CC010-A

	Chelmsford City Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables
Site details	
Site Code	**GS1n**
Address	Waterhouse Lane Depot and Nursery Chelmsford
Area	0.85ha
Current land use	Industrial Estate
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 is 657.4km^2. Within the operational catchment, the site is located on the East of the River Can catchment, which drains 48.0km^2 of land. This catchment is not designated as artificial or heavily modified.
Topography	Environment Agency 1m LiDAR shows there is a gentle west to east slope at the site, and so water is likely to flow eastwards across the site. The highest section of the site, located on the western perimeter, is 29.9 mAOD, while the lowest area is on the northeast perimeter at 27.7mAOD. A slight depression appears to exist through the middle of the site, along the current access road. It should be noted that the site lies within the heavily urbanised city centre and LiDAR data may not accurately reflect ground levels due to the presence of tall buildings, which may cause distortions in the dataset. Developers may need to undertake their own topographic survey to determine true site levels.
Existing drainage features	There are no visible drainage features on the site, however the site is previously developed, and is likely to be drained by the existing surface water drainage network. Surface water drains appear to be visible along the access road. The River Can flows 300m to the northwest of the site.
Critical Drainage Area	The site is not located in 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%).* **Defended outputs:** **3.3% AEP fluvial event – 0%**

	1% AEP fluvial event – 0% **0.1% AEP fluvial event – 0%** *Modelled results show the percentage of site at risk from a given AEP flood event.* **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. Therefore, the defended scenario outputs from the Environment Agency's 1D-2D ISIS-TUFLOW River Chelmer (2010) hydraulic model have been reported as a more accurate representation of the flood risk to this site due to the presence of flood defence structures. **Flood characteristics:** The site is not expected to experience fluvial or tidal flooding for any of the AEPs modelled (including and up to the 0.1% AEP event). There is thus considered to be a very low flood risk posed to the site by fluvial or tidal sources. The closest flood warning and flood alert area is 65m north of the site.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0% Max depth – 0m Max velocity – 0m/s **1% AEP** – 4.6% Max depth – 0.3-0.6m Max velocity – 0.5-1m/s **0.1% AEP** – 28.8% Max depth – 0.6-0.9m 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 expected to remain dry under a 3.3% AEP surface water event. During a 1% AEP event, flooding is expected to lower lying areas in the southeast of the site, seemingly travelling from the allotments to the south onto the access track, where a small section reaches a maximum depth of 0.6m, and velocities of up to 1m/s. Under this scenario, a section of the current footprint of the central glasshouse is also expected to be inundated with up to 0.3m depth water. The maximum hazard for this event is "Danger for some". During a 0.1% AEP event, much of the southern and eastern section of the site is expected to experience flooding. Flow routes appear concentrated around the boundary with the allotments to the south, and along the eastern half of the access track, where velocities may reach as high as 2m/s. Under this scenario, the eastern car park is expected to be entirely flooded with up to 0.15m water, and most of the current footprint of the central glasshouse is modelled to be under up to 0.3m of water. A small section of the southwestern corner of the easternmost glasshouse is expected to experience up to 0.9m flooding.

	The highest hazard score for this site, located in the areas of greatest depth, is "Danger for most".
Reservoir	The site is not expected to be at risk from reservoir flooding under either a dry or wet day scenario.
Groundwater	The JBAs Groundwater Flood Risk Map, is provided as 5m resolution grid squares. The whole site is shown to have negligible risk of groundwater flooding in this area, and any groundwater flooding 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 no records of flooding on the site. Similarly, Essex County Council as LLFA has no records of flooding within the site boundary. There is a record of a historic flood within 250m of the site, which occurred in 2007 and affected the property's electrics. The source of flooding in this event is not known.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by formal flood defences along the River Chelmer, and falls outside all modelled undefended flood extents.
Residual risk	The site is not protected by defences or at risk in undefended scenarios, and is therefore not at risk in the event of overtopping/breach. 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. 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.
Emergency planning	
Flood warning	The site is not located within a flood warning or flood alert area.
Access and egress	Access and egress to the site for vehicles and pedestrians is currently only possible via the junction between the access road to the site with Waterhouse Lane (A1016). Access to the site is expected to remain possible for all modelled fluvial AEP events and climate change scenarios.

