

# Harborough District Council

## Level 2 Strategic Flood Risk Assessment

### Detailed Site Summary Table

#### Site details

<b>Site Code</b>	<b>8631 - Land South of Gartree Road Strategic Development Area</b>
<b>Address</b>	<b>Land south of Gartree Road and north of the A6</b>
<b>Area</b>	377 hectares
<b>Current land use</b>	Greenfield Arable
<b>Proposed land use</b>	Residential
<b>Flood Risk Vulnerability</b>	More vulnerable

#### Sources of flood risk

<b>Location of the site</b>	<p>The site is bounded by Gartree Road along the northern boundary and Glen Rise/London Road along the southern most boundaries. In the central area of the site, the site surrounds a housing estate and bounds the road - Chestnut Drive. The River Sence flows along the eastern boundary and through the site in the upper north-eastern area, crossing the north-eastern corner. The central west part of the site (including the source of the Wash Brook), lie within Oadby and Wigston Borough, whilst the east of the site lies within Harborough District.</p> <p>In the north-western area of the site, the Wash Brook rises and flows south-westerly through the site. The central-western area of the site is bounded by residential areas of Oadby, and the remainder of the site is bounded by arable greenfield land.</p> <p>The site falls within two catchments, the Wash Brook that rises within the site close to the central area of the northern boundary, and the River Sence that flows through and borders the site. The Wash Brook drains approximately 1.8km<sup>2</sup> at the site and flows west approximately towards the</p>
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	<p>confluence with the Saffron Brook 3.8km downstream. The River Sence drains approximately 21.6km<sup>2</sup> at the site, rising approximately 5.8km north-east of the site. The River Sence flows south along the boundary, with a confluence with the Burton Brook at the southwest corner, then flows westwards into the River Soar approximately 16.6km downstream of the site.</p>
<p><b>Topography</b></p>	<p>Environment Agency 1m resolution LiDAR across the site shows that the site has varied topography to allow drainage into the various watercourses. The highest elevation is 137.1m AOD in the central northern boundary of the site and lowest elevation is 99.7m AOD in the south-eastern area of the site at the banks of the River Sence.</p>
<p><b>Existing drainage features</b></p>	<p>The site is able to drain into the Wash Brook within the north-western area of the site, and the River Sence along the eastern boundary.</p> <p>There are two ponds within Highland Close Spinney and three stretches of unnamed ordinary watercourses within the site, one in the north-western area of the site near Rose Cottage, in the lower western area of the site flowing out of the site, and in the north-eastern corner near Great Stretton that flows into the River Sence.</p>
<p><b>Fluvial</b></p>	<p><b>Available data and mapping:</b></p> <p>Flood Zones are determined from the Environment Agency's Flood Map for Planning (FMfP) and are based on broadscale modelling at this location. No detailed model outputs for the unnamed watercourse to the south of the site were provided. This is due to the catchment of the watercourses being less than 3km<sup>2</sup>.</p> <p><b>Flood characteristics:</b></p> <p>The site is partially located within Flood Zone 2 and Flood Zone 3.</p> <ul style="list-style-type: none"> <li>• Flood Zone 3 representing an area greater than 1 in 100 (1%) chance of river flooding in a given year. Flood Zone 3 covers 2.1% of the site.</li> <li>• Flood Zone 2 represents areas which have less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of river flooding in a given year. Flood Zone 2 covers 2.3% of the site.</li> </ul>

