Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="4">SHR177</td></tr>
<tr><td>Address</td><td colspan="4">Oak Farm, Gains Park, Shrewsbury</td></tr>
<tr><td>Area</td><td colspan="4">2.45 hectares</td></tr>
<tr><td>Current land use</td><td colspan="4">Greenfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Location of site within catchment</td><td colspan="4">The site lies in the Bow Brook/ Rad Brook catchment, a sub-catchment of the River Severn. It is located approximately 4.1km upstream of the confluence of the Rad Brook and the River Severn and approximately 400m downstream of the confluence of the Bow Brook and an unnamed ordinary watercourse. The site lies at low elevation and with higher ground to the northeast and southwest of the site. The Bow Brook becomes the Rad Brook downstream of the B4386.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">The Rad Brook runs from northwest to southeast along the northern and eastern site boundary.</td></tr>
<tr><td rowspan="6">Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>18%</td><td>21%</td><td>23%</td><td>77%</td></tr>
<tr><td colspan="4">Highest zone of risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="4">High</td></tr>
<tr><td colspan="4">The % Flood Zones quoted show the % 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, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%)</td></tr>
<tr><td colspan="4">Available data:
The Environment Agency’s Flood Zone mapping and Rad Brook hydraulic model has been used in this assessment. The Rad Brook 100-year and 1,000-year outputs form Flood Zones 3 and 2 respectively, with the 20-year extent representing Flood Zone 3b. Environment Agency’s Flood Zone mapping has been used in this assessment.
Flood characteristics:
Fluvial flood risk to this site is associated with the Bow Brook (which turns into the Rad Brook downstream of the site), which flows along the northern and eastern boundary of the site. Flood Zones 3b, 3a and 2 encroach westward onto the site from this watercourse with Flood Zone 2 extending slightly further onto the site than Flood Zone 3. Overall, the floodplain appears relatively constrained here with all Flood Zones of a similar size.
The Environment Agency’s Risk of Flooding from Rivers and Sea mapping shows that the area close to the Bow Brook, along the north and eastern site boundary, is within the zone of high risk with a more than 3.3% probability of flooding occurring in this area in any given year. The zone of medium risk (1%-3.3% probability of flooding in a year) extends slightly further across the northern site boundary.</td></tr>
<tr><td rowspan="4">Surface Water</td><td colspan="4">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td colspan="2">30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td colspan="2">2%</td><td>4%</td><td>7%</td></tr>
<tr><td colspan="4">Max depths (m)</td></tr>
</table>

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**		
	Address	Oak Farm, Gains Park, Shrewsbury		
	Area	2.45 hectares		
	Current land use	Greenfield		
	Proposed land use	Residential		
		0.3-0.9	0.3-0.9	0.3-0.9
		Max velocity (m/s)		
		>0.25	>0.25	>0.25
		The % SW extents quoted show the % 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. 100-year includes the 30-year %)		
		Description of surface water flow paths: A surface water flow route crosses the northern end of the site in all surface water events, in alignment with the Bow Brook channel and floodplain, with the 1,000-year event flooding extending further south onto the site.		
	Reservoir	The site is not shown to be at risk of reservoir flooding from the available online maps.		
	Flood history	There are no records of historic flooding at the site from the Environment Agency. The Shropshire Level 1 SFRA highlights Shrewsbury as an area where there have been a number of historical flooding events, including fluvial, pluvial and sewer flooding events. Records from the February 2020 flooding event in Shropshire identify a flooding incident within a 200m grid square approximately 100m to the north of the site.		
Flood risk management infrastructure	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		-	-	-
		This site is not protected by any formal flood defences.		
	Residual risk	There is a culvert approximately 450m downstream of the site, but it anticipated that a blockage here would be unlikely to impact the site. This could be tested in the hydraulic model as part of a site-specific assessment.		
Emergency planning	**Flood warning**	The site is partially covered by the Environment Agency flood alert area. The area of the site affected by the Environment Agency Flood Zones is within the River Severn in Shropshire flood alert area (031WAF103).		

