Bassetlaw Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables	

Site details

Site Code	**HS7**
Address	Trinity Farm, North Rd, Retford DN22 8QH. Grid Reference: SK 68540 82789
Area	12.02ha
Current land use	Greenfield
Proposed land use	Residential

Sources of flood risk

Location of the site within the catchment	The site is within the catchment of an unnamed watercourse. The unnamed watercourse rises to the north of Elkesley and flows in a northerly direction to the west of Retford towards its confluence with the River Idle.
Existing drainage features	The north western boundary of the site is bordered by an unnamed tributary of the River Idle. The river is an ordinary watercourse and flows in a northerly direction towards its confluence with the River Idle, approximately 790m east of the site, passing through a railway culvert just upstream of the site. The Chesterfield Canal is located 400m south-west of the site.
Fluvial	**The proportion of site at risk:** **Published Flood Zones** **FZ3b–** 0% **FZ3a–** 10**%** **FZ2–** 11% **FZ1–** 89% **Modelled Flood Extents** **5% AEP-** 11% **1% AEP-** 13% **0.1% AEP -**14% *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%).* *AEP events quoted are based on modelling undertaken for this study, as described below* **Available data:** A 2D generalised model (JFLOW model) has been built to inform flood risk to the Trinity Farm site which takes into account a critical upstream railway culvert. Culvert dimensions have been assumed in the absence of survey or design drawings at this strategic scale. The model extends from (469077, 381181) the privet road bride upstream of the Chesterfield Canal to the confluence with the River Idle (469169, 383329) for the 5%, 1% and 0.1% AEP events to inform the Flood Zones and the three climate change scenarios (+20%, +30% and +50%). **Flood characteristics:** Fluvial flooding impacts a small area of the north and north west of the site from the unnamed watercourse located along the northern site boundary. Flood water in all scenarios is confined to the northern edge of the site. The site access point from Trinity Farm remains unaffected by flooding. In the 5% AEP scenario, flood water is present along the northern boundary of the site. The unnamed watercourse flows through a culvert underneath the railway line before emerging and

	flowing north along the site boundary. Flood water extends along the northern site boundary, with a largest area of flood water present in the northern corner of the site, adjacent the A638 North Road where site levels are lowest. Flood depths in the north western part of the site are shallow and are less than 0.3m. In the north east of the site, in the large area of flood water ponding, flood depths range from 0.1-0.8m. Flood flow velocities on the site are mostly below 0.25m/s. The flood water on the site has a flood hazard rating of 'caution' to 'dangerous for some'. In the 1% AEP scenario, the extent of flood water is not significantly increased, remaining limited to the northern site boundary. Flood water reaches depths of up to 1.1m in the north-eastern corner of the site mostly remains below 0.5m across the rest of the flooded area. Flood velocities are predominantly below 0.25m/s with some localised areas of higher velocities. The flood water on the site has a flood hazard rating of 'caution' to 'dangerous for most'. In the 0.1% AEP flood event, the extent of flood water on the site does not increase significantly. The depth of flood water increases slightly, up to 1.2m in the north east of the site. Across the rest of the flooded area, depths are 0.1-0.7m. Flood velocities increase, between 0.1 and 0.6m/s across the site. Flood water on the site has a flood hazard rating of 'caution' to 'dangerous for most'.
Coastal and Tidal	The site is not at risk of coastal or tidal flooding.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP –** 1% Max depth 0.3m-0.6m Max velocity 0m/s **1% AEP –** 3% Max depth 0.3m-0.6m Max velocity <0.25m/s **0.1% AEP** – 8% Max depth 0.6m-0.9m Max velocity 0.5m/s- 1m/s *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. 1% AEP extent includes the 3.3 % AEP extent)* **Description of surface water flow paths:** Surface water flooding on the site is limited to the north and western boundaries of the site and some ponding in the north east corner. In the 3.3% AEP event, a small area of surface water pooling is modelled along the site's north eastern boundary. Depths range from 0.15-0.3m, with minimal areas reaching up to 0.6m. This area has a flood hazard rating of 'caution' to 'dangerous for some'. In the 1% AEP event, the extent of surface water flooding increases slightly, remaining limited to the north east corner. Depths remain largely below 0.3m, with small areas reaching up to 0.6m in depth. This area has a flood hazard rating of 'caution' to 'dangerous for some'. In the 0.1% AEP event, surface water ponding extent in the north of the site is slightly increased with flood depths of 0.3 to 0.9m. This area has a flood hazard rating of 'caution' to 'dangerous for most'. Surface water ponding is also present along the western boundary of the site however flood depths are shallow and are below 0.3m. These areas have a flood hazard rating of 'caution'.
Reservoir	The northern part of the site and the western boundary is shown to be at risk of reservoir flooding from the available online maps. Flood depths in this area reach up to 2m with flow speeds of up to 2m/s.
Canals	The site is in close proximity to the Chesterfield Canal. If a breach in the Chesterfield canal occurred, flood water could flow towards the site. It is recommended that overtopping and breach modelling is carried out to inform a site specific Flood Risk Assessment.
Groundwater	The Environment Agency Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows an area's susceptibility to groundwater flood emergence. The following comments can be made about groundwater flood risk: • The entire site has a <25% susceptibility to groundwater flood emergence from superficial deposits. This assessment does not negate the requirement that an appropriate groundwater regime assessment should be carried out at the site-specific FRA stage.

