RIDA
FLOOD RISK ASSESSMENTS & DRAINAGE STRATEGIES

44 Fairway Avenue, West Drayton, UB7 7AN

Reference: 624 FRA-v1

FLOOD RISK ASSESSMENT

Feb-24

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Introduction 1

Purpose of this report

1.1 RIDA Reports Ltd has been appointed to undertake a Level 1 – Screening Study Flood Risk Assessment for a development located at UB7 7AN.

Objectives

1.2 The objectives of this FRA are to demonstrate the following:

* Whether the proposed development will likely be affected by current or future flooding.
* Whether the proposed development will increase flood risk elsewhere.
* Whether the flood risks associated with the proposed development can be satisfactorily managed.
* Whether the measures proposed to deal with the flood risk are sustainable.

Documents Consulted

1.3 To achieve these objectives, the following documents have been consulted and referenced:

The National Planning Policy Framework (NPPF)
CIRIA C753 document The SuDS Manual, 2015
Local Flood Risk Management Strategy (LFRMS)
Level 1 Strategic Flood Risk Assessment (SFRA)
Aerial photographs and topographical survey of the site
British Geological Society Records
Local Council flood Maps
Environment Agency flood maps
The CIRIA publication 'C635 Designing for exceedance in urban drainage— Good practice'

Development Site and Location

2.1 The site is located at Fairway Avenue, London. The nearest postcode is UB7 7AN. Refer to appendix A for site location plan.

2.2 The current use of the site is the garden of the property. The current use vulnerability classification of the site is Water compatible. The site is located in the River Flood Zone 2. Refer to Appendix B for more details.

Development Proposals

2.3 The proposed development includes the construction of a single storey extension to the side and rear. Refer to Appendix B for the layout of the proposed development.

2.4 The vulnerability classification of the proposed development is More vulnerable with an estimated lifetime between 50 and 100 years.

Site Hydrology and Hydrogeology

Hydrology

2.5 The Fray`s River is located approximately 110 m away from the development.

Aquifer

2.6 The development is located within a secondary aquifer type A. Aquifers type A consist of permeable layers capable of supporting water supplies at a local rather than strategic scale. They are generally aquifers formerly classified as minor aquifers.

Source Protection Zone

2.7 The site is not located within a Source Protection Zone.

Groundwater Levels

2.8 The ground water levels for this site are unknown.

Site Geology

Bedrock

2.9 The British Geological Survey records of the site show that it is located within the London Clay Formation - Clay, Silt And Sand.

Superficial Deposits

2.10 The British Geological Survey records show that the superficial deposits are Alluvium - Clay, Silt, Sand and Gravel.

National and Local Planning Policy 3

National Planning Policy Framework (NPPF)

3.1 The NPPF and its technical guidance is a set of planning policies with the key objective of contributing to sustainable development. As part of it, they ensure that flood risk and sustainability are considered during the planning process. This ensures that developments are not located in flood risk areas and directs developments to lower risk areas. The NPPF applies a sequential risk-based approach to determining land suitability for development in flood risk areas. The NPPF also encourages developers to seek opportunities to reduce the overall level of flood risk through the development layout and the application of Sustainable Drainage Systems (SuDS).

The Flood and Water Management Act (2010)

3.2 The Flood and Water Management Act aims to reduce the flood risk associated with extreme weather events. It provides robust flood risk management for people, homes and businesses and encourages using SuDS for developments. A robust SuDS strategy should consider the recommendations in this Flood Risk Assessment.

Strategic Flood Risk Assessment (SFRA)

3.3 Planning policy with regard to development and flood risk in the area is detailed in the Local Flood Risk Management Strategy (LFRMS) which was published in 2015. The proposed development site is located within the administrative boundary of the London Borough of Hillingdon.

3.4 The SFRA commits to direct new development to locations at the lowest flood risk. The SFRA provides information on the levels and flood hazards that could result from flooding. The Environment Agency flood zone maps and the SFRA ignore the presence of existing flood defences when defining the potential extent of flooding.