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential
	Access and egress	Access and egress to the site can be gained from Gains Park Way along the site's eastern boundary. The access point to the site may be impacted by Flood Zones 3b, 3a and 2 and lies in an area of high risk of flooding according to the Environment Agency's Risk of Flooding from Rivers and Sea mapping. A site-specific assessment would need to consider how access across the watercourse can be made available, to access Gains Park Way by vehicle and foot. Access along Gains Park Way itself is possible from the north or south in fluvial flood events. Gains Park Way is a major flow route during all surface water flood events with water joining the road close to the north-eastern corner of the site and flowing southwards to cross the B4386. A major flow route crosses Gains Park Way to the north of the site in the 1,000-year event with isolated ponding present in the 30-year and 100-year event. In the 30-year event, water on Gains Park Way is estimated to reach a maximum level of 0.3m. In the 100-year event surface water is estimated to be a maximum of 0.3m to the north of the site and 0.3-0.9m to the south of the site. In the 1,000-year event Gains Park Road to the north of the site is flooded to a maximum of 0.3m and close to the access point and to the south of the site, maximum flood levels are estimated to be 0.3-0.9m. As a result, it is likely that emergency vehicles will still be able to gain access and egress to the site in times of flooding. Alternatively, if access can be gained via Site SHR057, there is clear access to the B4386 to the south. The depths, velocities, hazards, durations and speeds of onset of surface water and fluvial flooding along access/ egress routes should be investigated further in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained.

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="2">SHR177</td></tr>
<tr><td>Address</td><td colspan="2">Oak Farm, Gains Park, Shrewsbury</td></tr>
<tr><td>Area</td><td colspan="2">2.45 hectares</td></tr>
<tr><td>Current land use</td><td colspan="2">Greenfield</td></tr>
<tr><td>Proposed land use</td><td colspan="2">Residential</td></tr>
<tr><td>Climate Change</td><td>Implications for the site</td><td colspan="2">• Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of both fluvial and surface water flooding.
• The site is partially covered by an area of detailed climate change modelling in the north-western corner. Across the rest of the site, where no detailed climate change modelling results are available, Flood Zone 2 has been used as a conservative indication of fluvial flood risk from climate change. The upper end, higher central and central estimates for increased fluvial flood risk encroach slightly into the northwest corner of the site. The indicative climate change (Flood Zone 2) shows that flood risk remains in an area along the northern and eastern boundary close to the path of the Bow Brook.
• Climate change also needs to be considered for surface water events; at the site-specific stage, the 100-year +40% event is considered as part of surface water drainage strategies, or surface water modelling.
• The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent surface water flooding events. This would require a detailed FRA to assess the site layout and design.
• Developers should consider SuDS strategies to reduce the impacts of climate change from surface water in a detailed site-specific FRA.</td></tr>
<tr><td rowspan="3">Cumulative Impact of development within the catchment</td><td rowspan="3">Level of risk</td><td>Catchment</td><td>Level of risk</td></tr>
<tr><td>Rad Brook</td><td>High</td></tr>
<tr><td colspan="2">Development within the Rad Brook catchment is concentrated in the central area of the catchment with a number of proposed sites covering a total of 8.75% of the entire catchment. This catchment has been identified as one of those that is more sensitive to the cumulative impact of any development within the catchment. Communities within this catchment are at risk of surface water flooding in the 100-year event.</td></tr>
</table>

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential
	Recommendations	It is estimated that a minimum of 138m^3 of long-term storage in addition to storage to capture the 100-year plus climate change event would need to be compensated for at this site to maintain current greenfield runoff rates. This could be achieved through the installation of online storage ponds on watercourses close to or downstream of the sites or through developer contribution to proposed or existing flood alleviation schemes downstream. However, storage and attenuation options in this catchment need to be considered at a wider strategic scale due to the proximity of development sites and catchment characteristics. It is important that any drainage management systems installed at the sites ensure that the release of storm water from the development sites does not synchronise with the arrival of the flood peak from the upper catchment. Refer to Section 9 of the main Level 2 SFRA for more information on the cumulative impact assessment and policy recommendations in this catchment.

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential

Requirements for drainage control and impact mitigation	**Broad scale assessment of possible SuDS**	• Geology at the site consists of:
		  ○ Bedrock: Kinnerton Sandstone Formation - Sandstone.
		  ○ Superficial: Till, Devensian - Diamicton.
		• The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
		• Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk both to and from groundwater.
		• Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. If possible, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located with a Source Protection Zone.
		• Detention features may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has contamination or groundwater issues; a liner will be required.
		• Filtration systems are probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues; a liner will be required.
		• All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues; a liner will be required.
		• The site is not designated by the Environment Agency as previously being a landfill site.
		• Developers should refer to Shropshire Council's 'Surface Water Management: Interim Guidance for Developers' and 'SuDS requirements for new developments' webpage as well as the Level 1 SFRA, for information on suitable types of SuDS, the management train and opportunities and constraints in site master-planning.

