FLOOD RISK AND DRAINAGE SOLUTIONS

NPPF Flood Risk Assessment

Proposed Garage at Wendlebury Village Hall, Bicester

Report No: 2019-027

Client: Kerry Wilce

Date: 02/04/2019

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Document Control

Document Title: Flood Risk Assessment

Project Number: 2019-027

Revision	Date	Issued to	Status	Comments
/	02/04/2019	Kerry Wilce	Final	

Contract

This report describes work commissioned by Kerry Wilce on behalf of his client dated 22nd March 2019. Chris Vose of Flood Risk and Drainage Solutions carried out the work.

Disclaimer

This document has been prepared solely as a Flood Risk Assessment for the client of Kerry Wilce. Flood Risk and Drainage Solutions accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

Executive Summary

Flood Risk and Drainage Solutions have been appointed by Kerry Wilce on behalf of his client to provide a Flood Risk Assessment in support of a planning application which includes the erection of a new garage at Wendlebury Village Hall in Bicester, Oxfordshire.

The site is shown to be situated within Flood Zone 3 on the Environment Agency Flood Map and therefore has a high risk of fluvial flooding.

An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial source Wendlebury Brook and surface water flooding.

The proposed garage will be located to the south east of the Wendlebury Village Hall site, between the hall and an existing shed/outbuilding, on land which currently comprises of an access track, with Wendlebury Brook located adjacent to the east boundary.

At the time of writing a topographical survey was not available, therefore the average ground level of the proposed footprint of the garage was ascertained using LIDAR Data as 62.238m AOD.

Wendlebury Brook is the closest watercourse located approximately 5.500m to the east of the proposed garage and flows in a southerly direction.

Pluvial: Surface Water Flooding

Low Risk Event

During the low-risk event the site is expected to experience flooding to depths between 300mm and 900mm with a velocity over 0.25m/s. During this event the EA Surface Water Flood Map shows the field directly downstream of the application site to be severely flooded, this is likely to be as a result of both surface water runoff and an interaction between fluvial flooding associated with overtopping of the banks of Wendlebury Brook.

Medium Risk Event

During the medium-risk event the overall severity of flooding is greatly reduced compared to the low risk event, flood depths are reduced to between 300mm-900mm with a velocity of less than 0.25m/s. Flooding during the medium risk event is considered to be as a result of surface water runoff and fluvial interaction.

High Risk Event

During the high-risk event i.e. most frequent the flooding on site has a depth of between 300mm-900mm and a velocity of less than 0.25 m/s. Surface water flows during this event is likely to be a result of surface water flowing overland making its way into the watercourse.

Providing that mitigation measures are incorporated into the design of the garage as described within Section 7.0 of this report, the risk of pluvial flooding can be suitably managed.

Fluvial: Wendlebury Brook

The Environment Agency have provided flood levels associated with Wendlebury Brook at a number of node locations within the vicinity of the site, the closest node is Node Ref: 061_14_2014_001WB_958_MIN located adjacent to Wendlebury Village Hall.

Furthermore, it is noted that the application site is not located within an area benefiting from flood defences.

1 in 100 Year Event

The 1 in 100 year flood level associated with Wendlebury Brook is anticipated to be 62.300m AOD.

The current ground level associated with the garage is 62.238m AOD.

As such during the 100 year event the existing ground level associated with the garage would flood to a depth of 0.062m.

1 in 100 Year + 20% Climate Change Event

The 1 in 100 year + 20% climate change flood level associated with Wendlebury Brook is anticipated to be 62.410m AOD.

As such during the 100 year + 20% climate change event the existing ground level associated with the garage would flood to a depth of 0.172m.

1 in 100 Year + Higher Central Allowance of 700mm

The 1 in 100 year + higher central allowance of 700mm flood level associated with Wendlebury Brook is anticipated to be 63.000m AOD.

As such during the 100 year + higher central climate change event the existing ground level associated with the garage would flood to a depth of 0.762m.

1 in 1000 Year Event

The 1 in 1000 year flood level associated with Wendlebury Brook is anticipated to be 61.840m AOD.

As such during the 1000 year event the existing ground level associated with the garage would flood to a depth of 0.398m.

Fluvial Conclusion

Following a review of the Environment Agency Flood Data, the existing level associated with the footprint of the garage would flood during all return periods from the 100 year event up to the 100 year plus higher central climate change event, which corresponds with the EA Flood Map.

Therefore, the application site is located within Flood Zone 3, however due to the nature of the development being classified as 'less vulnerable' and only used for vehicular storage the risk posed to people is considered to be low.

Furthermore, suitable mitigation measures will be incorporated into the garage to negate any volume displacement as a result of the building in the event of a flood, as outlined within Section 7.0 of this report.

Mitigation Measures

Finished Floor levels

Finished floor levels of the garage will be set at existing to allow level vehicular access which will reduce the impact of volume displacement as a result of the building.

Finished floor levels will remain the same as existing ground levels i.e. 62.238m AOD.

Flood Resilience/Resistance

Flood Resilience/Resistance = 100 year + Higher Central Climate Change Level = 63.000m AOD

- Careful consideration of materials: use low permeability materials to limit water penetration if dry proofing required. Consider applying a water-resistant coating.
- Avoid use of gypsum plaster and plasterboards; use more flood resistant linings (e.g. hydraulic lime, ceramic tiles). Avoid use of stud partition walls.
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property.

- Airbricks will be raised to as high as is feasible and practicable.
- Storage of any materials or possessions that may be susceptible to flood damage should be stored at a level of 63.000m AOD to limit the damage caused in the event of a flood.
- Front entrance will remain free of doors to allow flood water to migrate through the building
- Flood openings on west and east facing solid walls to allow flood water to migrate through the building

Flood Storage Compensation

Flood Storage Compensation would not be achievable within this specific situation as the total displaced volume required to be compensated would be in excess of 23m^3, which could not be accommodated onsite.

The proposed garage will be designed to allow flood water to migrate through the building during all events up to and including the 100 year + higher central allowance climate change flood level of 63.000m AOD.

Furthermore, the vehicle will be removed to higher ground upon receipt of flood warnings and/or flood alarm to prevent flood water displacement and damage.

This will be achieved by ensuring that the entrance remains free from doors and flood openings are incorporated into the west and east facing walls, designed to the following specification:

- Void openings to open all the way down to existing ground levels to allow free flow during a flood event
- Void openings to be constructed up to the 100 year + higher central allowance for climate change i.e. 63.000m AOD i.e. 0.762m high
- Minimum width of void 1m
- Spaced at a minimum of 2.5m apart
- Void grills bars spaced at 10cm centres to reduce the risk of blockage
- Slab to be sloped to facilitate flood waters escaping the property
- Periodic maintenance of grills to check for debris
- Maintenance to be undertaken following a flood event

Environment Agency Flood Warning Service

The application site is situated within an area covered by the Environment Agency's Flood Warning's Direct Service.

Due to the site being located within Flood Zone 3, it is advised that staff sign up to receive flood warnings to allow the vehicle to be removed well in advance of any actual onset of flooding.

Stand Alone Flood Alarm

Although the site is covered by the Environment Agency's Flood Warning service, it is also recommended that staff of Wendlebury Village Hall invest in a standalone flood alarm that will act as a primary or secondary flood alert system.

This should be located to the east of the garage set at a level below the floor level which will be triggered when flood water comes into contact with the device.

Removal of Vehicle into Flood Zone 1

Upon receipt of the Environment Agency Flood Warning staff must move the vehicle to a place of safety immediately via the following route:

- Out of the site north on Oxford Road
- West on Oxford Road
- Into Flood Zone 1

Business Flood Plan

It is also recommended that staff create a business flood plan. This is a simple document that assists the occupant to prioritise actions required at the property before, during and following a flood event.

A copy of a business flood plan template has been provided within the appendices of this report.

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1.0 Introduction

1.1 Terms of Reference

Flood Risk and Drainage Solutions have been appointed by Kerry Wilce on behalf of his client to provide a Flood Risk Assessment in support of a planning application which includes the erection of a new garage at Wendlebury Village Hall in Bicester, Oxfordshire.

The site is shown to be situated within Flood Zone 3 on the Environment Agency Flood Map and therefore has a high risk of fluvial flooding.

It is usual for the Environment Agency to raise an objection to development applications within the floodplain, or Zones 2 and 3 of the flood map, until the issue of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is in excess of 1 Hectare until suitable consideration has been given to the management of surface water runoff.

1.2 Objectives

The objective of this assessment is to evaluate the following issues in regard to flood risk at the application site.

- Suitability of the proposed development in accordance with current planning policy.
- Identify the risk to both the proposed development and people from all forms of flooding.
- Provide a preliminary assessment of foul and surface water management.
- Increasing the risk of flooding elsewhere e.g. surface water flows and flood routing.
- Recommendation of appropriate measures to mitigate against flooding both within the proposed development, and neighbouring land and property.

1.3 Data Sources

This assessment is based on desk-top study of information from the following sources:

- National Planning Policy Framework (2018)
- Planning Practice Guidance at www.gov.uk
- Building Regulations Approved Document H
- Environment Agency Flood Mapping
- Cherwell Level 1 Strategic Flood Risk Assessment Update Final Report May 2017
- Cherwell Level 2 Strategic Flood Risk Assessment Cherwell District Council May 2017
- British Geological Society – Historic Borehole Logs
- Cranfield University's Soilscape Viewer
- CIRIA C697 The SUDS Manual
- Chronology of British Hydrological Events (Dundee University)

2.0 Planning Policy Context

2.1 Approach to the Assessment

An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial source Wendlebury Brook and surface water flooding.

Consideration has also been given to the site flooding from secondary sources such as pluvial, groundwater; artificial water bodies; infrastructure failure and ponding.

The requirements for flood risk assessments are generally as set out in the 'Technical Guidance to the National Planning Policy Framework', updated in July 2018; and in more detail from the Environment Agency's 'Standing Advice on Flood Risk' available from www.gov.uk.

2.2 National Planning Policy Framework (NPPF)

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 Assessment for the area, and the interactive flood risk maps available on the www.gov.uk website.

A flood risk assessment should also be appropriate to the scale, nature and location of the development.

2.2.1 Site Specific Flood Risk Assessment Checklist

The following checklist has been extracted from Flood Risk & Coastal Change Section available from www.gov.uk, updated in July 2018.

1. Development site and location

Provide a description of the site you are proposing to develop, including, or making reference to, a location map which clearly indicates the development site.

A. Where is the development site located? (e.g. postal address or national grid reference)
B. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
C. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3).

Check the Flood Map for Planning (Rivers and Sea) and the Strategic Flood Risk Assessment for the area available from the local planning authority.

2. Development proposals

Provide a general summary of the development proposals, including, or making reference to, an existing block plan and a proposed block plan, where appropriate.

A. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
B. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development?
C. What is the expected or estimated lifetime of the proposed development likely to be? (E.g. less than 20 years, 20-50 years, 50-100 years?).

3. Sequential test

For developments in flood zones 2 or 3 only.

(If the development site is wholly within flood zone 1, this section can be skipped - go to section 4).

Describe how the sequential test has been applied to the development (if required, and as set out in paragraphs 101-104 of the National Planning Policy Framework); and provide the evidence to demonstrate how the requirements of the test have been met.

See paragraph 033 of the NPPF guidance for further information. (It is recommended that the Developer or Agent contacts the LPA to confirm whether the sequential test should be applied and to ensure the appropriate level of information is provided).

A. What other locations with a lower risk of flooding have you considered for the proposed development?
B. If you have not considered any other locations, what are the reasons for this?

C. Explain why you consider the development cannot reasonably be located within an area with the lowest probability of flooding (flood zone 1); and, if your chosen site is within flood zone 3, explain why you consider the development cannot reasonably be located in flood zone 2.
D. As well as flood risk from rivers or the sea, have you taken account of the risk from any other sources of flooding in selecting the location for the development?

Exception test

Provide the evidence to support certain development proposals in flood zones 2 or 3 if, following application of the sequential test, it is appropriate to apply the exception test, as set out in paragraphs 102-104 of the National Planning Policy Framework.

It is advisable to contact the local planning authority to confirm whether the exception test needs to be applied and to ensure the appropriate level of information is provided.

A. Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development?

B. How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere?
C. Will it be possible to for the development to reduce flood risk overall (e.g. through the provision of improved drainage)?

4. Climate Change

How is flood risk at the site likely to be affected by climate change? (The local planning authority's Strategic Flood Risk Assessment should have taken this into account). Further advice on how to take account of the impacts of climate change in flood risk assessments is available from the Environment Agency.

5. Site specific flood risk

Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. It would be helpful to include any evidence, such as maps and level surveys of the site, flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired through consultation with the Environment Agency, the lead local flood authority for the area, or any other relevant flood risk management authority. Alternatively, you may consider undertaking or commissioning your own assessment of flood risk, using methods such as computer flood modelling.