3.5 This report follows the guidance given in the Local Flood Risk Management Strategy by evaluating the flood risk and providing relevant flood mitigation.

The Sequential and Exception Test 4

4.1 The NPPF guidance states that the sequential test "is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding."

Applicability of the Sequential Test

4.2 The flood risks were determined by identifying all the sources of flooding and assessing their possible impact and likelihood to development. It is confirmed that the development is:

- In Flood Zone 2, based on the Planning Flood Risk Map
- The final Flood Zone will be confirmed once the Environment Agency's data is recieved
- At Very Low risk of surface flooding
- At high risk of groundwater flooding
- Outside of a critical drainage area
- Outside of an area with sewer flooding

4.3 This type of development is exempt from applying the sequential test as per the National Planning Policy Framework paragraph 174, footnote 60. The development has been made safe and has not increased the risk to other properties.

Exception Test

4.2 Fluvial flood risk for this minor development was assessed using the Environment Agency Flood Zone Maps and the standing advice approach recommended in the NPPF guidelines. The standing advice considers the development's size and the flood risk vulnerability of land use.

Step 1
Flood Zone categorisation

4.3 The proposed development falls within The Environment Agency (EA) Flood Zone 2. The Flood Zone 2 is considered to have a medium probability of flooding with a 1000 to 100 years annual probability or 0.1-1.0%AEP.

Step 2 4.4 The Exception Test is not required for this development.

The Exception Test

Flood hazard assessment 5

5.1 The development has been assessed for the following potential flood risks, river and tidal flood risk, surface water flooding, flooding from groundwater, reservoir flood risk and drainage systems.

Flood Defence and Historic Flooding

5.2 The Environment Agency records show that the site does not benefit from flood defences. They also show that the area around the site has not been flooded in the past. See Appendix C for details.

Flooding from river and sea

5.3 The site is affected by River Flooding. The proposed development falls within The Environment Agency (EA) Flood Zone 2. The Flood Zone 2 is considered to have a medium probability of flooding with a 1000 to 100 years annual probability or 0.1-1.0%AEP.

5.4 The climate change allowances are as per the vulnerability of the development, the design life of the building, and the flood zone classification. It has been taken from the EA Peak River Flow Map. The climate change allowance for this development is 21%. As the levels are not available, it has been assumed a depth of 600mm for climate change allowance.

5.5 The flood levels have been requested from the Environment Agency. This flood risk assessment has been completed on an assumed flood levels.

5.6 The assumed flood depth for this site is 0.6m. The assumed flood level for this site is 26.2 mAOD

Surface water (overland flows) flood risk

5.7 The Environment Agency maps show that the flood risk from surface water is very low. A residual risk of localised ponding remains unlikely. The Environment Agency surface water flood risk maps are defined by applying a specific procedure based on digital terrain models and assumptions regarding infiltration and urban drainage losses. The surface water flood maps are determined by the Environment Agency as follows.

5.8 *"The nationally produced surface water flood mapping only indicates where surface water flooding could occur due to local rainfall. It does not fully represent flooding that occurs from:*
- Ordinary watercourses
- Drainage systems or public sewers caused by catchment-wide rainfall events
- Rivers
- Groundwater

Due to the modelling techniques, the mapping picks out depressions in the ground surface. It simulates some flow along natural drainage channels, rivers, low areas in floodplains, and flow paths between buildings. Although the maps appear to show flooding from ordinary watercourses, they should not be taken as definitive mapping of flood risk from these as the conveyance effect of ordinary watercourses or drainage channels is not explicitly modelled. Also, structures (such as bridges, culverts and weirs) and flood risk management infrastructure (such as defences) are not represented.

The nationally produced surface water flood mapping does not consider the effect of pumping stations in catchments with pumped drainage. No allowance is made for tide locking, high tidal or fluvial levels where sewers cannot discharge into rivers or the sea."

