Land at Pendle Road, Clitheroe

Flood Risk Assessment & Drainage Strategy May 2024





BEK Geo-Environmental Consulting No.2 Landwick Court, Metcalf Drive, Altham Business Park, Lancashire BB5 5TU

mbuckley@bekenviro.co.uk bekenviro.co.uk 01254 377622

PENDLE MILL, PENDLE ROAD, CLITHEROE

Flood Risk Assessment



Report Prepared For:

Report Ref: BEK-22035-3-RevA

MULLER PROPERTY GROUP

May 2024

BEK Enviro Limited Company No. 08868761 | VAT No. 179 9310 65



BEK Geo-Environmental Consulting No.2 Landwick Court, Metcalf Drive, Altham Business Park, Lancashire BB5 5TU

mbuckley@bekenviro.co.uk bekenviro.co.uk 01254 377622

Project Quality Assurance Information Sheet

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MULLER PROPERTY GROUP		
The Point		
Crewe Road		
Alsager		
Cheshire		
ST7 2GP		
BEK ENVIRO LIMITED		
No. 2 Landwick Court		
Metcalf Drive		
Altham Business Park		
Lancashire		
BB5 5TU		
David Emmott		
BSc (Hons) MSc MIEnvSci CEnv		
BSC (HONS) MISC MIENVSCI CENV		
Michael Buckley		
RSc (Hons) MSc MIEnvSci CEnv		
mbuckley@bekenviro.co.ukwww.bekenviro.co.uk		
Office: 01254 377622 Mobile: 07906753583		



BEK Geo-Environmental Consulting No.2 Landwick Court, Metcalf Drive, Altham Business Park, Lancashire BB5 5TU

mbuckley@bekenviro.co.uk bekenviro.co.uk 01254 377622

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EXECUTIVE SUMMARY

BEK Enviro have been appointed by Muller Property Group to provide a Flood Risk Assessment in support of a planning application for the development of a 75No bed care home, located on land currently occupied by commercial buildings on Pendle Road in Clitheroe, Lancashire.

The site is shown to be situated within Flood Zone 2 of the Environment Agency Flood Map and therefore has a medium risk of fluvial flooding.

An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial source Shaw Brook.

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

The application site is currently occupied by commercial buildings and comprises of approximately 5No physically attached buildings with basement storage areas, car parking and turning area at the frontage onto Pendle Road, with green space to the north.

The nearest watercourse to the site is Shaw Brook which flows in a westerly direction and is culverted through the northern extent of the site, where it exits becoming open channel at the north west boundary.

The topographical survey provided identifies that the basement entrance located at the south west of the site is at a level of 87.550m AOD, the north west corner of the site located closest to the open stretch of Shaw Brook is at a level of 85.000m AOD. The north east corner of the site is at a level of 88.70m AOD and the south east adjacent to Pendle Road is at a level of 93.700m AOD. In general, the site falls from east to west with a topographical depression along the route of the culvert.

Fluvial Flooding: Shaw Brook

Following a review of the available Environment Agency Flood Data, flood levels during the 100 year + 70% climate change range from 85.75m AOD (west of the site) to 89.28m AOD (east of the site).

Engineering judgement suggests that this a result of the culverted watercourse downsizing and becoming constricted as it traverses through the site causing flooding during storm events in excess of the 100 year + 35% climate change event.

Flows within the culvert then surcharge within the manholes then flood above ground, where they flow overland following topography along the culverts route, before making its way back into the open section of the watercourse at the downstream headwall west of the site.



Taking the above into account, flooding at the site is considered to be a fluvial overland flow route when the capacity of the culvert is exceeded, rather than a flood plain where levels would have less of a range.

Development proposals provide an 8m easement from the edge of the culvert, providing a betterment compared to the existing building (which builds over the culvert). As such the flow route can now be contained within the easement where levels could be graded off directing flows towards the route of the culvert, rather than it backing up against the building's envelope.

In order to ensure that level access can be maintained throughout the ground floor level of the proposed development, finished floor levels have been based on the 100 year + 70% climate change flood level at Node Sample Point 2: i.e., 88.16m AOD + 0.600m (freeboard), which equated to a finished floor level of 88.76m AOD.

Providing that mitigation measures as outlined within this report are implemented into the development the risk of fluvial flooding can be suitably managed.

Preliminary Drainage Strategy

The preliminary drainage strategy directs surface water flows from the roof and car parking area into the open channelled section of Shaw Brook, located at the north of the site via a new outfall.

The preliminary network has been modelled using FLOW Software for the proposed impermeable area of 0.288Ha, with discharge rates into the watercourse restricted to no more than 35.7l/s for all return periods up to and including the 100 year + 40% climate change event via a vortex flow control chamber. Flows in excess of this will be attenuated within a geo-cellular storage tank located within the car parking area and also within the piped network itself.

Modelled Tank Details

- Area = 30m²
- Depth of crate = 1m
- 95% void ratio

Modelled Flow Control

- Design Flow = 35.7l/s
- Design Depth = 2m

Permeable paving was considered, however once drainage runs from the rear of the building were brought to the frontage, the required depth of sub-base would not be economically viable and would be well in excess of the storage volume required.

Furthermore, providing permeable paving for only the car parking area would still require an additional tank to take flows from the roof area. This combined with the excessive maintenance burden discounted permeable paving from the preliminary drainage strategy.



The Environment Agency may require any works within 8m of the culverted watercourse apply for an Environmental Permit prior to any works being undertaken, this will include any new headwall structure.

Mitigation Measures

Finished Floor Levels

Due to the application site being located within Flood Zone 2 finished floor levels of the site should be elevated whichever is the highest.

- 300mm above existing ground level
- 600mm above the 100 year + climate change event

The existing site has a range in level of approximately 5m. Because the development requires level access on the ground floor level a stepped approach is not feasible, therefore finished floor levels have been elevated 600mm above the 100 year + 70% climate change event at the Sample Point labelled No2.

Sample Point 2: i.e., 88.16m AOD + 0.600m (freeboard) = finished floor level of 88.76m AOD

Watercourse Easements

The Environment Agency will require an 8m easement from the edge of the culverted watercourse, which has been incorporated into the development proposals. This provides a significant benefit over the existing building which built over the culvert.

Business Flood Plan

It is also recommended that staff create the business flood plan. This is a simple document that assists the staff/residents 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



1. INTRODUCTION

1.1 Appointment

- 1.1.1 BEK Enviro Limited (BEK) has been commissioned by Muller Property Group to prepare a Flood Risk Assessment in support of a planning application for the development of a 75No bed care home, located on land currently occupied by commercial buildings in Clitheroe, Lancashire.
- 1.1.2 The site is shown to be situated within Flood Zone 2 of the Environment Agency Flood Map and therefore has a medium risk of fluvial flooding.
- 1.1.3 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

- 1.2.1 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

- 1.3.1 This assessment is based on desk-top study of information from the following sources:
 - National Planning Policy Framework (2018)
 - Planning Practice Guidance at <u>www.gov.uk</u>
 - Building Regulations Approved Document H
 - Environment Agency Flood Mapping
 - Ribble Valley Borough Council Level 1 Strategic Flood Risk Assessment April 2017
 - Ribble Valley District Flood Report February 2017
 - British Geological Society Historic Borehole Logs
 - Cranfield University's Soilscape Viewer



- CIRIA C697 The SUDS Manual
- Chronology of British Hydrological Events (Dundee University)
- R&D Technical Report FD2320/TR2 (2005)



2. PLANNING POLICY CONTEXT

2.1 Approach to the Assessment

- 2.1.1 An initial assessment indicates that the primary flood risk at the proposed development is from the fluvial source Shaw Brook.
- 2.1.2 Consideration has also been given to the site flooding from secondary sources such as pluvial, groundwater; artificial water bodies; infrastructure failure and ponding.
- 2.1.3 The requirements for flood risk assessments are generally as set out in the 'Technical Guidance to the National Planning Policy Framework', updated in February 2021; and in more detail from the Environment Agency's 'Standing Advice on Flood Risk' available from: https://www.gov.uk/government/publications/national-planning-policyframework--2.

2.2 National Planning Policy Framework (NPPF)

- 2.1.1 The information provided in the flood risk assessment should be credible and fit for purpose. A flood risk assessment should also be appropriate to the scale, nature and location of the development.
- 2.1.2 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 Environment Agency's website.

2.3 Site Specific Flood Risk Assessment Checklist

2.3.1 The following checklist has been extracted from Flood Risk & Coastal Change Section available from <u>www.gov.uk</u>, updated in August 2021.

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.

2.4 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.





2.5 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.

2.6 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.