Sewers	The Level 1 SFRA indicates that 17 incidences of sewer flooding have occurred in the DN22 8 postcode area.
Flood history	The Environment Agency's historic flooding map does not hold a record of flooding at the site. NCC do not have any records of flooding within 100m of the site.
Flood risk management infrastructure	
Defences	This site is not protected by any formal flood defences.
Residual risk	There is no residual risk to the site from flood risk management structures.
Emergency planning	
Flood warning	The site is located in the 'River Idle in Nottinghamshire' flood alert area. The site is not located in an Environment Agency flood warning area.
Access and egress	Access to the site is currently available from Trinity Farm to the south of the site. In terms of fluvial flood risk, the access road from Trinity Farm onto North Road is not at risk of flooding from fluvial sources; therefore, access and egress will not be affected. In terms of surface water flood risk, surface water flooding impacts the north of the site; however, this would not affect access from the south of the site onto North Road.
Dry islands	The site is not located on a dry island.
Climate change	
Implications for the site	Flooding from the unnamed watercourse on the site is not sensitive to climate change. The extent of flood water on the site does not significantly increase between the 1% AEP plus 20%, 30% and 50% scenarios and flood extent remains limited to the northern boundary. Flood depths across all the scenarios increase by approximately 0.1m between the 1% plus 20% AEP event and the 1% plus 50% AEP event. The flood water on the site has a flood hazard rating of 'caution' to 'dangerous for most' in all scenarios. The increase in risk between a 1% and 0.1% AEP surface water flood event suggests that the site has some sensitivity to climate change for surface water flooding. Flood depths on the site are predominantly between 0.3-0.6m, with small areas up to 0.9m in depth. The flow velocities are between 0.25m/s and 1m/s across the site and has a flood hazard rating of 'caution' to 'dangerous for most people'.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• Geology at the site consists of:
	  ○ Bedrock – Chester Formation- Sandstone, Pebbly (Gravelly)
	  ○ Superficial – River terrace deposits, 1 – Sand and Gravel
	• Soils at the site consist of:
	  ○ Naturally wet, very acid sandy and loamy soils
	SuDS
	• The site is considered to have very low susceptibility to groundwater flooding; this should be confirmed through additional site investigation work. Below ground development such as basements may still be susceptible to groundwater flooding.
	• BGS data indicates that the underlying geology is sandstone which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
	• The entire site is mainly located within Groundwater Source Protection Zone 1 (SPZ), and infiltration techniques may not appropriate for anything other than clean roof drainage. If infiltration is proposed for anything other than clean roof drainage, a hydrogeological risk assessment should be undertaken to ensure that the system does not pose an unacceptable risk to the supply source. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.

	• The site is not located within a historic landfill site. • Surface water discharge rates should not exceed the current greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on-site using a combination of permeable surfacing and soft landscaping techniques. • The site is within the Isle of Axholme & North Nottinghamshire Water Level Management Internal Drainage Board district who may have additional requirements regarding discharge rates (directly or indirectly) into their district. The IDB should be consulted during the site's detailed design to establish the Board's requirements and determine whether there will be a need to apply for surface water discharge or ordinary watercourse consents. • The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3, 1 and 0.1% AEP event. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space. Care should be taken to ensure that SuDS is not at risk of being overwhelmed during a surface water flood event. • If it is proposed to discharge runoff to a watercourse or sewer system, the receiving watercourse or asset's condition and capacity should be confirmed through surveys, and the discharge rate agreed with the asset owner.
Opportunities for wider sustainability benefits and integrated flood risk management	• There is an opportunity to create high amenity public open space in the low lying areas in the watercourse floodplain and restore the watercourse to a more natural form. • Implementation of SuDS at the site could provide opportunities to deliver multiple benefits, including volume control, water quality, amenity and biodiversity. This could provide more comprehensive 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. • Site masterplans should be designed to ensure space is made for above-ground SuDS features. • Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, the primary source of runoff and the likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753). • Development at this site should not increase flood risk either on or off-site. The design of the surface water management proposals should consider the impacts of future climate change over the development's projected lifetime.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the sequential test has been carried out. The Sequential Test will need to be passed before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. Part of the site is located in Flood Zone 3 therefore the Exception test will be required.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** • A site-specific Flood Risk Assessment will be required at the planning application stage as the development is more than 1ha in size and part of the site is in Flood Zone 3. • All flooding sources, particularly the risk of fluvial flooding, surface water and the Chesterfield Canal, should be considered part of a site-specific flood risk assessment. • The site-specific FRA should be carried out according to the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance, Bassetlaw Council's Local Plan policies, and the Nottinghamshire County Council Lead Local Flood Authority's Statutory Consultee for Planning Guidance Document. • The development should be designed using a sequential approach. Development should be steered away from fluvial flood risk areas, 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. • Where development cannot be located outside Flood Zone 2, the site should be designed to ensure that mitigation measures are in place to ensure the development does not flood or that ground-level space is used for less vulnerable parts of the development. • It is recommended that overtopping and breach modelling of the Chesterfield Canal is considered as part of a site-specific FRA to establish the residual risk of canal flooding to the development. **Guidance for site design and making development safe:**