5.9 The strategic flood risk for the London Borough of Hillingdon confirms that the flood risk for the site is Very Low.The surface water flood data has not been produced to determine the flood levels at individual properties. This data does not contain the climate change allowances for depth levels. Therefore, the Design flood level given above is an assumption. The new development may have greater or lower surface water flood depths.

5.10 Based on Environment Agency and the Strategic flood risk assessment's surface water mapping, together with the presence of surface water drainage systems at the site and surrounding area it is concluded that the site is at Very Low risk of flooding from surface water sources.

Flooding from drainage systems in adjacent areas

5.11 The council records have been reviewed. The flooding from drainage incidents maps were not found in the Strategic Flood Risk Assessment. Therefore, for the purpose of this report, it has been assumed that the risk of flooding from drainage systems is low.

Reservoirs Risks

5.12 The Reservoir Flood Map (RFM) produced by the Environment Agency do not show the risk to individual properties of dam breach flooding. The maps do not indicate or relate to any particular probability of dam breach flooding. The maps were prepared for emergency planning purposes. They can be used to help reservoir owners produce on-site plans, and the Local Resilience Forum produce off-site plans and to prioritise areas for evacuation/early warning in the event of a potential dam failure. The RFM shows that the development could be within the possible dam breach flooding path. See Appendix C.

Groundwater flood risk

5.13 The British Geological Survey's flood risk susceptibility maps show that the development has the potential for groundwater flooding above ground level. Groundwater levels vary seasonally and are influenced by ground and meteorological conditions and proximity to water features. The groundwater flooding risk for this site is considered to be high. The groundwater flood depth could potentially be 0.15m. The external level at the site is 25.6m AOD. The potential groundwater flood level is 25.75m AOD. This level has been given as a precautionary measure. It is recommended that monitoring of groundwater is undertaken should this measure be reviewed. Refer to Appendix C for record drawings.

Critical Drainage Areas

5.14 The Strategic Flood Risk Assessment was reviewed as part of this assessment. However, it does not show the critical drainage areas within the council. For this report, it has been assumed that the site is outside of a notified critical drainage area.

6.1 The Flood hazard assessment has demonstrated that the site is:
- In Flood Zone 2, based on the Planning Flood Risk Map

- The final Flood Zone will be confirmed once the Environment Agency's data is recieved
- At Very Low risk of surface flooding
- At high risk of groundwater flooding
- Outside of a critical drainage area
- Outside of an area with sewer flooding

6.2 Under the NPPF it is necessary to demonstrate that, for any new development on the site, it is possible to provide an adequate level of flood protection for personnel working or living at the development.

Design Flood Level

6.3 The design flood level is the maximum estimated water level during the design storm event including an allowance for climate change in line with current best practice and the national planning policy guidance.

6.4 The Design Flood Level for this development has been determined by evaluating the levels from the Pluvial/Sea, Surface Water and Groundwater flood levels.

6.5 For this site, the Design Flood Level is 26.2m AOD. This is the highest level and corresponds to the River/Sea Flood Level.

Flood Protection

6.6 The National Planning Guidance standing advice and Environment Agency, states that where possible, flood avoidance is provided by establishing the development's finished floor level 0.3m above the Design Flood Level. The finished floor should be 26.5m AOD. It would involve a height differential of 0.9m. This is the distance between the average external level (25.6m AOD) and the potential Finished Floor Level.

6.7 It is not possible to achieve this FFL due to access and site constraints. A level of 25.75m AOD is achieved. This level is as per the FFL of the existing building. Therefore, the following flood mitigation interventions should be provided.

6.8 The flood mitigation strategies for the development has been based on the CLG 2007 Improving the Flood Performance of New Buildings. See the figure below for the strategy highlighted in red. The strategy is based on the water level within the proximity to the building.

Figure 1: Rationale for flood resilient and/or resistant design strategies.

