Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details	
Site Code	**ABB-8 & ABB8-1**
Address	ABB-8: Land west of Vicarage Street (A444) and east of Justice Walk. ABB8-1: Land west of Vicarage Street (A444) and north of Wheat Street.
Area	ABB-8: 1.0ha ABB8-1: 0.2ha
Current land use	ABB-8: Brownfield ABB8-1: Greenfield
Proposed land use	Residential
Sources of flood risk	
Location of the site within the catchment	The sites are located within an urban section of the downstream Tame, Anker and Mease Management Catchment in central Nuneaton. **ABB-8:** The east and south of the site is adjacent to Vicarage Street (A444). The north borders Wheat Street whilst the west of the site is adjacent to Justice Walk and then Church Street in the south-western corner of the site. **ABB8-1:** The east of the site is adjacent to Vicarage Street (A444). The south borders Wheat Street whilst the west and north of the site is adjacent to a car park and a grass verge, respectively.
Topography	**ABB-8:** The site generally slopes from east to west with the highest elevation in the north-east of the site being 85.09m AOD and the lowest elevation being 81.68m AOD in the south-west of the site. However, the south-western boundary is of lower elevation than the north-western boundary of the site, with a difference in elevation of approximately 0.5m AOD. **ABB8-1:** The site gently slopes from north to south with the highest elevation in the north of the site being 86.4mAOD and the lowest elevation being 82.7mAOD in the south-western corner of the site. Although there is a low point within the centre of the site, it is not clear what this represents as the site consists of overgrown vegetation. The lower elevation within the south of the site correlates with the ground levelling off with the adjacent pavement.
Existing drainage features	The nearest main river to the site is the River Anker, located approximately 115m west of the sites. This watercourse is within a highly urbanised area with artificially reinforced banks and development built up to the river edge. Within site ABB-8, there are no notable existing drainage features, however, as this is a brownfield site and therefore has been previously developed, it will likely drain into the surface water drainage network. Within site ABB8-1, there are limited existing drainage features. The only feature to note is the vegetation located in several areas within the site.

Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **ABB-8:** **FZ3 –** 0% **FZ2 –** 0.1% **FZ1 –** 99.9% **ABB8-1:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **ABB-8:** **3.3% –** 0% **1% –** 0% **0.1% –** 0.89% **ABB8-1:** **3.3% –** 0% **1% –** 0% **0.1% –** 0% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The 2015 River Anker and 2023 Warwickshire County Council's Nuneaton detailed hydraulic models have been used within this assessment. **Flood characteristics:** Both of these models indicate that the sites are at very low risk of fluvial flooding. The majority of the sites are not encroached by the modelled fluvial flood extents. Data from the River Anker hydraulic model shows that the south-western part of site ABB-8, at the corner of Church Street and Justice Walk, is encroached during all modelled fluvial events, excluding the 3.3% defended, 1% AEP defended and the 1% AEP +20CC. Data from the River Anker portion of the WCC Nuneaton hydraulic model shows the south-western corner of site ABB-8 to only be encroached during all modelled 0.1% AEP events. All modelled fluvial flood events for both models also encroach Wheat Street, excluding the River Anker's 3.3% AEP defended event. Some of these modelled extents situated along Wheat Street do encroach site ABB8-1 in the south-western corner and site ABB-8 in the north-western corner, however, this is minimal.
Surface Water	**Proportion of site at risk (RoFfSW):** **ABB-8:** **3.3% AEP** – 0% Max depth – 0m Max velocity – 0m/s **1% AEP** – 0% Max depth – 0m Max velocity – 0m/s **0.1% AEP** – 9.1%

	Max depth – 0.6-0.9m Max velocity – 1.0-2.0m/s **<u>ABB8-1:</u>** **3.3% AEP – 0%** Max depth – 0m Max velocity – 0m/s **1% AEP – 0%** Max depth – 0m Max velocity – 0m/s **0.1% AEP – 0%** Max depth – 0m Max velocity – 0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** **<u>ABB-8:</u>** Risk of Flooding from Surface Water data for this site shows that the site is free from surface water flood risk in the 3.3% and 1% AEP extents, although there is ponding present adjacent to the site boundary on Vicarage Street and the corner of Church Street and Justice Walk in these events. 9.1% of the site is located within the 0.1% AEP surface water extent. In this event, a flow path forms originating from an area of ponding on Vicarage Street on the eastern boundary to the corner of Church Street and Justice Walk at the southwest boundary, flowing around the footprint of the existing library building. Maximum depths in the flow are 0.15-0.3m/s, with velocities up 1.0-2.0m/s, giving a hazard of 'Caution' across the majority of the flooded area. Maximum depths and velocities on the site are found at the south-western corner where the flow joins the area of extensive flooding along the River Anker. **<u>ABB8-1:</u>** Risk of Flooding from Surface Water data for this site shows that the site is free from surface water flood risk in the 3.3%, 1% and 0.1% AEP extents. The nearest surface water flooding occurs during the 0.1% AEP event along Wheat Street, 6m west of the site.
Reservoir	Both the western and southern parts of site ABB-8, and the south-western corner of site ABB8-1 are shown to be at risk of reservoir flooding during the wet day event, according to the Environment Agency reservoir flood maps. These extents encroaching the sites are deemed as high risk, which means that in the very unlikely event the reservoir fails it is predicted that there is a risk to life. The reservoir referred to here is Seeswood Pool.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comments can be made about groundwater flood risk on both sites: • The site is deemed to have a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The sites are located in a postcode area with no recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).

Flood history	The Environment Agency's historic flooding and recorded flood outline datasets show there was an historic flood incident in May 1932. Flooding occurred less than 10m west of site ABB-8 and approximately 30m west of site ABB8-1. This was due to the channel capacity being exceeded. There were no raised defences at the time.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the sites are not protected by any formal flood defences. The nearest flood defences are located along both banks of the River Anker which flows approximately 115m west of the sites. These defences consist of various sections of high ground.
Residual risk	The River Anker is located approximately 115m west of the sites. According to the River Anker 1% AEP defended scenario, the fluvial flood extent does not enter the sites, only reaching areas along Mill Street and Wheat Street. The 1% AEP undefended scenario shows a much larger extent which borders the south-western boundary of site ABB8-1. The extent covers a slightly larger area of Wheat Street than the defended, however, this remains outside the boundaries of both sites. It is believed the large difference in extent between the defended and undefended scenarios is due to the defended taking into account a bridge which runs over the River Anker further upstream from the sites. This is located approximately 1.2km south-east of the sites.
Emergency planning	
Flood warning	Whilst site ABB8-1 is not located within a Flood Warning or Flood Alert Area, part of site's ABB-8 western boundary is located in a Flood Warning and Flood Alert Area. These are 033FWF3ANKR002 and 033WAF307, respectively. This risk is posed by the River Anker which is located approximately 115m west of the sites.
Access and egress	Currently, access and egress to site ABB-8 is via the car park entrances and exits within the north and west of the site, which lead on to Justice Walk and Wheat Street. Access and egress to site ABB8-1 is via the south of the site along Wheat Street and to the east of the site along Vicarage Street. The River Anker 1% AEP +22%CC portion of the WCC Nuneaton model and the 1% AEP +20%CC event from the River Anker model shows that access to the sites via Justice Walk will not be affected by flooding. However, during both these modelled fluvial events, the western end of Wheat Street leading on to Bond Gate and Bond Street is encroached by fluvial flooding. Access to site ABB-8 via Justice Walk to the north and west of the site is unaffected during the 3.3% and 1% AEP surface water events. During the 0.1% AEP event, the majority of Justice Walk is affected, with flooding reaching the north-western corner of the site on Justice Walk. In some areas along Justice Walk, depths are shown to exceed 1.2m with a maximum velocity of 2.0m/s and a maximum hazard rating of 'danger for most', meaning access and egress for emergency vehicles is likely to be impeded. Access to site ABB8-1 via Wheat Street and Vicarage Street remain unaffected during the 3.3% and 1% AEP surface water events. During the 0.1% AEP event, the majority of Wheat Street to the south-west of the site is encroached. This forms a flow path which flows along Bond Gate and Bridge Street which are roads adjacent to Wheat Street. In some areas along Wheat Street, depths are shown to exceed 1.2m with a maximum velocity of 2.0m/s and a maximum hazard rating of 'danger for most', meaning access and egress for emergency vehicles is likely to be affected. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water and fluvial events. During the 1% AEP +40% CC surface water event and the aforementioned modelled fluvial climate change events, the site ABB8-1 is not encroached but flooding extends along Wheat Street, approximately 20m west of the site. During this surface water event,

	ponding occurs along the eastern boundary of site ABB-8 on Vicarage Street as well as in the south-western corner of site ABB-8 on the corner of Justice Walk and Church Street. There is also some ponding along the outskirts of the eastern boundary of the library within this site. Maximum depths along Vicarage Road to the east of site ABB-8 reach 0.57m with maximum velocities of 0.99m/s and a maximum hazard rating of 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The sites are not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • Detailed fluvial modelling is available for the River Anker defended 1% AEP +20% and 30% climate change scenarios as well as the undefended 3.3% AEP +22% and 30% climate change scenarios. The River Anker portion of the WCC Nuneaton model provided fluvial modelling data for the 1% AEP +22% and 30% climate change scenarios as well as the 3.3% AEP +22% and 30% climate change scenarios. Flooding for these scenarios is not predicted to enter the sites with the exception of the south-western corner of site ABB-8. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • The 1% AEP plus 40% climate change event is slightly larger than the 1% AEP event as surface water within the former encroaches the south-western boundary of site ABB-8, albeit minimally. There is also some surface water ponding along the eastern edge of the library within this site, which does not exist in the 1% AEP event. Flooding does not enter site ABB8-1 during the 1% AEP plus 40% climate change. This climate change extent is not as significant as the 0.1% AEP surface water event in which a flow path forms between Vicarage Street and the library. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at both sites consists of:
	  ○ Bedrock – Mercia Mudstone Group (mudstone)
	  ○ Superficial – There is no data available for this site.
	• Soils at both sites consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage
	SuDS
	• The sites are not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone which may have highly variable permeability. This should be confirmed through infiltration testing.

	• The sites are not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The sites are not located within an historic landfill site. • Where possible, proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 2 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the River Anker may be susceptible to surcharging/tide locking due to water levels in the River Anker. The impacts of tide locking/flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls. • ABB-8: Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • ABB8-1: Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 0.1% AEP event in site ABB-8. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test is not required for these sites because the sites are not deemed as 'highly vulnerable'. The risk of surface water flooding in the 1% AEP

	plus 40% climate change event is minimal and would therefore not justify an Exception Test.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required for site ABB-8 as this proposed development site is greater than 1ha and shown to be at surface water flood risk in the 0.1% AEP event. • All sources of flooding should be considered as part of a site-specific flood risk assessment. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the developments will not be placed in danger from flood hazards throughout their lifetime. It is for the applicant to show that the developments meet the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the developments. (Para 048 Flood Risk and Coastal Change PPG). • Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Designs and access arrangements will need to incorporate measures so developments and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the developments are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The developments are likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with developments to be steered away from the areas identified to be at risk of surface water flooding within the sites.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- A site-specific FRA demonstrates that the sites are not at an increased risk of flooding in the future and that development of the sites does not increase the risk of surface water flooding on the sites and to neighbouring properties.

- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for these sites were the 2015 River Anker and 2023 WCC Nuneaton hydraulic models and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	For the purposes of this study, the 2015 River Anker model's 3.3% and 0.1% AEP defended scenarios were uplifted with the latest climate change allowances to indicate the impacts of climate change on fluvial flood risk. The existing climate change allowances for the 1% AEP event (+20%, 30% and 50%) have not been updated for the purposes of this study as they are still within +/- 10% of the latest climate change allowances. The 3.3%, 1% and 0.1% AEP events for the River Anker portion of the WCC Nuneaton 2023 hydraulic model have also been uplifted with the latest climate change allowances. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker detailed hydraulic model (2015) and the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data was taken from the Environment Agency's River Anker (2015) hydraulic model and the River Anker portion of the WCC Nuneaton model (2023).
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events have been taken from the Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**BUL-9**
Address	South of Oakham Crescent, Bulkington
Area	0.3ha
Current land use	Brownfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located north of the junction between Rugby Road (B4112) and Wolvey Road (B4109) and south of Oakham Crescent in Bulkington. The site is located in the south of the River Anker catchment, between its source and Wem Brook. This catchment is 3442ha and predominantly rural. The site lies in the south of the catchment and is not within the floodplain of the River Anker. There is an unnamed watercourse located 90m north of the site which flows in a northerly direction to join the River Anker to the northwest of Burton Hastings. The River Anker is over 2.5km north of the site.
Topography	The Environment Agency 1m LiDAR shows the elevation is highest in the south and slopes downhill from south to north across the site. Elevations on the site range from approximately 109.3mAOD up to 111.3mAOD.
Existing drainage features	There are no drainage features within the site boundary. There is an unnamed drainage channel located 90m north of the site, which flows in a northerly direction away from the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Available data:** The Environment Agency's Flood Map for Planning has been used within this assessment. **Flood characteristics:** The Environment Agency's Flood Map for Planning shows no fluvial flood risk to the site. The site is unlikely to be at risk of fluvial flooding from the unnamed drainage channel due to the distance and small size of the watercourse.

Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 0.0% **1% AEP** – 6.1% Max depth – 0.00 - 0.15m Max velocity – 0.50 – 1.00m/s **0.1% AEP** – 26.3% Max depth – 0.15 – 0.30m Max velocity – 1.00 – 2.00m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** There is no predicted surface water flood risk on the site in the 3.3% AEP event. In the 1% AEP event, a small surface water flow path begins to form in the east of the site between Withybrook Road to the south of the site and Oakham Crescent to the north of the site however flood risk across most of the site remains very low. Depths in the east of the site are not shown to exceed 0.15m with velocities of up to 1.00m/s and a maximum hazard of 'Very low hazard'. During the 0.1% AEP event the flow path in the east of the site is shown to join up and bisect the site. There is also a small area of risk which develops in the northwest of the site. In the 0.1% AEP event depths on the site are not shown to exceed 0.30m, with velocities of up to 2.00m/s. The hazard remains at 'Very low hazard' across most of the site with a maximum hazard of 'Danger for some'.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • The northern half of the site is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Groundwater levels in the southern half of the site are located between 0.5m and 5m below the ground surface. Within this zone there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 48 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council also provided historic flooding data which did not include any records of flooding on or surrounding the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is not protected by any formal flood defences.

Residual risk	There is no residual risk to the site from flood risk management structures.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.
Access and egress	The site can currently be accessed by vehicles off Nuneaton/Rugby Road to the southwest and Wolvey Road to the southeast. In all modelled fluvial events, the site and surrounding roads are unaffected by flooding. Access to the site via both Nuneaton/Rugby Road and Wolvey Road remains unaffected during the 3.3% AEP surface water event. During the 1% AEP event, a flow path begins to form on Withybrook Road flowing northwest towards the site across Wolvey Road. Depths along the road are not shown to exceed 0.15m with a maximum velocity of 2.00m/s and a maximum hazard rating of 'Very low hazard', meaning access and egress for emergency vehicles is unlikely to be affected. During the 0.1% AEP event, the flow path is shown to increase in extent along Withybrook Road and flows north across Wolvey Road and through the site, bisecting the site. Access to the west of the site is still likely to be possible from Rugby Road which is not shown to be affected in the vicinity of the site. Depths along Wolvey Road remain low, not exceeding 0.30m, with velocities up to 2.00m/s and a hazard rating of mostly 'Very low hazard', meaning access and egress for emergency vehicles is unlikely to be affected. During the 1% AEP plus 40% climate change surface water event there is a flow path which flows west along Withybrook Road and the north across Wolvey Road and through the site. Depths along Wolvey Road are shown to reach a maximum of approximately 0.15m with velocities of up to 1.3m/s and a maximum hazard rating of 'Very low hazard' meaning access and egress for emergency vehicles is unlikely to be affected. As the site is bisected by a surface water flow path during this event, access to both the west and the east side of the site needs to be considered if access between them will not be possible during this flood event. Safe access and egress will need to be demonstrated in the 1% AEP plus 40% climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • In the absence of detailed modelling, Flood Map for Planning Flood Zone 2 can be used as an indicative 1% AEP plus climate change flood extent. The site is not shown to be at fluvial risk with climate change. **Surface Water** • The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event the flow path in the east of the site is shown to bisect the site and the extent is slightly widened, but it still remains confined to the eastern side of the site. However, no LiDAR data was available from the Environment Agency for this site to compare with this flow path. There is also a small area of risk on the

	northern boundary of the site where the flow path along the west side of Oakham Crescent extends south as far as the site boundary. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – Mercia Mudstone Group (Mudstone).
	  ○ Superficial – in the southern half of the site the superficial deposits are Dunsmore Gravel (Sand and gravel). In the northern half of the site the superficial deposits are Oadby Member (Diamicton).
	• Soils at the site consist of:
	  ○ Freely draining slightly acid loamy soils.
	
	SuDS
	• In the southern half of the site groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
	• The northern half of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within a historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The RoFSW mapping indicates the presence of a surface water flow path in the east of the site during the 1% and 0.1%AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.

	• Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test is required for these sites because the sites are at risk of surface water flooding and surface water flow paths in the 1% AEP plus 40% climate change event.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, it is recommended that a site-specific Flood Risk Assessment (FRA) is required as the eastern side of the proposed development site is shown to be at surface water flood risk, particularly in the 0.1% AEP and 1% AEP plus 40% climate change events. • All sources of flooding should be considered as part of a site-specific flood risk assessment. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage. • Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. • The development should be designed with mitigation measures in place where required. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and

	access arrangements will need to incorporate measures, so development and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the area identified to be at risk of surface water flooding in the eastern part of the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to check that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Environment Agency Flood Map for Planning and the Environment Agency's RoFSW map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	In the absence of detailed hydraulic modelling, Flood Zone 2 has been used as a proxy for climate change to indicate the impacts on fluvial flood risk. The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk.
Fluvial depth, velocity and hazard mapping	Depth, velocity, and hazard data were not available for this assessment. Detailed hydraulic modelling was not available for the site.
Surface Water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**EXH-1**
Address	Smarts Road, Exhall, Bedworth
Area	3.74Ha
Current land use	Brownfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within Bedworth, in the east of the 'Sowe source to confluence with Breach Brook' catchment. This catchment has an area of 17km² and is designated as 'heavily modified'. The site is located in the upper catchment of the River Sowe and within the Avon Warwickshire Management Catchment. The site is bordered to the north and west by forested land. Smarts Road and a housing development site border the site to the south. Rectory Drive borders the site to the east.
Topography	The site generally slopes downhill from north-west to -south-east, towards the River Sowe. There is also an area of lower-lying ground at the south-west corner of the site, towards Smarts Road. LiDAR shows a maximum height of approximately 101.0m AOD at the western border and a minimum height of approximately 95.5m AOD at the south-western corner of the site.
Existing drainage features	The River Sowe is located approximately 40m east of the site. The River also curves around to the west and runs parallel to the southern boundary approximately 190m from the southern border of the site. There is also a drainage ditch to the River Sowe that runs along the A444 at the back of Croft Pool and Delamere Road. This ditch is approximately 25m north of the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 – 0%** **FZ2 – 4%** **FZ1 – 96%** *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled results:** **3.3%** – 0% **1%** – 0% **0.1%** – 0% *Modelled results show the percentage of site at risk from a given AEP flood event.*

	Available data: The Environment Agency's Flood Map for Planning (FMfP) and the River Sowe (2010) hydraulic model outputs The EA's Flood Map for Planning is generally based on broadscale modelling and historic flooding records (sometimes records are from before flood defences were built). Detailed hydraulic modelling, such as the River Sowe (2010) model, is more accurate and more representative of actual flood risk at the site. **Flood characteristics:** The north-western corner of the site is located within Flood Zone 2 of the FMfP. This flooding is associated with the River Sowe. The River Sowe (2010) model does not show any flooding to the site during the 0.1% AEP (1000-year) event.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 0.47% Max depth – >1.2m Max velocity – 0.25-0.50m/s **1% AEP** – 0.70% Max depth – >1.2m Max velocity – 0.50-1.0m/s **0.1% AEP** – 2.3% Max depth – >1.2m Max velocity – 1.0-2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFfSW) map has been used within this assessment. **Description of surface water flow paths:** The site is generally at low risk of surface water flooding. Due to the lower-lying ground at the south-west corner of the site, deep surface water flooding (of >1.2m) is predicted during all three events. During the 3.3% AEP event, there is small area of ponding at the southern-western corner of the site. This flooding is associated with a surface water flow that travels down Alice Close and east along Smarts Road, entering the site at the southern border. The maximum velocity of this flow path (at the site) is 0.25-0.50m/s, with a hazard rating of 'Danger for most'. During the 0.1% AEP event, the flow path extends further across the across the southern border of the site. There are also some small additional areas of flooding on the southern and eastern border. Depths of flooding in the flow path (at the south-western corner) remain >1.2m. Depths of flooding at the additional areas of flooding reach a maximum of 0.60m. The maximum velocity of the flow path increases to up to 2m/s and the hazard rating increases to 'Danger for all' at the very south-western corner. The maximum velocity of the additional areas of flooding is 0.50-1.m/s, with a hazard rating of 'Danger for some'. However, broadly the site remains unaffected by surface water flooding.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets,

	based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • This site is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • The area surrounding the site also has a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area with 3 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets show fluvial flooding to the site in December 2008 due to channel capacity exceedance. This flooding encroached onto the north-west corner of the site. Nuneaton and Bedworth Borough Council conducted an investigation into this flood event and concluded that the cause of flooding was water backing up in a blocked drainage ditch to the River Sowe that runs along the A444 at the back of Croft Pool and Delamere Road. The historic flooding records held by Nuneaton and Bedworth Borough Council indicate 8 flooding incidents within a 500m radius of the site. The sources of this flooding were blocked drains, surface runoff and flooding from main rivers.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows a flood wall along the River Sowe approximately 500m upstream of the site.
Residual risk	The River Sowe is culverted under the Bedworth Bypass, under Croft Pool, Delamere Road and Dalton Road all upstream of the site and emerges again in the woodlands approximately 100m north-east of the site. This could pose a residual risk in the event of a blockage, which could cause water to back up and encroach on the site. However, this would likely only impact the lower lying ground at the east and south of the site.
Emergency planning	
Flood warning	The site is located in the 033WAF202 Environment Agency Flood Alert Area. The site is not located in an Environment Agency Flood Warning Area.
Access and egress	The site is currently accessed via Smarts Road, from the south. Smarts Road can be accessed from the west via Heath Road, Bowling Green Lane and Goodyers End Lane. Smarts Road is unaffected by flooding in all modelled fluvial flood events. Smarts Road is also not in Flood Zone 2 or 3 of the FMfP. The surface water flow path that affects the south-western corner of the site, flows down Alice Close and east along Smarts Road. This flow path is present in the 3.3%, 1% and 0.1% AEP surface water events. During all three events, the maximum depth of flooding on Smarts Road is >1.2m, with a maximum hazard rating of 'Danger for all'. During the 0.1% AEP event, all of Smarts Road, up to the junction with Alice Road is predicted to flood, with a hazard rating of 'Danger for most' or 'Danger for all'. Surface water flooding to Smarts Road during the modelled 1% AEP +40% climate change event, is very similar to the flooding predicted during the 0.1% AEP present day event, with a maximum hazard rating of 'Danger for all'.

	Surface water flooding with this hazard rating could provide issues for access and egress of emergency service vehicles to the site. Safe access and egress will need to be demonstrated in the 1% AEP +40% climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** The River Sowe hydraulic model was re-ran for the defended 1% AEP (+22%, +30% and +51%) and 0.1% AEP (+22%, +30% and +51%) climate change scenarios as part of this assessment. Flooding during these scenarios is not predicted to enter the site. **Surface Water** • The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • Surface water flooding during the modelled 1% AEP +40% climate change event, is similar to the flooding predicted during the present day 0.1% AEP event with flooding to Smarts Road having a hazard rating of 'Danger for all'. • When compared to the 1% AEP event, flooding during the 1% AEP +40% climate change surface water event, extends further across the across the southern border of the site. There is also an additional area of flooding at the south-eastern corner of the site. Depths of flooding at the end of the flow path (at the south-western corner) remain >1.2m. Depths of flooding at the south-eastern corner could reach a maximum of 0.60m. The maximum velocity of the flow path remains up to 1m/s. The hazard rating of the flooding at the very south-western corner is 'Danger for all'. The maximum hazard rating of the additional areas of flooding is 'Danger for most'. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock - Whitacre Member- Mudstone and Sandstone
	  ○ Superficial:
	  ▪ Alluvium- Clay, silt, sand and gravel at the south-eastern corner of the site (the part extending to Rectory Drive)
	  ▪ Thrussington Member- Diamicton at the remainder of the site
	
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (impeded drainage)
	
	SuDS

	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • BGS data indicates that the underlying geology is mudstone and sandstone which is likely to have highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site. • The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is not located within a historic landfill site. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test is required for this site because access and egress via Smarts Road, is located in an area at high risk of surface water flooding.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as:
	  ○ The proposed development site has an area of 1 hectare or more
	  ○ Part of the proposed development site is within Flood Zone 2 and

- The site has a high risk of flooding from surface water (particularly regarding access and egress via Smarts Road)
- All sources of flooding should be considered as part of a site-specific FRA.
- Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
- Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Borough Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local Guidance for developers.
- The development should be designed with mitigation measures in place where required.

Guidance for site design and making development safe:

- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.
- Arrangements for safe access and egress will need to be provided for the 1% AEP rainfall/surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures so the development and occupants are safe.
- Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the north-western corner which is in FMfP Flood Zone 2 and the south-western corner of the site where there is significant surface water flood risk.
- Safe access and egress can be demonstrated in the 1% AEP +40% climate change surface water event.
- Any flood mitigation measures implemented are tested to ensure they will not displace water elsewhere (for example, if land is raised to permit development in one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Sowe hydraulic model (2010) the Environment Agency's Flood Map for Planning (FMfP) and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent EA guidelines state the Central, Higher and Upper peak river flow allowances for the 2080s epoch, within the Tame, Anker and Mease Management Catchment, are 22%, 30% and 51%. These allowances have been applied to the model and used within this assessment. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the River Sowe detailed hydraulic model (2010). As the modelled flood extents do not enter the site, the EA's FMfP (which shows FZ2 does impact the site) has also been used. Depth, velocity, and hazard data was derived from the River Sowe (2010) hydraulic model. Defended outputs were used for this site assessment.
Surface water	The RoFfSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFfSW. Extent, depth, velocity and hazard data for the 1% AEP and 3.3% AEP plus climate change surface water events have been derived from the RoFfSW mapping also.

