CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**SGS16b**
Address	Land adjacent to A12 Junction 18
Area	22.1ha
Current land use	Farmland/Green space
Proposed land use	Employment
Flood Risk Vulnerability	Less Vulnerable
Sources of flood risk	
Location of the site within the catchment	This site is located to immediately east of the A12 (Chelmsford Bypass) in Chelmsford, south of its junction (J18) with the A414 (Maldon Road). The A414 runs parallel to the northern site boundary. The site is located within the Chelmer Operational Catchment of the Combined Essex Management Catchment. This management catchment is 3,413km^2 and spans the counties of Essex, Suffolk, and a small part of Cambridgeshire. The site is located in the downstream end of the catchment, close to the River Chelmer. Although immediately adjacent to a highly urbanised part of the catchment (Chelmsford City), the site is located in a predominately rural part of the catchment. The Sandon Brook borders the eastern site boundary.
Topography	Environment Agency 1m resolution LiDAR across the site shows that the topography slopes downwards from south west to north east. The south west of the site at lies at a maximum of 28.4mAOD and the north east of the site lies at a minimum of 20.8mAOD.
Existing drainage features	Along the length of the eastern border of the site, Sandon Brook flows from north to south towards its confluence with the River Chelmer, 160m south of the site. LiDAR also shows a series of drainage ditches consistent with arable farming, which route water out of the site.
Critical Drainage Area	The site is not located within a Critical Drainage Area.
Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 13.6%** **FZ2 – 17.3%** **FZ1 – 82.7%** *The Flood Zone values quoted show the percentage 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. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).* **Available data:**

	Flood Zones are determined from the Environment Agency's Flood Map for Planning (FMFP). This represents the undefended scenario. **Flood characteristics:** Flood risk associated with Sandon Brook impacts the length of the eastern border of the site. Flood Zones 2 and 3 encroach a maximum of 174m and 126m respectively into the site at the north eastern corner. To the north east of the site, Flood Zones 2 and 3 only encroach by 41m and 9m respectively. In all modelled scenarios, flooding is limited to the area within Flood Zones, immediately adjacent to the watercourse in the east of the site. Maximum depths outside the main watercourse are up to 0.1m in th3.33% AEP, 0.4m in the 1% AEP and 0.7m in the 1% AEP event. The reminder of the site remains unaffected.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 4.7% Max depth – >1.2m Max velocity –1.0-2.0m/s **1% AEP** – 12.9% Max depth – >1.2m Max velocity – 1.0-2.0m/s **0.1% AEP** – 19.4% Max depth – >1.2m Max velocity – 1.0–2.0m/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. 100-year includes the 30-year %).* The Environment Agency's Risk of Flooding from Surface Water mapping was used in this assessment. **Description of surface water flow paths**: In all events, surface water is channelled by the lower topography of the fluvial watercourse. Sandon Brook flows along the eastern border of the site and is a carrier for most of the surface water. The maximum depth and velocity of this water, for each event, are listed above, and the maximum hazards are 'Danger for Most', 'Danger for All, and 'Danger for All' in the 3.3%, 1%, and 0.1% AEP events respectively. In addition, the north east corner of the site experiences extensive surface water ponding. In the 3.3% AEP event, it encroaches 0.3m into the site and has a maximum depth, velocity, and hazard of <0.25m, 0.25–0.5m/s, and 'Very Low Hazard/Caution'. In the 0.1% AEP event, this extends 190m into the site, and has a maximum depth, velocity, and hazard of 0.3–0.6m, 0.25–0.5m/s, and 'Danger for Some'. Finally, there is isolated minor surface water ponding elsewhere in the site, generally in low spots in the topography, in the 1% and 0.1% AEP events. This is the case in the north-western corner of the site where the ponding reaches a maximum depth, velocity, and hazard of 0.6–0.9m, <0.25m/s, and 'Danger for Most' in the 0.1% AEP event.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, in the Wet Day Scenario the entirety of site is covered by the Hanningfield Raw Water (Northumbrian Water Ltd) flood extent, and encroachment from the east boundary from the Great Sir Hughes (by GHS Farming Ltd) flood extent. In the dry day scenario, Hanningfield Raw Water flood extents cover the entire site, while the Great Sir Hughes flood extents borders the eastern area of the site.