2.7 Climate Change

2.7.1 The NPPF requires the application of climate change over the lifetime of a development. As of 06th October 2021, the Technical Guidance for NPPF has updated the climate change allowances based on river basin catchments. The climate change allowance for the Ribble Management Catchment is tabulated below:

Parameter	Allowance Category	2020's	2050's	2080's
Peak Rainfall Intensity	Upper	+27%	+44%	+71%
	Higher	+ 19%	+ 29%	+46%
	Central	+ 16%	+ 23%	+36%

 Table 1: Ribble Management Catchment Climate Change Allowances



2.7.2 Due to the development being located within Flood Zone 2 and being considered highly vulnerable development, the central allowance of 36% should be applied to peak river flow to account for climate change.

Applied Across All of England	2015 - 2039	2040 - 2069	2070 - 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

 Table 2: Peak Rainfall Intensity Allowance

2.7.3 Due to the development having a proposed life span in excess of 50 years, 40% should be applied to rainfall intensity when developing the drainage strategy, to account for climate change over the lifetime of the development.



3. <u>DETAILS OF THE SITE</u>

3.1 Site Details

Site Name:	Pendle Mill
Purpose of Development:	Care home
Existing Land Use:	Commercial
OS NGR:	SD7492641547
Country:	England
County:	Lancashire
Local Planning Authority:	Ribble Valley Borough Council
Internal Drainage Board:	Not Applicable
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:



Source: Google

 Table 3: Development Location



3.2 Site Description

- 3.2.1 The application site is currently occupied by Worthington Brougham Furniture Ltd and comprises of approximately 5No physically attached buildings with basement storage areas, car parking and turning area at the frontage onto Pendle Road, with green space to the north.
- 3.2.2 The nearest watercourse to the site is Shaw Brook which flows in a westerly direction and is culverted through the northern extent of the site, where it exits becoming open channel at the north west boundary.
- 3.2.3 The topographical survey provided identifies that the basement entrance located at the south west of the site is at a level of 87.550m AOD, the north west corner of the site located closest to the open stretch of Shaw Brook is at a level of 85.000m AOD. The north east corner of the site is at a level of 88.70m AOD and the south east adjacent to Pendle Road is at a level of 93.700m AOD. In general, the site falls from east to west with a topographical depression along the route of the culvert.

3.3 Proposed Development Details

3.3.1 Development proposals include demolition of the existing building to make way for the erection of a 75No bedroom care home with access from Pendle Road and car parking provisions.



4. <u>HISTORIC FLOODING</u>

4.1 Internet Search

4.1.1 An internet search for historic flooding within the area of Pendle Road came back with no recorded incidents.

4.2 Ribble Valley Council SFRA April 2017

- 4.2.1 The Strategic Flood Risk Assessment (SFRA) was undertaken by Ribble Valley Borough Council and was completed in April 2017.
- 4.2.2 Section 4.4 Table 1 Major Historical Floods Recorded in the Ribble Catchment and RVBC Communities Worst Hit identifies that Clitheroe was affected during the following events:
 - 1866 Clitheroe River Ribble
 - 1923 Clitheroe River Ribble, River Calder

4.3 Environment Agency Historic Flooding

4.3.1 The Environment Agency have provided Historic Flood Information in relation to historic flood events which shows that the application site was no affected during the floods of August 2016 and July 2017.





5. Initial Evaluation of Flood Risk

5.1 Environment Agency Flood Map

5.1.1 The Environment Agency Flood Map illustrated within Figure 1, confirms that proposed development site is located in Flood Zone 2. The definition for each of the flood zones highlighted above is provided for reference within Section 2.5 of this report.

5.2 Sources of Flooding

Source/Pathway	Significant?	Comment/Reason	
Fluvial	Yes	Flood Zone 2 (Shaw 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)	Yes	Site will require a new drainage strategy	
Groundwater	No	SFRA states that groundwater flooding within the area is not considered to be a significant risk	
Surface Water Flooding	No	Site is located within an area that has a medium risk of flooding	
Overland Flow	No	EA mapping shows velocity from overland flow to be low risk.	
Blockage	No	Potential of culvert blocking upstream, however the culvert head is approx. 50m east of the site, as such there is a low risk associated with blockage onsite.	
Infrastructure failure	No	Not Applicable	
Rainfall Ponding	No	Small area of ponding identified within the boundary of the site, which will be served by a positive drainage strategy.	

 Table 1: Possible Flooding Mechanisms

5.2.1 From the initial assessment it is concluded that the primary source of flood risk will be from the fluvial source Shaw Brook and surface water runoff resulting from the development.



5.3 Fluvial: Shaw Brook

- 5.3.1 Shaw Brook emanates from Pendle Hill located approximately 3km east of the development site, where it flows west through the north of Clitheroe for approximately 3.7km, before joining Mearley Brook under Shaw Bridge Street approximately 300m west of the site.
- 5.3.2 Shaw Brook is culverted at a number of locations along its reach and this applies to the application site also. Within the immediate vicinity of the site, the upstream head of the culvert is located approx. 50m east of the site within a car park associated with Highmoor Park The head of the culvert is surrounded by low lying green open space, which is shown to provide some flood storage during extreme rainfall events.
- 5.3.3 The culvert stretches for approx. 120m, where it passes under Highmoor Park Road and traverses through the northern extent of the site, before exiting at the downstream head located at the north west corner of the application site, it then continues to flow west towards Mearley Brook.
- 5.3.4 Shaw Brook is considered to be a 'Main River' and therefore the Environment Agency have certain roles and responsibilities regarding maintenance and management of the watercourse.
- 5.3.5 Due to the proposed development site being located within Flood Zones 2 and therefore having a medium risk of fluvial flooding, further evaluation is required and is undertaken within Section 6 of this report.











5.4 Groundwater

5.4.1 Section 4.2.9 of the Ribble Valley Borough Councils SFRA states the following in relation to groundwater flooding:

'Following consultation with the EA, no evidence of groundwater flooding in the area has been identified. While no risk has been demonstrated, this is not to say that unrecorded groundwater flooding events may have taken place or that groundwater flooding may not occur in the future, but using the best available information they are not considered to be a significant risk at this time.'

- 5.4.2 A review of local borehole logs taken the BGS online service from approximately 300m east identifies that no water was struck at 5.50m BGL. The borehole records are available for reference within the appendix of this report.
- 5.4.3 In conclusion groundwater emergence is considered to be a low-risk flooding mechanism.



5.5 Surface Water Flooding

5.5.1 The Environment Agency's Surface Water Flood Map identifies that the application site has a medium risk associated with pluvial (surface water) flooding.



- Medium risk means that each year this area has a chance of flooding of between 1% and 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.
- 5.5.2 Surface water flooding to the north of the existing building is considered to be as a result of interaction with fluvial flooding associated with Shaw Brook and therefore has been assessed as part of the fluvial flooding assessment within Section 6 of this report.
- 5.5.3 The main area of surface water flooding attributed to the existing site is associated with the lower-level basement storage entrance.



- 5.5.4 During the worst-case low risk event i.e., 1000-year event there are no flow routes present and the depth is considered to be between 300mm-900mm. Taking this into account engineering judgment suggests that surface water flooding in this location is as a result of poor surface water drainage. Following development the scheme will have a new surface water drainage strategy, as such flooding at this location can be suitably managed.
- 5.5.5 Taking the above into consideration, flooding from surface water can be suitable managed within the proposed drainage strategy.

5.6 Pluvial: Exceedance and Local System Failure (Sewer Flooding)

5.6.1 The following text has been extracted from CIRIA 2906 'Managing Extreme Events by Designing for Exceedance January 2013':

'Climate change and urbanisation is already contributing to increased surface water flooding, where the capacity of the existing drainage systems are overwhelmed (or exceeded).

The traditional approach to fixing the problem is to build bigger pipes or provide underground storage. Ofwat, the Environment Agency and others believe that this approach is unsustainable and unaffordable and are encouraging sewerage undertakers, Lead Local Flood Authorities and highway authorities to look at different approaches to managing sewer and surface water flooding.

One approach being promoted is "designing for exceedance".

Designing for exceedance is an approach to manage flood risk (particularly from extreme events) by planning, designing and retrofitting drainage schemes that can safely accommodate rainfall and flooding that exceeds their design capacity (normally a 1 in 30 rainfall event). This is often achieved by considering flood pathways (such as managing runoff on highways) or providing additional storage (preferably on the surface through car parks, or multifunctional detention basins).

In England and Wales Sewers for Adoption and the National Planning Policy Framework encourage the consideration of drainage exceedance, it is a flexible approach to manage extreme events that can be used to reduce the need for more traditional, expensive underground approaches to manage surface water and often complement sustainable drainage and other local urban design initiatives.'

5.6.2 The impact of extreme rainfall events and/or local system failure will therefore need to be assessed as part of the overall surface water management strategy for the proposed development.