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Detailed Site Summary Tables

Site details

Site Code	**GAL-7**
Address	Land east of Alders Lane and south of Chancery Lane.
Area	2.2ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment north-west of central Nuneaton. The River Anker rises near Wolvey, approximately 4km south-east of Nuneaton, before flowing north-west through the predominantly urban area of Nuneaton. To the south-west, the site borders Lilleburne Drive whilst the north is adjacent to Willow Close. The north-east of the site borders Chancery Lane and the south-east border runs through the field in which the site is located.
Topography	The site generally slopes from north to south with the maximum elevation in the north of the site being 117m AOD and the lowest elevation being 108m AOD in the south of the site. There are also some low patches along the south-western boundary which runs parallel to Lilleburne Drive. The slope is steepest in the northern part of the site, and flatter in the south, near to the Bar Pool Brook.
Existing drainage features	The nearest main river to the site is the River Anker, located approximately 2.2km north-east of the site. The Coventry Canal is located approximately 1.7km north-east of the site. There is also a small ordinary watercourse called the Bar Pool Brook which flows along the east and south site boundaries toward the River Anker. Within the site itself there is a ditch running across the north-eastern corner of the site, joining the Bar Pool Brook.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled results:** **3.3%** – 38.6% **1%** – 40.9% **0.1%** – 46.0% *Modelled results show the percentage of site at risk from a given AEP flood event.*

	Available data: The Warwickshire County Council (WCC) 2023 Nuneaton hydraulic model was used to assess fluvial flood risk within this assessment. According to the Bar Pool Brook portion of the WCC Nuneaton hydraulic model, a flow path forms which flows through the site's north-western corner to the south of the site, encroaching the majority of the west and south of the site. This is the case during all modelled fluvial flood events. In the 3.3% AEP event flood depths are up to 0.2m, with flood velocities varying from 0, to 0.6m/s in the north. The resulting flood hazard is 'Very Low', with some areas of 'Danger for Some' in the south of the site where flood depths are deeper. In the 1% AEP event, flood depths are similar to the 3.3% AEP event, flood velocities are greater, and up to 0.55m/s. The resulting flood hazard is 'Very Low', with some areas of 'Danger for Some' in the south of the site where flood depths are deeper. In the 0.1% AEP event the flood extent is slightly bigger than the 1% AEP event, flood depths are slightly deeper in the south and up to 0.37m, and lower in the north at 0.1m. Flood velocities vary from 0.1 to 0.8 m/s in the south. The resulting flood hazard is 'Very Low' to 'Danger for Most' in the south where flood depths are deeper.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 28.8% Max depth – 0.6 - 0.9m Max velocity – 1.0 - 2.0m/s **1% AEP** – 38.2% Max depth – 0.6 - 0.9m Max velocity – >2.0m/s **0.1% AEP** – 54.4% Max depth – >1.2m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** The Environment Agency's Risk of Flooding from Surface Water dataset shows that 28.8% of the site is at risk in the 3.3% AEP surface water event. A flow path forms along Bar Pool Brook in this event, before flowing across the site from the south to the north-western corner of the site by Alders Lane. Maximum depths in the flow path are up to 0.6-0.9m, with velocities up to 1.0-2.0m/s and a maximum hazard of 'danger for most', with highest hazard associated with the area immediately in the vicinity of Bar Pool Brook. 38.2% of the site is at risk in the 1% AEP surface water event. This is very similar to the 3.3% AEP event but the flow path extends further across the site, particularly in the south-eastern corner. Maximum depths in the flow path remain up to 0.6-0.9m, with velocities >2.0m/s and a maximum hazard of 'danger for most', with highest hazard associated with the area immediately in the vicinity of Bar Pool Brook and the centre of the flow path across the south-eastern corner. 54.4% of the site is at risk in the 0.1% AEP surface water event. This extent follows the same flow path as the 3.3% and 1% AEP events but extends across the entirety of the south-western boundary of the site. Maximum depths here are >1.2m, with velocities of >2m, and a hazard of 'danger for all' and 'danger for most' across the flooded area. A flow path also forms within the site near the north-eastern boundary. This flows from Coleshill Road, along both forks of Chancery Road into the site from the northern boundary. This flow path is much smaller, and has a maximum hazard rating of 'very low hazard'.

	The Environment Agency's Risk of Flooding for Surface Water dataset gives an indication of the surface water risk to the site, however it is high level and does account for the surface water drainage network and other structures which may affect the risk to sites. Given the significant risk to the site, it is recommended that modelling is undertaken to confirm surface water risk as part of a site-specific Flood Risk Assessment.
Reservoir	The site is shown to be at risk of Dry Day reservoir flooding according to the Environment Agency reservoir flood maps. These reservoirs are Oldbury No.1 and Oldbury No.2, both of which are managed by Severn Trent Water and are deemed as high-risk. This means that in the very unlikely event the reservoir fails it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comments can be made about groundwater flood risk on the site: • The entire site is deemed as having 'no risk' to groundwater emergence. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 36 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place on land adjacent to the Trent Valley Railway line on 01/12/1992 as a result of the River Anker overtopping its banks. This is approximately 2.0km north-east of the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is not protected by any formal flood defences.
Residual risk	There are no flood defences or structures within the vicinity of the site that could pose a risk in the event of failure.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area. The nearest Flood Alert Area (033WAF307) is located approximately 380m south-east of the site.
Access and egress	Safe access and egress is possible via Willow Close and Alders Lane to the north of the site and Salisbury Drive to the south-east of the site. Whilst site access via Salisbury Drive is unaffected, access via Willow Close and Alders Lane is impeded during the 1% AEP +22% climate change due to a flow path which flows across Coleshill Road to the north, entering the north-western corner of the site. Access to the site via Salisbury Drive remains unaffected during the 3.3% AEP, 1% AEP and 0.1% AEP surface water events. Access via Willow Close will be impacted by a flow path which extends across Coleshill Road, Plough Hill Road and Willow Close during the 3.3% AEP, 1% AEP and 0.1% AEP surface water events. The 3.3% AEP event only covers a small part of Willow Close and depths reach 0.3m-0.6m with hazards of up to 'danger for some'. The 0.1% AEP event extends across the majority of Willow

	Close with depths reaching 0.6-0.9m and hazards of up to a 'danger for all' classification. During the 3.3% AEP, 1% AEP and 0.1% AEP surface water events, a flow path forms along the south-western boundary of the site which extends to the end of Alders Lane where it meets the north-western corner of the site. During the 3.3% AEP event, depths on Alders Lane are 0.3-0.6mwith a hazard classification of up to 'danger for most' meaning access and egress for emergency vehicles is likely to be affected. During the 1% AEP event, the flow path is shown to increase in extent at the end of Alders Lane. Depths here are 0.6-0.9mwith a maximum hazard rating of 'danger for most', meaning access and egress for emergency vehicles is likely to be affected. During the 0.1% AEP event, the flow path extends the entire length of Alders Lane and continues south along Plough Hill Road and Coleshill Road. Depths along Alders Lane are 0.9-1.2m with a maximum hazard rating of 'danger for all', meaning access and egress for emergency vehicles is likely to be affected. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. During the 1% AEP +40% CC surface water event and the 1% AEP +22% CC fluvial event (derived from the Bar Pool Brook portion of the WCC Nuneaton model), a flow path forms across Coleshill Road (B4114), Plough Hill Road, Willow Close and Alders Lane before flowing through the west and south of the site. Maximum depths within the site reach 1.03m, velocities reach 2.34m/s and the hazard rating reaching 'danger for all'. There is also some surface water ponding along Chancery Lane to the north-east of the site. Depths here reach 0.45m, with maximum velocities being 1.35m/s and the maximum hazard rating reaching 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The Bar Pool Brook portion of the WCC Nuneaton 2023 model has been used to inform the risk to the site from Bar Pool Brook. The central and higher central (22% and 30%) climate change allowances have been applied to the 3.3% and 1% AEP events to give an indication of the sensitivity of the site to increases in fluvial flooding from the Bar Pool Brook due to climate change. Flood depths increase in the climate change events, by up to 0.3m more in the south where flooding is deepest, and by up to 0.1m more elsewhere within the site. Flood velocities also increase in all climate change events, and therefore the site is sensitive to climate change in fluvial flood events. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event a flow path forms along the Bar Pool Brook before flowing across the site from the south to the north-western corner of the site by Alders Lane. This flow path covers the majority of the south of the site, reaching depths of 0.9m. It also follows the same route as the flow path in the 0.1% AEP event, although the latter extends further across the site, particularly in the south. In contrast to the 0.1% AEP event, there is no flow path within the site near the north-eastern boundary. The 1% AEP plus 40% climate change

	corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock – The majority of the site is Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone). Some of the north-eastern boundary of the site from Salisbury Drive north to Chancery Lane consists of Outwoods Shale Formation (mudstone). There is also a small section of the north-eastern boundary that consists of Midlands Minor Intrusive Suite (lamprophyres).
	  ○ Superficial – The western half of the site from Alders Lane to the south-western corner of the site consists of alluvium (clay, silt, sand and gravel). For the rest of the site there is no data available.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet acid loamy and clayey soils.
	
	SuDS
	
	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone, siltstone and sandstone which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The majority of the site's south-western boundary is designated by the Environment Agency as being an historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA, to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable', and therefore the Exception test is required for this site as part of it is within Flood Zone 3a. 'More Vulnerable' development is not permitted in Flood Zone 3b.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as;
	  ○ the proposed development site is greater than 1ha, is
	  ○ at fluvial flood risk from the Bar Pool Brook, and;
	  ○ is shown to be at surface water flood risk in the 3.3% AEP, 1% AEP and 0.1% AEP events.
	• All sources of flooding should be considered as part of a site-specific flood risk assessment. In particular, fluvial modelling of the Bar Pool Brook will be required to determine the fluvial risk to the site. Careful consideration will also need to be given to the significant surface water flood risk on site.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place to ensure the development does not flood.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained

	effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. • Should built development be proposed within the 0.1% AEP fluvial or surface water flood extents, careful consideration will need to be given to flood resistance and resilience measures, including ideally raising finished floor levels to a minimum of 300mm above the 0.1% AEP flood depth. • Construction materials that have low permeability up to at least the same height as finished floor levels should also be used. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The site is shown to be at significant risk of surface water flooding and may also be at risk from fluvial flooding from the Bar Pool Brook. The development may be able to proceed if:

- The area of the site located in within the 3.3% AEP flood extent is left undeveloped
- Development is steered away from the southern edge of the of the site which lies within the 1% AEP modelled flood extent
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- A site-specific Flood Risk Assessment, including fluvial and surface water modelling, demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change.
- Safe access and egress can be demonstrated in the 1% AEP plus Higher Central climate change surface water and fluvial events.
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Bar Pool Brook portion of the WCC Nuneaton 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The latest climate change allowances have been applied to the WCC Nuneaton model's 3.3%, 1% and 0.1% AEP fluvial events. The uplifts applied were 22% for the central, 30% for the higher and 51% for the upper end allowances. These are all for the 2080s epoch.

	The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the Bar Pool Brook portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data have been provided for this assessment as part of the WCC Nuneaton 2023 model.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be low, medium and high risk) have been taken from Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SEA-1**
Address	Faultlands Farm, Gipsy Lane
Area	26.4ha
Current land use	Online imagery shows current land use at the site is predominantly fields (greenfield) with a small area in the northeast of the site containing a farmhouse and associated buildings (brownfield).
Proposed land use	Employment

Sources of flood risk

Location of the site within the catchment	The site is located to the south of Nuneaton, in the north of the Wem Brook from Source to River Anker catchment. This is a large catchment, beginning at the source of Wem Brook approximately 4km east of Bedworth, and extending in a north-westerly direction between Nuneaton and Bedworth. The site is located in a predominantly rural area of the lower catchment. Coventry Road (B4113) follows the curved part of the western boundary of the site, while Gipsy Lane borders the entire southern boundary. A small watercourse named Griff Brook flows adjacent to the northern boundary and the Coventry Canal borders the eastern boundary.
Topography	The site generally slopes downhill from west to east, with the LiDAR showing a maximum height of approximately 104m AOD at the western boundary and 93m AOD at the eastern boundary.
Existing drainage features	Griff Brook flows adjacent to the site, 30m north of the site boundary, in an easterly direction towards Wem Brook which is approximately 600m to the east of the site. Wem Brook then flows northwards to its confluence with the River Anker, approximately 1km downstream. The Coventry Canal runs along the eastern boundary of the site and around the northeast corner.
Fluvial	**The proportion of site at risk:** **EA Flood Map for Planning:** **FZ3 –** 0% **FZ2 –** 0.3% **FZ1 –** 99.7% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Flood Extents:** **3.3% AEP** – 0% **1% AEP** – 0% **0.1% AEP** – <1% *Modelled results show the percentage of site at risk from a given AEP flood event.*

	Available data: The section of the Warwickshire County Council (2023) Nuneaton hydraulic model along Griff Brook has been used within this assessment. The site also falls within the domain of the SHA-2 detailed hydraulic model developed by JBA (2023) however the Warwickshire County Council (2023) Nuneaton hydraulic model has been used in preference as it shows slightly larger extents within the vicinity of the site so provides a more conservative assessment. **Flood characteristics:** Most of the site is not at fluvial flood risk. The site is not located within Flood Zone 3b (3.3% AEP) or Flood Zone 3a (1% AEP). The Flood Zone 2 (0.1% AEP) extent from Griff Brook, which runs to the north of the site, encroaches slightly onto the northern most tip of the site. Flood depths on the site are up to 0.14m with velocities of up to 3.2m/s and a maximum hazard classification of 'Danger for some'.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 0.5% Max depth – 0.6-0.9m Max velocity – 0.25-0.5m/s **1% AEP** – 1.1% Max depth – 0.6-0.9m Max velocity – 0.5-1.0m/s **0.1% AEP** – 3.6% Max depth – 0.6-0.9m Max velocity – 1.0-2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** During the 3.3% AEP event, there are small, isolated areas of surface water ponding. Near the centre of the site, a very small area reaches a maximum depth of between 0.6 and 0.9m, while depths are below 0.3m in the southwest corner and eastern part of the site where the existing buildings are. The extent of these areas increases slightly during the 1% AEP and a shallow flow path (maximum depth of 0.15m) starts to develop in the southeast corner. The velocity of this flow path is predicted to be between 0.5 and 1m/s, equating to a hazard rating of 'Very low hazard'. During the 0.1% AEP event, the small areas of ponding increase slightly again and there are some additional areas of flooding, but depths remain below 0.3m apart from the small area in the centre where the maximum depth is between 0.6 and 0.9m. The flow path in the southeast corner becomes more continuous, flowing from the centre of the site to the southeast corner. The flow path meets the Coventry Canal here, which isn't accounted for in the modelling and may affect the flow of water. It then continues in a southeast direction to eventually join Wem Brook 300m southeast of the site.. Although the velocity increases to between 1.0 and 2.0m/s, the hazard rating remains at 'Very low hazard'.
Reservoir	The Environment Agency reservoir flood maps show both the 'dry-day' and the 'wet-day' extents for Seeswood Pool passing close to the northern boundary of the site, extending along Griff Brook. The risk designation for these extents is high risk which means in the very unlikely event the reservoir fails, it is predicted that there is a risk to life.

Groundwater	The JBA Groundwater Flood Risk Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • The majority of the site is deemed to have a negligible risk from groundwater due to the nature of the local geological deposits. • Groundwater levels in the eastern quarter of the site are between 0.025 and 0.5m below the ground surface. This means there is a risk of groundwater flooding to both surface and subsurface assets, and there is the possibility of groundwater emerging at the surface locally. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific flood risk assessment (FRA) stage.
Sewers	The site is located in a postcode area with 0 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council also provided historic flooding data and this has a record of road flooding due to surface water at Griff Roundabout on the A444, approximately 150m west of the site off Coventry Road.
Flood risk management infrastructure	
Defences	The site is not protected by any formal flood defences.
Residual risk	There is no residual risk to the site from flood risk management structures. The Coventry Canal, which borders the eastern boundary of the site, could pose a residual risk in the event of a breach or overtopping incident, however any impacts are predicted to be minimal due to most of the site being at a higher elevation than the canal.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning Area. The northern tip of the site is in the River Anker and River Sence (033WAF307) Environment Agency Flood Alert Area.
Access and egress	The site can currently be accessed through a gate off Gipsy Lane, from the south. In all modelled fluvial events, Gipsy Lane is unaffected by flooding in the vicinity of the site. Approximately 600m from the site, east along Gipsy Lane, the road is shown to be impacted by fluvial flooding during the 1% AEP plus 22% climate change event where Wem Brook flows under it. Depths along the road are shown to reach a maximum of 0.03m with velocities of up to 0.46m/s and a maximum hazard classification of 'Very Low Hazard'. Therefore, access and egress in this direction is likely to remain unaffected. During the 3.3% AEP surface water event, there is a small amount of ponding on Gipsy Lane near the southwest corner of the site. Maximum depths are predicted to be 0.3m, with a hazard rating of 'Very low hazard', so are unlikely to affect access and egress at the site for emergency vehicles. Similar depths and hazard rating are predicted for the 1% AEP event. During the 0.1% AEP event, the extent on Gipsy Lane increases and the maximum depth increases to 0.6m. The hazard rating also increases to the next category of 'Danger for some', however this is unlikely to affect access and egress for emergency vehicles.

	A surface water flow path also passes over Gipsy Lane near Wem Brook 600m to the east of the site, in the 3.3%, 1% and 0.1% AEP events. Depths on the road are predicted to be up to 0.3m for the 3.3% AEP event, increasing to a maximum of 0.6m during the 1% and 0.1% AEP events. During the 1% AEP event, the hazard rating could reach 'Danger for most' for part of the road here and for the 0.1% AEP event, a stretch of more than 100m of the road could be in this category. This may pose a hazard to the public if leaving the site in this direction and could impede access and egress for emergency services. Therefore, it is recommended that access and egress along Gypsy Lane is to the west rather than the east. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The site is not shown to be at risk during the 3.3% AEP plus 22% climate change (central allowance) and 3.3% AEP plus 30% climate change (higher central allowance) events. • However, the northern tip of the site is shown to be sensitive to increased fluvial flood risk with climate change during the 1% AEP event. • The site is not shown to be at risk in the 1% AEP event, but the northern tip of the site is shown to be at risk during the 1% AEP plus 22% climate change (central allowance) and 1% AEP plus 30% climate change (higher central allowance). These events both show the same extent as the 0.1% AEP event. • In the 1% AEP plus 30% climate change event, depths on the site are up to 0.06m, with velocities of up to 1.74m/s and a maximum hazard classification of 'Very Low Hazard'. • In the absence of detailed modelling, Flood Map for Planning Flood Zone 2 can be used as an indicative 1% AEP plus climate change flood extent. The northern tip of the site may be at fluvial risk with climate change. **Surface Water** • The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event, the extent of surface water flooding on the site is predicted to be only slightly larger than the present day 1% AEP extent, with similar depths, velocities, and hazard ratings, which suggests the site is not very sensitive to climate change. This also applies to Gipsy Lane, the access and egress road to the site. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – Outwoods Shale Formation (Mudstone) for the majority of the site with two bands of Midlands Minor Intrusive Suite (igneous rock) to the west of the site and down to the centre of the site from the north.
	  ○ Superficial – Thrussington Member (Diamicton) in a band across the centre of the site from southeast to northwest and Glaciofluvial deposits (sand and gravel) in the eastern quarter of the site. For a large portion of the site, there is no information available on the superficial geology.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
	SuDS
	• For the eastern quarter of the site, groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this part of the site.
	• BGS data indicates that the underlying geology is mudstone and igneous rock and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site has an area within its boundary designated by the Environment Agency as being a historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA, to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The RoFSW mapping indicates the presence of surface water flow paths during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take

	into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies this form of non-residential development as 'Less Vulnerable'. The Exception Test is not required for this site because the proposed land use is in the 'Less Vulnerable' category and there is not a significant flood risk predicted at the site.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development site:
	  ○ is greater than 1 hectare
	  ○ is within flood zone 2 (the northern tip of the site)
	• All sources of flooding should be considered as part of a site-specific FRA. In particular, the risk to the site from the canal on the eastern border should be quantified as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place where required.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

	• Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- Development is steered away from the northern tip of the site which lies within Flood Zone 2.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the area identified to be at risk of surface water flooding in the southeast part of the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- Any flood mitigation measures implemented are tested to ensure they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning and RoFSW map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent uplifts have been applied to the defended Warwickshire County Council (2023) Nuneaton hydraulic model to indicate the impacts on fluvial flood risk. The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the Warwickshire County Council (2023) Nuneaton hydraulic model along Griff Brook and Wem Brook Fluvial depth, velocity, and hazard data was available for this site from the Warwickshire County Council (2023) Nuneaton hydraulic model along Griff Brook and Wem Brook.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

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Detailed Site Summary Tables

Site details

Site Code	**SEA-4**
Address	Coventry Road, Nuneaton
Area	9.6ha
Current land use	Greenfield
Proposed land use	Employment

Sources of flood risk

Location of the site within the catchment	The site is located in Bermuda, a suburb to the south of Nuneaton at the northern edge of the Wem Brook from Source to River Anker catchment. This is a large catchment, beginning at the source of Wem Brook approximately 4km east of Bedworth, and extending in a north-westerly direction between Nuneaton and Bedworth. The site is located in a predominantly urban area of the lower catchment and is outside the floodplain of Wem Brook. The Coventry to Nuneaton railway line runs adjacent to the western boundary of the site, a residential area is to the north, Coventry Road (B4113) is to the east and a footpath borders the south of the site.
Topography	The site is generally highest in the centre and gradually sloping down to each of the boundaries. LiDAR shows a maximum height of 110mAOD near the centre of the site, approximately 102mAOD along the north and west boundaries, 105mAOD along the eastern boundary and 92m AOD on the southern boundary. The steepest sloping part of the site is down towards the southern boundary.
Existing drainage features	Bermuda Lake is approximately 300m to the west of the site. This feeds into Griff Brook which appears to be culverted as it flows adjacent to the southern boundary of the site, in an easterly direction towards Wem Brook. Where Griff Brook flows adjacent to the site, the floodplain is constrained on both sides by the surrounding land which comprises fields which have not been built on. The brook re-emerges after passing under the southern boundary, which is situated within a field, and Coventry Road near the south-east corner of the site. It then flows approximately 1km to the east into Wem Brook which also flows through fields despite being approximately 40m west of residential development. Wem Brook then flows northwards to its confluence with the River Anker, approximately 1km downstream.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 1.1% **FZ2 –** 4.0% **FZ1 –** 96.0% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).*

	Modelled results: **3.3% –** 0% **1% –** 1.85% **0.1% –** 2.62% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The section of the Warwickshire County Council (2023) Nuneaton hydraulic model along Griff Brook has been used within this assessment. The site also falls within the domain of the SHA-2 detailed hydraulic model developed by JBA (2023), however the Warwickshire County Council (2023) Nuneaton hydraulic model has been used in preference as it shows slightly larger extents within the vicinity of the site so provides a more conservative assessment. **Flood characteristics:** This model indicates the site is at very low risk of fluvial flooding. The entirety of the site is unaffected during the 3.3% AEP event. During the 1% and 0.1% AEP event, the majority of the site is not encroached with the exception of along the southern site boundary from a flow path which eventually feeds into the Wem Brook.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 1.2% Max depth – 0.15-0.3m Max velocity – 0.01-0.25m/s **1% AEP** – 1.5% Max depth – 0.15-0.3m Max velocity – 0.01-0.25m/s **0.1% AEP** – 4.4% Max depth – 0.3-0.6m Max velocity – 0.25-0.5m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** Overall, surface water poses a low risk to the site with only a small portion of the site covered by the predicted flood extents. There are three small, isolated patches of surface water ponding during the 3.3% AEP event, two in the north of the site and one in the south-east corner. Depths are predicted to be below 0.3m. Surface water also pools along the southern boundary of the site, where the footpath runs along a lower elevation than the site. Depths here are predicted to reach a maximum of 0.6m here at a low velocity of less than 0.25m/s, and hazard rating of 'Danger for some'. During the 1% AEP event, the isolated areas of ponding increase slightly in extent but remain at a similar depth to the 3.3% AEP event. The pooling along the southern boundary extends further along but remains at a hazard rating of 'Danger for some'. During the 0.1% AEP event, the two areas of ponding in the north of the site merge together although depths generally remain below 0.3m. The surface water flooding along the southern boundary becomes more extensive and deeper, but does not encroach any further onto the site. Velocities along here

	could reach 0.5m/s and the hazard rating is predicted to increase to 'Danger for most'.
Reservoir	The Environment Agency reservoir flood maps show both the 'dry-day' and the 'wet-day' extents for Seeswood Pool encroaching onto the site across the southern boundary, as they extend along Griff Brook. In the 'wet-day' event, the flood outline extends further onto the site, especially in the southeast corner. The risk designation is high risk meaning that in the very unlikely event the reservoir fails, it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • The entire site is deemed to have a negligible risk from groundwater due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area with 0 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council also provided historic flooding data and this has a record of road flooding due to surface water at Griff Roundabout on the A444, approximately 400m south of the site off Coventry Road.
Flood risk management infrastructure	
Defences	The site is not protected by any formal flood defences.
Residual risk	The Griff Brook is culverted adjacent to the site's southern boundary which then flows in an easterly direction towards Wem Brook which is situated approximately 1km east of the site. According to the Griff Brook portion of the WCC Nuneaton hydraulic model 1% AEP defended scenario, the fluvial flood extent only enters a small area of the site along the southern boundary. The undefended 1% AEP scenario has been derived from the EA's Flood Map for Planning Flood Zone 3. This extent covers a similar sized area to that of the defended scenario. However, the undefended scenario flow path extends much further from an unnamed watercourse which flows into Bermuda Lake, approximately 515m west of the site, to the Wem Brook. It is believed the difference in extent between the defended and undefended scenarios is due to the defended event culverting the watercourse immediately south of the site and therefore reducing the impact on fluvial flood risk to the site.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning Area. The southern edge of the site is in the River Anker and River Sence (033WAF307) Environment Agency Flood Alert Area.
Access and egress	The site is currently not accessible by vehicles. Due to the railway line running adjacent to the western boundary, a footpath along the southern boundary, and a residential area to the north of the site, potential ways to access the site are limited. One possibility would be off Coventry Road on the eastern

	boundary, towards the south end of the site before the residential area of Hill Top begins. This section of road remains unaffected during the 3.3% and 1% AEP modelled fluvial flood events. During the 0.1% AEP event, there is a flow path which crosses Coventry Road (B4113) south-east of the site which may impede access to the site via Coventry Road. Maximum flood depths here reach 0.88m with maximum velocities of 2.41m/s and a maximum hazard rating of 'danger for all'. In terms of surface water flood risk, during the 3.3% AEP event, shallow ponding is predicted along Coventry Road here to depths below 0.3m with a 'Very low hazard' rating. During the 1% AEP event, the ponding extends into a longer and more continuous flow path along Coventry Road, although depths remain below 0.3m and the hazard rating is still 'Very low hazard'. The extent of this flow path is predicted to increase slightly during the 0.1% AEP event, encroaching on the eastern boundary. The hazard rating increases to 'Danger for some' but this is unlikely to impede access and egress for emergency vehicles. For the 1% AEP plus 40% climate change event, the extent is slightly smaller than the 0.1% AEP event, but the depth, velocity and hazard are similar. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. During the 1% AEP +22% CC fluvial event and the 1% AEP +40% CC surface water event, there is a flow path which flows across Coventry Road along the Griff Brook. There are also small areas of ponding within the south-east and north-east of the site as well as a small flow path along Coventry Road which flows parallel to the eastern boundary of the site, however this does not converge with any other significant flow paths. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The Griff Brook portion of the WCC Nuneaton model provided fluvial modelling data for the 1% AEP +22% and +30% climate change scenarios as well as the 3.3% AEP +22% and +30% climate change scenarios. Flooding during these scenarios is only predicted to enter the south of the site and remain along the southern site boundary. **Surface Water** • The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event, the extent of surface water flooding on the site is predicted to be only slightly larger than the present day 1% AEP extent, with similar depths, velocities and hazard ratings, which suggests the site is not very sensitive to climate change. This also applies to Coventry Road to the east, the likely access and egress road for the site. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – Outwoods Shale Formation (Mudstone) mainly for the eastern part of the site, Midlands Minor Intrusive Suite (igneous rock) mainly for the west part of the site.
	  ○ Superficial - for the majority of the site, there is no information available on the superficial geology. A very small area in the southeast corner of the site has Alluvium (clay, silt, sand and gravel) superficial deposits.
	  ○
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
	SuDS
	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone and igneous rock and is likely to have highly variable permeability. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site has an area within its boundary designated by the Environment Agency as being a historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA, to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.

	• Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies this form of non-residential development as 'Less Vulnerable'. Although a small proportion of the site is located within Flood Zones 2 and 3 the majority of the site is at low risk of flooding, and the proposed land use is classified as 'less vulnerable' therefore the Exception Test is not required for this site.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	
	• At the planning application stage, a site-specific FRA will be required as the proposed development site:
	  ○ is greater than 1 hectare
	  ○ is within Flood Zone 2, 3a and 3b.
	  ○ at risk of surface water flooding in the 0.1% AEP event.
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place where required to ensure users of the site are not at risk from flooding.
	
	Guidance for site design and making development safe:
	
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.
	• Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

	• Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- The area of the site located in the 3.3% AEP event extent is left undeveloped.
- Development is steered away from the southern edge of the of the site which lies within Flood Zone 2 and 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the isolated areas identified to be at risk of surface water flooding in north and southeast parts of the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- Any flood mitigation measures implemented are tested to ensure they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the 2023 WCC Nuneaton hydraulic model and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	For the purposes of this study, the 3.3%, 1% and 0.1% AEP events for the Griff Brook portion of the WCC Nuneaton 2023 hydraulic model have been uplifted with the latest climate change allowances (+22%, +30% and +51%) to indicate the impacts of climate change on fluvial flood risk. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP event and 40% for 1% AEP event. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the Griff Brook portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data was taken from the Griff Brook portion of the WCC Nuneaton model (2023).
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

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Site details

Site Code	**SEA-5**
Address	Longford Road, Exhall
Area	2.06ha
Current land use	Greenfield
Proposed land use	Employment

Sources of flood risk

Location of the site within the catchment	The site is located within Exhall, in the north of the 'Sowe confluence with Breach Brook to confluence with Withy Brook' catchment. This catchment has an area of 27km² and is 'not designated artificial or heavily modified'. The site is located in the upper catchment of the River Sowe and within the Avon Warwickshire Management Catchment. Longford Road (B4113) borders the entire eastern boundary of the site, while Wilsons Lane follows the majority of the north-western boundary. The southern part of the north-western boundary and the southern boundary of the site are bordered by forested land.
Topography	The site generally slopes downhill from north-west to east. LiDAR shows a maximum height of approximately 102.4m AOD at the northern corner of the site and a minimum height of approximately 97.8m AOD at the east of the site (due to the pond). Excluding the pond, land at the east of the site has a minimum height of approximately 98.2m AOD.
Existing drainage features	Coventry Canal is located approximately 500m south of the site. The River Sowe is located approximately 750m north-west of the site. Within the east of the site there is a pond measuring approximately 40m in diameter. The topography of the site slightly slopes down towards this pond, indicating water on site is likely to drain into it.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning Results:** **FZ3 -**0% **FZ2** –0% **FZ1** –100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled results:** **3.3% AEP** – 0% **1% AEP** – 0% **0.1%** – 0% *Modelled results show the percentage of site at risk from a given AEP flood event.*

	Available data: The 2010 River Sowe detailed hydraulic model has been used within this assessment. JBA Consulting re-ran this model in April 2023 with updated climate change allowances. **Flood characteristics:** This site is located within Flood Zone 1 and outside of any modelled flood extents. The nearest modelled flood extent is 800m south-west of the site.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 2.5% Max depth – 0.3-0.6m Max velocity – 0.25-0.5m/s **1% AEP** – 5.6% Max depth – 0.3-0.6m Max velocity – 0.5-1.0m/s **0.1% AEP** – 18.1% Max depth – 0.6-0.9m Max velocity – 1.0-2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFfSW) map has been used within this assessment. **Description of surface water flow paths:** The site is generally at low risk of surface water flooding in the 3.3% and 1% AEP events, but low to moderate risk in the 0.1% AEP event. During the 3.3% AEP event, there is very small area of ponding, with depths of up to 0.3m at the southern border of the site (excluding the pond within the east of the site). The extent of these areas increases during the 1% AEP event, there are also some additional areas of flooding, and a flow path (maximum depth of 0.3m, excluding the pond) starts to develop in the south-east corner. The velocity of this flow path is predicted to be between 0.25 and 0.50m/s, equating to a hazard rating of 'Very low hazard'. During the 0.1% AEP event, the areas of ponding at the relatively lower-lying south of the site increase again and there are some additional areas of flooding. Depths largely remain below 0.3m (excluding the pond). The flow path in the south-east corner becomes more continuous and extends across the corner of the site. It is joined by a flow of surface water from Longford Road and travels in a western direction across the southern border of the site. The velocity of the flow path increases to 1.00-2.00m/s and the hazard rating increases to 'Danger for some' in some areas. However, the majority of the north and west of the site remains unaffected by surface water flooding.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • The majority of the site is deemed to have a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Groundwater levels in the north-western quarter of the site are between 0.50m and 5.00m below the ground surface. This means there is a risk

	of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area with 3 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. The historic flooding records held by Nuneaton and Bedworth Borough Council do not indicate any flooding incidents within 500m of the site. There are four recorded flooding incidents within 1km of the site. These incidents are listed below: • 2012: Residential external flooding from an unknown source • 2012: Residential internal flooding from the River Sowe • 2012: Residential external flooding from surface water runoff • 2019: Highway flooding from surface water runoff
Flood risk management infrastructure	
Defences	The site is not protected by any formal flood defences.
Residual risk	Coventry Canal is located approximately 500m south of the site. This could pose a residual risk to the site in the event of a breach, which could cause a large volume of water to encroach on the site. However, this is unlikely to occur due to the location of the site at a topographic high.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.
Access and egress	The site can currently be accessed through an opening on Wilsons Lane, from the north. Wilsons Lane can be accessed from the north or south via Longford Road or from the east via Blackhorse Road. In all modelled fluvial events, Wilsons Lane is unaffected by flooding in the vicinity of the site. A surface water flow path passes over Longford Road (which provides access to Wilsons Lane) in the 1% and 1% AEP +40% climate change events. Depths on the road are predicted to be up to 0.30m for the 1% event, increasing to a maximum of up 0.60m during the 1% AEP +40% climate change event. The velocity of surface water flooding on Longford Road during the 1% AEP event could reach a maximum of 1.0-2.0m/s, with the amount of flooding with this velocity during the 1% AEP +40% event increasing. During the 1% AEP event, the hazard rating could reach 'Danger for some' for part of the road, south of the site, and for the 1% AEP +40% climate change event, more than 100m of Longford Road could have a hazard rating of 'Danger for most'. This may pose a hazard to the public when leaving the site, heading south on Longford Road, but emergency services vehicles should still be able to pass through this flooding. During the 3.3%, 1% and 0.1% AEP surface water events, there is flooding to the south-east corner, and southern border of the site. During the 1% AEP +40% event, maximum depths of flooding are predicted to be up to 0.3m (excluding the pond), with a maximum velocity of 1.0m/s equating to

	maximum hazard rating of 'Danger for some' (i.e. children), so are unlikely to affect access and egress for emergency vehicles. Safe access and egress will need to be demonstrated in the 1% AEP +40% climate change fluvial/surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** The River Sowe hydraulic model was re-run for the defended 1% AEP (+22%, +30% and +51%) and 0.1% AEP (+22%, +30% and +51%) climate change scenarios as part of this assessment. Flooding during these scenarios is not predicted to enter the site. **Surface Water** • The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP +40% climate change event, the extent of surface water flooding on the site is predicted to be larger than the present day 1% AEP extent, with a flow path across the south-east corner and along the southern border of the site forming. The maximum velocity of this flow path 1.0m/s. This flow path is smaller than the one that is predicted during the 0.1% AEP present day event. • Within the site, the flood depths predicted during the 1% AEP +40% climate change event, are similar to the depths predicted during the 1% AEP event (max depth of 0.3m, excluding the pond), which suggests the site is not especially sensitive to climate change. The depth of flooding to Wilsons Lane and Longford Road, which provide access to the site, is expected to increase (max depth of 0.6m). This is discussed in further detail in the access and egress section. • The hazard rating of the surface water flooding during the 1% AEP +40% climate change event is predicted to be 'very low hazard' across the majority of the site with a couple of isolated areas of flooding with a hazard rating of 'danger for some' within the flow path at the south-eastern corner of the site. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock – Whitacre Member- Mudstone and Sandstone
	  ○ Superficial:
	  ▪ Glaciofluvial Deposits, Mid Pleistocene- Sand and Gravel at the north-western corner of the site
	  ▪ Thrussington Member- Diamicton at the remainder of the site
	• Soils at the site consist of:

	○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (impeded drainage) **SuDS** • For the north-western corner of the site, groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. • The remainder of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • BGS data indicates that the underlying geology is mudstone and sandstone which is likely to have highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site. • The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is not located within a historic landfill site. • Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	

Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies most employment site development (excluding hospitals, drinking establishments, nightclubs, hotels/residential institutions, health services, nurseries, educational establishments, landfill and sites used for waste management facilities for hazardous waste) as 'Less Vulnerable'. Although a small proportion of the site is located within an area with low-moderate surface water flooding in the 1% AEP +40% climate change event, the proposed land use is classified as 'less vulnerable' therefore the Exception Test is not required for this site.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	
	• At the planning application stage, a site-specific FRA will be required as:
	  ○ the proposed development site has an area of 1 hectare or more.
	  ○ the site is shown to be at significant risk of surface water flooding during the 1%, 1% +40% climate change and 0.1% AEP events.
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Borough Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local Guidance for developers.
	• The development should be designed with mitigation measures in place where required.
	
	Guidance for site design and making development safe:
	
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.
	• Arrangements for safe access and egress will need to be provided for the 1% AEP rainfall/surface water events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so the development and occupants are safe.
	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
	• Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages	
The development is likely to be able to proceed if:	

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the south-eastern corner and southern border of the site where there is significant risk of flooding from surface water.
- Safe access and egress can be demonstrated in the 1% AEP +40% climate change surface water event.
- Any flood mitigation measures implemented are tested to ensure they will not displace water elsewhere (for example, if land is raised to permit development in one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Sowe hydraulic model (2010), the Environment Agency's Flood Map for Planning (FMfP) and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent EA guidelines state the Central, Higher and Upper peak river flow allowances for the 2080s epoch, within the Tame, Anker and Mease Management Catchment, are 22%, 30% and 51%. These allowances have been applied to the model and used within this assessment. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the River Sowe detailed hydraulic model (2010). Depth, velocity, and hazard data was derived from the River Sowe (2010) hydraulic model. Defended outputs were used for this site assessment.
Surface water	The RoFfSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFfSW. Extent, depth, velocity and hazard data for the 1% AEP and 3.3% AEP plus climate change surface water events have been derived from the RoFfSW mapping also.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA1**
Address	Land south of Watling Street (A5) and west of Higham Lane.
Area	94.2ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment north of central Nuneaton. The north of the site borders a field adjacent to Watling Steet (A5) whilst the eastern boundary lies adjacent to Higham Lane. The south borders a park (Coronation Walk) and the western site boundary is adjacent to the ends of several residential cul-de-sacs.
Topography	The site generally slopes from north to south with the maximum elevation in the north of the site being 99.30m AOD and the lowest elevation being 80.03m AOD in the south of the site. There are also some low spots in the north-western corner of the site and agricultural infrastructure (Top Farm) roughly in the centre of the site which LIDAR represents as elevated land in contrast to the surrounding area. The lines of lower elevation within the site follow hedgerow boundaries between fields.
Existing drainage features	The nearest main river to the site is the River Anker, located approximately 475m south-west of the site. The Coventry Canal is located approximately 1.4km south-west of the site. Within the site itself there are several drainage features: • Change Brook flows into the River Anker approximately 675m south-west of the site and forms a network of flow paths running along the south-western site boundary, across the centre of the site along hedgerows, flowing west of Top Farm to the northern site boundary. It then branches off here to Watling Street (A5) and west of the site across country to the River Anker. • The flow path along branches off from the south-west of the site to a single section along the eastern boundary at Higham Lane. • There is also a pond situated in the centre of the site, to the south-west of Top Farm. This may be able to act as a drainage feature.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 2.3% **FZ2 –** 2.9% **FZ1 –** 97.1% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).*

	Modelled results: **3.3% –** 1.46**%** **1% –** 1.77**%** **0.1% –** 2.81**%** *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The 2023 site-specific SHA1 detailed hydraulic model of the Change Brook and an unnamed tributary of the River Anker has been used within this assessment. **Flood characteristics:** According to the site-specific SHA1 hydraulic model, a flow path forms within the south of the site, corresponding with low lying land derived from LIDAR, which flows along the site's boundary, flowing along the Change Brook and eventually into the River Anker approximately 660m south-west of the site. There is also a smaller flow path which flows along the site's north-western boundary before flowing into the River Anker further downstream, approximately 1.5km west of the site. For both these flow paths, this is the case during the modelled 3.3%, 1% and 0.1% AEP fluvial flood events. In the 3.3% AEP event, flood depths vary from 0.02 – 0.2m, flood velocities vary from 0.01 to 0.2m/s, resulting in flood hazards of 'Very Low'. In the 1% AEP event, flood depths vary from 0.04 – 0.4m, flood velocities vary up to 0.4m/s, with flood hazards of 'Very Low'. In the 0.1% AEP event, flood depths vary from 0.06 – 0.3m along both flow paths. Flood velocities vary from 0.2 to 0.5m/s, resulting in flood hazards of 'Very Low' to 'Danger for Some'.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 1.8% Max depth – >1.2m Max velocity – 1.0 - 2.0m/s **1% AEP** – 4.1% Max depth – >1.2m Max velocity – >2.0m/s **0.1% AEP** – 10.0% Max depth – >1.2m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** Risk of Flooding from Surface Water data for this site shows that 1.8% of the site is located within the 3.3% AEP surface water extent. Several flow paths are present in this event, flowing from Change Brook in the south-western corner of the site towards the centre, approximately 200m south of Top Farm. There is also a flow path running into the north-west of the site from an unnamed tributary of the River Anker. Some of minor areas of surface water ponding exist within the site. 4.1% of the site is within the 1% AEP surface water extent. These extents cover similar areas to the 3.3% AEP extent but the flow paths extend further and are more connected within the site. 10.0% of the site is within the 0.1% AEP surface water extent. This extent follows the same flow paths as the two previously mentioned but creates much wider flow paths which extend further still within the site. There are also more areas of ponding within the site.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps. The nearest wet day extent is located

	approximately 155m south-west of the site. The reservoir posing this risk is the Seeswood Pool and has been classified as high-risk. This means that in the very unlikely event the reservoir fails it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comments can be made about groundwater flood risk on the site: • The majority of the site is deemed to have a negligible risk from groundwater flooding due to the nature of the local geological deposits. • There is a large area in the north-west of the site that has groundwater levels of between 0.025m and 0.5m below the ground surface. • There is also a small area in the north-west corner of the site that has groundwater levels either at or very near (within 0.025m of) the ground surface. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 38 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place within the car park adjacent to Cleaver Park, south-west of Weddington Road (A444). This occurred on 01/12/1992 as a result of the River Anker overtopping its banks. This is approximately 480m south-west of the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is protected along the southern boundary by high ground to defend against fluvial flooding caused by Change Brook. This defence runs along the entire length of the site's southern boundary and was last inspected on 15/01/2021 according to this dataset. There is also another area of high ground which runs approximately 10m along the entirety of the outside of the site's southern boundary. This also defends against fluvial risk from Change Brook and was last inspected on 15/01/2021 according to this dataset.
Residual risk	The River Anker is located approximately 475m south-west of the site which has several tributaries flowing into it. One such tributary is Change Brook which flows along the southern boundary of the site and also forks into the site forming a network of flow paths flowing through central, northern and eastern areas within the site. There is also a tributary of the River Anker which flows along the north-western boundary of the site. These could pose a residual risk to the site in the event of a breach, which could cause a large volume of water to encroach on the site.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning Area. The nearest Flood Warning Area (033FWF3ANKR003) is located approximately 450m south-west of the site. There is a Flood Alert Area within the south of the site (033WAF307), signifying risk from the Rivers Anker and Sence. This is due to low-lying land and roads between Nuneaton and Tamworth on the River Anker and between Temple Mill and Ratcliffe Culey on the River Sence.

Access and egress	The only viable safe access and egress route is via Higham Lane to the east of the site. The residential cul-de-sacs directly to the west of the site are all accessed via Weddington Road, however this main road has several flow paths flowing across it during the 3.3%, 1% and 0.1% AEP surface water flood events, therefore making it unsuitable to recommend for safe access and egress to and from the site. According to the 2023 site-specific SHA1 hydraulic model, during the 1% AEP plus 22% climate change fluvial flood event the majority of the site is unaffected by flooding with the exception of flow paths which run along the site's southern and north-western boundaries. There are no flood extents during this event on or surrounding the access road on Higham Road which leads to Top Farm. This access route is situated approximately 520m south of Watling Street (A5). During the 3.3% and 1% AEP surface water flood events, there is minimal ponding surrounding this access route on Higham Lane. During the 0.1% AEP surface water flood event, this ponding increases in extent, forming a flow path between the entrances to Peake Avenue and Milby Drive on Higham Lane. During the 3.3% and 1% AEP surface water flood events, flood depths between the entrances to Peake Avenue and Milby Drive on Higham Lane do not exceed 0.15 – 0.30m with a maximum velocity of 0.25 – 0.50m/s and a maximum hazard rating of 'danger for some', meaning access and egress for emergency vehicles may be affected. During the 0.1% AEP surface water flood event, flood depths between Peake Avenue and Milby Drive on Higham Lane do not exceed 0.30 – 0.60m with a maximum velocity of 1.00 – 2.00m/s and a maximum hazard rating of 'danger for most', meaning access and egress for emergency vehicles is likely to be affected. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water flood events. During the 1% AEP +40% CC surface water event there are flow paths along the site's southern and north-western boundaries which both extend into the site towards Top Farm. There is also some surface water ponding during this event along Higham Lane to the east of the site. Maximum flood depths between the entrances to Peake Avenue and Milby Drive on Higham Lane reach approximately 0.3m with maximum velocities of 1.6m/s and a maximum hazard rating of 'danger for some'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • Detailed site-specific fluvial modelling of the Change Brook and the unnamed tributary of the River Anker is available for the following scenarios: 3.3% AEP +22% and +30% climate change allowances and 1% AEP +22% and +30% climate change allowances. Flooding during these scenarios is only expected to encroach along the site's southern and north-western boundaries, flood depths increase slightly in the climate change events. These fluvial flood events do not extend further into the site. Therefore, the site is slightly sensitive to fluvial flooding. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.

	• In the 1% AEP plus 40% climate change event there are several networks of flow paths which are predominantly in the south-west and north-west of the site. There is a flow path that extends across the entirety of the southern boundary. Maximum depths reach 0.7m. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock – The majority of the site is Mercia Mudstone Group (mudstone). There is a strip of land north of Top Farm within the site that is Gunthorpe Member (siltstone and dolomitic). This bedrock geology extends across the entire width of the site.
	  ○ Superficial – For the majority of the site there is no data available. The southern and north-western boundaries of the site consist of alluvium (clay, silt and gravel). There is a large area in the north-west of the site which consists of Anker Sand and Gravel (sand and gravel).
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	
	SuDS
	
	• The majority of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• There is a large area in the north-west of the site where the groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
	• There is also a small area in the north-west corner of the site where groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site
	• BGS data indicates that the underlying geology is mainly mudstone with siltstone and dolomitic situated north of Top Farm. These are likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within an historic landfill site.

	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable', and therefore the Exception Test is required for this site as part of it is within Flood Zone 3 as well as being at risk of surface water flooding in the 1% AEP plus 40% climate change event. 'More Vulnerable' development is not permitted in the 3.3% AEP event extent.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site is shown to be at surface water flood risk in the 3.3% AEP, 1% AEP and 0.1% AEP events. • All sources of flooding should be considered as part of a site-specific flood risk assessment. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.

- Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
- The development should be designed with mitigation measures in place to ensure the development does not flood.

Guidance for site design and making development safe:

- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Designs and access arrangements will need to incorporate measures, so development and occupants are safe.
- Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The development is likely to be able to proceed if:

- The area of the site located in the 3.3% AEP event extent is left undeveloped.
- 'More Vulnerable' development proposed within Flood Zone 3/modelled 1% AEP event extent will require the Exception Test to be passed.
- It is recommended that development is steered away from the parts of the site which lie within Flood Zone 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the site-specific 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.	
Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	For the purposes of this study, the 2023 site-specific SHA1 model's 3.3%, 1% and 0.1% AEP defended scenarios were uplifted with the latest climate change allowances (+22%, +30% and +51%) to indicate the impacts of climate change on fluvial flood risk. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the site-specific detailed hydraulic model of the Change Brook and the unnamed tributary of the River Anker produced in 2023 for site SHA1. Depth, velocity, and hazard data was derived from the 2023 site-specific hydraulic model for SHA1.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be low, medium and high risk) have been taken from Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SEA-2**
Address	South of the M6 at Exhall Interchange
Area	18.3ha
Current land use	Greenfield with some hardstanding and commercial buildings in the northeast.
Proposed land use	Employment and Residential

Sources of flood risk

Location of the site within the catchment	The site is situated to the south of the M6 at Exhall Interchange, bordered by Pickard's Way to the north, the A444 to the west, Wilson's Lane to the east and Amphion Business Park to the south. The site is located within the catchment of the River Sowe, between its confluences with Breach Brook and Withy Brook. This catchment is 2649ha and is predominantly urban. The site is located in the upper catchment on the floodplain of the River Sowe. The River Sowe flows in a southerly direction to the west of the site, approximately 165m from the site boundary, passes under the A444 then flows along the south-west boundary of the site before continuing in a south-easterly direction away from the site.
Topography	LiDAR shows the site slopes downhill from north-east to south-west towards the River Sowe, which flows along the south-west boundary of the site. The highest elevations on the site are approximately 101.9mAOD in the north-east of the site and decrease to approximately 88.3mAOD in the south-west of the site.
Existing drainage features	The River Sowe flows along the south-west boundary of the site, in a southerly direction. At this point the River Sowe is heavily urbanised and artificially reinforced as it flows out of Bedworth and towards Coventry. Upstream of the site the River Sowe is joined by Breach Brook, which flows in an easterly direction approximately 175m west of the site. The Coventry Canal lies approximately 500m east of the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 7.1% **FZ2 –** 7.6% **FZ1 –** 92.4% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled results:** **3.3% AEP** – 5.3% **1% AEP** – 5.6% **0.1%** – 6.3%

	Modelled results show the percentage of site at risk from a given AEP flood event. **Available data:** The Environment Agency's 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe was used in this assessment. **Flood characteristics:** Fluvial flood risk across most of the site is low. The River Sowe flows in a southerly direction along the south-west boundary of the site from where it passes beneath the A444 and enters the site. The 3.3%, 1% and 0.1% AEP events all show similar flood extents, with flood risk in the south-west corner of the site, adjacent to the River Sowe. The extents are confined as the channel passes under the A444, and then they spread to fill the area of lower floodplain topography but remaining confined to the south-west corner of the site as the topography slopes steeply uphill away from this area. There is no change in flood extents between the defended and undefended scenarios as the site is not affected by any formal flood defences. During the 3.3% AEP event, depths across the floodplain in the southwest corner of the site reach approximately 0.73m with maximum velocity of approximately 0.82m/s and a maximum hazard rating of 'Danger for most'. During the 1% AEP event, depths across the floodplain in the southwest corner of the site reach approximately 0.82m with maximum velocity of approximately 1.08m/s and a maximum hazard rating of 'Danger for most'. During the 0.1% AEP event, depths across the floodplain in the southwest corner of the site reach approximately 0.96m with maximum velocity of approximately 1.33m/s and a maximum hazard rating of 'Danger for all'.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 4.5% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **1% AEP** – 6.2% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 12.4% Max depth – >1.2m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** Across the whole site, surface water flood risk is mostly very low. The main surface water flow path follows the River Sowe floodplain, flowing in a southerly direction through the south-west corner of the site and remains confined to the southwest of the site due to the area of lower topography. During the 3.3% AEP and 1% AEP events, the surface water flood risk follows the path of the River Sowe along the southwest boundary of the site, and the flood extents are shown to be smaller to that of the 1% AEP modelled fluvial

	flood extent. There are also a couple of isolated areas of surface water ponding in the 1% AEP event along a field boundary and along small section of the south of the site. During the 0.1% AEP event, the main surface water flood risk again follows the path of the River Sowe floodplain, but extends wider to the east and north than the 0.1% AEP fluvial flood extent, filling the full area of lower topography in this corner of the site. The areas of surface water ponding along the field boundaries in the south of the site also develop into flow paths which flow in a westerly direction to join the River Sowe. Depths along these smaller flow paths are shown not to exceed 0.6m with velocities of up to 2.0m/s and a maximum hazard classification of 'Danger for most' although most of the flow paths are shown to be 'Very low hazard'. Along the River Sowe floodplain, surface water depths on the site are shown to exceed 1.2m, with velocities of greater than 2.0m/s in places and a maximum hazard classification of 'Danger for all' in some areas. There is also a small area of surface water risk which develops on the north-east boundary of the site during the 1% AEP event and increases in size for the 0.1% AEP event. This corresponds to an area of low elevation along a field boundary. Site investigations should confirm whether there is a ditch along this field boundary or whether the area of low elevation is a result of the filtering process to remove the trees from the LiDAR.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The emergence across the site is banded with sections classified as: • No risk – this zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Groundwater levels are either at or within 0.025m of the ground surface – within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. There are two bands through the centre of the site where groundwater levels are within this zone. • Groundwater levels are between 0.025m and 0.5m below the ground surface - within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. There is a band through the centre of the site and a large area in the northeast of the site where groundwater levels are within this zone. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area (CV6 6) with one recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022). However, it should be noted that the sewer data provided is only for the borough of Nuneaton and Bedworth and the CV6 6 postcode also covers a large area outside the borough, including the areas of Hawkesbury, Longford, and Foleshill so it is likely that there have been more sewer flooding incidents recorded within the postcode area.
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site.

