



Glasshouse Lane,
Kenilworth
Flood Risk Assessment

For Vistry Homes

Date: 18 May 2022

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DOCUMENT CONTROL SHEET

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CONTENTS

1.	INTRODUCTION.....	1
2.	SITE INFORMATION.....	2
2.1	Site Location	2
2.2	Topography.....	3
2.3	Hydrological Setting.....	3
2.4	Proposed Development	4
3.	SOURCES OF FLOOD RISK.....	5
3.1	Climate Change Considerations	5
3.2	Fluvial Flooding	6
3.3	Tidal Flooding.....	7
3.4	Surface Water Flooding	7
3.5	Groundwater Flooding.....	9
3.6	Infrastructure Flooding	9
4.	LOCAL PLANNING POLICY.....	11
4.1	Warwick District Local Plan 2011 - 2029.....	11
5.	NATIONAL PLANNING POLICY FRAMEWORK	13
5.1	Sequential and Exception Tests	13
5.2	Mitigation Measures.....	13
5.3	Finished Floor Level	13
5.4	Safe Access and Egress	13
5.5	Floodplain Storage	13
5.6	Impact of the Development on Flood Risk Elsewhere	13
6.	SUMMARY.....	15

Tables

Table 1:	Site Location.....	2
Table 2:	Avon Warwickshire Management Catchment Peak River Flow Allowances.....	5
Table 3:	Peak rainfall intensity allowance in small catchments (less than 5km ²) or urban drainage catchments (based on a 1961 to 1990 baseline).....	5
Table 4:	Flood Zone Definitions Defined in the NPPG.....	6

Figures

Figure 1: Site Location.....	2
Figure 2: Site Levels	3
Figure 3: River Avon Catchment	4
Figure 4: EA Flood Map for Planning.....	6
Figure 5: EA Risk of Flooding from Surface Water	8
Figure 6: EA Surface Water Flood Map - Medium Risk Scenario.....	8

Appendices

- Appendix A - Site Plan
- Appendix B - Site Levels

1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Vistry Homes, in support of a planning application for the proposed redevelopment of the existing brownfield site. A copy of the proposed development is included within **Appendix A**.

Local Planning Authorities are advised by the Government's National Planning Policy Framework (NPPF) to consult the Environment Agency (EA) on development proposals in areas at risk of flooding and / or for sites greater than 1 hectare in area. The EA requires a Flood Risk Assessment to be submitted in support of the planning application for the proposed development.

The report has been prepared to consider the requirements of the NPPF through:

- Assessing whether the proposed development is likely to be affected by flooding;
- Assessing whether the proposed development is appropriate in the suggested location, and,
- Detailing measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe, and that flood risk would not be increased elsewhere.

This report considers the requirements for undertaking a Flood Risk Assessment as stipulated in NPPF Technical Guidance. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been prepared in accordance with current EA policy.

2. SITE INFORMATION

2.1 Site Location

The site is located on approximately 2ha of predominantly brownfield land at the eastern periphery of the town of Kenilworth, Warwickshire, 7km south-west of Coventry city centre. The site currently comprises of hardstanding with vegetated areas at the east and west of the site. The site is bounded in all directions by greenfield land; however, the majority of this land is allocated for residential development. Glasshouse Lane is located 70m west of the site, beyond which lies residential neighbourhoods comprising eastern Kenilworth. The A46 is approximately 130m south-east of the site.

The site address can be found in **Table 1**. The site location can be seen in **Figure 1**.

Table 1: Site Location

Site Referencing Information	
Site Address	Woodside, Glasshouse Lane, Park Hill, Kenilworth, Warwick, Warwickshire CV8 2AL
Grid Reference	SP 30740 71916 430740, 271916



Figure 1: Site Location

2.2 Topography

Insert Environment Agency (EA) LiDAR data shows that the highest level on site can be found at the north-west corner, at approximately 85.4m AOD. The lowest level on site can be found adjacent to the eastern boundary at approximately 77.9m AOD. In general, the levels on site slope from the southwest-northeast, towards the unnamed tributary of the River Avon. The site levels can be found in **Figure 2** and **Appendix B**.