	<ul style="list-style-type: none"> <li>Flood Zone 1 represents areas which have less than 1 in 1000 (0.1%) chance of river flooding in a given year. Flood Zone 1 covers 97.7% of the site.</li> </ul> <p>Flood Zones 2 and 3 have similar extents that follow the River Sence along the eastern boundary and where the River Sence crosses the north-eastern corner of the site. There are no extents given for the Wash Brook and the unnamed ordinary watercourses. For these watercourses, the Environment Agency’s Risk of Flooding from Surface Water dataset can be used to understand the risk from the Wash Brook and the small ordinary watercourses. Refer to section below titled “Surface Water” for details on the risk to the site from the ordinary watercourses.</p> <p>Detailed fluvial modelling of the Wash Brook and River Sence should be undertaken to inform a site-specific flood risk assessment, including an allowance for climate change, as part of a site-specific flood risk assessment to confirm the risk to the site.</p>
<p><b>Fluvial plus climate change</b></p>	<p>While the site does fall into Flood Zone 2 and 3 no detailed model outputs covering the site from which to infer the impact of climate change were provided for the Wash Brook, River Sence and unnamed watercourses. Climate Change Allowances have however been applied to the Environment Agency’s Risk of Flooding from Surface Water dataset and this is used below to assess the sensitivity of risk from the unnamed ordinary watercourses to climate change.</p>
<p><b>Surface water</b></p>	<p><b>Available data and mapping:</b></p> <p>The EA’s Risk of Flooding from Surface Water dataset for the 3.3%, 1% and 0.1% AEP events.</p> <p><b>Data analysis:</b></p> <p><b>3.3% AEP (1 in 30 year) event:</b></p> <p>Proportion is 2.9%</p> <p>Max Depth is less than 0.15m</p> <p>Max Velocity is between 1.0 to 2.0m/s</p> <p><b>1% AEP (1 in 100 year event):</b></p> <p>Proportion is 4.5%</p>

Max Depth is between 0.15 to 0.3m

Max Velocity is between 1.0 to 2.0m/s

**0.1% AEP (1 in 1000 year) event:**

Proportion is 15.5%

Max Depth is between 0.15 to 0.3m

Max Velocity is between 1.0 to 2.0m/s

**Flood characteristics:**

Within the site, flow paths are present in the 3.3% AEP, 1% AEP, and 0.1% AEP events, however some of the extents can be attributed to the unnamed ordinary watercourses, Wash Brook and River Sence. The remaining flow paths are directed into the watercourses throughout the site.

In the 3.3% AEP event, the majority of flow paths are associated with the watercourses, with three flow paths forming in the central-eastern area of the site, directed to the River Sence. In these flow paths, depths do not exceed 0.15m but maximum velocities are between 1.0 to 2.0m/s. This produces a hazard rating of 'Caution'.

In the 1% AEP event, the majority of flow paths are again associated with the watercourses. There are four flow paths in the central-eastern area flowing into the River Sence, a flow path associated with the ordinary watercourse along the south-eastern boundary, a flow path along the north-western boundary, and two in the south-western area of the site. Maximum depths are between 0.15 to 0.3m in the north-western flow path, with maximum velocities between 1.0 to 2.0m/s with an overall hazard rating of 'Caution'. There are isolated areas within the watercourses themselves where hazard is higher, reaching 'Danger for most'.

In the 0.1% AEP event, the extent of surface water flooding expands considerably, particularly in the east of the site. Flow paths are predominantly within the eastern areas of the site with ten flow paths and

	<p>multiple instances of ponding, all of which are directed to the River Sence. The majority of the new areas of flooding are very shallow, however. In the western area, there are flow paths that feed into the ordinary water courses with the larger flow paths is the south-western area near Glen Gorse and along the lower south-western boundary. Maximum depths are between 0.15 to 0.3m in the flow paths in the south-eastern, north-western, and the central-eastern areas of the site. Maximum velocities are between 1.0 to 2.0m/s in all flow paths, which produces a predominant hazard rating of 'Caution' though the flow paths with maximum depths have a rating of 'Danger to Some'. Within the watercourses themselves (Wash Brook and River Sence), hazard is predominantly 'Danger for Most'.</p> <p>Detailed surface water modelling will be required as part of a site-specific flood risk assessment to confirm the risk to the site.</p>
<p>Surface water plus climate change</p>	<p><b>Available data and mapping:</b></p> <p>The EA's Risk of Flooding from Surface Water dataset for the 3.3% and 1% AEP events with both upper and central climate change scenarios.</p> <p><b>Management Catchment:</b></p> <p>The site is located within the Soar Management Catchment. The EA guidance recommends that the Upper End allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch, unless the allowance for the 2050's epoch is higher, in which case this should be used. This is appropriate for development with a lifetime beyond 2100. The recommended uplift on peak rainfall intensity for the 3.3% AEP central and upper estimates are 25% and 35%, and 25% and 40% for the 1% AEP event.</p> <p><b>Flood characteristics:</b></p> <p>The design event for rainfall intensities is the 1% AEP event with upper end climate allowance for the 2070s epoch, as such the event is the 1% AEP + 40% climate change allowance. The extent of the design event slightly exceeds the present day 0.1% AEP event, with maximum depths of 0.5m</p>