	The risk designation of reservoirs has not yet been determined while the others have been determined to be high risk, therefore, in the very unlikely event that the reservoirs fail, there is be a risk to life.
Groundwater	The JBAs Groundwater Emergence Map, is provided as 5m resolution grid squares. The majority of the site is shown to have negligible risk of groundwater emerging in this area, and any groundwater emergence incidence has a chance of less than 1% annual probability of occurrence. There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location. On the other hand, the north west of the site is shown to have groundwater levels between 0.5m and 5m below the surface. As such, there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. This will need to be assessed further as part of a site-specific flood risk assessment and is likely to require ground investigations to determine the true risk to the site.
Sewers	Sewer flooding records were not available for this assessment. The entirety of Chelmsford is identified as a Flood priority catchment in Anglian Water's Drainage and Wastewater Management Plan (DWMP). Developers should consult Anglian Water as part of any development proposal to ensure development does not exacerbate existing issues and maximise opportunities for development to deliver benefits in line with the long term strategic aims set out in the DWMP.
Flood history	The Environment Agency's Historic Flood Map shows records of flooding on the site, associated with the River Chelmer or Sandon Brook. Essex County Council as LLFA has no records of flooding within the site boundary. The closest incident is over 1km north west on Sandford Mill Lane due to a pump failure.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows there are no formal flood defences in the vicinity of the site. The site does not lie within the Environment Agency's reduction in risk of flooding from rivers and sea dataset. The Margaretting Flood Alleviation Scheme to safeguard the city centre was cancelled in March 2022. The risk from flooding remains. The City Council continues to work with the Environment Agency to supplement existing flood defences and deliver a new series of catchment-based measures under the Chelmsford Flood Resilience Partnership. Developers should consult the Environment Agency to find out whether this site will be affected by this flood alleviation scheme. Sites affected by flood risk should devise an FRA on the basis that existing city centre flood defences are in place and, if sufficiently advanced, the catchment-based measures identified by the Chelmsford Flood Resilience Partnership project. In either scenario a financial contribution to the Chelmsford Flood Resilience Partnership project would be required.
Residual risk	There are no defences in the vicinity of the site, therefore there is no residual risk posed to the site by failure of defences. The residual risk to the site posed by failure of flood defences, including overtopping and breach must be considered in a site-specific Flood Risk Assessment if defences are proposed for the site. Maintenance arrangements (including funding mechanisms) for any proposed defences will need to be demonstrated for the lifetime of development, this will need to include how the existing defences can be improved and fixed.

Emergency planning	
Flood warning	The eastern border of the site, around Sandon Brook is located in an Environment Agency Flood Alert Area. Flood Alert Area: 051WAFEF6D (The River Chelmer from the A138 at Chelmsford to Langford, the River Ter from A120 at Stebbing Green to Boreham, and the brooks around Sandon). The site is not located in an Environment Agency Warning Area.
Access and egress	Existing access and egress to the site is either via the A12 (Chelmsford Bypass), or the A414 (Maldon Road). Access and egress are not impacted in any fluvial event. Access and egress, from the north, are not impacted in the 3.3% AEP surface water event. When approaching from the north, LiDAR shows the A12 sloping downwards towards the underpass beneath the A1060. This location is at surface water flood risk in the in the 1% AEP, 0.1% AEP, and 1% AEP plus climate change events, all impeding private and emergency vehicle access. The maximum depth, hazard and velocity in each event is listed below: 1% AEP – 0.3–0.6m, 0.25–0.5m/s, 'Danger for Some'. 0.1% AEP - 0.9–1.2m, 0.5–1.0m/s, and 'Danger for Most'. 1% AEP plus 40% Climate Change – 0.8m, 1.5m/s, and 'Danger for Most'. Access and egress, from the south, are not impacted in the 3.3% or 1% AEP surface water events. When approaching from the south, the A12 is shown to be at surface water flood risk in the 0.1% AEP, and 1% AEP plus climate change events. The maximum depth, hazard and velocity in each event is listed below, and suggest that emergency vehicle access only may be possible: 0.1% AEP - 0.15–0.3m, 1.0–2.0m/s, and 'Danger for Most'. 1% AEP plus 40% Climate Change – 0.3m, 1.0m/s, and 'Danger for Some'. Arrangements for safe access and egress will need to be demonstrated for 1% AEP plus an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. Given the considerable risk to the site during the breach and surface water scenarios, consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment: Combined Essex Management Catchment** Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. **Fluvial** Sandon Brook (2015) has available climate change outputs for the Central (25%) and Upper End (72%) allowances for the 2080s. The 1% AEP plus Central climate change extents associated with Sandon Brook encroach an additional 5m in the north of the site, and 24m in the south of the site compared with the baseline outputs. The remainder of the site however remains low risk in the future, and the site is generally less sensitive to the impacts of climate change on fluvial risk.