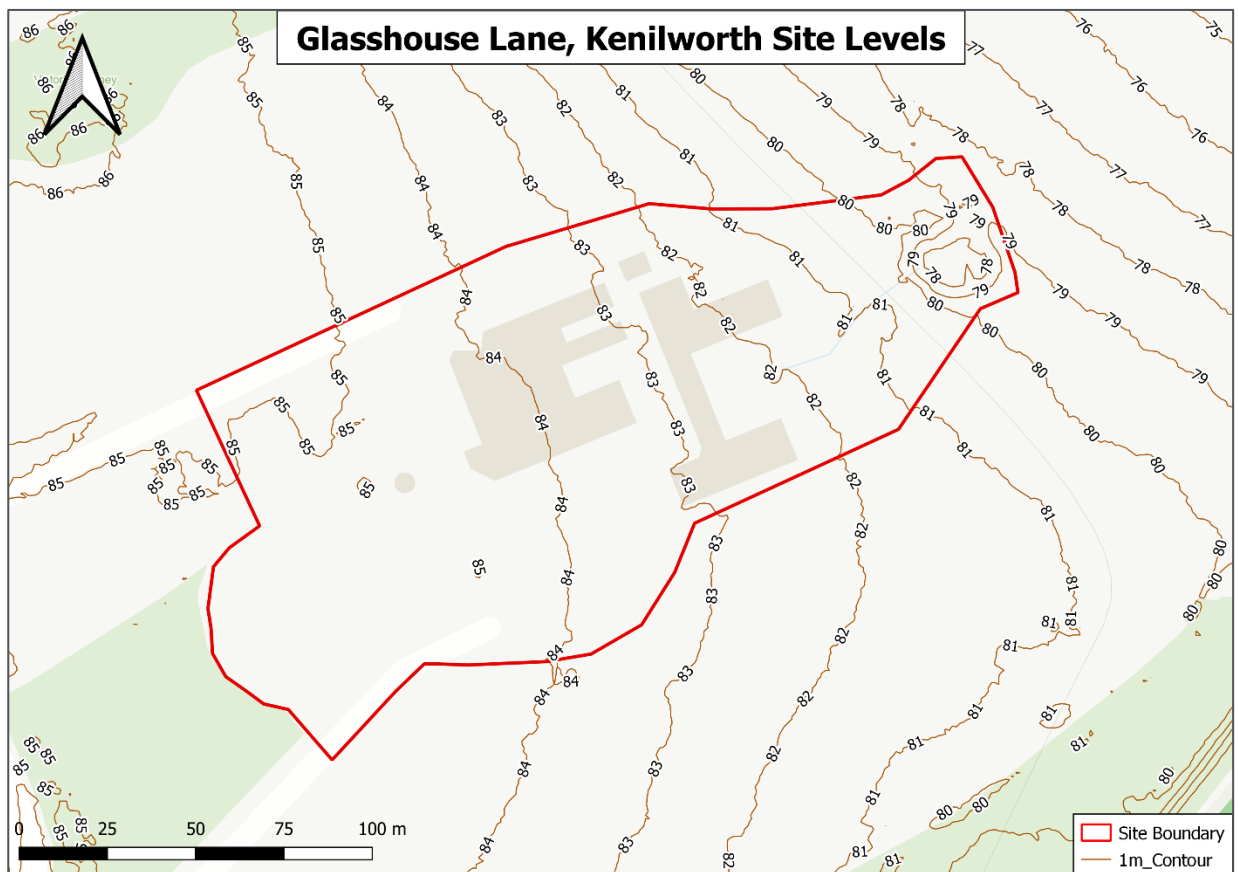


Figure 2: Site Levels

2.3 Hydrological Setting

According to the EA's 'Main Rivers Map' and 'Catchment Data Explorer', the site is located within the catchment of a main river, approximately 650m west of the River Avon which flows south. A main river refers to watercourses under the jurisdiction of the EA. **Figure 2** shows the extent of the catchment boundary.

An unnamed tributary of the River Avon is located approximately 120m north of the site and flows east. According to OS maps, a drain is located at the west of the site, flowing north-east and discharging into an existing pond.