A. What is/ are the main source(s) of flood risk to the site? (E.g. tidal/sea, fluvial or rivers, surface water, groundwater, other?). You should consider the flood mapping available from the Environment Agency, the Strategic Flood Risk Assessment for the area, historic flooding records and any other relevant and available information.
B. What is the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency, the local planning authority's Strategic Flood Risk Assessment and any further flood risk information?

C. Are you aware of any other sources of flooding that may affect the site?
D. What is the expected depth and level for the design flood? See paragraph 055 of the NPPF guidance for information on what is meant by a "design flood". If possible, flood levels should be presented in metres above Ordnance Datum (i.e., the height above average sea level).
E. Are properties expected to flood internally in the design flood and to what depth? Internal flood depths should be provided in metres.
F. How will the development be made safe from flooding and the impacts of climate change, for its lifetime? Further information can be found in paragraphs 054 and 059 (including on the use of flood resilience and resistance measures) of the NPPF guidance.
G. How will you ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere? Have you taken into account the impacts of climate change, over the expected lifetime of the development? (e.g. providing compensatory flood storage which has been agreed with the Environment Agency).
H. Are there any opportunities offered by the development to reduce the causes and impacts of flooding?

6. Surface water management*

Describe the existing and proposed surface water management arrangements at the site using sustainable drainage systems wherever appropriate, to ensure there is no increase in flood risk to others off-site.

A. What are the existing surface water drainage arrangements for the site?
B. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?
C. What are the proposals for managing and discharging surface water from the site, including any measures for restricting discharge rates? For major developments (e.g. of ten or more homes or major commercial developments), and for all developments in areas at risk of flooding, sustainable drainage systems should be used, unless demonstrated to be inappropriate.
D. How will you prevent run-off from the completed development causing an impact elsewhere?
E. Where applicable, what are the plans for the ongoing operation and/or maintenance of the surface water drainage systems?

7. Occupants and users of the development

Provide a summary of the numbers of future occupants and users of the new development; the likely future pattern of occupancy and use; and proposed measures for protecting more vulnerable people from flooding.

A. Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use? If this is the case, by approximately how many will the number(s) increase?
B. Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change.
C. Where appropriate, are you able to demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g., residents who will sleep in the building; people with health or mobility issues; etc.,) will be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed?

8. Residual risk

Describe any residual risks that remain after the flood risk management and mitigation measures are implemented, and to explain how these risks can be managed to keep the users of the development safe over its lifetime.

A. What flood related risks will remain after the flood risk management and mitigation measures have been implemented?
B. How, and by whom, will these risks be managed over the lifetime of the development? (e.g., putting in place flood warning and evacuation plans).

9. Flood risk assessment credentials

Provide details of the author and date of the flood risk assessment.

A. Who has undertaken the flood risk assessment?
B. When was the flood risk assessment completed?

Other considerations

* Managing surface water

The site-specific flood risk assessment will need to show how surface water runoff generated by the developed site will be managed. In some cases, it may be advisable to detail the surface water management for the proposed development in a separate drainage strategy or plan. You may like to discuss this approach with the lead local flood authority.

Surface water drainage elements of major planning applications (e.g., of ten or more homes) are reviewed by the lead local flood authority for the area. As a result, there may be specific issues or local policies, for example the Local Flood Risk Management Strategy or Surface Water Management Plan, that will need to be considered when assessing and managing surface water matters.

It is advisable to contact the appropriate lead local flood authority prior to completing the surface water drainage section of the flood risk assessment, to ensure that the relevant matters are covered in sufficient detail.
Proximity to Main Rivers

If the development of the site involves any activity within specified distances of main rivers, a flood risk activity permit may be required in addition to planning permission.

For non-tidal main rivers, a flood risk activity permit may be required if the development of the site is within 8 metres of a river, flood defence structure or culvert.

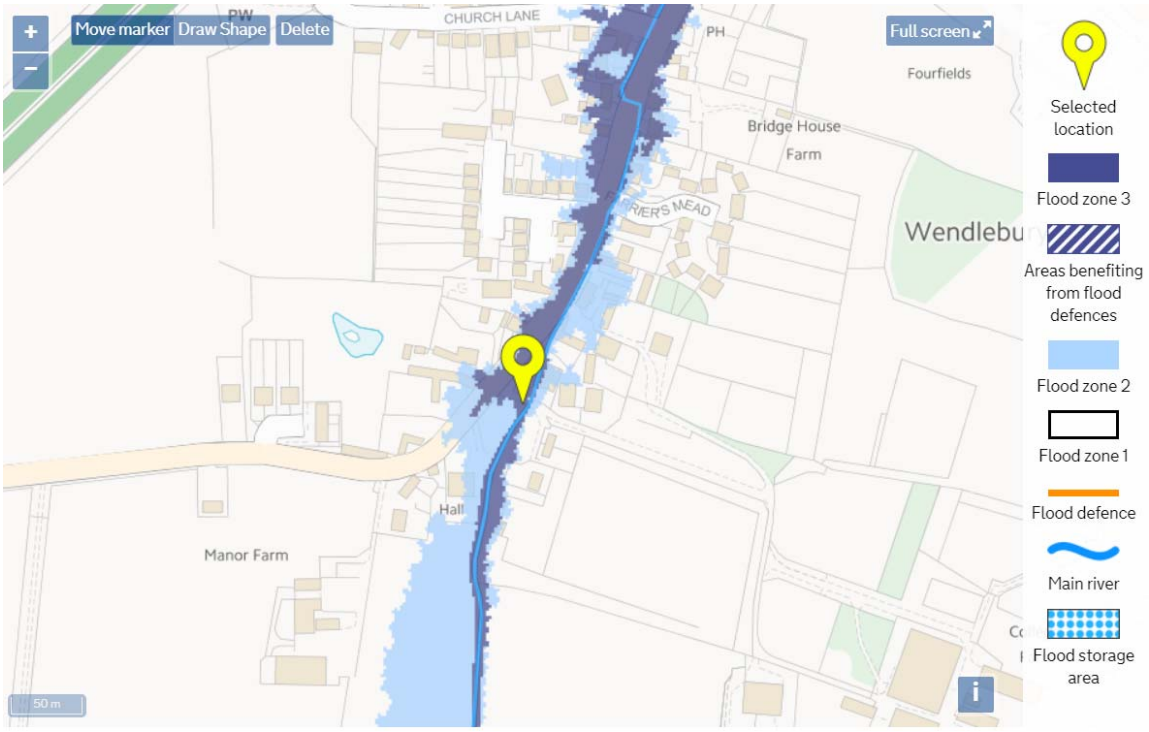
For tidal main rivers, a flood risk activity permit may be required if the development of the site is within 16 metres of a river, flood defence structure or culvert.

Details on obtaining a Flood Risk Activity Permit are available from the Environment Agency.

2.2.2 Sources of Flooding

- Rivers (fluvial): Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g. flash flooding; depends upon the characteristics of the river catchment.
- The Sea (tidal): Flooding at low lying coastline and tidal estuaries is caused by storm surges and high tides; with overtopping and breach failure of sea defences possible during extreme storm events.
- Pluvial (surface flooding or overland flows): Heavy rainfall, which is unable to soak away via infiltration or enter drainage systems can flow overland, resulting in localised flooding. Topography generally influences the direction and depth of flooding caused by this mechanism.
- Groundwater: Caused when ground water levels rise to the surface; and is most likely to occur in low lying areas underlain by aquifers.
- Sewers and drains: Generally occurs in more urban areas; where sewers and drains are overwhelmed by heavy rainfall or blocked pipes and gullies.
- Artificial Sources (reservoirs, canals, lakes and ponds): Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

Figure 2.1: The Environment Agency Flood Map



Source: www.gov.uk

2.2.3 Flood Zones

- Flood Zone 1: Low probability (less than 1 in 1000 year (<0.1% AEP) annual probability of river or sea flooding in any year.
- Flood Zone 2: Medium probability (between 1 in 100 year (1.0% AEP) and 1 in 1000 year (0.1% AEP) annual probability of river flooding; or between 1 in 200 year (0.2% AEP) and 1 in 1000 year (0.1% AEP) annual probability of sea flooding in any year).
- Flood Zone 3a: High probability (1 in 100 year (1.0% AEP) or greater annual probability of river flooding in any year or 1 in 200 year (0.5% AEP) or greater annual probability of sea flooding in any year).
- Flood Zone 3b: This zone comprises 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% AEP), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

2.2.4 Vulnerability of Different Development Types

- Essential Infrastructure: Transport infrastructure (railways and motorways etc...); utility infrastructure (primary sub-stations, water treatment facilities; power stations; and wind turbines).
- Water Compatible Development: Flood control infrastructure; water and sewage infrastructure; navigation facilities.
- Highly Vulnerable: Emergency services; basement dwellings; mobile home parks; industrial or other facilities requiring hazardous substance consent.
- More Vulnerable: Hospitals; residential dwellings; educational facilities; landfill sites caravan and camping sites.
- Less Vulnerable: Commercial premises; emergency services not required during a flood; agricultural land.

2.2.5 Sequential & Exceptions Test

As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new development to areas at the lowest probability of flooding.

The development proposals include the erection of a garage to store a community mini bus which would not be suitable within any other location, therefore the proposed development does not have to pass the Sequential and Exceptions Tests

2.2.6 Climate Change

The NPPF requires the application of climate change over the lifetime of a development. As of 3rd February 2017 the Technical Guidance for NPPF has updated the climate change allowances based on the river basin district. The climate change allowance was provided within the Environment Agency Flood Data for the Thames basin district and is provided within the figure below:

Figure 2.2: Environment Agency Climate Change Allowance

Table B – Local allowances for potential climate change impacts

Watercourse	Central	Higher central	Upper
Thames	500mm	700mm	1000mm

Use of these allowances will only be accepted after discussion with the Environment Agency.

Source: Environment Agency

Due to the proposed development being 'less vulnerable' and located within Flood Zone 3 the central and higher central allowance of 500mm and 700mm should be applied to peak river flow in accordance with current Environment Agency guidance.

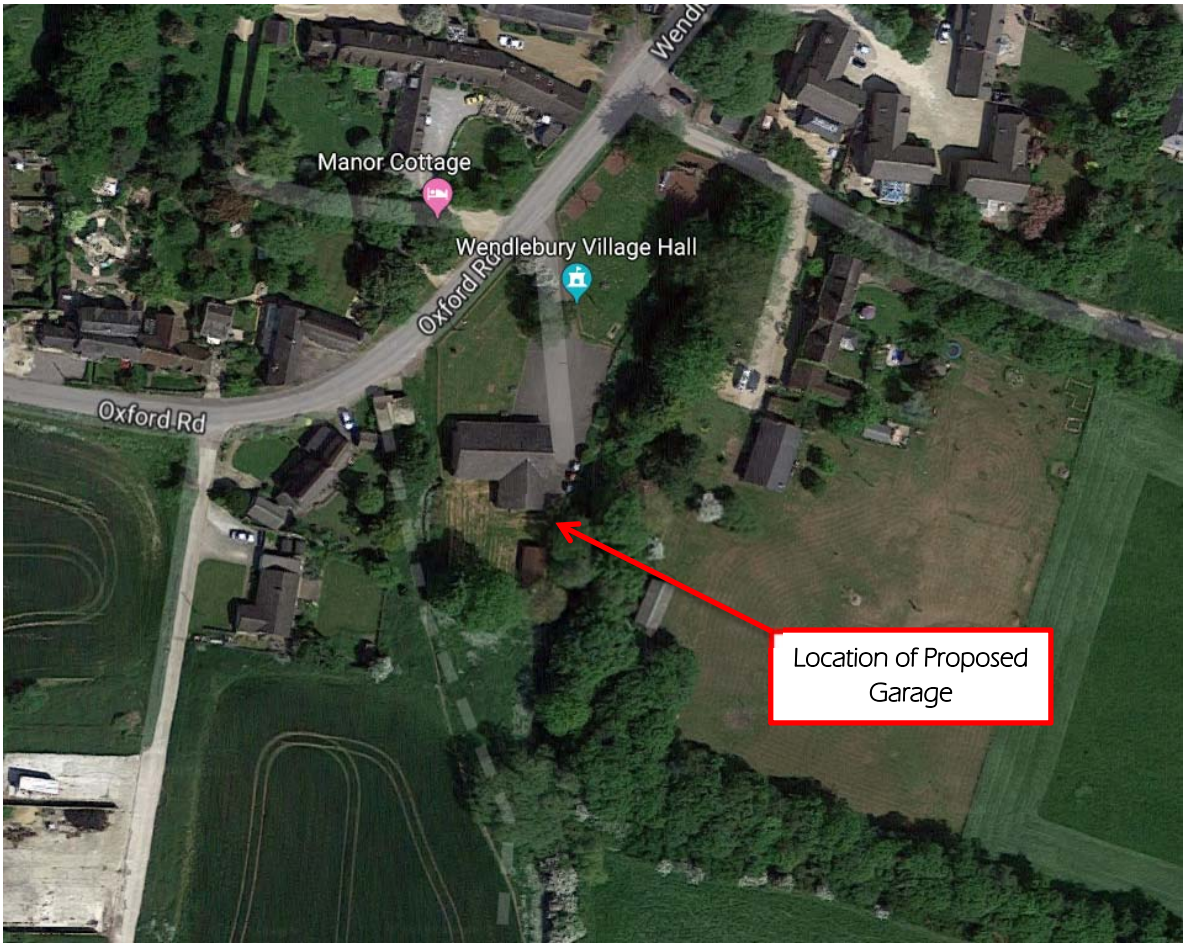
3.0 Details of the Site

3.1 Site Details

Table 1: Development Location

Site Name:	Garage at Wendlebury Village Hall
Purpose of Development:	Vehicle Storage
Existing Land Use:	Access Track
OS NGR:	SP560193
Country:	England
County:	Oxfordshire
Local Planning Authority:	Cherwell District Council
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:



Source: Google Earth

3.2 Site Description

The proposed garage will be located to the south east of the Wendlebury Village Hall site, between the hall and an existing shed/outbuilding, on land which currently comprises of an access track, with Wendlebury Brook located adjacent to the east boundary.