	(of depths not associated with the watercourses), as such the site is shown to be very sensitive to increased flood risk from surface water due to climate change.
<b>Reservoir</b>	The site is not located in a Wet or Dry day reservoir flooding extent, according to the EA's reservoir flood mapping.
<b>Groundwater</b>	<p><b>Available data and mapping:</b></p> <p>The JBA Groundwater Flood Data Map (GW5) is provided as a 5m resolution grid.</p> <p><b>Flood characteristics:</b></p> <p>The JBA Groundwater Flood Emergence Mapping (5m resolution) shows that the majority of the site is at low risk from groundwater emergence. As such the area is deemed to have negligible risk from groundwater flooding due to the nature of the geological deposits.</p> <p>However, in the central and north-eastern areas of the site where there are pockets of varying risk of ground water in all risk categories, where the predominant groundwater levels are between 0.5m to 5m below the grounds surface. A site-specific investigation should be undertaken to confirm the risk of emergence to the site within these areas.</p>
<b>Sewers</b>	There is no available sewer flood data for the site. The site is located in the Wigston wastewater catchment and has not been identified to be an area of concern in Severn Trent Water's Drainage Water Management Plan.
<b>Flood history</b>	The Environment Agency's historic flooding and record flood outlines datasets shows no record of flooding within or around the site boundary. Leicestershire County Council (as the LLFA) also hold no records of flooding in this area.

### Flood risk management infrastructure

<b>Existing defences</b>	The Environment Agency AIMS dataset indicates there are no formal defences at or near the site.
<b>Potential defences</b>	There are no potential defences in or near the site.

<b>Residual risk</b>	There are no residual risks to the site from reservoir extents, nor are there known culverts which could pose a risk from blockages.
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**Emergency planning**

<b>Flood warning</b>	The east of the site is within the River Sence in Leicestershire (034WAF401) Flood Alert Area, and the River Sence at Great Glen (034FWFGREATGLEN) Flood Warning Area.
<b>Access and egress</b>	<p>Access and egress to the site is through the use of Glen Rise, London Road, Stretton Hall Drive, and Chestnut Drive in the south/south-eastern area of the site, and Gartree Road to the north.</p> <p>Access and egress are maintained throughout the site in the 3.3% AEP and 1% AEP surface water events.</p> <p>In the 1% AEP plus 40% climate change allowance event (the design event) and 0.1% AEP event, access and egress through the majority of the site is maintained due to the shallow depths of the flow paths, and access to and from the southern area of the site is maintained through London Road onto the A6 eastwards and westwards. Access from the north of the site will likely be impeded due to extents on the Gartree Road, particularly at the single-track bridge over the River Sence with a hazard rating of 'Danger to All'. There are also extents along Gartree Road from the watercourse in the north-western area of the site which have a hazard rating of 'Danger to Most'.</p> <p>Arrangements for safe access and egress will need to be demonstrated for the 1% AEP plus an allowance for climate change rainfall events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Any raising of access routes should not impede surface water flows or contribute to increasing flood risk off-site. If detailed modelling suggests that the site is at significant risk of flooding which affects access routes, a Flood Warning and Evacuation Plan will be required.</p> <p>It is likely that the infrastructure of Gartree Road will need to be upgraded to accommodate safe access and egress. Additionally, road infrastructure within the site should also account for crossing points for the Wash Brook,</p>

	<p>River Sence and other unnamed watercourses within the site. Surface water mapping does not include infrastructure such as bridges and culverts within its extents, and a detailed site-specific flood risk assessment should be conducted to assess actual risk to the site in a post development scenario.</p>
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### Requirements for drainage control and impact mitigation