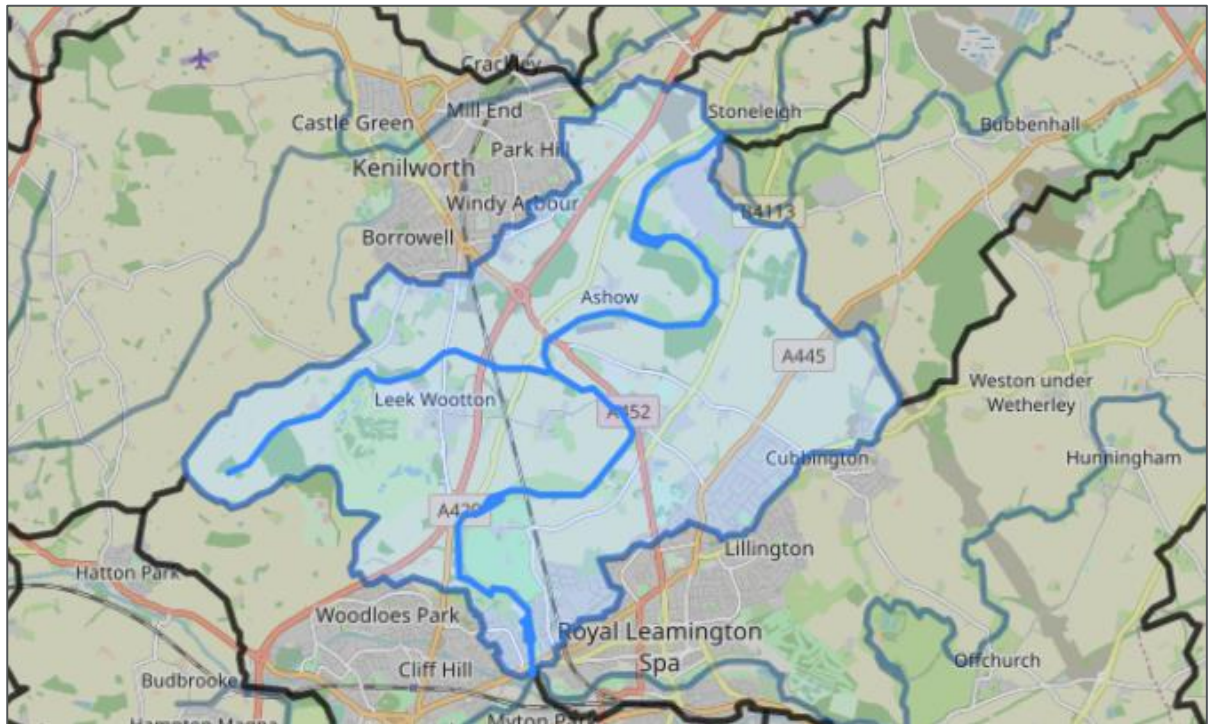


Figure 3: River Avon Catchment

2.4 Proposed Development

The proposed development is understood to include the construction of 61 one, two, three and four bedroomed residential units, with associated car parking and landscaping. The main access route to the site is via Glasshouse Lane. A copy of the proposed development is included within **Appendix A**.

3. SOURCES OF FLOOD RISK

3.1 Climate Change Considerations

The development should be designed to be flood resistant / resilient including safe access and escape routes for the following extreme flood events, also known as the 'design flood':

- » 1 in 100 (1%) fluvial flood event accounting for climate change
- » 1 in 200 (0.5%) tidal/coastal flood event accounting for climate change
- » 1 in 100 (1%) pluvial (surface water) event accounting for climate change

Climate change is projected to increase the likelihood of flooding from most flood sources and therefore an assessment of the effects of climate change should be considered over the estimated development lifetime. Commercial / industrial development has a generally accepted design life of no greater than 75 years, and the National Planning Policy Framework (NPPF) 2021 states that residential development has a design life of 100 years.

The following tables are the latest Environment Agency (EA) guidance for considering climate change which are to be taken into account for tidal, fluvial and surface water modelling.

Table 2: Avon Warwickshire Management Catchment Peak River Flow Allowances

Avon Warwickshire Management Catchment peak river flow allowances	Central Estimate	Higher Estimate	Upper Estimate
Total potential change 2020s	7%	12%	22%
Total potential change 2050s	8%	14	31%
Total potential change 2080s	21%	32%	59%

Table 3: Peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage catchments (based on a 1961 to 1990 baseline)

Applies Across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

3.2 Fluvial Flooding

The Environment Agency Flood Map for Planning (**Figure 4**) shows the site to be situated entirely within Flood Zone 1 at very low risk of fluvial flooding. This means the site has annual probability of flooding of less than 0.1% (1 in 1000-year return period) from both fluvial and tidal sources. Areas of Flood Zone 2 & 3, extending away from the River Avon, are located approximately 650m east of the site.