	Surface Water: The latest climate change allowances have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk. The 1% AEP plus 40% climate change corresponds to the 1% AEP upper end allowance for peak rainfall intensity for the 2070s epoch and is therefore the 'design event' scenario. In the 1% AEP plus climate change event the outlines detailed previously are larger and deeper. In the north eastern corner of the site, ponding extends by an additional 98m and reaches a maximum depth, velocity, and hazard of 1.6m, 1.3m/s, and 'Danger to All'. As such, it can be inferred that this site is highly sensitive to surface water climate change. 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 egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	
	• Geology at the site consists of:
	  ○ Bedrock Geology - London Clay Formation - Clay, silt, and sand.
	  ○ Superficial Geology - Head - Clay, silt, sand, and gravel; River Terrace Deposits, 3 - Sand and gravel; and Glaciolacustrine Deposits, Mid Pleistocene - Clay and silt.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
	
	SuDS
	
	• Groundwater levels are indicated to be between 0.5 and 5m below ground level across parts of the site, meaning there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
	• BGS data indicates that the underlying geology is a mixture of clay, silt, sand, and clay which is likely to be with highly variable permeability. This should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	• The site is not located within a Groundwater Source Protection Zone
	• The entire site is located within two Nitrate Vulnerable Zones (2021-2014). These are as follows:
	  ○ Sandings and Chelmsford
	  ○ River Chelmer
	• The entire site is within Drinking Water Safeguard Zone SWSGZ1029
	• The site is not located within a historic landfill 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.
	• The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 1% AEP event. 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.
Opportunities for wider sustainability benefits and integrated flood risk management	• 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. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces, and rainwater harvesting must be considered in the design of the site. • SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual. • 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 receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • 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.
NPPF and planning implications	
Exception Test requirements	The site is classified as less vulnerable and is partially within Flood Zone 2 and 3, therefore the Exception Test is required for this site. Furthermore, the site is at significant risk of surface water flooding.

Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
	• At the planning application stage, a site-specific FRA will be required as the proposed development site is:
	  ○ Greater than one hectare
	  ○ Within Flood Zone 2 and 3
	  ○ At risk of other sources of flooding (surface water, groundwater, and reservoir)
	• All sources of flooding should be considered as part of a site-specific FRA, including consideration of the residual risk from a failure, or overtopping of defences. In particular, the site is identified to be at significant groundwater flood risk and is likely to require ground investigations to determine the true risk to the site.
	• Consultation with Chelmsford City Council, Essex County Council, Anglian Water, and the Environment Agency should be undertaken at an early stage.
	• Any FRA should be carried out in line with the National Planning Policy Framework (NPPF); Flood Risk and Coastal Change Planning Practice Guidance (PPG); and the Council's Local Plan Policy's and SuDS Strategy.
	• The development should be designed with mitigation measures in place where required.
	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). • 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. • Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall 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. Given the significant risk to the site and proximity to the watercourse, a flood warning and evacuation plan should be prepared for the site. See Section 8.6 of the Level 1 SFRA for details of the requirements for plans. • Developers should consult with Chelmsford City Council and the Environment Agency to determine whether any land within the site needs to be safeguarded for improvements to flood defences either as part of the development, or in the future. • Provisions for safe access and egress 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. • Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.

Key messages

The site is within Flood Zone 2 and 3, at significant risk of surface water flooding and is shown to be highly sensitive to increased risk as a result of climate change, therefore the Exception Test will need to be passed before the site can be bought forwards. With regards to the flood risk portion of the Exception Test, development may be able to proceed if:

- Development is steered away from areas of fluvial and surface water flood risk, such as that adjacent to Sandon Brook along the eastern border of the site, are incorporated and considered within the development design.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development steered away from the areas identified to be at risk of surface water flooding across the site.
- Safe access and egress can be demonstrated in the fluvial and surface water 1% AEP plus climate change events. This includes measures to reduce flood risk along these routes such as raising access, but not displacing floodwater elsewhere. Given the significant risk to the site a suitable flood warning and evacuation plan will be required, including consideration of breach scenarios.
- A site-specific FRA demonstrates that site users will be safe throughout the lifetime of the development and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring areas.
- If flood mitigation measures are implemented then they are tested to check 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).

Mapping Information	
The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning, the Environment Agency's Risk of Flooding from Surface Water map and the Environment Agency's River Chelmer model. 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 mapping.
Climate change	The central and upper end allowances were available for the Sandon Brook (2015) hydraulic model to indicate the impacts on fluvial flood risk. The latest climate change allowances (updated May 2022) have also been applied to the Risk of Flooding from Surface Water map to indicate the impact on pluvial flood risk.
Fluvial and tidal extents, depth, velocity and hazard mapping	No baseline modelling is available for Sandon Brook. As such, there us no depth, velocity, and hazard data.
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, 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.