6. QUANTITATIVE FLOOD RISK ASSESSMENT

6.1 Fluvial: Shaw Brook

Culvert Details

- 6.1.1 The culverted section of Shaw Brook within the redline boundary has been surveyed to GPS coordinates in order to determine its route through the site, the findings are identified below:
 - At the upstream extent of the culvert (from the upstream headwall where it passes under Highmoor Park Road) comprises of a 1m diameter pipe, for a length of approx. 25m.
 - The culvert then downsizes to a 950mm x 650mm box culvert supported by lintels (it is noted that a manhole is at this location), this section continues for approx. 21m.
 - The culvert then upsizes to a 1m diameter culvert, at this location another culverted ordinary watercourse enters the culvert from the south at a 90-degree angle (it is noted that a buried manhole is at this location), the main culverted section of Shaw Brook continues under the edge of the existing building for approx. 81m.
 - The culvert then upsizes to a 1.6m diameter brick culvert, where it continues for approx. 15m, then exists at the downstream headwall to become open course.
- 6.1.2 A survey of the culverted watercourse is provided as an appendix within this report.

6.2 Flood Defences

6.2.1 The EA Flood Data identifies that the application site is not considered to be formally benefit from flood defences, however Shaw Brook does have flood defences downstream of the application site. It is noted that levels within Shaw Brook are shown to be higher during the defended scenario.

6.3 Environment Agency Modelled Flood Levels

- 6.3.1 The Environment Agency have provided modelled flood sample point levels associated with the application site at 4No locations, for a range of return periods.
- 6.3.2 Due to flood levels being higher during the defended scenario, these have been used as worst-case scenario in order to undertake the comparison.
- 6.3.3 The Environment Agency require the application of the central allowance for climate change i.e., 36%. The EA have provided flood levels with the application of 30%, 35% and 70% climate change.



- 6.3.4 As a result of the steep nature of the site ground levels at the locations of the flood sample positions and node locations have been used to determine flood depths.
- 6.3.5 On site flood sample points have been provided for only the defended 100 year, 100 yea + 70% climate change and 1000 year events, however the 100 year + 35% climate change on-site levels have not been included.
- 6.3.6 As such, to determine the 100 year + 35% climate change flood level Nodes 5 (at the downstream headwall) and Node 6 (at the upstream headwall on Highmoor Park road) have been used.
- 6.3.7 Due to the fact that no flooding is recorded on-site during the 100 year + 35% climate change event, flood levels during the 100 year + 70% climate change event have been used when determining appropriate mitigation measures.

Sample Point	Ground Level	1 in 100 Year	1 in 100 Year + 70%	1 in 1000 Year
U/S 1	88.91	No Flooding	89.28(Depth=0.37)	89.32(Depth=0.41)
2	87.98	No Flooding	88.16(Depth=0.18)	88.16(Depth=0.18)
3	85.87	No Flooding	86.04(Depth=0.17)	86.06(Depth=0.19)
D/S 4	85.16	No Flooding	85.75(Depth=0.59)	85.80(Depth=0.64)

Table 2: Flood Depths Using Flood Sample Points





- 6.3.8 Following evaluation of flood depths associated with sample points it has determined that the site will flood during the 100 year + 70% climate change event and the 1000 year event, however it has a low risk of flooding during the 100 year event.
- 6.3.9 A review of flood depths associated with flood nodes during the 100 year + 35% climate change event determined that no flooding is present at the downstream node (Node 5) and flooding of 0.22m at the upstream node (Node 6).

Node Point	Ground Level	1 in 100 Year + 35%
Node 5	85.02	81.91(No Flooding)
Node 6	82.71	82.93(Depth=0.22)

 Table 6: Flood Depths Using Flood Nodes



6.4 Fluvial Conclusion

- 6.4.1 Following a review of the available Environment Agency Flood Data, flood levels during the 100 year + 70% climate change range from 85.75m AOD (west of the site) to 89.28m AOD (east of the site).
- 6.4.2 Engineering judgement suggests that this a result of the culverted watercourse downsizing and becoming constricted as it traverses through the site causing flooding during storm events in excess of the 100 year + 35% climate change event.



- 6.4.3 Flows within the culvert then surcharge within the manholes then flood above ground, where they flow overland following topography along the culverts route, before making its way back into the open section of the watercourse at the downstream headwall west of the site.
- 6.4.4 Taking the above into account, flooding at the site is considered to be a fluvial overland flow route when the capacity of the culvert is exceeded, rather than a flood plain where levels would have less of a range.
- 6.4.5 Development proposals provide an 8 m easement from the edge of the culvert, providing a betterment compared to the existing building (which builds over the culvert). As such the flow route can now be contained within the easement where levels could be graded off directing flows towards the route of the culvert, rather than it backing up against the building's envelope
- 6.4.6 In order to ensure that level access can be maintained throughout the ground floor level of the proposed development, finished floor levels have been based on the 100 year + 70% climate change flood level at Node Sample Point 2: 88.16m AOD + 0.600m (freeboard), which equated to a finished floor level of 88.76m AOD.
- 6.4.7 Providing that mitigation measures as outlined within this report are implemented into the development the risk of fluvial flooding can be suitably managed.



7. <u>SURFACE WATER RUNOFF</u>

7.1 General

- 7.1.1 The application site is currently occupied by Worthington Brougham Furniture Ltd and comprises of approximately 5No physically attached buildings with basement storage areas, car parking and turning area at the frontage onto Pendle Road with green space to the north.
 - The total existing impermeable site area is approximately 0.367Ha
 - The total proposed impermeable site area is approximately 0.228Ha (40% reduction compared to existing)

7.2 Existing on Site Drainage Regime

7.2.1 At present a CCTV Survey has not been undertaken, however engineering judgement suggests that surface water flows from the existing building/s and associated car parking areas are positively drained, directing flows to Shaw Brook at an unrestricted rate.

7.3 Existing Sewer

7.3.1 United Utilities sewer records identify that the only public sewer within the vicinity of the site is a 300mm diameter public combined sewer located within Pendle Road flowing west.

7.4 Surface Water Drainage Hierarchy

- 7.4.1 The hierarchy for disposal of surface water from new developments is outlined within the Buildings Regulations Approved Document H and specifies the following methods in order of preference:
 - Infiltration via soakaway or other suitable infiltration device
 - Discharge to watercourse
 - Discharge to public surface water sewer
 - Discharge to public combined sewer

Infiltration

- 7.4.2 Following a non-intrusive desk top study infiltration at the site is not considered to be feasible, a review of Soilscape maps identifies the site to be located on land which is considered to be 'Slowly permeable seasonally wet acid loamy and clayey soils'.
- 7.4.3 A review of local borehole logs taken from the BGS online service approx. 300 west identifies that the underlying ground comprises of boulder clay down to 9m BGL.



- 7.4.4 A desk top study of the ground conditions is provided within the appendix of this report.
- 7.4.5 Taking the above into consideration the use of soakaways at the proposed development is not considered to be feasible.

Watercourse

- 7.4.5 The nearest watercourse to the proposed development is the Shaw Brook which is culverted located along the north boundary of the site.
- 7.4.6 Due to the fact that infiltration methods are unlikely to be feasible, it is recommended that surface water flows from the site are directed into Shaw Brook mimicking the existing situation.

7.5 Existing Runoff Rates

- 7.5.1 Existing runoff rates have been calculated using the Modified Rational Method for a total impermeable area of 0.367Ha.
 - 2.78 x 0.367 x 50 = 51 l/s

7.6 Restricted Discharge Rate

- 7.6.1 It is recommended that surface water flows from the site are restricted no more than
 70% of the existing discharge rate for all return periods up to and including the 100
 year + 40% climate change event.
 - 70% of 51l/s = 35.7l/s

7.7 Indicative Attenuation Rates

- 7.7.1 Indicative attenuation volumes have been calculated using the proposed impermeable area of 0.228Ha with flows restricted to 35.7l/s during the 100 year + 40% climate change event.
 - 100 year + 40% climate change event = $34m^3 72m^3$

7.8 Sustainable Urban Drainage Systems (SUDS)

- 7.8.1 SUDS act to reduce the impact of surface water runoff from the development by limiting runoff volumes and rates from leaving the site.
- 7.8.2 Undertaking an assessment using the SUDS Planner a number of different methods could be used within the development. A summary of the results is tabulated below:



SUDS Criteria	Rank 1	Rank 2	Rank 3
Hydrological	On/offline Storage	Infiltration Trench/Soakaway	Wet Pond
Land Use	Infiltration Trench/Soakaway	Permeable Paving	Green Roof
Site Features	Permeable Pavements	On/offline Storage	Filtration Techniques
Community & Environment	Bioretention Area	Permeable Paving	Stormwater Wetlands
Economics & Maintenance	On/offline Storage	Filter Strip	Dry Detention
Total	On/Offline Storage	Permeable Paving	Green Roof

Table 7: SUDS Planner

1. Source Control

The inclusion of source control in SUDS schemes is one of the more important principles of SUDS design, and source control components should be upstream of any pond, wetland or other SUDS component.