For reference, listed below are the definition of the flood zones defined in the NPPG:

Table 4: Flood Zone Definitions Defined in the NPPG

Flood Zone	Definition
Flood Zone 1 (Low Risk)	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
Flood Zone 2 (Medium Risk)	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.
Zone 3a (High Risk)	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.
Zone 3b (Functional Floodplain)	Land where water must flow or be stored in times of flood.



Figure 4: EA Flood Map for Planning

The NPPF requires that the future impact of climate change on flood risk should be considered, even for those areas currently in Flood Zone 1. The site is approximately 650m from the outer extent of Flood Zones 2, with the minimum site levels shown to be approximately 21m above the worst-case flood extent. Therefore, a judgement can be made that the impact of climate change will not cause the floodplain to extend to reach the site.

Furthermore, the SFRA makes no mention of any historic flooding at the site.

The unnamed tributary of the River Avon, approximately 120m north of the site, is not modelled. The EA Surface Water Flood Map (**Figure 4**) is therefore assumed to represent a 'worst case' scenario of flooding. This shows that the extent of flooding does not reach the site.

The risk from fluvial flood risk at the site is consequently assessed to be **low**.

3.3 Tidal Flooding

EA Flood Map for Planning does not distinguish between fluvial and tidal flood risk. However, as the site is located inland with a lowest level of approximately 77.9m AOD, the risk of tidal flooding at the site can be classed as 'negligible'.

3.4 Surface Water Flooding

Surface water flooding occurs as the result of an inability of intense rainfall to infiltrate the ground. This often happens when the maximum soil infiltration rate or storage capacity is reached. Flows generated by such events either enter existing land drainage features or follow the general topography which can concentrate flows and lead to localised ponding/flooding.

The EA Surface Water Flood Map (**Figure 5**) shows the majority of the site to be at 'very low' risk of flooding from surface water. Very low risk means that each year this area has a chance of flooding of less than 0.1%. A small area of 'high' risk is located at the east of the site where there is currently a pond. High risk means that each year this area has a chance of flooding of greater than 3.3%.

Areas of low and medium risk are located close to the western boundary of the site, adjacent to Glasshouse Lane. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%. Due to the prevailing topography, surface water is unlikely to flow onto site from these areas as the levels begin to increase towards the site's western boundary.