	Warwickshire County Council also provided historic flooding data which has a record of road flooding due to surface water at Exhall Interchange to the north of the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows there is natural high ground along both sides of the River Sowe where it runs along the south-west boundary of the site; however, there are no formal defences benefiting the site.
Residual risk	The River Sowe is culverted beneath Silverstone Drive approximately 300m downstream of the site. This could pose a residual risk to the site in the event of a blockage, which could cause water to back up and encroach on the site, particular given the constriction of the channel at the A444 structure at the site boundary upstream. However, any impacts would still be confined to this south-western corner given the well-defined topography in this area and the rest of the site raised outside of the floodplain.
Emergency planning	
Flood warning	The southwest of the site is located in the '033WAF202' Environment Agency Flood Alert Area. The site is not located in an Environment Agency Flood Warning Area.
Access and egress	There is currently vehicular access to the site along a track from Wilsons Lane in the north-east of the site and along a track from Old Farm Lane, off Wilsons Lane, in the east of the site. There are three ways to access Wilsons Lane: straight along Wilsons Lane from the east, along Woodshires Road from the south-east and along Rowleys Green Lane from the south. The existing access to the site from the two tracks in the east remains unaffected during all modelled fluvial events. Although the track and Wilsons Lane remain unaffected in all modelled surface water events, the access onto Wilsons Lane is affected in all directions during all the modelled surface water events. During the 3.3% AEP event depths along Wilsons Lane and Woodshires Road reach a maximum of 0.90m with depths of up to 0.60m along Rowleys Green Lane. Velocities reach a maximum of 0.50m/s along Wilsons Lane, 1.00m/s along Woodshires Road, and 2.00m/s along Rowleys Green Lane with a maximum hazard rating of '1.25-2.00' along Wilsons Lane and Woodshires Road and '0.75-1.25' along Rowleys Green Lane. During the 1% AEP event, depths along Wilsons Lane and Rowleys Green Lane reach a maximum of 0.90m with depths of up to 1.20m along Woodshires Road. During the 0.1% AEP event, depths reach a maximum of 1.20m along Wilsons Road, whilst exceeding 1.20m along Woodshires Road and Rowleys Green Lane. These flood depths are likely to affect access to the site for emergency vehicles during a flood event. During the 1% AEP plus 40% climate change surface water event, depths along Wilsons Lane are shown to reach approximately 0.9m, with depths of up to approximately 1.2m along Woodshires Lane and 1.25m along Rowleys Green Lane. It may be possible to provide alternative access to the site than the existing tracks, such as from along Pickards Way (B4113) to the north of the site. However, this road is still affected by surface water flooding with depths of up to approximately 0.6m during the 1% AEP plus 40% climate change surface water event. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals

	should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The latest climate change allowances have been applied to the River Sowe hydraulic model. • Between the 3.3% AEP, the 3.3% AEP plus 21% climate change (central allowance), and the 3.3% AEP plus 32% climate change (higher central allowance) events there are slight increases in extent; however, the extents remain confined to the southwest corner of the site. Maximum depths across the floodplain on the site increase from approximately 0.73m in the 3.3% AEP event up to 0.81m in the 3.3% AEP plus 32% climate change event, with an increase in velocity from 0.82m/s to 1.02m/s. The maximum hazard classification remains as 'Danger for most'. • Between the 1% AEP, the 1% AEP plus 21% climate change (central allowance), and the 1% AEP plus 32% climate change (higher central allowance) events there are slight increases in extent; however, the extents continue to remain confined to the southwest corner of the site. Maximum depths across the floodplain on the site increase from approximately 0.82m in the 1% AEP event up to 0.91m in the 1% AEP plus 32% climate change event, with an increase in velocity from 1.08m/s to 1.23m/s, and an increase in maximum hazard classification from 'Danger for most' to 'Danger for all'. • Therefore, the southwest corner of the site is shown to be sensitive to increases in fluvial flood risk due to climate change. **Surface Water** • The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • Between the 3.3% AEP and 3.3% AEP plus 35% climate change events the flow path channelled along the River Sowe increases in extent but still remains confined to the western edge of the site. There is also a small, isolated area of surface water ponding which appears along the north-east border of the site. • Between the 1% AEP and 1% AEP plus 40% climate change events the flow path along the River Sowe increases in extent but still remains confined to the western edge of the site. The flow paths along the field boundaries in the south-west of the site also increase in extent and there is a small, isolated area of surface water ponding which appears in the centre of the site. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – a combination of Whitacre Member Sandstone and Whitacre Member Mudstone and Sandstone across the site.
	  ○ Superficial – along the path of the River Sowe in the southwest of the site the superficial deposits are Alluvium (clay, silt, sand, and gravel). No information is available across the rest of the site.
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	SuDS
	• Groundwater levels across the site vary. In some areas groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate in these areas.
	• BGS data indicates that the underlying geology is a combination of sandstone and mudstone. Sandstone is likely to be free draining whilst mudstone is likely to be poorly draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within a historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during all modelled surface water events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of

	multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies employment development as 'Less Vulnerable' and residential development as 'More Vulnerable'. As there are two different flood risk vulnerability classifications for this site, the most vulnerable type is the one taken into consideration for the Exception Test. As some of the site is located within Flood Zones 2, 3a and 3b, and the site is classified as having 'More Vulnerable' development, the Exception Test is required.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development site is:
	  ○ Partially located within the fluvial Flood Zones 2, 3a and 3b.
	  ○ Greater than one hectare in area.
	  ○ At risk of surface water flooding in the 0.1% AEP event
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place where required to ensure users of the site are not at risk from flooding.
	
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.
	• Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.

	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- The area of the site located in the 3.3% AEP event extent is left undeveloped.
- 'More Vulnerable' development proposed within Flood Zone 3/1% modelled AEP event will require the Exception Test to be passed.
- Development is steered away from the south-western and western edges of the site which lie within the fluvial flood zones and are at high risk of surface water flooding.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding across the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event and in the 1% AEP plus 21% fluvial event.
- Any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Sowe hydraulic model (2011) and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent uplifts have been applied to the defended River Sowe hydraulic model to indicate the impacts on fluvial flood risk. The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe (2011). Depth, velocity, and hazard data was derived from the 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe (2011). Defended outputs were used for this site assessment, and undefended outputs are used to compare where appropriate.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SEA-6 and SEA-6-1**
Address	South of Goodyers End Lane, Bedworth SEA-6 is the main site whilst SEA-6-1 covers the northeast corner.
Area	SEA-6 - 19.9ha; SEA-6-1 – 6.4ha
Current land use	Greenfield with some existing farm buildings and hardstanding on SEA-6
Proposed land use	Employment and Residential

Sources of flood risk

Location of the site within the catchment	The sites are located in the southwest of Bedworth and are bordered by Goodyers End Lane to the north, Bowling Green Lane to the east, and the M6 to the south. SEA-6-1 and the east side of SEA-6 lie within the catchment of the River Sowe from its source to its confluence with Breach Brook. This catchment is 1698ha and rural in its upper reaches but becomes heavily urbanised as the River Sowe flows through Nuneaton and Bedworth, and the watercourse is designated as 'heavily modified'. The site lies in the downstream end of this catchment and is not located within the floodplain of the River Sowe, which flows in a southerly direction approximately 90m east of the site. The west side of the SEA-6 is in the Breach Brook catchment from its source to its confluence with the River Sowe. This catchment is 995ha and predominantly rural. The site lies in the downstream end of this catchment and is not located within the floodplain of Breach Brook, which flows in an easterly direction approximately 190m south of the site. The confluence of Breach Brook and the River Sowe is approximately 400m south of the sites.
Topography	**SEA-6** LiDAR shows the site is highest in the north-west corner with elevations up to 110.9mAOD. It is then shown to slope downhill in a south-easterly direction towards an existing field boundary, which runs through the site in a north-south direction. To the east of this field boundary, elevations are highest along the northern boundary of the site, and slope downhill slightly towards the field boundary, and then further downhill a south-easterly direction towards the River Sowe which runs to the east of the site. The lowest elevations are in the southeast corner of the site with elevations as low as approximately 93.9mAOD. **SEA-6-1** LiDAR shows the site slopes downhill from the northwest to the southeast. Elevations across the site range from approximately 107.1mAOD down to 94.8mAOD.
Existing drainage features	Online mapping shows no drainage features within either site. The River Sowe flows in a southerly direction approximately 90m east of the sites. Breach Brook flows in an easterly direction approximately 190m south of SEA-6 to its confluence with the River Sowe. The River Sowe is heavily urbanised and artificially reinforced as it flows through Bedworth, whilst Breach Brook is a smaller channel which has not been heavily modified.

	There is also a small drainage channel shown within the field north of Goodyers End Lane, approximately 250m northwest of the site.
Fluvial	**The proportion of site at risk (both SEA6-6 and SEA-6-1):** **Flood Map For Planning results:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled results:** **3.3%** – 0% **1%** – 0% **0.1%** – 0% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The Environment Agency's 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe and the Environment Agency's Flood Map for Planning have been used within this assessment. **Flood characteristics:** There is no fluvial flood risk shown to either site during the 3.3%, 1% or 0.1% AEP events. Flood risk along the River Sowe remains mostly confined to a narrow floodplain about 95m west of the site. The floodplain gets wider to the east of the site, north of School Lane, however, local topography shows the ground sloping uphill from the River Sowe towards the sites, and the flood extent remains at least 50m from the sites, even during the 0.1% AEP event. The Flood Map for Planning also shows fluvial risk along Breach Brook to the south of the site, however, even in the 0.1% AEP event the flood risk is shown to remain to the south of the M6, at least 150m from the sites.
Surface Water	**Proportion of SEA-6 at risk:** **3.3% AEP** – 2.0% Max depth – >1.2m Max velocity – 1.0 – 2.0m/s **1% AEP** – 3.0% Max depth – >1.2m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 6.3% Max depth – >1.2m Max velocity – >2.0m/s **Proportion of SEA-6-1 at risk:** **3.3% AEP** – 0% **1% AEP** – 0.2% Max depth – 0.15 - 0.30m Max velocity – 1.00 – 2.00m/s **0.1% AEP** – 4% Max depth – 0.15 – 0.30m Max velocity – 1.00 – 2.00m/s

	The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage). **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** **SEA-6** Surface water flood risk across most of the site is shown to be very low. However, during all modelled surface water flood events there is a surface water flow path in the western half of the site, which bisects the site in a north-south direction and then ponds along the southern boundary of the site to the north of the M6. This originates from high ground north of Goodyers End Lane, using the road network to flow south and into the area of lower topography through the site, connecting with Breach Brook south of the M6. Flood depths in this area of ponding along the southern site boundary exceed 1.2m in all events, with velocities of 1.0 – 2.0m/s in the 3.3% and 1% AEP events and velocities exceeding 2.0m/s in the 0.1% AEP event. During the 3.3% AEP event, the hazard classification along most of the flow path bisecting the site is 'Very low hazard' with small areas of 'Danger for most', and the area of ponding has a classification of 'Danger for most'. There are larger areas of the flow path classified as 'Danger for most' in the 1% AEP event and in the 0.1% AEP most of the flow path is classified as 'Danger for most' with a maximum hazard classification of 'Danger for all' in the area of ponding at the south of the site. There are also some smaller flow paths which form in the east of the site during the 1% and 0.1% AEP events, flowing in an easterly direction towards Bowling Green Lane. However, even in the 0.1% AEP event the hazard classification along these flow paths is predominantly 'Very low hazard' with depths not exceeding 0.6m and velocities mostly remaining below 2.0m/s. There are also a couple of localised areas of surface water ponding which form in the southwest of the site in all modelled flood events around the access track. **SEA-6-1** The surface water flood risk is shown to remain mostly very low across the site. There is no predicted flood risk to the site during the 3.3% AEP surface water event. During the 1% AEP event, there is a flow path along Bowling Green Lane to the east of the site which encroaches slightly onto the site in the southeast corner. Depths on the site are shown not to exceed 0.30m with velocities of up to 2.00m/s and a maximum hazard classification of 'Very low hazard'. During the 0.1% AEP event, a flow path forms along the east side of the path to join the flow path along Bowling Green Lane in the southeast of the site. There are a couple of areas of surface water flood risk through the centre of the site and further flow paths along the western boundary of the site and through the south end of the site. However, depths across the site are shown to remain below 0.30m, with velocities of up to 2.00m/s and a maximum hazard classification of 'Danger for some' but most of the risk remains at 'Very low hazard'.

Reservoir	The sites are not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The mapping shows banding across SEA-6. There are areas in the east and west of the site and parts of the centre of the site which are categorised as 'no risk'. There is a small area of the east of the site and parts of the centre of the site where groundwater levels are either at or very near (within 0.025m of) the ground surface, and large parts of the centre of the site where groundwater levels are between 0.025m and 0.5m below the ground surface. Most of SEA-6-1 is categorised as 'no risk' apart from an area in the centre to the south of the site where groundwater levels are either at or very near (within 0.025m of) the ground surface or between 0.025m and 0.5m below the ground surface. The following comments can be made about areas within the different groundwater categories: • Areas classified as 'no risk' are deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Where groundwater levels are at or very near the surface there is a risk of groundwater flooding to both surface and subsurface assets. • Where groundwater levels are between 0.025m and 0.5m below the ground surface there is a risk of groundwater flooding to both surface and subsurface assets. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The sites are located in a postcode area (CV12 0) with no recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the sites. Historic records provided by Nuneaton and Bedworth Borough Council do not have any records of flooding on the sites; however, there are three flooding incidents surrounding the sites to the east. These records are for internal and external residential flooding from both Main River and surface water runoff.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows natural high ground along both the River Sowe to the east of the sites and Breach Brook to the south of the sites; however, there are no formal defences benefiting the sites.
Residual risk	Online mapping shows a small drainage channel in the field north of Goodyers End Lane to the northwest of the site which is likely to enter a culvert and discharge into one of the main watercourses. This is where the surface water flow path which bisects the site is shown to originate. Therefore, should this culvert to the north become blocked it may form an overland flow route through the site. This should be investigated further within a site-specific FRA.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.

Access and egress	**SEA-6** Existing vehicular access to the site is along a small road from Goodyers End Lane in the northwest corner of the site. There is also a gate leading into the site in the southeast corner from Bowling Green Lane although recent online imagery shows this access appears heavily overgrown. The existing access from both sides of the site remains unaffected in all modelled fluvial events. The site is bisected by a surface water flow path in all modelled events therefore the access to the east side and west side of the site is assessed separately below. During the 3.3% AEP event access to the west of the site from Goodyers End Lane is likely to still be possible from Hospital Lane to the west of the access. Flood depths along Hospital Lane remain below 0.3m with velocities of up to 1.0m/s and a hazard classification of 'Very low hazard'. Access to the east of the site may be possible from School Lane, approaching from Church Lane and Vicarage Lane to the south. There is a flow path which is shown across Vicarage Lane where Breach Brook flows, with depths along the road up to 0.9m and velocities of up to 2.0m/s, however online imagery suggests this watercourse is culverted under the road which will not be represented in the RoFSW or in the 2D generalised modelling used in the Flood Map for Planning along this watercourse. During the 1% AEP event, the access to the west side of the site may be affected as velocities along Hospital Lane reach up to 2.0m/s. However, flood depths are shown to remain below 0.3m with a hazard classification of 'Very low hazard' so access for emergency vehicles during a flood is likely to still be possible. From the 1% AEP event, a flow path begins to develop along the access to the east of the site from Church Lane. In the 1% AEP event depths remain below 0.3m, with velocities of up to 2.0m/s and a maximum hazard of 'Very low hazard'. There is a further area of surface water flooding along Church Lane where it crosses under the M6; however, depths remain below 0.3m with velocities of up to 1.0m/s so access for emergency vehicles during a flood is likely to still be possible, depending on the flood depths and velocities along the road where Breach Brook passes beneath it. During the 0.1% AEP event, flood depths along Hospital Lane are up to 0.60m with velocities of up to 2.0m/s and a maximum hazard classification of 'Danger for most'. Depths along Church Lane to the east of the site are up to 0.60m with velocities exceeding 2.0m/s in places with a maximum hazard classification of up to 'Danger for most'. Therefore, access to both sides of the site are likely to be affected during the 0.1% AEP event. During the 1% AEP plus 40% climate change surface water event, depths along Hospital Lane reach approximately 0.3m with depths of up to 0.3m along Goodyers End Lane. Velocities across these roads are not shown to exceed 1.6m/s with a maximum hazard classification of 'Danger for some'. Depths along Church Lane and the access track to the east of the site are up to 0.3m with velocities of up to 1.8m/s and a maximum hazard classification of 'Danger for some'. Access to both sides of the site may therefore still be possible for emergency vehicles during a flood event. Safe access and egress will need to be demonstrated in the 1% AEP plus 40% climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment. Detailed modelling of Breach Brook, which flows to the south of the site, may be required to better assess potential depths and velocities along Vicarage Lane and Royal Oak Road if access to the site is required from this direction. **SEA-6-1**

	Online imagery shows the site can currently be accessed in the southeast from a gate off Bowling Green Lane. The existing access remains unaffected in all modelled fluvial events. Access to the gate from the south along Bowling Green Lane is affected during all surface water events, with depths of up to 0.6m in the 3.3% AEP event; however, access to the gate from the north along Bowling Green Lane is likely to be possible and is investigated further in all modelled surface water events below. During the 3.3% AEP access from the north remains unaffected. During the 1% AEP surface water event, a surface water flow path develops along Bowling Green Lane. To the north of the site access depths remain mostly below 0.15m, not exceeding 0.3m, with velocities of up to 2.0m/s and a maximum hazard classification of 'Very low hazard'. Access and egress, therefore, is unlikely to be affected for emergency vehicles. During the 0.1% AEP surface water event, depths along Bowling Green Lane reach up to 0.60m, but mostly remain below 0.30m. Velocities exceed 2.00m/s in places with a maximum hazard classification of 'Danger for most' although along most of the road the hazard remains at 'Very low hazard' or 'Danger for some'. Therefore, access and egress for emergency vehicles may still be possible. During the 1% AEP plus 40% climate change surface water event, depths along Bowling Green Lane are predicted to reach approximately 0.27m with a maximum hazard rating of 1.30 which falls into the bottom end of the 'Danger for most' category. Therefore, access and egress for emergency vehicles may still be possible. Safe access and egress will need to be demonstrated in the 1% AEP plus 40% climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The sites are not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • In the absence of detailed modelling for Breach Brook, Flood Map for Planning Flood Zone 2 can be used as an indicative 1% AEP plus climate change flood extent. The site is not shown to be at fluvial risk with climate change from Breach Brook. • The latest climate change allowances have been applied to the River Sowe hydraulic model for the 3.3% and 1% AEP events. The sites are not shown to be at fluvial flood risk now or in the future. **Surface Water** • The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk. • During the 1% AEP plus 40% climate change event, the small area of flood risk on SEA-6-1 in the 1% AEP event develops into a small flow path along the eastern side of the site; however, the rest of the site remains unaffected. In the 1% AEP plus 40% climate change event, there is also flood risk surrounding the site along Bowling Green Lane, which will affect access and egress to the site. • The 1% AEP and 1% AEP plus 40% climate change events show similar extents across SEA-6. The main flow path widens slightly and a couple of the smaller flow paths in the east of the site extend slightly further

	with the climate change uplifts. There are also a couple of small additional flow paths which appear in the east of the site with the climate change uplift. In the 1% AEP plus 40% climate change event, SEA-6 is bisected by a flow path and there is also flood risk surrounding the site along Goodyers End Lane, Hospital Lane and Bowling Green Lane, which will affect access and egress to the site. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock:
	  ▪ SEA-6: a combination of Whitacre Member (mudstone and sandstone) and Whitacre Member (sandstone) across most of the site with Keresley Member (argillaceous rocks and sandstone and conglomerate, interbedded) in the west of the site.
	  ▪ SEA-6-1: primarily Whitacre Member (mudstone and sandstone) with an area of Whitacre Member (sandstone) through the centre and south of the site.
	  ○ Superficial:
	  ▪ SEA-6: no information is available for superficial deposits across most of the site but in the west of the site the superficial deposits are Thrussington Member (Diamicton).
	  ▪ SEA-6-1: no information is available on superficial deposits across most of the site apart from a small area along the northwest boundary of the site where superficial deposits are Thrussington Member (diamicton).
	• Soils at both of the sites consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	
	SuDS
	• Groundwater levels are indicated to be less than 0.5m below ground level during a 1% AEP event across large areas of the sites. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are unlikely to be appropriate in these areas of the site.
	• BGS data indicates that the underlying geology is a combination of sandstone and mudstone so is likely to have highly variable permeability. This should be confirmed through infiltration testing.
	• The sites are not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The sites are not located within a historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

	• The RoFSW mapping indicates the presence of surface water flow paths during all modelled events on SEA-6 and during the 1% and 0.1% AEP events on SEA-6-1. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies employment development as 'Less Vulnerable' and residential development as 'More Vulnerable'. As there are two different flood risk vulnerability classifications for this site, the most vulnerable type is the one taken into consideration for the Exception Test. The majority of the sites are at low risk of flooding. However, it is highlighted that SEA-6 is bisected by a surface water flow path in all modelled surface water events and the most vulnerable classification for the sites is 'More Vulnerable'. Therefore the Exception Test is required for these sites.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development sites are:
	  ○ Greater than one hectare in area.
	  ○ At risk of surface water flooding in the 0.1% AEP event.
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and

	Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. • The development should be designed with mitigation measures in place where required. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

Development is likely to be able to proceed if:

- Development is steered away from the surface water flow path bisecting the west side of SEA-6 which is at high risk of surface water flooding.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding across the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event. As SEA-6 is bisected by a flow path in all modelled surface water events, safe access and egress must be demonstrated for both sides of the site if it would not be possible to cross between the two sides during a flood event.
- Any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Sowe hydraulic model (2011) and the Environment Agency's RoFSW map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning
Climate change	In the absence of detailed hydraulic modelling, Flood Zone 2 has been used as a proxy for climate change to assess the impact on fluvial flood risk for Breach Brook. The most recent uplifts have been applied to the defended River Sowe hydraulic model to indicate the impacts on fluvial flood risk.

	The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents been taken from the 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe (2011). Depth, velocity, and hazard data was derived from the 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Sowe (2011). Defended outputs were used for this site assessment, and undefended outputs are used to compare where appropriate. Depth, velocity, and hazard data for Breach Brook was not available for this assessment.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA2-1, SHA2-2 & ARB-1**
Address	SHA2-1: Land off Heath Road (B4112). ARB-1 & SHA2-2: Bermuda Road, Nuneaton.
Area	SHA2-1: 85ha SHA2-2: 0.8ha ARB-1: 0.8ha
Current land use	Most of the site is currently farmland (Greenfield) with an isolated farm property in the north-west of the site and some farm buildings in the east of the site and a commercial building in the east of the site (Brownfield). SHA2-2: Brownfield (car park). ARB-1: Brownfield (car park) with surrounding vegetation (greenfield).
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The sites are located within the Wem Brook from Source to River Anker catchment. There are two unnamed watercourses which flow to the south of the sites, one which flows along the south-west boundary of SHA2-1 for a short section. The confluence of these two watercourses is approximately 100m south of SHA2-1 where they form Griff Brook. Griff Brook then flows east, where it is joined by a further unnamed watercourse, into Nuneaton to its confluence with Wem Brook, approximately 2km east of the sites. From here, Wem Brook flows in a northerly direction through Nuneaton to join the River Anker to the north of Nuneaton.
Topography	Elevations across SAH2-1 vary between 124.0mAOD and 97.9mAOD. This site is highest in the west and slopes downhill towards both to the south, where the unnamed watercourse flows, and to the east. There is also a higher area within the south of the site which slopes downhill in all directions. LiDAR data indicates SHA2-2 is fairly level with a maximum elevation near the centre of 100.5m AOD. The elevation falls away slightly towards the roads which surround the site, with minimum elevations on site of approximately 98.8m AOD. ARB-1 generally slopes from north to south with a maximum elevation of 100.17m AOD in the north of the site and a minimum elevation of 96.58m AOD. However, the slope is not consistent, with the east of the site typically being flatter than the west. There is also an area of significantly lower elevation in the south-western corner of the site, reaching a minimum of 96.25m AOD. The extreme depression in the south-western corner of the site correlates with the location of vegetation situated within a ditch. The relatively flat eastern side of the site correlates with the entrance to the car park off Bermuda Road, as well as a pedestrianised footpath to a building 1.5m east of the site.
Existing drainage features	The nearest main river to the sites is the River Anker, located approximately 1.7km north-east of the site. This watercourse has a meandering channel and is within a highly urbanised area with artificially reinforced banks and development built up to the river edge. The Coventry Canal is also situated approximately 910m north-east of the sites. Online mapping and imagery show no drainage features within SHA2-1 and SHA2-2. There are two unnamed watercourses which flow to the south of the

	sites, one which flows along the south-western boundary of SHA2-1 for a short section. There are further unnamed watercourses/drainage ditches south of the sites. There is also a pond (Ensor's Pool) located adjacent to the east of SHA2-1 and Bermuda Lake is located approximately 400m south of SHA2-2. Within ARB-1, there are several existing drainage features; a ditch filled with vegetation in the south-western corner of the site. There is another ditch forming a flow path that begins approximately 15m north of the site and runs from the north of the site into the aforementioned vegetated ditch.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning Results:** **SHA2-1:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% **SHA2-2:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% **ARB-1:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **SHA2-1:** **3.3% –** 0.12% **1% –** 0.13% **0.1% –** 0.16% **SHA2-2:** **3.3% –** 0% **1% –** 0% **0.1% –** 0% **ARB-1:** **3.3% –** 0% **1% –** 0% **0.1% –** 0% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The 2023 site-specific detailed hydraulic model for the two unnamed watercourses, which eventually converge to form the Griff Brook, has been used within this assessment. **Flood characteristics:** The site-specific model indicates sites SHA2-2 and ARB-1 are not at risk of fluvial flooding. The majority of site SHA2-1 is also not at risk of fluvial flooding with the exception of the site's south-western boundary where small areas are encroached during all modelled fluvial flood events.