At the time of writing a topographical survey was not available, therefore the average ground level of the proposed footprint of the garage was ascertained using LIDAR Data as 62.238m AOD.

Wendlebury Brook is the closest watercourse located approximately 5.500m to the east of the proposed garage and flows in a southerly direction.

Table 2: Boundaries

North	Directly north of the site is the car parking area associated with Wendlebury Village Hall, beyond which is Oxford Road and residential development associated with the village of Wendlebury.
East	Directly east is Wendlebury Brook, beyond which are residential properties and an expanse of agricultural land.
South	Directly south of the site is an existing shed/outbuilding, beyond which Wendlebury Brook and an expanse of agricultural land.
West	Directly west of the site is garden area associated with Wendlebury Village Hall, beyond which are residential properties and an expanse of agricultural land.

Figure 3.1: Wendlebury Village Hall Viewed South from Oxford Road

Source: Google

3.3 Proposed Development Details

Development proposals comprise of the erection of a garage to storage the community mini bus at the east of Wendlebury Village Hall.

4.0 Historic Flooding

4.1 Internet Search

An internet search found numerous reports of flooding in Wendlebury, on the whole the most articles relate to flooding on the 19th October 2012 in which the Environment Agency failed to warn residents within the village prior to the onset of flooding resulting from Wendlebury Brook.

One article from the BBC dated 19/10/2012 states the following:

Wendlebury Brook burst its banks after 33mm (1.3 inches) of rain fell in six hours on Thursday morning.

As a result, houses and streets in the village were left underwater.

An agency spokesman said: "We failed to live up to the high standards we set for ourselves on this particular occasion."

The agency confirmed that both the flood alert and flood warning levels been breached overnight.

Thursday's flooding was the second in the village this year.

Julian Cordy said the weather was the main problem but he was also concerned about the brook in the village.

He added: "It fills up very quickly. It backs up, the drains can't cope, the sewage comes out and as you can see it just runs off the land into the houses, on to the roads and into the gardens."

He said the proposed Graven Hill relief road near the village would make the problem a lot worse and villagers were fighting to prevent it happening.

Lesley Bond has lived in Wendlebury for 30 years. In the last 20 years she has been flooded eight times and is now unable to get insurance on her property.

She said: "I've never actually seen the village so full of water, it's gone further this time than ever."

4.2 Cherwell Level 1 Strategic Flood Risk Assessment Update

The Cherwell Level 1 SFRA was undertaken by Aecom for Cherwell District Council and was released in May 2017, Section 4.2 Overview of Historic Flooding identifies that properties where flooded during 2007 and also in October/December in 2012.

The exact location, scale and magnitude of the flooding is not clear within the SFRA, therefore it is difficult to determine if the application site was affected.

4.3 Environment Agency

The Environment Agency have provided a Historic Flood Map which shows the extent of flooding during the June 2008 floods, the application site was not affected.

5.0 Initial Evaluation of Flood Risk

5.1 The Environment Agency Flood Map

The Environment Agency Flood Map illustrated within Figure 2.1, confirms that proposed development site is located in Flood Zone 3.

The definition for each of the flood zones highlighted above is provided for reference within Section 2.2.3 of this report.

5.2 Sources of Flooding

Table 3: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	Flood Zone 3 (Wendlebury Brook)
Canal	No	Not Applicable
Tidal/Coastal	No	Not Applicable
Reservoir	No	EA Map shows that the site is not affected by reservoir flooding.
Pluvial (urban drainage)	No	Garge located on land which comprises of hardstanding.
Groundwater	No	(AStGWF) shows that the site is not located the area considered to be at risk of groundwater flooding.
Surface Water Flooding	Yes	Site is located within an area that has a high risk of flooding
Overland Flow	Yes	High risk of surface water flooding
Blockage	No	Not Applicable
Infrastructure failure	No	Not Applicable
Rainfall Ponding	No	Not Applicable

From the initial assessment it is concluded that the primary source of flood risk will be from the fluvial source Wendlebury Brook and surface water flooding/overland flow.

Fluvial: Wendlebury Brook

Wendlebury Brook flows through the village of Wendlebury in a southerly direction, where is passes the site adjacent to the east boundary within a natural open channel.

The watercourse is designated as 'Main River' and therefore the Environment Agency have certain responsibilities regarding maintenance and management of the watercourse.

Due to the proposed development being located within Flood Zone 3 flooding from this mechanism requires further evaluation.

Groundwater

The Environment Agency's Areas Susceptible to Groundwater Flood Map identifies the application site to be located within an area at low risk of groundwater flooding.

Surface Water Flooding/Overland Flow

The Environment Agency's Surface Water Flood Map identifies that the application site has a high risk associated with pluvial (surface water) flooding, the definition of which is provided overleaf:

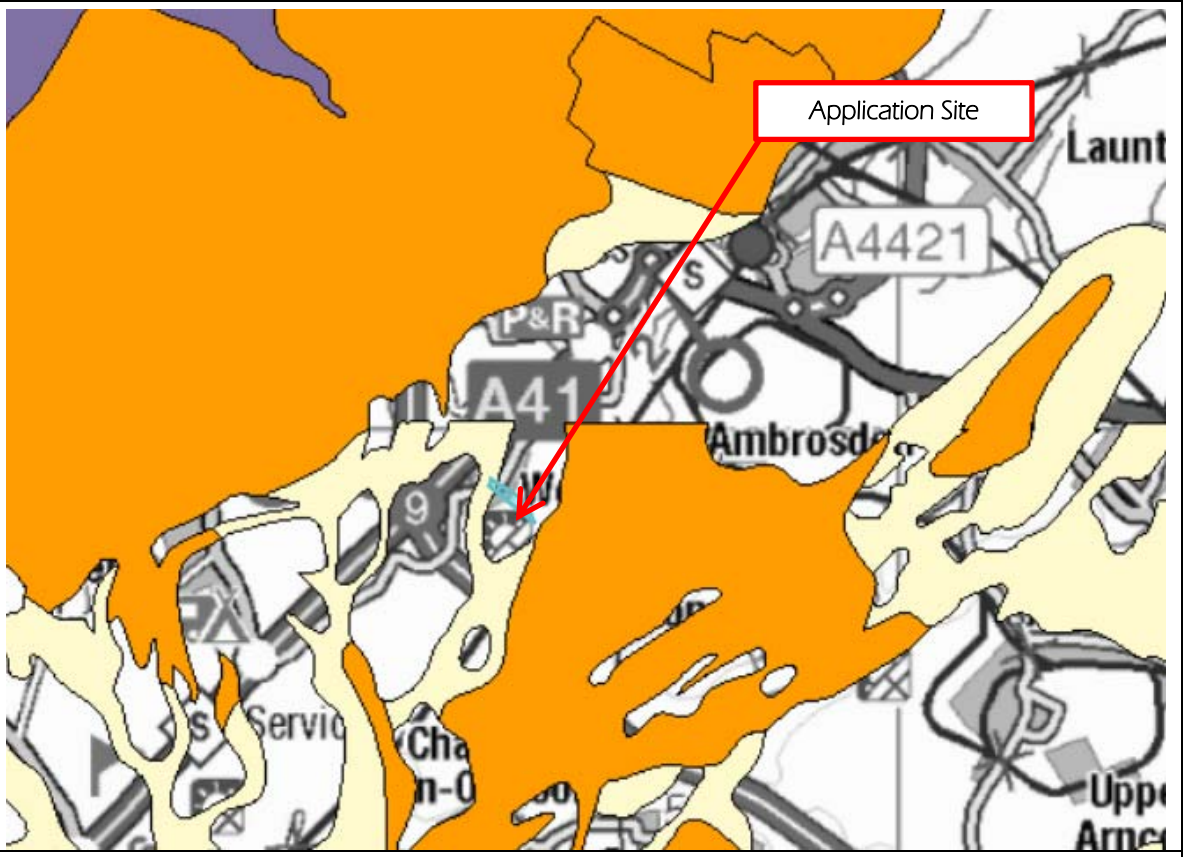
- **High risk** means that each year this area has a chance of flooding of greater than 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Due to the risk posed as a result of surface waterflooding/overland flow flooding from this mechanism requires further evaluation.

Flooding from Reservoirs

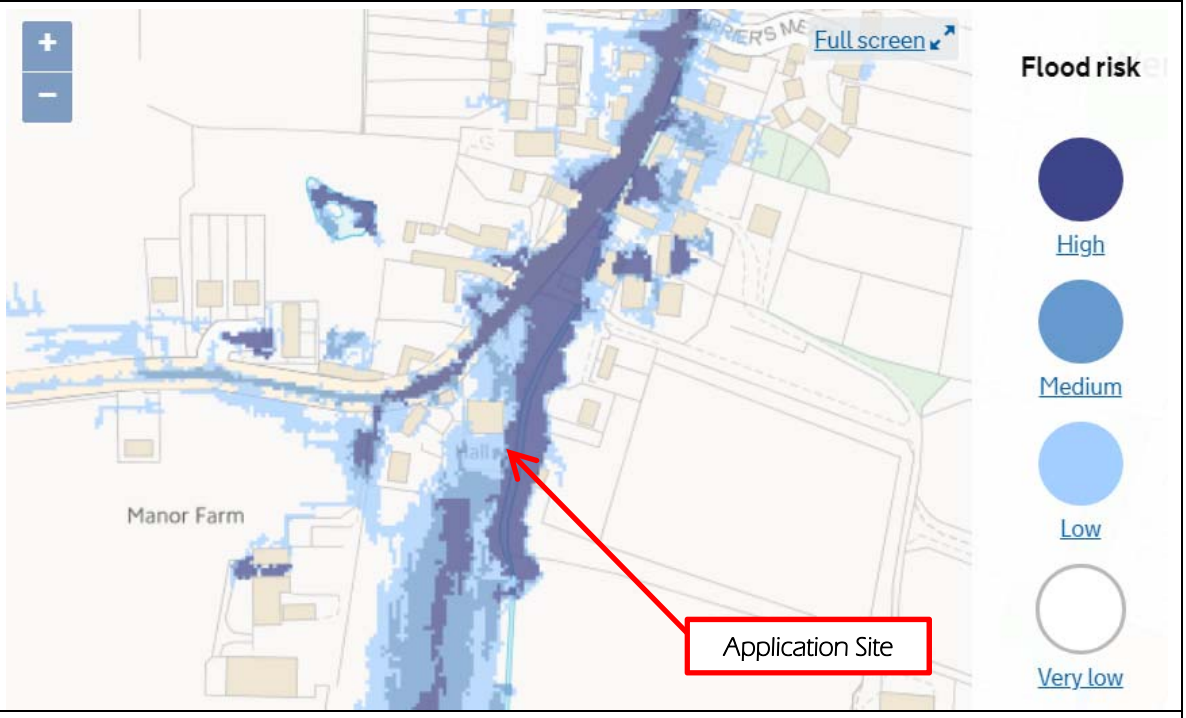
The Environment Agency's Flooding from Reservoirs map identifies that the proposed development will not be affected during breach or failure of any artificial bodies of water.