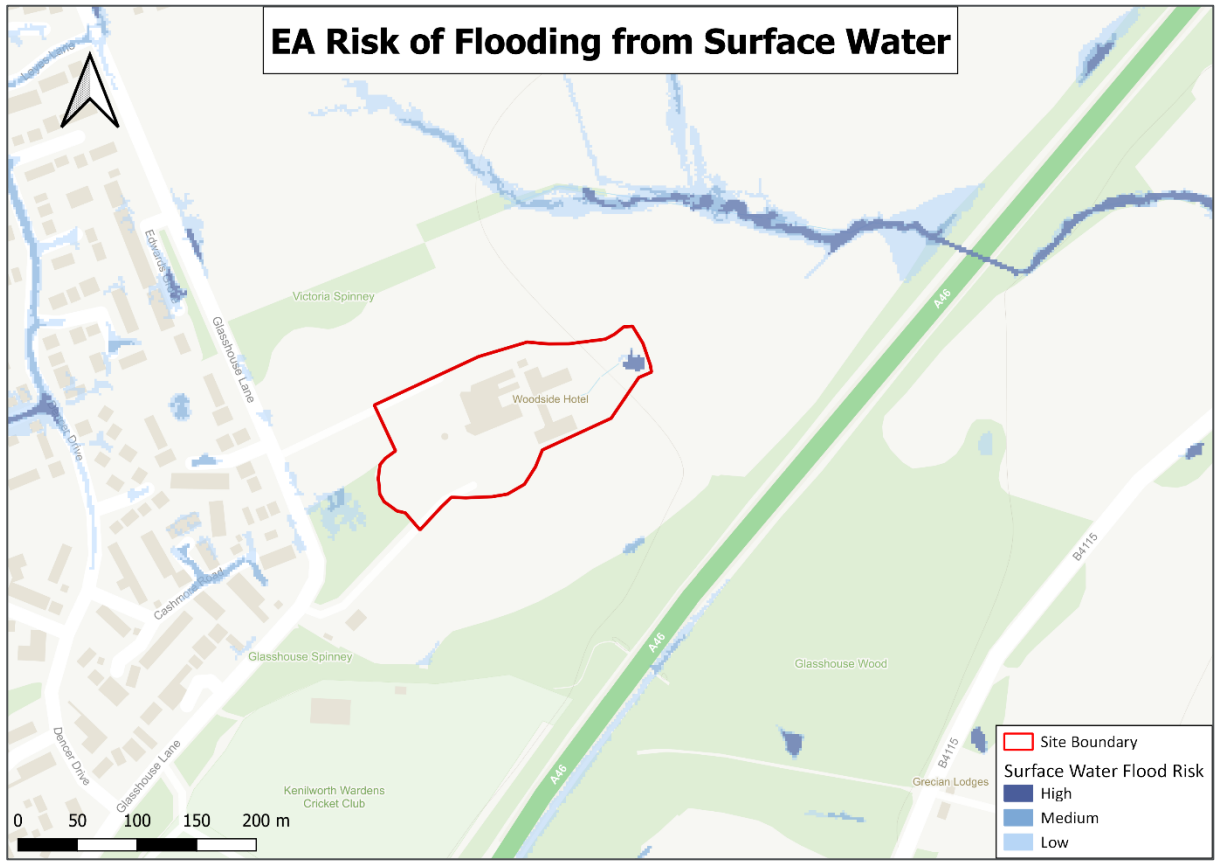


Figure 5: EA Risk of Flooding from Surface Water

Under the medium risk scenario, with the same probability of the design flood event (1% AEP), the majority of the site is shown to be flood free and will not flood at any depth. The pond at the east of the site is indicated to 'flood' at below 300mm. This is displayed below in **Figure 5**. As this area is currently a pond, the EA currently indicates the velocity of the water to flow at below 0.25m/s.



Figure 6: EA Surface Water Flood Map - Medium Risk Scenario

The EA Surface Water Flood Map does not account for existing drainage systems, and therefore the extent of flooding shown would likely be significantly less and that shown above is considered as the 'worst case' risk.

Whilst the potential effects of climate change could increase the frequency, depth and extent of on-site surface water flooding, the 'low' surface water flood risk of the area suggests that any increase in these variables will not significantly impact the site. Furthermore, the drainage strategy for the site will mitigate any residual impact, capturing and attenuating all flows before discharging at a controlled rate.

Therefore, surface water flood risk is assessed to pose a **low** risk of flooding to the site.

3.5 Groundwater Flooding

The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the south-western half of the site comprises entirely of the Ashow Formation - Sandstone, while the north-eastern half of the site is underlain by the Ashow Formation - Mudstone and Sandstone. This suggests the bedrock may have a degree of permeability, where water can flow through the rock following extended period of rainfall. Consequently, the ability for groundwater to emerge at the site is moderate. There are no superficial deposits which underly the site.

With regards to groundwater vulnerability, according to 'Magic' maps the site is in a 'Principal Aquifer' area. According to the EA, principal aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage and transmission. They may support water supply and/or river base flow on a strategic scale.

According to LandIS 'Soilscapes', the entire site is underlain by Soilscape 8: Slightly acid loamy and clayey soils with impeded drainage. The drainage is described as slightly impeded, which refers to soils with a tight, compact deep subsoil that impedes downward water movement; after heavy rainfall, particularly during the winter, the subsoil becomes waterlogged.

A review of available borehole data does not indicate a high water table.

According to the Warwick District Council Level 1 Strategic Flood Risk Assessment (SFRA) 2013 Consultation with the Environment Agency and the British Geological Survey (BGS) has suggested that there are no major problems with flooding from groundwater within Warwick District.

The risk of flooding from groundwater is therefore assessed to be **low**.

3.6 Infrastructure Flooding

Severn Trent Water is the statutory water undertaker and keeps a record of historic sewer flood events in a database called the DG5 register. According to data presented in the Level-1 SFRA, there have been 88 properties in the CV8 2 postcode recorded in the older 2008 SFRA, as well as a further 21 locations affected in data recorded up until October 2012. It is noted that there has been a significant reduction in the number of properties on the DG5 register since the 2008 SFRA following significant investment in major schemes to increase the capacity of the sewerage system.

As the site is currently brownfield and the surrounding area to the west is developed, it is likely there is an extensive public drainage system serving the area. In the event of any surcharging of sewer networks

on Glasshouse Lane, the prevailing topography indicates sewer flood water will not flow onto site as the levels increase towards the site.

