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">SHR057</td></tr>
<tr><td>Address</td><td colspan="4">Land at Oak Farm, Gains Park, Shrewsbury</td></tr>
<tr><td>Area</td><td colspan="4">16.41.0 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="11">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 3.9km upstream of the confluence of the Rad Brook and the River Severn.
The site lies on an area of sloping topography with high ground to the south and west that slopes downwards to the north and east. The Bow Brook becomes the Rad Brook downstream of the B4386.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">The Bow/ Rad Brook runs from north to south along part of the north-eastern boundary of the site before turning to flow eastwards underneath Oak Lane towards Gains Park Way.</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>1%</td><td>1%</td><td>1%</td><td>99%</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 2002 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 part of the north-eastern boundary of the site. Flood Zones 3b, 3a and 2 encroach westward onto the site from this watercourse but primarily stay in the area close to the channel. Overall, the floodplain appears relatively constrained here with all Flood Zones of a similar size.
The area closest to the Rad Brook along the site’s eastern boundary is at high risk of flooding in a year, with an estimated probability of flooding exceeding 3.3%, according to the Environment Agency’s Risk of Flooding from Rivers and Sea mapping.</td></tr>
<tr><td rowspan="5">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>2%</td><td>5%</td></tr>
<tr><td colspan="4">Max depths (m)</td></tr>
<tr><td colspan="2">0.3-0.9</td><td>0.3-0.9</td><td>0.3-0.9</td></tr>
<tr><td colspan="4">Max velocity (m/s)</td></tr>
</table>

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<tr><td>Proposed land use</td><td colspan="3">Residential</td></tr>
<tr><td rowspan="4"></td><td rowspan="3"></td><td><0.25</td><td>>0.25</td><td>>0.25</td></tr>
<tr><td colspan="3">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 %)</td></tr>
<tr><td colspan="3">Description of surface water flow paths:
There is an area of ponding present in all surface water events in the central area of the western site boundary in a localised area of lower topography. There are additional isolated areas of ponding in the southern and western parts of the site, primarily in the 1,000-year surface water flooding event, in addition to a small area in the north-east corner of the site in alignment with the river channel. Overall, aside from the area of ponding to the west, surface water risk is low.</td></tr>
<tr><td>Reservoir</td><td colspan="3">The site is not shown to be at risk of reservoir flooding from the available online maps.</td></tr>
<tr><td>Flood history</td><td colspan="3">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. Historic flooding datasets including incidents that occurred in February 2020 show no evidence of flooding on the site. The closest incidents occurred within a 200m grid square approximately 250m to the north of the site.</td></tr>
<tr><td rowspan="3">Flood risk management infrastructure</td><td rowspan="2">Defences</td><td>Defence Type</td><td>Standard of Protection</td><td>Condition</td></tr>
<tr><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="3">This site is not protected by any formal flood defences.</td></tr>
<tr><td>Residual risk</td><td colspan="3">There are a number of culverts downstream of the site, flowing beneath Oak Lane, Gains Park Way and the B4366. It is anticipated that a blockage at these locations would be unlikely to impact the site. This could be tested in the hydraulic model as part of a site-specific assessment.</td></tr>
<tr><td>Emergency planning</td><td>Flood warning</td><td colspan="3">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).</td></tr>
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	Area	16.41.0 hectares
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	Access and egress	Access and egress to the site is possible in all surface water events via the B4386 along the southern boundary of the site or via the A5 alongside the western boundary. There are some flow routes and isolated areas of ponding along these roadways in all events but the estimated maximum level of flooding is 0.3-0.9m so it is likely that emergency vehicles will still be able to gain access. Flood Zones 2 and 3 encroach onto the B4386 to the east of the site. However, access via the B4386 from the west of the site is not impeded by Flood Zones in fluvial flooding events. 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.

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	Address	Land at Oak Farm, Gains Park, Shrewsbury
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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. • There is detailed modelling of fluvial flood risk due to climate change along the Bow/ Rad Brook, though there are gaps in results between Gains Park Way and the B4286. This may be due to modelling and mapping techniques or stability of results. Flood Zone 2 can be used as a conservative indication of fluvial flood risk from climate change. The indicative climate change extent shows that flood risk remains in an area along the eastern boundary, close to the path of the Bow Brook. More detailed modelling may be required in a Flood Risk Assessment due to the age of the model. • 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 flooding extent provides an indication of the likely increase in extent of the more frequent surface water events. The 1,000-year surface water flood event impacts 5% of this site. 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.
Cumulative Impact of development within the catchment	**Level of risk**	**Catchment** / **Level of risk** Rad Brook / High 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. The Rad Brook has been identified as a catchment 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.

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	Recommendations	It is estimated that 1844m^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.

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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.

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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. • A more detailed hydraulic model will be required at Flood Risk Assessment stage, to confirm flood risk, FZ3b and climate change extents, using channel topographic survey, given the model was built in 2002 • 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, Local Lead 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 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.

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		• 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 99% of the site located outside of the Environment Agency's Flood Zone 3 and the 95% of the site not impacted by the 1,000-year surface water flooding event. Development should be steered toward the areas of the site at higher topography in the central and southern areas of the site, away from flood risk close to the eastern and western boundary. • 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. • 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.

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Mapping Information

The key datasets used to make planning recommendations regarding this site was 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.

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. It is recommended that a more detailed hydraulic model is constructed at the site-specific Flood Risk Assessment stage, to confirm flood risk given the age of the model (2002).
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 available fluvial modelling data; 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 1,000-year (low risk) events is taken from the Environment Agency's Risk of Flooding from Surface Water mapping.