	Design water depth*	Approach	Mitigation measures
Resistance/Resilience**	Design water depth above 0.6m	Allow water through property to avoid risk of structural damage. Attempt to keep water out for low depths of flooding **'Water Entry Strategy'***	• Materials with low permeability up to 0.3m • Accept water passage through building at higher water depths • Design to drain water away after flooding • Access to all spaces to permit drying and cleaning
	Design water depth from 0.3m to 0.6m	Attempt to keep water out, in full or in part, depending on structural assessment. If structural concerns exist follow approach above***	• Materials with low permeability to at least 0.3m • Flood resilient materials and designs • Access to all spaces to permit drying and cleaning
	Design water depth up to 0.3m	Attempt to keep water out **'Water Exclusion Strategy'**	• Materials and constructions with low permeability
Avoidance		Remove building/development from flood hazard	• Land raising, landscaping, raised thresholds

Notes:
* Design water depth should be based on assessment of all flood types that can impact on the building
** Resistance/resilience measures can be used in conjunction with Avoidance measures to minimise overall flood risk
*** In all cases the 'water exclusion strategy' can be followed for flood water depths up to 0.3m

6.9 The design water depth for this site is 0.6m. The development should utilise building materials that are suitable for a 'water exclusion strategy'. Materials classified as "Good" (highlighted in red) in the Figure below shall be used for new construction upto level of 26.8m AOD.

Figure 2: Flood resilience characteristics of building materials (based on laboratory testing)

Material	Resilience characteristics*		
	Water penetration	Drying ability	Retention of pre-flood dimensions, integrity
Bricks			
Engineering bricks (Classes A and B)	Good	Good	Good
Facing bricks (pressed)	Medium	Medium	Good
Facing bricks (handmade)	Poor	Poor	Poor
Blocks			
Concrete (3.5N, 7N)	Poor	Medium	Good
Aircrete	Medium	Poor	Good
Timber board			
OSB2, 11mm thick	Medium	Poor	Poor
OSB3, 18mm thick	Medium	Poor	Poor
Gypsum plasterboard			
Gypsum Plasterboard, 9mm thick	Poor	Not Assessed	Poor
Mortars			
Below d.p.c. 1:3(cement:sand)	Good	Good	Good
Above d.p.c. 1:6(cement:sand)	Good	Good	Good

* Resilience characteristics are related to the testing carried out and exclude aspects such as ability to withstand freeze/thaw cycles, cleanability and mould growth

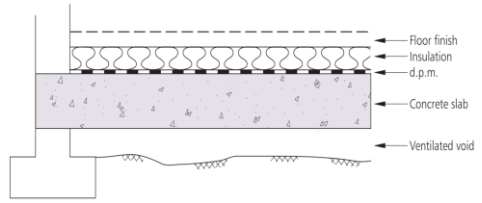
6.10 New services and fittings (communications wiring, heating systems, electrical services, water, electricity and gas meters) should be placed at above the level of 26.8m AOD. All service entries should be sealed (e.g. with expanding foam or similar closed cell material).

6.11 Closed-cell insulation should be used for pipes. Sealed PVC external framed doors or good fit and sealed wooden frames should be used. Hollow core timber internal doors should not be used unless sufficient flood warning is given, butt hinges, can be used to allow internal doors to be easily removed and stored. Carpets are to be avoided and use of tiles recommended in floor below the predicted design flood level.

6.12 Fittings should be designed to be replaced after a flood, it is advisable to specify durable fittings that are not appreciably affected by water and can be easily cleaned (e.g. use of plastic materials, or stainless steel). The cost of these units may need to be balanced against the predicted frequency of flooding. Avoid wood fiber based carcases and use easily removable solid wood doors and drawers.

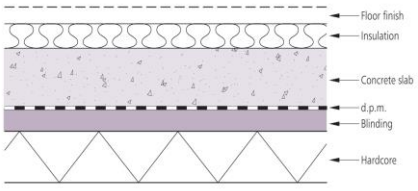
6.13 Suspended concrete floor slab at least 150mm thick is the preferred option. Beam and Block slabs with geomembrane and 75mm min screed can also be used. There should be a minimum space of 150mm ventilated void between the ground level and the bottom of the floor slab. Damp proof membranes should be included in the design. Floor insulation should be of the closed-cell type. Under floor services using ferrous materials should be avoided. Ceramic/concrete-based floor tiles, sitting on a bed of sand, cement render and water resistant grout can be used. See figures below.