Surface Water	**Proportion of site at risk:** **SHA2-1:** **3.3% AEP** – 2.3% Max depth – >1.20m Max velocity – 1.00 – 2.00m/s **1% AEP** – 3.5% Max depth – >1.20m Max velocity – >2.00m/s **0.1% AEP** – 8.4% Max depth – >1.20m Max velocity – >2.00m/s **SHA2-2:** **3.3% AEP** – 0% Max depth – N/A Max velocity – N/A **1% AEP** – 3.4% Max depth – 0.30-0.60m Max velocity – 0.01-0.25m/s **0.1% AEP** – 5.6% Max depth – 0.30-0.60m Max velocity – 0.25-0.50m/s **ARB-1:** **3.3% AEP** – 0.6% Max depth – 0.15 - 0.3m Max velocity – 0.00 - 0.25m/s **1% AEP** – 3.1% Max depth – 0.30 - 0.6m Max velocity – 0.25 - 0.5m/s **0.1% AEP** – 22.5% Max depth – 0.3 - 0.6m Max velocity – 1.00 - 2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** **SHA2-1:** During the 3.3% AEP surface water event there is a flow path which develops along a track through the east side of the site with considerable areas of ponding along this flow path. Depths are shown to exceed 1.20m in one small area, but mostly remain below 0.90m. Velocities along the flow path are up to 2.00m/s but are considerably lower in the areas of ponding. The hazard classification is up to 'Danger for most' in places. There are also some isolated areas of surface water risk across the site. During the 1% AEP surface water event, the main surface water flow path extends slightly north along a field boundary and the areas of ponding along

	this flow path increase in size. There are also further isolated areas of surface water risk which develop across the site. Depths within the main area of ponding in the east of the site exceed 1.20m, with velocities along the main flow path exceeding 2.00m/s in some areas and a maximum hazard classification of 'Danger for most' along the flow path and in large areas of the ponding. During the 0.1% AEP surface water event, there are a couple of flow paths which develop in the west and south of the site, which flow south to join the flow path along the unnamed watercourse to the south of the site. The main flow path and areas of ponding increase in extent and depth, particularly the area of ponding in the east of the site. A couple of small areas with hazard classification of 'Danger for all' develop but mostly the hazard classification remains at 'Danger for most' or lower. **SHA2-2:** There is no predicted surface water flood risk on the site in the 3.3% AEP event. During the 1% AEP event, surface water ponding occurs in the northwest corner of the site, mainly to depths between 0.15 and 0.3m, with some parts reaching up to 0.6m. Velocities are low, reaching a maximum of 0.25m/s and the hazard rating is 'Danger for some'. During the 0.1% AEP event, the surface water ponding in the northwest corner increases in extent and depths are mainly between 0.3m and 0.6m. Surface water flooding also occurs along Bermuda Road to the east of the site, to depths below 0.15m, as well as along the road to the west and south of the site (Hazell Way), up to depths of approximately 0.3m and maximum velocities of 2.0m/s. The hazard rating on the roads is mainly 'Very low hazard' but some small areas are in the higher rating category of 'Danger for some'. **ARB-1:** Risk of Flooding from Surface Water data for this site shows that the majority of the site is free from surface water flood risk in the 3.3% and 1% AEP extents. Almost a quarter (22.5%) of the site is located within the 0.1% AEP surface water extent. Small areas of ponding accumulation are present across the site in areas of low-lying topography, for example in the ditch forming a flow path from the north of the site. Maximum depths here reach 0.3-0.6 with velocities reaching 0.5-1.0m/s and a hazard rating of 'danger for some'. There is also ponding on, the vehicular entrance within the south of the site and areas across the centre and north-west of the site. Maximum depths here reach 0.3-0.6 with velocities reaching 0.5-1.0m/s and a maximum hazard rating of 'danger for most'.
Reservoir	Reservoir flood mapping shows the south-west edge of SHA2-1 to be affected by the Dry Day and Wet Day flood extents from Seeswood Pool reservoir, which is located approximately 500m west of the site. The Wet Day extent extends slightly further onto the site than the Dry Day extent but both remain confined to the southwest end of the site and follow the path of the unnamed watercourses along the southwest boundary of the site. SHA2-2 and ARB-1 are not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps. The nearest wet day extent is located approximately 260m south of the sites along the road Bermuda Village. The reservoir posing this risk is Seeswood Pool and is classified as high-risk. This means that in the very unlikely event the reservoir fails it is predicted that there is a risk to life. The 'Wet Day' event seeks to estimate the effect of a breach at the same time as a 0.1% AEP river flood is occurring and suggests that the consequences of such a breach are similar to the modelled 0.1% AEP event river flood event, but probably would be associated with a much lower probability.

Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The mapping shows banding across SHA2-1 with large areas categorised as 'no risk', however, there are some bands some areas where groundwater levels are either at or very near (within 0.025m of) the ground surface, or between 0.025m and 0.5m below the ground surface. The following comments can be made about groundwater flood risk on SHA2-1: • Areas classified as 'no risk' are deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Where groundwater levels are at or very near the surface there is a risk of groundwater flooding to both surface and subsurface assets. • Where groundwater levels are between 0.025m and 0.5m below the ground surface there is a risk of groundwater flooding to both surface and subsurface assets. The entirety of both SHA2-2 and ARB-1 are deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	All three sites are located in a postcode area (CV10 7) with no recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Historic flood incidents provided by Warwickshire County Council show one record of external flooding to residential properties within the east side of SHA2-1 which took place on 25/11/2012. On the same date, there is also a record of external flooding to commercial premises adjacent to SHA2-2's western boundary along Hazell Way. These are both records of external flooding due to surface water runoff.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is not protected by any formal flood defences. The River Anker, located approximately 1.7km north-east of the sites, is defended by high ground.
Residual risk	The unnamed watercourse which flows along the south-western boundary of SHA2-1 is culverted beneath Harefield Lane. This could pose a residual risk to the site in the event of a blockage, which could cause water to back up and encroach on the site. There is a branch of the Coventry Canal which flows into Bermuda Lake. This is located approximately 390m south of ARB-1. This could pose a residual risk to the sites in the event of a breach, which could cause water to encroach on the sites. However, this is unlikely to occur due to the location of the sites at topographic highs.
Emergency planning	
Flood warning	The sites are not located in an Environment Agency Flood Warning or Flood Alert Area; however, the 'River Anker and River Sence' Flood Alert Area extends along the unnamed watercourses along the south-western boundary of SHA2-1.

Access and egress	There is existing vehicular access to the site via a farm track in the north-west of SHA2-1 from Charnwood Avenue. There is also a farm track that enters SHA2-1 in the north-east from the B4112, runs south and then west across the site towards the farm. There is also vehicular access to the eastern area of the site along a small track off Hazel Way. Safe and access and egress to ARB-1 is possible via Bermuda Road to the south of the site. SHA2-2 is accessible through a gate off Hazell Way in the south-western corner of the site. **SHA2-1:** All three access points to and from the site remain unaffected during all modelled fluvial flood events. Access to the site along the existing farm track should be possible during all modelled surface water events. In the 0.1% AEP event (the largest modelled surface water event), depths are shown not to exceed 0.3m along a route onto the track along Arbury Road, Heath End Road, Radnor Drive, Rossendale Way and Charnwood Avenue. The hazard classification along this route is main 'Very Low Hazard' with a maximum hazard classification of 'Danger for some'. Although there are considerable surface water flow paths within the site during the 0.1% AEP event, access across the whole site should be possible via this route with the exception of a small area of the site, north of Ensor's Pool, which is cut off by the main surface water flow path. Access from the B4112 in the north-east of the site remains unaffected during the 3.3% AEP surface water flood event. However, the farm track which this road eventually leads into which runs west across the site towards the farm is encroached by a flow path during the 3.3%, 1% and 0.1% AEP surface water flood events. Maximum depths during the 0.1% AEP event exceed 1.2m with maximum velocities that exceed 2.00m/s and a maximum hazard rating of 'danger for all'. A flow path also forms along the B4112 at the location of the access road during the 1% and 0.1% AEP surface water flood events. Access via Hazell Way to the east of the site remains largely unaffected during the 3.3% and 1% AEP surface water events with only small areas of ponding occurring. During the 0.1% AEP event, a flow path forms along the majority of the south and west of Hazell Way as well as along the access route within the east of the site. Maximum depths during the 0.1% AEP surface water flood event reach 0.60 – 0.90m with maximum velocities of 0.50 – 1.00m/s and a maximum hazard rating of 'danger for most'. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water and fluvial events. During the 1% AEP +22% CC fluvial flood event, the site's access points remain unaffected. During the 1% AEP +40% CC surface water event, flow paths form along the B4112, Charnwood Avenue, the track which runs west across the site towards the farm and Hazell Way. Maximum flood depths along the farm track which leads on to the B4112 reach 2.04m with maximum velocities reaching 2.69m/s and a maximum hazard rating of 'danger for all'. **SHA2-2:** Access to and from the site remains unaffected during all modelled fluvial flood events. Access via Hazell Way is unaffected during the 3.3% AEP surface water event and 1% AEP event. During the 1% AEP event, a flow path develops along part of Bermuda road, to the southeast of the site. A maximum depth of 0.3m is predicted, at a maximum velocity of 1m/s and hazard rating of 'Very low hazard', meaning access and egress for the site from the east of the town is unlikely to be impeded. During the 0.1% AEP surface water event, there are flow paths on the roads bordering the site to the east, south and west. Depths and velocities on Bermuda Road to the east remain low so are unlikely to impact access and

	egress. Along Hazell Way, the depths and velocities increase slightly, but the hazard rating is mainly 'Very low hazard' with small areas falling into the category of 'Danger for some'. This is unlikely to impede the current access and egress route for emergency vehicles to the site, on this road. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water and fluvial events. During the 1% AEP +22% CC fluvial flood event, the site's access remains unaffected. During the 1% AEP +40% CC surface water event, a flow path forms along the outskirts of the south-west of the site on Hazell Way which flows on to Bermuda Road. Maximum flood depths along Hazell Way reach 0.19m with maximum velocities of 0.95m/s and a maximum hazard rating of 'low hazard'. **ARB-1:** Access to and from the site remains unaffected during all modelled fluvial flood events. Access to the site via Bermuda Road remains unaffected during the 3.3% AEP surface water event. During the 1% AEP event, a flow path forms along Bermuda Road to the south of the site. Depths along the road are not shown to exceed 0.3m, with a maximum velocity of 0.5m/s and a maximum hazard rating of 'very low hazard', meaning access and egress for emergency vehicles is unlikely to be affected. During the 0.1% AEP event, the flow path is shown to increase in extent along Bermuda Road and forms a flow path within the majority of the car park. Access from the north of the site is still likely to be possible from the playing field (if a road was to be developed here) which is not shown to be affected in the vicinity of the site. Depths within the car park do reach 0.3-0.6m, with velocities reaching 1.0-2.0m/s and the highest hazard rating being 'danger for most'. Depths along Bermuda Road during the 0.1% AEP event reach 0.6-0.9m with velocities reaching 1.0-2.0m/s and a maximum hazard rating being 'danger for most'. Therefore, access and egress may be affected for emergency vehicles. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water and fluvial events. During the 1% AEP +22% CC fluvial flood event, the site's access remains unaffected. During the 1% AEP +40% CC surface water event, a flow path forms along Bermuda Road which extends along the entirety of the road to the south of the site before flowing along some of the stretch of Bermuda Road which runs south towards Cygnet Avenue. Maximum depths reach 0.68m along Bermuda Road to the south of the site, with velocities reaching 1.24m/s and a maximum hazard rating of 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The sites are not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • Detailed fluvial hydraulic modelling is available for the two unnamed watercourses which eventually converge to form the Griff Brook. The climate change allowances which have been assessed are the 3.3% AEP +22% and +30% climate change scenarios as well as the 1% AEP +22% and +30% climate change scenarios. Flooding during these scenarios is not predicted to enter sites SHA2-2 and ARB-1. Flooding is also only

	expected to encroach small areas of SHA2-1's south-western boundary during these climate change scenarios. **Surface Water** • The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk. • The 1% AEP and 1% AEP plus 40% climate change events show similar extents across SHA2-1. The main flow path within the centre of the site widens slightly and a couple of the smaller isolated areas of surface water risk appear in the centre and north of the site with the climate change uplifts. • In SHA2-2, flooding in the north-western corner of the site is predicted to increase in extent, although depths remain similar to present day. An additional flow path develops along Hazell Way past the current access point at the site, flowing along the road south of the site. This is unlikely to impede access and egress as depths remain low at approximately 0.1m and the hazard rating is 'Very low hazard'. • The flow path along the outside of the southern site boundary of ARB-1 is shown to encroach into the site along the entrance into the car park. There is also some ponding within the car park which reaches a maximum of 0.51m. This is similar to the present day 0.1% AEP event where flood depths within the car park reach 0.3-0.6m. The 1% AEP plus 40% climate change event is slightly smaller than the 0.1% AEP event with the flow path along Bermuda Road and the vehicular access in the south of the site not extending as far as the 0.1% AEP event. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – within SHA2-1, the bedrock geology is banded across the site with area of Whitacre Member (mudstone and sandstone), Whitacre Member (sandstone), Halesowen Formation (mudstone, siltstone, and sandstone), Halesowen Formation (limestone), and Halesowen Formation (sandstone). SHA2-2 and ARB-1 consist of Pennine Middle Coal Measures Formation – mudstone, siltstone and sandstone.
	  ○ Superficial – Thrussington Member (diamicton) across the west and south of SHA2-1. No information is available for the east of SHA2-1, the majority of ARB-1 and the entirety of SHA2-2. In the south-eastern corner of ARB-1 the superficial deposits are Thrussington Member – Diamicton (sedimentary).
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
	
	SuDS
	• In areas where groundwater levels are indicated to be at or very near (within 0.025m) ground level there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring

	groundwater level. Below ground development such as basements may not be appropriate in all areas of this site. • BGS data indicates that the underlying geology varies across the sites. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff. • The sites are not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • Whilst SHA2-2 is not located within a historic landfill site, SHA2-1 has an area adjacent to the east of the site designated by the Environment Agency as being a historic landfill site. The majority of ARB-1 except along the southern boundary is also within a historic landfill site. Proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1%, 1% +40% CC and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'.

	The Exception Test is required for these sites because the sites are at risk of surface water flooding in the 1% AEP plus 40% climate change event. It is also required for SHA2-1 as part of the site lies within the 3.3% and 1% AEP modelled flood extents.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific FRA will be required for SHA2-1 as the site is within Flood Zone 1 but has an area larger than 1 hectare. Site-specific FRAs will also be required for SHA2-2 and ARB-1 as they are in Flood Zone 1 but are at risk from surface water flooding during the 3.3% AEP event for ARB-1, and the 1% AEP and 0.1% AEP events for both SHA2-2 and ARB-1. • All sources of flooding should be considered as part of a site-specific FRA. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage. • Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. • The development should be designed with mitigation measures in place where required. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

Development is likely to be able to proceed if:

- Development is steered away from the 3.3% and 1% AEP flood extents in SHA2-1.
- Development is steered away from the main surface water flow paths and areas of ponding across the centre and east of SHA2-1, the north-western corner of SHA2-2 and across the centre, south and east of ARB-1.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface

water flooding across the site, particularly the main surface water flow path and areas of ponding in the east of the site.

- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event. This may require the small parcel of SHA2-1 to the north of Ensor's Pond as well as the entrance to the car park in the south of ARB-1 to be left undeveloped.
- Any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for these sites were the site-specific 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent uplifts have been applied to the defended 3.3%, 1% and 0.1% AEP fluvial food events hydraulic model to indicate the impacts on fluvial flood risk (+22%, +30% and +51%). The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the 2023 site-specific detailed hydraulic model of the two unnamed watercourses which converge to form the Griff Brook. The modelled fluvial events used for these Flood Zones were the 0.1%, 1% and 3.3% AEP events, respectively. Depth, velocity, and hazard data was derived from the site-specific 2023 hydraulic model of the two unnamed watercourses which converge to form Griff Brook. Defended outputs were used for this site assessment, and Undefended outputs are used to compare where appropriate.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA-5**
Address	South of Bedworth Road (B4029), Bulkington. The site is spilt into two parts, referred to throughout this site table as Site A in the north and Site B in the south.
Area	18.8ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located to the southwest of Bulkington. The site is bordered by Bedworth Road (B4029) to the north, Coventry Road (B4109) to the southeast and the railway line to the southeast. The site is located in the Wem Brook catchment between its source and its confluence with the River Anker. The catchment is 3049ha and Wem Brook is not designated artificial or heavily modified. The site is in the upstream end of the catchment. Upstream of the site the catchment is predominantly rural but becomes urbanised downstream where it flows into Nuneaton. The Wem Brook flows in a northerly direction approximately 200m to the south-west of the site.
Topography	Environment Agency 1m resolution LiDAR data shows that Site A generally slopes downhill from north to south, whilst Site B generally slopes downhill from north-east to south-west. Elevations across the sites range from approximately 97.2mAOD up to 107.4mAOD.
Existing drainage features	Online mapping shows no drainage features within the site. However, there are several unnamed watercourses/drainage ditches surrounding the site. There is a watercourse which runs between the two parts of the site, along the northern boundary of Site B. There is also a watercourse to the south-east of Site B, approximately 60m east of the site at its closest point. There is a watercourse which runs parallel to the railway line along its south-west side of the railway line. These watercourses are all tributaries of the Wem Brook, which converge approximately 200m to the south-west of the site.
Fluvial	**The proportion of site at risk:** **FZ3** – 0% **FZ2** – 0% **FZ1** – 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Available data:** The Environment Agency's Flood Map for Planning was used for this assessment.

	Flood characteristics: The Environment Agency's Flood Map for Planning shows no fluvial flood risk at the site. The flood risk along Wem Brook for the 1% and 0.1% AEP events remains to the southeast of the railway line and remains over 130m from the site even in the 0.1% AEP event.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 1.9% Max depth – 0.6 – 0.9m Max velocity – 0.5 – 1.0m/s **1% AEP** – 4.2% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 13.7% Max depth – >1.2m Max velocity – 1.0 – 2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** **Site A** Site A is shown to be at very low risk of surface water flooding across most of the site in all modelled surface water events. The surface water risk across the site is mostly confined to the western boundary of the site. During the 3.3% AEP event there is a small area of surface water flood risk in the north-west corner of the site with depths of up to 0.3m, velocities of up to 0.5m/s and a maximum hazard classification of 'Danger for some'. During the 1% AEP event this small area in the northwest expands slightly with depths of up to 0.6m, velocities of up to 0.5m/s, and a maximum hazard classification of 'Danger for some'. There is also a flow path which develops along the south-east boundary of the site, along the footpath which runs parallel to the site. Depths along this flow path do not exceed 0.3m, with velocities of up to 1.0m/s and a maximum hazard classification of 'Danger for some'. There is also a small flow path which develops in the southern corner of the site, flowing in a southerly direction out of the site. Depths along this flow path do not exceed 0.3m, with velocities of up to 2.0m/s and a maximum hazard classification of 'Very low hazard'. During the 0.1% AEP event, there is a considerable increase in flood risk along the western edge of the site. The areas of surface water risk present in the northwest and south of the site during the 1% AEP event join to form a flow path flowing in a southerly direction along the western edge of the site. Depths along this flow path do not exceed 0.6m, with velocities of up to 2.0m/s and a maximum hazard classification of 'Danger for most'. The flow path along the southeast boundary of the site also increases slightly in size with depths not exceeding 0.6m, velocities of up to 1.0m/s and a maximum hazard classification of 'Danger for most'. **Site B** Most of Site B is shown to remain at very low risk of surface water flooding across all modelled flood events. The main areas of flood risk are in the north-west corner of the site and along the south-west boundary of the site, which lies adjacent to the railway embankment.

	During the 3.3% AEP event, flood risk is restricted to the south-west boundary of the site. There is a flow path which follows the path of the unnamed watercourse in a south westerly direction between Sites A and B. There is also an area of ponding which builds up on the north-east side of the railway line and extends into the north-west corner of Site B. Depths do not exceed 0.9m, with velocities of up to 1.0m/s, and a maximum hazard classification of 'Danger for most'. It is presumed that this unnamed watercourse is culverted beneath the railway line, which is not represented within the RoFSW. Therefore, detailed hydraulic modelling of this unnamed watercourse may show that the risk to the site is actually less than what is shown in the RoFSW. There are also a couple of smaller areas of surface water build up along the southwest boundary of the site. During the 1% AEP event, this area of ponding in the north-west corner of the site increases in size and a secondary flow path develops flowing in a south westerly direction in the north-west edge of the site. Depths in the area of ponding do not exceed 1.2m, with velocities of up to 2.0m/s and a maximum hazard classification of 'Danger for most'. There is further build-up of surface water along the southwest edge of the site and a couple of isolated areas of surface water ponding across the site. During the 0.1% AEP event, the surface water flood risk to the site increases considerably. The flow path between the sites increases in size, affecting the northern edge of Site B and the area of ponding increases considerably, extending along the entire south-west edge of the site. There are further small flow paths which flow in a south easterly direction through the east of the site to join this area of surface water accumulation along the south-west boundary. Depths in the area of ponding exceed 1.2m in places, with velocities of up to 2.0m/s and a maximum hazard classification of 'Danger for most'.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The centre of Site A is classified as 'no risk' with an area of groundwater levels between 0.5m and 5m below the surface in the north of the site and areas of groundwater levels at or very near the surface (within 0.025m) and groundwater levels between 0.025m and 0.5m below the surface in the south of the site. In Site B groundwater levels are either at or very near the surface along the southwest of the site. There is a small area along the northeast boundary of the site where groundwater levels are either between 0.025m and 0.5m or 0.5m and 5m below the surface. The rest of the site is classified as 'no risk'. The following comments can be made about areas within the different groundwater categories: • Areas classified as 'no risk' are deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Where groundwater levels are at or very near the surface there is a risk of groundwater flooding to both surface and subsurface assets. • Where groundwater levels are between 0.025m and 0.5m below the ground surface there is a risk of groundwater flooding to both surface and subsurface assets. • Where groundwater levels are between 0.5m and 5m below the ground surface there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

	This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area (CV12 9) with 48 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Historic flooding records provided by Warwickshire County Council do not have a record of any flooding on the site but there are a few incidences of surface water flooding recorded in the residential areas to the north-east of the site.
Flood risk management infrastructure	
Defences	The site is not protected by any formal flood defences.
Residual risk	Online mapping shows two drains, one between Sites A and B and one to the south of Site B, which appear to flow in a south westerly direction, are culverted beneath the railway line, and then join Wem Brook to the south-west of the railway line. If either of these culverts block up, then this could present an increased risk of flooding to the site.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.
Access and egress	There is currently no vehicular access to Site A but there is a footpath which runs along the southeast boundary of the site. There is vehicular access to Site B along a track which runs west in the north-east corner of the site from Coventry Road (B4109). There is also a footpath which runs west from Coventry Road (B4109) onto the site approximately halfway along the eastern boundary of the site. There is also a footpath which runs from north to south through Site B from Benn Road. Access to the site is not shown to be affected during all modelled fluvial events. During all modelled surface water events there is a flow path which forms flowing in a south westerly direction between the two parts of the site. Therefore, the following sections address the access to each part of the site separately. **Site A** There is a railway line which runs along the south-west boundary of Site A and residential properties along the western part of the northern boundary, but it may be possible to provide vehicular access to the site along the eastern part of the northern boundary from Bedworth Road (B4029). Where Bedworth Road is adjacent to the northern boundary of the site it remains unaffected during all modelled surface water events. To the east of the site, a flow path develops flowing across Bedworth Road with depths of up to 0.6m along the road in the 1% AEP plus 40% climate change event. To the west of the site, there are several flow paths which affect the road. The three main flow paths which cross the road follow the paths of the railway line, Coventry Canal, and Wem Brook, with the greatest depths of up to 0.8m shown along the Canal. However, the flood risk to the road from these flow paths is likely to be less than currently shown in the RoFSW. Coventry Canal is shown to be culverted under the road and the LiDAR levels pick up the lower level of the Canal rather than the road, suggesting if this surface water flow path does overtop onto the road the depths will be considerably lower than

	currently shown in the RoFSW. The road passes over the railway line so will not be affected by surface water flowing along the railway. Wem Brook is also likely to be culverted beneath the road. This culvert may not be represented in the RoFSW meaning the extents and depths shown along the road are likely be less severe than shown. This should be investigated further as part of a site-specific FRA. As most depths along the road remain below 0.3m, it is likely that access and egress for emergency vehicles will still be possible during this flood event. **Site B** The access from the north along Coventry Road remains mostly unaffected during the 3.3% AEP event. There is a small amount of ponding along the road but depths are not shown to exceed 0.3m with a maximum hazard rating of 'Very Low Hazard' so this should not affect access for emergency vehicles during a flood event. During the 1% AEP event, depths along Coventry Road north of the site and the access track and footpath are still shown to remain below 0.3m with a hazard of mostly 'Very Low Hazard' and a maximum hazard rating of 'Danger for some' so access to the site is still likely to be possible. During the 0.1% AEP event, a considerable flow path forms along Coventry Road with depths of up to 0.6m, velocities of up to 2.0m/s and a maximum hazard rating of 'Danger for most', which may affect access for emergency vehicles during a flood event. However, the footpath through the site remains unaffected in the north of the site with depths along Benn Road remaining below 0.3m with a hazard rating of mostly 'Very Low Hazard'. Therefore, access for people on and off the site should still be possible during this flood event. During the 1% AEP plus 40% climate change event, depths along Coventry Road north of the access track and along the access track are up to 0.44m, with velocities of up to 1.65m/s and a maximum hazard rating of 'Danger for most'. The depths and velocities of this flow means access to the site by emergency vehicles is likely to be affected during this flood event. Safe access and egress is not currently possible during the 1% AEP surface water event. For both parts of the site, safe access and egress will need to be demonstrated in the 1% AEP plus 40% climate change surface water event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • In the absence of detailed modelling, Flood Zone 2 (0.1% AEP event) can be used as a proxy to assess the potential implications of climate change to the site. No fluvial flood risk is shown to the site. **Surface Water** • The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk. • In Site A, there is quite a considerable increase in flood extent between the 1% AEP and 1% AEP plus 40% climate change events, with a flow path developing along the southwest edge of the site during the climate change event.