Source control can help provide interception storage which can handle and treat some of the more frequent but smaller, polluting events (at least 5mm).

Most source control components will be located within the private properties or highway areas. Their purpose is to manage rainfall close to where it falls, not allowing it to become a problem elsewhere.

The main types of source control include:

- Green roofs
- Rainwater harvesting
- Permeable paving
- Other permeable surfaces

Source control methods look to maximize permeability within a site to promote attenuation, treatment and infiltration, thereby reducing the need for off-site conveyance.

a) Green Roofs



Green roof solutions generally comprise of a multi-layered system that covers the roof of a building with vegetation cover, and/or landscaping over a drainage layer, designed to intercept and retain rainfall.

The incorporation of green roofs is to be decided by the architect/developers during the final design stage and is largely dependent on the final building design.

The likelihood of green roofs being utilised is considered to be low due to the increase in structural cost of the development.

b) Rainwater Harvesting

Rainwater harvesting provides a source of non-potable water, for purposes such as car washing; and landscaped area irrigation etc... and can be used for some industrial processes to reduce consumption of water from conventional supplies.

This SUDS solution, like green roof technology, is also designed to provide interception storage i.e. acts to reduce the volume of surface water leaving the proposed development; thereby helping to alleviate the current pressures on the receiving watercourse.

Rainwater harvesting can be installed at relatively low costs dependant on the chosen structure providing that the development site has scope.

c) Permeable Paving

Pervious surfaces can be either porous or permeable. The important distinction between the two is:

Porous surfacing is a surface that infiltrates water across the entire surface. Permeable surfacing is formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration through the pattern of voids.

Pervious surfaces provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into underlying layers.

The water can be temporarily stored before infiltration to the ground, reused, or discharged to a watercourse or other drainage system. Surfaces with an aggregate sub-base can provide good water quality treatment.

*Due to the proposed development having large drainage runs which cause excessive depths and the fact that the system will be privately maintained, permeable paving is unlikely to suitable for the proposed development site


2. On/Offline Storage

This is a traditional form of surface water attenuation and may be provided via online or offline structures such as oversized pipes; or shallow attenuation structures such as geo-cellular crate systems e.g. Hydro-International's Stormcell System or similar. These structures may be easily placed within either hardstanding or landscaped areas to provide ease of access for maintenance purposes.

7.9 Preliminary Drainage Strategy

- 7.9.1 The preliminary drainage strategy directs surface water flows from the roof and car parking area into the open channelled section of Shaw Brook, located at the north of the site via a new outfall.
- 7.9.2 The preliminary network has been modelled using FLOW Software for the proposed impermeable area of 0.288Ha, with discharge rates into the watercourse restricted to no more than 35.7l/s for all return periods up to and including the 100 year + 40% climate change event via a vortex flow control chamber. Flows in excess of this will be attenuated within a geo-cellular storage tank located within the car parking area and also within the piped network itself.

Modelled Tank Details

- Area = $30m^2$
- Depth of crate = 1m
- 95% void ratio

Modelled Flow Control

- Design Flow = 35.7l/s
- Design Depth = 2m
- 7.9.3 Permeable paving was considered, however once drainage runs from the rear of the building were brought to the frontage, the required depth of sub-base would not be economically viable and would be well in excess of the storage volume required.
- 7.9.4 Furthermore, providing permeable paving for only the car parking area would still require an additional tank to take flows from the roof area. This combined with the excessive maintenance burden discounted permeable paving from the preliminary drainage strategy.

7.10 Environmental Permit

7.10.1 The Environment Agency may require any works within 8m of the culverted watercourse apply for an Environmental Permit prior to any works being undertaken, this will include any new headwall structure.



7.11 Maintenance

7.11.1 It is anticipated that the proposed drainage network will remain private and therefore the land/property owner will be responsible for maintaining all the drainage elements.

7.12 Foul

7.12.1 It is recommended that foul flows from the proposed development site are directed into the 300mm diameter public combined sewer located within Pendle Road, following consent from United Utilities.



8. <u>MITIGATION MEASURES</u>

8.1 Finished Development Levels

- 8.1.1 Due to the application site being located within Flood Zone 2 finished floor levels of the site should be elevated whichever is the highest.
 - 300mm above existing ground level
 - 600mm above the 100 year + climate change event
- 8.1.2 The existing site has a range in level of approximately 5m. Because the development requires level access on the ground floor level a stepped approach is not feasible, therefore finished floor levels have been elevated 600mm above the 100 year + 70% climate change event at the Sample Point labelled No2.
 - Sample Point 2: 88.16m AOD + 0.600m (freeboard) = finished floor level of 88.76m AOD

8.2 Flood Resistance/Resilience Measures

8.2.1 Due to the finished floor levels of the proposed building being elevated to the required levels flood resilience/resistance measures are not required.

8.3 Access and Egress

8.3.1 Dry access and egress is available at all time via the main entrance at the south of the site, directly onto Pendle Road into Flood Zone 1.

8.4 Easement

8.4.1 The Environment Agency will require an 8m easement from the edge of the culverted watercourse, which has been incorporated into the development proposals. This provides a significant benefit over the existing building which built over the culvert.

8.5 Business Flood Plan

- 8.5.1 It is also recommended that staff create the business flood plan. This is a simple document that assists the staff/customers to prioritise actions required at the property before, during and following a flood event.
- 8.5.2 A copy of a business flood plan template has been provided within the appendices of this report.



9. <u>CONCLUSIONS & RECOMMENDATIONS</u>

Fluvial Flooding

- 9.1 Following a review of the available Environment Agency Flood Data, flood levels during the 100 year + 70% climate change range from 85.75m AOD (west of the site) to 89.28m AOD (east of the site).
- 9.2 Engineering judgement suggests that this a result of the culverted watercourse downsizing and becoming constricted as it traverses through the site causing flooding during storm events in excess of the 100 year + 35% climate change event.
- 9.3 Flows within the culvert then surcharge within the manholes then flood above ground, where they flow overland following topography along the culverts route, before making its way back into the open section of the watercourse at the downstream headwall west of the site.
- 9.4 Taking the above into account, flooding at the site is considered to be a fluvial overland flow route when the capacity of the culvert is exceeded, rather than a flood plain where levels would have less of a range.
- 9.5 Development proposals provide an 8m easement from the edge of the culvert, providing a betterment compared to the existing building (which builds over the culvert). As such the flow route can now be contained within the easement where levels could be graded off directing flows towards the route of the culvert, rather than it backing up against the building's envelope
- 9.6 In order to ensure that level access can be maintained throughout the ground floor level of the proposed development, finished floor levels have been based on the 100 year + 70% climate change flood level at Node Sample Point 2: 88.16m AOD + 0.600m (freeboard), which equated to a finished floor level of 88.76m AOD.
- 9.7 Providing that mitigation measures as outlined within this report are implemented into the development the risk of fluvial flooding can be suitably managed.

Preliminary Drainage Strategy

- 9.8 The preliminary drainage strategy directs surface water flows from the roof and car parking area into the open channelled section of Shaw Brook, located at the north of the site via a new outfall.
- 9.9 The preliminary network has been modelled using FLOW Software for the proposed impermeable area of 0.288Ha, with discharge rates into the watercourse restricted to no more than 35.7l/s for all return periods up to and including the 100 year + 40% climate change event via a vortex flow control chamber.



9.10 Flows in excess of this will be attenuated within a geo-cellular storage tank located within the car parking area and also within the piped network itself.

Modelled Tank Details

- Area = 30m2
- Depth of crate = 1m
- 95% void ratio

Modelled Flow Control

- Design Flow = 35.7l/s
- Design Depth = 2m
- 9.11 Permeable paving was considered, however once drainage runs from the rear of the building were brought to the frontage, the required depth of sub-base would not be economically viable and would be well in excess of the storage volume required.
- 9.12 Furthermore, providing permeable paving for only the car parking area would still require an additional tank to take flows from the roof area. This combined with the excessive maintenance burden discounted permeable paving from the preliminary drainage strategy.
- 9.13 The Environment Agency may require any works within 8m of the culverted watercourse apply for an Environmental Permit prior to any works being undertaken, this will include any new headwall structure.

Mitigation Measures

Finished Floor Levels

- 9.14 Due to the application site being located within Flood Zone 2 finished floor levels of the site should be elevated whichever is the highest.
 - 300mm above existing ground level
 - 600mm above the 100 year + climate change event
- 9.15 The existing site has a range in level of approximately 5m. Because the development requires level access on the ground floor level a stepped approach is not feasible, therefore finished floor levels have been elevated 600mm above the 100 year + 70% climate change event at the Sample Point labelled No2.

• Sample Point 2: 88.16m AOD + 0.600m (freeboard) = finished floor level of 88.76m AOD



Watercourse Easements

9.16 The Environment Agency will require an 8m easement from the edge of the culverted watercourse, which has been incorporated into the development proposals. This provides a significant benefit over the existing building which built over the culvert.