Figure 5.1: Environment Agency Groundwater Flood Map



Source: www.gov.uk

Figure 5.2: Environment Agency Surface Water Flood Map



Source: www.gov.uk

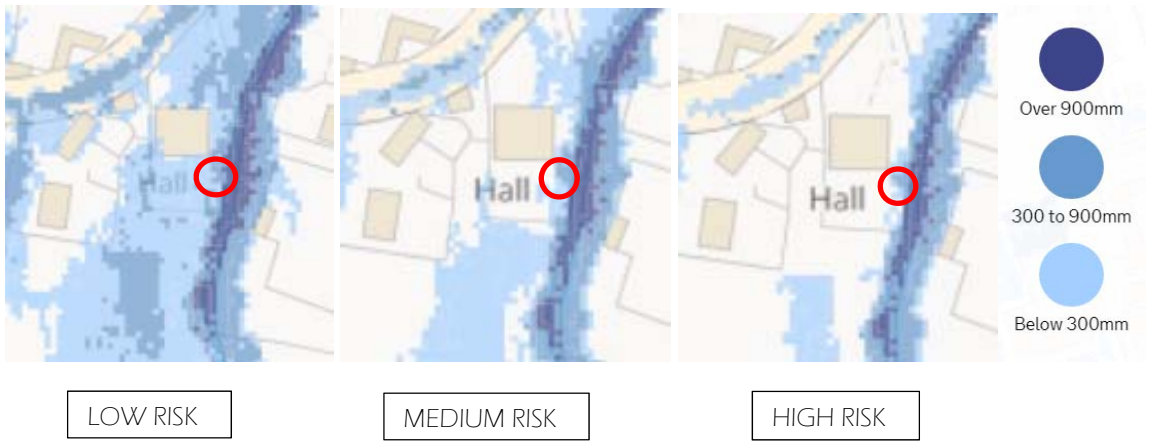
6.0 Quantitative Flood Risk Assessment

6.1 Pluvial / Overland Flow

6.1.1 General

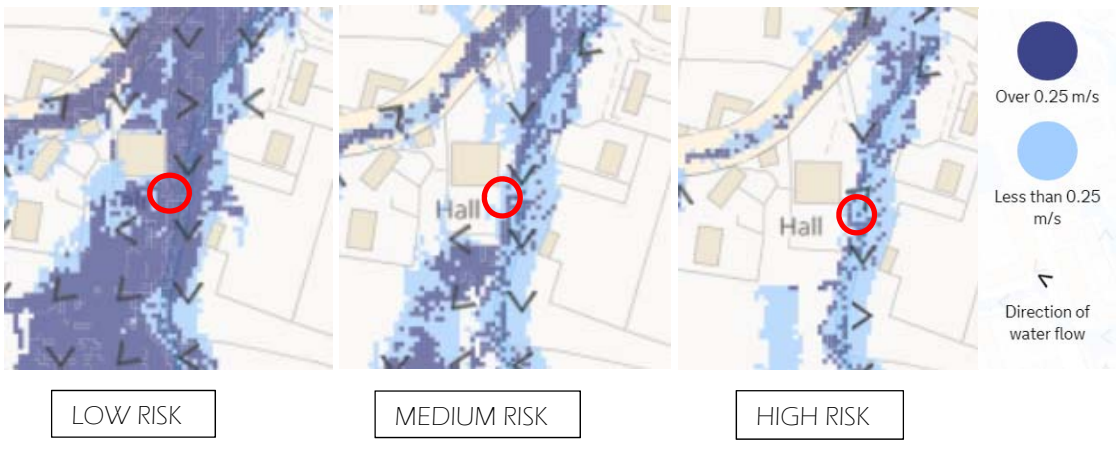
The area surrounding the proposed development site suffers from pluvial flooding, due to the scale and nature of surface water flooding it would be difficult to pin point the specific reason as to why this occurs. However, it is likely to be a mixture of low-lying topography, flow migration overland and a lack of capacity/drainage infrastructure within the immediate vicinity of the application site.

Figure 6.1: Environment Agency Surface Water Flood Depth



Source: www.gov.uk

Figure 6.2: Environment Agency Surface Water Flood Velocity



Source: www.gov.uk

Evaluation has been undertaken to determine flood depths and velocities within the footprint the proposed garage, this is shown below for a range of events.

6.1.2 Low Risk Event

During the low risk event (1:1000 year) the depths and velocities at the site are identified below:

- Depth = Between 300mm and 900mm

- Velocity = Over 0.25m/s

6.1.3 Medium Risk Event

During the medium risk event (1:100 year) the magnitude of flooding has reduced compared to the low risk even, the depths and velocities are identified below:

- Depth = Between 300mm – 900mm
- Velocity = Less than 0.25m/s

6.1.4 High Risk Event

During the high-risk event (1:30 year) the magnitude of flooding has reduced compared to the medium risk even, the depths and velocities are identified below:

- Depth = Between 300mm – 900mm
- Velocity = Less than 0.25m/s

6.1.5 Pluvial: Conclusion

During the low-risk event the site is expected to experience flooding to depths between 300mm and 900mm with a velocity over 0.25m/s. During this event the EA Surface Water Flood Map shows the field directly downstream of the application site to be severely flooded, this is likely to be as a result of both surface water runoff and an interaction between fluvial flooding associated with overtopping of the banks of Wendlebury Brook.

During the medium-risk event the overall severity of flooding is greatly reduced compared to the low risk event, flood depths are reduced to between 300mm-900mm with a velocity of less than 0.25m/s. Flooding during the medium risk event is considered to be as a result of surface water runoff and fluvial interaction.

During the high-risk event i.e. most frequent the flooding on site has a depth of between 300mm-900mm and a velocity of less than 0.25 m/s. Surface water flows during this event is likely to be a result of surface water flowing overland making its way into the watercourse.

Providing that mitigation measures are incorporated into the design of the garage as described within Section 7.0 of this report, the risk of pluvial flooding can be suitably managed.

6.2 Fluvial: Wendlebury Brook

6.2.1 General

Wendlebury Brook flows through the village of Wendlebury in a southerly direction, where is passes the site adjacent to the east boundary within a natural open channel.

The watercourse is designated as 'Main River' and therefore the Environment Agency have certain responsibilities regarding maintenance and management of the watercourse.

Due to the application site being located within Flood Zone 3 a comparison of flood levels associated with Wendlebury Brook and site levels is required to determine flood depths over various different return periods.

6.2.2 Environment Agency Modelled Flood Levels

The Environment Agency have provided flood levels associated with Wendlebury Brook at a number of node locations within the vicinity of the site, the closest node is Node Ref: 061_14_2014_001WB_958_MIN located adjacent to Wendlebury Village Hall.

Furthermore, it is noted that the application site is not located within an area benefiting from flood defences.

Table 4: Flood Levels (Node Ref: 061_14_2014_001WB_958_MIN)

Return Period	Flood Level (m AOD)
1 in 100 Year	62.300
1 in 100 Year + 20% Climate Change	62.410
1 in 100 Year + 700mm (Higher Central)	63.000
1 in 1000 Year	61.840

6.2.1 1 in 100-year Flood Event

The 1 in 100 year flood level associated with Wendlebury Brook is anticipated to be 62.300m AOD.

The current ground level associated with the garage is 62.238m AOD.

As such during the 100 year event the existing ground level associated with the garage would flood to a depth of 0.062m.

6.2.1 1 in 100-year + 20% Climate Change Flood Event

The 1 in 100 year + 20% climate change flood level associated with Wendlebury Brook is anticipated to be 62.410m AOD.

As such during the 100 year + 20% climate change event the existing ground level associated with the garage would flood to a depth of 0.172m.

6.2.2 1 in 100-year Flood Event + Higher Central Allowance 700mm

The 1 in 100 year + higher central allowance of 700mm flood level associated with Wendlebury Brook is anticipated to be 63.000m AOD.

As such during the 100 year + higher central climate change event the existing ground level associated with the garage would flood to a depth of 0.762m.

6.2.3 1 in 1000-year Flood Event

The 1 in 1000 year flood level associated with Wendlebury Brook is anticipated to be 61.840m AOD.

As such during the 1000 year event the existing ground level associated with the garage would flood to a depth of 0.398m.

6.2.4 Fluvial: Conclusion

Following a review of the Environment Agency Flood Data above, the existing level associated with the footprint of the garage would flood during all return periods from the 100 year event up to the 100 year plus higher central climate change event, which corresponds with the EA Flood Map.

Therefore, the application site is located within Flood Zone 3, however due to the nature of the development being classified as 'less vulnerable' and only used for vehicular storage the risk posed to people is considered to be low

Furthermore, suitable mitigation measures will be incorporated into the garage to negate any volume displacement as a result of the building in the event of a flood, as outlined within Section 7.0 of this report.

7.0 Mitigation Measures

7.1 Finished Floor Levels

Finished floor levels of the garage will be set at existing to allow level vehicular access which will reduce the impact of volume displacement as a result of the building.

Finished floor levels will remain the same as existing ground levels i.e. 62.238m AOD.

7.2 Flood Resistance/Resilience Measures

In order to provide an extra element of safety flood resilience/resistance measures as outlined below will incorporated into the buildings design, set to the undefended100 Year + higher central allowance flood level.

- Flood Resilience/Resistance = 100 year + Higher Central Climate Change Level = 63.000m AOD

Flood proofing is a technique by which buildings are designed to withstand the effects of flooding. There are two main categories of flood proofing, which are dry proofing and wet proofing.

Dry proofing methods are designed to keep water out of the building, and wet proofing methods are designed to improve the ability of the property to withstand effects of flooding once the water has entered the building.

In addition, fixtures and fittings should be built to withstand immersion in water or designed to be easily replaced.

Identified below are flood proofing measures which can be incorporated within the design for the proposed development works. Such measures are put forward in accordance with 'Development and Flood Risk Guidance for the Construction Industry' CIRIA C624.

Full details of manufacturer's or suppliers of flood protection equipment may be obtained from the Flood Protection Association (website: www.thefpa.org.uk).

Flood Resilience/Resistance Measures to be Incorporated into the Garage

- Careful consideration of materials: use low permeability materials to limit water penetration if dry proofing required. Consider applying a water-resistant coating.
- Avoid use of gypsum plaster and plasterboards; use more flood resistant linings (e.g. hydraulic lime, ceramic tiles). Avoid use of stud partition walls.
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property.
- Airbricks will be raised to as high as is feasible and practicable.
- Storage of any materials or possessions that may be susceptible to flood damage should be stored at a level of 63.000m AOD to limit the damage caused in the event of a flood.
- Front entrance will remain free of doors to allow flood water to migrate through the building
- Flood openings on all solid walls to allow water to migrate through the building

7.3 Flood Storage Compensation

Flood Storage Compensation would not be achievable within this specific situation as the total displaced volume required to be compensated would be in excess of 23m^3, which could not be accommodated onsite.

The proposed garage will be designed to allow flood water to migrate through the building during all events up to and including the 100 year + higher central allowance climate change flood level of 63.000m AOD.

Furthermore, the vehicle will be removed to higher ground upon receipt of flood warnings and/or flood alarm to prevent flood water displacement and damage.

This will be achieved by ensuring that the entrance remains free from doors and flood openings are incorporated into the west and east facing walls, designed to the following specification:

- Void openings to open all the way down to existing ground levels to allow free flow during a flood event
- Void openings to be constructed up to the 100 year + higher central allowance for climate change i.e. 63.000m AOD i.e. 0.762m high
- Minimum width of void 1m
- Spaced at a minimum of 2.5m apart
- Void grills bars spaced at 10cm centres to reduce the risk of blockage
- Slab to be sloped to facilitate flood waters escaping the property
- Periodic maintenance of grills to check for debris
- Maintenance to be undertaken following a flood event

7.4 Environment Agency Flood Warnings

The application site is situated within an area covered by the Environment Agency's Flood Warning's Direct Service.

Due to the site being located within Flood Zone 3, it is advised that staff sign up to receive flood warnings to allow the vehicle to be removed well in advance of any actual onset of flooding.

The Flood Warning's Direct Service is a free service which enables the Environment Agency to send a direct message when flooding is expected and may affect the development. Flood warnings are designed to provide businesses the time to prepare for flooding. Flood warnings can be sent by telephone, mobile, email SMS text message or fax.

The Environment Agency also provides the Floodline 0845 988 1188 service, where occupants can listen to recorded flood warning information for the area or speak to an operator for advice 24 hours a day.

Should a flood event reach the level where development is at risk of inundation, then the Environment Agency will issue a Severe Flood Warning.

Using the latest available technology, the Environment Agency is able to monitor rainfall, river levels and sea conditions 24 hours a day and use this information to forecast the possibility of flooding.

If flooding is forecast, they are able to issue warnings using a set of three different warning types.

Table 5: Environment Agency Flood Warning Codes

Flood Warning Code	What it means	When it's used	What to do
	Flooding is possible. Be prepared.	2 hours – 2 days in advance of flooding.	• Be prepared to act on you flood plan • Prepare a flood kit • Monitor local water levels and the flood forecast of the EA website
	Flooding is expected. Immediate action is required.	½ hour – 1 day in advance of flooding.	• Move people to a safe place • Turn of gas, electricity and water supplies if safe to do so • Put flood protection equipment in place

	Severe flooding. Danger to life.	When flooding poses a significant threat to life.	• Stay in a safe place with means of escape • Be ready to evacuate • Co-operate with the emergency services • Call 999 if you are in immediate danger
Warnings no longer in force	No further flooding is currently expected in your area	When river or sea conditions begin to return to normal	• Be careful as flood water may still be around for several days • If you have been flooded, ring your insurance company as soon as possible

How are Flood Warnings issued?

