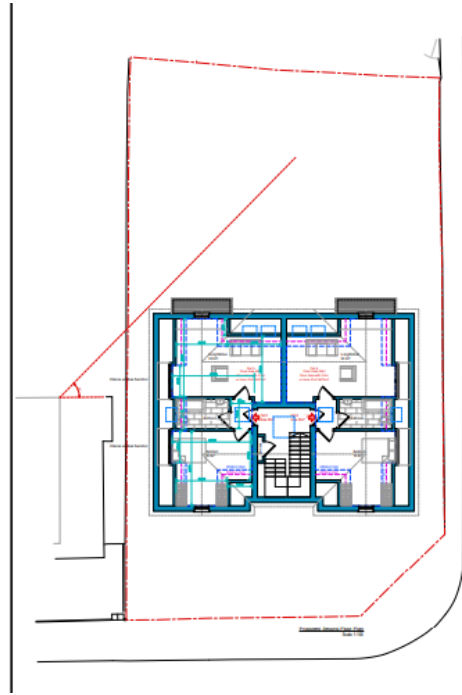


Figure 14 – Proposed second floor layout.

6. Surface Water Drainage

The greenfield runoff rate has been calculated using IH124 methodology. Table 4 below shows the calculations to determine the existing greenfield runoff rate.



Calculated by: James Scott

Site name: Development Site

Site location: Elm Avenue

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', SO30219 (2013), the SuDS Manual C753 (Cire, 2015) and the non-statutory standards for SuDS (Delta, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Greenfield runoff rate estimation for sites

www.ukstds.com | Greenfield runoff tool

Site Details

Latitude: 51.57586° N

Longitude: 0.40226° W

Reference: 1880778211

Date: Jan 05 2021 13:40

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1

Methodology

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

SPR estimation method: Calculate from SOIL type

Soil characteristics

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	648	648
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.44	0.44
1 in 1 year (l/s):	0.37	0.37
1 in 30 years (l/s):	1.01	1.01
1 in 100 year (l/s):	1.41	1.41
1 in 200 years (l/s):	1.65	1.65

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.ukstds.com. The use of this tool is subject to the UK SuDS terms and conditions and license agreement, which can both be found at www.ukstds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CSH, HydroSolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Table 4 – Greenfield runoff calculations.

The Q_{bar} Greenfield runoff rate is 0.44l/s. It is recommended that post development discharge rates are limited to 5l/s in accordance with industry best practice.

Table 5 below looks at the required attenuation that will be required on site. The figures include an allowance of 1.4 (+40%) for climate change.

The calculations show that 5m³ of attenuation storage is required.

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Surface water storage volume estimation - member's only area



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:
 Site name:
 Site location:

Site Details
 Latitude:
 Longitude:
 Reference:
 Date:

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance 'Rainfall runoff management for developments', SC030219 (2013), the SuDS Manual C753 (Cris, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics		Methodology	
Total site area (ha):	0.04	est:	BH124
Significant public open space (ha):	0	Q _{RAI} estimation method:	Calculate from SPR and SAAR
Area positively drained (ha):	0.04	SPR estimation method:	Calculate from SOIL type
Impermeable area (ha):	0.02	Soil characteristics	
Percentage of drained area that is impermeable (%):	50	SOIL type:	4 4
Impervious area drained via infiltration (ha):	0	SPR:	0.47 0.47
Return period for infiltration system design (year):	10	Hydrological characteristics	
Impervious area drained to rainwater harvesting (ha):	0	Default	Edited
Return period for rainwater harvesting system (year):	10	Rainfall 100 yrs 6 hrs:	63
Compliance factor for rainwater harvesting system (%):	66	Rainfall 100 yrs 12 hrs:	89.32
Net site area for storage volume design (ha):	0.04	FEH / FSR conversion factor:	1.16 1.16
Net impermeable area for storage volume design (ha):	0.02	SAAR (mm):	648 648
Pervious area contribution to runoff (%):	30	M5-60 Rainfall Depth (mm):	20 20
* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q _{RAI} and other flow rates will have been reduced accordingly.		'Y' Ratio M5-60/M5-2 day:	0.4 0.4
Design criteria		Hydrological region:	6 6
Climate change allowance factor:	1.4	Growth curve factor 1 year:	0.85 0.85
Urban creep allowance factor:	1.1	Growth curve factor 10 year:	1.62 1.62
Volume control approach:	Use long term storage	Growth curve factor 30 year:	2.3 2.3
Interception rainfall depth (mm):	5	Growth curve factor 100 years:	3.19 3.19
Minimum flow rate (l/s):	2	Q _{RAI} for total site area (l/s):	0.18 0.18
Site discharge rates		Q _{RAI} for net site area (l/s):	0.18 0.18
Default Edited		Estimated storage volumes	
1 in 1 year (l/s):	2 2	Attenuation storage 1/100 years (m³):	5 5
1 in 30 years (l/s):	2 2	Long term storage 1/100 years (m³):	0 0
1 in 100 year (l/s):	2 2	Total storage 1/100 years (m³):	5 5

