CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**GS1g**
Address	Chelmsford Social Club
Area	0.74ha
Current land use	Chelmsford Social Club
Proposed land use	Residential
Flood Risk Vulnerability	More vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located within the Chelmer Operational Catchment, which drains 657km^2. Within the operational catchment, the site is located on the East of the River Can catchment, which drains 48km^2 of land. This catchment is not designated as artificial or heavily modified. The site is bounded by the River Chelmer to the northeast (flowing in a southeasterly direction), a forested and residential area to the northeast, an industrial area to the southeast and a car park to the southwest. The catchment is predominantly rural, but at the site the River Chelmer has flown through the urban area of Chelmsford City.
Topography	EA LiDAR 1DRM indicates that the site is relatively flat with an average elevation of approximately 23.5mAOD. There is a slight elevation in the southeastern corner of the site to approximately 24.0mAOD.
Existing drainage features	The Environment Agency's Statutory Main River Map indicates that there are no main rivers within the site boundary. The nearest Main River is the River Chelmer, located along the northwestern boundary. There are no Ordinary Watercourses or ditches within the site boundary. The River Chelmer is constrained with development built up almost to the river edge. Parts of the site are already developed and are likely to be drained by the surface water drainage network.
Critical Drainage Area	The site is not in a critical drainage area.
Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 99.5%** **FZ2 – 100%** **FZ1 – 0%** *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%).* **Defended outputs:** **3.3% AEP fluvial event – 66.1%**

	1% AEP fluvial event – 93.0% **0.1% AEP fluvial event – 94.3%** *Modelled results show the percentage of site at risk from a given AEP flood event.* **Available data:** Proportion of the sites at flood risk are determined from the Environment Agency's Flood Map for Planning Flood Zones. This represents the undefended scenario. The EA's Reduction in Risk of Flooding from Rivers and Sea due to Defences dataset extent has been used to assess the area of the site located within this extent, see the 'Defences' section below for more details. The site is located at the very downstream end of the Environment Agency's 2018 River Chelmer Model, and there are considerable uncertainties in the results in the vicinity of this boundary. The Environment Agency's 1D-2D ISIS-TUFLOW detailed hydraulic model for the River Chelmer (2010) has therefore been used within this assessment of fluvial flooding instead, despite being older. It should be noted that the two models do show broadly similar results, particularly in more extreme events. **Flood characteristics:** The site is at significant risk form fluvial flooding in all modelled scenarios, with the majority of the site being within Flood Zone 3. The 3.3% fluvial AEP event shows fluvial flooding across the majority of the site with the exception of the centre of the site and the northeastern corner. The flooding has a maximum depth and velocity of approximately 0.4m and 0.2m/s respectively. The 1% and 0.1% fluvial AEP models predict vast fluvial flooding on the site, with all of the site inundated. The maximum depth and velocity for 1% AEP events are found in the north of the site and are approximately 1.0m and 0.2m/s respectively. The maximum depth and velocity for the 0.1% AEP event are found in the north of the site and measure approximately 1.6m and 0.3m/s respectively. Whilst hazard results are not available for this model, maximum depths and velocities suggest flooding is likely to pose a 'Danger for Most' in the 1% and 0.1% AEP events and a 'Danger for Some' in the 3.3% AEP event. The site is not considered to be at risk from tidal flooding.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 18.5% Max depth – 0.3-0.6m Max velocity – 0.25-0.5m/s **1% AEP** – 53.2% Max depth – 0.9-1.2m Max velocity – 0.5-1.0m/s **0.1% AEP** – 99.8% 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:** The site is at significant risk from surface water sources in all modelled events. For the 3.3% AEP event the extent of surface water flooding is small, with ponding in the southern corner of the site with a maximum depth and velocity of approximately 0.3-0.60m and <0.25m/s respectively. The hazard value for this event is 'Danger for Some'. For the 1% AEP event, a large area of ponding emerges in the north of the site. This has a maximum depth and velocity of approximately 0.3-0.6m and <0.25 m/s respectively. The ponding in the southern corner of the site also increases in extent and the maximum depth and velocity increases to approximately 0.3-0.6m and 0.5-1.0m/s respectively. The maximum hazard value for this event is 'Danger for Most'. For the 0.1% AEP event there is substantial surface water flooding covering the entire site. The majority of the water is ponding, however, the maximum velocity is approximately 1.0-2.0m/s immediately adjacent to the River. The maximum depth is approximately >1.2m and the maximum hazard value for this event is 'Danger for Most'.
Reservoir	According to the Environment Agency's (EA) risk of flooding due to reservoirs dataset, the site is not at risk from reservoir flooding in the Dry Day scenario. In the Wet Day scenario, flood extents from Chignal Hall Fram, Handley Barns Farm (Private Individual), and Mashbury Hall Fram (CJH Framing Ltd) cover the entirety of the site. 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 is a risk to life.
Groundwater	The JBA Groundwater Emergence Map is provided as 5m resolution grid squares. The whole site is shown to have negligible risk of groundwater emergence , and any groundwater emergence incidence has a chance of less than 1% annual probability of occurrence.
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 four records of flooding within 500m of the site. Two incidents were recorded approximately 350m southwest from the southwestern boundary and occurred on the 14/06/2007 and the 7/7/2008, although the source of the flooding is not noted. For the other two historic flood records, the date and source of flooding was not recorded.
Flood risk management infrastructure	