- Direct to you – receive warnings by phone, text, email or fax. Sign up for the Environment Agency's FREE Floodline Warnings Direct service via this website link: https://www.fws.environment-agency.gov.uk/app/olr/register or by calling Floodline on 0845 988 1188.
- On the flood warnings website – view up-to-date information about flood warnings in force, monitor the river or sea levels in your area and check out the latest flood risk forecast for your county.
- By calling Floodline on 0845 988 1188 – you can listen to recorded information on the latest warnings and predictions or speak to an operator for more general information 24 hours a day. Environment Agency operators can also provide a quick dial number which gives you faster access to information for your area.
- Through the media – you may see or hear Environment Agency warnings on television and in radio broadcasts. You can also view the latest warnings on Digital Ceefax page 405.
- Flood Wardens – in some areas Flood Wardens are there to alert and support their local community when a flood warning is issued. Call Floodline on 0845 988 1188 to find out if this service is available in your area.
- Sirens/loudhailers – in some areas the Environment Agency uses loudhailer or siren systems to warn people that a flood warning has been issued. Call Floodline on 0845 988 1188 to find out if this type of service operates in your area.
- Flood warning feeds – Flood warning (RSS) feeds shows national and regional flood warnings in force and are updated every 15 minutes. The feeds contain a brief summary and link to the full information on the Environment Agency website.

7.5 Stand Alone Flood Alarm

Although the site is covered by the Environment Agency's Flood Warning service, it is also recommended that staff of Wendlebury Village Hall invest in a standalone flood alarm that will act as a primary or secondary flood alert system.

This should be located to the east of the garage set at a level below the floor level which will be triggered when flood water comes into contact with the device.

7.6 Removal of Vehicle into Flood Zone 1

It is recommended that staff/persons on site are prepared to move the vehicle into Flood Zone 1, if advised to do so by the EA Flood Warning Service, the emergency services and/or local authority, in the advance of the onset of any flooding.

Figure 7.1: Suggested Route

Source: .GOV.UK

The vehicle will be moved away from the garage during fluvial flood events and directed to a suitable place outside of Flood Zone 3 and into Flood Zone 1.

Upon receipt of the Environment Agency Flood Warning staff must move the vehicle to a place of safety immediately via the following route:

- Out of the site north on Oxford Road
- West on Oxford Road
- Into Flood Zone 1

7.7 Business Flood Plan

It is also recommended that staff create a business flood plan. This is a simple document that assists the occupant to prioritise actions required at the property before, during and following a flood event.

A copy of a business flood plan template has been provided within the appendices of this report.

Figure 7.2: Stand Alone Flood Alarm Example

Source: ultrasecturedirect

8.0 Conclusions & Recommendations

An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial source Wendlebury Brook and surface water flooding.

The proposed garage will be located to the south east of the Wendlebury Village Hall site, between the hall and an existing shed/outbuilding, on land which currently comprises of an access track, with Wendlebury Brook located adjacent to the east boundary.

At the time of writing a topographical survey was not available, therefore the average ground level of the proposed footprint of the garage was ascertained using LIDAR Data as 62.238m AOD.

Wendlebury Brook is the closest watercourse located approximately 5.500m to the east of the proposed garage and flows in a southerly direction.

Pluvial: Surface Water Flooding

Low Risk Event

During the low-risk event the site is expected to experience flooding to depths between 300mm and 900mm with a velocity over 0.25m/s. During this event the EA Surface Water Flood Map shows the field directly downstream of the application site to be severely flooded, this is likely to be as a result of both surface water runoff and an interaction between fluvial flooding associated with overtopping of the banks of Wendlebury Brook.

Medium Risk Event

During the medium-risk event the overall severity of flooding is greatly reduced compared to the low risk event, flood depths are reduced to between 300mm-900mm with a velocity of less than 0.25m/s. Flooding during the medium risk event is considered to be as a result of surface water runoff and fluvial interaction.

High Risk Event

During the high-risk event i.e. most frequent the flooding on site has a depth of between 300mm-900mm and a velocity of less than 0.25 m/s. Surface water flows during this event is likely to be a result of surface water flowing overland making its way into the watercourse.

Providing that mitigation measures are incorporated into the design of the garage as described within Section 7.0 of this report, the risk of pluvial flooding can be suitably managed.

Fluvial: Wendlebury Brook

The Environment Agency have provided flood levels associated with Wendlebury Brook at a number of node locations within the vicinity of the site, the closest node is Node Ref: 061_14_2014_001WB_958_MIN located adjacent to Wendlebury Village Hall.

Furthermore, it is noted that the application site is not located within an area benefiting from flood defences.

Fluvial Conclusion

Following a review of the Environment Agency Flood Data, the existing level associated with the footprint of the garage would flood during all return periods from the 100 year event up to the 100 year plus higher central climate change event, which corresponds with the EA Flood Map.

Therefore, the application site is located within Flood Zone 3, however due to the nature of the development being classified as 'less vulnerable' and only used for vehicular storage the risk posed to people is considered to be low.

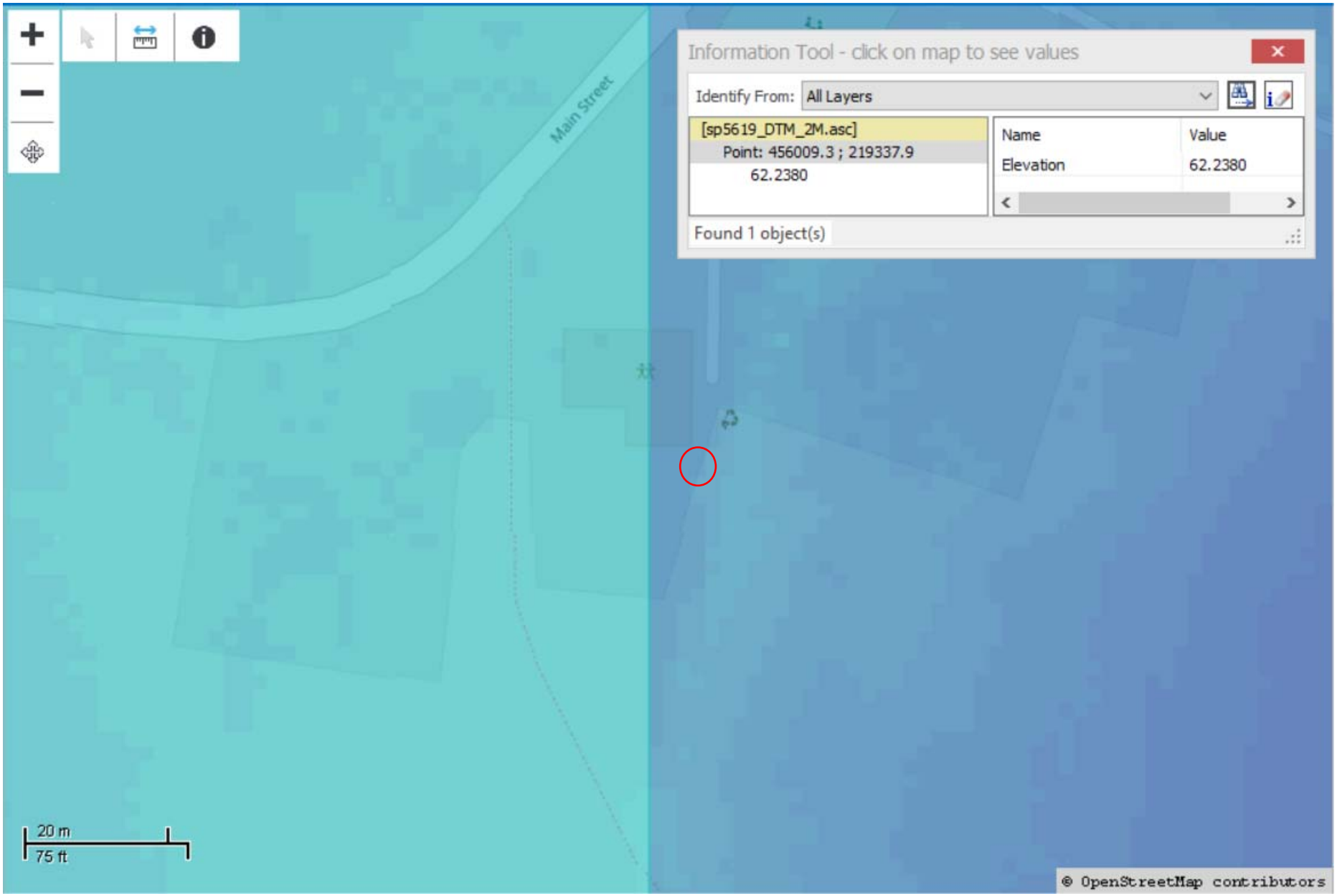
Furthermore, suitable mitigation measures will be incorporated into the garage to negate any volume displacement as a result of the building in the event of a flood, as outlined within Section 7.0 of this report.

Flood Mitigation Measures

- Finished floor levels to remain as 62.238m AOD
- Flood Resilience/Resistance = 63.000m AOD (outlined within Section 7.2.)
- Flood openings to negate flood storage compensation requirement
- Staff sign up to receive EA Flood Warning Service
- Implement a Stand Alone Flood Alarm
- Remove vehicle into Flood Zone 1during a flood event
- Implement Business Flood Plan

APPENDICES

Appendix A: - LIDAR Data


Information Tool - click on map to see values
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All Layers
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Name
Value
Elevation
62.2380
Found 1 object(s)
Main Street
20 m
75 ft
© OpenStreetMap contributors

Appendix B: - EA Flood Data

Thames Area Climate Change Allowances

Guidance for their use in flood risk assessments

Jan 2017

We recently updated our national guidance on climate change allowances for Flood Risk Assessments. The following information provides additional local guidance which applies to developments within our Thames area boundary.

Climate change allowances - overview

The National Planning Practice Guidance refers planners, developers and advisors to the Environment Agency to our guidance on considering climate change in Flood Risk Assessments. We updated this guidance in February 2016 and it should be read in conjunction with this document to inform planning applications, local plans, neighbourhood plans and other projects. It provides:

- Climate change allowances for peak river flow, peak rainfall, sea level rise, wind speed and wave height
- A range of allowances to assess fluvial flooding, rather than a single national allowance
- Advice on which allowances to use for assessments based on vulnerability classification, flood zone and development lifetime

Updated climate change allowances guidance:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

National Planning Practice Guidance:

http://planningguidance.communities.gov.uk/

Assessing climate change impacts on fluvial flooding

Table A below indicates the level of technical assessment of climate change impacts on fluvial flooding appropriate for new developments depending on their scale and location (flood zone). Please note that this should be used as a guide only. Ultimately, the agreed approach should be based on expert local knowledge of flood risk conditions, local sensitivities and other influences.

Applicants and consultants may contact the Environment Agency at the pre-planning application stage to confirm the assessment approach on a case-by-case basis. We provide standard guidance free of charge or bespoke advice for a fee for developments for which we are a statutory consultee. If your development is instead covered by Flood Risk Standing Advice, we recommend you contact the relevant Local Planning Authority for their guidance and confirmation of the assessment approach. Flood Risk Standing Advice can be found here:

https://www.gov.uk/flood-risk-assessment-local-planning-authorities

Table A defines three possible approaches to account for flood risk impacts due to climate change in new development proposals:

1. **Basic -** Developer can add an allowance to the 'design flood' (i.e. 1% annual probability) peak levels to account for potential climate change impacts. The allowance should be derived and agreed locally by Environment Agency teams.
2. **Intermediate -** Developer can use existing modelled flood and flow data to construct a stage-discharge rating curve, which can be used to interpolate a flood level based on the required peak flow allowance to apply to the ‘design flood’ flow.
3. **Detailed -** Perform detailed hydraulic modelling, through either re-running Environment Agency hydraulic models (if available) or construction of a new model by the developer.

Table A – Indicative guide to assessment approach

Vulnerability classification	Flood zone	Assessment by development type		
		Minor	Small-Major	Large-Major
Essential infrastructure	Zone 2	Detailed		
	Zone 3a	Detailed		
	Zone 3b	Detailed		
Highly vulnerable	Zone 2	Intermediate/Basic	Intermediate/Basic	Detailed
	Zone 3a	Not appropriate development		
	Zone 3b	Not appropriate development		
More vulnerable	Zone 2	Basic	Basic	Intermediate/Basic
	Zone 3a	Basic	Detailed	Detailed
	Zone 3b	Not appropriate development		
Less vulnerable	Zone 2	Basic	Basic	Intermediate/Basic
	Zone 3a	Basic	Basic	Detailed
	Zone 3b	Not appropriate development		
Water compatible	Zone 2	None		
	Zone 3a	Intermediate/Basic		
	Zone 3b	Detailed		

Definitions of terms in Table A

Minor

1-9 dwellings/less than 0.5 ha; office/light industrial under 1ha; general industrial under 1 ha; retail under 1 ha; travelling community site between 0 and 9 pitches.

