

Flood Risk Assessment

To accompany a planning application for an
extension to

St Eia, Hugh Street, St Mary's, Isles
of Scilly

Prepared by

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1 Executive Summary

- A The extension lies within an existing developed site and this is minor development;
- B The site lies, in part, in tidal Flood Zones 2 and 3 and is at a Medium risk from surface water flooding;
- C Flood resilience and mitigation methods will be implemented on site;
- D Predicted flood depths exceed 600mm hence the “water entry” strategy will be followed;
- E Access/egress routes are not affected and the site will be signed up to flood warning schemes;
- F There is no documented evidence of flood risk from any other sources;
- G The development does not impact on flood risk elsewhere;
- H Assuming the mitigation, warning and evacuation procedures can be maintained over the lifetime of the development, the proposed minor development to an existing dwelling within a developed area is considered acceptable.

Client actions required

- I Sign up to flood warning schemes.
- II Complete an emergency flood plan.

Designer actions required

- 1 Ensure plans and specification are updated to incorporate flood resilience and resistance measures prior to submission.
- 2 Ensure plans clearly show FFL of the extension is no lower than the existing FFL.
- 3 Confirm the design intention to manage surface water at source in line with current best practice and following the drainage hierarchy.

2 Introduction

2.1 Site location

The project is at St Eia, Hugh Street, St Mary's, Isles of Scilly, TR21 0LL (see Figure 1).



Figure 1: Site location plan, as indicated with North topmost. (source: EA flood mapping)

2.2 Development description

The proposal is for a domestic extension not exceeding 250m² in footprint. The site is an existing developed site and the proposed work is classed as minor development. The existing and proposed layouts and proposed sections are to be submitted under separate cover.

2.3 Site geology

Geological mapping data from within the vicinity indicate Head - Clay, silt, sand and gravel however this would require confirmation on site. If available on site, the superficial deposits may offer only medium permeability.

Infiltration SuDS may be viable subject to testing.

3 Policies

In preparation for this Flood Risk Assessment (FRA), National Planning Policy Framework^[4] and British Standards on Assessing and Managing Flood Risk^[2] were reviewed, and their related policies are, where applicable, referred to in this report.

The Environment Agency has been consulted in order to establish the flood zone of the proposed site.

In addition, planning policies from the Local Authority were also reviewed including its Strategic Flood Risk Assessment.

Some of key policies are summarised as below.

3.1 Standing Advice

Generally the following applies: Apart from habitable basements, domestic extensions within the curtilage of the dwelling (see GDPO definition of, minor development) and non-domestic extensions with a footprint of less than 250 m² will not require a detailed FRA. These applications should demonstrate that the risk of flooding from all sources has been assessed. The main sources of flooding are likely to be tidal, surface water and sewer flooding.

3.2 Environment Agency Guidance on Standing Advice

- You need to provide a plan showing the finished floor levels and the estimated flood levels.
- Make sure that floor levels are either no lower than existing floor levels or 300 millimetres (mm) above the estimated flood level. If your floor levels aren't going to be 300mm above existing flood levels, you need to check with your local planning authority if you also need to take flood resistance and resilience measures.
- State in your assessment all levels in relation to Ordnance Datum (the height above average sea level). You may be able to get this information from the Ordnance Survey. If not, you'll need to get a land survey carried out by a qualified surveyor.
- Your plans need to show how you've made efforts to ensure the development won't be flooded by surface water runoff, eg. by diverting surface water away from the property or by using flood gates.

- If your minor extension is in an area with increased flood risk as a result of multiple minor extensions in the area, you need to include an assessment of the off-site flood risk. Check with your local planning authority if this applies to your development.
- Make sure your flood resistance and resilience plans are in line with the guidance on improving the flood performance of new buildings.

For all relevant vulnerable developments (ie more vulnerable, less vulnerable and water compatible), you must follow the advice for:

- surface water management
- access and evacuation
- floor levels
- extra flood resistance and resilience measures

4 Flood risk analysis

4.1 Sources of potential flooding

Flood risk from various sources at the site is analysed in this section.

4.1.1 Flood risk from sea and rivers

Flooding can also take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.

The site is not at risk from fluvial flooding.

