

Level 2 Strategic Flood Risk Assessment – Site LPR205

Final Report

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Prepared for:
Hinckley and Bosworth Borough Council

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Site LPR205. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Hinckley and Bosworth Level 1 SFRA and read the Hinckley and Bosworth Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land to the north of Thurlaston Lane, Earl Shilton, located between Leicester Road and Clickers Way (A47)
- Site area: 37.94ha
- Existing site use: Greenfield
- Proposed site use: Residential

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The LiDAR shows that the site is largely on lower ground, with elevated terrain being concentrated in the south of the site. Ground elevations slope downhill from south to north. The minimum elevation is 82.5mAOD at the northeastern boundary, and the maximum elevation is 105.4mAOD near the southern boundary of the site.

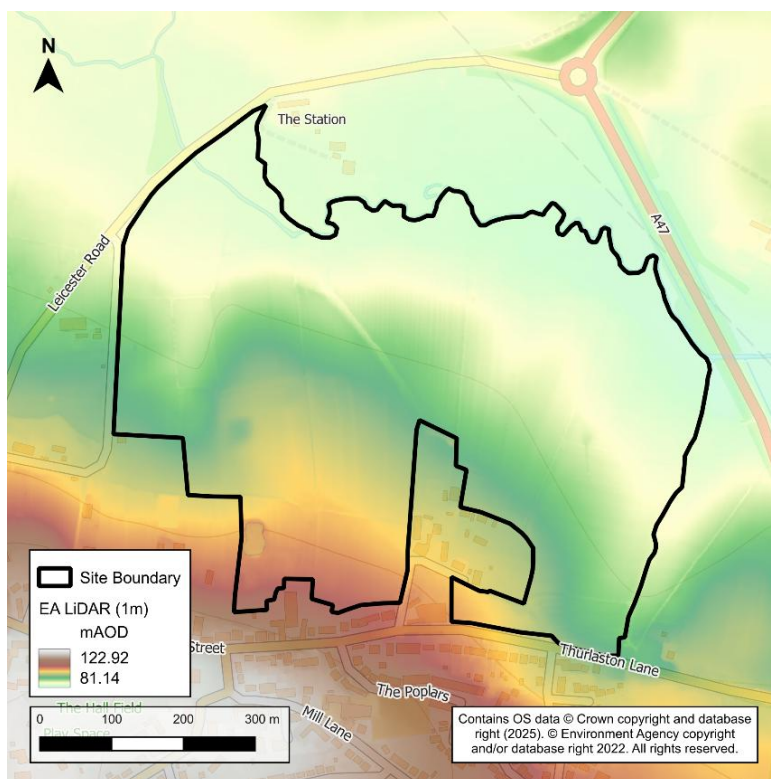


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: Gunthorpe Member Mudstone
- Superficial deposits:
 - The majority of the site does not have any available information on the superficial geology.
 - There is an area of River Terrace Deposits, comprising sand and gravel, located in the centre of the site.
 - There is an area of Alluvium, comprising clay, silt, sand and gravel, which is located in the north of the site along the path of the watercourse.

Soils at the site consist of:

- Slightly acid loamy and clayey soils with impeded drainage across most of the site.
- Freely draining slightly acid loamy soils located in the south of the site.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is within the downstream end of the Thurlaston Brook Catchment (Tributary of Soar), which drains an area of 65.4km². Thurlaston Brooks bisects the northwest corner of the site and then runs along the northern boundary. The catchment upstream of the site is predominantly rural, but contains several small settlements including Newbold Verdon, Brascote, Peckleton, and Kirkby Mallory.

2.2 Existing drainage features

Thurlaston Brook enters the site via a culvert under Leicester Road. The Brook then flows in a southeasterly direction through the northwest corner of the site and along the northern site boundary, before leaving the site where it is culverted beneath the A47. Online mapping shows the presence of a small pond located near the southern border of the site.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment to inform Flood Zones 2 and 3a. Flood Zone 3b has been defined using the EA's Rivers and Sea 3.3% AEP defended flood risk extent.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment.

2.3.2 Description of risk to the site

Most of the site is shown to not be at fluvial flood risk.

Flood Zone 2, Flood Zone 3a and Flood Zone 3b are shown to follow the path of Thurlaston Brook through the northern end of the site, near the site boundary. The topography of the site means that fluvial risk is confined to the low-lying areas along the banks of the watercourse.