- Any proposal should be accompanied by an overall Surface Water Management Masterplan and Strategy (SWMMS) which should cover:
    - How the cumulative effects of potential peak rates and volumes of water from development sites would impact on peak flows, duration of flooding and timing of flood peaks on receiving watercourses. This should be used to develop and implement appropriate drainage sub catchments and specific runoff rate and volume requirements for each phase of the development.
    - The risk of flooding from all sources, including for rainfall events greater than the design standard of the surface water drainage system should be taken into account to ensure there is no flood risk to new properties and that exceedance flows in extreme events are safely routed around those properties.
    - The consideration of how SuDS, natural flood management techniques, green infrastructure and green-blue corridors can be designed into the development master plan to facilitate drainage flood risk management and ensure wider benefits such as biodiversity, amenity, water quality and recreation are realised.
    - Based on the above, a Drainage Phasing Plan should be developed, based on the SuDS train method (considering firstly how water can be infiltrated/stored at a plot level, then conveyed through the site and any regional storage needs at a settlement level).
    - The provision of drainage during the building phase shall be based on the Drainage Phasing Plan to ensure adequate drainage is provided and implemented throughout the development life.
    - The LLFA, Environment Agency and LPA should be consulted during the development of the Surface Water Management Masterplan and Strategy.
- Areas at risk from surface water and watercourse flooding should ideally be integrated into green infrastructure, presenting wider opportunities to improve biodiversity and amenity and climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised. A detailed surface water flooding model using the existing drainage system, topographical and asset survey must be constructed at the FRA stage. This will further determine the risk from surface water flooding and ensure that overland flows do not overwhelm future sustainable drainage features.
- Through an FRA, the developer will need to show that the development users 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 development's lifetime. (Para 048 Flood Risk and Coastal Change PPG)
- Development should be situated outside the area of fluvial flooding. There is an opportunity to create high amenity public open space in the low lying areas in the watercourse floodplain and restore the watercourse to a more natural form.
- Safe access and egress will need to be demonstrated in the 1 in 100 year plus climate change, considering climate change (upper-end scenario), using depth, velocity and hazard outputs. The raising of access routes must not impact surface water flow routes. Consideration should be given to the siting of access points for areas of surface water flood risk.
- As part of the site-specific FRA, surface water flooding risk should be quantified, including a detailed surface water flooding model and the existing drainage system using topographical and asset survey data. To further determine the site's risk and ensure that runoff from the development is not increased by development across any surface water flow routes, a drainage strategy should help inform site layout and design to ensure no increase in runoff beyond current rates. Surface water mitigation measures should be designed for the 1% plus climate change event.
- New development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. This should include an allowance for climate change.
- Surface water should be discharged at the pre-development (greenfield) runoff rate.
- Developers should refer to Nottinghamshire County Council's 'Nottinghamshire County Council's Guidance Note on the Validation Requirements for Planning Applications and the Level 1 SFRA for information on SuDS guidance on the information required by the LLFA from applicants to enable it to respond to planning applications.

Key messages

Part of the site is within Flood Zone 3, therefore the Exception test will need to be applied.

The development is likely to be able to proceed if:

- Development is located outside of areas at risk of flooding.
- Any proposal is accompanied by an overall Surface Water Management Masterplan.
- Space for surface water to be stored on the site is provided, and rainwater harvesting should be considered.
- It is ensured that surface water is discharged at the pre-development greenfield rate.

Mapping Information

Flood Zones	A 2D generalised model (JFLOW model) has been built to inform flood risk to the Trinity Farm site. This takes into account a critical upstream railway culvert.
Climate change	Climate change outputs are based on the 1% AEP fluvial event with 20%, 30% and 50% climate change uplifts applied. Surface water impacts of climate change have been assessed using the 0.1% AEP event as a proxy.
Fluvial depth, velocity and hazard mapping	Depth, velocity and hazard outputs are based on 2D generalised JFLOW modelling.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth and hazard mapping for the 0.1% AEP event is taken from the Environment Agency's Risk of Flooding from Surface Water mapping.