FLOOD RISK ASSESSMENT

JBA Project Code	2015s3123
Client	Wye Valley Group
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Author	Lucy Archer-Lock
Reviewer	Daryl Taylor
Subject	Warehouse 701, Fordshill Road, Rotherwas Industrial Estate. Retrospective Flood Risk Assessment for new showroom.

1 Introduction

1.1 Terms of Reference

JBA Consulting was commissioned by Andrew Howell of the Wye Valley Group to undertake a Flood Risk Assessment (FRA) to support a retrospective planning application for a new showroom at an existing reclamation business located in the Rotherwas Industrial Estate, Hereford. This FRA report provides information on the nature of flood risk at the site and follows government guidance with regard to development and flood risk.

1.2 FRA Requirements

It is a requirement for development applications to consider the potential risk of flooding to a proposed development over its expected lifetime and any possible impacts on flood risk elsewhere, in terms of its effects on flood flows and runoff.

Where appropriate, the following aspects of flood risk should be addressed in all planning applications within flood risk areas:

- The area liable to flooding.
- The probability of flooding occurring now and over time.
- The extent and standard of existing flood defences and their effectiveness over time.
- The likely depth of flooding.
- The rates of flow likely to be involved.
- The likelihood of impacts to other areas, properties and habitats.
- The effects of climate change.
- The nature and expected lifetime of the development and the extent to which the development is designed to deal with flood risk.

This FRA follows government guidance on development and flood risk, within the National Planning Policy Framework (NPPF). All new developments must comply with the guidance set out in the NPPF.

The development is shown to be located in Flood Zone 2, and therefore a detailed flood risk assessment is required that considers the risk to the development from all sources of flooding including fluvial (river), pluvial (surface runoff / surcharging sewers) and groundwater. The NPPF advocates a risk-based approach to flood risk management in terms of appraising, managing and reducing the consequences of flooding both to and from a development site.

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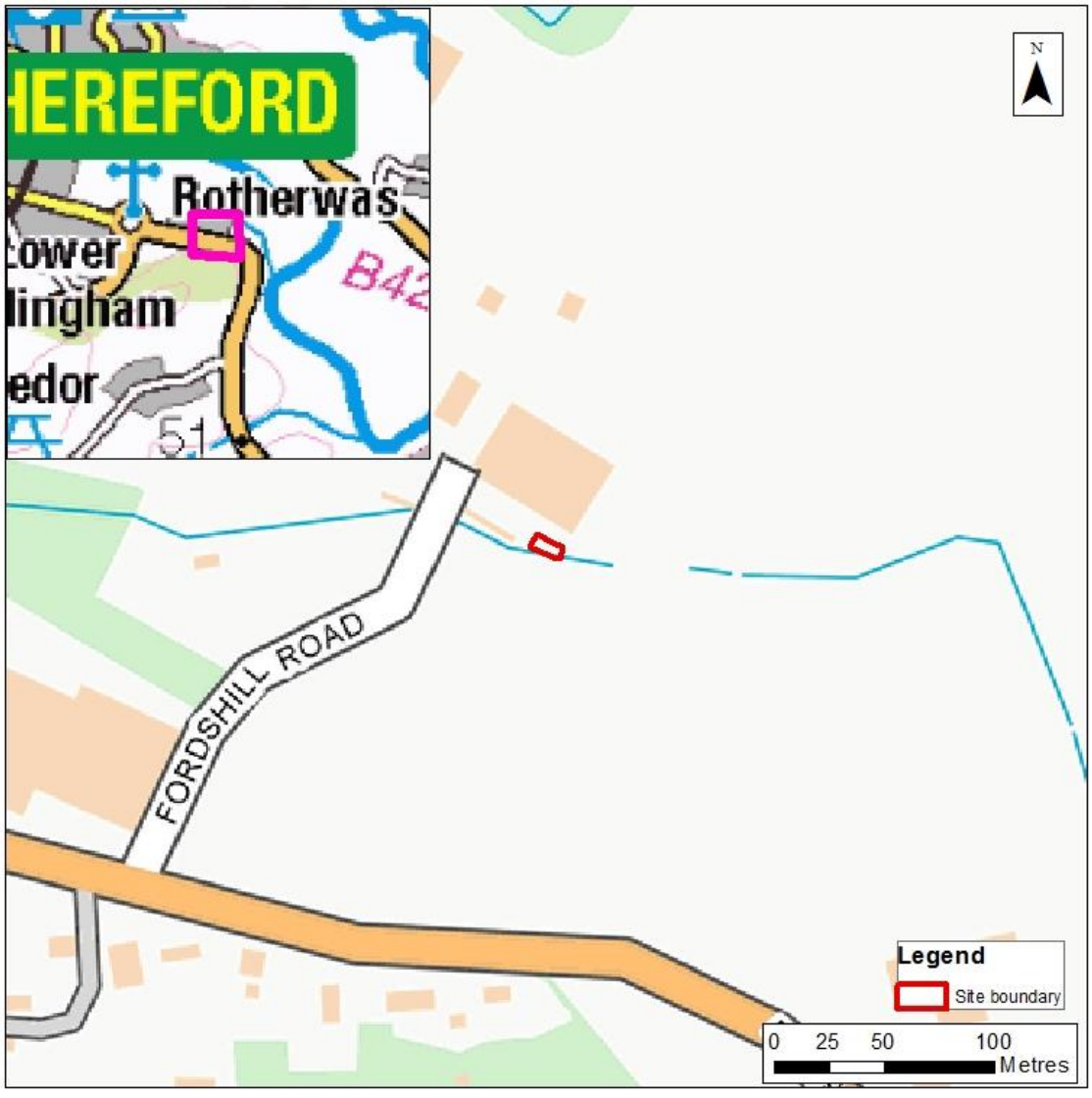
1.3 Site Details