	During a 3.33% AEP surface water event, vehicular access and egress is unaffected. During a 1% AEP surface water flood, flooding is expected at the current junction between the service road and Waterhouse Lane, with depths of 0.15-0.30m, with flows of 1-2m/s at the entrance. Dry access/egress to the site is thus expected to be significantly impeded under this scenario, and pedestrians and vehicles may face difficulties entering and exiting the site. During the design surface water flood event (1% AEP+40%CC), similar depths and velocities are expected at the junction, with an expanded extent. Similarly dry access will likely not be possible under a 0.1% AEP, with depths of 0.15-0.3m and velocities of 1-2m/s. Arrangements for safe access and egress will need to be demonstrated for the design event (1% AEP plus 40% CC), using the depth, velocity, and hazard outputs. Any raising of access routes should not impede surface water flow routes, or increase flood risk elsewhere.
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. Under all available climate change simulations, the site remained dry for all AEPs, and thus fluvial flooding is expected to remain a very low hazard to the site, even with climate change. **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 surface water 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. Under the design event surface water flood, Waterhouse Lane, eastern car park and current access track running through the site is expected to become inundated, at a far greater spatial extent than the standard 1% AEP. Under this scenario, 26.6% of the site is expected to be affected by flooding, up from 4.6% under the 1% AEP scenario, suggesting the area is relatively sensitive to climate change. Despite this, maximum flood depth and velocity is expected to remain the same under the design event as the current 1% AEP. 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 consisting of clay, silt and sand.
	  ○ Superficial Geology – The site is expected to have sedimentary superficial deposits of Head, which consists of clay, silt, sand and gravel.
	• Soils at the site consist of:
	  ○ Freely draining slightly acid loamy soils.
	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 clay, silt and sand 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.
	• The site is designated in two Nitrate Vulnerable Zones (NVZs)
	  ○ Surface Water - "Surface Water S428 - River Chelmer NVZ"
	  ○ Groundwater - "Groundwater G78 - Sandlings and Chelmsford"
	• The site is also within a Drinking Water Safeguard Zone (SWSGZ1029), meaning it is at risk from nutrients and certain pesticides.
	• 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 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 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.
NPPF and planning implications	
Exception Test requirements	Whilst the Exception Test is only required for sites at risk from fluvial flooding, it is recommended the Chelmsford City Council carefully weigh up the benefits of developing the site against the significant surface water 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	A site-specific Flood Risk Assessment (FRA) is required due to the risk of surface water flooding and the proposed development constituting a change of use to a more vulnerable class (industrial to residential). **Flood Risk Assessment:** • All sources of flooding should be considered as part of a site-specific FRA. • 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. If safe access/egress cannot be provided in the design event, a Flood Warning and evacuation Plan should be prepared if the site is bought forwards. • 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 sensitive to climate change. Development may be able to proceed if:

- Safe access and egress can be demonstrated in the surface water 1% AEP and 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. If safe access and egress cannot be provided, an adequate flood warning and evacuation plan should be prepared.
- Flood vulnerable uses should be steered away from the southern and eastern borders due to risks from surface water flooding. These installations should instead be in the western section of the site to benefit from greater elevation and lower surface water flood risk.
- 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.
- A site-specific FRA demonstrates 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 (2010) 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 River Chelmer (2010) Environment Agency model has been used in this assessment.
Fluvial and tidal extents, depth, velocity and hazard mapping	The central and upper end allowances were available for the River Chelmer (2010) hydraulic model to indicate the impacts on fluvial flood risk.
Surface Water	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.
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.