<p><b>Broad-scale assessment of possible SuDS</b></p>	<p><b>Geology and Soils</b></p> <ul style="list-style-type: none"> <li>• The geology consists of:             <ul style="list-style-type: none"> <li>○ Bedrock geology at the site is comprised of Lias Group rock consisting of mudstone, siltstone, limestone, and sandstone.</li> <li>○ Superficial geology at the site is comprised of till.</li> </ul> </li> <li>• The soil is comprised of predominantly slowly permeable, seasonally wet, slightly acidic but base rich loamy and clayey soils for the north-western, western and southern areas of the site. The remainder of the site is comprised of slightly acidic loamy and clayey soils with impeded drainage.</li> </ul> <p><b>SuDS</b></p> <ul style="list-style-type: none"> <li>• The majority of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. However, the north-eastern area of the site has variable groundwater emergence risk and the actual risk to the site should be confirmed through additional site investigation work</li> <li>• BGS Data suggests that the underlying geology is likely to have variable permeability and should be confirmed through infiltration testing. Offsite Discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff.</li> <li>• The site is not within a Groundwater Source Protection Zone and there are no known areas of historic landfill within the site.</li> <li>• The site is within a Nitrate Vulnerability Zone, and a Secondary (undifferentiated) Superficial Aquifer Designation Zone. As such,</li> </ul>
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	<p>infiltration techniques may not be appropriate at the site to preserve water quality.</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>
<p><b>Opportunities for wider sustainability benefits and integrated flood risk management</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.</li> <li>• 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 &gt;5%, features should follow contours or utilise check dams to slow flows.</li> <li>• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3% AEP, 1% AEP, 1% + 40% climate change, 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.</li> <li>• Development at this site should not increase flood risk either on or off site. In particular, careful consideration will need to be given to</li> </ul>

	<p>the Wash brook, and opportunities sought to provide betterment and reduce flood risk downstream. This could be in the form of oversized SuDS or creating areas of flood storage.</p> <ul style="list-style-type: none"> <li>Existing watercourses on the site should form the backbone of any SuDS proposal and be integrated into blue-green infrastructure. SuDS should be designed in line with <a href="#">Leicestershire County Council's SuDS Guidance</a>.</li> </ul>
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### NPPF and planning implications

<p><b>Exception Test requirements</b></p> <p><b>(Local Authority Considerations)</b></p>	<p>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.</p> <p>As the site is partially within Flood Zone 3 and Flood Zone 2, classified as 'More Vulnerable' and has some surface water flood risk, the Exception Test is required for this site.</p> <p>There are surface water flooding issues within the site, although the majority of the site is low risk. The councils will need to ensure that any development proposal considers the risk carefully against the benefits of developing the site. A surface water drainage plan should be adopted to ensure the development can be made safe for its lifetime.</p>
<p><b>Requirements and guidance for site-specific Flood Risk Assessment</b></p> <p><b>(Developer considerations)</b></p>	<p><b>Flood Risk Assessment:</b></p> <p>Section 2 of the Oadby and Wigston Level 2 SFRA and Sections 2 and 3 of the Oadby and Wiggston Level 1 SFRA have more guidance on this section and any relevant policies and information applicable to development within Oadby and Wigston and/or Harborough District.</p> <ul style="list-style-type: none"> <li>A detailed Flood Risk Assessment should be undertaken at the planning stage including detailed modelling of the ordinary watercourses, including the Wash Brook and River Sence to confirm the risk to the site. All sources of flooding should be considered as part of a site-specific Flood Risk Assessment and ensure that the flood risk is minimised and mitigated.</li> <li>Consultation with Oadby and Wigston Borough Council, Harborough District Council, Leicestershire County Council (LLFA), Severn Trent</li> </ul>

Water, and the Environment Agency should be undertaken at an early stage.