Flood Zones 2, 3a, and 3b demonstrate similar extents, except in the northwest corner of the site. In Flood Zone 3b, the flood risk is confined to the channel of Thurlaston Brook, whereas the Flood Zone 3a and Flood Zone 2 extents are wider, particularly on the left bank of the watercourse. The extents are shown to widen at the northeastern corner of the site at the A47, where the watercourse exits the site and flow is restricted as it runs under the road through a culvert.

Table 2-1: Existing fluvial flood risk based on EA FMfP *.

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
86.0	2.7	2.6	8.7

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, excluding the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 does not include the Flood Zone 3 percentage.*

2.4 Surface water

2.4.1 Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

2.4.2 Description of risk to the site

The RoFSW mapping indicates that the majority of the site is not at risk from surface water flooding. In the 3.3% AEP event a couple of small areas of ponding develop in the western side of the site. These slightly increase in extent in the 1% AEP event with new areas of ponding in the east of the site. In the 0.1% AEP a couple of small flow paths develop in the western side of the site. Depths on the site mostly remain below 0.2m and are classified as 'Very Low Hazard'.

Table 2-2: Existing surface water flood risk based on the RoFSW map.

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	<1	<1	1.4
Maximum depth (m)	Exceeds 0.2m but does not exceed 0.3m	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.6m but does not exceed 0.9m
Maximum velocity (m/s)	Less than 0.25m/s	Exceeds 0.5m/s but does not exceed 1.0m/s	Exceeds 1.0m/s but does not exceed 2.0m/s
Maximum hazard classification	Danger for Some	Danger for Most	Danger for Most

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, excluding the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP does not include the 3.3% AEP percentage).*

2.5 Reservoir

The northern end of the site is at reservoir flood risk from Mallory Park Large Lake reservoir.

In the 'Dry Day' extent the reservoir affects the northern end of the site extending approximately 200m into the site. In the 'Wet Day' extent the flood extent still only impacts

the northern end of the site, but extends further into the site than in the Dry Day scenario. The 'Wet Day' extent is larger than the Flood Zone 2 fluvial extent.

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.

2.6 Groundwater

The JBA Groundwater Emergence Map shows that the majority of the site is shown to be at negligible risk of groundwater emergence due to the nature of the local geological deposits.

There is an area in the centre of the site where groundwater levels are between 0.5m and 5m below the ground surface, this is where the area the superficial deposits of River Terrace Deposits is located. In this area there is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.

There is a small area in the south of the site where groundwater levels are between 0.025m and 0.5m below the ground surface. Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow in a northerly direction through the site.

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.

2.7 Sewers

Severn Trent Water were consulted as part of the Regulation 18 process and each of the Strategic Housing and Employment Land Availability Assessment reports to provide comments on known issues of sewer flooding within or surrounding the site. There is some model predicted flooding in the network downstream of the site. The size of site is also likely to have an adverse impact on the downstream sewer network. Therefore, Severn Trent Water should be consulted at an early stage to discuss the drainage requirements for the site.

This assessment does not negate the requirement that drainage at the site should be in line with the drainage hierarchy (see Section 6.1).

2.8 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Information provided by Leicestershire County Council shows no recorded flood incidents on or surrounding the site.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 4.6 of the Hinckley and Bosworth Level 2 SFRA report for information on climate change allowances.

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 escape must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

The EA's FMfP Flood Zones plus Climate Change layer has been used to indicate areas of the site likely to be at increased flood risk in future.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment including modelling of the latest climate change uplifts.

3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer is similar to the present day Flood Zone 2 extent, with a slight increase in flood extent along Thurlaston Brook, extending further south into the site. No new areas of flooding are identified between the present day and climate change scenarios.

3.2 Surface water

3.2.1 Available data

In the absence of suitable climate change data, the 0.1% AEP extent from the EA's RoFSW mapping has been used as a proxy to indicate areas likely to be at risk during the 1% AEP plus climate change event.

3.2.2 Description of risk to the site

The RoFSW mapping shows that the site is slightly sensitive to climate change. The main difference between the 1% and 0.1% AEP events is that the surface water ponding extents increase significantly, particularly near the northwest, southeast and southern boundaries of the site. In the 0.1% new areas of surface water ponding develop in the western side and in the northeastern corner of the site.

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

Thurlaston Brook is culverted where it enters the site beneath Leicester Road and where it exits the site beneath Clickers Way (A47), creating potential residual risk of a blockage resulting in water backing up within the site. The topography of the site means any water is likely to remain confined to the floodplain of the Thurlaston Brook within the northern end of the site.