Small-Major

10 to 30 dwellings; office/light industrial 1ha to 5ha; general industrial 1ha to 5ha; retail over 1ha to 5ha; travelling community site over 10 to 30 pitches.

Large-Major

30+ dwellings; office; light industrial 5ha+; general industrial 5ha+; retail 5ha+; gypsy/traveller site over 30+ pitches; any other development that creates a non-residential building or development over 1000 sqm.

Further info on vulnerability classifications:

http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-2-flood-risk-vulnerability-classification/

Further info on flood zones:

http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-2-flood-risk-vulnerability-classification/

Specific local considerations

Where the Environment Agency and the applicant or their consultant has agreed that a basic level of assessment is appropriate, the figures in Table B below can be used as an allowance for potential climate change impacts on peak design (i.e. 1% annual probability) fluvial flood level rather than undertaking detailed modelling.

Table B – Local allowances for potential climate change impacts

Watercourse	Central	Higher central	Upper
Thames	500mm	700mm	1000mm

Use of these allowances will only be accepted after discussion with the Environment Agency.

Fluvial food risk mitigation

Please use the national guidance to find out which allowances to use to assess the impact of climate change on flood risk.

For planning consultations where we are a statutory consultee and our Flood Risk Standing Advice does not apply, we use the following benchmarks to inform flood risk mitigation for different vulnerability classifications.

These benchmarks are a guide only. We strongly recommend you contact us at the pre-planning application stage to confirm this on a case-by-case basis. Please note you may be charged for pre-planning advice.

For planning consultations where we are not a statutory consultee or where our Flood Risk Standing Advice does apply, we recommend local planning authorities and developers use these benchmarks but we do not expect to be consulted.

Essential Infrastructure

For these developments, our benchmark for flood risk mitigation is for it to be designed to the **upper end** climate change allowance for the epoch that most closely represents the lifetime of the development, including decommissioning.

Highly Vulnerable

For these developments in flood zone 2, the **higher central** climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **upper end** allowance.

More Vulnerable

For these developments in flood zone 2, the **central** climate change allowance is our minimum benchmark for flood risk mitigation. In flood zone 3 the **higher central** climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** (in flood zone 2) and the **upper end** allowance (in flood zone 3).

Water Compatible or Less Vulnerable

For these developments, the **central** climate change allowance for the epoch that most closely represents the lifetime of the development is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** to inform built in resilience, particularly in flood zone 3.

Further info on our Flood Risk Standing Advice:

https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities

There may be circumstances where local evidence supports the use of other data or allowances. Where you think this is the case we may want to check this data and how you propose to use it.

For more information

Please contact our Thames area Customers and Engagement team:

Enquiries_THM@environment-agency.gov.uk

Product 4 (Detailed Flood Risk) for Windlebury Village Hall OX25 2PR
Our Ref: THM120788

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and

ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
Model extents showing *defended* scenarios;
FRA site boundary (where a suitable GIS layer is supplied);
Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
Flood Map areas benefiting from defences (where available/relevant);
Flood Map flood storage areas (where available/relevant);
Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
Statutory (Sealed) Main River (where available within map extents);

A table showing:

i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.

ii) Flood defence locations unique identifiers and attributes; (supplied seperately)

iii) Historic flood events outlines unique identifiers and attributes; and

iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

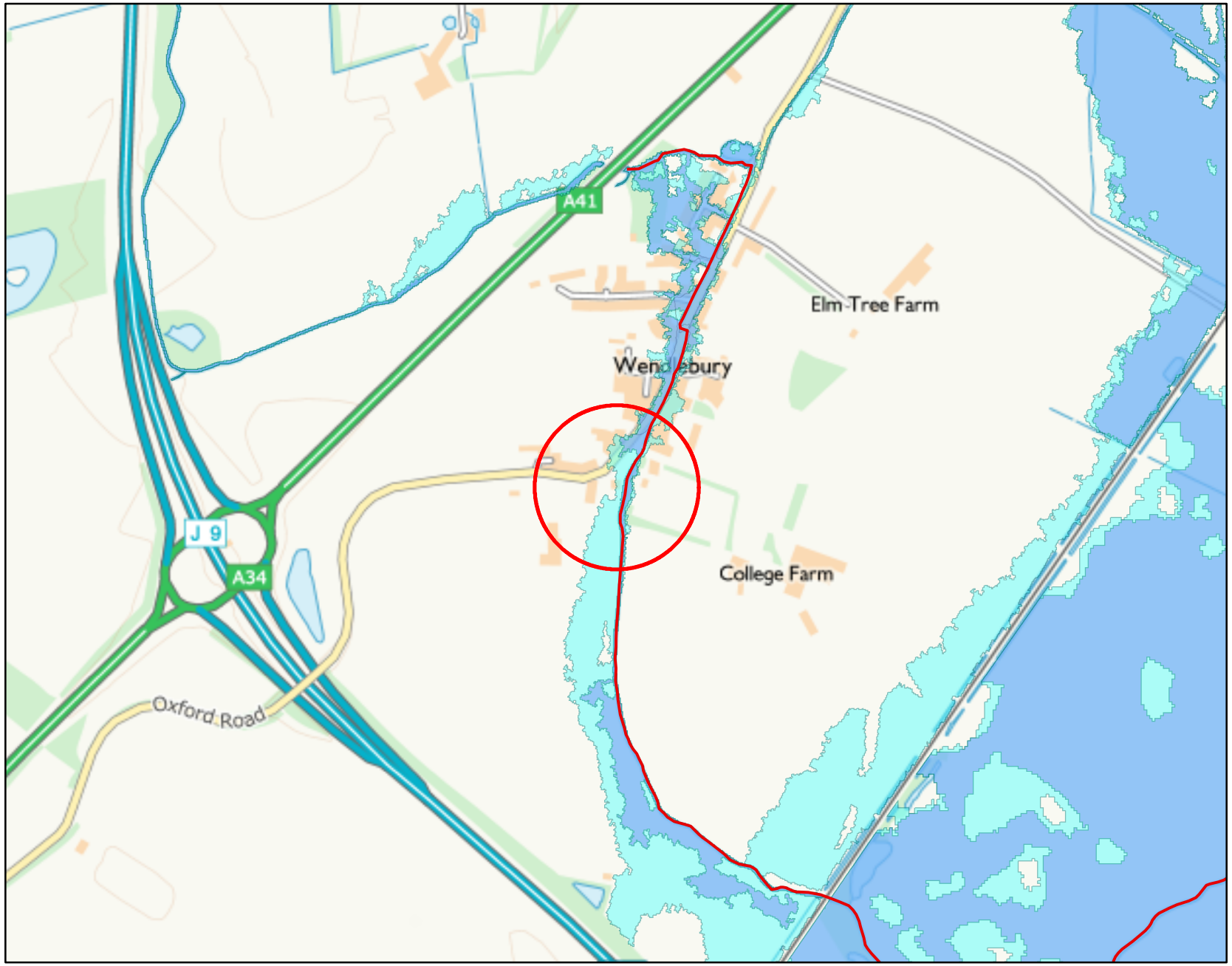
This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Flood Map for Planning centred on OX25 2PR
Created on 27/03/19 REF: THM120788



Environment Agency

Kilometres

0 0.25 0.5

Legend

- Main River
- Flood defences
- Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Flood Map - flood storage areas

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Defence information

THM120788

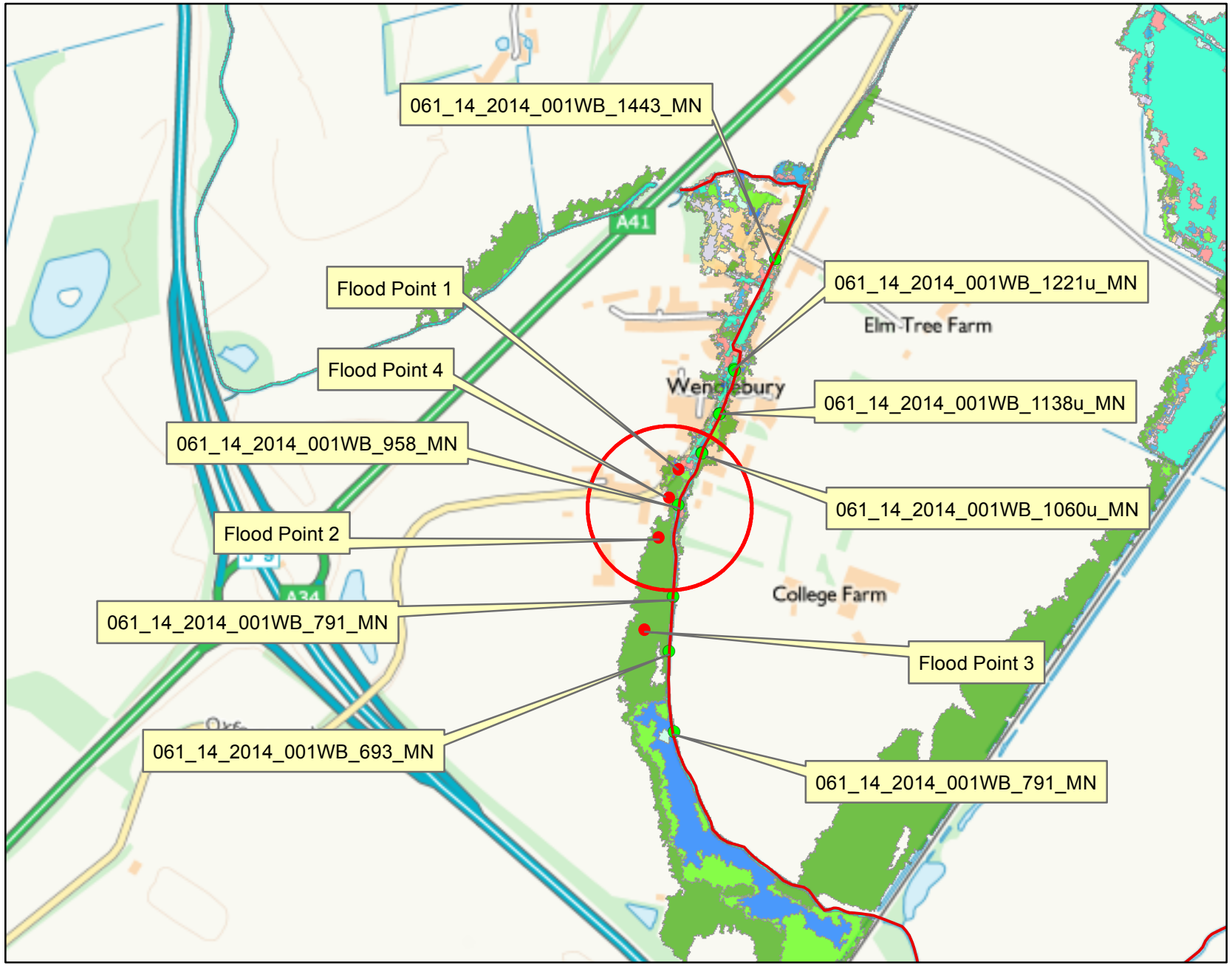
Defence Location:	No defences on Main River
Description:	This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

Model information

THM120788

Model:	Wendlebury Brook 2014
Description:	The information provided is from the Wendlebury Brook Flood Mapping Study completed in April 2014. The study was carried out using 2D modelling software (ISIS-Tuflow). Model design runs: 1 in 5 / 20% Annual Exceedance Probability (AEP); 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP, 1 in 100+20% / 1% AEP plus 20% increase in flows and 1 in 1000 / 0.1% AEP. Mapped outputs: 1 in 5 / 20% AEP; 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP and 1 in 1000 / 0.1% AEP. Model accuracy: Levels ± 250mm

Detailed FRA centred on OX25 2PR
Created on 27/03/19 REF: THM120788



Environment Agency

Kilometres

0 0.25 0.5

Legend

- Main River
- Model Nodes
- 20% AEP Flood Outline
- 10% AEP Flood Outline
- 5% AEP Flood Outline
- 3.3% AEP Flood Outline
- 2% AEP Flood Outline
- 1.3% AEP Flood Outline
- 1% AEP Flood Outline
- 1%+20% AEP Flood Outline
- 0.1% AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occuring in any given year

Where available climate change extents have been calculated with an additional flow added to an AEP event. An example of how this is written is 1%+20% AEP.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled in-channel flood flows and levels