Business Flood Plan

- 9.17 It is also recommended that staff create the business flood plan. This is a simple document that assists the staff/customers to prioritise actions required at the property before, during and following a flood event.
- 9.18 A copy of a business flood plan template has been provided within the appendices of this report

APPENDIX A

Development Proposals



APPENDIX B

Topographical Survey



	374850.000		
AMENDMENT	DATE	BY	CHKD.

NOTES
This survey has been fitted to Ordnance Survey Grid and Datum using GPS coordinates system OSGB36-15 and has been drawn at a scale factor of 1.0000.
Although this survey is tied to Ordnance Survey, due to the scale facto any setting out or design works should strictly use the control co-ordinates contained within the table.
Boundaries shown are physical features on site and do not necessarily represent the legal extents of ownership.
This drawing and the information contained therein is issued in confidence and is the copyright of CSL Surveys (Engineering) Ltd. Disclosure of this information to Third Parties without permission

APPENDIX C

Culvert Survey



	LEGEND		
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	REVISION	DESCRIPTION	DATE
	PR	ODAR round Mapping	PRODAR SURVEYS LTD. Unit 20 Carlisle House Carlisle Street Goole DN14 5DS T: +44 (0) 1482 778 588 F: +44 (0) 8443 913 111 E: info@prodarsurveys.co.uk W: www.prodarsurveys.co.uk
	JOB TITLE:	CSL SURVEYS (E PENDLE MILL CLITHEROE BB7 1JQ	ENGINEERING) LTD
	DRAWING TI	TLE: CULVERT LINE A	ND LEVEL SURVEY
500.000	DRAWING N	O: 92307-001	DATE: 29/04/2022
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		MG Y: AB	SCALE: 1:200 @ A1
	SCALE BAR:		
		0.0m 2.0m 4.0m	6.0m 8.0m 10.0m

APPENDIX D

Environment Agency Modelled Flood Data

Flood risk assessment data



Location of site: 374928 / 441549 (shown as easting and northing coordinates) Document created on: 11 April 2022 This information was previously known as a product 4. Customer reference number: P6CRH2EYX3XG

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- areas benefiting from defences
- historic flooding
- flood defences and attributes
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Not included in this document

This document does not include a Flood Defence Breach Hazard Map.

As your location benefits from flood defences, you need to request a Flood Defence Breach Hazard Map and information about the level of flood protection offered at your location from the Cumbria and Lancashire Environment Agency team at <u>inforequests.cmblnc@environment-agency.gov.uk</u>. This information will only be available if modelling has been carried out for breach scenarios.

Include a site location map in your request.

Surface water and other sources of flooding

Use the long term flood risk service to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Mearley Brook 2018

Scenario(s): Defended fluvial, defences removed fluvial, defended climate change fluvial Date: 1 December 2017

This model contains the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your development is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

This data is updated on a quarterly basis as better data becomes available.

Areas benefiting from defences

This map shows the areas benefiting from defences for 2 possible events:

- fluvial (river flooding) event that has a 1% annual exceedance probability (AEP), this means a 1% chance of occurring in any one year
- tidal or coastal event that has a 0.5% annual exceedance probability (AEP), this means a 0.5% chance of occurring in any one year

Download the GIS dataset for areas benefiting from defences



Historic flooding

This map is an indicative outline of areas that have previously flooded. Remember that:

- our records are incomplete, so the information here is based on the best available data
- it is possible not all properties within this area will have flooded
- other flooding may have occurred that we do not have records for
- flooding can come from a range of different sources we can only supply flood risk data relating to flooding from rivers or the sea

You can also contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

Download recorded flood outlines in GIS format



Historic flood event data

Start date	End date	Source of flood	Cause of flood	Affects location
22 August 2016	23 August 2016	main river	channel capacity exceeded (no raised defences)	No
3 July 2007	4 July 2007	ordinary watercourse	obstruction/blockage - culvert	No

Flood defences and attributes

The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is In mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.



Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	536674	Flood Gate		Fair	77.10	77.10	77.10
2	148786	Wall	10	Poor	78.25	79.30	78.25
3	150181	Wall	10	Poor	78.10	79.90	78.10

Any blank cells show where a particular value has not been recorded for an asset.

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

The climate change data included in the models may not include the latest <u>flood risk</u> <u>assessment climate change allowances</u>. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change





Page 14





Modelled node locations data

Defended

Label	Modelled location ID	Easting	Northing	5% AEF		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	982264	374694	441672	75.61	2.22	75.83	2.75	76.07	3.02	76.26	3.23	76.85	3.85	77.74	4.69
2	982352	374708	441658	76.58	2.22	76.65	2.75	76.68	3.02	76.72	3.25	76.98	3.86	77.98	6.04
3	982269	374736	441636	77.26	2.22	77.33	2.75	77.36	3.02	77.38	3.24	77.49	3.86	78.03	6.04
4	982263	374781	441611	78.61	2.08	78.67	2.57	78.69	2.82	78.71	3.02	78.76	3.61	78.91	5.64
5	982431	374877	441576	81.72	2.08	81.77	2.57	81.79	2.82	81.81	3.02	81.87	3.60	81.96	4.59
6	982333	375013	441537	91.84	2.08	92.03	2.57	92.12	2.82	92.20	3.02	92.61	3.60	93.33	5.65
7	982374	375040	441477	93.40	1.78	93.47	2.20	93.51	2.42	93.61	2.97	93.62	3.26	93.88	4.85
8	982382	375074	441372	96.40	1.78	96.56	2.20	96.64	2.42	96.70	2.80	96.70	3.09	96.84	4.85
9	982365	375086	441313	97.52	1.78	97.60	2.20	97.64	2.42	97.67	2.59	97.73	3.09	97.85	4.85
10	982456	375187	441763	93.92	1.50	93.97	1.85	94.0	2.03	94.02	2.18	94.08	2.60	94.21	4.08

Data in this table comes from the Mearley Brook 2018 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second. Any blank cells show where a particular scenario has not been modelled for this location.



Modelled node locations data

Defences removed

Label	Modelled location ID	Easting	Northing	5% AEF)	2% AEP	2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	
1	982264	374694	441672	75.61	2.22					76.21	3.23			76.53	3.46	
2	982352	374708	441658	76.58	2.22					76.72	3.25			76.99	5.70	
3	982269	374736	441636	77.26	2.22					77.38	3.24			77.66	6.04	
4	982263	374781	441611	78.61	2.08					78.71	3.02			78.95	5.64	
5	982431	374877	441576	81.72	2.08					81.81	3.02			81.94	4.59	
6	982333	375013	441537	91.84	2.08					92.20	3.02			93.33	5.65	
7	982374	375040	441477	93.40	1.78					93.61	2.97			93.88	4.85	
8	982382	375074	441372	96.40	1.78					96.70	2.80			96.84	4.85	
9	982365	375086	441313	97.52	1.78					97.67	2.59			97.85	4.85	
10	982456	375187	441763	93.92	1.50					94.02	2.18			94.21	4.08	

Data in this table comes from the Mearley Brook 2018 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second. Any blank cells show where a particular scenario has not been modelled for this location.



Modelled node locations data

Defended climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+30%)		1.0% AEP (+35%)		1.0% AEP (+70%)		0.1% AEP (+30%)	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	982264	374694	441672	77.19	4.19	77.36	4.35	77.71	4.66	77.81	4.74
2	982352	374708	441658	77.32	4.20	77.50	4.35	77.91	5.52	78.16	7.63
3	982269	374736	441636	77.58	4.20	77.65	4.36	77.97	5.52	78.20	7.83
4	982263	374781	441611	78.77	3.92	78.78	4.07	78.86	5.16	79.06	7.30
5	982431	374877	441576	81.90	3.92	81.91	4.07	81.95	4.55	81.98	4.68
6	982333	375013	441537	92.83	3.92	92.93	4.07	93.30	5.13	93.40	7.35
7	982374	375040	441477	93.68	3.36	93.71	3.50	93.85	4.40	93.94	6.30
8	982382	375074	441372	96.70	3.36	96.71	3.50	96.81	4.40	96.91	6.30
9	982365	375086	441313	97.75	3.36	97.76	3.49	97.83	4.40	97.91	6.30
10	982456	375187	441763	94.10	2.83	94.11	2.94	94.18	3.70	94.32	5.30

Data in this table comes from the Mearley Brook 2018 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second. Any blank cells show where a particular scenario has not been modelled for this location.



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Fluvial Flood Levels Map: Pendle Mill Showrooms, Clitheroe, BB7 1JQ

Key

Fluvial Defended 1% annual probability of flooding scenario

mAOD

High : 89

Low : 85

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.





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Fluvial Flood Levels Map: Pendle Mill Showrooms, Clitheroe, BB7 1JQ

Key

Fluvial Defended 1% annual probability of flooding scenario + 70% Climate Change

mAOD

High : 90

Low : 85

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.