- Developers should consult with Severn Trent Water to ensure that the development aims to help achieve the targets of the Drainage and Wastewater Management Plan.
- Development within 20m of a watercourse or flood defence will require specific planning permissions.
- Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Oadby and Wigston Borough Council's Local Plan Policies; Harborough District Council's Local Plan Policies; and Sustainable Drainage Systems developers.
- Development plans should use the Level 1 and 2 SFRAs for Oadby and Wigston, and Harborough, as well as the Local Flood Risk Management Strategies to identify cumulative flood risk issues. It should also promote an integrated approach to water management. Drainage should be designed and implemented in ways that promote multiple benefits. Leicestershire County Council (as the LLFA) should review the strategies. The CIA identifies this site to be in a catchment at high sensitivity to increased risk as a result of development.

**Guidance for site design and making development safe:**

- The developer will need to show, through an FRA and Surface Water Drainage Strategy, 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).
- Should built development be proposed within the 1% AEP surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.

- 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 do not exceed greenfield rates. According to Severn Trent Water's DWMP, surface water is expected to be discharged to the watercourses. The ordinary watercourses on site should be integrated into SUDS/blue-green infrastructure. Particular consideration should be given to the Wash Brook, where there are known downstream flooding issues. Opportunities should be sought to provide betterment as part of the development through measures such as flood storage and oversized SuDS.
- Arrangements for safe access and egress will need to be demonstrated for the 1% AEP surface water event including an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
- Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere. If the floor levels cannot be raised to meet the minimum requirements, developers will need to:
  - raise them as much as possible.
  - consider moving vulnerable uses to upper floors.
  - include extra flood resistance and resilience measures.
- Other examples of flood resistance and resilience measures include:
  - using flood resistant materials that have low permeability to at least 600mm above the estimated flood level.
  - making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level.

	<ul style="list-style-type: none"> <li>○ by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level.</li> <li>● The scale of development in this catchment is likely to require upgrades of the water supply network infrastructure. It is recommended that the Developer and the Local Planning Authorities liaise with Severn Trent Water at the earliest opportunity to agree a housing phasing plan.</li> </ul>
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### Key messages

The site is most affected by the 1% AEP plus 40% climate change and 0.1% AEP surface water events where the majority of flow paths are shallow but moderately fast moving. Parts of the site are also within Flood Zones 2 and 3 therefore the Exception Test is required for the site. The majority of the site however remains low risk and development is likely to be able to proceed if:

- The Exception Test shall be undertaken and passed.
- A site-specific Flood Risk Assessment demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change. This will be informed by detailed fluvial and surface water modelling, and investigation of any interaction with the unnamed ordinary watercourses, Wash Brook and River Sence to show 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 off site.
- Safe access and egress to all areas of the site must be demonstrated during the 1% AEP + 40% climate change surface water event. If there are significant issues, a Flood Warning and Evacuation Plan should be prepared which considers the likely onset and duration of flooding during a breach scenario and demonstrates how residents can safely be evacuated and/or shelter safely in situ during the fluvial and surface water design events.
- It is likely that the infrastructure of Gartree Road will need to be upgraded to accommodate safe access and egress. Additionally, road infrastructure within the site should also account for crossing points for the Wash Brook, River Sence and other unnamed watercourses within the site. Surface water mapping does not include infrastructure such as bridges and culverts within its extents, and a detailed site-specific flood risk assessment should be conducted to assess actual risk to the site in a post development scenario.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling (as above), with development to

be steered away from the areas identified to be at highest risk of surface water flooding within the site. It is essential that this demonstrates that there will be no increase in risk off-site, particularly along the Wash Brook where there are known flooding issues, and that it strives to take opportunities to provide betterment off site through measures such as flood-storage and oversized SuDS.

### Mapping information

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

<b>Flood Zones</b>	Flood Zones 2 and 3 have been taken from the EA’s Flood Map for Planning mapping.
<b>Climate change</b>	The latest climate change allowances (updated May 2022) have been applied to the EA’s RoFSW dataset.
<b>Surface water</b>	The EA’s Risk of Flooding from Surface Water (RoFSW) map has been used to define areas at risk from surface water flooding.
<b>Surface water depth, velocity and hazard mapping</b>	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, which have been uplifted for climate change.