Suspended Concrete Slab detail



- Reinforced concrete slab at least 150mm thick and complying with structural requirements for uplift forces
- Damp proof membrane of polythene at least 1200 gauge
- Insulation as rigid closed-cell material
- Ceramic tiles or stone floor finishes and including skirting boards.

Ground bearing Concrete Slab detail

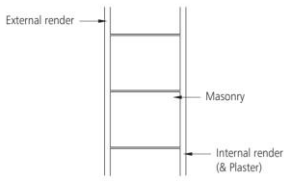


- Hardcore bed at least 100mm thick of well compacted inert material, blinded with fine inert material to provide a smooth base
- Damp proof membrane of polythene at least 1200 gauge
- Concrete slab at least 150mm thick
- Insulation as rigid closed-cell material
- Ceramic tiles or stone floor finishes and skirting boards.

6.14 Concrete blocks used in foundations should be sealed with an impermeable material or encased in concrete to prevent water movement from the ground to the wall construction. In new walls use extended periscope subfloor ventilators or fit removable airbrick covers; fix plasterboard sheets horizontally rather than vertically, or split sheets mid-height with a dado rail, to reduce the extent of replacement; specify lime- or cement-based renovating plasters or renders rather than gypsum-based, with water-resistant paint finishes. The use of water-proof, water-resistant or micro-porous surface coatings on masonry should be avoided as they can inhibit the drying-out of the building fabric.

6.15 Good quality facing bricks or external renders with water-repellent properties can be used for the external face. See the examples below of external walls that can be used.

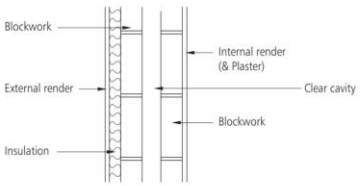
Solid External Wall



- External cement based render, preferably with lime content. Composition depends on masonry. The following mixes have good resilient properties:
  - 1 cement : 6 sand on bricks;
  - 1 cement : 4 sand: ½ lime on concrete blockwork or bricks;
  - 1 cement : 6 sand: 1 lime on Aircrete blocks.
- Masonry with minimum thickness of 300mm (thin mortar joint construction using Aircrete blocks is effective as demonstrated in laboratory tests) or alternatively reinforced concrete wall
- Internal cement-based render, preferably with lime content. Composition depends on masonry; the following mix is effective for flood resilience:
  - 1 cement : 6 sand: 1 lime on Aircrete.

  Apply external and internal renders, following good practice guidance, ensuring minimum total thickness of 20mm and at least two coats.
- Use external insulation in preference to internal insulation.

Cavity External Walls – Clear cavity

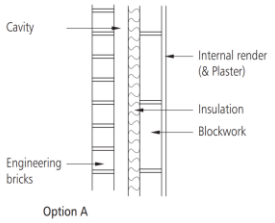


Clear cavity

- External cement based render, preferably with lime content. Composition depends on masonry; the following mixes are effective for flood resilience:
  - 1 cement: 4 sand: ½ lime on concrete blockwork (or bricks);
  - 1 cement: 6 sand: 1 lime on Aircrete.

  Apply render following good practice guidance, ensuring minimum total thickness of 20mm and two coats.
- Internal cement based render, preferably with lime content. Composition depends on masonry. The following mix works well:
  - 1 cement: 6 sand: 1 lime on Aircrete.
- Stainless steel wall ties should be used to minimise corrosion and consequent staining.