1.3.1 Site Location

Table 1-1: Summary of Site Details

Site name	New Showroom Eastside 2000
OS NGR	SO 54037 37910
County	Herefordshire
Country	England (NPPF applies)
Local Planning Authorities	Herefordshire Council
Lead Local Flood Authority	Herefordshire Council



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1.4 Site Proposals

The development site forms part of the Warehouse 701 site, a reclamation yard within the Rotherwas Industrial Estate. The site was previously surfaced with hardstanding, and formed part of the reclamation yard.

The site now consists of a combined showroom, shop and café, supporting the existing reclamation business. The building is based around a reclaimed Victorian railway platform canopy structure, and is single storey with a footprint of 131 square metres. The showroom uses the existing access and car park, so no new highways were constructed to serve the showroom.

1.4.1 Topography

The nearest watercourse to the site is the Red Brook, which runs along the southern boundary of the site. The River Wye is located approximately 400m away from the site.

A topographic survey of the site and its surroundings shows that the development site is relatively flat, with levels varying from 48.89 – 48.85m around the location of the showroom. To the south, the land falls very steeply, to a lowest elevation of 46.42m AOD at the Red Brook.

It is understood that the finished floor level of the new showroom is approximately 48.85m AOD.

1.5 Planning Policy and Flood Risk

1.5.1 Planning Context

The National Planning Policy Framework (NPPF) was introduced by the Department for Communities and Local Government in March 2012 and replaces Planning Policy Statement 25 (PPS25, 2006). Its technical guidance relates to development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map, and minerals policy. The main study requirement is to identify the flood zones and vulnerability classification relevant to the development, based on an assessment of current and future conditions.

Environment Agency flood mapping and results from hydraulic modelling have been used to determine the flood risk to the site.

1.5.2 Development Site Flood Zones

The Environment Agency (EA) states that the flood risk is a function of:

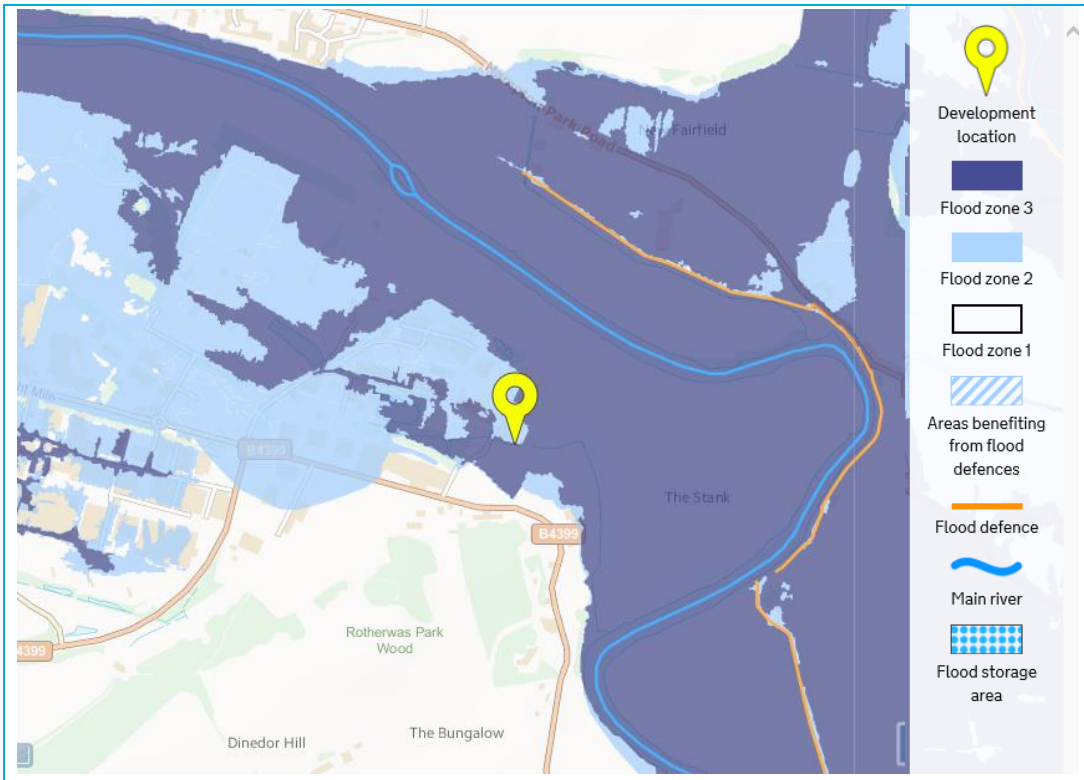
- *"The likelihood of a particular flood happening, best expressed as a chance or probability over a period of one year. For example, 'There is a 1 in 100 chance of flooding in any given year in this location'.*
- *The impact or consequences that will result if the flood occurs."*

The EA categorise the risk into a series of flood zones; a definition of the flood zones can be found in Table 1-2Table 1-2. The EA has developed a Flood Map for Planning which shows the risk of flooding in England and Wales for different return period events, assuming no flood defences. This map provides the basis for the assessment of flood risk and development suitability under the NPPF.

It is important to note that the EA's Flood Map for Planning is, in the majority of cases, based on broad-scale river modelling and provides an indication of the potential flood risk to a site rather than a detailed assessment. When a detailed river modelling study is undertaken, the broad-scale river model outputs are updated using the detailed river model.

Figure 1-1 shows the EA Flood Zones for the site and the surrounding area. The map shows the site to just lie within Environment Agency Flood Zone 3 (high risk of flooding). However, based on our knowledge of the local topography, with the showroom being located on the raised plateau that can be seen in the flood zone maps, this is likely to be as a result of the coarse model resolution and smoothing of the underlying DTM. It is therefore considered that the site should be considered as Flood Zone 2, and further discussion of this is included in Section 2.3 of this report.

Figure 1-1: Environment Agency Flood Map for Planning (Rivers and Sea)



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1.6 NPPF Flood Zones

Table 1-2Table 1-2 defines each of the flood zones.

Table 1-2: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown as light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Flood Zone 3a on the Flood Map)

Source: Table 1, NPPF Planning Practice Guidance, Reference ID: 7-065-20140306
Note: The "Flood Map" referred to is the Environment Agency Flood Map for Planning

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NPPF provides a flood risk vulnerability classification for different types of development. Based on this classification, the new showroom would be classed as a 'Less Vulnerable' development, and therefore is permitted to lie within Flood Zone 2.

Table 1-3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

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

Source: Table 3, NPPF Planning Practice Guidance, Reference ID: 7-067-20140306

2 Assessment of Flood Risk

2.1 Assessment Approach

This study assesses the risk from different types of flooding to the site and the risk of flooding elsewhere from the site; as well as how these flood risks can be managed.

The approach used to assess flood risk at the site was informed by the requirements of NPPF in conjunction with the client and EA requirements. To meet the above objectives a desk-based study was undertaken, supported by results from an existing hydraulic model. The primary objectives of this FRA are to determine the following:

- Whether the site is at significant risk from any forms of flooding;
- If the site is at risk of flooding:
    - Whether appropriate mitigation measures are in place to minimise the impact of potential flooding
    - whether safe access to and from the site will be maintained during an extreme flood event
- The impact of the development on flood risk to other sites, with particular focus on the effects of surface water from the site.

2.2 Historical Flooding

An internet search was undertaken although no records of historical flooding at the location of the new showroom were found.