	• The 1% AEP plus 40% climate change event shows some small increases in flood risk to Site B compared with the 1% AEP event. The area of surface water accumulation along the southwest of the site increases slightly in extent, the flow path through the northwest edge of the site also increases in extent, and the small flow paths through the south of the site, present in the 0.1% AEP event, start to develop. • This shows the sites are sensitive to increased flood risk due to climate change. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – primarily Helsby Sandstone Formation (sandstone, pebbly (gravelly)) with a small area of Mercia Mudstone Group (mudstone) in the east of Site B.
	  ○ Superficial
	  ▪ Site A is predominantly Thrussington Member (diamicton) with some Dunsmore Gravel (sand and gravel) in the northeast.
	  ▪ Site B is predominantly Thrussington Member (diamicton) with some Bosworth Clay Member (clay and silt) in the east of the site and some Dunsmore Gravel (sand and gravel) in the north of the site.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils across Site A and most of Site B.
	  ○ A small area of freely draining slightly acid loamy soils in the northeast of Site B.
	
	SuDS
	• Groundwater levels are indicated vary considerably across the site. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements may not be appropriate in some areas of this site.
	• BGS data indicates that the underlying geology is predominantly sandstone which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within a historic landfill site.
	• Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.

	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. As the site is at a high risk of surface water flooding and the proposed land use if classified as 'more vulnerable' it is recommended that a precautionary approach is undertaken, and the Exception Test is applied to this site.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development site is:
	  ○ Greater than one hectare in area.
	  ○ At surface water flood risk in the 0.1% AEP event
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place where required.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets

	the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

Development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding across the site, particularly the area of surface water ponding in the north-west corner of Site B. Detailed hydraulic modelling of the unnamed watercourse which flows between the two parts of the site may show that this area of flood risk is actually predicted to be less severe than what is shown in the RoFSW.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event. As the two parts of the site are shown to be bisected by a flow path following the path of an unnamed watercourse in all modelled surface water events safe access and egress must be demonstrated for both parts of the site.
- Any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	Fluvial Flood Zone 2 has been used as a proxy to assess the potential impacts of climate change in the absence of detailed hydraulic modelling. The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial depth, velocity and hazard mapping	Depth, velocity, and hazard data was not available for this study as there is no detailed hydraulic modelling available that covers this site.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA3-4**
Address	West of Sandon Park, Weddington
Area	8.4ha
Current land use	Greenfield with some farm buildings and an access track.
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located in the east side of Weddington, in north Nuneaton. Sandon Park lies to the west of the site, Stoney Road, the existing farm access track, runs along the southern part of the eastern boundary of the site and the railway line runs to the south of the site. The site is located within the catchment of the River Anker between Wem Brook and the River Sence. This catchment has an area of 5756ha and is mostly rural upstream of the site, which lies in the downstream end of the catchment. The River Anker flows in a northerly direction to the east of the site, within 20m of the site boundary and its closest point, and then in a westerly direction along the northern boundary of the site.
Topography	Environment Agency 1m resolution LiDAR data shows the site is highest in the southwest and slopes downhill towards the north and east where the River Anker flows. Elevations across the site range from approximately 76.1mAOD up to 87.2mAOD.
Existing drainage features	The River Anker flows in a northerly direction to the east of the site and then in a westerly direction along the northern border of the site. The Environment Agency's Detailed River Network shows an unnamed watercourse/drain which flows west along the southern boundary of the site to join the River Anker and a further unnamed watercourse/drain which flows in a south-westerly direction out of Weddington to join the River Anker to the northeast of the site. There are several topographic constrictions upstream and downstream of the site, where the River Anker flows beneath the railway line and through a raised embankment at the north-western corner of the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 7% **FZ2 –** 13% **FZ1 –** 87% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **3.3% -** 13.3%

	1% – 14.5% **0.1%** – 19.4% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The Environment Agency's detailed ISIS-TUFLOW hydraulic model for the River Anker (2015) and the section of the Warwickshire County Council (2023) Nuneaton hydraulic model along the River Anker were both available for this assessment. The Warwickshire County Council (2023) model has been used in preference for this assessment as it is a newer model and the downstream boundary is located further downstream from the site, so should not affect the results within the vicinity of the site. **Flood characteristics:** Most of the site is shown to be at low fluvial flood risk. The fluvial flood extent is confined to the eastern boundary and north of the site where the River Anker flows as the site slopes uphill away from the watercourse. The River Anker flood extents are between the railway line and the raised embankment which causes an impoundment. During the 3.3% AEP modelled fluvial event (Flood Zone 3b) the flood extent from the River Anker extends across the north of the site, extending between 100 and 130m south of the left bank into the site. The eastern border of the site is also impacted. Maximum depths on the site reach approximately 1.0m with velocities of up to 1.3m/s and a maximum hazard classification of 'Danger for some'. The 1% AEP modelled event (Flood Zone 3a) shows a similar extent across the north of the site, extending between 10 and 15m further south into the site than the 3.3% AEP extent. Maximum depths on the site reach approximately 1.1m with velocities of up to 1.3m/s and a maximum hazard classification at the site is 'Danger for some'. During the 0.1% AEP modelled event (Flood Zone 2) the flood extent is slightly wider, affecting parts of the southeast boundary of the site and covering a greater area in the northeast of the site, extending up to 30m further into the site than the 1% AEP event. Maximum depths on the site reach 1.4m with velocities up to 1.8m/s and a maximum hazard classification of 'Danger for all'.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 0.8% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **1% AEP** – 1.3% Max depth – >1.2m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 12.5% Max depth – >1.2m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:**

	Surface water flood risk across most of the site is very low. The highest risk to the site is along the northern boundary following the path of the River Anker and its floodplain. During the 3.3% AEP surface water event a flow path is shown to follow the path of the River Anker along the northern boundary of the site. There is also a small flow path which flows along the southern border of the site following the path of the unnamed watercourse. There is also a small, isolated area of ponding by the existing farmhouse and a couple of small flow paths along field boundaries in the north of the site. Surface water depths on the site are not predicted to exceed 0.90m, with velocities of up to 0.50m/s and a maximum hazard classification of 'Danger for most'. During the 1% AEP event, the existing flow paths and areas of ponding from the 3.3% AEP event are predicted to increase only slightly in size. Depths on the main site are predicted to remain below 0.90m but velocities increase in places up to 1.00m/s. The maximum hazard classification remains at 'Danger for most'. During the 0.1% AEP event, there is a considerable increase in predicted surface water flood risk across the north part of the site, similar to the fluvial flood extent from the River Anker. Depths in the north end of the site are predicted to reach 1.20m with velocities of up to 2.00m/s and a maximum hazard classification of 'Danger for most'.
Reservoir	Reservoir flood mapping shows the northern edge of the site to be affected by the Dry Day flood extent from Seeswood Pool reservoir, which is located approximately 3.5km southwest of the site. Flooding from this reservoir follows the path of the River Anker which flows along the northern boundary of the site. The flood extent is confined to a narrow topographic path and only extends up to approximately 5m south onto the site. The Wet Day flood extent shows the risk from Seeswood Pool Reservoir inundates approximately the top quarter of the site and also extends slightly west along the eastern boundary of the site. The 'Wet Day' event seeks to estimate the effect of a breach at the same time as a 0.1% AEP river flood is occurring and suggests that the consequences of such a breach are similar to the modelled 0.1% AEP event river flood event, but would likely be associated with a much lower probability.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The mapping shows banding across the site with most areas categorised as either 'no risk' or where groundwater levels are between 0.5m and 5m below the ground surface. Along the path of the River Anker there are also some areas where groundwater levels are either at or very near (within 0.025m of) the ground surface, and some areas where groundwater levels are between 0.025m and 0.5m below the ground surface. The following comments can be made about groundwater flood risk on the site: • Areas classified as 'no risk' are deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This includes the north of the site, and parts of the centre and southeast of the site. • Where groundwater levels are at or very near the surface there is a risk of groundwater flooding to both surface and subsurface assets. This covers a small band in the north of the site. • Where groundwater levels are between 0.025m and 0.5m below the ground surface there is a risk of groundwater flooding to both surface and subsurface assets. This covers a small band in the north of the site. • Where groundwater levels are between 0.5m and 5m below the ground surface there is a risk of flooding to subsurface assets, but surface

	manifestation of groundwater is unlikely. This covers large parts of the west and centre of the site fall and the eastern site boundary. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area (CV10 0) with 20 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets and historic records provided by Warwickshire County Council do not have a record of any flooding on or surrounding the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows natural high ground along both sides of the River Anker to the east and north of the site; however, there are no formal defences benefitting the site.
Residual risk	The River Anker is restricted to the north of the site where it passes through the embankment within a narrow structure. Should this structure become blocked, water may back up and increase the flood extent and depths in the north of the site.
Emergency planning	
Flood warning	The eastern boundary of the site is located in the 'River Anker at Weddington' Environment Agency Flood Warning Area and the eastern boundary and northern part of the site are located in the 'River Anker and River Sence' Environment Agency Flood Alert Area.
Access and egress	Currently the site is accessible from the south along Stoney Road which is an existing farm track which passes under the railway line to the south of the site, heads north along the eastern boundary of the site and then heads in a westerly direction through the centre of the site to the existing farm building. There are currently no other access routes to the site, as the River Anker flows around the east and north site boundaries. The access is shown to be affected in all modelled fluvial flood events as the flood extent from the River Anker encroaches towards the southeast corner of the site. In the 1% AEP plus 22% climate change event, depths along the access track are shown to reach approximately 0.19m, with velocities of up to 0.07m/s, and a maximum hazard classification of 'Very Low Hazard'. Therefore, access and egress for emergency vehicles is likely to still be possible during a fluvial flood event. During all the modelled surface water flood events there is some surface water flood risk predicted along the existing access track under the railway. Depths reach up to 0.60m in the 3.3% AEP event, 0.90m in the 1% AEP event and up to 1.20m in the 0.1% AEP event with a maximum hazard of 'Danger for most' across all events. During the 1% AEP plus 40% climate change surface water event depths along the existing access track under the railway are shown to reach 0.82m. Therefore, the access and egress of emergency vehicles is likely to be impacted during all modelled surface water events. There is a bridge crossing over the railway line 300m to the west of the site which could provide an alternative access route to the site. Safe access and egress is not currently possible during the 1% AEP surface water event. Safe access and egress will need to be demonstrated in the 1% AEP plus 22% climate change fluvial event and the 1% AEP plus 40% surface water event. Site drainage proposals should address the requirements for access routes,

	avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The Warwickshire County Council (2023) Nuneaton hydraulic model along the River Anker has been run with the latest climate change allowances to indicate the impact on fluvial flood risk. • Between the 3.3% AEP and 3.3% AEP plus 22% climate change (central allowance) events there is a slight increase in extent along the eastern boundary and in the northeast area of the site, but the fluvial flood risk remains confined to the north and eastern boundary of the site. There is a slight further increase in extent in the northeast and southeast of the site within the 3.3% AEP plus 30% climate change (higher central allowance) event. • Depths on the site increase from 1.0m in the 3.3% AEP event up to 1.1m in the 3.3% AEP plus 30% climate change event. Maximum velocities remain at approximately 1.3m/s but the maximum hazard classification increases from 'Danger for some' up to 'Danger for most'. • Between the 1% AEP and 1% AEP plus 22% climate change event the fluvial extent remains confined to the north and eastern boundary of the site but increases slightly in extent, extending up to 10m further into the site in the north and affecting a larger section of the southeastern boundary. There is then a small further increase in extent in the 1% AEP plus 30% climate change event, extending up to approximately 6m further into the site in the north. • Depths on the site increase from 1.1m in the 1% AEP event up to 1.2m in the 1% AEP plus 30% climate change event. Maximum velocities remain at approximately 1.4m/s but the maximum hazard classification increases from 'Danger for some' up to 'Danger for all'. • This shows that the north and eastern boundary of the site are susceptible to increased fluvial flood risk with climate change. **Surface Water** • The latest climate change allowances have also been applied to the RoFSW map to indicate the impact on pluvial flood risk. • The 1% AEP plus 40% climate change event shows a considerably larger flood extent in the north of the site, along the south of the River Anker, than the 1% AEP event, indicating the north of the site is sensitive to the impacts of climate change. The smaller area of ponding on the site and flow paths along the east and west boundaries of the site show similar extents across both events. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	
Broad-scale assessment of possible SuDS	**Geology & Soils** • Geology at the site consists of: ○ Bedrock – Mercia Mudstone Group (Mudstone). ○ Superficial - Alluvium (clay, silt, sand and gravel) in the north of the site, River Terrace Deposits (sand and gravel) to the south of this, and Anker Sand and Gravel (sand and gravel) across the

	south and west of the site. No information on superficial deposits is available across the centre of the site and the eastern site boundary. • Soils at the site consist of: ○ Slightly acid loamy and clayey soils with impeded drainage. **SuDS** • Groundwater levels are indicated to be between 0.5 and 5m below ground level across large parts of the site and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. • BGS data indicates that the underlying geology is mudstone and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is required to discharge surface water runoff. • The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is not located within a historic landfill site. • Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of a surface water flow path along the northern boundary of the site during all the modelled surface water events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

NPPF and planning implications

Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test is required for this site because part of the site is located within Flood Zone 3. 'More Vulnerable' development is not permitted in the 3.3% AEP flood extent.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development site is:
	  ○ Located within the modelled fluvial flood zones.
	  ○ Greater than one hectare.
	• All sources of flooding should be considered as part of a site-specific FRA.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place where required.
	
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.
	• Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
	• Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- The northern area of the site located in Flood Zone 3 and the 3.3% AEP event is left undeveloped.

- Development is steered away from the flow path which follows the River Anker along the east and north sides of the site.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding across the site.
- Safe access and egress can be demonstrated in the 1% AEP plus 22% climate change fluvial event and the 1% AEP plus 40% climate change surface water event. A site-specific Flood Risk Assessment will be required to determine a suitable access route given the current limitation of options, due to the restrictions posed by the railway line and River Anker.
- Any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Anker hydraulic model (2015) and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent uplifts have been applied to the defended Warwickshire County Council (2023) Nuneaton hydraulic model to indicate the impacts on fluvial flood risk. The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the section of the Warwickshire County Council (2023) Nuneaton hydraulic model along the River Anker Depth, velocity, and hazard data was derived from the River Anker detailed hydraulic model (2015). Defended outputs were used for this site assessment.
Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**ABB-4**
Address	Land at Manor Park Community School and Specialist Arts College, west of Earls Road and south of Vernons Lane.
Area	2.3ha
Current land use	Former Manor Park School
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment west of central Nuneaton. The River Anker rises near Wolvey, approximately 4km south-east of Nuneaton, before flowing north-west through the predominantly urban area of Nuneaton. To the north, the site borders Vernons Lane whilst the south-west is adjacent to Beaumont Road. Earls Road is located east of the site and the south-east is bordered by Countess Road. The site is located on land which was formerly Manor Park School.
Topography	The site generally slopes from north to south with the maximum elevation along the western boundary in the north being 95.32m AOD and the lowest elevation being 88.58m AOD along the southern boundary. There is also a low spot in the northern tip of the site with elevations as low as 93.03m AOD.
Existing drainage features	The nearest Environment Agency Main River to the site is the River Anker, located approximately 1.1km east of the site. The Coventry Canal is located approximately 100m west of the site. There is also an unnamed ordinary watercourse which flows approximately 110m north of the site. This watercourse converges with the Coventry Canal 206m north-west of the site, and the River Anker approximately 1.1km east of the site. Within the site itself there is an area in the south-west where there is an open field which could act as a drainage ditch. LiDAR also suggests the topography of the site slopes from north to south, which would allow water to runoff the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 2.5% **FZ2 –** 4.1% **FZ1 –** 95.9% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** 3.3% – 0% 1% – 0% 0.1% – 0.76%

	Modelled results show the percentage of site at risk from a given AEP flood event. **Available data:** The Warwickshire County Council (WCC) 2023 Nuneaton hydraulic model was used to assess fluvial flood risk within this assessment. **Flood characteristics:** According to the River Anker portion of the WCC Nuneaton hydraulic model, a flow path extends from the River Anker which encroaches a small section in the southern tip of the site during the 0.1% AEP fluvial flood event. Flood depths here reach 0.01m with maximum velocities of 1.1m/s. The resulting flood hazard is 'very low'. The site is unaffected by fluvial flooding during the 3.3% and 1% AEP modelled events.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0% Max depth – n/a Max velocity – n/a **1% AEP** – 0.01% Max depth – 0.15 - 0.3m Max velocity – 0.5 – 1.0m/s **0.1% AEP** – 1.93% Max depth – 0.3 – 0.6m Max velocity – 0.5 – 1.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** The Environment Agency's Risk of Flooding from Surface Water dataset shows the site is only at risk during the 1% and 0.1% AEP events. During the 1% AEP surface water event, 0.01% of the site is at risk. This comprises a small section along the south-eastern boundary of the site, adjacent to Countess Road. Maximum depths here reach 0.15 to 0.3m with velocities up to 0.5 to 1.0m/s. The resulting flood hazard is 'very low'. During the 0.1% AEP surface water event, 1.93% of the site is at risk. This extent encroaches further into the site from the south-eastern boundary. There is also an area of ponding adjacent to the south-western boundary as well as in the northern tip of the site. Most flood depths in these areas are 0 to 0.15m with a small area within the ponding in the south of the site reaching 0.3 to 0.6m. Water is fastest flowing in the south of the site, reaching 0.5 to 1.0m/s. The resulting flood hazard is 'very low' to 'danger for some'. The Environment Agency's Risk of Flooding for Surface Water dataset gives an indication of the surface water risk to the site, however it is high level and does account for the surface water drainage network and other structures which may affect the risk to sites. Given the significant risk to the site, it is recommended that modelling is undertaken to confirm surface water risk as part of a site-specific Flood Risk Assessment.
Reservoir	The site is not shown to be at risk of reservoir flooding during the Wet Day or Dry Day scenarios.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on

	groundwater levels. The following comments can be made about groundwater flood risk on the site: • The majority of the site is deemed as having 'no risk' to groundwater emergence. • There is a section in the northern tip of the site where groundwater levels are either at or very near (within 0.025m of) the ground surface. Therefore, there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 1 recorded historic sewer flooding incident, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place on Queens Road, 331m south-east of the site. This flooding was on the highway and lifting footpath and was due to a blocked culverted watercourse. This occurred on 21/11/2016.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is not protected by any formal flood defences.
Residual risk	There are no flood defences or structures within the vicinity of the site that could pose a risk in the event of failure.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning Area. The southern tip of the site is within the 033WAF307 River Anker and River Sence Flood Alert Area.
Access and egress	Safe access and egress is possible via Beaumont Road in the south of the site and two points along Vernons Lane in the north and west of the site via the former Manor Park School. Access and egress is unaffected by fluvial flooding during the 3.3% and 1% AEP modelled fluvial events (derived from the River Anker portion of the WCC Nuneaton model). During the 0.1% AEP modelled fluvial event, flow paths form along Beaumont Road and the connecting Queens Road and Manor Court Road to the south of the site. Flood depths along Beaumont Road reach approximately 0.15m with velocities up to approximately 2.18m/s. The resulting flood hazard along Beaumont Road is 'very low'. Access to the site via all previously mentioned routes are unaffected during the 3.3% AEP surface water event. During the 1% AEP surface water event, the flow path along Countess Road extends on to Beaumont Road to the south of the site, affecting this access route. Flood depths here reach 0.15 to 0.3m with water flowing up to 1.0 to 2.0m/s. The resulting flood hazard is 'very low'. During the 0.1% AEP surface water event, the aforementioned flow path extends further along Beaumont Road and the connecting Queens Road and Manor Court Road to the south of the site. There is some ponding along

	Vernons Lane approximately 130m north-east of the site which will affect pedestrian access and egress via the footpath connecting Vernons Lane to Stanley Road. There is also a flow path along Vernons Lane approximately 155m west of the site. Flood depths reach 0.3 to 0.6m along all these roads with water flowing the fastest along Beaumont Road at >2.0m/s. The resulting flood hazard is 'very low' to 'danger for most'. There are small sections along Beaumont Road which reach 'danger for all' where flood water is fastest flowing. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. During the 1% AEP +40% CC surface water event and the 1% AEP +22% CC fluvial event (derived from the River Anker portion of the WCC Nuneaton model), flow paths form along Beaumont Road to the south of the site which extend on to the connecting Queens Road and Manor Court Road. Maximum depths along Beaumont Road reach 0.40m during the 1% AEP +40% CC surface water event and 0.07m during the 1% AEP +22% CC fluvial event. Velocities along Beaumont Road reach 2.53m/s during the 1% AEP +40% CC surface water event and 0.75m/s during the 1% AEP +22% CC fluvial event. The resulting flood hazard along Beaumont Road is between 'very low' and 'danger for most' during the 1% AEP +40% CC surface water event and 'very low' during the 1% AEP +22% CC fluvial event. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The River Anker portion of the WCC Nuneaton 2023 model has been used to inform the risk to the site from fluvial flooding. The central and higher central (22% and 30%) climate change allowances have been applied to the 3.3% and 1% AEP events to give an indication of the sensitivity of the site to increases in fluvial flooding from the River Anker due to climate change. Flooding during these scenarios is only predicted to enter the south of the site to a minimal extent and remain along the southern site boundary. Whilst flood depths are close to 0m during the 1% AEP +22% CC event, velocities increase by around 0.3m/s from the 1% AEP event. The resulting flood hazard, however, remains 'very low'. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event, the flood extent increases from the 1% AEP event. The south-eastern boundary of the site is encroach by flooding, however this is very minimal. There is also a small area of ponding in the south of the site which is not present during the 1% AEP event. Flood depths are a maximum of 0.27m which are similar to the 1% AEP event depths at around 0.15 to 0.3m. This shows the site is not very sensitive to increases in pluvial flooding due to climate change. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.

Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – The majority of the site is Purley Shale Formation (mudstone). The north-eastern corner of the site is Jee's Member, Home Farm Member and Woodlands Member - undifferentiated (sandstone and conglomerate, interbedded).
	  ○ Superficial – There is no data for the site pertaining to the superficial geology.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet acid loamy and clayey soils.
	SuDS
	• The majority of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. However, there is a section in the northern tip of the site where groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site
	• BGS data indicates that the underlying geology is mudstone, sandstone and conglomerate which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within an historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths surrounding the site during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take

	into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. As the site is within the EA's FMfP Flood Zone 3 and Flood Zone 2, and classified as 'More Vulnerable', the Exception Test is required.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site;
	  ○ is greater than 1ha,
	  ○ is at fluvial flood risk from the River Anker, and;
	  ○ is shown to be at surface water flood risk in the 1% AEP and 0.1% AEP events.
	• All sources of flooding should be considered as part of a site-specific flood risk assessment.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place to ensure the development does not flood.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
	• Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
	• Should built development be proposed within the 0.1% AEP fluvial or surface water flood extents, careful consideration will need to be given to flood resistance and resilience measures, including ideally raising finished floor levels to a minimum of 300mm above the 0.1% AEP flood level.
	• Construction materials that have low permeability up to at least the same height as finished floor levels should also be used.

	• Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The site is shown to be at some risk of surface water flooding during the 1% and 0.1% AEP events, at risk of flooding in Flood Zone 3 and Flood Zone 2, as well as being at risk from fluvial flooding from the River Anker. The development may be able to proceed if:

- Development is steered away from the southern tip of the site which lies within Flood Zones 2 and 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- A site-specific Flood Risk Assessment, including fluvial and surface water modelling, demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event and the 1% AEP plus 22% climate change fluvial event.
- A site-specific FRA demonstrates that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Anker portion of the WCC Nuneaton 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The latest climate change allowances have been applied to the WCC Nuneaton model's 3.3%, 1% and 0.1% AEP fluvial events. The uplifts applied were 22% for the central, 30% for the higher and 51% for the upper end allowances. These are all for the 2080s epoch. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker detailed hydraulic model (2015) and the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data have been provided for this assessment as part of the WCC Nuneaton 2023 model.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.

Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be low, medium and high risk) have been taken from the Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**ABB-6**
Address	Land east of Jubilee Way, north of Queens Road and south of Abbey Street.
Area	2.4ha
Current land use	Car park and commercial uses (supermarket, restaurants and shops)
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment in the west of central Nuneaton. The River Anker rises near Wolvey, approximately 4km south-east of Nuneaton, before flowing north-west through the predominantly urban area of Nuneaton. To the north, the site borders Abbey Street whilst the south is adjacent to Queens Road. Jubilee Way (A444) is located west of the site and the east is bordered by building units on Stratford Street.
Topography	The site generally slopes from west to east with the maximum elevation along the north-western boundary being 85.46m AOD and the lowest elevation being 82.02m AOD along the south-eastern boundary. The elevations within the car park are a maximum of around 2.50m AOD higher than ground levels along the pedestrian footpath New Century Way.
Existing drainage features	The nearest Environment Agency Main River to the site is the River Anker, located approximately 255m east of the site. The Coventry Canal is located approximately 600m south-west of the site. There is also an unnamed ordinary watercourse which flows approximately 45m north of the site. This watercourse converges with the Coventry Canal 997m west of the site, and the River Anker 326m north-east of the site. Within the site itself there are no drainage ditches, however LiDAR suggests the topography slopes from west to east. This would allow water to runoff to the east of the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 12.0% **FZ2 –** 18.6% **FZ1 –** 81.4% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **3.3%** – 0% **1%** – 0.4% **0.1%** – 3.9%

	Modelled results show the percentage of site at risk from a given AEP flood event. **Available data:** The River Anker portion of the Warwickshire County Council (WCC) 2023 Nuneaton hydraulic model was used to assess fluvial flood risk within this assessment. The site also falls within the domain of the River Anker (2015) hydraulic model, however, the WCC hydraulic model has been used in preference as it shows slightly larger extents within the vicinity of the site so provides a more conservative assessment. **Flood characteristics:** According to the River Anker portion of the WCC Nuneaton hydraulic model, the site is unaffected by fluvial flooding during the 3.3% AEP modelled event. A flow path forms along the south of the site during the 1% AEP event but remains along the southern boundary. Flood depths here reach 0.1m with maximum velocities of 0.2m/s. The resulting flood hazard is 'very low'. This flow path then extends further into the site during the 0.1% AEP event but remains within the south of the site. Flood depths reach 0.4m with maximum velocities of 0.9m/s. The resulting flood hazard varies from 'very low' to 'danger for most'.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0% Max depth – 0.6 - 0.9m Max velocity – 1.0 - 2.0m/s **1% AEP** – 1.15% Max depth – 0.15 - 0.3m Max velocity – 0.5 – 1.0m/s **0.1% AEP** – 6.29% Max depth – 0.6 – 0.9m Max velocity – 1.0 – 2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** The Environment Agency's Risk of Flooding from Surface Water dataset shows the site is only at risk during the 1% and 0.1% AEP events. During the 1% AEP surface water event, there are very small areas of ponding within the north and centre of the site which only covers 1.15% of the site. During the 0.1% AEP surface water event, 6.29% of the site is at risk. This extent encroaches the southern boundary as well as forming areas ponding along the access road into the site via Abbey Street to the north. Flood depths reach 0.6 – 0.9m in the south with velocities in this area reaching 1.0 – 2.0m/s. The resulting flood hazard is 'very low' to 'danger for most'. The Environment Agency's Risk of Flooding for Surface Water dataset gives an indication of the surface water risk to the site, however it is high level and does account for the surface water drainage network and other structures which may affect the risk to site.
Reservoir	The site is shown to be at minimal risk of reservoir flooding during the Dry Day event which only encroaches the southern boundary. This reservoir is Oldbury No.2 which is managed by Severn Trent Water and is deemed as high-risk. The south and east of the site is affected by flooding during the Wet Day reservoir flood event. This risk is posed by the Seeswood Pool reservoir which is managed by Warwickshire County Council and is deemed as high-risk, and in

	the very unlikely event that the reservoirs fail, it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comments can be made about groundwater flood risk on the site: • The majority of the site is within an area where groundwater levels are either at or very near (within 0.025m of) the ground surface. Therefore, there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. • There is a small area in the south-west of the site which is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 1 recorded historic sewer flooding incident, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets show the eastern boundary is within an historic flood extent, however this extent does not extend further into the site. This occurred in May 1932 and was due to the channel capacity being exceeded and there being no raised defences at the time. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place on Queens Road, 193m south-west of the site. This flooding took place in 2021 and consisted of surface water runoff on the highway.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows within the site there are no formal flood defences. The nearest flood defences are along the River Anker approximately 260m east of the site which consist of high ground with a standard of protection of 100 years.
Residual risk	There are no formal flood defences or structures within the vicinity of the site that could pose a risk in the event of failure. The only defence in the vicinity of the site is high ground along the banks of the River Anker which, if overtopped, could pose a residual risk to the site. More information on this defence is detailed above.
Emergency planning	
Flood warning	A small section along the site's eastern boundary is within the 033FWF3ANKR002 Environment Agency Flood Warning Area. This covers the River Anker at Nuneaton Town Centre. The southern and eastern boundaries as well as some of the western boundary is within the 033WAF307 Environment Agency Flood Alert Area. This covers low-lying land and roads between Nuneaton and Tamworth on the River Anker.
Access and egress	Safe vehicular access and egress is possible via Abbey Street to the north and Jubilee Way to the west. There is also pedestrian access which is gained via New Century Way which extends from Abbey Street to Queens Road, the latter of which being to the south of the site.

	Access and egress is unaffected by fluvial flooding during the 3.3% AEP modelled fluvial event (derived from the River Anker portion of the WCC Nuneaton model). During the 1% and 0.1% AEP modelled fluvial events, pedestrian access from the south of the site via Queens Road will be affected. Maximum flood depths during the 1% AEP event reach around 0.2m whilst during the 0.1% AEP event, flood depths reach around 0.5m along this section of Queens Road. During the 1% AEP event, maximum velocities here reach around 0.6m/s whilst velocities reach 0.9m/s during the 0.1% AEP event. The resulting flood hazard during the 1% AEP varies between 'very low' to 'danger for some' whilst the 0.1% AEP event is 'very low' to 'danger for most'. The 1% AEP fluvial event is similar to the 1% AEP +22% CC fluvial event where flood depths reach 0.3m along this stretch of Queens Road with velocities up to 0.6m/s. The resulting flood hazard is 'very low' to 'danger for most'. During the 3.3% AEP surface water event, there is a flow path along Queens Road to the south of the site. Flood depths reach 0.3 – 0.6m with maximum velocities of 0.5 – 1.0m/s. The resulting flood hazard is 'very low' to 'danger for most'. During the 1% AEP surface water event, as well as the flow path along Queens Road there is also ponding along the entrance to the access road on Abbey Street. Flood depths in the north of the site are mainly 0.15 – 0.30m with velocities of <0.25m/s. The resulting flood hazard here is 'very low' to 'danger for some'. During the 0.1% AEP surface water event, the aforementioned flow path and ponding extends further along Queens Road and the access road off Abbey Street. There is also a flow path which extends from Queens Road on to Jubilee Way to the west of the site. Flood depths here reach 0.3 – 0.6m with velocities reaching 1.0 – 2.0m/s. The resulting flood hazard is 'very low' to 'danger for some'. Although slightly smaller than the 0.1% AEP surface water event, the 1% AEP +40% CC surface water event covers similar areas. The deepest flooding during this event occurs on Queens Road and reaches 0.6m. Here, velocities reach 0.8m/s with a resulting flood hazard of 'very low' to 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The River Anker portion of the WCC Nuneaton 2023 model has been used to inform the risk to the site from fluvial flooding. The central and higher central (22% and 30%) climate change allowances have been applied to the 3.3% and 1% AEP events to give an indication of the sensitivity of the site to increases in fluvial flooding from the River Anker due to climate change. Flooding during these scenarios is only predicted to enter the south of the site to a minimal extent and remain along the southern site boundary. Flood depths during the 1% AEP +22% CC fluvial event increase by about 0.1m whilst maximum velocities increase by approximately 0.1m/s. The resulting flood hazard, however, remains at 'very low' during both events. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.

	• In the 1% AEP plus 40% climate change event, the flood extent increases from the 1% AEP event. Flooding along the southern boundary encroaches further into the site, however flooding here is still minimal. The ponding along the access road into the site from Abbey Street also increases in size but remain isolated from any flow paths. Flood depths are a maximum of 0.3m which are similar to the 1% AEP event depths at around 0.15 to 0.3m. This shows the site is not very sensitive to increases in pluvial flooding due to climate change. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – The majority of the site is Mercia Mudstone Group (mudstone). The south-west of the site is Mercia Mudstone Group (mudstone and siltstone).
	  ○ Superficial – The majority of the site is River Terrance Deposits, 1 (sand and gravel) whilst the north-western corner is Anker Sand and Gravel (sand and gravel).
	• Soils at the site consist of:
	  ○ The majority of the site is slowly permeable seasonally wet acid loamy and clayey soils whilst the north-eastern corner is slightly acid loamy and clayey soils with impeded drainage.
	
	SuDS
	• Across the majority of the site, groundwater levels are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
	• BGS data indicates that the underlying geology is mudstone, siltstone, sand and gravel which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within an historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths surrounding the site during the 3.3%, 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.

	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. As the site is within the EAs FMfP Flood Zone 3 and Flood Zone 2, and classified as 'More Vulnerable', the Exception Test is required.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site;
	  ○ is greater than 1ha,
	  ○ is at fluvial flood risk from the River Anker, and;
	  ○ is shown to be at surface water flood risk in the 1% AEP and 0.1% AEP events.
	• All sources of flooding should be considered as part of a site-specific flood risk assessment.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place to ensure the development does not flood.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout

	its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. • Should built development be proposed within the 1% AEP fluvial or surface water design flood extents, careful consideration will need to be given to flood resistance and resilience measures, including ideally raising finished floor levels to a minimum of 300mm above the 1% AEP design flood level. • Construction materials that have low permeability up to at least the same height as finished floor levels should also be used. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The site is shown to be at some risk of surface water flooding during the 1% and 0.1% AEP events, at risk of flooding in Flood Zone 3 and Flood Zone 2, as well as being at risk from fluvial flooding from the River Anker. The development may be able to proceed if:

- Development is steered away from the southern and western boundaries of the site which lie within Flood Zones 2 and 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- A site-specific Flood Risk Assessment, including fluvial and surface water modelling, demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event and the 1% AEP plus 22% climate change fluvial event.
- A site-specific FRA demonstrates that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Anker portion of the WCC Nuneaton 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The latest climate change allowances have been applied to the WCC Nuneaton model's 3.3%, 1% and 0.1% AEP fluvial events. The uplifts applied were 22%

	for the central, 30% for the higher and 51% for the upper end allowances. These are all for the 2080s epoch. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker detailed hydraulic model (2015) and the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data have been provided for this assessment as part of the WCC Nuneaton 2023 model.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be low, medium and high risk) have been taken from the Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA-6**
Address	Former Hawkesbury Golf Course (remaining land), Black Horse Road
Area	29ha
Current land use	Brownfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Withy Brook, source to confluence with River Sowe catchment. This catchment is part of the greater Avon Warwickshire Catchment. The Withy Brook flows south-west from Ansty Park and joins the River Sowe in the east of Coventry. To the north the site borders the Bayton Lake Miners Welfare Park. To the east the site borders the Coventry Canal. The Coventry to Nuneaton railway line borders the site to the west and Sinclair Drive, Aspen Drive and Sephton Drive (residential) border the site to the south. The site is located on land which was formerly Hawkesbury Golf Course.
Topography	2022 Environment Agency LiDAR DTM indicates that there are four ponds and a small watercourse within the site. The lowest lying part of the site is the south-west corner which has an elevation of approximately 91.0m AOD. The highest elevation of approximately 99.3m AOD lies within the north-west corner of the site.
Existing drainage features	The nearest Environment Agency Main River to the site is the River Sowe, approximately 1.5km to the west. The Coventry Canal borders the site to the east. The Wem Brook (an ordinary watercourse) is located approximately 1.55km north-east of the site and flows in a northwesterly direction towards the River Anker. Within the site itself there are four ponds. LiDAR data also suggests that there is a small watercourse linked to the largest pond at the centre of the site. This could aid surface water drainage within the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **3.3% –** 0% **1% –** 0% **0.1% –** 0%

	Available data: The Environment Agency Flood Map for Planning (FMfP) and 2010 River Sowe (Coventry Up) were used to assess fluvial flood risk within this assessment. **Flood characteristics:** The site is not located within the modelled flood extent of the River Sowe or within Flood Zones of the EA's FMfP.
Surface Water	**Proportion of site at risk:** **3.3% AEP** – 2.88% Max depth – 0.15 – 0.3m Max velocity – 0.25 – 0.5m/s **1% AEP** – 4.94% Max depth – 0.3 – 0.6m Max velocity – 0.25 – 0.5m/s **0.1% AEP** – 12.94% Max depth – 0.6 - 0.9m Max velocity – 1 – 2m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment. **Description of surface water flow paths:** During the 3.3% AEP and 1% AEP surface water events, the flooding within the site (excluding ponds and watercourses) is limited to the south-west corner, the lowest lying part of the site with depths up to 0.9m and velocities less than 0.25m/s. During the 1% AEP event, flooding covers 4.94% of the site. Maximum flood depths are between 0.3 and 0.6m and maximum velocities are between 0.25 and 0.5m/s. The resulting hazard classification is 'Danger for Some'. During the 0.1% AEP event, a flow path travels along Stephenson Road, under the railway bridge and joins the flooding in the southwest corner of the site. Within the site, this flow path has a maximum depth of between 0.6 and 0.9m and a maximum velocity of between 1 and 2m/s. The resulting hazard classification is 'Danger for Most'.
Reservoir	The site is not shown to be at risk of reservoir flooding from the Environment Agency reservoir flood maps.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels. The following comments can be made about groundwater flood risk on the site: • The site is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The site is located in a postcode area with 3 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site.

	Warwickshire County Council have also provided historic flooding data. According to this dataset, no recorded flood events have taken place within 500m of the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the site is not protected by any formal flood defences.
Residual risk	There are no flood defences or structures within the vicinity of the site that could pose a risk in the event of failure.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.
Access and egress	In the Nuneaton and Bedworth Borough Council HSG12 Concept Plan for Strategic Allocations (2020), site access and egress is proposed via Sephton Drive leading to Blackhorse Road. During the 3.3% AEP event there is ponding along Sephton Drive in two locations. The maximum depth of this flooding is 0.3 to 0.6m. This flooding has a maximum velocity of 0.25 to 0.5m/s and the resulting hazard classification ranges from 'Low Risk/Caution' to 'Danger for Most'. In the 1% AEP event the area of ponding along Sephton Drive increases. The hazard classification of the flooding remains largely 'Danger for Some' but there is an area of 'Danger for Most' near the junction of Sephton Drive and Heritage Drive. During the 0.1% AEP event there is flooding to the entirety of Sephton Drive. Maximum depths increase to between 0.9 and 1.2m and the maximum velocity of flooding is 1 to 2m/s. The hazard classification of this flooding ranges from 'Danger for Some' to 'Danger for Most'. Safe access and egress will need to be demonstrated in the 1% AEP plus climate change surface water event. During the 1% AEP +40% climate change event flooding along Sephton Drive is similar to the 0.1% AEP event. Maximum depths are around 0.95m. Maximum velocities are around 1.1m/s and the resulting hazard classification ranges between 'Danger for Some' and 'Danger for Most'. Therefore, pedestrian, vehicular and emergency services access and egress is likely to be affected. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • Detailed hydraulic modelling of the River Sowe is available for the following scenarios: 3.3% AEP +21%, +32% and +59% climate change allowances and 1% AEP +21%, +32% and +59% climate change allowances. Flooding during these scenarios does not encroach into the site. **Surface Water**

	• The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event a flow path forms along Stephenson Road, under the railway bridge and across the southwestern corner of the site to join further flooding on Sephton Drive. Maximum depths within the site reach 0.47m. The extent increases when compared to the 1% AEP event, but is smaller than the 0.1% AEP event. This shows that the site is sensitive to climate change with regards to pluvial flooding. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock –
	  ▪ The north and parts of the east of the site are underlain by Pennine Middle Coal Measures Formation- Mudstone, siltstone and sandstone (sedimentary)
	  ▪ The centre and part of the west of the site are underlain by Etruria Formation- Mudstone and sandstone (sedimentary)
	  ▪ The southeastern corner of the site is underlain by Helsby Sandstone Formation- Sandstone, pebbly (sedimentary)
	  ▪ The southwestern corner of the site is underlain by Halesowen Formation- Mudstone, siltstone and sandstone (sedimentary)
	  ○ Superficial – The whole site is underlain by superficial deposits of Thrussington Member- Diamicton (sedimentary)
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
	
	SuDS
	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone, siltstone and sandstone which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site has areas within its boundary designated by the Environment Agency as being a historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA, to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.

	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% AEP +40% climate change event. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The Exception Test may be required for this site because the site is located in an area at high risk of flooding from surface water, particularly in the design flood event (1% AEP +40% CC) where access and egress is likely to be impacted.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific FRA will be required as the proposed development site at is shown to be at surface water flood risk during the 3.3%, 1% and 0.1% AEP events. • All sources of flooding should be considered as part of a site-specific FRA. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage. • Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); Nuneaton and Bedworth Council's Local Plan Policy's and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. • The development should be designed with mitigation measures in place where required. **Guidance for site design and making development safe:**

	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG). • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates. • Arrangements for safe access and egress will need to be provided for the 1% AEP rainfall event with an appropriate allowance for climate change (40%), considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site (the southwestern corner of the site).
- Safe access and egress can be demonstrated in the 1% AEP +40% climate change surface water event.
- A site-specific Flood Risk Assessment demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Sowe hydraulic model (2010), the Environment Agency's Flood Map for Planning (FMfP) and the Environment Agency's Risk of Flooding from Surface Water (RoFSW) map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	The most recent uplifts have been applied to the defended River Sowe hydraulic model to indicate the impacts on fluvial flood risk. The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been taken from the River Sowe detailed hydraulic model (2010). Depth, velocity, and hazard data was derived from the River Sowe hydraulic model. Defended outputs were used for this site assessment, and undefended outputs are used to compare where appropriate.

Surface water	The RoFSW map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be high, medium, and low risk) have been taken from Environment Agency's RoFSW.

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Detailed Site Summary Tables

Site details

Site Code	**CAM-1**
Address	Land east of Bucks Hill, south of Camp Hill Road and west of Eden Court.
Area	1.9ha
Current land use	Greenfield land
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment to the north-west of central Nuneaton. The River Anker rises near Wolvey, approximately 4km south-east of Nuneaton, before flowing north-west through the predominantly urban area of Nuneaton. To the north, the site borders allotments and greenfield land whilst the west is adjacent to Bucks Hill. Eden Court is located east of the site and the south is bordered by the ends of three cul-de-sacs (Birchtree Road, Orchard Way and Almond Avenue).
Topography	The site generally slopes from north-east to south-west with the maximum elevation in the northern tip of the site being 136.6m AOD and the lowest elevation being 114.7m AOD midway along the south-western boundary. There is a slightly lower lying area in the centre of the northern half of the site in comparison to the surrounding ground levels along the northern boundary. These elevations are as much as 10.8m AOD lower than ground within the northern tip of the site.
Existing drainage features	The nearest Environment Agency Main River to the site is the River Anker, located approximately 2km east of the site. The Bar Pool Brook is situated approximately 120m south-west of the site. The Coventry Canal is located approximately 1.5km east of the site and the Bar Pool Brook converges with this canal approximately 1.9km south-east of the site. The Whittleford Brook converges with the Bar Pool Brook approximately 705m south of the site. Within the site itself there is a slightly low lying area in the north which could act as a drainage ditch. LiDAR also suggests the topography slopes from north-east to south-west which would allow water to runoff to the south-west of the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **3.3%** – 0%

	1% – 0% **0.1%** – 0% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The Bar Pool Brook portion of the Warwickshire County Council (WCC) 2023 Nuneaton hydraulic model was used to assess fluvial flood risk within this assessment. **Flood characteristics:** According to the Bar Pool Brook portion of the WCC Nuneaton hydraulic model, the site is unaffected by fluvial flooding during the 3.3%, 1% and 0.1% AEP modelled events. The nearest fluvial flooding to the site is along Buck Hill approximately 115m south of the site.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0.6% Max depth – 0.3 - 0.6m Max velocity – 0.5 – 1.0m/s **1% AEP** – 2.9% Max depth – 0.6 – 0.9m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 6.4% Max depth – 0.6 – 0.9m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** The Environment Agency's Risk of Flooding from Surface Water dataset shows the site is at risk during all AEP surface water events. During the 3.3% AEP surface water event, there is a small area of ponding that extends from the south-western boundary to the centre of the site. Flood depths here are mostly <0.15m with velocities of up to 0.5 – 1.0m/s. The resulting flood hazard varies from 'very low' to 'danger for most'. During the 1% AEP surface water event, this ponding forms a flow path that extends to the north of the site. Flood depths are mostly <0.15m with velocities up to 1.0 – 2.0m/s. The resulting flood hazard varies from 'very low' to 'danger for most'. During the 0.1% AEP surface water event, the flow path further extends across the northern boundary out of the site. There is also a small section of a second flow path which encroaches the southern tip of the site. Flood depths reach 0.6 – 0.9m in the south with velocities in the south and centre of the site reaching >2.0m/s. The resulting flood hazard is 'very low' to 'danger for most'. The Environment Agency's Risk of Flooding for Surface Water dataset gives an indication of the surface water risk to the site, however it is high level and does account for the surface water drainage network and other structures which may affect the risk to site.
Reservoir	The site is shown to be outside both the Wet Day and Dry Day Environment Agency reservoir flood events. The nearest extent is the Dry Day extent which is situated approximately 100m south-west of the site. The Oldbury No.1 and Oldbury No.2 are the reservoirs that pose this risk which are both managed by

	Severn Trent Water and are deemed as high risk, and in the very unlikely event that the reservoirs fail, it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comment can be made about groundwater flood risk on the site: • The entirety of the site is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with 1 recorded historic sewer flooding incident, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets show there are no historic flood extents within the site or surrounding area. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place on Salisbury Drive, 218m north-west of the site. This flooding took place in 2020 and consisted of surface water runoff on the highway.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows there are no formal flood defences within or surrounding the site.
Residual risk	There are no formal flood defences or structures within the vicinity of the site that could pose a risk in the event of failure. The only residual risk posed within the vicinity of the site is from reservoir flooding, as detailed in the reservoir section above.
Emergency planning	
Flood warning	The site and surrounding area is not within any of the Environment Agency Flood Warning Areas. Although the site is not within any of the Environment Agency Flood Alert Areas, the nearest one is located approximately 140m south of the site. This is the 033WAF307 River Anker and River Sence Flood Alert Area. This covers low-lying land and roads between Nuneaton and Tamworth on the River Anker.
Access and egress	Access and egress is possible via Buck Hill to the west and Ryders Hill Crescent to the north. Access is also gained via Eden Court to the east of the site. Access and egress is unaffected by fluvial flooding during the 3.3%, 1%, 1% +22% CC and 0.1% AEP modelled fluvial events (derived from the Bar Pool Brook portion of the WCC Nuneaton model). During the 3.3% AEP surface water event, there is a flow path which crosses Green Lane to the east of the site. Flood depths here reach 0.15 – 0.3m with maximum velocities of 1.0 – 2.0m/s. The resulting flood hazard varies between 'very low' to 'danger for some'. During the 1% AEP surface water event, this flow path increases in extent along Green Lane and extending across Camp Hill Road (B4114). Flood depths reach 0.3 – 0.6m along Green Lane with velocities reaching 1.0 – 2.0m/s along Green Lane and Camp Hill Road. The resulting flood hazard varies between 'very low' to 'danger for most' along Green Lane meaning access and egress will not be possible here.

	During the 0.1% AEP surface water event, the aforementioned flow path extends along the majority of Green Lane and flow paths also begin to form along Hedge Way and Eden Court to the east of the site. Flood depths reach 0.3 – 0.6m along Green Lane with maximum velocities reaching >2.0m/s also along Green Lane. The resulting flood hazard varies between 'very low' to 'danger for some'. Along Green Lane, the flood hazard reaches 'danger for most' meaning access and egress will not be possible here. Although slightly smaller than the 0.1% AEP surface water event, the 1% AEP +40% CC surface water event covers similar areas, excluding Eden Court. The deepest flooding during this event occurs on Green Lane and reaches 0.5m. Here, velocities reach 2.0m/s with a resulting flood hazard of 'very low' to 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The Bar Pool Brook portion of the WCC Nuneaton 2023 model has been used to inform the risk to the site from fluvial flooding. The central and higher central (22% and 30%) climate change allowances have been applied to the 3.3% and 1% AEP events to give an indication of the sensitivity of the site to increases in fluvial flooding from the Bar Pool Brook due to climate change. These flood extents in the vicinity of the site do not increase significantly from the 3.3% and 1% AEP extents and are not predicted to enter the site. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event, the flood extent increases slightly from the 1% AEP event. The flow path, which enters the site along the south-western boundary, extends slightly further across the site than during the 1% AEP event, almost reaching the northern boundary. Flood depths are a maximum of 0.7m in the south of the site which are similar to the 1% AEP event depths at around 0.6 – 0.9m. This shows the site is not very sensitive to increases in pluvial flooding due to climate change. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock – The majority of the site is Outwoods Shale Formation (mudstone). There are also strips of Midlands Minor Intrusive Suite (lamprophyre) going through the site.
	  ○ Superficial – There is no data for the superficial geology of the site.
	• Soils at the site consist of:

	○ Slowly permeable seasonally wet acid loamy and clayey soils. **SuDS** • The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • BGS data indicates that the underlying geology is mudstone and lamprophyre which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site. • The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is not located within an historic landfill site. • Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of a surface water flow path within the site during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. As the site is outside the EA's FMfP Flood Zone 3 and Flood Zone 2, and is not at significant risk of flooding from other sources (including surface water), the Exception Test is not required.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site; ○ is greater than 1ha and; ○ is shown to be at surface water flood risk in the 3.3%, 1% and 0.1% AEP events. • All sources of flooding should be considered as part of a site-specific flood risk assessment.

- Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
- Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
- The development should be designed with mitigation measures in place to ensure the development does not flood.

Guidance for site design and making development safe:

- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
- Should built development be proposed within the 1% AEP surface water design flood event, careful consideration will need to be given to flood resistance and resilience measures, including ideally raising finished floor levels to a minimum of 300mm above the 1% AEP design flood level.
- Construction materials that have low permeability up to at least the same height as finished floor levels should also be used.
- Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The site is shown to be at some risk of surface water flooding during the 3.3%, 1% and 0.1% AEP events. The development may be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- A site-specific Flood Risk Assessment, including fluvial and surface water modelling, demonstrates that site users will be safe in the 1% AEP surface water event, including an allowance for climate change.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event and the 1% AEP plus 22% climate change fluvial event.
- A site-specific FRA demonstrates that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Bar Pool Brook portion of the WCC Nuneaton 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning. Hydraulic modelling of the Bar Pool Brook has been provided within the WCC Nuneaton 2023 model. The 3.3%, 1% and 0.1% AEP modelled fluvial events have been used to derive Flood Zones 3b, 3a and 2, respectively.
Climate change	The latest climate change allowances have been applied to the WCC Nuneaton model's 3.3%, 1% and 0.1% AEP fluvial events. The uplifts applied were 22% for the central, 30% for the higher and 51% for the upper end allowances. These are all for the 2080s epoch. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker detailed hydraulic model (2015) and the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data have been provided for this assessment as part of the WCC Nuneaton 2023 model.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events (considered to be low, medium and high risk) have been taken from the Environment Agency's Risk of Flooding from Surface Water.