Flooding can occur from the sea due to a particularly high tide or surge, or combination of both.

With reference to the Environment Agency flood map, Figure 2, the site lies, in part, in Flood Zone 2 and immediately adjacent to flood Zone 3. This means that the front of the site has a High probability of tidal flooding (greater than a 1 in 200yr annual probability of flooding).

The rear of the site is however shown to be in Flood Zone 1 and at a Very Low risk from Tidal flooding.



Figure 2: Flood mapping from the EA online data. The site falls within Flood Zone 3

4.1.2 Tidal surge

The site falls outside of an area at risk from a tidal surge, the predicted extents of which are shown as red lines in Figure 3.



Figure 3: Site location relative to the extents of a tidal surge

4.1.3 Historic tidal flood events

No records of historic flooding to the site have been identified.

4.1.4 Flood risk from groundwater

Groundwater flooding occurs when water levels in the ground rise above surface levels. It is most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather. This site is considered to be in an area at a Medium risk.

Since the proposed development does not involve any basement elements, the impact of groundwater flooding on the proposed site will be minimal.

Hence, the relative risk of groundwater flooding on the proposed site can be considered to be Low.

4.1.5 Flood risk from sewer and highway drains

Flooding occurs when combined, foul or surface water sewers and highway drains are temporarily over-loaded due to excessive rainfall or due to blockage.

There are no indicators to Sewer flooding at the site.

Hence, the risk of sewer flooding to the site can be considered to be Negligible.

Highway flooding will manifest as surface water flooding at this location.

4.1.6 Flooding risk from surface water

Flooding occurs when rainfall fall on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.

With reference to the E.A online mapping, Figure 4, the front of the site is at High risk from surface water flooding (>1 in 30yr) associated with a natural dip in the adjacent highway.

For the design period, 1 in 100yr event estimated flood depths in relation to the rear extension are predicted to 300mm above relative ground level as shown in Figure 5.

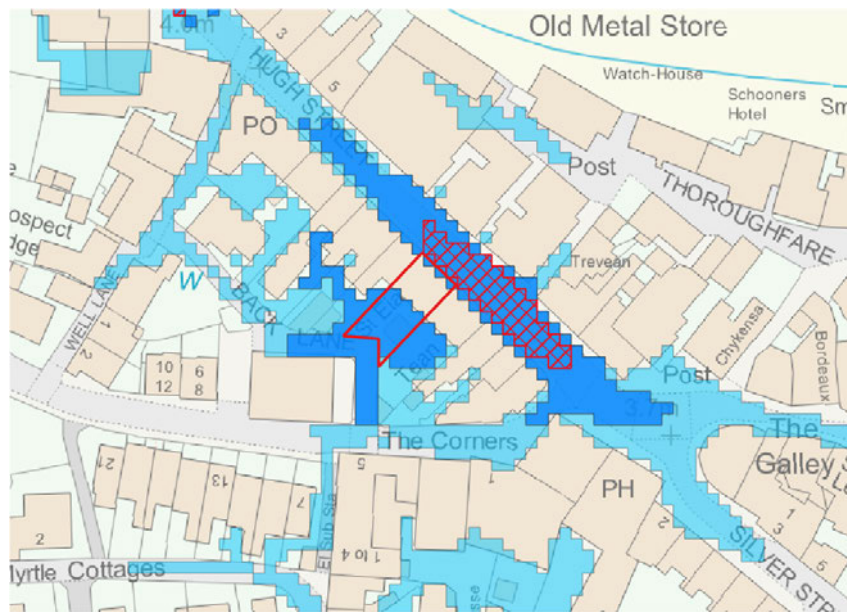


Figure 4: SW flood extent mapping. The front of the site is shown to be at a High risk from SW flooding.