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Fluvial Flood Levels Map: Pendle Mill Showrooms, Clitheroe, BB7 1JQ

Key

Fluvial Defended 0.1% annual probability of flooding scenario

mAOD

High : 90

Low : 85

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.





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Fluvial Flood Levels Map: Pendle Mill Showrooms, Clitheroe, BB7 1JQ

Key

Fluvial Undefended 1% annual probability of flooding scenario

mAOD

High : 89

Low : 85

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.





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Fluvial Flood Levels Map: Pendle Mill Showrooms, Clitheroe, BB7 1JQ

Key

Fluvial Undefended 0.1% annual probability of flooding scenario

mAOD

High : 89

Low : 85

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

Find out more about flood risk activity permits

Help and advice

Contact the Cumbria and Lancashire Environment Agency team at <u>inforequests.cmblnc@environment-agency.gov.uk</u> for:

- more information about getting a product 5, 6, 7 or 8
- general help and advice about the site you're requesting data for

Site Location	Pendle Mill Showrooms, Pendle Rd., Clitheroe	CL253138
---------------	--	----------

•

Fluvial Defences

Asset ID	National Grid	Asset Type	Protection	Location	Maintained By	Design Standard	Overall Condition	Effective Crest Level (m)		E.C.L Data Quality (Reliable 1-4	Length (m)	Height
	Reference		туре			(Neturn Penou)	Grade	UCL (mAOD)	DCL (mAOD)	Unreliable)	(11)	(11)
67006	SD7431441441	Wall	Fluvial	Moor Lane to Culvert at Homebase Car Park off Queensway	Environment Agency	10	3 - Fair	72.86	73.65	2	89.42	3.3
67140	SD7461941745	Wall	Fluvial	Shawbridge Street to Holden Street	Environment Agency	5	3 - Fair	76.01	75.92	1	179.94	3.8
148786	SD7469441672	Wall	Fluvial	Culvert adjacent Shawbridge Street to Access Bridge off Pendle Road	Environment Agency	10	4 - Poor	79.3	78.25	1	55.06	-
536674	SD7469641674	Flood Gate	Fluvial	Shawbridge Street	Environment Agency	-	3 - Fair	77.1	77.1	2	2.3	1.5
150181	SD7469641674	Wall	Fluvial	Culvert adjacent Shawbridge Street to Access Bridge off Pendle Road	Environment Agency	10	4 - Poor	79.9	78.1	1	63.33	-

The Environmental Permitting (England and Wales) Regulations 2016 require a permit to be obtained for any activities which will take place:

on or within 8 metres of a flood defence structure or culvert (16 metres if tidal)

• on or within 16 metres of a sea defence

Site LocationPendle Mill Showrooms, Pendle Rd., ClitheroeCL253138

Asset ID	National Grid Reference	Asset Type	Protection Type	Location	Maintained By	Design Standard (Return Period)	Overall Condition Grade	Width (m)	Height (m)
229933	SD74254143	Outfall	Fluvial	Downstream face of Moor Lane	Private individual, Company or Charity	-	3 - Fair	0.3	2.2
229931	SD74614174	Outfall	Fluvial	Downstream of Shawbridge Street	Private individual, Company or Charity	-	3 - Fair	-	-
229932	SD74614174	Outfall	Fluvial	Downstream of Shawbridge Street	Private individual, Company or Charity	-	3 - Fair	-	1.5

Fluvial Structures

CL253138 Pendle Mill Showrooms, Pendle Rd., Clitheroe - Overview Map



CL253138 Pendle Mill Showrooms, Pendle Rd., Clitheroe - Map 1



CL253138 Pendle Mill Showrooms, Pendle Rd., Clitheroe - Map 2



March 8, 2022



APPENDIX E

Desktop Ground Condition Review



But Client Suive Consulting	Engineers	Co-part	nership	gical Survey					British	Geologic	al Survey		
Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sam Dep	ble ths	Sample Types	N Value	Cu	9	Water Level	Pie [-zo F)ai] Proc
Soft to firm brown grey silty CLAY, with fine to coarse gravel and cobbles (Boulder Clay)	5.	×a	(0.60)		0.50 -	0.95	s _T 1	N 7					
Firm to stiff grey sandy CLAY, with fine to coarse gravel and cobbles.	e				1.00								
					1.50 -	1.75	U _T 1						
					2.00		D 5 T						
					2.50 -	2.95	s_2	N 25					
itish Geological Survey			(4.90)	gical Survey	3.00		DT3		British	Geologia	al Survey		
		P			3.50 -	3.95	\$_3	N 23					
					4.00		D [⊥] 4						
					4.50 -	4.95	S_4	N 97	-				
		₽		5 50	5.00		0-5						20
Cobble obstruction Borehole Completed	1												-23
British Geological Survey			British Geolo	ecal Survey					Bonitish	Geologic	al Survey		
British Geological Survey			British Geolo	fical Survey					British	Geologic	al Survey		
General Remarks :							Datas			E 00			
No water encountered dur Chiselling and slow dril Chiselling cobble obstru	ing drilling ling (3 ho ction (1 hou]. jurs) ir)					Drill Engin	er : T eer: G	.A.M .H	L 50			

APPENDIX F

United Utilities Sewer records



Christian vose

ACCRINGTON, BB5 3QW

144

FAO:

New Lane,

How to contact us:

United Utilities Water Limited Property Searches Haweswater House Lingley Mere Business Park Great Sankey Warrington WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: PENDLE MILL Our Ref: UUPS-ORD-395139 Date: 23/05/2022

Dear Sirs

Location: WORTHINGTON BROUGHAM FURNITURE LTD PENDLE MILL PENDLE ROAD, CLITHEROE, BB7 1JQ

I acknowledge with thanks your request dated 17/05/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <u>http://www.unitedutilities.com/work-near-asset.aspx</u>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us.

Yours Faithfully,

new

Karen McCormack Property Searches Manager

UUWaterLtd/041/03-15

United Utilities Water Limited Registered In England & Wales No. 2366678 Registered Office Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP



TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



Wastewater Symbology

Abandoned	Foul	Surface Water	Combined	Public Sewer
				Private Sewer
				Section 104
+++++++++++++++++++++++++++++++++++++++	+++++++++++++++++++++++++++++++++++++++	+++++++++++++++++++++++++++++++++++++++	+++++++++++++++++++++++++++++++++++++++	Rising Main
<u> </u>				Sludge Main
.	3 	+		Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convent	tion:	red – combinedbrown - foulblue – surface waterpurple - overflow
Manhole	•	Side Entry Manhole
Head of System	C	Outfall
Extent of Survey		Screen Chamber
Rodding Eye	IC	Inspection Chamber
Inlet	0	Bifurcation Chamber
Discharge Point	LH	Lamp Hole
Vortex	-	T Junction / Saddle
Penstock	0	Catchpit
💞 Washout Chamber	0	Valve Chamber
🎽 Valve	-	Vent Column
🎳 Air Valve	O	Vortex Chamber
Non Return Valve	0	Penstock Chamber
Soakaway		Network Storage Tank
Gully	Ď	Sewer Overflow
Cascade		Ww Treatment Works
Flow Meter		Ww Pumping Station
💾 Hatch Box		Septic Tank
Oil Interceptor		Control Kiosk
Summit		
Drop Shaft	\bigtriangledown	Change of Characteristic
🗳 Orifice Plate		



APPENDIX G

Indicative Attenuation Requirements

Storage Estimate

Return Period (years)

Climate Chan

Impermeable

Peak Dischar

Infiltration Co (leave blank

Required Sto

nge (%)	40
e Area (ha)	0.228
rge (I/s)	35.700
oefficient (m/hr) if no infiltration)	
orage (m³)	Calc
from	34
to	72

100

APPENDIX H

Drainage Design



CLIENT: MULLER PROPERTIES	DATE: 26/05 STATUS:	/2022
PROJECT: CARE HOME AT PENDLE ROAD,	drawn by C	: V
CLITHEROE	SCALE:	50
DRAWING TITLE: PRELIMINARY DRAINAGE STRATEGY	SIZE:	1
DRAWING REFERENCE: 2022-025-01	REVISION:	

APPENDIX I

Modelled Calculation Report



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	150.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	0.500
CV	0.750	Include Intermediate Ground	\checkmark
Time of Entry (mins)	4.00	Enforce best practice design rules	\checkmark