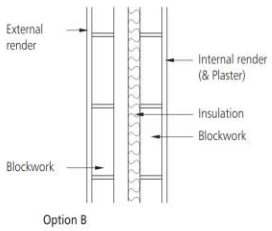
Cavity External Walls- Part fill Option A



Part-filled cavity – Option A

- External face consisting of engineering bricks up to required level for flood protection (up to 0.6m maximum above floor level plus one course). Other external facing materials can be used above this level, but ensure interface is watertight.
- Rigid insulation.
- Internal face consisting of blocks.
- Internal cement based render, preferably with lime content. Composition depends on masonry; the following mix is effective:
  - 1 cement : 6 sand: 1 lime on Aircrete.
- Ensure stainless steel wall ties are used to minimise corrosion and consequent staining.
- Sacrificial plasterboard can be used, but it needs to be removed between ground floor and flood level. The board should be fitted horizontally to make removal easier. In some cases a dado rail can be used to cover the joints.

Cavity External Walls- Part fill Option B



Part-filled cavity – Option B

- External cement based render, preferably with lime content. Composition depends on masonry; the following mixes are effective:
  - 1 cement : 4 sand: ½ lime on concrete blockwork
  - 1 cement : 6 sand: 1 lime on Aircrete.
- External face consisting of blocks.
- Rigid insulation.
- Internal face consisting of blocks.
- Internal cement based render, preferably with lime content. Composition depends on masonry; the following mix is effective for flood resilience:
  - 1 cement : 6 sand: 1 lime on Aircrete.
- Ensure stainless steel wall ties are used to minimise corrosion and consequent staining.

6.16 It is not possible to increase the FFL to avoid potential groundwater intrusion fully. The following interventions are proposed.

- Flow paths are provided around the proposed development, which groundwater will take in the event of groundwater emergence.

- It is proposed to add a tanking membrane up to 300mm above the ground level.

- It is proposed that new slabs be made of concrete and fully sealed.

7.1 The NPPF specifically stipulates that consideration should be given to potential off-site flood impacts of any proposed development. These off-site impacts are in relation to the following:

- Surface water management

- Flood flow conveyance, storage and climate change

Surface Water Management

7.2 The surface water run-off will be disposed of using SuDS techniques. The aim is to provide a sustainable design that accommodates the proposed attenuation volume and replicates the existing drainage regime using the SuDS hierarchy, is shown in the figure below.

7.3 The Landis Top Soil classification is naturally wet. The SuDS techniques highlighted in red below could be used on-site. This assessment is based on the LANDIS Top Soil infiltration, ground conditions and available potential discharge points.

The SuDS Hierarchy (Source:EA Thames region, SuDS a practical guide)

Most Sustainable	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living Roofs	X	X	X
	Basins and Ponds - Constructed wetlands - Balancing Ponds - Detention basins - Retention Ponds	X	X	X
	Filter strips and Swales	X	X	X
	Infiltration Devices - Soakaways -Infiltration trences and basins	X	X	X
	Permeable Surfaces and Filter Drains - Gravelled areas - Solid Paving Blocks -Porous Paviours	X	X	
Least Sustainable	**Tanked Systems** - Over-sized pipes/tanks - Storms cells	X		

7.4 With no increase in the rate of surface water discharge from the site, compared to the site in its current configuration, the proposed development would have no adverse impact on surface water flood risk at the site or surrounding area. The SuDS should be designed at the detailed project stage.

Flood Flow conveyance and storage

7.5 Due to the size of the development and its location in the flood zone, flood compensation for this development is not required.

Residual Risk 8

8.1 This flood risk assessment has identified the potential flooding mechanisms that could affect the site. As part of this, the following residual risks have been evaluated.

Public safety and Site Access

8.2 This assessment has demonstrated that the proposed development will have no adverse impact on flood risk in the area surrounding the site. Available evidence indicates that the development would not change surface water generation. Therefore, there is no basis to indicate that, with respect to flood risk, the proposed development would adversely impact public safety.

8.3 It will be necessary to ensure that all building users are fully informed of procedures to be implemented during the threat of imminent flooding.

Flood Warning and evacuation

8.4 The site is located within an area covered by the Environment Agency Flood Alert service. It is recommended that the proposed development is registered with this service to receive early warning of imminent flood hazards.

