CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables **This Assessment was updated in December 2024**
Site details	
Site Code	**SGS16a**
Address	East Chelmsford Garden Community (Hammonds Farm)
Area	310.44ha (excluding Country Park)
Current land use	Farmland/Green space
Proposed land use	Residential and employment (Garden Community)
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	This site is located immediately east of the A12 (Chelmsford Bypass) in Chelmsford, north of its junction (J18) with the A414 (Maldon Road). As a water compatible use, the Country Park has not been assessed for flood risk, however the proposals include a bridge across the Chelmer approximately 400m east of the A12 and an access road. These are classed as 'essential infrastructure, and are therefore included. 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.
Topography	Environment Agency 1m resolution LiDAR across the site shows that the topography is relatively consistent, but slopes gently downwards towards the north. The south of the site lies at a maximum of 28.7mAOD and the north of the site lies at a minimum of 16.4mAOD.
Existing drainage features	Sandon Brook flows through the site from north to south towards its confluence with the River Chelmer. The area of the site to the east of the Brook is proposed for informal recreation use and/or biodiversity, through which Blake's Stream also flows. LiDAR also shows a network of drainage ditches along various field boundaries, which route water out of the site. In addition, the site lies approximately 310m south of the River Chelmer, which flows west to east at this location. Finally, a small proportion of the site has existing impermeable surfaces, meaning it may be drained by the surface water drainage network.
Critical Drainage Area	The site is not located within a Critical Drainage Area.

Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 7.2%** **FZ2 – 8.6%** **FZ1 – 91.4%** *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:** The proportion of the site at flood risk is determined from the Environment Agency's Flood Map for Planning Flood Zones. 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 206m and 172m respectively into the site at the south eastern corner. To the north east of the site, Flood Zones 2 and 3 only encroach by 17m and 6m respectively. Fluvial modelling extents match the extents of Flood Zones, with the greatest depths present in the immediate vicinity of the channel. Maximum depths outside the main channel reach up to 0.5m in the 3.3% AEP event, up to 0.7m in the 1% AEP event and up to 0.9m in the 0.1% AEP (although depths across much of the flooded area are significantly lower). The remainder of the site remains low risk, and fluvial risk is unlikely to pose a barrier to development provided development is located away from the area within Flood Zones 2 and 3. Flood Zones and fluvial modelling extents are not available for Blakes Stream to the east of the site, however surface water mapping suggests that flood extents from this watercourse are limited. The proposed bridge and access road through the proposed country park lies within Flood Zone 3, and is classified as essential infrastructure, therefore the Exception Test will need to be applied. Developers will need to demonstrate that the bridge and access road will not increase flood risk elsewhere, including consideration of potential blockage of the bridge, or impedance of floodplain flows. Due to the nature of the infrastructure, it will not be possible to construct a crossing outside of Flood Zone 3, so other proposed bridge locations within the country park will be subject to the same considerations. As a navigable watercourse, the proposed bridge should not impede navigation, and developers should consult Essex Waterways for information on the design requirements with regard to navigation.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0.1% Max depth – 0.6m – 0.9m Max velocity – 0.5m/s – 1m/s **1% AEP** – 0.5% Max depth – 0.9m – 1.2m Max velocity – 1m/s – 2m/s **0.1% AEP** – 4.1% Max depth – >1.2m Max velocity – >2m/s *The % Surface Water 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 risk is limited, with flows channelled by the lower topography of the watercourses. 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 Most', and 'Danger for All' in the 3.3%, 1%, and 0.1% AEP events respectively. Risk remains low away from the main watercourse in the 3.3% and 1% AEP events. Furthermore, the 0.1% AEP shows some additional surface water flow paths and isolated ponding across the site. This is often located where there are existing drainage features or spots of low topography. The maximum depth, velocity, and hazard of water in drainage ditches within the site are 0.3–0.6m, 0.5– 1.0m/s, and 'Danger for Most' respectively. Risk away from these areas remains low however.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, in the Wet Day scenario there is a risk of flooding from the Great Sir Hughes (GSH Farming Ltd) and Handley Burns Farm (Private Individual) which follows the upper eastern boundary, and the Hanningfield Raw Water (Northumbrian Water Limited) extents cover the majority of the site with the exception of an area of high ground in the south-western area of the site, and areas east of Sandon Brook. In the Dry Day scenario, Great Sir Hughes and Hanningfield Raw Water and Hanningfield Treated water have extents that follow the eastern boundary where extents are out of bank. The risk designation of Chignal Reservoir 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 may be a risk to life. Consultation with the reservoir owners and the Environment Agency should be sought at an early stage to ensure that residents of the site can be kept safe in the unlikely event of a reservoir breach, which is likely to require suitable arrangements for warning and evacuation.
Groundwater	JBAs Groundwater Emergence Map, is provided as 5m resolution grid squares. The east 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. In the southwest of the site, groundwater levels are 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. Furthermore, the northwest of the site has groundwater levels at or very near the surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. To the east of Sandon Brook, groundwater levels are 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. As this area is proposed for open space/recreation uses this is unlikely to cause a barrier to development. The risk from groundwater should be confirmed and quantified as part of a site-specific flood risk assessment, which is likely to require ground

	investigations. Development should be steered away from areas that are identified as at risk from groundwater flooding (either form groundwater emerging, or due to overland flows where groundwater emerges uphill). In particular subsurface development (e.g. basement dwellings and buildings with deep foundations) should be avoided in areas where groundwater is found to be close to the surface.
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 Lead Local Flood Authority (LLFA) has no records of flooding within the site boundary. The closest incident is approximately 240m to the north east, where in 2009 an incident was recorded to pose risk to life.
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 any future planned or proposed schemes. Whilst the site is downstream of the City Centre, City Centre defences have the potential to impact risk on the site. The developer should devise a Flood Risk Assessment (FRA) for sites affected by flood risk 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	The site is not at residual risk from breach or failure of defences. There is residual risk to the site posed by Chignal Hall Farm Reservoir, described above.
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 Flood Warning Area.
Access and egress	Existing access and egress to the site will primarily be via Hammonds Road off the A414 (Maldon Road). Hammonds Road bisects the site running from south west to north. This road allows access to most of the site.