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Detailed Site Summary Tables

Site details

Site Code	**ABB-7**
Address	Land at Mill Street, south of Bridge Street and north of George Eliot Memorial Garden.
Area	0.5ha
Current land use	Commercial
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is located within the Upper Anker portion of the River Trent Catchment west of central Nuneaton. The River Anker rises near Wolvey, approximately 4km south-east of Nuneaton, before flowing north-west through the predominantly urban area of Nuneaton. To the north, the site borders Bridge Street whilst the south is adjacent to George Eliot Memorial Garden. Church Street is located east of the site and the River Anker borders the west of the site. Mill Street enters the site along the eastern boundary and dissects the centre of the site.
Topography	The majority of the site has relatively uniform ground levels ranging between 80.7m AOD within the centre of the site to 82.3m AOD along the northern boundary. Elevations slope down along the western boundary where the River Anker is situated to around 79.3m AOD. Despite the River Anker being culverted beneath the shopping centre in the north-west of the site, LiDAR suggests this area is lower lying than surrounding with elevation as low as 79.6m AOD.
Existing drainage features	The nearest Environment Agency Main River to the site is the River Anker, which flows as close as 2m away from the site's western boundary and is culverted beneath the shopping centre in the north-west of the site. The Coventry Canal is located approximately 790m south-west of the site. There is also an unnamed ordinary watercourse which flows approximately 335m north of the site where it converges with the River Anker. Within the site itself there are no drainage ditches. However, LiDAR suggests topography along the western boundary of the site slopes down towards the River Anker, which would allow water to runoff the site.
Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **FZ3 –** 78.6% **FZ2 –** 100% **FZ1 –** 0% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **3.3% -** 0.2% **1% -** 41.4%

	0.1% - 87.7% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The River Anker portion of the Warwickshire County Council (WCC) 2023 Nuneaton hydraulic model was used to assess fluvial flood risk within this assessment. **Flood characteristics:** According to the River Anker portion of the WCC Nuneaton hydraulic model, only 0.2% of the site is flooded during the 3.3% AEP fluvial flood event which is situated along the western boundary of the site. During the 1% AEP fluvial event, flooding increases significantly, covering a large area that extends from the south to the centre of the site. Flood depths reach 1.1m with maximum velocities of 0.3m/s. The resulting flood hazard is 'very low' to 'danger for most' where flood depths are deeper in the lower-lying areas. During the 0.1% AEP fluvial event, flooding affects the majority of the site, excluding part of the north-west of the site. Maximum flood depths are 1.5m with velocities reaching 0.8m/s. The resulting flood hazard is 'very low' to 'danger for most' with a small area within the west of the site reaching 'danger for all'.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 6.5% Max depth – 0.3 – 0.6m Max velocity – 0.25 – 0.5m/s **1% AEP** – 47.6% Max depth – >1.2m Max velocity – >2.0m/s **0.1% AEP** – 87.5% Max depth – >1.2m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** The Environment Agency's Risk of Flooding from Surface Water dataset shows the site is at risk during the 3.3%, 1% and 0.1% AEP events. During the 3.3% AEP surface water event, 6.5% of the site is at risk. This comprises an area of ponding within the centre of the site along Mill Street and partially along the western boundary. Maximum depths reach 0.3 – 0.6m with velocities up to 0.25 – 0.5m/s. The resulting flood hazard varies between 'very low' to 'danger for some' with a small section along the western boundary reaching 'danger for most'. During the 1% AEP surface water event, 47.6% of the site is at risk. The areas not affected include the north of the site, the section in the west where the Nuneaton Job Centre is located and small areas along the southern and eastern boundaries. Most flood depths range between 0.15 – 0.9m with velocities mainly <0.25m/s. The resulting flood hazard is 'very low' to 'danger for most' with small sections along the western boundary being 'danger for all'. During the 0.1% AEP surface water event, 87.5% of the site is at risk. The only areas not encroached by this extent include an area in the north of the site as well as the north-western corner. These two unaffected areas are dry islands. Flood depths across the site vary greatly between <0.15 - >2.0m. Water velocities are fastest flowing along the west of the site reaching >2.0m/s. The

	resulting flood hazard is 'very low' to 'danger for most'. There are small sections along the western boundary that are 'danger for all'.
Reservoir	The west of the site is shown to be at risk of reservoir flooding during the Environment Agency's Dry Day scenario. This risk is posed by Oldbury No.2 reservoir which is managed by Severn Trent Water and the Seeswood Pool reservoir which is managed by Warwickshire County Council and both of which are deemed as high risk. The latter extent also covers the southern tip of the site, leaving a small area in the south that is situated within a dry island. The entirety of the site is shown to be at risk of reservoir flooding during the Wet Day scenario. This risk is posed by the Seeswood Pool which is managed by Warwickshire County Council and is deemed as high risk, which means that in the very unlikely event the reservoir fails it is predicted that there is a risk to life.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comment can be made about groundwater flood risk on the site: • The entirety of the site is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.
Sewers	The site is located in a postcode area with no recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).
Flood history	The Environment Agency's historic flooding and recorded flood outline datasets shows there were two recorded flood events within the site. These both occurred in May 1932 and were due to the channel capacity of the River Anker being exceeded and there being no raised defences at the time. Warwickshire County Council have also provided historic flooding data. According to this dataset, the nearest flood event to the site took place on Queens Road, approximately 580m west of the site. This flooding took place in 2021 and consisted of surface water runoff on the highway.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows there are no formal flood defences within or surrounding the site. However, this datasets shows that within the west of the site along both banks of the River Anker, there is high ground which has a standard of protection that ranges between 5 and 100 years.
Residual risk	The River Anker flows as close as 2m away from the site's western boundary and is culverted beneath the shopping centre in the north-west of the site. This could pose a residual risk to the site in the event of a breach, which could cause a large volume of water to encroach on the site. The risk of flooding to the site from a reservoir breach is also classed as residual risk, as detailed in the reservoir section above.
Emergency planning	
Flood warning	The site is located in the 033FWF3ANKR002 River Anker at Nuneaton Town Centre Environment Agency Flood Warning Area.

	The site is also located within the 033WAF307 River Anker and River Sence Flood Alert Area. This covers low-lying land and roads between Nuneaton and Tamworth on the River Anker.
Access and egress	Vehicular access and egress is possible via Mill Street to the east of the site. Pedestrian access and egress is gained via George Eliot Memorial Garden to the south and via two footbridges over the River Anker to the west of the site. Access and egress is affected by fluvial flooding during the 3.3% AEP modelled fluvial events (derived from the River Anker portion of the WCC Nuneaton model). This occurs in ponding in the George Eliot Memorial Garden to the south. Flood depths reach 0.4m with maximum velocities being 0.5m/s. The resulting flood hazard is 'very low' to 'danger for some'. During the 1% AEP modelled fluvial event, the aforementioned ponding increases as well as there being areas flooded along Mill Walk, affecting pedestrian access to the west. Flood depths here reach 0.6m with maximum velocities reaching 0.5m/s. The resulting flood hazard is 'very low' to 'danger for most'. During the 1% AEP +22% CC modelled fluvial event, the same access routes are affected with maximum flood depths of 0.7m along Mill Walk. Velocities here reach 0.5m/s with the resulting flood hazard being 'very low' to 'danger for most'. Therefore, access and egress is affected in these flood events. During the 0.1% AEP modelled fluvial event, all access and egress routes are affected. Flood depths reach 0.5m with velocities up to 0.7m/s. The resulting flood hazard is 'very low' to 'danger for most'. Access to the site via Mill Street is affected during the 3.3% AEP surface water event. Flood depths here reach 0.15 – 0.3m with velocities of <0.25m/s. The resulting flood hazard is 'very low'. Access and egress is possible here. During the 1% AEP surface water event, the flooded extent increase significantly, affecting all access routes. Flood depths reach 0.9 – 1.2m with maximum velocities being >2.0m/s to the west of the site along the pedestrian footpaths. The resulting flood hazard 'very low' to 'danger for most'. During the 0.1% AEP surface water event, all access routes are affected, with all roads surrounding the site also being impacted. Flood depths exceed 1.2m along Mill Walk and the pedestrian footpaths leading from this road to the west of the site. The maximum velocities are also within this area and exceed 2.0m/s. The resulting flood hazard is 'danger for most' to 'danger for all', meaning access and egress will not be possible via these routes during this event. Although slightly smaller than the 0.1% AEP surface water event, the 1% AEP +40% CC surface water event covers the same access routes. The deepest flooding during this event occurs on Mill Walk and reaches approximately 1.3m. Here, velocities reach 1.6m/s with a resulting flood hazard of 'danger for some' to 'danger for most'. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	There are several sections of the site that are located on dry islands. The southern tip of the site is in a dry island during the 1% AEP surface water event whilst parts of the northern boundary are within dry islands during the 0.1% AEP surface water event. The southern tip and north-western corner of the site are in dry islands during the Dry Day reservoir flood event.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • The River Anker portion of the WCC Nuneaton 2023 model has been used to inform the risk to the site from fluvial flooding. The central and higher central (22% and 30%) climate change allowances have been applied to

	the 3.3% and 1% AEP events to give an indication of the sensitivity of the site to increases in fluvial flooding from the River Anker due to climate change. Flooding during these scenarios is predicted to increase in extent within the site with the north-eastern corner of the site being affected during the se climate change fluvial events. Maximum flood depths increase by 0.3m during the 1% AEP +22% CC event compared to the 1% AEP event, and velocities increase by around 0.4m/s from the 1% AEP event. The resulting flood hazard, however, remains 'very low' to 'danger for most'. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • In the 1% AEP plus 40% climate change event, the flood extent increases from the 1% AEP event. The majority of the site is affected during the 1% AEP +40% CC event, excluding part of the northern section of the site. Flood depths are a maximum of 1.1m which is an increase from the majority of the 1% AEP event depths at around 0.3 – 0.9m. This shows the site is sensitive to increases in pluvial flooding due to climate change. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock – The bedrock geology at the site is Mercia Mudstone Group (mudstone).
	  ○ Superficial – The superficial geology at the site is Alluvium (clay, silt, sand and gravel).
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	
	SuDS
	
	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
	• BGS data indicates that the underlying geology is mudstone, sand, clay, silt and gravel which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
	• The site is not located within an historic landfill site.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths within and surrounding the site during the 1% and 0.1% AEP events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.

	• If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. As the site is within the EA's FMfP Flood Zone 3 and Flood Zone 2, classified as 'More Vulnerable', and at significant surface water flood risk, the Exception Test is required.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required as the proposed development site;
	  ○ is within the Flood Map for Planning Flood Zones 2 and 3,
	  ○ is at fluvial flood risk from the River Anker, and;
	  ○ is shown to be at surface water flood risk in the 3.3% AEP, 1% AEP and 0.1% AEP events.
	• All sources of flooding should be considered as part of a site-specific flood risk assessment.
	• Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers.
	• The development should be designed with mitigation measures in place to ensure the development does not flood.
	Guidance for site design and making development safe:
	• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).

	• Arrangements for safe access and egress will need to be demonstrated for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. • Should built development be proposed within the 1% AEP fluvial or surface water flood extents with an appropriate allowance for climate change, careful consideration will need to be given to flood resistance and resilience measures, including ideally raising finished floor levels to a minimum of 300mm above the 1% AEP design flood level. • Construction materials that have low permeability up to at least the same height as finished floor levels should also be used. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development rates.

Key messages

The site is shown to be at significant risk of surface water flooding during the 1% and 0.1% AEP events, at risk of flooding in the Flood Map for Planning Flood Zone 3 and Flood Zone 2, as well as being at risk from fluvial flooding from the River Anker. The development may be able to proceed if:

- Development is steered away from areas of the site which lie within the 1% AEP modelled fluvial event.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk of surface water flooding within the site.
- A site-specific Flood Risk Assessment, including fluvial and surface water modelling, demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change.
- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event and the 1% AEP plus 22% climate change fluvial event.
- A site-specific FRA demonstrates that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the River Anker portion of the WCC Nuneaton 2023 hydraulic model and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	For the purposes of this study, the River Anker portion of the 2023 WCC Nuneaton hydraulic model's 3.3%, 1% and 0.1% AEP defended scenarios were uplifted with the latest climate change allowances to indicate the impacts of climate change on fluvial flood risk. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts

	applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data was taken from the River Anker portion of the WCC Nuneaton model (2023).
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events have been taken from the Environment Agency's Risk of Flooding from Surface Water.

Nuneaton and Bedworth Borough Council, Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Tables

Site details

Site Code	**SHA3-1 & SHA3-2**
Address	SHA3-1: Land north of Tuttle Hill and south and west of the Coventry Canal. SHA3-2: Land north of Tuttle Hill and west of Stoney Road.
Area	SHA3-1: 40.1ha SHA3-2: 15.0ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The sites are located within an urban section of the downstream Tame, Anker and Mease Management Catchment, north-west of central Nuneaton. **SHA3-1:** The north and east of the site runs parallel with the Coventry Canal whilst the south borders Tuttle Hill. The site is situated on and east of Judkins Quarry. **SHA3-2:** Tuttle Hill is located to the south of the site, whilst Stoney Road borders the south-east of the site before branching away from the site's eastern boundary. There are several railway lines which are located north and east of the site. The Coventry Canal dissects the centre of the site from the north to the south. The western half of the site overlaps with part of the east of SHA3-1.
Topography	**SHA3-1:** The site topography varies across the site, with land along the northern and eastern boundaries sloping down towards the Coventry Canal. Land within the south-east of the site is also lower with minimum elevations of around 95.3m AOD. The highest elevations are in the mid-west of the site at around 157.3m AOD. The access tracks within the site are of lower elevation than surrounding ground levels, decreasing by between 5.0 – 6.0m AOD. **SHA3-2:** The topography within this site also varies, with lower lying land dissecting the site from the north to the south which corresponds with the location of Coventry Canal. The highest elevations are in the north-west of the site which reach 109.9m AOD. The lower elevations are along the north-eastern boundary which are as low as 85.6m AOD. This corresponds with land in this area sloping down towards the railway cutting.
Existing drainage features	The nearest main river to the sites is the River Anker, located (at its closest point) approximately 265m east of SHA3-2. The Coventry Canal is situated along the north and eastern borders of SHA3-1 and dissects SHA3-2 from the northern to the southern boundary. The Bar Pool Brook flows approximately 480m south of the site where it converges with the Coventry Canal. Within SHA3-1, there is a pond towards the north as well as vegetation along the northern and part of the eastern boundary which may act as drainage features. Within SHA3-2, the Coventry Canal and the vegetation along a small section of this watercourse within the site are the only drainage features to note.

Fluvial	**The proportion of site at risk:** **Flood Map For Planning results:** **SHA3-1:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% **SHA3-2:** **FZ3 –** 0% **FZ2 –** 0% **FZ1 –** 100% *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Modelled Results:** **SHA3-1:** **3.3% –** 0% **1% –** 0% **0.1% –** 0% **SHA3-2:** **3.3% –** 0% **1% –** 0% **0.1% –** 0% *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** The 2023 Warwickshire County Council's Nuneaton detailed hydraulic models have been used within this assessment. **Flood characteristics:** This model indicates the sites are not at risk from fluvial flooding during the 3.3%, 1% and 0.1% AEP modelled events.
Surface Water	**Proportion of site at risk (RoFfSW):** **SHA3-1:** **3.3% AEP** – 0.7% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **1% AEP** – 1.6% Max depth – 0.9 – 1.2m Max velocity – 1.0 – 2.0m/s **0.1% AEP** – 6.0% Max depth – >1.2m Max velocity – >2.0m/s **SHA3-2:** **3.3% AEP** – 1.4% Max depth – 0.3 – 0.6m Max velocity – 1.0 – 2.0m/s **1% AEP** – 4.7% Max depth – 0.6 – 0.9m Max velocity – 1.0 – 2.0m/s

	0.1% AEP – 11.0% Max depth – 0.6 – 0.9m Max velocity – >2.0m/s *The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).* **Description of surface water flow paths:** **SHA3-1:** Risk of Flooding from Surface Water data for this site shows that the site is at minimal surface water flood risk during the 3.3% and 1% AEP events, although small areas of ponding are present throughout the site. 6.0% of the site is within the 0.1% AEP surface water event. In this event, the aforementioned areas of ponding increase in extent and a flow path begins to form along an access road within the site from the south-east to the centre of the site. Maximum flood depths in the flow path are 0.9 – 1.2m, with velocities up >2.0m/s, giving a hazard varying between 'very low' to 'danger for most'. There is a small area along the western boundary that is 'danger for all' due to deeper pluvial flood waters. **SHA3-2:** Risk of Flooding from Surface Water data shows that the site is at minimal risk during the 3.3% and 1% AEP events, as the majority of surface water is channelled into the Coventry Canal which flows through the site. Any additional surface water forms small areas of ponding throughout the site. During the 0.1% AEP event, 11% of the site is affected. The previously mentioned areas of ponding becomes larger with the most significant being within the south-eastern corner of the site. A flow path also forms in the south along an access route through the site. Flood depths here reach 0.3 – 0.6m with velocities reaching >2.0m/s. The resulting flood hazard is 'very low' to 'danger for most'.
Reservoir	The sites are not at risk from reservoir flooding during the Wet Day or Dry Day events.
Groundwater	The JBA Groundwater Emergence Map, provided as 5m resolution grid squares, shows the susceptibility of an area to groundwater flood emergence based on groundwater levels. The following comments can be made about groundwater flood risk on both sites: • The majority of the sites are deemed to have a negligible risk from groundwater flooding due to the nature of the local geological deposits. • Part of the south of SHA3-2 and small strips of land in the south of SHA3-1 are areas where groundwater levels are between 0.025m and 0.5m below the ground surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. • A small section in the north-eastern corner of SHA3-2 and an area in the south of SHA3-1 are where groundwater levels are between 0.5m and 5m below the ground surface. There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely. • An area which extends from the centre to the north of SHA3-1 is where groundwater levels are at least 5m below the ground surface. Flooding from groundwater is not likely. This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.
Sewers	The sites are located in a postcode area with 35 recorded historic sewer flooding incidents, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register (up to 27 September 2022).

Flood history	The Environment Agency's historic flooding and recorded flood outline datasets show there were no historic flood events within the sites in December 1992 along the Anker. The cause of this flood event is unknown. Warwickshire County Council have also provided historic flooding data. The nearest flood incident according to this dataset occurred approximately 350m south-west of SHA3-1 on Dingle Hill, Camp Hill. This took place in 2018 where there was a report of flooding on the highway.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows the sites are not protected by any formal flood defences. The nearest flood defences are located along both banks of the River Anker which flows, at its closest point to the sites, approximately 265m east of SHA3-2. These defences consist of various sections of high ground which have a standard of protection of 5 years.
Residual risk	There are no formal flood defences or structures within the vicinity of the site that could pose a risk in the event of failure.
Emergency planning	
Flood warning	The sites are not located within any of the Environment Agency's Flood Warning or Flood Alert Areas.
Access and egress	Currently, access and egress to SHA3-1 is via a track leading to Springwood Haven Marina to the west as well as a track leading to Canal Farm to the north. Access is also gained via a road off Tuttle Hill to the south and two roads leading over the Coventry Canal to the east of the site. The latter access routes can be used for SHA3-2 which lead to Tuttle Hill to the south whilst Stoney Road in the south-east also provides access. The access road off Tuttle Hill also leads out of SHA3-2 along the western boundary into SHA3-1. The River Anker portion of the WCC Nuneaton model was used to assess fluvial risk. According to the model, all access and egress routes for both sites are safe during the 3.3%, 1%, 1% AEP +22%CC and 0.1% AEP modelled events. During the 3.3% AEP surface water event, most access routes are unaffected, excluding access to the south of the sites via Tuttle Hill, where there is an area of ponding at the entrance to the sites. Flood depths here reach 0.15 – 0.3m with maximum velocities of 0.5 – 1.0m/s. The resulting flood hazard is 'very low' to 'danger for some'. Higher flood water velocities may impeded access and egress. During the 1% AEP surface water event, this ponding begins to form a flow path along Tuttle Hill, up to the turning to Arrow Road. The ponding along this access road within the two sites also increases. Flood depths here reach 0.3 – 0.6m with velocities reaching 1.0 – 2.0m/s. The resulting flood hazard is 'very low' to 'danger for some'. This will mean that access and egress is likely to be affected where water heights are higher along the road. During the 0.1% AEP surface water event, the previously mentioned flow path extends along the entire length of Tuttle Hill. There is also ponding along Stoney Road to the south of SHA3-2, as well as established or establishing flow paths along various points of all access roads within SHA3-1. Flow paths are present along the access roads at Springwood Haven Marina to the west of the site. Maximum flood depths reach 0.3 – 0.6m along roads within SHA3-1 and Tuttle Hill with maximum velocities of >2.0m/s. The resulting flood hazard is 'very low' to 'danger for most' along Tuttle Hill, meaning access and egress will not possible via this route. Although slightly smaller in extent, the 1% AEP +40% CC surface water event affects the same access and egress routes as the 0.1% AEP event, excluding the road to the north of the site leading to Canal Farm and Stoney Road. The resulting flood hazard during this event is 'very low' to 'danger for some'.

	Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk in the wider catchment.
Dry Islands	The sites are not located on dry islands.
Climate change	
Implications for the site	Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** • Detailed fluvial modelling is available for the River Anker defended 1% AEP +20% and 30% climate change scenarios as well as the undefended 3.3% AEP +22% and 30% climate change scenarios. The River Anker portion of the WCC Nuneaton model provided fluvial modelling data for the 1% AEP +22% and 30% climate change scenarios as well as the 3.3% AEP +22% and 30% climate change scenarios. Flooding during these scenarios is not predicted to enter the sites. **Surface Water** • The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. • The 1% AEP plus 40% climate change event is slightly larger than the 1% AEP event as there is an increase in the number of ponding areas within both sites. A flow path within the south of the sites also begins to form. Maximum flood depths along this flow path remain at around 1.1m which is similar to the maximum of 0.9 – 1.2m in the 1% AEP event. Velocities also remain between 1.0 – 2.0m/s with the resulting flood hazard reaming between 'very low' to 'danger for most'. This shows the sites are not very sensitive to increases in pluvial flooding due to climate change. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	
Broad-scale assessment of possible SuDS	**Geology & Soils** **SHA3-1:** • Geology at the site consists of: ○ Bedrock – the majority of the site is Mercia Mudstone Group (mudstone). Within the south, there are strips of a variety of bedrock geology including Park Hill Member (sandstone), Midlands Minor Intrusive Suite (lamprophyre), Caldecote Volcanic Formation - volcaniclastic rocks (both pyroclastic and reworked volcanic rocks), Mercia Mudstone Group (mudstone and siltstone) and Tuttle Hill member (sandstone and mudstone). ○ Superficial – There is no data available for the majority of the site, however the north-west of the site consists of Anker Sand and Gravel. • Soils at the site consist of: ○ Freely draining acid loamy soils over rock. **SHA3-2:** • Geology at the site consists of: ○ Bedrock – The majority of the site is Mercia Mudstone Group (mudstone). Within the south of the site, there are strips of

	land consisting of Helsby Sandstone Formation - Sandstone, Pebbly (Gravelly) and Mercia Mudstone Group (mudstone and siltstone). ○ Superficial – There is no data available for this site. • Soils at the site consist of: ○ Slightly acid loamy and clayey soils with impeded drainage. ○ Freely draining acid loamy soils over rock. **SuDS** • Groundwater levels are indicated to be at least 5m below ground level and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding. • BGS data indicates that the underlying geology is mudstone, sandstone, siltstone, gravel and lamprophyre which may have highly variable permeability. This should be confirmed through infiltration testing. • The sites are not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The sites are not located within historic landfill sites. • Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 0.1% AEP event in both sites. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. • If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at these sites should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the sites.
NPPF and planning implications	

Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. Due to the site SHA3-2 being at risk of surface water flooding in the present day and in the future (taking into consideration an allowance for climate change), is recommended the Exception Test is undertaken for SHA3-2.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment (FRA) will be required for both sites as they are greater than 1ha and are shown to be at surface water flood risk in the 3.3%, 1% and 0.1% AEP events. • All sources of flooding should be considered as part of a site-specific flood risk assessment. • Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the Environment Agency should be undertaken at an early stage. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Nuneaton and Bedworth Council's Local Plan Policies and Warwickshire County Council's Flood Risk and Sustainable Drainage Local guidance for developers. **Guidance for site design and making development safe:** • The developer will need to show, through an FRA, that future users of the developments will not be placed in danger from flood hazards throughout their lifetime. It is for the applicant to show that the developments meet the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the developments. (Para 048 Flood Risk and Coastal Change PPG). • Arrangements for safe access and egress will need to be demonstrated for the 1% AEP rainfall event with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Designs and access arrangements will need to incorporate measures so developments and occupants are safe. • Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the developments are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates.

Key messages

The developments are likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with developments to be steered away from the areas identified to be at risk of surface water flooding within the sites.

- Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event.
- A site-specific FRA demonstrates that the sites are not at an increased risk of flooding in the future and that development of the sites does not increase the risk of surface water flooding on the sites and to neighbouring properties.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for these sites were the 2023 WCC Nuneaton hydraulic models and the Environment Agency's Risk of Flooding from Surface Water maps. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 1, 2 and 3 are from the EA's Flood Map for Planning.
Climate change	For the purposes of this study, the River Anker portion of the 2023 WCC Nuneaton hydraulic model's 3.3%, 1% and 0.1% AEP defended scenarios were uplifted with the latest climate change allowances to indicate the impacts of climate change on fluvial flood risk. The latest climate change allowances have been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The uplifts applied were 35% for the 3.3% AEP and 40% for 1% AEP. These are both for the upper end allowance for the 2070s epoch.
Fluvial extents, depth, velocity and hazard mapping	Modelled flood extents have been derived from the 0.1%, 1% and 3.3% AEP fluvial events from the River Anker portion of the WCC Nuneaton model (2023). Depth, velocity, and hazard data was taken from the River Anker portion of the WCC Nuneaton model (2023).
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth, velocity, and hazard mapping for the 3.3%, 1% and 0.1% AEP events have been taken from the Environment Agency's Risk of Flooding from Surface Water.