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	29.700	166.0	225	Circular	88.610	87.885	0.500	88.610	87.706	0.679
1.001	22.700	166.0	225	Circular	88.610	87.706	0.679	88.610	87.569	0.816
1.002	13.600	166.0	225	Circular	88.610	87.569	0.816	88.610	87.487	0.898
1.003	38.600	166.0	225	Circular	88.610	87.487	0.898	88.610	87.254	1.131
1.004	20.000	166.0	225	Circular	88.610	87.254	1.131	88.610	87.134	1.251
1.005	4.700	166.0	225	Circular	88.610	87.134	1.251	88.610	87.106	1.279
1.006	12.200	166.0	225	Circular	88.610	87.106	1.279	88.610	87.033	1.352
1.007	16.000	166.0	225	Circular	88.610	87.033	1.352	88.610	86.937	1.448
2.000	5.500	100.0	150	Circular	88.610	87.960	0.500	88.610	87.905	0.555
2.001	6.800	100.0	150	Circular	88.610	87.905	0.555	88.610	87.837	0.623
2.002	6.000	100.0	150	Circular	88.610	87.837	0.623	88.610	87.777	0.683
2.003	5.000	100.0	150	Circular	88.610	87.777	0.683	88.610	87.727	0.733
2.004	27.000	50.1	150	Circular	88.610	87.704	0.756	88.610	87.165	1.295
1.008	2.700	166.0	225	Circular	88.610	86.937	1.448	88.610	86.921	1.464
3.000	3.500	166.7	225	Circular	88.610	87.086	1.299	88.610	87.065	1.320
1.009	1.500	166.7	225	Circular	88.610	86.500	1.885	88.610	86.491	1.894
1.010	11.000	10.0	225	Circular	88.610	86.000	2.385	86.000	84.900	0.875
1.011	4.600	10.0	225	Circular	86.000	82.000	3.775	85.040	81.540	3.275

Link	US	Dia	Node	MH	DS	Dia	Node	MH
	Node	(mm)	Туре	Туре	Node	(mm)	Туре	Туре
1.000	RE1	150	Manhole	Adoptable	S1	600	Manhole	Adoptable
1.001	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.002	S2	600	Manhole	Adoptable	S3	600	Manhole	Adoptable
1.003	S3	600	Manhole	Adoptable	S4	600	Manhole	Adoptable
1.004	S4	600	Manhole	Adoptable	S5	600	Manhole	Adoptable
1.005	S5	600	Manhole	Adoptable	S6	600	Manhole	Adoptable
1.006	S6	600	Manhole	Adoptable	S7	600	Manhole	Adoptable
1.007	S7	600	Manhole	Adoptable	S13	600	Manhole	Adoptable
2.000	S8	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
2.001	S9	600	Manhole	Adoptable	S10	600	Manhole	Adoptable
2.002	S10	600	Manhole	Adoptable	S11	600	Manhole	Adoptable
2.003	S11	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
2.004	S12	600	Manhole	Adoptable	S13	600	Manhole	Adoptable
1.008	S13	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
3.000	S14	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
1.009	TANK	600	Manhole	Adoptable	S15	1500	Manhole	Adoptable
1.010	S15	1500	Manhole	Adoptable	S16	1200	Manhole	Adoptable
1.011	S16	1200	Manhole	Adoptable	OUT	1	Manhole	Adoptable



Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Node Type	МН Туре	Connections	Link	IL (m)	Dia (mm)	Link Type
RE1	88.610	0.725	150	Manhole	Adoptable	\bigcirc				
						C	1.000	87.885	225	Circular
S1	88.610	0.904	600	Manhole	Adoptable		1.000	87.706	225	Circular
						C	1.001	87.706	225	Circular
S2	88.610	1.041	600	Manhole	Adoptable		1.001	87.569	225	Circular
						C	1.002	87.569	225	Circular
S3	88.610	1.123	600	Manhole	Adoptable		1.002	87.487	225	Circular
						C	1.003	87.487	225	Circular
S4	88.610	1.356	600	Manhole	Adoptable		1.003	87.254	225	Circular
						C	1.004	87.254	225	Circular
S5	88.610	1.476	600	Manhole	Adoptable		1.004	87.134	225	Circular
						C	1.005	87.134	225	Circular
S6	88.610	1.504	600	Manhole	Adoptable		1.005	87.106	225	Circular
<u> </u>	00.010	4 5 7 7	600	N de vele e la	A	C	1.006	87.106	225	Circular
57	88.610	1.577	600	Wannoie	Adoptable		1.006	87.033	225	Circular
<u> </u>	00 610	0.650	600	Manhala	Adoptoblo	C	1.007	87.033	225	Circular
30	88.010	0.650	600	Walliole	Adoptable	\bigcirc			450	
50	88 610	0 705	600	Manhole	Adontable		2.000	87.960	150	Circular
55	00.010	0.705	000	Wannoic	Лиориоте		2.000	07.005	150	Circular
S10	88 610	0 772	600	Manhole	Adontable	1	2.001	87.905	150	Circular
510	00.010	0.775	000	Wannoie	Ασριασίε		2.001	07.007	150	Circular
C11	00 610	0 0 2 2	600	Manhala	Adoptable		2.002	87.837	150	Circular
211	00.010	0.833	000	wannoie	Αυορταρία		2.002	01.111	120	CITCUId
C40	00.010	0.000	600	Mariah	Adamstall	C	2.003	87.777	150	Circular
512	88.610	0.906	600	Nanhole	Adoptable		2.003	87.727	150	Circular
						C	2.004	87.704	150	Circular



Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connection	S	Link	IL (m)	Dia (mm)	Link Type
S13	88.610	1.673	600	Manhole	Adoptable		1	2.004	87.165	150	Circular
						\bigcirc	2	1.007	86.937	225	Circular
							0	1.008	86.937	225	Circular
S14	88.610	1.524	600	Manhole	Adoptable	\bigcirc					
							0	3.000	87.086	225	Circular
TANK	88.610	2.110	600	Manhole	Adoptable		1	3.000	87.065	225	Circular
						\bigcirc	2	1.008	86.921	225	Circular
							0	1.009	86.500	225	Circular
S15	88.610	2.610	1500	Manhole	Adoptable	\bigcirc	1	1.009	86.491	225	Circular
							0	1.010	86.000	225	Circular
S16	86.000	4.000	1200	Manhole	Adoptable	\bigcirc	1	1.010	84.900	225	Circular
						Ŭ	0	1 011	82 000	225	Circular
	85 040	3 500	1	Manhole	Adoptable		1	1.011	81 540	225	Circular
001	05.040	3.500	Ţ	Wannoie	Adoptable	\bigcirc	Ţ	1.011	01.340	223	Circular
					Circuit at i and	C - 44 ¹					

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	х
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	х
Winter CV	0.840	Check Discharge Volume	х

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Node S15 Online ACO Q-Brake Control

Flap Valve	x	Design Depth (m)	2.000	Min Node Diameter (mm)	1500
Replaces Downstream Link	\checkmark	Design Flow (I/s)	35.7	Orifice Diameter (mm)	0.219
Invert Level (m)	86.000	Min Outlet Diameter (m)	0.220		



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Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)0.00000Side Inf Coefficient (m/hr)0.00000				ty Facto Porosit	or 2.0 y 0.95	Time to I	86.500 24		
Depth	Area	Inf Area	Depth	Area	Inf Area	Depth	Area	Inf Area	
(m)	(m²)	(m²)	(m)	(m²)	(m²)	(m)	(m²)	(m²)	
0.000	30.0	0.0	1.000	30.0	0.0	1.001	0.0	0.0	