	When approaching from the south only, access and egress are not impacted in any fluvial flood event. When accessing from the north, Hammonds Road enters Flood Zone 2 and 3 immediately north of the site. Access and egress are not impacted in the 3.3% AEP surface water event. LiDAR shows the A12 sloping downwards towards the underpass beneath the A1060. This location is at surface water flood risk in the 1% AEP, 0.1% AEP, and 1% AEP plus climate change surface water 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'. It important to note for the surface water datasets, that there are significant man-made structures in the vicinity of the site and LiDAR data is unlikely to be representative of structures such as underpasses. As such, surface water flow paths shown at highways or railways where there is an underpass, such as those under the A12, have been excluded from the calculation of maximum depth, velocity, and hazard. The site is currently undeveloped and surface water flows are likely to be affected by the form of any built development and associated drainage features. A site-specific FRA should consider the risk from surface water considering land levels and drainage features associated with the post development scenario, rather than just the currently available results. 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 risk management authorities (RMAs) early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site if safe access/egress routes cannot be provided.
Dry Islands	The site encounters a dry island in the Wet Day Hanningfield Raw Water reservoir flood event.
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 fluvial flood extents associated with Sandon Brook encroach an additional 14m in the north of the site, and 54m in the south of the site. It can be inferred that this site is only slightly sensitive to fluvial climate change, with the majority of the site remaining low risk in future. **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 flow paths and areas inundated are more akin to the 0.1% AEP event described previously, than the 1% AEP. Sandon Brook is the main carrier of surface water, and reaches

	a maximum depth, velocity, and hazard of 1.2m, 0.7m/s, and 'Danger for All'. Furthermore, additional flow paths are present along other drainage features, and there are small areas of surface water ponding. 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, and River Terrace Deposits, 3 - sand and gravel.
	• Soils at the site consist of:
	  ○ Freely draining slightly acid loamy soils
	
	SuDS
	• Groundwater levels are indicated to be at or very near (within 0.025m) ground level in some parts of the site, and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
	• British Geological Survey 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 a 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 0.1% 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	• 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

integrated flood risk management	techniques should be discussed with relevant stakeholders (Local Planning Authority, 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 they 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 the 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 more vulnerable and is partially within Flood Zone 2 and 3, however more vulnerable development is currently proposed in areas outside Flood Zone 2/3. Provided development is not proposed within Flood Zones 2/3 or an area identified as at high risk from other sources of flooding, the Exception Test is not required (although the Sequential Test will still need to be passed). As Essential Infrastructure within Flood Zone 3, the proposed bridge and access road will be subject to the Exception Test. Furthermore the access road and bridge are at risk from surface water flooding. Whilst the Exception Test is only required for sites at risk from fluvial flooding, it is recommended that Chelmsford City Council carefully weigh up the benefits of developing the site against the flood risk. Developers will need to demonstrate through a site-specific flood risk assessment that users of the site will be safe throughout its lifetime.

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
	  ○ 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.
	• Ground investigations are likely to be required to suitably assess the risk posed by groundwater to the site.
	• Consultation with Chelmsford City Council, Essex County Council, Anglian Water, and the Environment Agency should be undertaken at an early stage.
	• Climate Change outputs for the 0.1% AEP event for the Chelmer 2010 model could not be produced for this study. At the time of writing, the Environment Agency are currently undertaking updates to modelling

in this area and developers should consult the Environment Agency to understand the latest available information. If climate change scenarios for the latest allowances for the 0.1% AEP event are not available, developers will need to undertake additional work as part of a site-specific FRA to determine the risk to the site in this scenario.

- 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's SuDS Policy.
- Assessment of surface water risk to the site should be supported by detailed modelling, and consider the post-development site-layout and drainage features as well as the present undeveloped risk.
- Developers will need to demonstrate that the access road and bridge will not increase flood risk elsewhere, including consideration of potential blockage of the access road and bridge, or impedance of floodplain flows.

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 limited 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 if safe access and egress cannot be provided during an extreme event. 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

Part of the site is within Flood Zones 2 and 3, the site is 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 brought forward. With regards to the flood risk portion of the Exception Test, development may be able to proceed if:

- Development is steered away from the areas of fluvial risk along the eastern boundary of the site.

- Existing smaller drainage features on the site are incorporated into a sustainable drainage design for the site and considered within the wider 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, fluvial and groundwater 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 risks to the site, a suitable flood warning and evacuation plan will be required if development is located within areas of risk and/or safe access and egress cannot be provided in an extreme event.
- 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/fluvial flooding on the site and downstream.
- If flood mitigation measures are implemented they must be 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) and clear plans are set out for their operation and maintenance throughout the development lifetime.

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. The River Chelmer (2010) Environment Agency model has been used in this assessment.
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 central and upper end allowances were available for the River Chelmer (2010) 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	Depth, velocity, and hazard data was derived from the Sandon Brook (2015) hydraulic model. Depth, velocity, and hazard data was derived from the River Chelmer (2010) hydraulic model.
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.