2.3 Fluvial Flood Risk

The risk from fluvial flooding to the site has been assessed using hydraulic modelling, carried out as part of a wider flood risk study for the Rotherwas Enterprise Zone.

2.3.1 Hydraulic Modelling

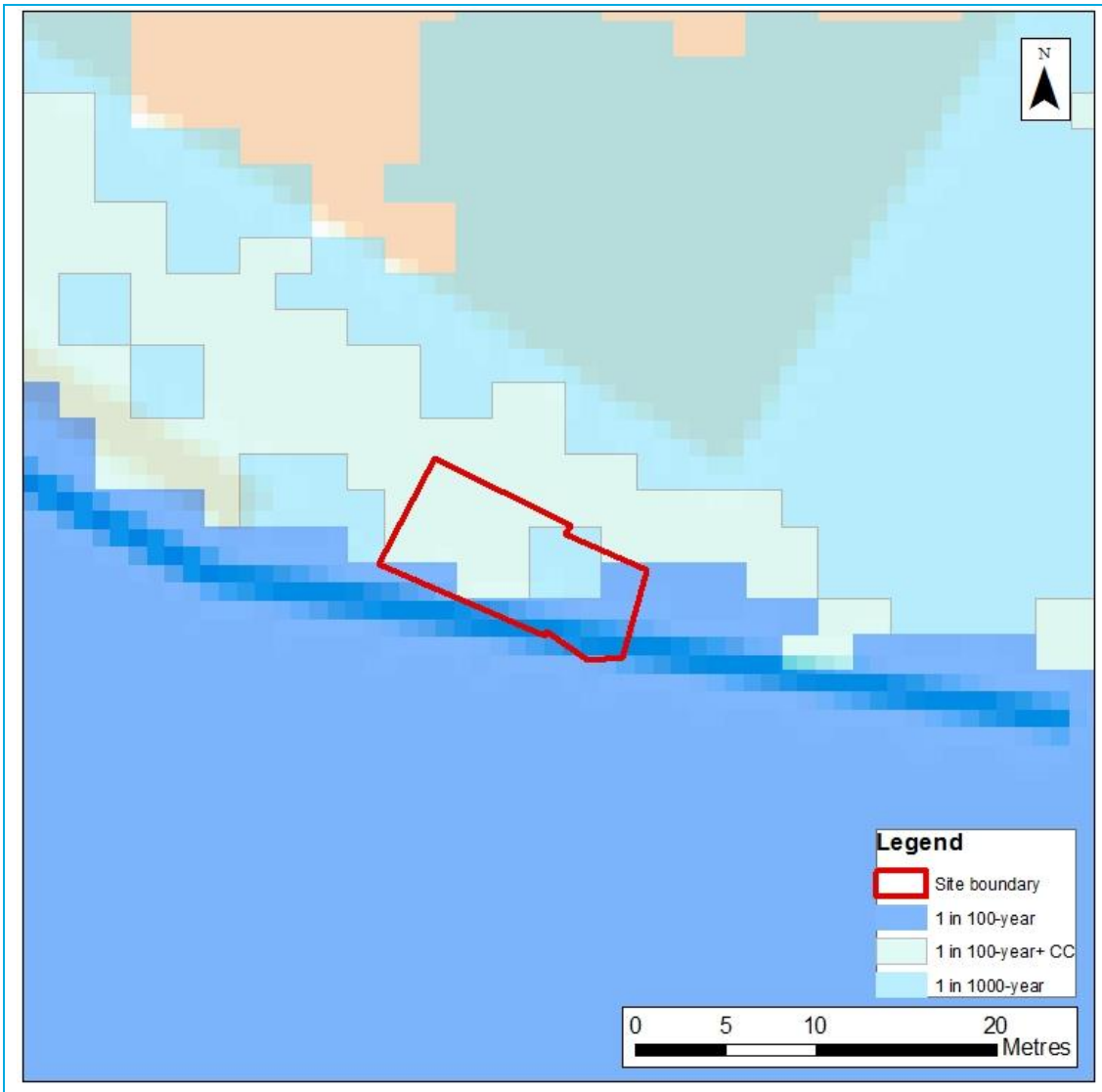
An existing hydraulic model of the area was obtained to provide design flood levels of the site for the 1 in 100-year event and 1 in 1000-year event. In addition, a 100-year scenario with 20% increase in flows to represent future climate change was provided.