THM120788

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

				Flood Levels (mAOD)		
Node label	Model	Easting	Northing	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
061_14_2014_001WB_1443_MN	Wendlebury Brook 2014	456186	219785	63.03	63.07	63.14
061_14_2014_001WB_1221u_MN	Wendlebury Brook 2014	456113	219587	62.86	62.90	62.98
061_14_2014_001WB_1138u_MN	Wendlebury Brook 2014	456087	219508	62.64	62.71	62.76
061_14_2014_001WB_1060u_MN	Wendlebury Brook 2014	456055	219438	62.46	62.54	62.69
061_14_2014_001WB_958_MN	Wendlebury Brook 2014	456013	219344	62.30	62.41	61.84
061_14_2014_001WB_791_MN	Wendlebury Brook 2014	456004	219180	62.16	62.25	61.73
061_14_2014_001WB_549_MN	Wendlebury Brook 2014	456005	218938	61.83	61.89	61.54
061_14_2014_001WB_693_MN	Wendlebury Brook 2014	455995	219082	62.02	62.08	61.63

				Flood Flows (m3/s)		
Node label	Model	Easting	Northing	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
061_14_2014_001WB_1443_MN	Wendlebury Brook 2014	456186	219785	1.79	1.99	2.35
061_14_2014_001WB_1221u_MN	Wendlebury Brook 2014	456113	219587	1.22	1.23	1.27
061_14_2014_001WB_1138u_MN	Wendlebury Brook 2014	456087	219508	1.80	1.92	1.98
061_14_2014_001WB_1060u_MN	Wendlebury Brook 2014	456055	219438	2.05	2.06	1.81
061_14_2014_001WB_958_MN	Wendlebury Brook 2014	456013	219344	2.79	3.22	4.22
061_14_2014_001WB_791_MN	Wendlebury Brook 2014	456004	219180	3.21	3.88	4.39
061_14_2014_001WB_549_MN	Wendlebury Brook 2014	456005	218938	3.32	3.50	4.39
061_14_2014_001WB_693_MN	Wendlebury Brook 2014	455995	219082	3.30	4.00	4.55

Note:
Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Modelled floodplain flood levels THM120788

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

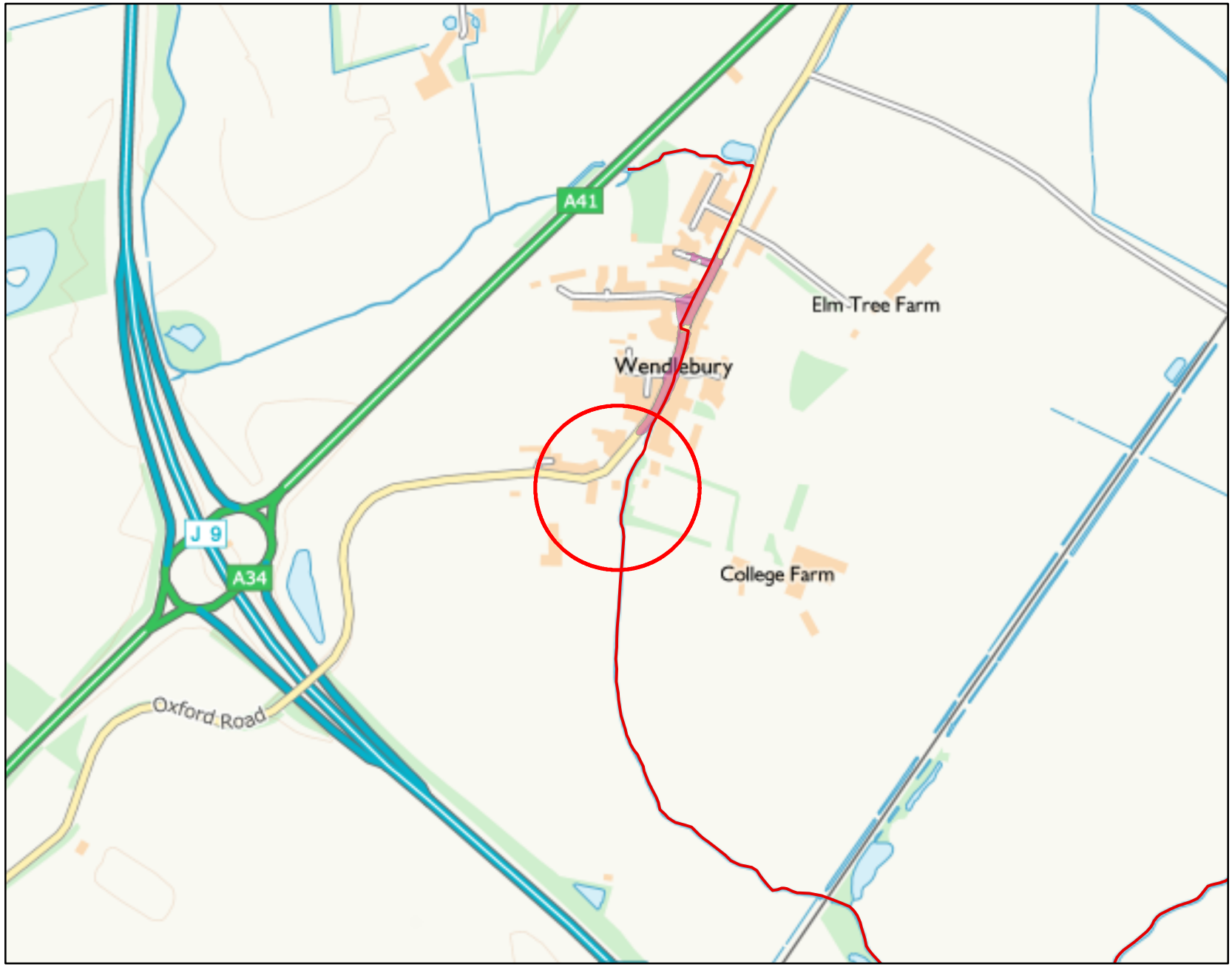
				flood levels (mAOD)		
2D grid cell reference	Model	Easting	Northing	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
Flood Point 1	Wendlebury Brook 2014	456,010	219,409	62.42	62.51	62.68
Flood Point 2	Wendlebury Brook 2014	455,976	219,283			62.48
Flood Point 3	Wendlebury Brook 2014	455,952	219,120			62.19
Flood Point 4	Wendlebury Brook 2014	455,996	219,359			62.61

This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:
20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allov

Historic Flood Map centred on OX25 2PR
Created on 27/03/19 REF: THM120788



Environment Agency

Kilometres

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Legend

Main River

year

2008

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic flood data

THM120788

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA061140001	EA06June2008	03/06/2008	10/06/2008	Main River	channel capacity exceeded (no raised defences)

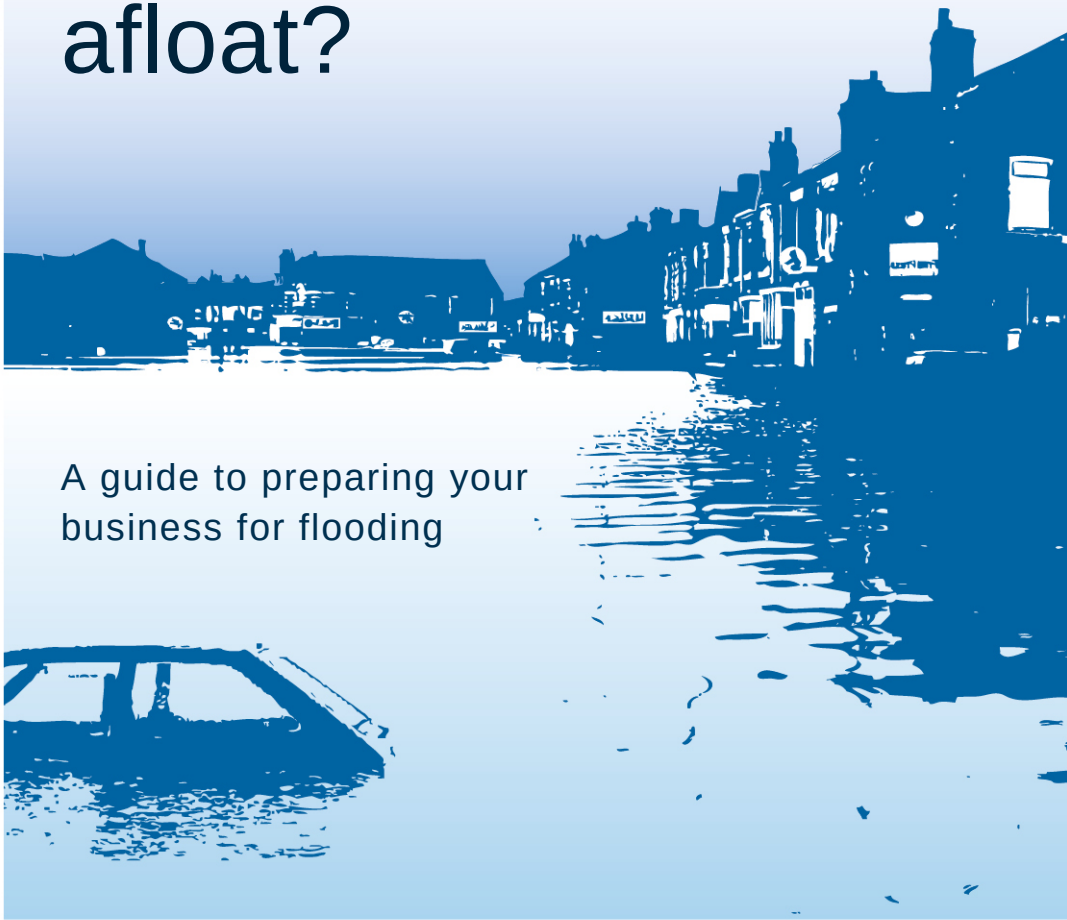
Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

Appendix C: - Business Flood Plan

Environment Agency

would your business stay afloat?



A guide to preparing your business for flooding

Flooding is the most common and widespread natural disaster in the UK. Since 1998 there has been at least one serious flood every year. Businesses like yours are more likely to be flooded than destroyed by fire. As our climate changes we can expect to see more extreme weather – and more floods.

We aim to reduce the likelihood of flooding by managing land, rivers, coastal systems and flood defences. While we do everything we can to reduce the chance of flooding, it is a natural process and can never be completely eliminated.

By taking action to prepare in advance for flooding, most businesses can save between 20 and 90 per cent on the cost of lost stock and movable equipment, as well as some of the trouble and stress that goes with such an event.

This is a simple guide to some of the easy actions that you can take to make sure that your business is as well prepared as possible.

It tells you about how to find out if your business is at risk, our flood warning service and what our flood warning codes mean. It also has a simple template to use to design a flood plan for your company.

For more information about flooding, visit our website at **www.gov.uk/flood** or call Floodline on **0345 988 1188**.

Make sure that your business is prepared for flooding.

How do I find out if my business is at risk from flooding?

There are two quick and easy ways for you to find out if you're at risk.

call us on
0345 988 1188

Our Floodline service is open 24 hours, calls are charged at local rate. By taking your postcode, our operators will check and see if your business is in a flood risk area.

Look at our website
www.gov.uk/flood

You need to be aware of flooding and keep an eye on the water levels and weather situation at all times. You can do this by checking the flood forecasts and the river and sea levels on our website.

Our online flood map uses the latest technology and data gathered over many years to give the most accurate view of flooding in your area.

By entering your postcode you can find out if your business is at risk. Areas at risk from flooding are shown in dark blue and areas at risk from extreme flooding in light blue.

My business is at risk from flooding. What should I do now?

Start preparing now. If the weather conditions are right, flooding can happen at any time.

Remember, floods can happen at any time and any day – make sure you provide a number that can be contacted at all times – even out of working hours.

Sign up for flood warnings.

The first thing you should do is find out if you can receive flood warnings. In areas of high flood risk, we offer a service called Floodline Warnings Direct. This is a free, 24 hour service that sends automated flood warnings by telephone, SMS text, email, fax or pager.

To find out if you can receive this service, call Floodline on 0345 988 1188.

If your business isn't in an area covered by our warnings you can still check the latest flood warnings in force on our website.

When the situation is serious, flood warnings will also be broadcast on local television and radio news.

What practical steps can I take to protect my business?

Now that you've checked your risk and found out about flood warnings, it's time to start thinking about preparing a flood plan specifically for your business.

Taking simple steps can go a long way to protecting your business from flooding. Preparing a flood plan could:

- Significantly reduce financial losses, damage to property and business interruption;
- Help compliance with regulatory requirements (for example, Occupier's Liability Act 1984);
- Reduce exposure to civil or criminal liability;
- Enhance your company's image and credibility with employees, customers, suppliers and the community;
- Help fulfil your moral responsibility to protect employees, the community and the environment;
- Help you to obtain insurance cover.

What is a flood plan?

Just as many businesses have health and safety policies and contingency plans for an emergency, they should also have flood plans.