New developments may in fact create betterment from both application of the SuDS Hierarchy and the potential for capital investment in the public sewer system. Therefore, for the reasons discussed, and the relationship between probability and impact, the risk of sewer flooding at the site is assessed to be **low**.

The EA Flood Risk from Reservoirs Map does not show the site to lie within the extent of potential reservoir flooding. As there is no known risk of flooding from canals or any other artificial sources at the site, it can be concluded that the risk of flooding from reservoir failure is **negligible**.

4. LOCAL PLANNING POLICY

4.1 Warwick District Local Plan 2011 - 2029

The Local Plan was adopted in September 2017. It is the overarching local policy document for the district and will guide the area's development until 2029. The following policies are relevant to flood risk.

4.1.1 Policy FW1 Reducing Flood Risk

Planning applications should be submitted in line with the revised validation checklist that has guidance on the national approach to meeting the sequential and exception tests and meeting the requirements of the NPPF.

Developers are advised to review the Environment Agency's flood map for planning at the earliest possible opportunity to consider what development would be appropriate for a potential development site to ensure that proposals are in line with the following policy requirements:

- a. There will be a presumption against development in flood zone 3, and no built development will be allowed in the functional floodplain. Development must be steered to areas with the lowest probability of flooding.
- b. Land that is required for current and future flood management will be safeguarded from development. Where development lies adjacent to or benefits from an existing or future flood defence scheme it will be expected to contribute towards the cost of delivery and/or maintenance of that scheme.
- c. New development that lies within the floodplain will be required to implement a flood alleviation scheme to reduce the risk of flooding to the proposed development site and deliver significant flood risk reduction benefits to the wider community.
- d. All new development proposals will contribute to meeting 'good status' as defined by the Water Framework Directive (WFD). This will include delivery of geomorphological, chemical and biodiversity enhancements and include a minimum eight metre buffer strip from the top of bank of all watercourses.
- e. New development must be resilient to surface water, fluvial and pluvial flooding. Where new development lies in an area of flood risk it must be designed to be flood resilient with safe dry access for vehicles and pedestrians. Finished floor levels should be 600mm above the predicted flood level and include a freeboard (see glossary) for climate change to ensure new development is safe.

Where development lies adjacent to a watercourse, the supporting planning application will include a WFD assessment to demonstrate how the waterbody will not deteriorate in status and will be enhanced, and:

- There will be no impact upon priority habitat or designated sites of nature conservation;
- Modified watercourses will be restored in line with the recommendations of the Severn River Basin Management Plan;
- Culverting open watercourses will not be allowed.

4.1.2 *FW2 Sustainable Drainage*

All new major developments must incorporate SuDS that provide biodiversity, water quality and amenity benefits and be in accordance with the Warwickshire Surface Water Management Plan. There will be a presumption against underground storage of water, and it should support the delivery of green infrastructure.

All new development sites will discharge at the QBAR (see glossary) greenfield run-off rate, including an allowance for climate change. For sites with a greater than 60-year life expectancy, the allowance must be 30%.

SuDS schemes must be located outside the floodplain; ideally this should be within the development site or close to the site as part of a masterplanned drainage scheme. Priority should be given to SuDS that incorporate green infrastructure, including green roofs, walls and rain gardens.

For development sites that are suspected to be contaminated, the SuDS scheme will be designed to prevent the mobilisation of contaminants to waterbodies. The Environment Agency must be consulted in relation to sites suspected to be contaminated and will provide advice and guidance to the council and developers on how best to implement SuDS on a site-specific basis.

4.1.3 *CC1 Planning for Climate Change Adaption*

All development is required to be designed to be resilient to, and adapt to the future impacts of, climate change through the inclusion of the following adaptation measures where appropriate:

b) optimising the use of multi-functional green infrastructure (including water features, green roofs and planting) for urban cooling, local flood risk management and to provide access to outdoor space for shading, in accordance with Policy NE1 Green Infrastructure.

d) Minimising vulnerability to flood risk by locating development in areas of low flood risk and including mitigation measures including SuDS in accordance with Policy FW2 Sustainable Drainage.

4.1.4 *SCO Sustainable Communities*

New development should be high quality and should ensure that it is brought forward in a way which enables strong communities to be formed and sustained. It is also important that new development protects and enhances the historic, built and natural features that make Warwick District a great place. To achieve this the development should:

l) manage flood risk to ensure that proposals do not unduly increase the risk of flooding

5. NATIONAL PLANNING POLICY FRAMEWORK

5.1 Sequential and Exception Tests

This assessment has demonstrated that the site is on land designated as Flood Zone 1 by the EA's Flood Map for Planning, and is at low or negligible risk of flooding from all other potential sources.