Figure 2-1 shows the modelled flood outlines at the site. The model predicts that the site would be affected by flooding in all modelled flood events. In the 100-year event, flooding is shown to encroach onto the southern and eastern boundaries of the site, however in reality this would not be expected to occur as the peak water level (48.61m AOD) is below the lowest level on site (48.69 m AOD). The flooding shown in the maps is caused by the relatively low resolution of the model and underlying DTM, which leads to a smoothing of the southern slope. This therefore confirms that the new showroom lies within Flood Zone 2.

The entire site is at risk of flooding in the 1 in 100-year plus climate change and 1 in 1000-year events, including access to the site. In the 100-year plus climate change event, flooding on site is predicted to be shallow, with peak water levels of approximately 48.93m AOD across the site. Predicted flooding is deeper in the 1 in 1000-year event, with peak water levels of approximately 49.33m AOD.

Fordshill Road to the south of the site is the only access route, and ground levels along the road reach a low of 48.10m AOD, meaning that flood depths on this route could reach 0.51m in the 100-year event, 0.82m in the 100-year plus climate change event and 1.23m in the 1000-year event.

Figure 2-1: Modelled Flood outlines



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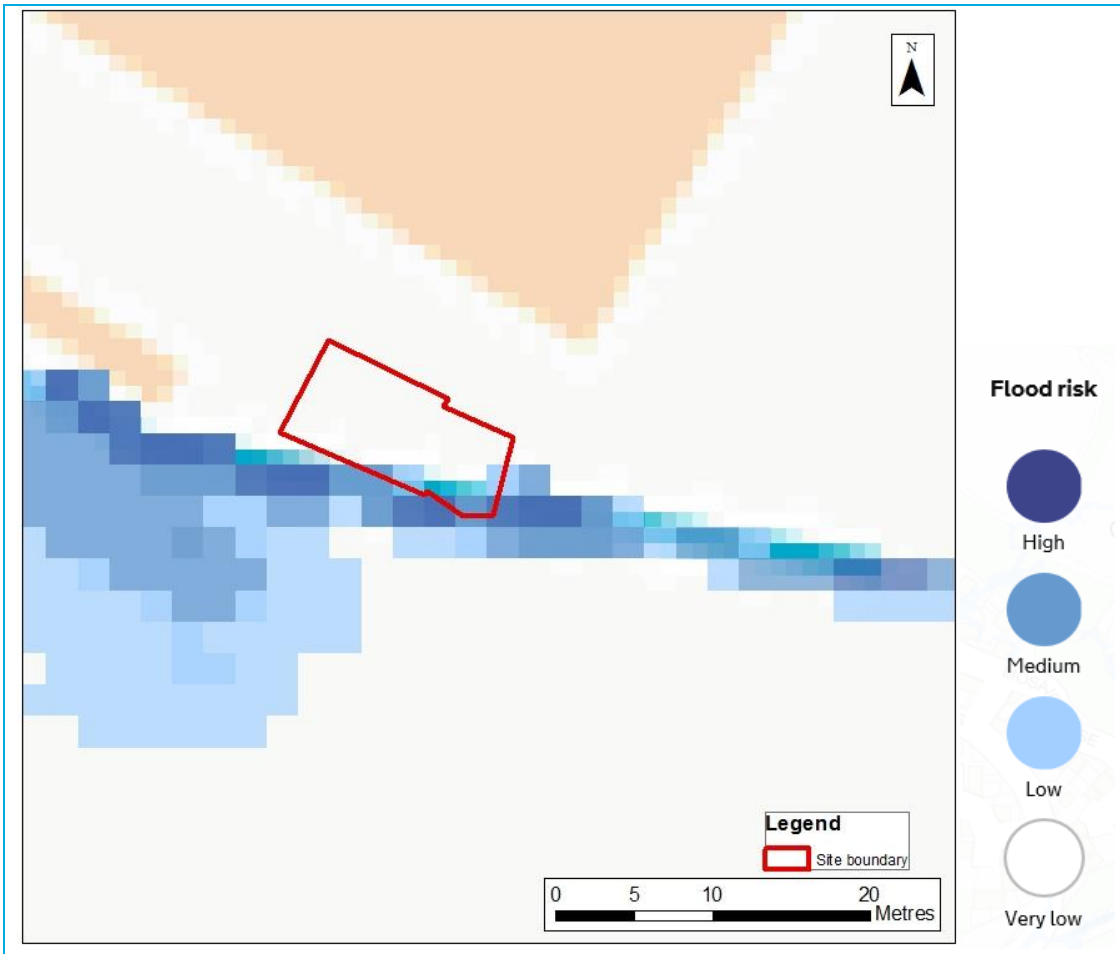
2.4 Surface Water Flood Risk to the Site

The flood risk from surface water to the development has been assessed using the Environment Agency's Risk of Flooding from Surface Water mapping.