15 minute winter

S6

S7

S8

S9

S10

S11

S12

S13

S14 TANK

S15

S16

1.006

1.007

2.000

2.001

2.002

2.003

2.004

1.008

3.000

1.009

1.011

ACO Q-Brake

S7

S13

S9

S10

S11

S12

S13

TANK

TANK

S15

S16

OUT

11.2

11.0

0.5

0.5

2.7

3.4

7.4

17.9

11.3

23.1

23.0

23.0

0.845

0.663

0.445

0.218

0.614

0.741

1.226

0.905

0.814

0.957

2.683

0.277

0.274

0.028

0.028

0.152

0.190

0.295

0.444

0.281

0.576

0.139

0.1610

0.2721

0.0063

0.0174

0.0264

0.0228

0.1634

0.0533

0.0486

0.0362

0.0394

13.6

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.40%

Node Ev	ent	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m ³)	Flood (m ³)	Stat	us
15 minute v	winter	RE1	10	87.926	0.041	3.0	0.0258	0.0000	ОК	
15 minute v	winter	S1	10	87.764	0.058	5.8	0.0435	0.0000	OK	
15 minute v	winter	S2	11	87.628	0.059	5.7	0.0166	0.0000	OK	
15 minute v	winter	S3	11	87.548	0.061	6.6	0.0260	0.0000	ОК	
15 minute v	winter	S4	11	87.325	0.071	8.7	0.0386	0.0000	ОК	
15 minute v	winter	S5	11	87.224	0.090	11.0	0.0513	0.0000	ОК	
15 minute v	winter	S6	11	87.192	0.086	11.2	0.0276	0.0000	ОК	
15 minute v	winter	S7	12	87.113	0.080	11.2	0.0226	0.0000	ОК	
15 minute v	winter	S8	9	87.978	0.018	0.5	0.0072	0.0000	ОК	
15 minute v	winter	S9	11	87.922	0.017	0.5	0.0049	0.0000	ОК	
15 minute v	winter	S10	10	87.879	0.042	2.7	0.0291	0.0000	ОК	
15 minute v	winter	S11	10	87.825	0.048	3.4	0.0192	0.0000	ОК	
15 minute v	winter	S12	10	87.761	0.057	7.5	0.0540	0.0000	ОК	
15 minute v	winter	S13	11	87.057	0.120	17.9	0.0339	0.0000	ОК	
15 minute v	winter	S14	10	87.177	0.091	11.3	0.1243	0.0000	ОК	
15 minute v	winter	TANK	12	86.643	0.143	27.8	4.1052	0.0000	ОК	
15 minute v	winter	S15	13	86.192	0.192	23.1	0.3401	0.0000	ОК	
15 minute v	winter	S16	13	82.064	0.064	23.0	0.0729	0.0000	ОК	
15 minute v	winter	OUT	13	81.596	0.056	23.0	0.0000	0.0000	OK	
Link Event	US	Lii	nk	DS	Outflow	Velocity	Flow/Ca	ap Lin	k	Discharge
(Upstream Depth)	Node			Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter	RE1	1.000		S1	3.0	0.459	0.07	74 0.1	944	
15 minute winter	S1	1.001		S2	5.7	0.700	0.14	41 0.1	842	
15 minute winter	S2	1.002		S3	5.6	0.666	0.14	40 0.1	149	
15 minute winter	S3	1.003		S4	6.6	0.684	0.16	54 0.3	730	
15 minute winter	S4	1.004		S5	8.6	0.672	0.22	13 0.2	555	
15 minute winter	S5	1.005		S6	10.9	0.759	0.27	71 0.0	676	



|--|

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	10	87.949	0.064	7.3	0.0402	0.0000	ОК
15 minute winter	S1	10	87.802	0.096	14.3	0.0714	0.0000	OK
15 minute winter	S2	10	87.667	0.098	14.2	0.0277	0.0000	OK
15 minute winter	S3	11	87.587	0.100	16.6	0.0423	0.0000	OK
15 minute winter	S4	11	87.377	0.123	22.1	0.0671	0.0000	OK
15 minute winter	S5	11	87.308	0.174	28.0	0.0984	0.0000	ОК
15 minute winter	S6	11	87.270	0.164	28.8	0.0531	0.0000	OK
15 minute winter	S7	11	87.213	0.180	28.6	0.0511	0.0000	OK
15 minute summer	S8	10	87.989	0.029	1.3	0.0116	0.0000	OK
15 minute winter	S9	10	87.932	0.027	1.3	0.0078	0.0000	OK
15 minute winter	S10	10	87.908	0.071	6.6	0.0495	0.0000	OK
15 minute winter	S11	10	87.857	0.080	8.3	0.0324	0.0000	OK
15 minute winter	S12	10	87.803	0.099	18.3	0.0932	0.0000	OK
15 minute winter	S13	11	87.167	0.230	45.0	0.0650	0.0000	SURCHARGED
15 minute summer	S14	10	87.243	0.157	27.6	0.2159	0.0000	OK
15 minute winter	TANK	14	86.929	0.429	69.7	12.3575	0.0000	SURCHARGED
15 minute winter	S15	14	86.905	0.905	49.0	1.5997	0.0000	SURCHARGED
15 minute summer	S16	19	82.084	0.084	35.7	0.0948	0.0000	OK
15 minute winter	OUT	10	81.611	0.071	35.7	0.0000	0.0000	ОК
Link Event L	IS	Link	DS	Outflov	v Velo	city Flow	/Cap	Link Discharg

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)	Node		Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter	RE1	1.000	S1	7.3	0.577	0.181	0.3773	
15 minute winter	S1	1.001	S2	14.2	0.871	0.353	0.3699	
15 minute winter	S2	1.002	S3	13.9	0.834	0.346	0.2271	
15 minute winter	S3	1.003	S4	16.6	0.850	0.412	0.7531	
15 minute winter	S4	1.004	S5	22.0	0.793	0.546	0.5496	
15 minute winter	S5	1.005	S6	27.9	0.890	0.694	0.1502	
15 minute winter	S6	1.006	S7	28.6	0.950	0.712	0.3977	
15 minute winter	S7	1.007	S13	28.6	0.781	0.712	0.5913	
15 minute summer	S8	2.000	S9	1.3	0.577	0.073	0.0125	
15 minute winter	S9	2.001	S10	1.3	0.261	0.073	0.0354	
15 minute winter	S10	2.002	S11	6.6	0.739	0.371	0.0535	
15 minute winter	S11	2.003	S12	8.3	0.895	0.465	0.0463	
15 minute winter	S12	2.004	S13	18.2	1.518	0.722	0.3230	
15 minute winter	S13	1.008	TANK	44.9	1.189	1.117	0.0990	
15 minute summer	S14	3.000	TANK	27.6	1.009	0.687	0.0956	
15 minute winter	TANK	1.009	S15	49.0	1.255	1.221	0.0597	
15 minute winter	S15	ACO Q-Brake	S16	35.7				
15 minute summer	S16	1.011	OUT	35.7	2.964	0.216	0.0554	29.8





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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.40%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	10	87.973	0.088	13.2	0.0549	0.0000	ОК
30 minute winter	S1	25	87.874	0.168	20.4	0.1257	0.0000	ОК
30 minute winter	S2	25	87.866	0.297	20.2	0.0842	0.0000	SURCHARGED
30 minute winter	S3	25	87.861	0.374	23.9	0.1591	0.0000	SURCHARGED
30 minute winter	S4	25	87.854	0.600	31.7	0.3286	0.0000	SURCHARGED
30 minute winter	S5	24	87.847	0.713	37.5	0.4042	0.0000	SURCHARGED
30 minute winter	S6	24	87.842	0.736	37.9	0.2377	0.0000	SURCHARGED
30 minute winter	S7	23	87.831	0.798	36.6	0.2258	0.0000	SURCHARGED
15 minute winter	S8	11	88.073	0.113	2.4	0.0459	0.0000	ОК
15 minute winter	S9	11	88.072	0.167	2.5	0.0474	0.0000	SURCHARGED
15 minute winter	S10	11	88.071	0.234	11.5	0.1633	0.0000	SURCHARGED
15 minute winter	S11	11	88.046	0.269	12.0	0.1083	0.0000	SURCHARGED
15 minute winter	S12	11	88.009	0.305	28.0	0.2886	0.0000	SURCHARGED
30 minute winter	S13	23	87.818	0.881	60.6	0.2494	0.0000	SURCHARGED
30 minute winter	S14	23	87.814	0.728	39.7	0.9984	0.0000	SURCHARGED
30 minute winter	TANK	23	87.807	1.307	98.3	28.8843	0.0000	SURCHARGED
30 minute winter	S15	23	87.781	1.781	39.7	3.1475	0.0000	SURCHARGED
30 minute summer	S16	15	82.084	0.084	35.7	0.0948	0.0000	ОК
120 minute winter	OUT	98	81.611	0.071	35.7	0.0000	0.0000	ОК

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)	Node		Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter	RE1	1.000	S1	13.2	0.664	0.328	0.5933	
30 minute winter	S1	1.001	S2	20.2	0.939	0.502	0.8130	
30 minute winter	S2	1.002	S3	20.2	0.911	0.502	0.5409	
30 minute winter	S3	1.003	S4	23.1	0.865	0.574	1.5352	
30 minute winter	S4	1.004	S5	27.8	0.786	0.692	0.7954	
30 minute winter	S5	1.005	S6	36.5	0.917	0.906	0.1869	
30 minute winter	S6	1.006	S7	36.6	0.943	0.909	0.4852	
30 minute winter	S7	1.007	S13	34.9	0.879	0.868	0.6363	
15 minute winter	S8	2.000	S9	2.5	0.675	0.143	0.0876	
15 minute winter	S9	2.001	S10	4.7	0.288	0.264	0.1197	
15 minute winter	S10	2.002	S11	10.1	0.779	0.571	0.1056	
15 minute winter	S11	2.003	S12	12.7	0.887	0.713	0.0880	
15 minute winter	S12	2.004	S13	27.2	1.557	1.079	0.4753	
30 minute winter	S13	1.008	TANK	58.7	1.479	1.460	0.1074	
30 minute winter	S14	3.000	TANK	39.5	1.125	0.985	0.1392	
30 minute winter	TANK	1.009	S15	39.7	1.122	0.990	0.0597	
30 minute winter	S15	ACO Q-Brake	S16	35.6				
30 minute summer	S16	1.011	OUT	35.7	2.963	0.216	0.0555	74.7

APPENDIX J

Business Flood Plan



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**.




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.



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.



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.



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 b	be able to help you	u 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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