A flood plan is a written document that outlines how your business will respond to a flood.

This might include a list of steps you will take in case of a flood and the order you will take them in. It could also include the purchase of flood products and insurance.

A written plan can make information **easy** to access during a flood, **easy** to communicate to staff, and **easy** to remember.

Small businesses should make sure there is a plan of action in case of flooding. As the business owner, this may be your responsibility.

If your business is **medium sized**, flood preparation might be the responsibility of a team of people from different areas of the business.

If your business decides to have a flood planning team, this could be led by the business owner or Managing Director.

The leader of the flood planning team will need to let staff know about the plan once it is finished.

All members of the team should also keep a copy of important flood contacts at home for easy access.

Key areas to consider in your flood plan are:

- human resources;
- maintenance/facilities;
- finance and purchasing.

Once you have completed your plan don't forget about it. Look at it regularly and make sure it is up to date and in the event of a flood **use it**.

business flood plan

A written flood plan is recommended for businesses.

It should include:

- A list of important contacts, including Floodline, building services, suppliers and evacuation contacts for staff;
- A description or map showing locations of key property, protective materials and service shut-off points;
- Basic strategies for protecting property, preventing business disruption and assisting recovery;
- Checklists of procedures that can be quickly accessed by staff during a flood.

If a flood is imminent, your main priority is to make sure that your staff are safe. However there may be other actions that you can take to prepare your building and it's contents to minimise damage and post-flood repair and restoration costs.

Business flood plan

Flood plan for _____ dated _____

Registered address _____

_____

Postcode _____

Staff contact list

Name	Address	Telephone/mobile	Emergency contact	Emergency telephone and address

Note staff who may require assistance in the event of a flood.

Name	Office location

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Answer the following if applicable

	Description of location	How to protect from a flood (for example, move, cover, tie down)
First Aid Kit		
Oil based products (gasoline, oil, cooking oil etc.)		
Chemicals (including cleaning products)		

Protective actions

Identify stock, equipment and possessions that may need special protective measures, and describe the actions you will take to prevent damage in the event of a flood. We have suggested items and ways to protect them, but make sure you follow through on your plans.

think about:

- Computers;
- Tables / heavy furniture;
- Vehicles;
- Paper files;
- Electrical items;
- Chairs / stools;
- Databases;
- Soft furnishings;
- Computer files;
- Staff files.

ways to protect items

- Make a copy of important documentation and store in safe location;
- Raise items above ground level;
- Buy flood protection products;
- Buy new flood-resistant items;
- Move items to a safer location if possible – to an upper level of the building or off site.

Valuable item	Protective action	New location (if applicable)	Done
			☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐

Suggested basic building materials to help protect your property

If materials are not needed, leave the relevant section blank

Materials	Used for	Items to protect / where to use	Storage location	Done
Sand and sand bags (unfilled), shovel	Creating flood barriers (used with plastic sheeting)			☐
Tools – hammer, nails, saw	Boarding up doors, windows and openings, creating shelves			☐
Wood – plywood, blocks of wood	Boarding up doors, windows and openings, creating shelves			☐
Sturdy plastic sheeting	Sandbag barriers, pulling up around furniture and appliances			☐
Strong plastic bags	Putting around legs of tables and chairs			☐
Pallets	Raising stored stock above flood level			☐
Emergency power generator	Maintaining function of air conditioning units (can help dry out a building), running fridges and freezers, medical equipment if appropriate			☐

Identify people who can help you before, during and after a flood, and what they can do.

We have suggested ways they might be able to help, but you'll need to discuss this with them.

Name	Address	Telephone day	Telephone evening	Mobile

Ways people can help

- assistance with installing flood products;
- assistance with transporting stock/materials to new location if possible;
- provision of emergency storage;
- provision of emergency supplies or medical support if required.

discussion guide

This discussion guide sums up the key areas of flood planning. Some of this information can be found in this pack to help get you started.

Research

- Look at your existing business policies, and think about whether they are appropriate in the event of a flood.

Staff

- Make a list of **employees' contact details in the event of an evacuation**. This might include mobile telephone numbers, or numbers for their home or the home of a friend or relative;
- Think about staff who **may need special assistance** in the event of a flood (for example, elderly, deaf, blind etc.)

Security procedures

- **Locking windows, doors** and **setting the alarm**. You might need more than one person to help do this;
- Insurance policies – **Are you insured for flood damage**, business interruption and lost revenue?
- Employee manuals – You might **add flood safety to staff information packs**, or adapt job descriptions to include flood warden duties;
- Hazardous materials plan – You must ensure that **chemicals, oils** and other **substances in your possession are kept safe** and do not contaminate flood water;
- Health and safety assessment – Plan to **check the functioning of flood products and flood warning systems regularly**, just as you do for fire safety equipment.

Check codes and regulations that might apply to your business in the event of a flood. The following could provide guidance on the right actions to take:

- Occupational health and safety regulations;
- Environmental regulations.

Important contacts

Make a list of important telephone numbers, including contacts for gas, electricity, water and telephone providers.

Key locations

- **Know the location** of cut-off points for gas, electricity and water. Ideally, these should be marked on a map that is stored with your flood plan;
- Know the location of chemicals, oils or other materials that could be dangerous or contaminate flood water. These should be stored safe from floods and other damage.

Protective actions

- Note key stock, equipment and possessions that may need special protection from flood water;
- Consider things you may need during or after a flood (for example, sandbags, plastic sheeting, loudspeaker);
- See if it's **possible to move key operations**, such as shipping or customer services, to another building.

Suppliers and external links

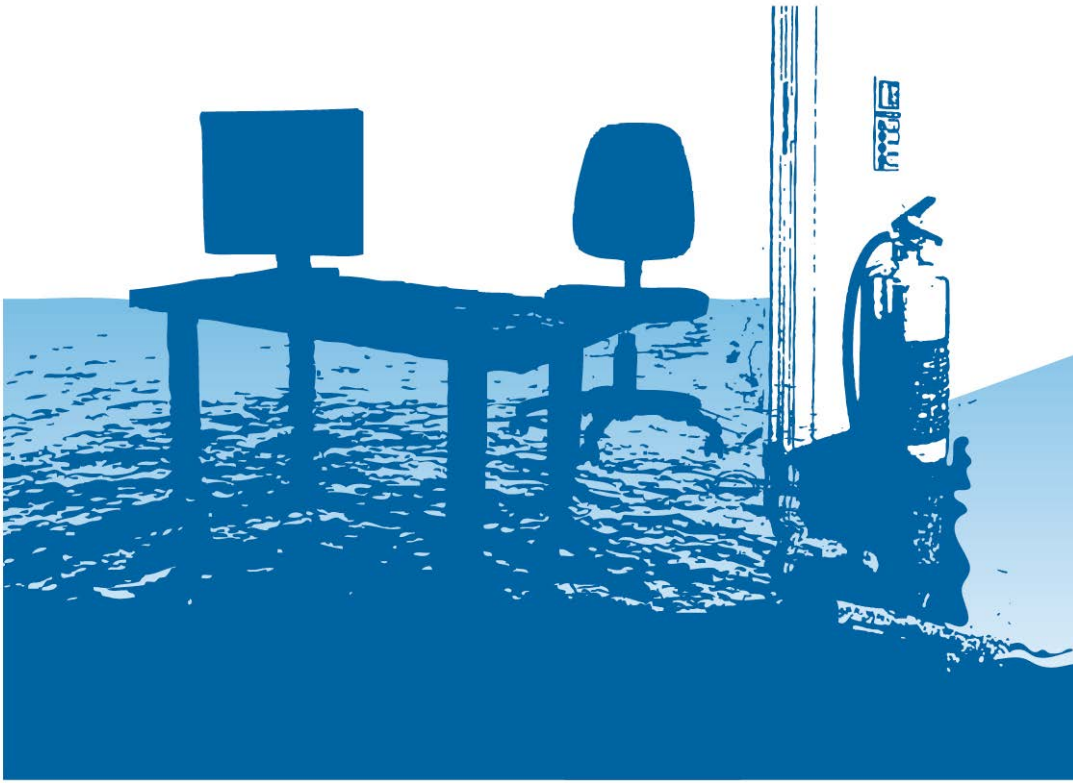
- Identify products and services you won't need in the event of a flood, or which suppliers may not be able to provide. **Make back-up plans** or arrangements for short-notice cancellation of deliveries;
- Consider contracting in advance with companies whose help you may need after a flood.

business checklist

Are you prepared for flooding?

If you answer no to any of the questions overleaf, there may be more you can do to protect your business.

The individual sections will give you valuable information on effective actions you can take to prepare for a flood.



If you can answer yes, please ☒, otherwise leave blank for no.

Know if you're at risk

- ☐ Do you know if you're at risk of flooding?
- ☐ Are flood warnings available in your area?
- ☐ Do you know how you can receive flood warnings?

Preparing a flood plan

- ☐ Do you know how your business will respond to a flood?
- ☐ Do you have a list of useful numbers including Floodline, local authority and insurance company?
- ☐ Do you know how to shut off your gas/electric/water supplies?
- ☐ Are your stock, fittings and valuable equipment stored above flood level?
- ☐ Have you developed flood contingency plans with suppliers and/or clients?
- ☐ Can you call someone to help you in the event of a flood?

Staff training and evacuation

- ☐ Are you aware of correct flood safety procedures for you and your staff?
- ☐ Have you trained your staff on flood safety procedures?
- ☐ Can your staff work quickly and efficiently to protect your business in the event of a flood?

Protecting your property

- ☐ Have you installed flood protection products?
- ☐ Do you have a stockpile of useful materials including plywood, plastic sheeting, sandbags (unfilled), sand, nails, hammer, shovel, blocks of wood and a saw?
- ☐ Have you installed non return valves in your toilets and drains?
- ☐ Do you and your staff have high ground where you can park your cars?
- ☐ Are your electrical sockets above flood level?
- ☐ Do you have computer equipment in the basement?

Flood insurance

- ☐ Do you have sufficient insurance cover in the event of a flood situation?
- ☐ Do you know what information your insurer will require to support a claim?

Evacuation

- ☐ Do you have an easy way to let your staff know about an evacuation?
- ☐ Do you know which roads will stay open in your area during a flood?
- ☐ Have you identified where staff can shelter in the event of a flood?
- ☐ Could you control staff panic during a flood?

understand your flood warning codes

Our warning service has three types of warnings - Flood Alert, Flood Warning and Severe Flood Warning - that will help you prepare for flooding and take necessary actions.

ONLINE FLOOD RISK FORECAST

What it means

Be aware.
Keep an eye on the weather situation.

When it's used

Forecasts of flooding on the Environment Agency website are updated a least once a day.

What to do

- Check weather conditions.
- Check for updated flood forecasts on our website.

FLOOD ALERT

What it means

Flooding is possible.
Be prepared.

When it's used

Two hours to two days in advance of flooding.

What to do

- Be prepared to act on your flood plan.
- Prepare a flood kit of essential items.
- Monitor local water levels and the flood forecast on our website.

FLOOD WARNING

What it means

Flooding is expected. Immediate action required.

When it's used

Half an hour to one day in advance of flooding.

What to do

- Move staff, stock and valuables to a safe place.
- Turn off gas, electricity and water supplies if safe to do so.
- Put flood protection equipment in place.

SEVERE FLOOD WARNING

What it means

Severe flooding. Danger to life.

When it's used

When flooding poses a significant risk to life.

What to do

- Stay in a safe place with means of escape.
- Be ready should you need to evacuate.
- Co-operate with the emergency services.
- Call 999 if you are in immediate danger.

WARNING NO LONGER IN FORCE

What it means

No further flooding is currently expected in you area.

When it's used

When river or sea conditions begin to return to normal.

What to do

- Be careful. Flood water may still be around for several days.
- If you've been flooded, ring your insurance company as soon as possible.

useful contacts

Fill in the contact details you may need if your business floods. Keep it in a safe place, where you can hold of it quickly.

	Company name	Telephone number/s
Environment Agency Floodline		0345 988 1188
Electricity supplier and meter number		
Gas supplier and meter number		
Water supplier and meter number		
Telephone provider		
Local authority emergency services		
Insurance company 24-hour number and policy number		
Insurance agent		
Local radio station for news alerts and weather updates		
Companies that may be able to help you after a flood		
Electrician		
Plumber		
Builder		
Equipment repair/suppliers		
Security services		
Water pumping services		
Emergency power suppliers		

Would you like to find out more about us, or about your environment?

Then call us on
08708 506 506* **(Mon-Fri 8-6)**

email
enquiries@environment-agency.gov.uk

or visit our website
www.gov.uk/environment-agency

incident hotline **0800 80 70 60** (24hrs)
floodline **0345 988 1188** (24hrs)

*** Weekday Daytime calls cost 8p plus up to 6p/min from BT Weekend Unlimited. Mobile and other providers' charges may vary.**

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