The Proposal can be classified as a 'More-Vulnerable' development, in accordance with Paragraph 066 of the NPPG. Paragraph 33 of the Flood Risk and Coastal Change National Planning Practice Guidance (NPPG) states that it is not required to apply the Sequential Tests to sites located within Flood Zone 1. The NPPG Flood Risk Vulnerability and Flood Zone Compatibility matrix (Table 3 of the NPPG) also indicates that all forms of development are "appropriate" in Flood Zone 1 without application of the Exception Test.

Therefore, the application of the Sequential and Exception Tests are not required for this site.

5.2 Mitigation Measures

The following mitigation measures are recommended to mitigate any residual flood risk and ensure that the proposal will be safe over the lifetime of the development. This accounts for the vulnerability of its occupiers, without increasing flood risk elsewhere, in accordance with the requirements outlined in the NPPF.

Any residual risk from surface water and sewers, as well as the impact of the development on flood risk elsewhere, will be addressed by an appointed contractor which will confirm the proposed drainage system.

5.3 Finished Floor Level

Given the very low risk of surface water flooding identified in and across the site, it is recommended best practice for the finished floor levels of the site to be elevated above surrounding ground levels by a minimum of 150mm where practicable to address any residual risk of surface water flooding, adopting a design for exceedance approach.

5.4 Safe Access and Egress

Safe access and egress should be maintained over the lifetime of the development. The site is in Flood Zone 1 and is not indicated to be adversely affected by surface water flooding. Furthermore, access to the site is via Glasshouse Lane, which is also within Flood Zone 1 and is at low risk from surface water flooding. Therefore, safe access and egress is possible over the lifetime of the development.

5.5 Floodplain Storage

As the site is not being developed within the 1% AEP fluvial floodplain, any changes will not displace floodwater. Therefore, the proposed development is not considered to increase flood risk within the catchment through a loss of floodplain storage and no further mitigation measures are required.

5.6 Impact of the Development on Flood Risk Elsewhere

A requirement of this FRA is to adequately assess the impact of the development on flood risk elsewhere, which involves determining the source of the risk, as well as the pathway of the risk and the receptors to the risk.

The proposal does not have the potential to increase surface water flood risk elsewhere by increasing impermeable area and/or re-direction of flow. This is because the site already benefits from an existing drainage network and all flows (i.e., the drain discharging into the pond) originate and are contained on site.

Sewer flood risk could potentially increase elsewhere if the proposal were to increase off-site discharge to surface water and foul network. This will be addressed by an appointed contractor which will confirm the proposed drainage system, ensuring this risk will have no detrimental impact elsewhere.

As the site is not expected to be affected by the 1 in 100-year +CC fluvial flood event, any changes on site will not displace floodwater. Therefore, the proposal will not increase fluvial flood risk elsewhere.

Consequently, due to the general low flood risk of the area, this risk is assessed to be **low**.

6. SUMMARY

This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Vistry Homes, in support of a planning application for the proposed redevelopment of the existing brownfield site.

The site is located within Flood Zone 1, meaning there is a less than 0.1% annual probability of fluvial/tidal flooding occurring. This is the lowest flood zone classification given by the EA and is considered safe from flooding. It has also been assessed that the impact of climate change will not significantly change the probability of flooding at the site. In accordance with the NPPF, the application of the Sequential and Exception Tests are not required.

Other sources of flood risk were also assessed at the proposed development area, as well as the impact of the development on flood risk elsewhere.

Tidal flood risk was discounted, due to the sites location inland being far beyond the tidal reach. Surface water flooding was assessed to be low and will therefore require no mitigation. The risk of flooding from infrastructure failure was assessed to be low and therefore no mitigation will be required.

Groundwater flood risk was assessed to be low and will therefore require no mitigation.

The impact of the development on flood risk elsewhere was also assessed to be low, due to the general low risk of flooding in the area and the site being outside of the 1% AEP fluvial flood event.

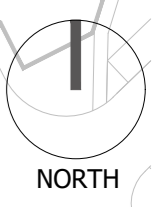
Any residual risk from surface water and sewers, as well as the impact of the development on flood risk elsewhere, will be addressed by an appointed contractor which will confirm the proposed drainage system.