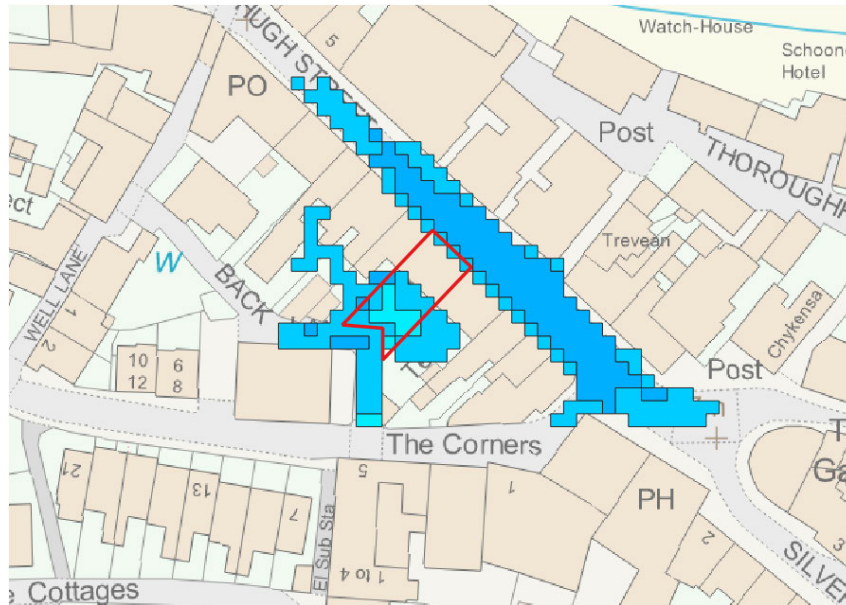


Figure 5: 1 in 100yr SW flood depth mapping. The rear of the site is at risk with predicted flood depths to 300mm

4.1.7 Flood risk from infrastructure failure

Flooding occurs because of canals, reservoirs, industrial processes, burst water mains or failed pumping stations.

The site is not in an area with a flood risk due to reservoir failure.

Hence the flood risk to the site from reservoir failure is considered to be Negligible.

4.1.8 Urban flash flooding

With reference to the UFF dataset there are no referenced flash flood incidents at this location.

4.2 On-site surface water analysis and management

4.2.1 Generation of Run-off

The post-development surface water run-off volume will increase when compared to the pre-development level because there is an overall reduction in permeable areas.

Hence all additional surface water arising will be managed on site in line with current best practice following the drainage hierarchy.

4.2.2 SuDS Statement:

Surface water will be managed in full alignment with the SuDS hierarchy as required under provisions made under the Town and Country Planning Act 1990.

While not required for Planning permission consent it can be confirmed that all SW on site will be also be designed, installed and tested in full accordance with Part H of the Building Regulations 2010 (as amended 2013), Requirement H3, as made under the Building Act 1984.

It is possible that soakaways will be viable hence the recommendation of this report would be to adopt the use of a shallow soakaway if ground conditions allow.

Otherwise the use of a small raised rain-garden planter and water butt would be an equally a viable and proportionate SuDS solution with the naturally reduced outfall from these taken to the existing drainage provision on site.

4.3 Impact on flood risk elsewhere

SW arising: Since the proposal is intending to manage any additional surface water at source the impact on flood risk elsewhere is Low.

5 Levels

5.1 Tidal flood levels and depths

5.1.1 Mean High Water Spring Level 2017

The MHWS for at the nearest EA model node (St Mary's) is 2.7m AOD

5.1.2 Highest Astronomical Tide

The HAT for at the nearest EA model node (St Mary's) is 3.4m AOD

5.1.3 Extreme Sea Level values 2017

The design period 1 in 200yr ESL for at the nearest EA model node (St Mary's) is 3.79m AOD

5.1.4 Climate change allowance

Assuming a design life of 100 years or greater (to epoch beyond 2100) then with a further Upper End climate change allowance of +1.62m then the design period extreme flood level is 5.41m AOD.

5.2 Surface water flood depths

Flood depths to 300mm externally.

5.3 Floor level data

The proposed floor level to be no lower than any existing ground floor levels at circa 4.10m AOD.

6 Management of flood risk

6.1 Flood risk resilience measures

Because the site is located in Flood Zone 3, and floor levels are not higher than 300mm above predicted flood levels, it is a recommendation¹ of this report that flood risk resilience measures should be incorporated into the development's construction, specifically at ground floor and all construction below such that "the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment"^[4].

For the purpose of the following guidance the estimated flood level is 5.41m AOD.

