CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**SG12**
Address	St Giles Moor Hall Lane
Area	2.89ha
Current land use	Mixed use – Residential and green space.
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	This site is located to the west of Bicknacre, Chelmsford. The site is located along Moor Hall Lane, opposite Priory Fields. 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 at the upstream reaches of an unnamed tributary of Sandon Brook, in a predominately rural part of the catchment.
Topography	Environment Agency 1m resolution LiDAR shows that the site gently slopes downwards from the northwestern corner to the south eastern corner. The maximum elevation in the north west is 49.7mAOD, and the lowest elevations in the south east are 45.5mAOD. In addition, there is a small depression in the centre of the site, towards the eastern border, which is consistent with a small pond or body of water.
Existing drainage features	A small drainage ditch runs along the west and southern boundaries of the site, joining the upstream reaches of an unnamed tributary of Sandon Brook approximately 150m east of the site, which flows southwest to northeast. In addition, some of the site is previously developed, and may be drained by the existing 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 either of the flood zones, or within any modelled flood outlines. Flood Zone 2 extents associated with the unnamed tributary reach approximately 130m from the southeast of the site. Flood Zones are not available for smaller ordinary watercourses with a catchment size below 3km^2, and there may be a risk to the site posed by the drainage ditch to the west and south. The Environment Agency's Risk of Flooding form surface water sources can give an indication of the likely risk from these smaller watercourses. For details, see the 'Surface Water' section below.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 13.2% Max depth – 0.9m – 1.2m Max velocity – 1m/s – 2m/s **1% AEP** – 25.1% Max depth – >1.2m Max velocity – >2m/s **0.1% AEP** – 58.6% Max depth – >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**: The site is at significant risk of surface water flooding in all modelled scenarios. In the 3.3% AEP event, a small surface water flow path bisects the site, flowing from the northwest corner to the southeast corner. The most extreme depths and hazards are found at the south eastern corner where the elevation is lower and water ponds against Moor Hall Lane; however, maximum velocities are found towards the north west of the site where the slope is more extreme. The maximum depth and velocity of this flow path are quote above, and the maximum hazard is 'Danger for Most'. The flow path described above is exacerbated in the 1% AEP event. The maximum depth and velocity are quoted above, and the maximum hazard is 'Danger for Most'. In addition, isolated minor surface water ponding forms in the south of the site, and flow paths along the southern border of the site begin encroaching into the site. The maximum depth, velocity, and hazard here is 0.6–0.9m, 0.5-1.0m/s, and 'Danger for Most'. Again, the surface water flow paths described above expand in the 0.1% AEP event, now affecting over half of the site. The maximum depth and velocity of the surface water flow path bisecting the site are detailed above, and the maximum hazard is 'Danger for All'. The surface water flow path along the south of the site also begins to pond against the road on the eastern border, and has a maximum depth, velocity, and hazard of 0.6–0.9m, 0.5– 1.0m/s, and 'Danger for Most'. An additional surface water flow path flows from midway up the western border of the site to the south eastern corner of the site, also ponding against Moor Hall Farm. The maximum depth, velocity, and hazard of this flow path are 0.3–0.6m, 1.0–2.0m/s, and 'Danger for Most'.

	The site is at significant risk from surface water flooding- whilst the Exception Test is only explicitly required for sites at risk from fluvial/tidal sources, it is recommended that the Council carefully weigh the benefits of development against the risk and review applications carefully to ensure the risk can be safely managed. Surface water modelling will be essential to inform the risk to the site as part of a site-specific Flood Risk assessment.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, the site is not impacted by the 'Dry Day' or 'Wet Day' scenarios.
Groundwater	The JBAs Groundwater Emergence 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. The closest incidences are 160m to the south, and 430m to the southwest. The type of flooding i.e. internal or external is unknown; however, both events are associated with the unnamed tributary.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site does not benefit from any flood defences and there are no defences in the vicinity of the site.
Residual risk	The site is not at residual risk from breach or overtopping of defences.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Alert Area, or an Environment Agency Flood Warning Area. The closest Flood Alert Area is 120m 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	Existing access and egress to the site is currently via Moor Hall Farm. The site has three small roads off Moor Hall Farm that reach different parts of the site. Access and egress are not impacted in any modelled fluvial flood event. In the surface water 3.3%AEP event, the flow path that bisects the site, also crosses Moor Hall Lane from west to east. The maximum depth, velocity, and hazard of this flow path, on the road, are 0.15–0.3m, 0.25–

	0.5m/s, and 'Danger for Some'. As such, access and egress for public and emergency vehicles, in this event, may be impacted. In the surface water 1% AEP, 0.1% AEP, and 1% AEP plus climate change events, the surface water flow path across Moor Hall Farm described above is more significant. As such, access and egress for public and emergency vehicles, is not possible in these events. The maximum depth, hazard and velocity in each event is listed below: 1% AEP - 0.6–0.9m, 1.0–2.0m/s, and 'Danger for Most'. 0.1% AEP - 0.9–1.2m, >2.0m/s, and 'Danger for All'. 1% AEP plus 40% Climate Change – 0.7m, >2.0m/s, and 'Danger for Most'. 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. Access will need to be demonstrated to all developed areas of the sites, considering that a surface water flow bisects the site. 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 if safe access and egress cannot be provided. Any raising of access routes should not impede surface water flows.
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 outputs. It is therefore not sensitive to fluvial climate change from Sandon Brook (although may be sensitive to increased risk form the unnamed ordinary watercourse). **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. The 1% AEP plus climate change event impacts a much larger proportion of the site, including the entire eastern side. The surface water flow path from the northwest to the southeast corner in significantly exacerbated, with a maximum depth and velocity of 1.4m and 2.3m/s. In addition, a surface water flow path flows from midway up the western border of the site to the south eastern corner of the site, also ponding against Moor Hall Farm. The maximum depth, velocity, and hazard of this flow path are 0.45m and 1.4m/s. Maximum hazard at this site, in this event, is 'Danger for All'. 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.
	• Soils at the site consist of:
	  ○ Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey 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 not 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 pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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 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	Although the site is not within Flood Zone 2, it is at significant 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, in particular the significant risk of surface water flooding. This will require site-specific surface water modelling to determine the risk to the site and demonstrate that proposed drainage strategies can safely manage the risk.
	• 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 if access and egress cannot be provided. Raising of access routes should not impede

	surface water flows. 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 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 surface water flood risk, and ponding/flow routes such as that against Moor Hall Farm on the southeastern border are incorporated and considered within a sustainable development drainage design.
- 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 if access/egress cannot be demonstrated.
- 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. This will require site-specific modelling to determine the risk to the site and demonstrate that proposals adequately manage the risk.
- 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	Depth, velocity, and hazard data was derived from the Sandon Brook (2015) 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.