CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**SGS16a(N)**
Address	East Chelmsford Garden Community (Hammonds Farm) – Northern site
Area	13.18ha
Current land use	Farmland/Green space
Proposed land use	Employment
Flood Risk Vulnerability	More 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, at its junction with the A131 (Beaulieu Parkway). 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 shows the topography to generally slope downwards towards the south, with the north of the site lying at a maximum of 33.9mAOD and the south of the site lying at a minimum of 18.6mAOD.
Existing drainage features	LiDAR shows two drainage ditches running west to east through the site. These run along the field boundaries within the site. In addition, the site lies approximately 380m north of the River Chelmer, which flows west to east at this location. Finally, some of the site has impermeable surfaces, which 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 – 0%** **FZ2 – 0%** **FZ1 – 100%** *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:** The site does not lie within any flood zones, or within any modelled flood outlines. Flood Zone 2 extents associated with the River Chelmer lie approximately 118m from the southeast of the site. Flood Zones are not available for ordinary watercourses with a catchment area <3km^2. These may still pose a fluvial risk to the site, however the Environment Agency's Risk of Flooding form Surface Water dataset can be used to understand the areas likely to be at risk from these small watercourses. See the Surface Water section below for more detail.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 1.1% Max depth – 0.6m – 0.9m Max velocity – 1m/s – 2m/s **1% AEP** – 3.0% Max depth – 0.9m – 1.2m Max velocity – >2m/s **0.1% AEP** – 9.4% Max depth – >0.9m – 1.2m Max velocity – >2m/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 the 3.3% AEP event, a small surface water flow path bisects the site, flowing from west to east, through the southernmost drainage ditch. Small areas of surface water ponding also occur to the west of this ditch where the topography is lower; however, it is important to note that the majority of flooding remains in bank of the drainage ditches. The maximum depth and velocity are quoted above, and the maximum hazard is 'Danger to Most'. In the 1%AEP event, the southernmost drainage ditch is once again a primary flow path. The maximum depth and velocity of this is noted above, and the maximum hazard is 'Danger for All'. The ponding in the west of the site increases in extent, reaching a maximum depth, velocity, and hazard of 0.15–0.3m, 0.5–1m/s, 'Danger for Most' respectively. Finally, a small area of ponding along the eastern edge encroaches into the site by 11m. This has a maximum depth, velocity, and hazard of 0.15–0.6m, 0.5–1.0m/s, 'Very Low Hazard/Caution'. In the 0.1% AEP event, the existing flow path in the southernmost drainage ditch is exacerbated. The maximum depth and velocity in channel are stated above, and the maximum hazard is 'Danger for All'. The ponding around this ditch extends from west to eastern borders and is approximately 48m on the southern bank. The maximum depth, velocity, and hazard of this ponding is 0.3– 0.6m, 1.0-2.0m/s, and 'Danger for Most'. Furthermore, an additional flow path appears through the northern drainage ditch. This ditch also flows west to east, bisecting the site. The maximum depth, velocity, and hazard of this flow path are <0.15m, 0.25–0.5m/s, and 'Very Low Hazard/Caution'.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, the site is not impacted by the 'Dry Day' scenario.

	In the Wet Day scenario, flood extents from Hanningfield Raw Water (Northumbiran Water Limited) encroach the site along the southern boundary and a third of the way up the eastern boundary. The risk designation of Hanningfield Raw Water has 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 Risk Map, is provided as 5m resolution grid squares. The whole site is shown to have negligible risk of groundwater emergence 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.
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. Essex County Council as LLFA has no records of flooding within the site boundary. All recorded incidences of flooding are over 1km from the site border.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site does not benefit from any flood defences. The closest defence is natural high ground that lines both banks of the River Chelmer. 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. Whilst the site is downstream of the City Centre, City Centre defences have the potential to impact risk on the site. 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	The site is not at residual risk from breach or failure of defences. There is residual risk to a small part of the site posed by Chignal Hall Farm Reservoir, described above.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Alert Area, or an Environment Agency Flood Warning Area. The closest Flood Alert Area is 81m south east, and is detailed below:

	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)
Access and egress	At present, there are no access roads into the site; however, if developed, access to the site would be via the A12 (Chelmsford Bypass), which lines the western border of the site. Access and egress via the A12 are not impacted in any fluvial flood event. Access and egress are not impacted in the 3.3% or 1% AEP surface water events. In the 0.1% AEP and 1% AEP plus climate change events, parts of the roundabout junction between the A12 and A131 are inundated by surface water. However, in both cases, the depth and velocity may still allow access by emergency vehicles. The maximum depth, hazard and velocity in each event is listed below: 0.1% AEP - 0.15–0.3m, 1.0-2.0m/s, and 'Danger for Some'. 1% AEP plus 40% Climate Change – <0.15m, 1.1m/s, and 'Very Low Hazard/Caution'. 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 the site topography and 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 due to surface water, 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 site does not lie within any present day or climate change fluvial model outputs. It is therefore not sensitive to fluvial climate change, although Flood Zone 2 is 100m from the southern site boundary and it is possible that parts of the southern border may be in Flood Zone 2 in the 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. Both the northern and southern drainage features act as surface water flow paths, with the maximum depth, velocity, and hazard of the drains being 0.14m, 0.7m/s, and 'Very Low Hazard/Caution'; and 1.1m, 2.7m/s, and 'Danger for Most' respectively. 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 Glaciolacustrine Deposits, Mid Pleistocene - Clay and silt.
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage
	  ○ Freely draining slightly acid 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 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 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 (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	Although the site is not within Flood Zone 2, it is at significant risk from surface water flooding. Developers will need to demonstrate through a site-specific flood risk assessment that this risk can be safely managed and 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 e.g. surface water
	• 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 any proposed defences.
	• 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 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 Policy's and SuDS Strategy.
	• 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.
	• 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 limited to the pre-existing 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 at risk of surface water flooding and is shown to be highly sensitive to increased risk as a result of climate change. With regards to safely managing flood risk, development is likely to be able to proceed if:

- Development is steered away from areas surface water flood risk and ponding around the existing drainage features and low spots in the topography 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. 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.