The site is also at residual risk of reservoir flooding as a result of a breach of Mallory Park Large Lake reservoir.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

5.2 Access and escape

Safe access and escape routes 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 elsewhere on the site and in the wider catchment.

5.2.1 Potential access

The site can be accessed from the west and north via Leicester Road, and from the south via Church Street/Thurlaston Lane and Nock Verges, which is accessible from Church Street. There is also potential access from Clickers Way to the east.

5.2.2 Fluvial

Fluvial risk is shown to impact Leicester Road to the west of the site, where it crosses Thurlaston Brook, which may impede this road being used to travel between the northern and southern parcels. However, the A47 to the east of the site is likely to remain free from risk, as the fluvial risk shown along this road is unlikely to be representative of reality as the A47 is raised approximately 2m higher than the level of the Brook.

However, all other access and escape routes are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset. Therefore, safe access and escape is likely to be maintained.

5.2.3 Surface water

In the 3.3% and 1% AEP events the roads surrounding the site are not shown to be at surface water risk and safe access and escape should be possible from all routes.

During the 0.1% AEP event, there are areas of surface water risk which develop along Leicester Road, Church Street and Clickers Way however depths largely remain below 0.2m, with velocities below 2.0m/s, and hazard classification of 'Very Low Hazard'. Therefore, these areas are unlikely to impede access and escape.

5.3 Dry islands

The site is not located on a dry island.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the [National standards for SuDS \(gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/614222/national_standards_for_suds.pdf). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.

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.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- Groundwater levels are indicated to be at least 5m below ground level across most of the site 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 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.

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 (see Section 2.7).

Thurlaston Brook should be integrated into the site drainage strategy as blue-green infrastructure.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the 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.
- 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 Thurlaston Brook and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. Thurlaston Brook is considered to be of poor ecological status.

7 NPPF and planning implications

7.1 Exception Test requirements

The Local Planning 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'.

Should 'More Vulnerable' development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. 'More Vulnerable' development will not be permitted within Flood Zone 3b.

7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site is:

- in Flood Zones 2, 3a, and 3b
- greater than 1 hectare
- at risk of flooding from surface water and reservoir
- identified as being at increased flood risk in future.

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 EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Hinckley and Bosworth Local Plan Policies.

The development should be designed with mitigation measures in place where required.

7.3 Guidance for site design and making development safe

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk in the northern low-lying area surrounding Thurlaston Brook. Developers should consider utilising this northern area of the site as a green corridor or as a location for SuDS.

A detailed hydraulic model of Thurlaston Brook may be required at FRA stage to accurately represent the risk from this watercourse. Detailed survey of the culverts upstream and downstream of the site is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.

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, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial and surface 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 escape 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.

If proposed works affect an ordinary watercourse, Leicestershire County Council as the Lead Local Flood Authority should be contacted respectively to obtain prior written consent. Any watercourses should be accommodated within the site layout and should not be culverted except for where access is required. The site layout should allow for access to any watercourse for maintenance and they should generally be located within publicly accessible areas. A buffer of at least 8 metres should be maintained between the watercourse and any built development.

8 Conclusions

The site is affected by fluvial and surface water flooding, but the majority of the site is not shown to be at flood risk. The northern end of the site is at risk from fluvial flooding, and is located within Flood Zones 2, 3a, and 3b. Low-lying areas in the northeast of the site alongside Thurlaston Brook are at risk of flooding from this watercourse, represented within the surface water mapping. There are several culverts surrounding the site which present a residual flood risk.

Should 'More Vulnerable' development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. 'More Vulnerable' development will not be permitted within Flood Zone 3b.

A site-specific FRA will be required, because the proposed development site is greater than 1 hectare, in Flood Zones 2, 3a and b, at risk of surface water and reservoir flooding, and identified as being at increased flood risk in the future.

The following points should be considered in development of this site:

- A buffer of at least 8 metres should be maintained between the watercourse and any built development.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk in the northern end of the site. Developers should consider utilising this area as a green corridor or as a location for SuDS.
- A detailed hydraulic model of the Thurlaston Brook may be required at FRA stage to accurately represent the risk from this watercourse. Detailed survey of the culverts within and surrounding the site is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.
- Further assessment of the surface water risk to the sites should be undertaken as part of a site-specific FRA to quantify the volume of surface water risk at the sites and ensure that any modification of ground levels required as part of the site design will not displace surface water and increase flood risk off the sites.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling.
- Flood mitigation measures should be implemented then tested to check that 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).

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