This report was produced using the storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and license agreement, which can both be found at <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEM, Hydro Solutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Table 5 – Estimated attenuation calculations.

7. Hierarchy of disposing surface water

The Planning Practice Guidance and part H of the Building Regulations state that “generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer”.

7.1 Infiltration

Due to the minimal amount of permeable ground infiltration is not considered a viable option.

7.2 Surface Water Body

There are no watercourses within the vicinity of the development.

7.3 Surface Water or Combined Sewer

It is assumed that a public surface water or combined sewer is available and serves the existing dwelling, it is recommended that surface water is continued to be discharged to the public sewerage system.

8. Use of SuDS

The NPPF, Planning Practice Guide and the Ministerial Statement all look at the use of SuDS as a priority to aid the disposal of surface water from new developments.

Due to the minor nature of the development proposal there is limited capacity to include SuDS measures although permeable paving and the use of water butts may be considered for use, where appropriate, to minimise surface water runoff from the site.

9. Management of flood risk

9.1 Fluvial and tidal

The analysis of flooding from fluvial and tidal sources shows that the building is in Flood Zone 1 and hence is at a risk of flooding from events less than 1 in 1000 (0.1%).

Table 2 of this report details that residential developments are classified as More Vulnerable; Table 3 of the report shows that More Vulnerable developments are appropriate in Flood Zone 1.

9.2 Surface Water

The development site is at low risk from surface water flooding, which means that the probability of flooding is between 1 in 1000 (0.1%) and 1 in 100 (1%) in any year.

Due to the minor risk of flooding, it is recommended that the floor level is set at a minimum of 300mm above ground level.

It is assumed that a public surface water or combined sewer is available and serves the existing dwelling, it is recommended that surface water is continued discharged to the public sewerage system.

The calculations show that 5m³ of attenuation storage is required.

Appropriate SuDS features and measures, such as permeable paving, should be incorporated within the development to minimise surface water discharges.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

10. Conclusions

The analysis of flooding from fluvial and tidal sources shows that the building is in Flood Zone 1 and hence is at a risk of flooding from events less than 1 in 1000 (0.1%).

Table 2 of this report details that residential developments are classified as More Vulnerable; Table 3 of the report shows that More Vulnerable developments are appropriate in Flood Zone 1.

The development site is at low risk from surface water flooding, which means that the probability of flooding is between 1 in 1000 (0.1%) and 1 in 100 (1%) in any year.

Due to the minor risk of flooding, it is recommended that the floor level is set at a minimum of 300mm above ground level.

It is assumed that a public surface water or combined sewer is available and serves the existing dwelling, it is recommended that surface water is continued discharged to the public sewerage system.

The calculations show that 5m³ of attenuation storage is required.

Appropriate SuDS features and measures, such as permeable paving, should be incorporated within the development to minimise surface water discharges.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

There is no evidence of historic flooding of the development site.

The development is not at risk of flooding from groundwater. However, it is recommended that a mitigation plan is developed and implemented if groundwater is encountered during construction.

The development is not at risk from reservoir failure.

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

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