Defences	The Environment Agency AIMS dataset shows no flood defences at this site. However, there is engineered high ground approximately 150m southwest of the southwestern boundary. 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. Whilst there are currently no formal defences within the vicinity of the site, developers should consult with Chelmsford City Council and the Environment Agency to identify whether land within the site boundary may need to be safeguarded for flood defences in future. If defences are proposed as part of the development, maintenance arrangements (including funding mechanisms) for the defences will need to be demonstrated for the lifetime of development.
Residual risk	The natural high ground upstream along the Chelmer Channel is recorded to protect to a 1% AEP flood event, although modelling suggests the standard of protection is lower, with flooding occurring in the 3.3% AEP event. The most recent Visual Asset Inspection (16 April 2023) found that the natural high ground protecting the site was in good condition. 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 to protect the site. Maintenance arrangements (including funding mechanisms) for the 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 entire site is located in both an Environment Agency Alert Warning Area, and an Environment Agency Flood Warning Area. Flood Alert Area: 051WAFEF6BC (the Rivers Wid and Can). Flood Warning Area: 051FWFEF6C1 (Riverside properties on the Rivers Chelmer and Can in Chelmsford).
Access and egress	Access and egress to the site is currently via a small access road off Highbridge Road on the southwestern boundary. Given the significant widespread risk to the site in all modelled fluvial events, access and egress is likely to be impeded in even relatively frequent fluvial events. Access and egress are impacted by the 3.3% surface water AEP event and greater events, as ponding depths reach an approximate maximum depth of 0.3-0.6m. Despite some ponding on the access road, access and egress are unlikely to be impacted in the 3.3% fluvial AEP event because depths are below 0.3m and the velocity is negligible.

	However, access and egress may be severely impacted by fluvial 3.3% plus climate change events and greater with a maximum depth and velocity of approximately 1.4m and 0.3m/s respectively. 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 information. If climate change scenarios for the latest allowances for the 0.1% AEP 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. Arrangements for safe access and egress will need to be demonstrated for 1% AEP plus an appropriate allowance for climate change fluvial and surface water events, using the depth, velocity, and hazard outputs. Given the considerable risk to the site during the surface water and fluvial scenarios, consultation with RMAs early on should be implemented to ensure an appropriate flood warning and 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** The River Chelmer has available climate change outputs for the Central (25%) and Upper End (72%) allowances for the 2080s. In the fluvial 3.3% AEP plus central climate change allowance, there is substantially more fluvial flooding compared to the baseline 3.3% fluvial AEP. The extent of the flooding covers almost the whole site and has a maximum depth and velocity of approximately 0.7m and 0.2m/s respectively, in the north of the site. In the fluvial 3.3% AEP plus upper climate change allowance, the whole site is inundated with a maximum depth and velocity of approximately 1.2m and 0.23m/s respectively, again in the north of the site. The extent, depth and velocity of the 3.3% AEP plus upper climate change allowance is very similar to the present day 1% AEP extent, indicating that the site is very sensitive to increased risk in future due to climate change. 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. **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 design event scenario inundates the whole site with a maximum depth and velocity of approximately 1.7m and 1.2m/s respectively. This classifies the site as a 'Danger for All'. This change in depth and velocity, shows that this site is sensitive to climate change in the surface water events. 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** The bedrock geology of the site is London Clay Formation consisting of clay, silt and sand. The superficial geology is Alluvium consisting of clay, silt, sand and gravel. The site is likely to have loamy and clayey floodplain soil with naturally high groundwater. **SuDS** • The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work. • 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 and there are no restrictions over the use of infiltration techniques with regard to groundwater quality. • The site is not located within a historic landfill site. • It is advisable that attenuation features such as basins, ponds and tanks, are not located on the site, since the whole site is located in Flood Zone 2. This is to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the River Chelmer may be susceptible to surcharging due to water levels in the River Chelmer. • Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the River Chelmer may be susceptible to surcharging due to water levels in the River Chelmer. The impacts of flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls. • 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. • 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. • 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 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. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site. • 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.
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. • 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.
NPPF and planning implications	
Exception Test requirements	The site is classified as more vulnerable and is within Flood Zone 2 and 3, therefore the Exception Test is required for this site. Significant interventions are likely to be required to bring forward such a high risk site.

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:
	  ○ Almost entirely within fluvial Flood Zones 2 and 3
	  ○ At risk of other sources of flooding (surface water 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.
	• 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.
	• 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. **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. • 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 fluvial and 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. Given the proximity to the watercourse and the nature of the risk, significant interventions are likely to be required to safely bring forward such a high risk site and CCC should carefully consider whether wider benefits outweigh the risks, and whether proposals adequately address the flood risk. With regards to the flood risk portion of the Exception Test, development may be able to proceed if:

- Development is steered away from the north of the site at risk of deepest flooding in the 1% and 0.1% fluvial AEP events.
- 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.
- 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). If defences are proposed, plans will need to set out how the defences are to be maintained throughout the lifetime of the development and include an assessment of the risk form breach or overtopping of any proposed defences.

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 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 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.