The Government's guidance states:

The design should be appropriately flood resistant and resilient by:

- using flood resistant materials that have low permeability to at least 600mm above the estimated flood level;
- making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level;
- using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level;
- by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level;
- making it easy for water to drain away after flooding such as installing a sump and a pump;
- making sure there is access to all spaces to enable drying and cleaning;
- ensuring that soil pipes are protected from back-flow such as by using non-return valves.

In accordance with the document "Improving the Flood Performance of New Buildings - Flood Resilient Construction"^[3] a series of design approaches should be planned to mitigate the flood risk based on the flow chart as at Figure 6.

¹While the actual choice of resilience measures is not a Statute requirement under the T&CP Act 1990, the designer should follow best practice guidance to meet NPPF:167(b). Hence the designer is advised to consider in full such recommendations so that NPPF:167(b) is met and compliance with Part C of the Building Regulations 2010 can later be demonstrated to the B.C.B.

Note predicted flood depths exceed 600mm hence the “water entry” strategy should be followed.

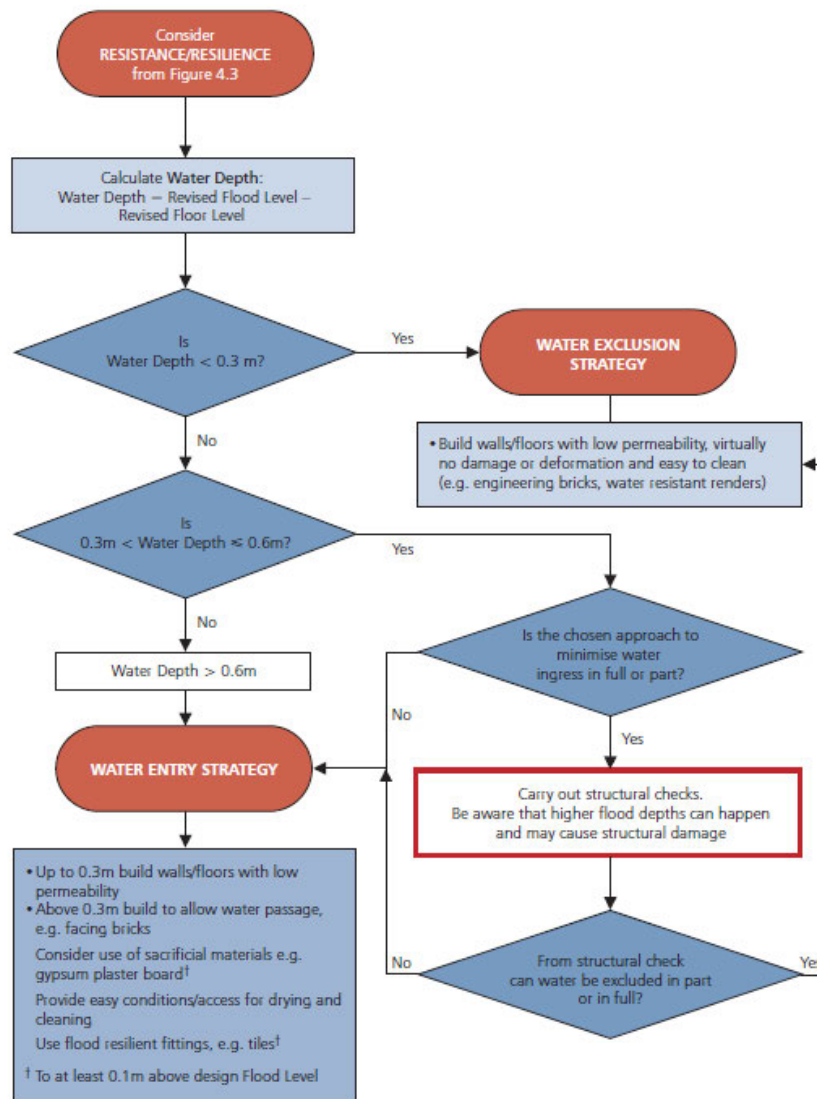


Figure 6: Design strategies for resistance and resilience^[3]

Table 1 provides guidance on which materials are most suitable, suitable and unsuitable, when considering construction work involved in this project. This report recommends the use of materials from the “most suitable” column were this is at all possible on site, however they are not mandatory requirements.