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential
NPPF and planning implications	**Exception Test requirements**	The Local Authority have carried out the Sequential Test in line with national guidance. The Sequential Test will need to be passed before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. It is recommended that proposed development will be sequentially located within Flood Zone 1 areas of the site. The Exception test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b.

	Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or is greater than one hectare. • All sources of flooding, particularly the risk of surface water and groundwater flooding, should be considered as part of a site-specific Flood Risk Assessment. • Climate change impacts should be considered in more detail in a site-specific Flood Risk Assessment in the vicinity of the site using the Bow/ Rad Brook model. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Shropshire Council's Local Plan policies, and the LLFA's 'Surface Water Management: Interim Guidance for Developers' and 'SuDS requirements for new developments' webpage. • Consultation with the Local Authority, Lead Local Flood Authority and the Environment Agency should be undertaken at an early stage. • The development should be designed using a sequential approach. Development should be steered away from areas of fluvial flood risk and surface water flow routes, preserving these spaces as green infrastructure. Development must be in line with Table 3: flood risk vulnerability and flood zone compatibility of the NPPG. • Development in FZ3b should be avoided unless appropriate use can be demonstrated in line with NPPF. • Development in FZ3 may require floodplain compensation and this should be confirmed with the EA at FRA stage. **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). • Safe access and egress will need to be demonstrated in the 1 in 100-year plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to areas of surface water flood risk. • Resilience measures will be required if buildings are situated in the flood risk area. Raising Finished Floor Levels above the design event may remove the need for resilience measures. • The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by placing development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond the current greenfield rates. • On site attenuation schemes would need to be tested against the Bow/ Rad Brook to ensure flows are not exacerbated downstream within the catchment. • New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. Assessment for runoff should include allowance for climate change effects. • Betterment on the existing site runoff rate should be sought to ensure that there is no increase in surface water flood risk elsewhere. Ideally, surface water runoff should be fully attenuated to the greenfield rate.

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential

		• Developers should refer to Shropshire Council's 'Surface Water Management: Interim Guidance for Developers' and 'SuDS requirements for new developments' webpage, and the Level 1 SFRA for information on SuDS.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.
		• Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

Key messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 77% of the site located outside of the Environment Agency's Flood Zone 2 and 3. These Flood Zones cover the area of the site closest to the Rad Brook with the remainder of the site lying outside of fluvial flood risk zones. • Areas in Flood Zone 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. No residential development is permitted in Flood Zone 3 and no development at all is permitted in Flood Zone 3b • 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) • Space for green infrastructure should be considered in the areas of highest flood risk to the north. • Safe access and egress routes must not be in the areas of high surface water risk or the 100-year fluvial design flood event (taking into account climate change). Therefore, consideration is needed regarding how to provide access across the watercourse, to access Gains Park Way by vehicle and foot. Alternatively, if access can be gained via Site SHR057, there is clear access to the B4386 to the south. • This site lies within a catchment identified as high risk of cumulative impact of development. It is important to incorporate drainage strategies on site to compensate for long-term storage capacity and to ensure current greenfield runoff rates are maintained. Refer to Section 9 in the main SFRA for specific policy recommendations related to this site and its wider catchment. Refer to the detailed 'guidance for developers' section for further information on the measures that are appropriate for this site.

Shropshire Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

Site details	**Site Code**	**SHR177**
	Address	Oak Farm, Gains Park, Shrewsbury
	Area	2.45 hectares
	Current land use	Greenfield
	Proposed land use	Residential

Mapping Information

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

Mapping Information

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning and the Bow/ Rad Brook hydraulic model used to represent Flood Zone 3b
Climate change	Climate change was based on a combination of detailed hydraulic modelling and Flood Zone 2 to serve as an indication of possible extents. It is recommended that the latest EA's climate change allowances are modelled in a detailed hydraulic model as part of a site-specific Flood Risk Assessment.
Fluvial depth, velocity and hazard mapping	There is no depth, velocity or hazard data available from the hydraulic model as it is 1D-only; therefore, the Risk of Flooding from Surface Water mapping has been used as this represents the floodplains of small watercourses. This should be explored further at site-specific stage.
Surface Water	The Risk of Flooding from Surface Water 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 1 in 30-year (high risk), 1 in 100-year (medium risk) and 1 in 1000-year (low risk) events is taken from the Agency's Risk of Flooding from Surface Water mapping.