Figure 2-2 shows that the majority the site is at very low risk of flooding from surface water. The mapping shows the south-eastern edge of the site is at high and medium risk of surface water flooding from the Red Brook, but as with the fluvial flooding this is considered to be a result of low DTM resolution that smooths the steep slope on the southern boundary, as there is no surface water flooding shown at the higher platform level adjacent to the site.

Figure 2-2: Environment Agency Risk of Flooding from Surface Water map



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2.5 Surface Water Flood Risk from the Site

Development of a site can increase impermeable surface areas and thus increase runoff. If not mitigated, this may result in an increase in surface water flood risk to the site and to third parties. The proposed development does not increase the impermeable area of the site, and as such would not be expected to increase flood risk from the site.

2.6 Risk of Flooding from Sewers

No records of sewer flooding have been found in the vicinity of the site and the flood risk from this source to the site is expected to be low.

2.7 Groundwater Flood Risk

Groundwater flood risk is thought to pose a low risk to the site due to the nature of the topography at the site, which is elevated above its surroundings. In the event of elevated groundwater levels, it is expected that the nearby Red Brook would act to intercept and drain this level and prevent the water table from further increasing.

2.8 Risk of flooding from Reservoirs

The Environment Agency's Risk of Flooding from Reservoirs mapping has been inspected and the site has been found to be just inside of the maximum extent of flooding from reservoirs. Therefore, there is a risk of flooding from reservoirs to the site, however this risk is considered to be low as the likelihood of a reservoir breach is low and flows would be expected to be shallow at the edge of the maximum flood extent.

3 Mitigation

3.1 Finished Floor Levels

The site is considered at risk from fluvial flooding during the design 1 in 100-year plus climate change event. Based on the understood finished floor level of the building at approximately 48.85m AOD and a design flood level of 48.93m AOD, flood depths in the design flood event would be approximately 80mm. Whilst this does indicate a risk of flooding to the showroom in this event, flood depths remain shallow meaning any damage to occur is likely to be limited to flooring and floor coverings. The floors of the showroom are constructed from solid concrete, overlain by reclaimed timber, so the damages and associated costs in the event of flooding are considered to be low.

3.2 Additional Mitigation Measures

Whilst the new showroom is shown to be at risk of flooding in the design event, the likelihood of flooding is low and the depth of flooding would be very shallow. Given the use of the showroom, additional flood mitigation measures for the building are not considered necessary.

The main access road is shown to be at a higher risk of flooding, and in the event of flooding the depth of water would be significant and therefore hazardous to enter. It is therefore important to ensure that the site can be safely evacuated in advance of a significant flood event which might cause inundation of Fordshill Road. The site falls within a Flood Warning Area, so it is recommended that the site sign up for this and consider evacuating and closing the site if flooding is predicted.

4 Conclusions

- JBA Consulting was commissioned by Wye Valley Group to undertake a Flood Risk Assessment (FRA) for a new showroom at an existing reclamation business located in the Rotherwas Industrial Estate, Hereford.
- The flood risk from all sources has been assessed through a desk study of local policy documents and flood risk mapping.
- A review of the Environment Agency's Flood Map for Planning indicates that the site is located within Flood Zone 2.
- The showroom is classified as Less Vulnerable to Flooding, and is considered appropriate within Flood Zone 2 by NPPF.
- Hydraulic modelling indicates that the site would not be affected by flooding during the modelled 1 in 100-year event, however all of the site is at risk of flooding in the design 100-year plus climate change event and the 1000-year event.
- The Environment Agency Risk of Flooding from Surface Water map indicates that the site is generally at very low risk of Surface Water flooding.
- The risk of groundwater flooding is considered to be low.
- The site is found to be within the maximum extent of flooding from reservoirs, however the risk of flooding from a reservoir breach is considered to be low.
- The finished floor level of the new showroom is at 48.85m AOD, and so flooding in the design event will remain shallow at 80mm.
- No additional mitigation measures are recommended due to the low likelihood of flooding occurring at the site.
- The proposed access route would be flooded to a significant depth, so it is recommended that the site sign up for Environment Agency flood warnings in order to evacuate and close the site in the event of flooding.