Component	Most suitable	Suitable	Unsuitable
Flooring	Concrete, pre-cast or in situ	Timber floor, fully sealed, use of marine plywood.	Untreated timber, Chipboard
Floor Covering	Clay tiles, Rubber sheet floors, Vinyl sheet floors	Vinyl tiles, Ceramic tiles	
External Walls - to max flood level	Engineering brick, Reinforced concrete	Low water absorption brick	Large window openings
Doors	Solid panels with waterproof adhesives, Aluminium, plastic or steel	Epoxy sealed doors	Hollow core plywood doors
Internal Partitions	Brick with waterproof mortar, Lime based plasters	Common bricks	Chipboard, Fibreboard panels, Plasterboard, Gypsum plaster
Insulation	Foam or closed cell types	Reflective insulation	Open cell fibres
Windows	Plastic, metal	Epoxy sealed timber with waterproof glues and steel or brass fittings.	Timber with PVA glues and mild steel fittings

Table 1: Summary of Material Suitability for Building Components^[1]

6.2 Flood mitigation measures

The designer is also recommended to consider the provision of a combination of the following flood mitigation measures, to be installed if at all practicable, for use within and around the extension for use in any flooding event:

- Flood resilient doors: Specifically designed to prevent ingress of flood water - passive system (see also Figure 7).
- Door defence: Bespoke barriers fitted externally across doors and low windows and/or the provision of filled sandbags (see also Figures 8 & 9).

- Anti flood air bricks: Where these are unavoidable, these offer replacements for standard air bricks these prevent water entering the sub floor void - passive system i.e. fully automatic (see also Figure 10).
- Air brick and flue covers (see also Figure 11).
- No service penetrations or other openings (cat flaps and letter boxes included) below 1m above FFL.



Figure 7: UPVC doors under flood conditions. These appear to offer reasonable flood resilience



Figure 8: Flood gate example.



Figure 9: Sand bag defence.



Figure 10: Anti flood air brick. Example from CSI products



Figure 11: Air brick covers. Example from Buffalo products

7 Management of residual risk

Any residual risk can be safely managed by not impairing access and evacuation routes, signing residents up to flood warning schemes and preparation of domestic flood plans.

7.1 Safe access and egress routes

The NPPF stipulates that, where required, safe access and escape routes should be available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access and exit buildings in design flood conditions. The extension does not impact on existing access and egress routes. It is noted that the existing routes are within the flood risk zone (ref Figure 12).

It should be noted that tidal flood events are generally more predictable than fluvial events due to the cyclic nature of the tides and hence (given this the main town on the island) early warning is expected to be widely broadcast. It is therefore important that the occupiers gain early warning of any likely flood events.

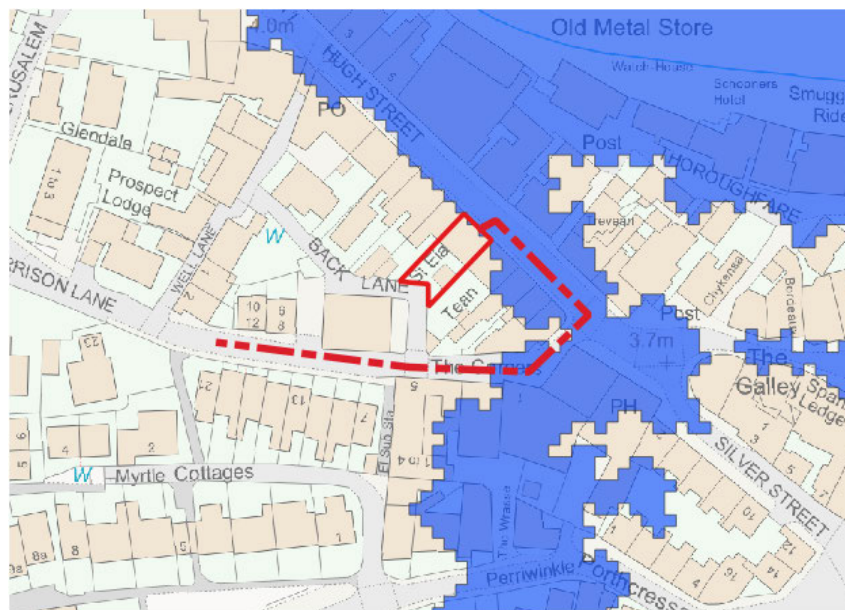


Figure 12: Access and Egress routes, although not ideal, are however existing and not impacted by the extension.