This report therefore demonstrates that, in respect of flood risk, the proposed development of the site:

- Is suitable in the location proposed.
- Will be adequately flood resistant and resilient.
- Will not place additional persons at risk of flooding, and will offer a safe means of access and egress.
- Will not increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage or impedance of flood flows.

The application is therefore concluded to meet the flood risk requirements of the NPPF.

Appendix A - Site Plan



Accommodation Schedule - PL002B

Bovis Private Sale:				
2bAP	2 bed Apt	12 no. @	900 ft ² / 83.6 m ²	= 10,800 ft ² / 1003.3 m ²
X204	Holly	2 bed/2 storey	4 no. @ 851 ft ² / 79.1 m ²	= 3,404 ft ² / 316.2 m ²
X307	Spruce	3 bed/2 storey	6 no. @ 1,079 ft ² / 100.2 m ²	= 6,474 ft ² / 601.4 m ²
X308	Cypress	3 bed/2 storey	8 no. @ 1,200 ft ² / 111.5 m ²	= 9,600 ft ² / 891.8 m ²
X414	Aspen	4 bed/2 storey	5 no. @ 1,370 ft ² / 127.3 m ²	= 6,850 ft ² / 636.4 m ²
X416	Maple	4 bed/2 storey	4 no. @ 1,792 ft ² / 166.5 m ²	= 7,168 ft ² / 665.9 m ²
C5006	Cedar	5 bed/2 storey	3 no. @ 2,200 ft ² / 204.4 m ²	= 6,600 ft ² / 613.1 m ²
X531	Oak (Shottery)	5 bed/2.5 storey	3 no. @ 3,300 ft ² / 306.6 m ²	= 9,900 ft ² / 919.7 m ²
X531	Oak	5 bed/2 storey	1 no. @ 2,428 ft ² / 225.6 m ²	= 2,428 ft ² / 225.6 m ²
Total:		46 no. @	63,224 ft² / 5873.5 m²	

Affordable:				
A	Type Q	1 bed quarter	2 no. @ 465 ft ² / 43.2 m ²	= 930 ft ² / 86.4 m ²
S241		2 bed/2 storey	3 no. @ 764 ft ² / 71.0 m ²	= 2,292 ft ² / 212.9 m ²
S351		3 bed/2 storey	3 no. @ 890 ft ² / 82.7 m ²	= 2,670 ft ² / 248.0 m ²
S461		4 bed/2 storey	1 no. @ 1,143 ft ² / 106.2 m ²	= 1,143 ft ² / 106.2 m ²
Total:		9 no. @	7,035 ft² / 653.6 m²	

Overall Total: 55 no. @ 70259 ft² / 6527.1 m²
Net Developable Area: 4.20 ac 1.7 ha 32DPH
16,728 ft² per acre

Private Sale			
2beds	16 no. @	34.78%	
3beds	6 no. @	13.04%	
4beds	17 no. @	36.96%	
5beds	7 no. @	15.22%	

Affordable			
1 bed	2 no. @	22.22%	
2 beds	3 no. @	33.33%	
3 beds	3 no. @	33.33%	
4 beds	1 no. @	11.11%	
		16.36%	

Gross Area:			
Green Infrastructure Area achieved:	1.44 ac	0.6 ha	23.44%
Green Infrastructure Area required:	2.26 ac	0.9 ha	36.76%

○ Preliminary ○ Design ○ Information ● Comment ○ Planning ○ Construction

WIP 14-02-23

Rev	Date	Details
A	16.01.23	Client changes incorporated.
B	18.01.23	Further changes incorporated to reduce impact on TPAs.

Notes:
 Subject to tracking



- Key**
- Site Boundary
 - Existing Conference Building Footprint
 - NDA
 - RPA
 - Mandatory tree retention
 - Indicative POS Area

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Client: Bovis Homes

Project: Woodside Conference Centre, Kenilworth Job No: BVA04 Drawing No: PL002

Title: Site Layout Date: Sep 2022 Rev: B

Scale: 1:500 Sheet Size: @ A2 Drawn: KK Checked: MB

T: 0121 439 1151 A: Suite 3 Aspley House, 36 Hyton Street, Birmingham, B18 6HN

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 All written scaled dimensions and floor areas are subject to verification by Contractor(s) on site.
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Appendix B - Site Levels

Glasshouse Lane, Kenilworth Site Levels