8.6 The occupants of the site are encouraged to sign up for the alerts. They should use these to form an appropriate Flood Management and Evacuation Plan tailored to the use of the site before the site occupation. Table 4 below shows the actions that will be taken for each flood warning.

8.7 Action to be taken in the event of an Alarm being Raised or a Flood Warning Received:

a. Raise the alarm and evacuate the site following the established Fire Drill procedures. The main assembly is as per the main house fire drill assembly point.

b. Contact Emergency Fire Services (999) if necessary and Environment Agency Floodline: (0845 988 1188) if the event is unexpected.

c. If safe to do so, locate and turn off critical services, e.g. water, gas & electricity.

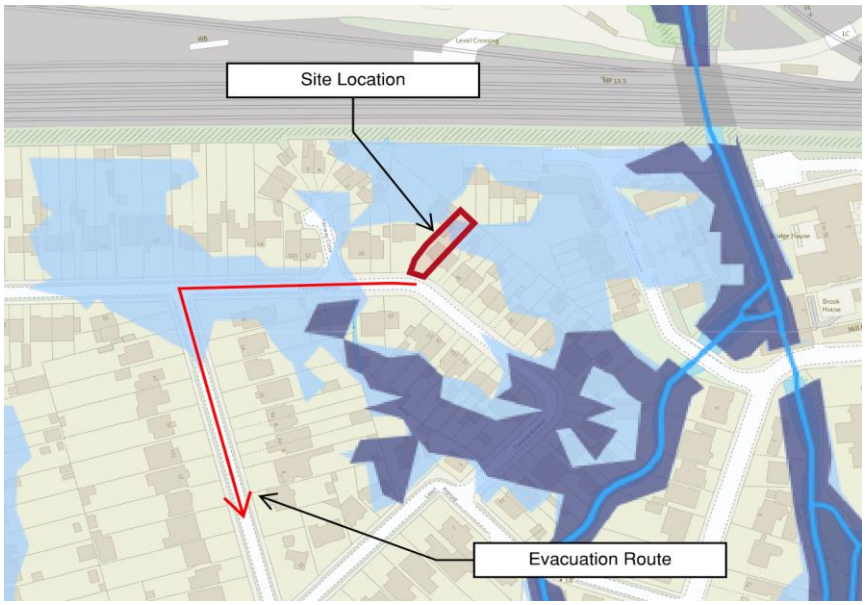
d. Follow the routes below to evacuate the site altogether.

Actions that will be taken for each flood warning

Warning	Message	Timing	Action
FLOOD ALERT	Flooding is possible. Be prepared.	2 hours to 2 days in advance of flooding.	- Be prepared for flooding. - Prepare a flood kit.
FLOOD WARNING	Flooding is expected. Immediate action required.	Half an hour to 1 day in advance of flooding.	- Act now to protect your property. - Block doors with flood boards or sandbags and cover airbricks and other ventilation holes. - Move pets and valuables to a safe place. - Keep a flood kit ready. - Move any critical equipment and information to a safe location
SEVERE FLOOD WARNING	Severe flooding. Danger to life.	When flooding poses a significant threat to life and different actions are required.	- Be ready should you need to evacuate from the property. - Co-operate with the emergency services and call 999 if you are in immediate danger.
Warning Removed	No further flooding is currently expected for your area.	Issued when a flood warning is no longer in force.	- Flood water may still be around and could be contaminated. - If you've been flooded, ring your buildings and contents insurance company as soon as possible.

8.8 Safe egress is achievable by followingFairway Avenue up to Sunray Avenue, which is shown to be beyond the extent of flooding. See figure below for details.

Evacuation Route



Conclusions 9

9.1 It is concluded that subject to the proposed mitigation measures, the site can be developed in accordance with the provisions of the NPPF and the requirements of the Environment Agency and the local planning authority.

9.2 This report demonstrates that the proposal will be safe, in terms of flood risk, for its design life and will not increase the flood risk elsewhere.