7.2 Flood warning schemes

Since it has been established that the site is sited in an area with a possibility of flooding the owners of the dwelling should (if they have not done so already) sign up to the E.A.

“Flood Warnings Direct” which is a free service providing flood warnings by phone, text or email. See <https://www.fws.environment-agency.gov.uk/app/olr/register>, or call the E.A. on 0345 988 1188 for full information.

7.3 Flood Plan

The project team will also provide the owners of the dwelling with a proforma Flood Plan (See Appendix A for an example). The plan will provide guidance on emergency response procedures in the event of flooding to the site. This will:

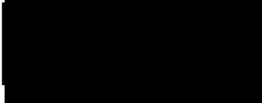
- Provide details of who to contact and how;
- Provide details of how to turn off gas, electricity and water mains supplies;
- Provide details of designated safe egress routes out of the building and out of the local area at risk;
- Provide details of E.A. Flood warning codes;
- Provide details of local radio stations
- Provide a check list of essential items.

8 Conclusions

Given that:

- The extension lies within an existing developed site and this is minor development;
- The site lies, in part, in tidal Flood Zones 2 and 3 and is at a Medium risk from surface water flooding;
- Flood resilience and mitigation methods will be implemented on site;
- Predicted flood depths exceed 600mm hence the “water entry” strategy will be followed;
- Access/egress routes are not affected and the site will be signed up to flood warning schemes;
- There is no documented evidence of flood risk from any other sources;
- The development does not impact on flood risk elsewhere;

and assuming the mitigation, warning and evacuation procedures can be maintained over the lifetime of the development, the proposed minor development to an existing dwelling within a developed area is considered acceptable.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD


Date: 28th September, 2023

References

- [1] J Wingfield; M Bell; P Bowker. Improving the flood resilience of buildings through improved material, methods and details. Technical Report WP2c, CIRA, 2005.
- [2] BSI. BS 8533:2011. Technical report, 2011.

- [3] CIRIA, CLG, EA and DEFRA. Improving the flood performance of new buildings. Flood resilient construction, 2007.
- [4] Ministry of Housing, Communities and Local Government. National planning policy framework. 2021.

A Emergency flood plan (example)



Environment Agency

Personal flood plan

Name

Are you signed up to receive flood warnings?
 If not call Floodline on 0345 988 1188 to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline on 0345 988 1188.
 This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		0345 988 1188
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	


Who can help/who can you help?

Relationship	Name	Contact details	How can they/you help?
Relative			
Friend or neighbour			

Be prepared for flooding. Act now

Personal flood plan

What can I do NOW?



Put important documents out of flood risk and protect in polythene

Check your insurance covers you for flooding

Look at the best way of stopping floodwater entering your property

Make a flood plan and prepare a flood kit

Find out where you can get sandbags

Identify who can help you/ who you can help

Identify what you would need to take with you if you had to leave your home

Understand the flood warning codes

What can you do if a flood is expected in your area?

Actions	Location
<p>Home</p> <ul style="list-style-type: none"> ● Move furniture and electrical items to safety ● Put flood boards, polythene and sandbags in place ● Make a list now of what you can move away from the risk ● Turn off electricity, water and gas supplies ● Roll up carpets and rugs ● Unless you have time to remove them hang curtains over rods ● Move sentimental items to safety ● Put important documents in polythene bags and move to safety 	
<p>Garden and outside</p> <ul style="list-style-type: none"> ● Move your car out of the flood risk area ● Move any large or loose items or weigh them down 	
<p>Business</p> <ul style="list-style-type: none"> ● Move important documents, computers and stock ● Alert staff and request their help ● Farmers move animals and livestock to safety 	
<p>Evacuation - Prepare a flood kit in advance</p> <ul style="list-style-type: none"> ● Inform your family or friends that you may need to leave your home ● Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons 	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at www.bluepages.org.uk

Be prepared for flooding. Act now

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